

QK-A027-plus AISnet Receiver Manual

NMEA 2000 AIS+GPS Receiver with Ethernet Output

Multiplexing Seataalk¹ & NMEA 0183 Input

NMEA 2000/0183/WiFi/USB/Ethernet Output

Built-in NMEA 0183 to NMEA 2000 Converter



Designed in UK



Features

- Two independent receivers monitoring AIS channels (161.975MHz & 162.025MHz) and decoding both channels simultaneously
- Sensitivity up to -112 dBm@30% PER (where A027 is -105dBm)
- Up to 50 nautical miles receiving range
- SeaTalk¹ to NMEA 0183 protocol converter
- NMEA 0183 message output through Ethernet (RJ45 port), WiFi, USB, and NMEA 0183
- Built-in GPS receiver to provide positional data
- Multiplexes NMEA input with AIS+GPS sentences, and outputs as a seamless stream of data
- Converts the combined NMEA 0183 data into NMEA 2000 PGNs
- WiFi can be set up to work in Ad-hoc/station/standby operating modes
- Up to 4 devices can be connected simultaneously to the internal WiFi access point
- Plug & Play connectivity with chart plotters and PCs
- Compatible with Windows, Mac, Linux, Android, and iOS (The configuration tool is a Windows application, therefore a Windows computer is required for the initial configuration)
- The interfaces are compatible with NMEA0183-RS422 devices. For RS232 devices a Protocol Bridge (QK-AS03) is recommended.

Contents

1.	Introduction	3
2.	Mounting	4
3.	Connections	4
3.1.	Status LEDs.....	5
3.2.	Power.....	6
3.3.	VHF/AIS antenna.....	6
3.4.	GPS antenna	7
3.5.	NMEA input and output connection	7
3.5.1.	NMEA 0183 default baud rates	7
3.5.2.	NMEA 0183 wiring - RS422 / RS232?	7
3.6.	SeaTalk ¹ Input	8
3.7.	Ethernet Connection (RJ45 port).....	9
3.8.	NMEA 2000 Port.....	9
3.8.1.	Conversion Lists	9
3.9.	WiFi connection	10
3.9.1.	WiFi Ad-hoc mode connection.....	11
3.10.	USB connection	11
3.10.1.	Will you need a driver to connect via USB?	11
3.10.2.	Checking the USB connection (Windows).....	12
4.	Configuration (via USB)	13
4.1.	Configuring Baud Rates	14
4.2.	WiFi - Station mode	14
4.3.	WiFi – Standby/Disable	15
4.4.	Filtering	15
4.4.1.	Configuring filters.....	16
4.4.2.	Routing data away from chosen outputs	16
4.5.	Ethernet Settings	16
4.6.	USB - Monitoring NMEA Messages	16
5.	Upgrading firmware.....	17
6.	Specification.....	17
7.	Limited Warranty and Notices.....	18
8.	Disclaimer	18
9.	Document History	18
10.	Glossary	18
11.	For more info... ..	18

1. Introduction

The A027+ is a commercial level AIS/GPS receiver with multiple routing functions. Data is generated from the built-in AIS and GPS receivers. The NMEA 0183 and Seataalk¹ inputs are combined by the multiplexer and forwarded to the WiFi, Ethernet (RJ45 port), USB, NMEA0183, and N2K outputs. Whether you are using a tablet, a mobile phone, or an onboard computer, you can easily connect the device to your on-board navigation system. The A027+ can also be used as an AIS shore station which can receive and transfer AIS data to a remote server via the internet by government bodies.

The A027+ comes with a standard RS422 NMEA 0183 input. NMEA sentences from another on-board device, such as a wind sensor, depth transducer or radar, can be combined with other navigation data by the A027+.

The internal SeaTalk¹ converter allows the A027+ to convert data received from the SeaTalk¹ bus to NMEA messages. These messages can be combined with other NMEA data and sent to the relevant outputs.

The A027+ features an integrated GPS module, which provides GPS data to all outputs. when an external GPS antenna (with TNC connector) is connected to it.

The A027+'s built-in NMEA 2000 converter offers the option to connect it and send navigation data to the NMEA2000 network. This is a one-way interface, meaning the combined GPS, AIS, NMEA0183 and SeaTalk data is converted to NMEA 2000 PGNs and sent to the N2K network. Please be aware of that the A027+ cannot read data from the NMEA2000 network.

When connected to a chart plotter or on-board PC running compatible software, the AIS data transmitted from ships within range will be displayed on the screen, enabling the skipper or navigator to visualize the traffic within VHF range. The A027+ can enhance safety at sea by providing proximity, speed, size, and directional information of other vessels, improve safety and efficiency in navigation and help protect the marine environment.

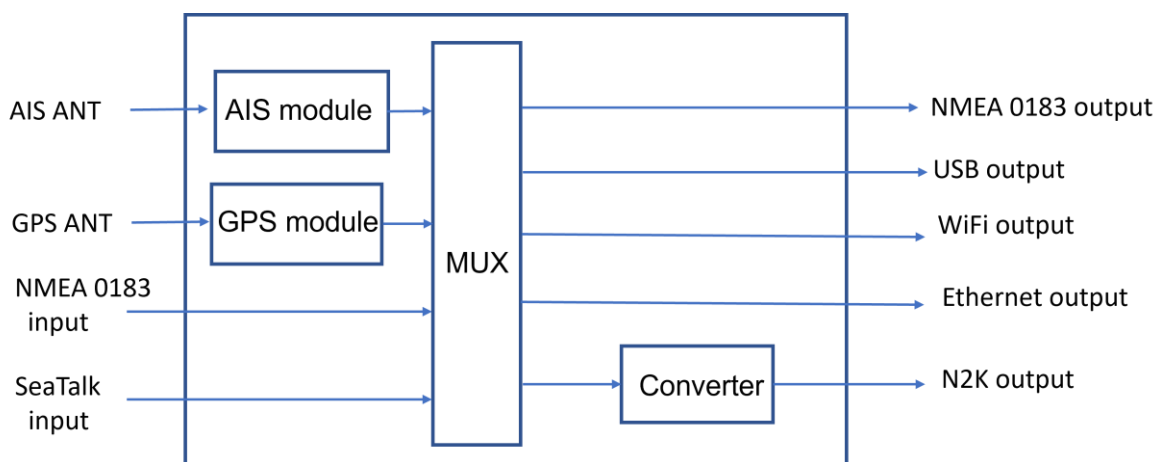


Figure 1: A027+ function diagram

The A027+ is classed as a commercial grade AIS receiver as it offers more enhanced functions such as the Ethernet and NMEA 2000 outputs, which some entry level AIS receivers do not. It has a greater AIS range of 45nm, like the commercial grade A026+, however, as it is a one-way interface, the A027+ is perfect for those wanting the extra AIS range, but do not need the additional features that the A026+ provides. This keeps the A027+ pocket-friendly, while still offering more advanced functions than the entry-level devices.

The below comparison chart briefly explains the functional differences between these products:

	USB	WiFi	Ethernet	N2K	Maximum AIS range
A027+	One-way	One-way	Yes	One-way	45nm
A026+	Bi-directional	Bi-directional	No	Bi-directional	45nm
A024	One-way	One-way	No	No	22nm
A026	One-way	One-way	No	No	22nm
A027	One-way	One-way	No	No	20nm
A028	One-way	No	No	One-way	20nm

2. Mounting

Although the A027+ comes with an extruded aluminium enclosure to shield it from external RF interference, it should not be fitted close to generators or compressors (e.g., refrigerators) as they can generate substantial RF noise. It is designed to be installed in a protected indoor environment. Generally, a suitable placement of the A027+ is together with other types of navigation equipment, along with the PC or chart plotter that will be used to display the output data. The A027+ is designed to be securely mounted to a suitable bulkhead or shelf in an indoor environment and needs to be placed where it is well protected from humidity and water. Ensure there is enough space around the multiplexer to connect the wirings.

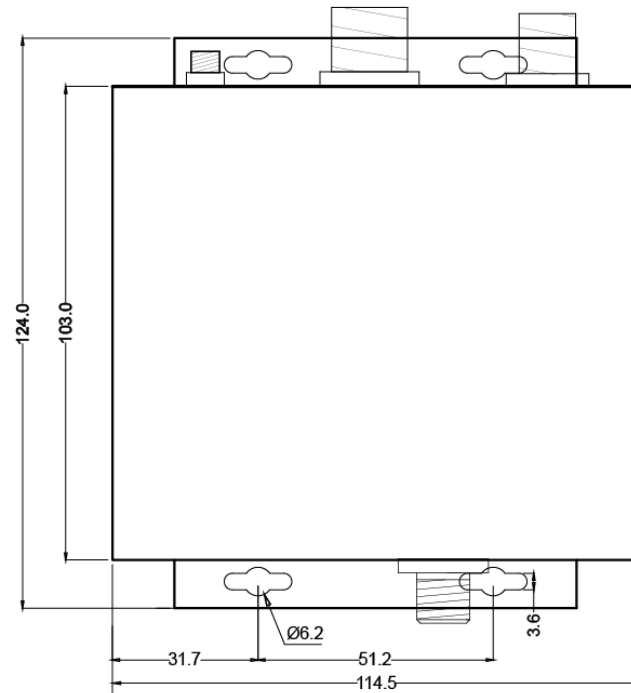


Figure 2: Dimensions

3. Connections

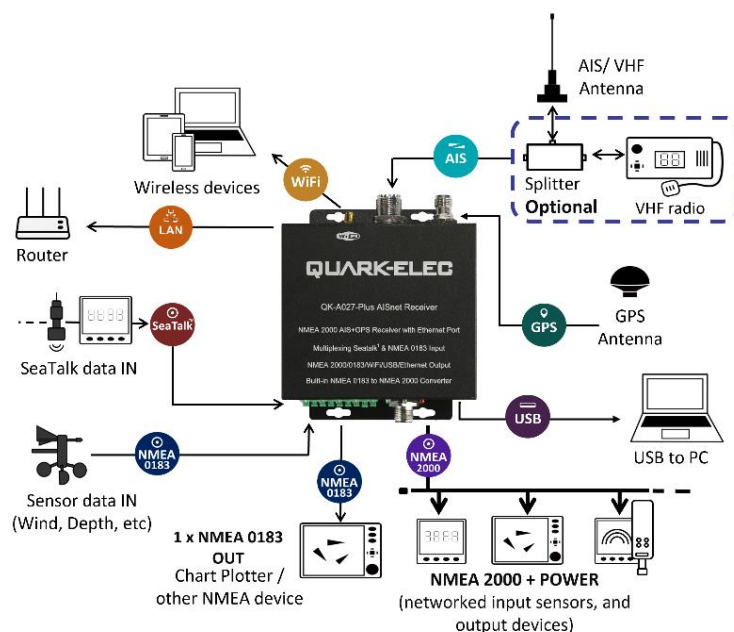


Figure 3 Typical system connection

The A027+ NMEA 2000 AIS+GPS receiver has the following options for connection to other devices:

- **AIS antenna connector:** A SO239 VHF connector for external AIS antenna. An active VHF antenna splitter is required if one VHF antenna is shared by the A027+ and a VHF voice radio.
- **GPS connector:** A TNC female bulkhead connector for external GPS antenna. The integrated GPS module supplies positional data provided a GPS antenna is connected to the A027+.
- **WiFi:** Connectivity in both Ad-hoc and station modes on 802.11 b/g/n provides WiFi output of all messages. The WiFi module can also be disabled by changing WiFi mode to standby.
- **Ethernet:** The multiplexed navigation data can be sent to a computer or remote server (by connecting the A027+ to a router with internet connection).
- **NMEA 0183 input/output connectors:** A027+ can be connected to other NMEA0183 compatible equipment, like wind/depth or heading sensors, via the NMEA input. The NMEA 0183 messages from these devices can be multiplexed with AIS+GPS messages and then sent out through the NMEA 0183 output to a chart plotter or other on-board device.
- **USB connector:** The A027+ comes with a type B USB connector and USB cable. The USB connection supports data input (for firmware update and changing default settings) and output as standard (multiplexed information from all input instruments will be sent to this connection).
- **NMEA 2000:** The A027+ comes 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. An NMEA 2000 backbone always requires two termination resistors, one at each end.



Figure 4: Pin NMEA 2000 male micro-fit connector

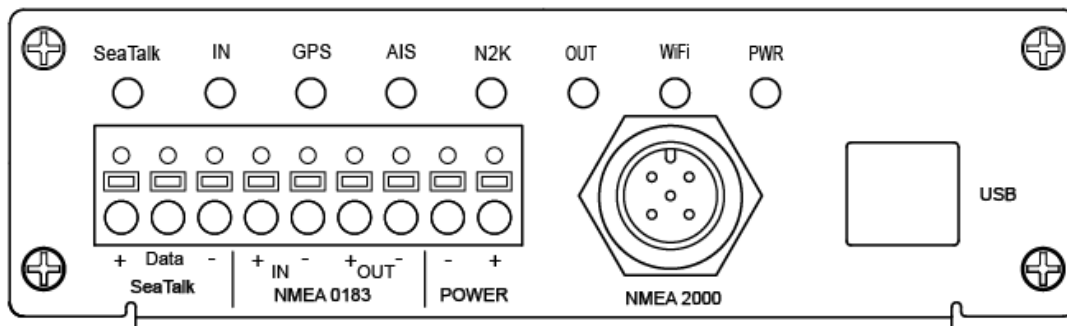


Figure 5 A027+ bottom side view

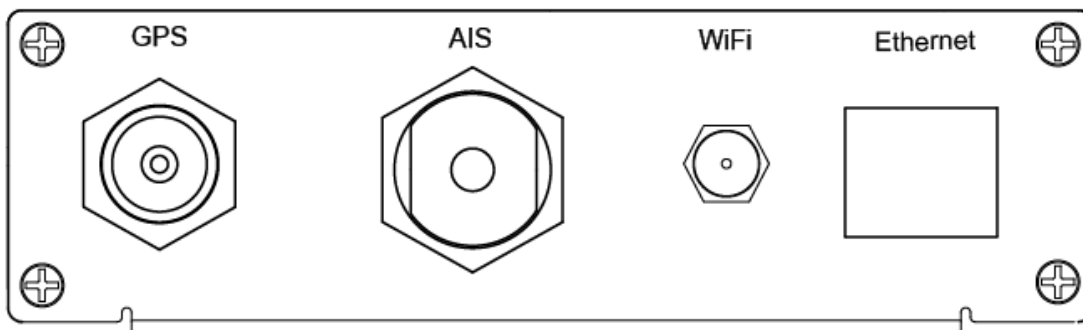


Figure 6 A027+ top side view

3.1. Status LEDs

The A027+ features eight LEDs which indicate power, NMEA 2000, and WiFi status respectively. The status LEDs on the panel show port activity and system status.

- **SeaTalk¹ and IN (NMEA 0183 input):** LEDs will flash for each valid message received.

- **GPS:** LED flashes every second while receiving a valid message.
- **AIS:** LED flashes for each valid AIS message received.
- **N2K:** LED will flash for each valid NMEA 2000 PGN sent out on NMEA 2000 port.
- **OUT (NMEA 0183 output):** LED will flash for each valid message send out.
- **WiFi:** LED will flash for each valid NMEA message sent to WiFi output.
- **PWR (Power):** LED light is constantly lit in red when device is powered on.

3.2. Power

The A027+ operates from 12V DC. Power and GND are clearly indicated. Ensure these are connected correctly. The A027+ is equipped with reverse polarity protection to protect the device in case of faulty installation.

Ensure you use a reliable 12V power supply. A poorly designed power supply or battery, if connected directly to the engine or other noisy devices, could result in significantly degraded receiver performance.

3.3. VHF/AIS antenna

The A027+ is not supplied with a VHF antenna, as the antenna and cable requirements differ from vessel to vessel. A suitable VHF antenna must be connected before the receiver will operate fully.

AIS communication systems use frequencies in the maritime VHF band, which is considered to be 'line of sight' radio. This means that if an AIS receiver's antenna cannot 'see' the antennas of other vessels, the AIS signals from those vessels will not reach that receiver. In practice, this is not a strict requirement. In case the A027+ is used as a shore station, a few buildings and trees between a vessel and the station may be fine. Large obstacles such as hills and mountains, on the other hand, will significantly degrade the AIS signal.

To achieve the best possible receiving range, the AIS antenna should be placed as high as possible with a relatively clear view of the horizon. Large obstructions might shade the AIS radio communication from certain directions, giving uneven coverage.

VHF antennas can be used for AIS messages or radio communications. One antenna cannot be connected to both AIS and VHF radio equipment unless an active VHF/AIS splitter is used. There are important considerations when deciding whether to use two separate antennas or one combined antenna:

- **2 VHF antennas:** The best reception is achieved by using two separate antennas, one for AIS and one for VHF radio. The antennas must be separated as much space as possible (ideally at least 3.0 meters). A good distance between the AIS/VHF antenna and the radio communication VHF antenna is required to avoid interference.
- **1 shared VHF antenna:** If using only one antenna, e.g. Using an existing VHF radio antenna to receive AIS signals, proper separation equipment (an active VHF Splitter) must be installed between the antenna and the connected equipment.



Figure 7: GPS (TNC), AIS (SO239), WiFi (SMA) antenna connections

3.4. GPS antenna

A TNC female bulkhead 50 Ohm connector is for the external GPS antenna (not included).

For best results, the GPS antenna should be in 'line of sight' of the sky. Once connected to a GPS antenna, the integrated GPS module supplies positional data to the NMEA 0183 output, WiFi, USB Ethernet and NMEA 2000 backbone. GPS output can be disabled when an external GPS signal is used.

3.5. NMEA input and output connection

NMEA 0183 input/output ports allow for connection to NMEA 0183 instruments and a chart plotter. The built-in multiplexer combines the input NMEA 0183 data (e.g., wind/depth/radar) with the AIS and GPS data and sends the combined data stream to all outputs, including the NMEA 0183 output port.

3.5.1. NMEA 0183 default baud rates

'Baud rates' refer to the data transfer speed. When connecting two NMEA 0183 devices, both devices' baud rates must be set to the same speed.

- The A027+ input port's default baud rate is 4800bps as it is usually connected to low speed NMEA format data instruments such as heading, sounder, or wind/depth sensors.
- The A027+ output port's default baud rate is 38400bps. The connected chart plotter should be configured to this rate to receive data as AIS data transfer requires this higher speed.

These are the default baud rate settings and are most likely to be the baud rates required, however, both baud rates are configurable if needed. Baud rates can be adjusted using the configuration software. (See configuration section)

3.5.2. NMEA 0183 wiring - RS422 / RS232?

The A027+ uses the NMEA 0183-RS422 protocol (differential signal), however some chart plotters or devices may use the older NMEA 0183-RS232 protocol (single-ended signal).

Based on the following tables, the A027+ can be connected to most NMEA 0183 devices, no matter if these are using RS422 or the RS232 protocol. Occasionally, the connection methods shown below might not work with older 0183 devices. In this case, a protocol bridge like our QK-AS03 is required (please follow link for more details: [QK-AS03 protocol bridge](#)). The QK-AS03 connects and converts RS422 to the older RS232 and vice-versa. It is easy to install, no configuration required.

Devices using the NMEA0183-RS232 protocol usually have one NMEA signal wire and GND is used as a reference signal. Occasionally the signal wire (Tx or Rx) and GND must be swapped if the following wiring does not work.

QK-A027+ wires	Connection needed on RS232 device
NMEA IN+ →	GND *
NMEA IN- →	NMEA TX

NMEA OUT+ →	GND *
NMEA OUT- →	NMEA RX
* Swap two wires if the connection does not work.	

Warning: Your NMEA 0183-RS232 device might have two GND connections. One is for the NMEA connection, and one is for the power.

Ensure you check the above table and your device's documentation carefully before connection.



For RS422 interface devices, data wires need to be connected as shown below:

QK-A027+ wires	Connection needed on RS422 device
NMEA IN+ →	NMEA OUT+ *
NMEA IN- →	NMEA OUT-
NMEA OUT+ →	NMEA IN+ *
NMEA OUT- →	NMEA IN-
* Swap two wires if the connection does not work.	

3.6. SeaTalk¹ Input

The built-in SeaTalk¹ to NMEA converter translates SeaTalk¹ data into NMEA sentences. The SeaTalk¹ port has 3 terminals for connection to the SeaTalk¹ bus. Ensure the connection is correct before powering up your device. An incorrect connection can damage the A027+ and the other devices on the SeaTalk¹ bus.

The SeaTalk¹ converter converts the SeaTalk¹ messages as outlined in the conversion table below. When a SeaTalk¹ message is received, the A027+ checks if the message is supported. When the message is recognized as being supported, the message is extracted, stored, and converted to an NMEA sentence. Any unsupported datagrams will be ignored. These converted NMEA messages are filtered and then combined with NMEA data received on the other inputs.

This function allows the NMEA multiplexer to listen on the SeaTalk¹ bus. Only one SeaTalk¹ input is needed as the SeaTalk¹ bus is a single-cable system that connects all instruments. The SeaTalk¹ to NMEA converter works in one direction only on the A027+. NMEA sentences are not converted to SeaTalk¹.

Supported SeaTalk ¹ Datagrams		
SeaTalk	NMEA	Description
00	DBT	Depth below transducer
10	MWV	Wind angle, (10 and 11 combined)
11	MWV	Wind speed, (10 and 11 combined)
20	VHW	Speed through water, includes heading when present
21	VLW	Trip mileage (21 and 22 combined)
22	VLW	Total mileage (21 and 22 combined)
23	MTW	Water temperature
25	VLW	Total and Trip mileage
26	VHW	Speed through water, includes heading when present
27	MTW	Water temperature
50	---	GPS latitude, value stored
51	---	GPS longitude, value stored
52	---	GPS speed over ground, value stored
53	RMC	Course over ground. RMC sentence is generated from stored values from other GPS related datagrams.
54	---	GPS time, value stored
56	---	GPS date, value stored
58	---	GPS lat/long, values stored
89	HDG	Magnetic heading, including variation (99)
99	---	Magnetic variation, value stored

As the table shows, not all datagrams result in an NMEA 0183 sentence. Some datagrams are only used to retrieve data, which is combined with other datagrams to create one NMEA 0183 sentence.

3.7. Ethernet Connection (RJ45 port)

The A027+ can be connected to a standard PC, network router or switch. Ethernet cables, also known as RJ-45, CAT5, or CAT6 cables, have a square plug with a clip on each end. You'll use an ethernet cable (not included) to connect the A027+ to other devices.

Please note: if connecting directly to a PC you will need a crossover cable.

3.8. NMEA 2000 Port

The A027+ converter provides an NMEA 2000 network connection. The A027+ combines all the NMEA 0183 data inputs and then converts them to NMEA 2000 PGNs. With the A027+, NMEA 0183 input and SeaTalk¹ input data can be forwarded to more modern NMEA 2000 capable instruments, such as NMEA 2000 chart plotters.

NMEA 2000 networks must at least consist of a powered backbone with two terminators (termination resistors), to which the multiplexer and any other NMEA 2000 devices must be connected. Each NMEA 2000 device connects to the backbone. It is not possible to simply connect two NMEA 2000 devices directly together.

The A027+ is supplied with a spurred five-core screened cable for the NMEA 2000 connection, fitted with a male micro-fit connector. Simply connect the cable to the network backbone.

3.8.1. Conversion Lists

The following conversion table lists the supported NMEA 2000 PGN's (parameter group numbers) and NMEA 0183 sentences. It is important to check the table to confirm that the A027+ will convert the required NMEA 0183 sentences to PGNs:

NMEA 0183 sentence	Function	Converted to NMEA 2000 PGN/s
AAM	Waypoint Arrival Alarm	129284
ABM	AIS Addressed Binary and Safety Related Messages	129795, 129801
APB	Heading/Track Controller (Autopilot) Sentence "B"	129283, 129284
DBT	Depth Below Transducer	128267
DPT	Depth	128267
DSC	Digital Selective Calling Information	129808
DSE	Expanded Digital Selective Calling	129808
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
HSC	Heading Steering Command	127237
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
THS	True Heading and Status	127250
VDR	Set and Drift	129291, 130577
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
XDR	Battery information (voltage, current, from A016)	127508, 127506
XTE	Cross Track Error, Measured	129283
ZDA	Time & Date, Local Time Offset	126992,129033
VDM/VDO	AIS Message 1,2,3	129038
VDM/VDO	AIS Message 4	129793
VDM/VDO	AIS Message 5	129794
VDM/VDO	AIS Message 9	129798
VDM/VDO	AIS Message 14	129802
VDM/VDO	AIS Message 18	129039
VDM/VDO	AIS Message 19	129040
VDM/VDO	AIS Message 21	129041
VDM/VDO	AIS Message 24	129809. 129810

Please note: some PGN sentences that are received require additional data before being sent.

3.9. WiFi connection

The A027+ allows the data send through WiFi to a PC, tablet, smartphone, or other WiFi enabled device. Users can access marine network data including vessel course, vessel speed, position, wind speed, direction, water depth, AIS etc. on their computer or mobile device using a suitable chart software.

The IEEE 802.11b/g/n wireless standard has two basic modes of operation: Ad-hoc mode (peer to peer) and Station mode (also called infrastructure mode). The A027+ supports 3 WiFi modes: Ad-hoc, Station and Standby (disabled).

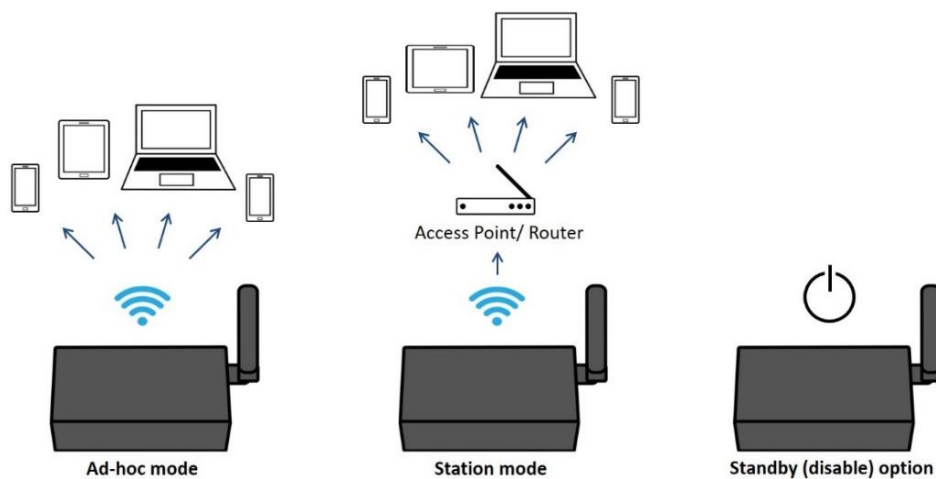


Figure 8 WiFi supports mode

- In **Ad-hoc mode**, wireless devices connect directly (peer to peer) without a router or access point. For example, your smartphone can connect directly to the A027+ to receive marine data.
- In **Station mode**, 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 your router to handle the data and traffic from your device. This data can then be picked up through your router anywhere on your local area network. Similar to plugging the device directly into the router but using wireless technology. This way, the mobile devices receive both your marine data and other AP connections such as internet.

- In **Standby mode**, WiFi will be disabled, which reduces power consumption.

The A027+ is set to Ad-hoc mode as default, but this can be easily changed to Station or Standby mode if required, by using the configuration tool (See configuration section).

3.9.1. WiFi Ad-hoc mode connection

From a Phone, Tablet or PC:

Once you powered up your A027+, scan for a WiFi network with an SSID of 'QK-A027xxxx' or similar.

Connect to '**QK-A027xxxx**' with the default password: '**88888888**'.

A027+ SSID	Similar to 'QK-A027xxxx'
WiFi password	88888888

Note: The SSID and password can be changed if desired. The password must be 8 to 12 characters long. If changing the SSID and password, A027+ should be turned off and on again to activate the new settings. (The IP address, Gateway, Net Mask and Port can be left blank if no fixed IP address is needed.)

In your chart software (or chart plotter):
Set the protocol to '**TCP**', IP address to '**192.168.1.100**' and the port number to '**2000**'.

Protocol	TCP
IP address	192.168.1.100
Data Port	2000

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

With the above settings, a wireless connection is established, and the user will receive the data through the chart software. (More information in the chart software section)

The wireless connection and data flow can be checked using a TCP/IP port monitoring software.

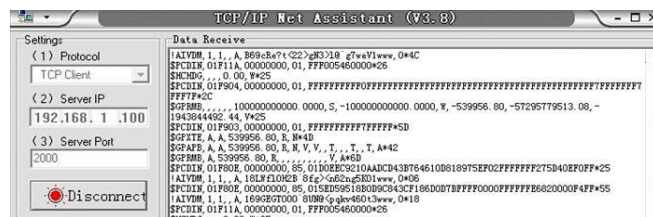


Figure 9 TCP/IP Net Assistant example

To configure station mode, see the configuration section.

3.10. USB connection

The A027+ features a type-B USB connector and is supplied with a USB cable. The USB connection provides data output as standard (multiplexed information from all input instruments will be sent to this connection). The USB port is also used to configure the A027+ and to update its firmware.

3.10.1. Will you need a driver to connect via USB?

To enable the USB data connection of A027+ to other devices, related hardware drivers might be required depending on your system configuration.

Mac:

No driver required. For Mac OS X, the A027+ will be recognized and shown as a USB modem. The ID can be checked with the following steps:

1. Plug the A026+ into a USB port and launch Terminal.app.
2. Type: `ls /dev/*sub*`
3. The Mac system will return a list of USB devices. The A027+ will be listed as -
"/dev/tty.usbmodemXYZ" where XYZ is a number. Nothing further needs to be done if it is listed.

Windows 7,8,10:

Drivers are usually installed automatically if your computer is running an original Windows 10 operating system. A new COM port will automatically show up in device manager once the A027+ is powered up and connected to the computer via USB.

The A027+ registers itself to the computer as a virtual serial com port.

If the driver does not install automatically, it can be found on the included CD or can be downloaded from www.quark-elec.com.

Linux:

No driver required. When connected to the computer, the A027+ will show up as a USB CDC device on /dev/ttyACM0.

3.10.2. Checking the USB connection (Windows)

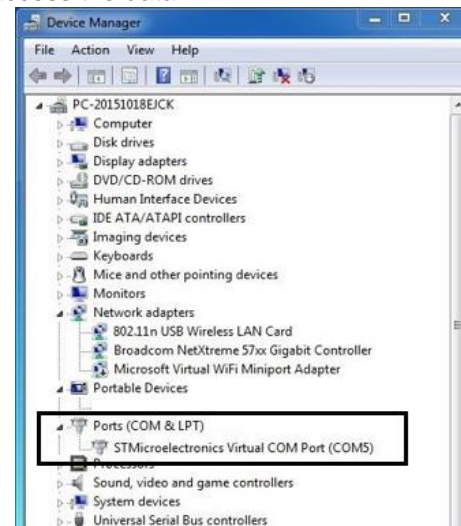
After the driver is installed (if needed), run the device manager and check the **COM (port) number**. The port number is the number assigned to an input device. These can be generated randomly by your computer.

Your chart software may require your COM port number in order to access the data.

The port number for the A027+ can be found in Windows 'Control Panel>System>Device Manager' under 'Ports (COM & LPT)'. Find something similar to 'STMicroelectronics Virtual Com Port' in the list for the USB port. If the port number needs to be changed for some reason, double click on the A027+'s com port and select the 'Port Settings' tab. Click the 'Advanced' button and change the port number to the one required.

The USB connection status can always be checked with a terminal monitor application like Putty or HyperTerminal. Ensure that the COM port settings are set to the same as the figure shown as below.

To use a terminal monitor application, first connect A027+ to the computer, follow the instructions to install the driver if required. After the driver is installed, run device manager, and check the COM (port) number.



HyperTerminal example (if using the default A027+ settings).
Run HyperTerminal and set COM Port settings to:

Bits per second: **38400bps**

Data bits: **8**

Stop bits: **None**

Flow control: **1**

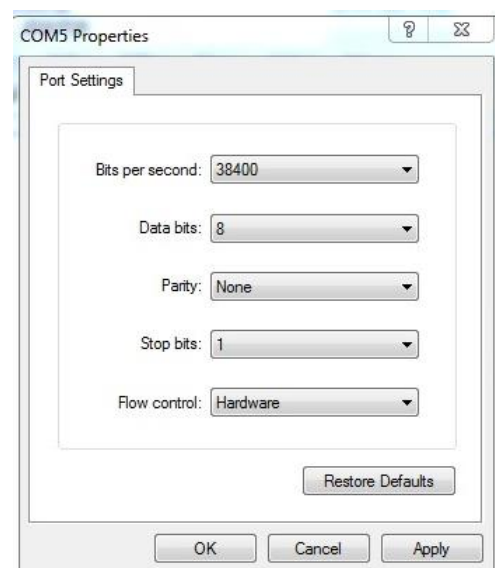


Figure 10: HyperTerminal settings

If all the above is set up correctly, similar NMEA messages to the examples below should be shown.

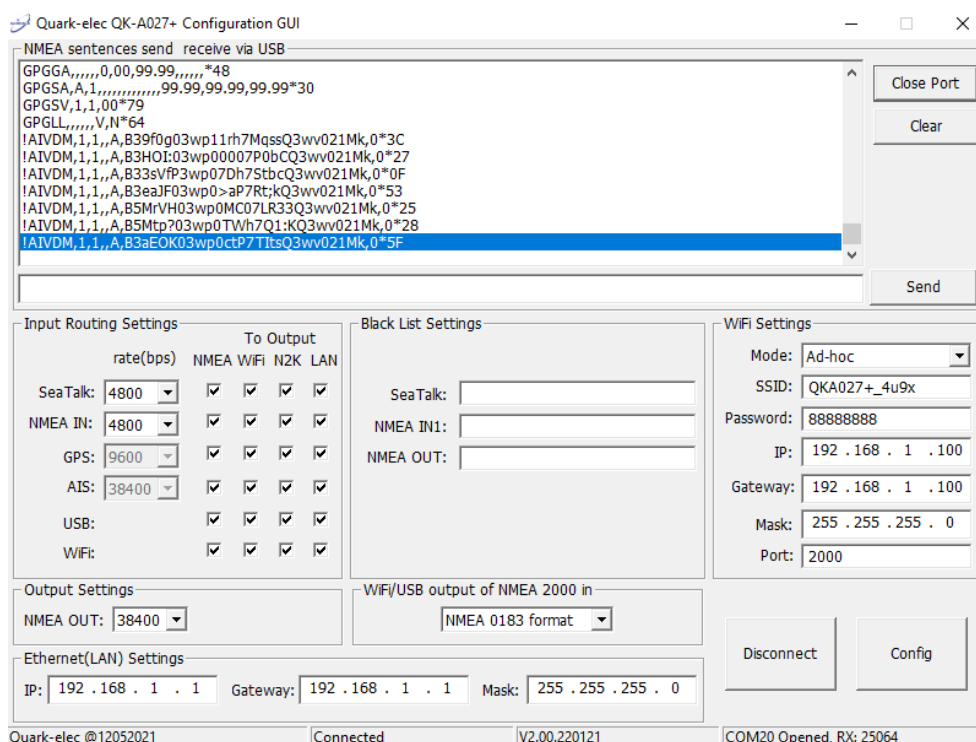
Figure 11: Display on HyperTerminal

4. Configuration (via USB)

The A027+ configuration tool software can be found on the free CD provided with your product or at <https://www.quark-elec.com/downloads/configuration-tools/>.

The Windows configuration tool can be used to setup the port routing, sentence filtering, NMEA baud rates, and WiFi settings for the A027+. It can also be used to monitor and send NMEA sentences through the USB port. The configuration tool must be used on a Windows PC (or Mac use Boot Camp or other Windows simulating software) while the A027+ is connected via USB cable. The software cannot access the A027+ via WiFi.

! The configuration tool won't be able to connect to your A027+ while another program is running. Please close all applications using the A027+ before running the configuration tool.



Once open, click 'Connect'. When the A027+ is powered up and successfully connected to a computer (Windows system), the application will display 'Connected' and the firmware version in the status bar (at the bottom of the application). Once you have finished modifying the relevant settings, press 'Config' to save them to the A027+. Then click 'Disconnect' to safely remove your device from the PC. Re-start the A027+ to activate the new settings on your device.

4.1. Configuring Baud Rates

The NMEA 0183 input and output baud rates can be configured from dropdown menu. The A027+ can communicate with standard NMEA 0183 devices at 4800bps as default, with high-speed NMEA 0183 devices (at 38400bps) and 9600bps can also be used if necessary.

Input Routing Settings		To Output			
	rate(bps)	NMEA	WiFi	N2K	LAN
SeaTalk:	4800	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
NMEA IN:	4800	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
GPS:	9600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
AIS:	38400	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
USB:		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
WiFi:		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Output Settings	
NMEA OUT:	38400

Figure 12 Setup the baud rate

4.2. WiFi - Station mode

WiFi is set to Ad-hoc mode by default. Station mode, however, allows your device to connect to and send data to a router or access point. This data can then be picked up through your router anywhere on your local area network (similar to plugging the device directly into the router but using wireless technology). This allows your mobile device to still receive internet while viewing your marine data.

To begin setting up station mode the A027+ should be connected via USB to a computer running Windows (Mac users can use BootCamp).

1. Connect the A027+ to computer via USB.
2. Run the configuration software (having closed any other programs that would access the A027+)
3. Click 'Connect' and check connection to the A027+ at the bottom of configuration tool.
4. Change working mode to '**station mode**'
5. Enter your router's **SSID**.
6. Enter the **password** for your network.
7. Enter the **IP address** assigned to the A027+, this normally starts with 192.168. The third group of digits depends on your 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 your router.
8. Enter your **router's IP address** in the **gateway** section. This can usually be found under the router. Leave the other settings as they are.
9. Click '**Config**' in the bottom right-hand corner and wait 60 seconds. After 60 seconds click '**Disconnect**'.
10. Repower the A027+ and it will now attempt to connect to the router.

WiFi Settings	
Mode:	Ad-hoc
SSID:	QKA027+_4u9x
Password:	88888888
IP:	192 . 168 . 1 . 100
Gateway:	192 . 168 . 1 . 100
Mask:	255 . 255 . 255 . 0
Port:	2000



In your chart software, set the protocol as '**TCP**', insert the **IP address** you assigned to the A027+ and enter the port number '**2000**'.

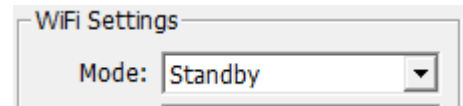
You should now see your marine data in your chart software. If not, check your router's **IP address list** and confirm the **IP address** that your router has assigned to the A027+. Occasionally, a router assigns a different **IP address** to a device than the one you chose to assign during configuration. If this is the case, copy the IP address from the router into your chart software.

If the **IP address** in the router's **IP address list** matched the one inputted into the chart software, the connection will work in station mode.



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

4.3. WiFi – Standby/Disable



The WiFi module can be disabled by selecting 'standby' in the WiFi menu.

4.4. Filtering

The A027+ features filtering of the NMEA 0183 input, SeaTalk input¹, and NMEA 0183 output sentences. Each data stream has a flexible filter that can be configured to pass or block specific sentences from entering the multiplexer.

NMEA sentences can be passed or blocked, specified by input or output. This frees up bandwidth, significantly reducing the possibility of data overflow which can result in the loss of data.

Blacklisted input data is filtered out and ignored by the A027+'s multiplexer, while the remaining data is then forwarded to the outputs. As default, all filter lists are empty, so all messages are passed through the filters. Filters can be set using the configuration software.

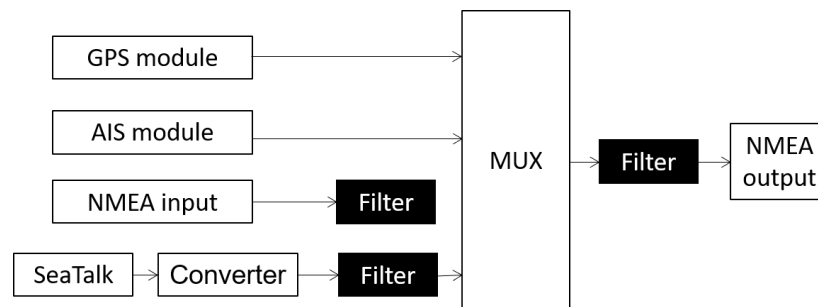


Figure 13 Filter diagram

Filtering allows the A027+ to reduce the processing data load by disabling unneeded input sentences. GPS receivers for example often transmit an abundance of sentences every second and can fill much of the available bandwidth of an NMEA 0183 port at 4800bps. By filtering out any unnecessary data, the bandwidth is saved for other more important device data.

Most chart plotters also have their own sentence filter, however many PC/mobile phone-based applications do not. So, using the blacklist to filter un-necessary sentences can be helpful.

Filtering also removes potential conflict if two similar NMEA devices transmit the same sentence type. Users may choose to enable this data on one input only (filtering), and to transmit it to the outputs.

4.4.1. Configuring filters

Each input port's blacklist can block up to 8 sentence types. To filter out unwanted message types from a specific input, enter the details in the corresponding 'Blacklist' in the configuration software.

All you need to do is remove the '\$' or '!' from the 5-digit NMEA talker and sentence identifiers and insert them separated by commas. For example to block '!AIVDM' and '\$GPAAM' enter 'AIVDM,GPAAM'. If blacklisting SeaTalk¹ data, use the corresponding NMEA message header. (See SeaTalk¹ section for a full list of converted messages).

Black List Settings

SeaTalk:

NMEA IN1:

NMEA OUT:

4.4.2. Routing data away from chosen outputs

As a default, all input data (excluding any filtered data) is routed to all outputs (NMEA 0183, NMEA 2000, WiFi and USB). Data can be routed to limit the data flow to only certain output/s. Simply un-tick the corresponding boxes in the configuration software.

Please note: The WiFi module allows one way communication only. It allows the sending of navigation data to a computer or mobile device via WiFi, but these devices cannot send data back to the A027+ or other networks / devices connected to the A027+.

Input Routing Settings

	rate(bps)	To Output			
		NMEA	WiFi	N2K	LAN
SeaTalk:	4800	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
NMEA IN:	4800	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
GPS:	9600	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
AIS:	38400	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
USB:		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
WiFi:		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Output Settings

NMEA OUT:

4.5. Ethernet Settings

Similar to the WiFi, the Ethernet module supports one-way communication only. It allows sending but does not support receiving of navigation data. The A027+ does not support DHCP (Dynamic Host Configuration Protocol), a valid static IP address, gateway and subnet mask will be required for setup.

Ethernet(LAN) Settings

IP: Gateway: Mask:

4.6. USB - Monitoring NMEA Messages

Connect the A027+ and then click 'Open port' which will display all the sentences in the application window.

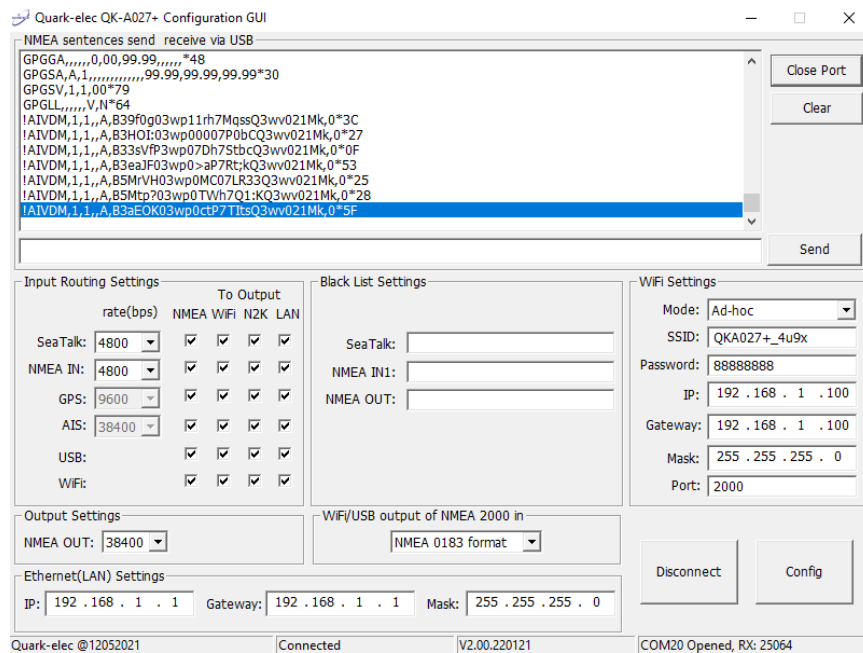


Figure 14: Monitor via USB

5. Upgrading firmware

The current firmware version can be verified through the configuration tool (when connected, the firmware version will be shown at the bottom of the configuration software window).

To upgrade the firmware,

1. Power up your A027+ and then connect it to a Windows computer via USB.
2. Run the configuration software.
3. Ensure the configuration tool is connected to the A027+, and then press Ctrl+F7.
4. A new window will pop up with a drive named 'STM32' or similar. Copy the firmware into this drive and wait around 10 seconds to make sure the file has been fully copied to this drive.
5. Close the window and the configuration software.
6. Re-power the A027+, and the new firmware will be active on your device.

6. Specification

Item	Specification
Frequency bands	161.975MHz & 162.025MHz
Operating temperature	-5°C to +80°C
Storage temperature	-25°C to +85°C
DC supply	12.0V(+/- 10%)
Maximum supply current	235mA
AIS receiver sensitivity	-112dBm@30%PER (where A027 is -105dBm)
GPS receiver sensitivity	-162dBm
NMEA data format	ITU/ NMEA 0183 format
NMEA input data rate	4800bps
NMEA output data rate	38400bps
WiFi mode	Ad-hoc and Station modes on 802.11 b/g/n
LAN Interface	10/100 Mbps RJ45-Jack
Security	WPA/WPA2
Network Protocols	TCP

7. Limited Warranty and Notices

Quark-elec warrants this product to be free from defects in materials and manufacture for two years from the date of purchase. Quark-elec will, at its sole discretion, 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.

8. 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-elec, 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-elec 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.

9. Document History

Issue	Date	Changes / Comments
1.0	13-01-2022	Initial release
2.0	05-08-2022	Supporting new NMEA 0183 sentences (AAM, ABM, APB, DSC, DSE, HSC, THS, VDR). And ZDA --> 129033
2.1	07-03-2023	Supports XDR(U,I,G) --->127508 and 127506. This new feature allows battery information (voltage, current, from A016) shown on N2K devices

10. Glossary

IP: internet protocol (ipv4, ipv6).

IP Address: is a numerical label assigned to each device connected to a computer network.

NMEA 0183: is a combined electrical and data specification for communication between marine electronics, where data transfer is one-directional. Devices communicate through talker ports being connected to listener ports.

NMEA 2000: is a combined electrical and data specification for networked communication between marine electronics, where data transfer is one-directional. All NMEA 2000 devices must be connected to a powered NMEA 2000 backbone. Devices communicate both ways with other connected NMEA 2000 devices. NMEA 2000 is also known as N2K.

Router: A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet.

USB: cable for communication and power supply between devices.

WiFi - Ad-hoc mode: devices communicate directly with each other without a router.

WiFi - Station mode: devices communicate by going through an Access Point (AP) or router.

11. For more info...

For more technical information and other enquiries, please go to the Quark-elec forum at:
<https://www.quark-elec.com/forum/>

For sales and purchasing information, please email us: info@quark-elec.com

QUARK-ELEC

Quark-elec (UK)

Unit 7, the Quadrant, Newark close

Royston, UK, SG8 5HL

info@quark-elec.com