

Quark-elec QK-A042T Class B Transponder Manual



Designed in UK



Features

- Low-cost anti-collision / monitoring system
- Receives and processes all AIS message types
- Automatic transmission of vessels own position, speed and heading to other vessels within VHF range
- A method of monitoring the position, speed and heading of other AIS vessels within VHF range
- The ability to plot the progress, changes in heading and speed of other AIS vessels on a PC or Chart Plotter
- Transmitter 'switch-off' facility to conserve power, or for privacy.
- Compatible with Windows, Mac and Linux (optional Configuration must be completed using Windows software.)
- This device connects to NMEA 0183 and is compatible with RS422 output devices. NMEA 0183 RS232 devices can connect to our device by using the Garmin Bridge (QK-AS03).
- This device does not come pre-loaded with map data. We advise using OpenCPN (free to use) for map data. Some iOS apps will charge for map use.

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2. Introduction

In the box:

- 1× AIS class B Transponder
- 1× USB cable
- 1×CD (USB driver)
- 1×power/NMEA cable
- 1×4 Sets of nuts, bolts and washers



This manual provides installation procedures, configuration and safety instructions for the A042T Class B Transponder.

AIS stands for Automatic Identification System. AIS is a location and vessel information reporting system. It allows vessels equipped with AIS to automatically and dynamically share and regularly update their position, speed over ground (SOG), course over ground (COG) and other information such as vessel identity with similarly equipped craft. Position is derived from GPS satellites and communication between vessels is by Very High Frequency (VHF) digital transmissions. A sophisticated and automatic method of time sharing the radio channel is used to ensure that even where a large number of vessels are in one location blocking of individual transmissions is minimized, any degradation of the expected position reporting interval is indicated to the user and even if the unit suffers extreme channel overload conditions it will always recover to normal operation.

AIS is defined in a series of formal documents issued by the ITU and IEC.

3. AIS Class A/B

There are two classes of AIS unit fitted to vessels, Class A and Class B. In addition AIS base stations may be employed by the Coastguard, port authorities and other authorized bodies. AIS units acting as aids to navigation (AtoNs) can also be fitted to fixed and floating navigation markers such as channel markers and buoys.

Class A units are a mandatory fit under the safety of life at sea (SOLAS) convention to vessels above 300 gross tons or which carry more than 11 passengers in International waters. Many other commercial vessels and some leisure craft also fit Class A units. Class B units are currently not a mandatory fit but authorities in several parts of the world are considering this. Class B units are designed for fitting in vessels which do not fall into the mandatory Class A fit category. A042T is a class B transponder.

A Class A unit will transmit its IMO number (if known), MMSI, Call sign and Name, length and beam, ship type, time, course over ground (COG), speed over ground (SOG), heading, navigational status, rate of turn, draught, cargo type, destination and safety related messages via a short message service (SMS) facility. Message lengths are variable with static and voyage related information being transmitted less often.

Class A ship messages reporting intervals

Ships dynamic conditions	Rate
Ship at anchor or moored	3 min
Ship 0-14 Knots	10 sec
Ship 0-14 Knots and changing course	3.3 sec
Ship 14-23 Knots	6 sec
Ship 14-23 Knots and changing course	2 sec

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Ship > 23 Knots	2 sec
Ship > 23 Knots and changing course	2 sec
Ships Static Information	6 min

A Class B unit will transmit its MMSI, Call Sign and Name, length and beam, ship type, time, course over ground (COG), speed over ground (SOG).

Class B ship messages reporting intervals

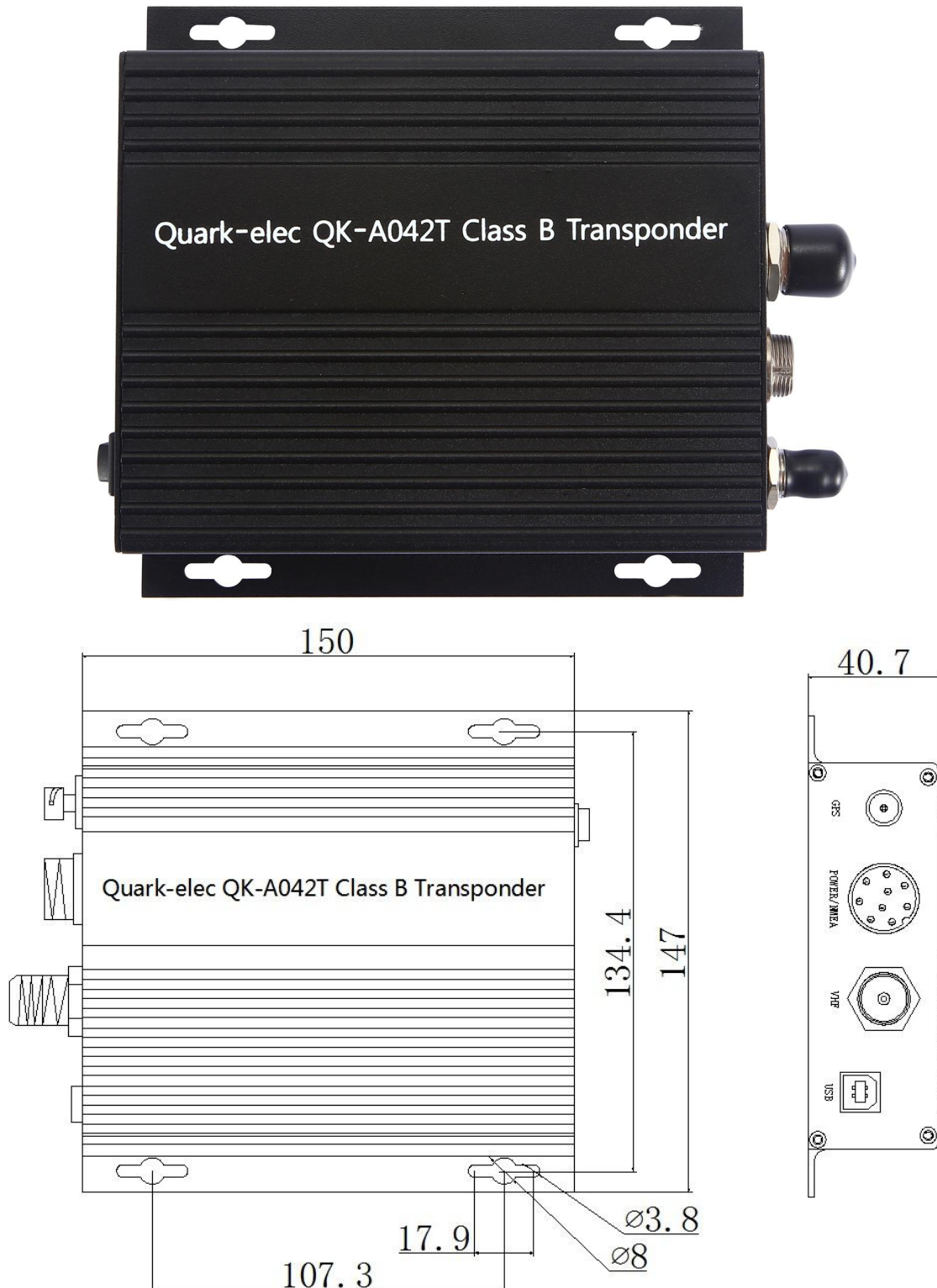
Ships dynamic conditions	Rate
Ship with Speed Over the Ground < 2 Knots	3 min
Ship with Speed Over the Ground > 2 Knots	30 sec
Ships Static Information	6 min

4. Maritime Mobile Service Identity (MMSI)

IMPORTANT: In most countries the operation of an AIS unit is included under the vessel's marine VHF license provisions. The vessel on to which the AIS unit is to installed must therefore possess a current VHF radiotelephone license which lists the AIS system and the vessel Call Sign and MMSI number. An MMSI number is required in order for the Quark-elec AIS CLASS B transponder to operate. Please contact the relevant authority in your country for more information.

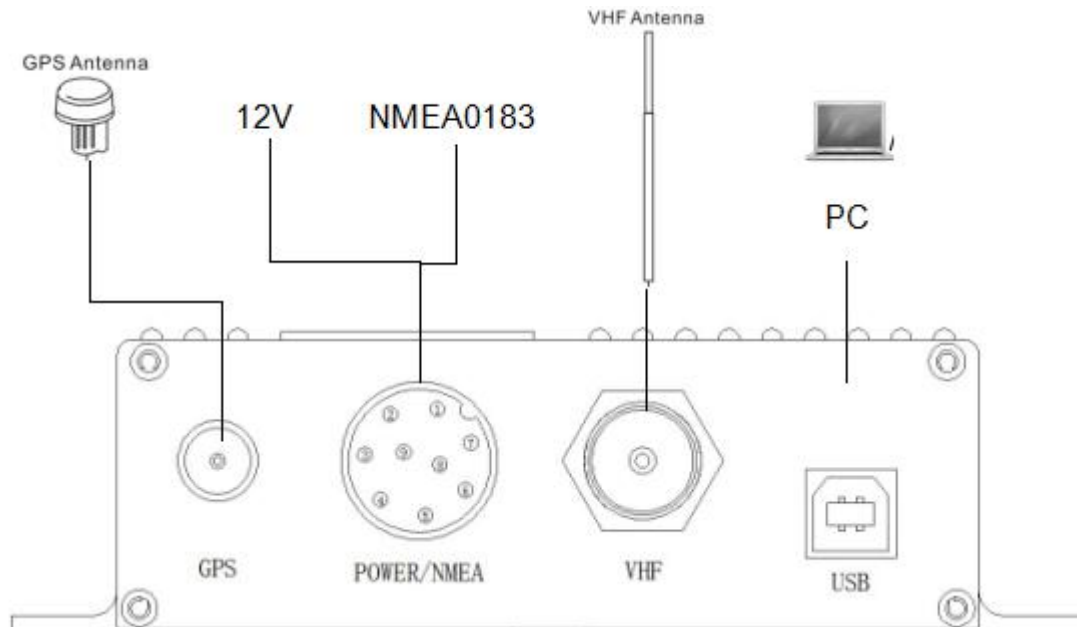
5. Mounting

A042T comes with an extruded aluminium enclosure to shield it from external RF interference. Four fixing holes can be used to attach it to a suitable surface. It is not waterproof so should be mounted in a dry place on a flat surface. Ideally the LED's need to be visible to the operator at all times. The ambient temperature around A042T receiver should be maintained between -25°C and +55°C. A042T should not be located in a flammable or hazardous atmosphere such as in an engine room or near to fuel tanks.



6. Connecting

The following figure shows connections for the AIS transceiver. The user should take the time to familiarize themselves with the system elements and their connections prior to attempting installation. A042T Class B transponder has the following electrical connections

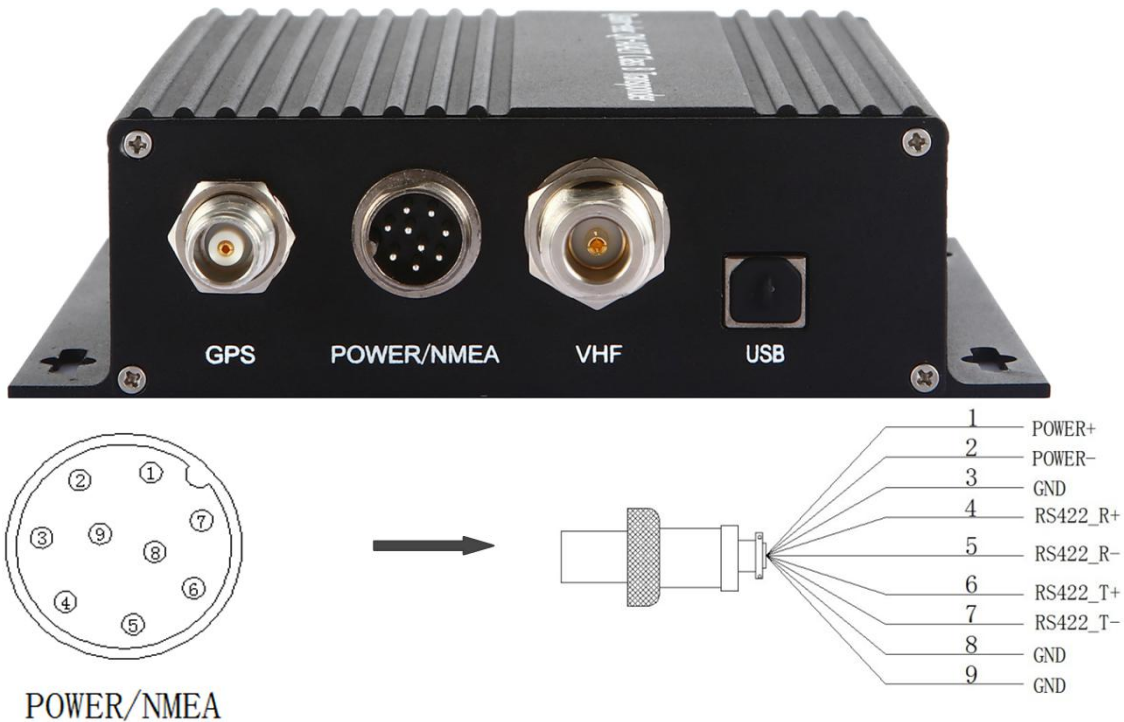


- **GPS connector:** a TNC female bulkhead connector mounted on the enclosure for external GPS antenna. Connect external GPS antenna'
- **9 pins POWER/NMEA connector:** 9-pin coaxial female connector mounted on the enclosure. It provides power input and NMEA input/output. NMEA 0183 data can be connected with chart plotters or other NMEA0183 compatible equipment.
- **VHF connector:** an N-type female bulkhead connector for external VHF antenna. Connect external VHF antenna
- **USB:** Type B USB connector for software configuration and information display on PC. Connect the PC for software configuration and information display

Note: Please check your wiring very carefully before applying power to the A042T. Failure to wire the product correctly could result in permanent damage.

6.1. NMEA/POWER connection

NMEA data and power for the A042T comes from the 9-pin POWER/NMEA connector. This has 9 wires separated out for use with your NMEA equipment.



Colour Instructions

Pin name	Colour
Power+	Red
Power-	Black (thick)
GND	Black
RS422 R+	Yellow
RS422 R-	Orange
RS422 T+	Blue
RS422 T-	Green
GND	Black
GND	Black

Chart plotter: To display received AIS position reports from other vessels on your chart plotter, you will need to connect your A042T to your chart plotter or NMEA bus. Please refer to the user manual supplied with your chart plotter for details of how to connect and configure your chart plotter for use with AIS devices. For general guidance your chart plotter should be configured to accept NMEA data at 38400 baud (sometimes referred to as 'NMEA HS' or 'NMEA High speed' in the plotter configuration menu). You may also need to enable the display of AIS targets in the chart options.

6.2. Connecting via USB port

A042T is supplied with a USB connector. This connector provides AIS, GPS data output as standard. 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: To enable the USB data connection of A042T to other devices, related hardware drivers may be needed dependent on your system requirements.

Windows 7,8,10 the driver can be found on the CD in the packing box or be downloaded from <https://www.quark-elec.com>

The A042T registers itself to the computer as a virtual serial com port. The drivers usually install automatically to your device if it is running an original Windows 10 version. A new COM port will automatically show up in the device manager after plug in.

Mac: For Mac OS X, the A042T will be recognized and shown as a USB modem. The ID can be checked with the following steps:

1. Plug the A042T into a USB port and launch Terminal.app.
2. Type: `less /dev/*sub*`
3. The Mac system will return a list of USB devices. A042T will display as - `"/dev/tty.usbmodemXYZ"` where XYZ is a number. Nothing further needs to be done if it is listed.

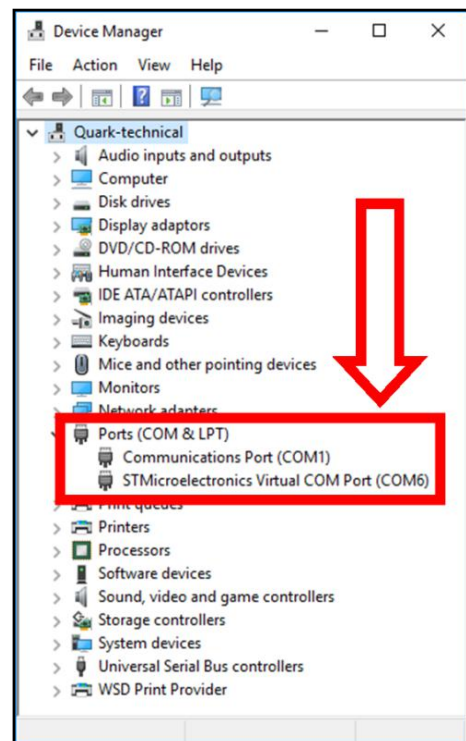
Linux: No driver is required for Linux. When plugged into the computer, A042T will show up as a USB CDC device on `/dev/ttyACM0`.

6.3. 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 you are using. The port number is the number that Windows assigns as an input device. These can be generated randomly by your computer). Your chart software may require your COM number in order to access the data.

The port number for the A042T can be found in Windows 'Control Panel->System->Device Manager' under 'Ports (COM & LPT)'. Find the A042T in the list for the USB variant. To change this number, double click the A042T and select the 'Port Settings' tab. Click the 'Advanced' button and change the port number to the one required.

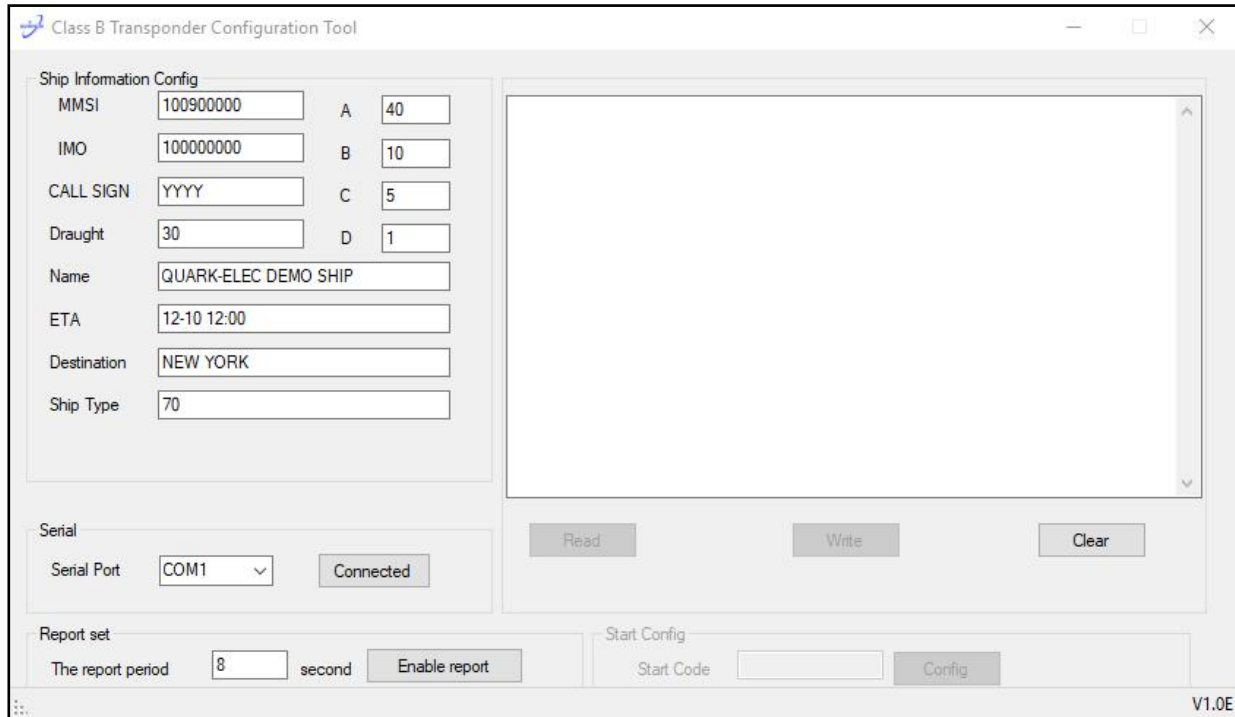
Checking the USB data flow: If desired, the USB data can always be checked with a terminal monitor application, like Putty or HyperTerminal. To do this, enter the following into the COM port settings: **Bits per second: 38400bps**, **Data bits: 8**, **Parity: None**, and **Stop bits: 1** as shown below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



7. Configuration

The configuration tool for the A042T is where the user will assign their ship's information to the transponder. This information is needed for the transponder to accurately locate and use the class B AIS system. Use the link below to download the configuration tool if not on CD. Configuration tool can only be used on Windows.

<https://www.quark-elec.com/downloads/configuration-tools/>



Name	Description
MMSI	Maritime Mobile Service Identity is a unique 9 digit number that is assigned to a (Digital Selective Calling) DSC radio or an AIS unit. Your MMSI number is your unique calling number for DSC radios or an AIS unit. See chapter mobile maritime service identity
IMO	International Maritime Organization number should be entered into this section. The IMO number will be on the hull and certificates for the ship.
CALL SIGN	Call sign for your vessel
Draught	Draught is the vertical distance between the waterline and the bottom of the hull (keel), with the thickness of the hull included. Draft determines the minimum depth of water a ship or boat can safely navigate
Name	Enter the name of your vessel
ETA	Estimated Time of Arrival to destination entered below
Destination	This is the destination your vessel is heading to. This should be entered before every journey ideally.
Ship type	This field should contain a number referring to the type of vessel you are using this transponder on. For example enter the number 36 for vessels using sail propulsion. For example enter the number 37 for pleasure craft (Yacht powered by engine)
Serial	This refers to the connection you are using between the transponder and the software. Find the right COM port for your transponder and click connect. This information can be found in the device manager on your PC. See chapter check the USB connections .
Report set	How often (in seconds) Class B AIS signal is reported by the transponder. We recommend not setting report to anything below 10 seconds

Note: Some of this information is legally required if using the A042T on water. Please check with your relevant authority or coastguard. Please input this information carefully.

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7.1. GPS antenna location:-

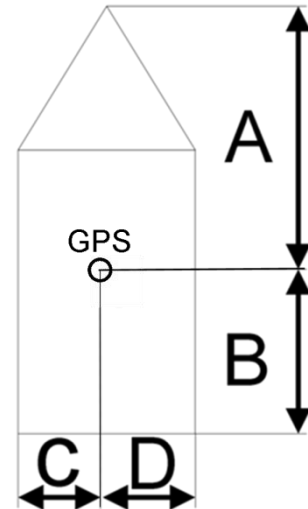
Your ships size is determined by the Data input into the transponder under the section **A, B, C, and D** (see image above). The transponder must know where your antenna is located to make accurate readings for other ships and your own. Please be as accurate as possible when filling this information in.

A: Distance from bow to GPS antenna position in metres

B: Distance from stern to GPS antenna in metres

C: Distance from port to GPS antenna in metres

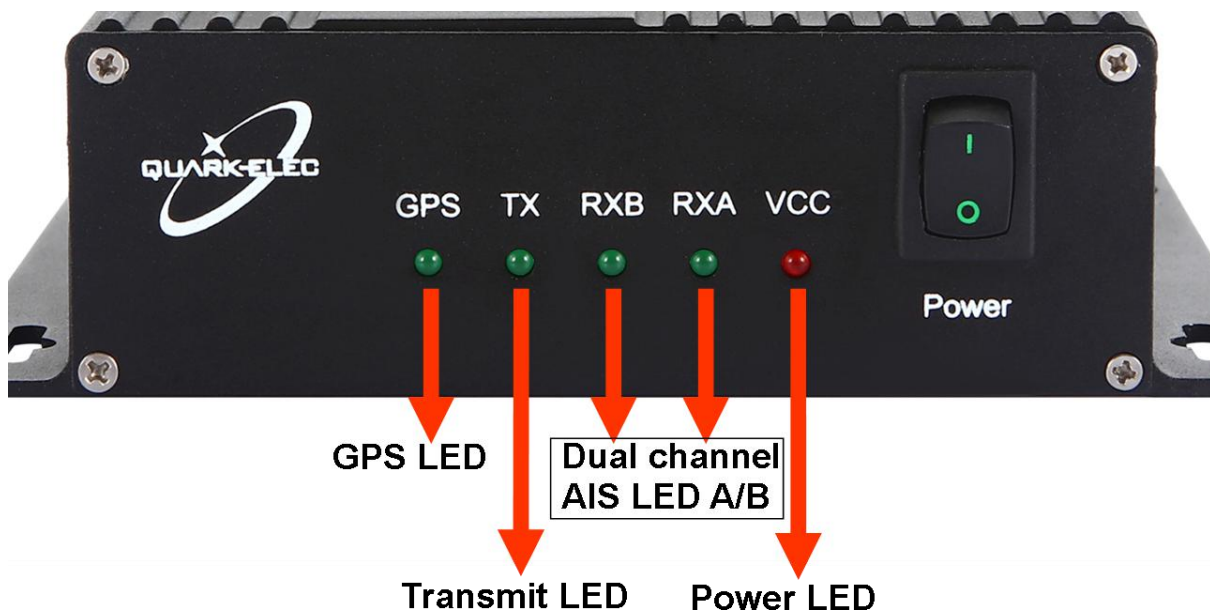
D: Distance from Starboard to GPS antenna in metres



8. Status LED'S

The A042T has 5 LED lights to show the internal workings and for troubleshooting any problems with the unit.

- **GPS:** GPS LED will stay lit once a GPS connection is established. This will flash if there is a drop in the connection.
- **TX:** The TX LED will flash for every class B signal sent from A042T.
- **RXA/RXB:** The RXA/RXB LED will flash independently depending on the channel signal received. The A042T Receives AIS data on channel A (161.975 MHz) and B (162.025 MHz) simultaneously.
- **VCC:** The VCC LED indicates power.



- **Note** that this process may take several minutes depending on the switch-on state of the GPS receiver.

9. Chart Software

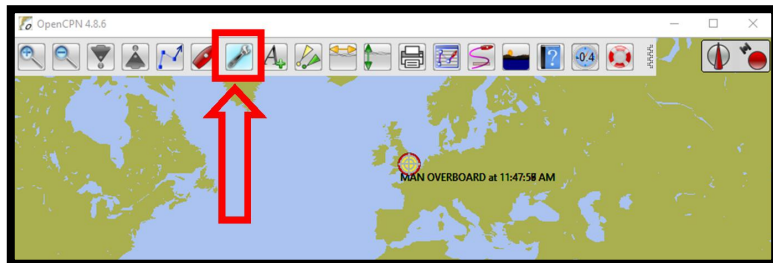
There is a wide range of chart software is available such as Imray, PolarView and OpenCPN.

- <https://opencpn.org/> OpenCPN (Open Chart Plotter Navigator) is a free software project to create 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.
- <http://www.polarnavy.com/main/download>
- <https://www.imray.com/imray-navigator-app/>

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

9.1. OpenCPN example USB setup

1. When you first open the software you will be greeted with a page similar to the one below. This is the main view of openCPN software. You now need to add data to openCPN via your Quark-elec instruments. Click on the 'Options' tab at the top. The settings tab looks like a spanner as seen below in the highlighted image.



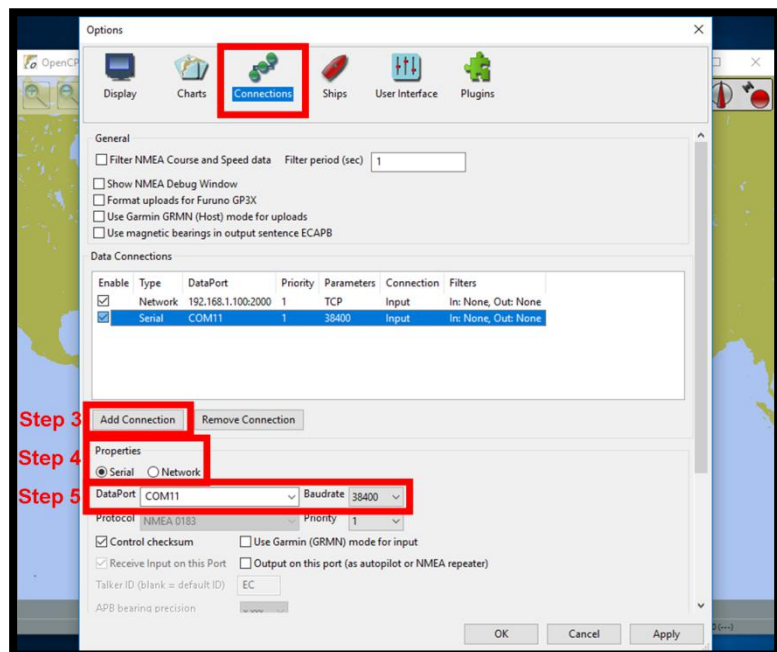
2. In the options at the top of the menu will be a tab/button that says 'Connections'. Click on this

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

4. Select 'Serial'

5. Select from the drop down the COM number assigned to A042T (See [connecting via USB](#) to find com port in device manager). Adjust the Baud rate accordingly (38400 covers AIS)

6. Click 'Apply' and then 'OK'



9.2. Maps

OpenCPN interface comes with a basic map view. You 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 openseachart.org. The collection and the updates are community driven.

10. Specification

Item	Specification
Standard	IEC 62287,ITU-RM.1371,IEC 60945, IEC 61162
NMEA 0183	38400 bps
Sensitivity	-110 dBm
Power	2W
Channel A	CH87B(161.975MHz)
Channel B	CH88B(162.025MHz)
Input Level	9.6V-36.0V
Transmit Mode	CSTDMA
Bandwidth	25 KHz
Bit ratio	9600 bps
Consumption	< 4 W
Working Temperature	-15°C~55°C
Store Temperature	-25°C~70°C
Humidity	0~95% RH at 40°C
Water resistance	IPx2

11. Troubleshooting

Phenomenon	Trouble Part	Reason	Solution
RXA indicator falls	AIS channel	NMEA 0183 port disconnection	Reconnect cable
RXB indicator falls	AIS channel	NMEA 0183 port disconnection	Reconnect cable
GPS indicator falls	GPS antenna	Disconnection or loose	Check the connection
TX indicator falls	Serial port	Serial definition fault or disconnection	Check configuration tool to check report rate
VCC indicator falls	Power cable	Cable disconnection	Check if the connection is correct
VCC indicator flashes	Power cable	Power supply is out of defined range	Set or transfer power level within defined range

12. 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	27-04-2018	Initial release
2.0	24-10-2018	New 2018 format

13. Glossary

- **USB:** cable for communication and power supply between devices.
- **NMEA 0183:** is a combined electrical and data specification for communication between marine electronics
- **MMSI (Maritime mobile service identity):** is a unique 9 digit number that is assigned to an AIS transponder. Similar to a cell phone number, your MMSI number is your unique calling number for that AIS transponder.
- **IMO (International Maritime Organization):** is a unique identifier for ships and for registered ship management companies. For ships, it consists of the three letters "IMO" followed by the seven-digit number assigned to all ships
- **Draught/Draft:** is the vertical distance between the waterline and the bottom of the hull (keel), with the thickness of the hull included

Quark-elec (UK)
Unit 7, the Quadrant
Newark close
Royston, UK
SG8 5HL

