Installation instructions for Brookhouse NMEA multiplexer model AISC

General

This addendum describes connections and features of multiplexer model AISC where they are different from the standard Brookhouse NMEA 0183 multiplexer. Please use the comprehensive manual for the standard model for descriptions of general subjects such as the setup procedure, USB connections, the optional LCD, backup switching etc.

Model AISC is specifically aimed at connection of an AIS receiver and other NMEA talkers to Raymarine chart plotters, but there are many other uses as well. In this quick installation guide, connection to a C- or E-series chart plotter is assumed. For use whith other than Raymarine C/E series chart plotters, ignore the colour-coding on the front-label of the multiplexer and substitute "chart plotter" for "C-series" or "C/E".

For C-series AIS support a software upgrade is available from Raymarine. The baudrate of the NMEA port of the chart plotter has to be set to 38400 (AIS).
For the connection of the C-series display to the Brookhouse multiplexer a cable with a special 5-pin connector is required, Raymarine product code R08004.

Brookhouse NMEA multiplexer model AISC 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 filtering or conversion of NMEA sentences or a different baudrate conversion option is required. We recommend to install the multiplexer first without setup to check if all functions are working. The setup procedure is described elsewhere in this installation instruction.

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 Seatalk connector. If the Seatalk option has not been installed in the mux, do not connect the Seatalk signal wire, just power (red +, black -). Also see **Seatalk** below.

AIS receiver or transponder:
Signal wire +   →   NMEA CH4 IN A (e.g. for SR161 or NASA AIS receiver to pin 2 of 9-pin D-sub)
Signal return - →   NMEA CH4 IN B (e.g. for SR161 or NASA AIS engine pin 5 of 9-pin D-sub connector)

The number of AIS receivers and transponders used with Brookhouse multiplexers is steadily growing. Unfortunately the output signal characteristics of the various models differ significantly. The multiplexer's NMEA input for AIS is, like the other NMEA inputs, opto-isolated. Opto-couplers used at the high bit-rate of 38400 bps require an input signal strength that falls in a narrower range than e.g. a computer serial port. To cater for the various AIS receiver and transponder models that are on the market today, the AIS input port of Brookhouse multiplexer AIS models can be configured as follows to allow different signal strengths and signal characteristics.

Under the large green main multiplexer connector an insulated *white* wire can be found. This wire is external, the mux enclosure does not need to be opened! The white wire can be used to adapt the input resistance of the AIS input port for certain AIS receivers and transponders. If this applies, remove the heatshrink insulation and combine the wire with the AIS output signal wire in NMEA IN 4 A of the multiplexer.

This adaption is **not necessary** for the popular Smart Radio AIS receivers such as the SR161. For Nasa AIS receivers the white wire is required. For an NMEA output signal (RS244) of the correct level, the adaption is not necessary, but in practice the NMEA output of many of the current class B transponders the adaption wire should be used. This applies to class B transponders such as the Comar CSB200, the Radar Plus AIS-BX, True Heading AIS-Ctrx and similar units.

However, if instead of the RS422 NMEA output the **RS232 output** of these transponders is connected to the multiplexer AIS input, the white adaption wire should **not** be used.

Other NMEA Talkers (4800 baud):
NMEA Output A +   →   NMEA CH1 – CH3 IN A
NMEA Output B -   →   NMEA CH1 – CH3 IN B
Note: If the Seatalk option has been installed and activated, CH1 is not available for NMEA input. Leave open. (see **Seatalk** 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.

Seatalk
If the Seatalk option has been installed in mux model AIS-C, a direct connection to the Raymarine Seatalk bus can be made. The multiplexer will translate Seatalk GPS and instrument data received from the ST-bus to NMEA sentences independently and include this in the multiplexer output data stream. This option is intended for installations including a computer. If the C-series chartplotter is switched off, instrument and ST GPS data will still be available to the computer in NMEA format via RS232 or USB.
Connections:
Seatalk signal wire (yellow) → ST Yellow Signal
Seatalk shield (-12V)   → ST Shld –
Seatalk +12V (red)   → ST Red +
Note: If the Seatalk 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 Seatalk and free up CH1 for NMEA, the setup procedure has to be executed.

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 +   →   Grey connector top screw (NMEA OUT + 4800 baud)
NMEA Input B -   →   Grey connector bottom screw (NMEA OUT – 4800 baud)

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). The top screw terminal is A, the bottom B.

C- or E-series:
Assuming Raymarine NMEA cable R08004, connect as follows:
(NMEA baudrate in C- or E- series has to be set to 38400 - AIS)

NMEA Output + (Yellow)   →   As indicated on mux
NMEA Output - (Brown)   →   As indicated on mux
NMEA Input +   (White)   →   As indicated on mux
NMEA Input -   (Green)   →   As indicated on mux

Note: This is the standard wiring method. The baudrate of the NMEA output from the C- or E-series is converted by the mux from 38400 to 4800 bps, allowing connection of standard NMEA listeners to the 4800 bps output on the mux (grey connector) to receive NMEA data from the C- or E-series. There are alternative wiring methods whereby instead of the C-/E-series NMEA output, the computer output is converted to 4800 bps, e.g. to control the auto pilot in track-mode or to be able to load waypoints/routes from the computer to the C-/E-series chartplotter.

RS232 output
The output of multiplexer model AIS-C can also be connected to a serial computer port. Assuming a 9-pin D-sub connector, mux terminal TxD should be connected to pin 2 of the computer connector and the G-terminal (labelled "Brown C-series NMEA out –") to pin 5. If the standard wiring method is used, this means that the brown wire of the the C-/E- series cable and the pin 5 wire of the RS232 port are combined in the same terminal

USB
The USB connection is optional and is only required if the output of the mux AIS-C also needs to be connected to a computer. Follow the instructions in the standard multiplexer manual for USB driver installation.

Alternative use of the baudrate conversion feature
In the standard connection method, described above, the baud rate of NMEA data received from the C- or E-series chart plotter at 38400 bps is converted to 4800bps. If a computer is part of the integrated system, the baudrate conversion feature may be used in a different way, in particular if the multiplexer Seatalk-NMEA conversion option has been installed. In the latter case, data from the Seatalk network, including GPS data, is already converted to NMEA by the multiplexer and the system is not dependent on NMEA data output by the chart plotter.
The yellow and brown NMEA OUT wires of the C/E-series plotter can stay disconnected and instead, 38400 bps computer output can be converted to 4800 bps., e.g. to control the auto pilot in track mode. If the multiplexer is to be connected via USB, the blue wire under the green mux connector has to be inserted in the terminal marked "Yellow – C-series NMEA Out +". If the computer is connected via RS232, the TxD wire from the computer (pin 3) has to be inserted in this terminal.

Baudrate Conversion options
Instead of only converting the baudrate of data received back from the chart plotter or 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** tranmitted 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.

Setup
Setup for the AIS-C is only required for disabling/enabling the Seatalk option, to upload filter/editing/LCD directives or to select options such as backup switching. It is assumed that Windows program Hyperterminal is used for setup, but other terminal programs can be used instead.

Setup via RS232
The connections labeled "**Yellow C-series NMEA Out +**", **TxD** and "**Brown C-series NMEA Out –**" are used for communication with the computer during setup. Switch the C-/E-series chartplotter off. Disconnect the yellow and brown wires from the C-/E- series NMEA cable from the mux and, assuming a 9-pin D-sub computer connector, connect an RS232 cable as follows:

Computer serial port pin 3 → "Yellow C-series NMEA OUT"
Computer serial port pin 2 → TxD
Computer serial port pin 5 → "Brown C-series NMEA Out –"

Set the baudrate in Hyperterminal to **38400 bps.** Execute the setup procedure as described in the manual for the standard multiplexer model. After setup, disconnect the RS232 cable and re-connect the yellow and brown wires from the C-series.

Setup via USB
Switch off the C-series. Remove the yellow wire (C-series NMEA Out) from the mux terminal if the C-/E- series is already connected.
Under the large green connector block a blue wire can be found. Remove the insulation from this wire and insert it in the terminal labeled "**Yellow C-series NMEA Out+**". Set the baudrate in Hyperterminal to **38400 bps.**
Execute the setup procedure as described in the manual for the standard multiplexer model. When finished, remove the blue wire, insulate it and re-insert the yellow wire of the C-series NMEA output.

Backup GPS
Assuming the C-series chart plotter receives GPS lat/lon from a Seatalk GPS, we recommend connecting a backup NMEA GPS via the mux. A separate document that can be found on the USB driver CD in folder 'documentation' or on the Brookhouse website describes the advantages and method. The multiplexer can detect when the Seatalk GPS stops functioning and switches to the NMEA GPS automatically.

Filtering / Conversion of NMEA sentences
A separate description is available from Brookhouse and on the website.
The main application of this feature is converting or filtering NMEA output data from the C-series. 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-C 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 grey connector).
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.

Note: *Filtering (removal of NMEA sentences) on the speed conversion channel is usually not neccessary, as the NMEA sentences that are required in the C-series output can be individually specified in the C-series.*
However, the filtering/editing feature is very useful for modification of NMEA sentences. The C-series output NMEA version 3.01. The sentence format can be changed to an older version of

NMEA, e.g. to 2.1, which is required by some auto pilots. The NMEA format can also be made compatible with some older repeaters and other instruments.

Important: *Only select the NMEA sentences (during C-series setup) for output by the C-series, that are necessary as input for other equipment. Do not select them all. For example, if only DSC radio(s) are connected (via the mux speed conversion to 4800), only the GGA or RMC sentence is required. For auto pilots, only the APB or APA sentence is required.Too many redundant NMEA sentences can cause degredation of the performance of the multiplexer. Keep in mind that data received from the C-series NMEA Out port at 38400 bps is converted to 4800 bps. This is a bandwidth reduction by a factor 1/8. The total length in bytes of the transmitted sentences should not exceed 400.*
Although the transmission of output sentences can be controlled from the C-series, filter-directives may be loaded in the mux as a precaution that redundant data is not processed.

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).