

What to look for when buying a wifi NMEA 0183 multiplexer

The Brookhouse iMux/iMux-ST was the first wifi multiplexer on the market. It was received with great enthusiasm by the boating community and many happy customers have crossed oceans with the iPad/iMux combination for navigation. The testimonials on our website (under "What users say") say enough.

Since the early iMux days other wifi multiplexer products have come onto the market.

We are now often asked for comparisons of the iMux features with other products. While we will leave the actual comparisons to others, we can help potential buyers with some suggestions what to look for before they purchase.

Over the years we have added a significant number of new features to the original iMux and the product as it is today is a top-scorer on all points.

Compare the following technical aspects with other products before you buy:

- **Wifi**

There are 2 different protocols that can be used for wifi communication: TCP and UDP. UDP is a far simpler protocol than TCP and does not provide error checking and re-transmission. It is therefore less secure. The Brookhouse iMux only uses the TCP protocol, because we feel that the risk of lost or incomplete data is not acceptable. While occasional NMEA data-loss won't have a huge effect on the functioning of a navigation system, the problem is that if UDP data is being lost due to various circumstances, the extent of the data loss cannot be determined. If e.g. AIS target data is lost, this can be a safety issue. If an auto pilot is controlled via wifi, the performance can degrade if data is regularly lost. As the TCP protocol is more complex, the original iMux only supported a single TCP session via wifi, in ad-hoc mode. The present version supports up to 16 simultaneous TCP sessions, so 16 secure sessions with iPads, iPhones, laptops, Androids in standard AP infrastructure mode. In addition to the data-integrity issue of UDP, most PC software only works with TCP, including most virtual com port software. The iMux works like a standard wifi access point and supports DHCP for automatic IP address assignment. Computers can connect without changing the default Windows settings for wireless network connections. The iMux also supports WPA2 security. Navigation data is not particularly confidential, but with the growing number of wifi-based navigation systems, security prevents (accidental) connection to another vessel's wifi system, especially when in port. A unique WPA2 key is supplied with each iMux.

- **Integration with another on-board wifi network.**

Most Wifi devices can usually be configured for either access point mode or station mode (sometimes referred to as client mode). An embedded wifi module that fully relies on wifi for configuration settings, can become completely inaccessible if an error is made while setting it in station mode. If the smallest mistake is made in IP address or security password, the connection to the other network/router cannot be established. The device is rejected each time it attempts to associate with the network and there is no way the settings can be corrected as AP mode is no longer active to access the internal configuration webpage.

Wifi devices like routers often also have an ethernet port which can be used for configuration, but this is not the case for embedded wifi devices.

We have overcome this problem in the iMux in the latest firmware version, by allowing dual mode operation. If the iMux is configured for Station Mode, to join another network, the AP-mode (access point mode) also remains active, for re-configuration via the internal configuration webpage. The NMEA server can also still be accessed in AP mode.

The maximum of 16 simultaneous TCP sessions is for combined client connections directly to the iMux network and via the router.

- **Multiplexer performance.**

What is good multiplexer performance? Good multiplexer performance means minimal data delays, minimal risk of congestion, high data-integrity and equal priority of input ports. In fact, port priority is irrelevant if data-delays for all ports are always very short..

The iMux, like all other Brookhouse multiplexers, uses a sophisticated circular buffer system with dynamic buffer allocation. The delay between data coming in and going out is always very short, even if high frequency NMEA talkers such as fast heading sensors are connected. It is a misunderstanding that large buffers are the primary requirement for optimal multiplexer performance. On the contrary, large buffers can cause unacceptable delays. Efficient data handling is far more important. Standard NMEA sentences are no longer than 82 characters.

If under any circumstance more than just a few sentences per input port are buffered, unacceptable transmission delays will occur. With a steady input data flow that approaches the maximum multiplexer capacity, inefficient data handling can fill up large buffers and cause seconds long delays. Not so in a Brookhouse multiplexer. If not necessary, Brookhouse multiplexers do not even buffer and data is transmitted from the output port only a few character times later after being received at the input port. Minimal delays are important for time-critical data-feeds such as fast heading data for Marpa. Congestion and data-overflow are extremely rare in Brookhouse multiplexers. There is no warning light for data overflow on

our multiplexers, because it is simply not needed. The inherent efficiency of data handling in Brookhouse multiplexers does not call for port prioritizing or configuration options to overcome delays for high frequency NMEA input.

- **Filtering and modifying the contents of NMEA sentences.**
For optimizing a complex navigation system, it can be advantageous to filter out certain redundant NMEA sentences in the multiplexer. Also, it is sometimes necessary to make changes to NMEA sentences to make them compatible with equipment that supports a different version of NMEA 0183. A classic example is an older B&G autopilot: Quality equipment and still many years of reliable service ahead, but requiring NMEA vers. 1.5 for external control. Most new chart plotters support version 3.01 or higher and are thus incompatible. Brookhouse multiplexers have the unique ability to make the necessary adjustments in the NMEA data "on the fly", to achieve compatibility between old en new.
- **Configuration**
In the majority of cases, Brookhouse multiplexers can be installed "out of the box", without the need for configuration. If the need for configuration arises, such as in the example above to achive NMEA compatibility, a terminal program such as the (free) Teraterm program can be used to access the multiplexer configuration menu via a serial computer port or via USB-serial adapter. Brookhouse multiplexers do not come with a special configuration program, because we feel it is too restrictive and often not necessary in the first place. Many of the options, in particular NMEA sentence editing, are controlled by uploadable scripts, available from Brookhouse. The scripts can be easily uploaded using a terminal program from any available computer, without the need to first install special software. The baudrates of input ports of Brookhouse multiplexers are preset to 4800 and 38400 and cannot be changed. Fixed baudrates help in the earlier discussed efficiency of data handling. Output baudrates can be changed, although we recommend the default 38400 as the preferred baudrate in most cases (for multiplexers with AIS support). While it may seem advantageous to be able to change input port baudrates, the NMEA 0183 standard only recommends the above two baudrates (4800 for instruments and GPS, 38400 for AIS). All NMEA instruments we know support at least one of these baudrates.

Configuration of wifi parameters can be done via the built-in configuration web-page.

- **General specifications.**
For a comparison of general specifications, detailed information is available on the Brookhouse website. In short, the iMux has three standard opto-isolated NMEA input ports, one opto-isolated 38400 input

port, one serial output (for chart plotter or computer) and a standard NMEA OUT port (4800 baud) for control of an auto pilot and/or DSC radio position feed. The serial port output is the same as the wifi data-stream (up to 16 TCP sessions). Wifi communication is bi-directional and allows auto pilot control via wifi and downloading of waypoints.

Automatic GPS backup switching, conversion of DSC/DSE sequences to waypoints and filtering of redundant AIS transponder data are among activated special features. These features can be disabled, changed or extended if required, by configuring the multiplexer using a terminal program.

The iMux-ST is identical, but a (classic) Seatalk connection is available instead of NMEA input port #1. Seatalk can be disabled, which makes port # 1 available for NMEA.

- **Seatalk**

The iMux-ST is the Brookhouse iMux model for (classic) Seatalk support, for the connection of Raymarine instruments and GPS. The Brookhouse Seatalk to NMEA conversion has been available for many years and is well-proven. For detailed specifications and comparisons, please refer to the Seatalk page on our website: <http://brookhouseonline.com/seatalk.htm>

- **Practical points**

Often the little things matter. While most connections of electronic devices do not require heavy gauge wiring, from experience we know that on boats this is often the case. We know how frustrating it can be to try and insert a wire in a connector opening that is too small, especially if two wires need to be combined.

For this reason, the connectors used on Brookhouse multiplexers are larger and more robust than found on other equipment.

The iMux has no external wifi antenna, but has an internal chip-antenna with more than ample range. Often this simplifies installation if limited space is available.

Hopefully the above information will be of assistance when selecting a NMEA 0183 multiplexer product for a wifi-based navigation system.

Brookhouse