

Addendum for Installation of Brookhouse NMEA multiplexer model AIS

General

Model AIS combines the NMEA data from an AIS receiver transmitting at 38400 bps and other NMEA talkers transmitting at 4800 bps (bits per second) to a single data stream with baud rate 38400 for input by a computer via a RS232 serial or USB port (option). It also converts the baudrate of data returned by the computer to the multiplexer via the same port from 38400 bps to 4800 bps.

The computer port has to be set to 38400 bps to be able to receive the data. As the baudrate of a computer port applies to both the transmit and receive direction, computer output such as auto pilot NMEA control sentences are also sent at 38400. This baudrate is too high to feed an auto pilot or other NMEA listener directly. Multiplexer model AIS therefore converts the baudrate from 38400 to 4800 bps to overcome this problem. The multiplexer's RS422 port (NMEA OUT) outputs the data (received via RS232 or USB at 38400 bps) at 4800 bps.

The Brookhouse NMEA multiplexer model AIS is supplied pre-configured, i.e. it is not necessary to execute the setup procedure, unless one or more of the extra features are required, such as GPS backup switching, filtering, conversion of NMEA sentences or if you wish to use a baudrate conversion option other than the default. We recommend to install the multiplexer first without setup to check if all functions are working. The setup procedure is described hereunder.

Connections

Make sure that the wires are inserted in the correct screw terminals that correspond with the descriptions on the front label of the multiplexer. A mistake can easily be made if looking at the connector and label from an angle. Count the terminal screws and corresponding descriptions from the end of the connector if in doubt.

Power supply: 9-35V. For practical reasons, power may be obtained from the Raymarine Seataalk connector. If the Seataalk option has not been installed in the mux, do not connect the Seataalk signal wire, just power (red +, black -). Also see **Seataalk** below.

AIS receiver or transponder:

NMEA OUT + (38400 baud)	→	NMEA CH4 IN A
NMEA OUT -	→	NMEA CH4 IN B

Brookhouse NMEA 0183 multiplexers can be used with a large range of AIS receivers and transponders. Unfortunately the output signal characteristics of the various devices differ significantly and some do not comply with NMEA (RS422) or RS232 standards.

The multiplexer's NMEA input port for AIS is, like the other NMEA inputs, opto-isolated. The opto-isolated port with the high baud rate 38400 requires signal characteristics, that fall in a narrower acceptable range, than non-opto isolated ports. Therefore a given model AIS receiver or transponder may work with a certain chart plotter or a computer port if directly connected, but may not work if connected via the multiplexer. However, if the following simple instructions for 'conditioning' the output signal of certain receivers or transponders are followed, any compatibility problems can be resolved.

Under the large green main multiplexer connector an insulated *white* wire (pig tail) can be found. This wire is external, the mux enclosure does not need to be opened! The white pig tail can be used to adapt the input impedance of the AIS input port for certain AIS receivers and transponders. If this applies, remove the heatshrink insulation and combine the bare end with the AIS output signal wire in NMEA ch4 IN A of the multiplexer.

Connect the following devices directly to the multiplexer's AIS port (NMEA ch4 IN), without the white adaptation wire:

Nauticast class A transponders.
Furuno class A transponders.
Standard Horizon GX2100 VHF with built-in AIS
Smart Radio AIS receivers.

Use the white adaptation wire as described above for the following:

All class B AIS transponders based on the SRT board (Comar CSB200, True Heading AIS-Ctr, Westmarine re-branded class B transponder, Simrad, etc.)

We also supply a separate 1K5 resistor, which should be used for some AIS receivers/transponders in the following ways:

For the Nasa AIS engine.

Connect the 1k5 resistor as a "pull-up" resistor between NMEA ch4 IN A and the +12V connection to the multiplexer. The receiver and the multiplexer should share the same 12V power supply. Pin 2 of the AIS engine output port should also be connected to NMEA ch4 IN A, i.e. the resistor and the signal wire are combined in this terminal.
Connect signal ground (pin 5 of the 9-pin connector) to NMEA ch4 IN B.
Do not use the white adaptation wire.

Other incompatible AIS output signals

Sometimes it is necessary to connect the 1K5 resistor in-line with the white adaptation wire, i.e. do not combine the white adaptation wire with the AIS output signal wire directly, but connect the resistor to the end of the white wire and combine the other side of the resistor with the AIS signal wire in NMEA ch4 IN A. This is sometimes necessary for connecting an RS232 port, including a PC port (for AIS emulation). There are also a few known cases where the resistor had to be used in this way for connecting a SR161 AIS receiver.

We will also explain with photos how to make the AIS connections on our website under "tips and suggestions".

Other NMEA Talkers (4800 baud):

NMEA Output A + → Multiplexer NMEA CH1 – CH3 IN A
NMEA Output B - → Multiplexer NMEA CH1 – CH3 IN B

Note: If the Seataalk option has been installed and activated, CH1 is not available for NMEA input. Leave open. (see **Seataalk** below).

Note 2: Standard NMEA talkers with baud rate 4800 can only be connected to NMEA IN 1, 2 and 3. NMEA IN 4 accepts baud rate 38400 for connection of an AIS receiver.

NMEA Listeners (4800 baud):

Note that the 4800 bps multiplexer output is the baudrate conversion output and by default not the combined output of the connected NMEA talkers. Also refer to "Baudrate Conversion options" below.

NMEA Input A + → Multiplexer RS422 - NMEA OUT A
NMEA Input B - → Multiplexer RS422 – NMEA OUT B

A maximum of 4 NMEA listeners can be connected in parallel to this output, provided that they comply with the NMEA standard. The output is a differential signal (RS422, NMEA standard).

RS232 output (TxD)

The output of the multiplexer model AIS is connected to a computer as described in the manual for the standard version. Assuming a 9-pin D-sub connector, mux terminal TxD should be connected to pin 2 of the computer connector and Gnd to pin 5.

RS232 input (RxD)

This is the multiplexer's baudrate conversion input port. Return data from the computer (pin 3) or chartplotter, entered via this port at 38400 bps is output at the mux NMEA OUT port at 4800bps. Connect signal ground to Gnd.

USB

The USB connection is optional. Follow the instructions in the standard multiplexer manual for USB driver installation. If data sent back to the multiplexer via USB (typically auto pilot sentences like APA, APB, XTE etc.) needs to be converted from 38400 to 4800 bps, the blue wire coming out from the multiplexer enclosure under the green multiplexer connector has to be inserted in the RS232 RxD terminal. RS232 RxD is the baudrate conversion input port.

Seatalk

If the Seataalk option has been installed in mux model AIS, a direct connection to the Raymarine Seataalk bus can be made. The multiplexer will translate Seataalk GPS and instrument data received from the ST-bus to NMEA sentences and include these in the multiplexer output data stream.

Connections:

Seataalk signal wire (yellow) → ST Yellow Signal

Seataalk shield (-12V) → ST Shld –

Seataalk +12V (red) → ST Red +

Note: If the Seataalk option has been ordered, it has been enabled in our workshop. This means that CH1 NMEA IN cannot be used for a NMEA talker connection.

To disable Seataalk and free up CH1 for NMEA, the setup procedure has to be executed.

Setup

Setup is necessary if any of the special multiplexer functions are required and for uploading filter/edit and/or LCD script files.

Note that the baudrate of the multiplexer model AIS is preset 38400. The baudrate of the terminal program used to communicate with the multiplexer for setup (Hyperterminal on a PC) therefore has to be set to 38400 bps as well.

Baudrate Conversion options

Instead of only converting the baudrate of data received back from the computer from 38400 to 4800 bps (default), it is also possible to convert the multiplexer's own combined NMEA output data stream from 38400 to 4800 baud. This situation may occur if the multiplexer is required to feed standard NMEA listeners at 4800 bps when the computer is switched off.

If the complete data-stream including AIS data would be converted from 38400 to 4800 bps, not enough bandwidth would be available to transmit all data during periods of increased AIS traffic. For this reason, AIS data occurring in the speed conversion input data stream is always automatically filtered out.

Baudrate conversion options can be selected from the multiplexer's setup menu.

Option 5 (baudrate conversion option 1)

This is the default. Only data received on the baudrate conversion input port is converted to 4800 bps.

Option 6 (baudrate conversion option 2)

Only data received from the baudrate conversion input port is converted to 4800 bps, the same as for option 5 (baudrate conversion option 1). However, if no data is received for 10 seconds, the multiplexer transmits the combined data stream at 4800 bps instead, with AIS data automatically filtered out. This option is very useful in the following situation: If an auto pilot is connected to the 4800bps mux output it receives data from the computer when navigation software is running on the computer. If the computer is switched off, instrument and GPS data from the combined data stream is sent to the auto pilot instead. This ensures that the auto pilot receives speed (SOG), course (COG) and wind-data, also with the computer switched off.

Option 7 (baudrate conversion option 3)

1. The return data entered via the baudrate conversion input port **plus** data from the combined output data stream but AIS data filtered out is **always** transmitted at 4800 bps.
2. In addition, NMEA data received via the baudrate conversion input port is also included in the combined output data stream.

For options 6 and 7, a channel block mask can be specified. This allows exclusion of input channels 1 and/or 2 and/or 3 from the baudrate conversion output data stream. Also, for option 7, baudrate conversion input data can be blocked from inclusion in the combined data stream.

Channel block mask values:

0	-	No channels are blocked. Options 6 and 7 work as described above.
1	-	NMEA Input channel 1 is blocked.
2	-	NMEA Input channel 2 is blocked.
3	-	NMEA Input channel 1 and 2 are blocked.
4	-	NMEA Input channel 3 is blocked.
5	-	NMEA Input channels 1 and 3 are blocked.
6	-	NMEA Input channels 2 and 3 are blocked.
7	-	NMEA Input channels 1, 2 and 3 are blocked.
8	-	Baudrate conversion input data is blocked from combined data stream.
9	-	8 and 1 above
A	-	8 and 2 above
B	-	8 and 3 above
Etc.		

A separate document describing the baudrate conversion options in more detail is available from Brookhouse.

Important:

In spite of the filtering out of the AIS data, the bandwidth of the 4800 output may potentially still be insufficient to transmit all data from the 38400 output data stream. Reducing the baudrate from 38400 to 4800 means effectively a reduction in bandwidth by a factor 1/8. Normal combined traffic from slow NMEA talkers only will hardly ever cause this situation to occur, but if the bandwidth is exceeded, use the channel block mask or the Brookhouse filter feature to selectively filter out redundant NMEA sentences.

Filtering / Conversion of NMEA sentences

A separate description is available from Brookhouse and on the website.

The format of NMEA sentences can be altered to suit NMEA listeners that require a different version of NMEA or entire sentences can be filtered out to remove redundant data.

Multiplexer model AIS has two separate data streams:

- 1 . The combined data stream of AIS plus other NMEA talkers connected to NMEA IN CH1 – CH3 and

2. The speed conversion data stream (NMEA output from the C-series @ 38400 baud converted to 4800 bps and available at RS422 out terminal).

Filtering / editing can be used for either of the 2 data streams, but not at the same time. The channel number in the first directive of the filtering/editing script, uploaded to the multiplexer, determines to which data stream the entire script applies.

- If the channel number is 5, the script applies to the speed conversion data stream. All other directives in the script have to apply to channel 5 as well. If not, they will be ignored.
- If the first channel number is not 5, the script applies to channels 1-4. The channel number in each directive specifies to which channel the directive applies or channel number 9 means that the directive applies to all channels (ch1 – ch 4).

If you need a script for a particular purpose, ask Brookhouse support. There are a number of scripts available that can be made available at no charge.

Compact LCD

For the compact LCD (repeater), the same script rules apply as for filtering/editing, i.e. data from either the combined data stream or the speed conversion data stream can be displayed. The channel number in the first display directive determines which one:

- If the channel number is 5, the script applies to the speed conversion data stream. All other directives in the script have to apply to channel 5 as well. If not, they will be ignored.
- If the first channel number is not 5, the script applies to channels 1-4. The channel number in each directive specifies to which channel the directive applies or channel number 9 means that the directive applies to all channels (ch1 – ch 4).