QK-A026/024 Wireless AIS+GPS Receiver

Features

- Two independent receivers monitoring AIS channels (161.975MHz &162.025MHz) and decoding both channels simultaneously.
- Sensitivity up to -106 dBm@30% PER
- Up to 45 nautical miles receiving range
- USB 2.0 powered (<270mA@5.0V)
- NMEA-0183 message output through WiFi, USB and RS422
- Built-in GPS to provide positional data
- Combines NMEA input (4.8kpbs only), GPS and AIS messages, and outputs as a seamless stream of data
- BNC connector for 50 Ohm VHF antenna
- Powered SMA connector for 50 Ohm GPS antenna
- Ad Hoc and Station operating modes
- The internal WiFi access point connects up to 4 devices simultaneously
- Plug & Play connectivity with chart plotters and PCs
- Compatible with Windows, Mac, Linux, Android and iOS (Initial 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 for map data. Some iOS apps may charge for map use.

Designed in UK

Figure 1 QK-A024/26 Connection Diagram

Limited warranty

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-elec, nor their distributors or dealers accept responsibility or liability either to the product user or their estate for any accident, loss, injury or damage whatsoever arising out of the use or of liability to use this product.

Accuracy of this manual

Quark-elec AIS receiver 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	31-10-2016	Initial release

Order Information

Part No	Description
QK-A024	Dual channel AIS wireless receiver without built-in GPS receiver
QK-A026	Dual channel AIS wireless receiver with built-in GPS receiver

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1 INTRODUCTION

The marine 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, course and other information such as vessel identity with similarly equipped vessels. Position is derived from the Global Positioning System (GPS) and communication between vessels is by Very High Frequency (VHF) digital transmissions. There are a number of types of AIS device, like Class A transceivers, Class B transceivers, AIS base stations, Aids to Navigation (AtoN) and AIS receivers.

QK-A024 is a compact dual channel, VHF AIS receiver and is able to receive information from both AIS frequencies simultaneously. It can also combine one external NMEA0813(4800kbps) data source with GPS and

AIS messages. This single data stream is then transmitted synchronously via WiFi, USB and RS422. QK-A026 includes all of the features of the QK-A024 and includes an integrated GPS module. Both of them share the same capabilities for most other features; therefore they are covered together in this document.

2 HARDWARE

The QK-A026/024 is aimed at the small-commercial, leisure, fishing boat and vessel monitoring markets. Connected to an on board PC running compatible software, or a chart plotter, AIS data transmitted from ships within range can be displayed on the screen enabling the skipper or navigator to visualize the traffic within VHF range. Using QK-A026/24 can enhance safety at sea by providing proximity, size and directional information from other vessels, improve safety and efficiency in navigation and help protect the marine environment.

Although QK-A026/024 comes with an extruded aluminum 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. So generally a suitable placement of QK-A026/024 is together with other types of navigation equipment and the PC or chart plotter that will be used to display the AIS data. The following figure shows an overview of the QK-A026/024.

Figure 2 Overview of QK-A026/024

QK-A026/024 has the following electrical connections/indicators:

- USB connector. A micro USB connector provides the power source for the product and also outputs NMEA messages.
- NMEA 0813 input/output connectors. QK-A026/024 can be connected to other AIS compatible equipment, like wind/depth or heading sensors, via the NMEA inputs. The NMEA 0183 messages (4800kbps) from these devices can be multiplexed with QK-A026/024 received messages and then sent out through WiFi, USB and NMEA outputs simultaneously.
- GPS antenna. Standard SMA female 50 Ohm connector.

- AIS antenna. Standard BNC female 50 Ohm connector. An active VHF antenna splitter is required if one VHF antenna is shared by QK-A026/024 and VHF voice radio.
- WiFi connectivity in both Ad Hoc and Station modes on 802.11 b/g/n.

LED lights. A026/024 features three LEDs which indicate power, AIS and GPS status respectively. Three LEDs turn on and then off after initialization. When operating, these LEDs flash as below:

Power: Top LED flashes at 3 second intervals.

AIS : Middle LED Flashes for each valid AIS message received.

GPS: Bottom LED Flashes every second while receiving a valid message (not applicable on the A024 model)

Figure 3 USB and NMEA input/output connector

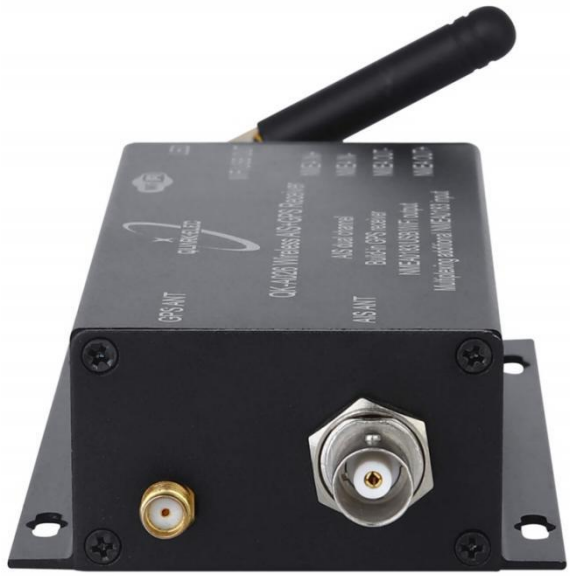


Figure 4 GPS and AIS antennas

3 INSTALLATION & OPERATION

3.1 Mounting

QK-A026/024 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.

QK-A026/024 is **not** supplied with a VHF antenna as the type of antenna and cable requirements differ from vessel to vessel. A suitable VHF antenna should be connected before the receiver will operate fully.

3.2 Power up

QK-A026/024 is typically powered by PC, laptop, tablet or other devices with 5.0V micro USB connector. If USB data output isn't required(data outputs through WiFi or NMEA output port), a power bank or any 5.0V supply with greater than 500mA current power source can be applied.

3.3 USB connection

QK-A026/024 is supplied with a USB connector. This connector provides power supply and the NMEA 0813 data output through it. This USB connector can be linked directly to a USB port on the PC or other mobile devices via the supplied cable.

To enable the USB data connection of QK-A026/024 to other devices, related hardware drivers may be needed dependent on system requirements.

For Windows 8, 7, Vista and XP, the driver can be found on the CD in the packing box or can be downloaded from the Quark-elec website at:

https://www.quark-elec.com/product/qk-a026-wireless-ais-gps-receiver/

QK-A026/024 registers itself to the computer as a virtual serial port.

No drivers are required on Windows 10. A new COM port will automatically show up in the device manager after plug in.

For Mac OS X,QK-A026/024 will be recognized and shown as a USB modem. The ID can be checked with the following steps:

--- After plugging QK-A026/024 into a USB port, launch Terminal.app.

--- Type ls /dev/*usb*

--- Mac system will return a list of USB devices. QK-A026/024 will display as - “/dev/tty.usbmodemXYZ” where XYZ is a number. Nothing further needs to be done if it is listed.

No driver is required for Linux. When plugged into the computer, QK-A026/024 will show up as a USB CDC device on /dev/ttyACM0.

The USB connection status can always be checked with a terminal monitor application like Putty or HyperTerminal. Ensure that the COM port is set at 38400bps, 8, N and 1 as shown below using HyperTerminal on Windows as an example to illustrate this process. Connect QK-A026/024 to the computer, follow the instructions to install the driver if required. After the driver is installed, run the Hardware Manager and check the COM interface number.

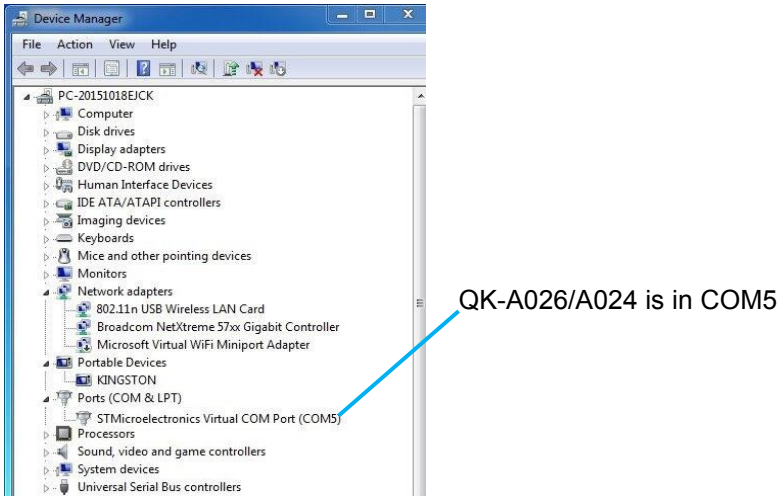


Figure 5 Check COM port

Run HyperTerminal, ensure that the COM port is set at 38400bps, 8, N and 1.

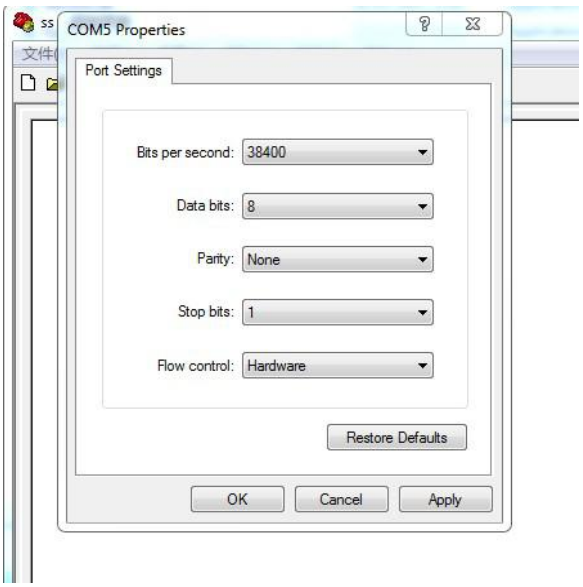
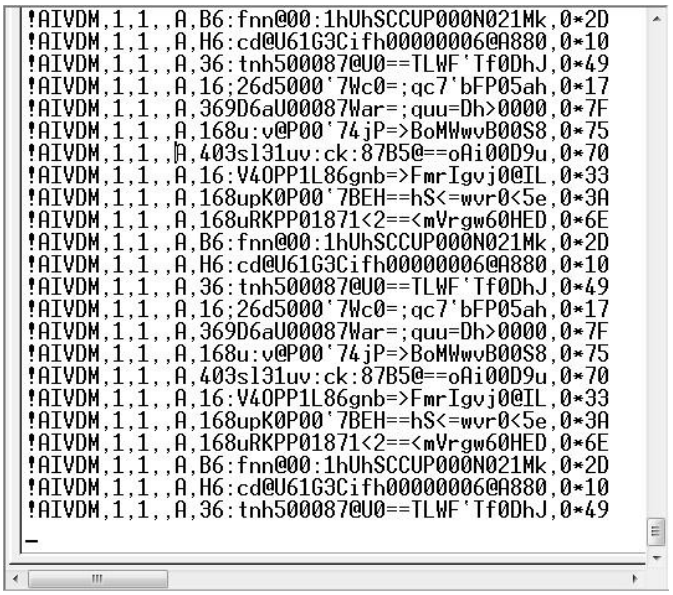


Figure 6 Setting on HyperTerminal

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



```
!AIVDM,1,1,,A,B6:fnn@00:1hUhSCCUP000N021Mk,0*2D
!AIVDM,1,1,,A,H6:cd@U61G3Cifh00000006@A880,0*10
!AIVDM,1,1,,A,36:tnh500087@U0==TLWF'Tf0DhJ,0*49
!AIVDM,1,1,,A,16;26d5000'7Wc0=;qc7'bFP05ah,0*17
!AIVDM,1,1,,A,369D6aU00087War=;quu=Dh>0000,0*7F
!AIVDM,1,1,,A,168u:v@P00'74jP=>BoMWwvB00S8,0*75
!AIVDM,1,1,,A,403sl31uv:ck:87B5@==oAi00D9u,0*70
!AIVDM,1,1,,A,16:V4OPP1L86gnb=>FmrIgvj0@IL,0*33
!AIVDM,1,1,,A,168upK0P00'7BEH==hS<=wvr0<5e,0*3A
!AIVDM,1,1,,A,168uRKPP01871<2==<mVrgw60HED,0*6E
!AIVDM,1,1,,A,B6:fnn@00:1hUhSCCUP000N021Mk,0*2D
!AIVDM,1,1,,A,H6:cd@U61G3Cifh00000006@A880,0*10
!AIVDM,1,1,,A,36:tnh500087@U0==TLWF'Tf0DhJ,0*49
!AIVDM,1,1,,A,16;26d5000'7Wc0=;qc7'bFP05ah,0*17
!AIVDM,1,1,,A,369D6aU00087War=;quu=Dh>0000,0*7F
!AIVDM,1,1,,A,168u:v@P00'74jP=>BoMWwvB00S8,0*75
!AIVDM,1,1,,A,403sl31uv:ck:87B5@==oAi00D9u,0*70
!AIVDM,1,1,,A,16:V4OPP1L86gnb=>FmrIgvj0@IL,0*33
!AIVDM,1,1,,A,168upK0P00'7BEH==hS<=wvr0<5e,0*3A
!AIVDM,1,1,,A,168uRKPP01871<2==<mVrgw60HED,0*6E
!AIVDM,1,1,,A,B6:fnn@00:1hUhSCCUP000N021Mk,0*2D
!AIVDM,1,1,,A,H6:cd@U61G3Cifh00000006@A880,0*10
!AIVDM,1,1,,A,36:tnh500087@U0==TLWF'Tf0DhJ,0*49
```

Figure 7 Display on HyperTerminal

3.4 WiFi connection

QK-A026/024 support both Ad-hoc mode and station mode from Jan 2018. The module will work in Ad-hoc mode by default but it can be easily setup to station mode through GUI.

3.4.1 Ad-hoc mode

15 seconds after QK-A026/024 has been powered up, the operator should be able to scan and find a WiFi network (SSID) similar to 'QK-A026xxxx' using WiFi enabled devices such as computers, mobile phones or tablets.

Connect the device/s to 'QK-A026xxxx' with '88888888' as the default password. Set the protocol as 'TCP', IP address as '192.168.1.100' and the port number as '2000' in the chart software.

Item	Setting
SSID	Similar to 'QK-A026xxxx'
Protocol	TCP
IP address	192.168.1.100
Port	2000

With the above settings, wireless connection should be set and the operator will be able to receive the AIS messages through the chart software. the operator can always check the wireless connection with TCP/IP port monitoring software as shown below:

Note: In Ad-hoc mode, the IP address should not be changed and the password should between 8 to 12 characters.

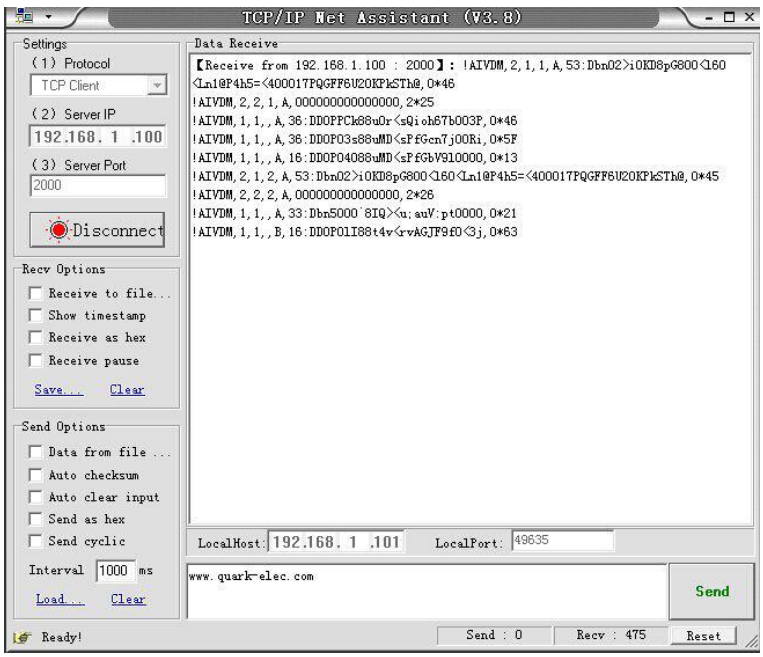


Figure 8 TCP/IP setting check

3.4.2 Station mode

QK-A026/024 can also be connected in Station Mode by changing these parameters to those of your Wireless Access Point as illustrated below:

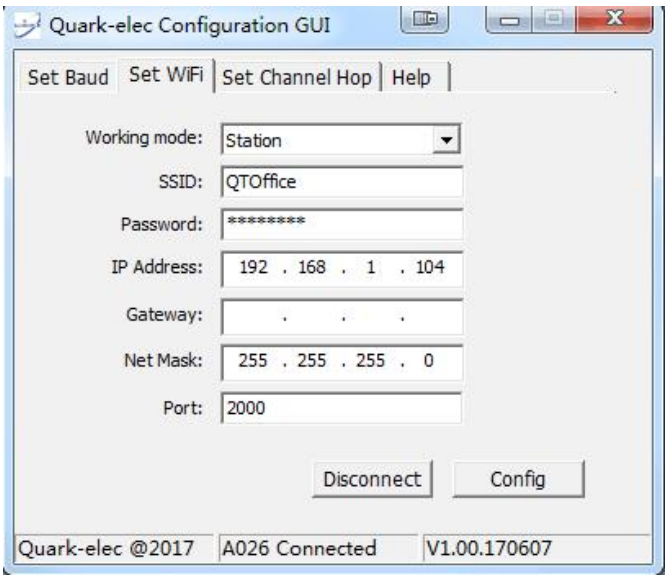


Figure 10 Station Mode Settings

Figure 9 Station Mode Connection

The Configuration Software (GUI) can be used to adjust these settings, including baud rates and WiFi settings. You can download the software here:

https://quark-elec.com/doc/QE_MUX_configTool.zip

Detailed instructions on how to use the Configuration software are available here:

https://www.quark-elec.com/doc/QK-A0xx_GUI_application_note.pdf

3.5 NMEA connection

The NMEA0183 connector provides the links to a chart plotter and other instruments. It consists of four wires, where two are RS422 standard differential output and the other two are differential input. The output operates at a baud rate of 38400bps. The connected chart plotter should be configured at this rate to receive the proper data. The input operates at 4800bps and are usually connected to low speed NMEA format data instruments, like the heading sensor, sounder and wind/depth sensors.

The built-in multiplexer combines the input NMEA0183 data together with GPS and AIS messages, mixing into a single stream and then sends out to NMEA output at 38400bps.

4 WORKING WITH OPENCPN

OpenCPN is free software that can be used to view concise chart plotter and navigation information, It is available for use on both Windows and the MAC OSX system from:

http://opencpn.org/ocpn/download

The following is a sample setting for the OpenCPN plotter. COM2 was set as the QK-A026/024 input and COM1 is used for a standard serial port GPS input (QK-026 doesn't need extra GPS input).

Other software is available such as SeaClear, PolarNavy, PolarView. They all have similar settings.

http://www.sping.com/seaclear/

http://www.polarnavy.com/

http://www.polarnavy.com/main/prod1

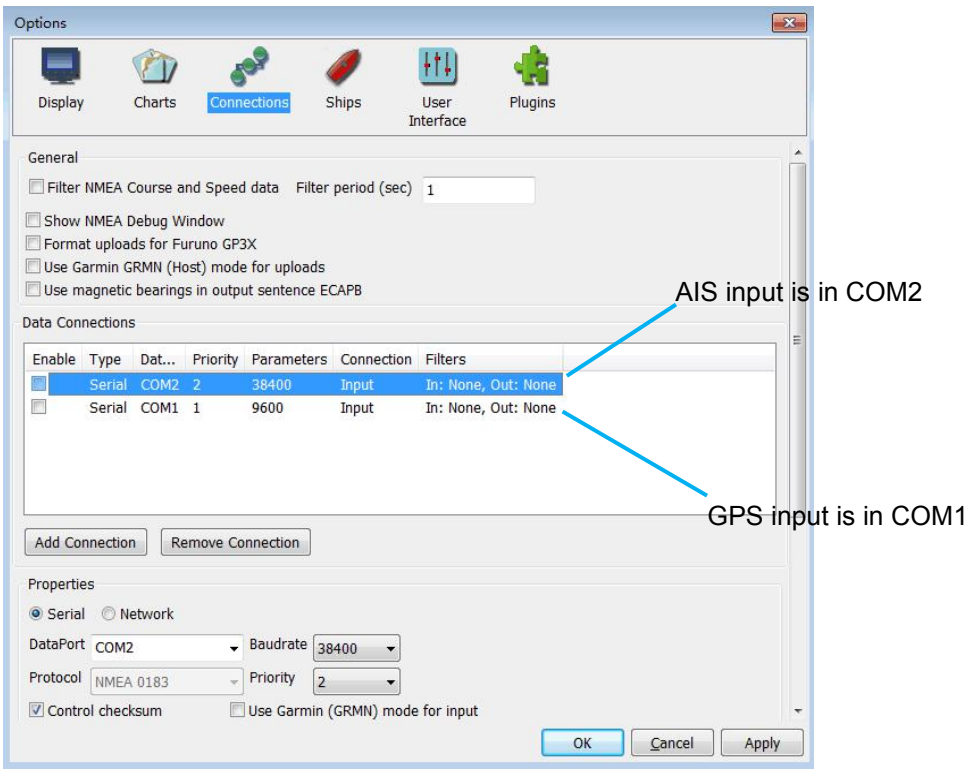


Figure 11 Serial port setting on OpenCPN

For Wifi connection, 'Network' rather than 'Serial' needs to be selected in 'Connections->Properties' and the following settings need to be input.

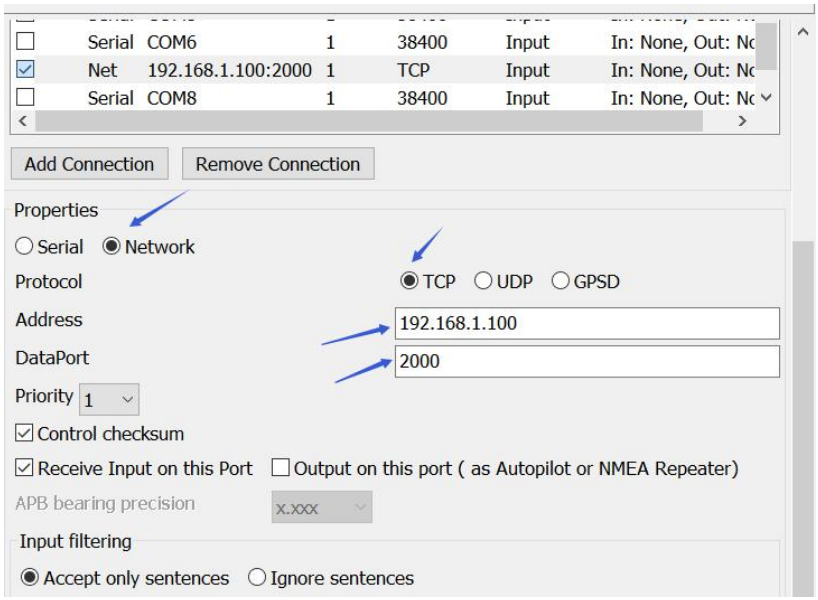


Figure 12 WiFi setting on OpenCPN

5 ANTENNA

AIS communication systems use frequencies in the maritime VHF band, which is considered to be 'line of sight' radio. This means that if the QK-A026/024 antenna cannot 'see' the antennas of other vessels, the AIS signals from vessels will not reach QK-A026/024. In practice, this is not a strict requirement, a few buildings and trees between them will be fine. Large obstacles such as hills and mountains, on the other hand, will significantly degrade the AIS signal

To have 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.

AIS communication system frequencies are close to the duplex channels used for marine communication, so the antenna should be separated as much as possible(Ideally at least 3.0 meters) from the voice communication VHF antenna to avoid unnecessary adjacent channel interference. Best separation is achieved by installing the antennas over each other or on separate sides of the mast. If an existing VHF transmitting antenna is used to receive AIS signals, proper separation equipment(e.g., an active VHF antenna splitter) should be applied.

6 SPECIFICATION

Item	Specification
Frequency bands	161.975MHz &162.025MHz
Operating temperature	-25°C to +80°C
Storage temperature	-25°C to +85°C
DC supply	5.0V(+/-0.2V)
Average supply current (typical quiescent)	180mA
Maximum supply current(during SMS transceiver activity)	270mA
AIS receive sensitivity	-106dBm@30%PER
GPS receiver sensitivity	-162dBm
NMEA data format	ITU/ NMEA 0183 format
NMEA input data rate	4.8kbps
NMEA output data rate	38.4kbps
WiFi mode	Ad Hoc and Station modes on 802.11 b/g/n
Security	WPA/WPA2
Network Protocols	TCP

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

Choosing the right Quark Marine product...

Features	A021	A022	A023	A024	A026	A027	A031
AIS channel hopping[3]	✓		✓				
AIS dual channel		✓		✓	✓	✓	
AIS sensitivity @30% PER	-105dBm	-106dBm[1]	-105dBm	-106dBm[1]	-106dBm[1]	-105dBm	
AIS range[2]	45nm	45nm	45nm	45nm	45nm	45nm	
AIS antenna type	SMA	SMA	BNC	BNC	BNC	BNC	
USB powered	✓	✓	✓	✓	✓		
Configuration through USB port	✓		✓	✓	✓	✓	✓
USB NMEA 0183 output	✓	✓	✓	✓	✓	✓	✓
Windows /Mac/Linux	✓	✓	✓	✓	✓	✓	✓
Works with chart plotters	✓	✓	✓	✓	✓	✓	✓
Interworks with GPS	✓	✓	✓	✓	Built in GPS	Built in GPS	✓
Android		✓	✓	✓	✓	✓	✓
iOS		✓	✓	✓	✓	✓	✓
WiFi			✓	✓	✓	✓	✓
Ad-Hoc connection			✓	✓	✓	✓	✓
Station mode connection				✓	✓	✓	✓
NMEA 0183 input				✓	✓		✓
NMEA 0183 output				✓	✓	✓	✓
Multiplexing				✓	✓	✓	✓
GPS (powered for active antennas)					✓	✓	
SeaTalk™ converting						✓	✓
Connects to Garmin if used with AS03				✓	✓	✓	✓

[1] Next upgrade should increase this to -110dBm.
[2] Tested with a pushpit antenna mounted at masthead, 60 feet above sea level.
[3] Next upgrade will include manually adjustable hopping interval rates (0.25 second, 1 second, 30 second and auto-hopping. (due 3/18)

Unit 7, The Quadrant
Newark Close
Royston, UK
SG8 5HL

Warning：

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-- Reorient or relocate the receiving antenna.
-- Increase the separation between the equipment and receiver.
-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-- Consult the dealer or an experienced radio/TV technician for help.
NOTE: This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter

RF Exposure Statement

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance of 20Cm the radiator your body. This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter