Specification for NASA Marine AIS Engine

Electronic Interface

Power input: +10Volts to + 16Volts.
RS232 interfaces:
- data format: 8 bits, 1 start bit, no parity, 1 stop bit.
- Connector: 9-pin D-type socket mounted on the board.
  - pin 2: 38,400 Baud output from Engine to PC = **black**
  - pin 3: 38,400 Baud input to Engine from PC = **red**
  - pin 5: common (ground).= **screen**
  - pin 9: 4800 Baud NMEA input from GPS receiver to Engine
- Amplitudes: standard PC RS232 (0 to 5V)
- Message headers: see below.

Data format (AIS sentences from Engine to PC)

The signals sent by the Engine shall comprise strings conforming with the NMEA 2000 specification at 38,400 Baud. AIS message types 1, 2, 3, 4, 5, 11, and 21 shall be formatted as UAIS VHF Data-link Messages, as defined in NMEA 0183 Version 3, and having the header code !AIVDM. Whereas the NMEA 0183 specifies a channel number of 1 or 2 for the AIS receive channel, the AIS Engine signifies the channel by A for channel 1, and B for channel 2.

Data format (Status sentences from Engine to PC)

Status sentences will be transmitted following transmission of a valid !AIVDM message or following detection of an AIS message with reception errors. Erroneous reception causes an increment of the threshold setting, which is shown by a status sentence without a preceding !AIVDM sentence. For valid !AIVDM sentences, the status sentence always follows the AIS Encapsulation sentence it applies to.

Status sentences sent by the Engine shall comprise strings conforming with the NMEA 2000 specification at 38,400 Baud. They will have the proprietary format $PNMLS,ss,tt,r*cc<CR><LF>.

The field ss is a decimal value in the range 0 to 63, signifying the signal level for the preceding message. The value tt is the present detection threshold setting. The value r is the interval in seconds (values between 1 and 7) between reductions of the threshold setting. The threshold is continually adjusted upwards in the Engine to minimise the error rate, whilst maintaining maximum signal sensitivity by reducing it at the rate specified by the r field.

Data format (GPS RMC sentences from Engine to PC)

NMEA RMC sentences received on a separate input channel at 4,800 Baud (on pin 9 of the 9-pin socket) will be copied through on the 38,400 Baud output channel whenever they are available. RMC sentences are re-transmitted only if the CRC check on the incoming data is passed, and are sent whenever they are available.

Data format (PC to Engine)

The unit is shipped with factory default settings as follows:

Alternating receive channel A, channel B every 36 seconds, threshold setting 19 (corresponding to approximately1 μVolt). These settings can be changed using the following commands:

The signals sent by the PC shall comprise the following types:

- Channel setting sentence (C):

$PNMLC,c*hh<CR><LF>
Where:
c is the channel receive mode as follows:
A = Channel A (channel 1)
B = Channel B (channel 2)
S = Alternating every 36 seconds between channel A and channel B.
Note setting channel A or B cancels alternation

hh = Checksum as defined in NMEA 0183
<CR><LF> = Carriage Return, Line Feed sequence as defined in NMEA 0183

- Threshold sentence (T):

$PNMLT,t*hh<CR><LF>
Where:
t is the required threshold rate setting. The value specifies the interval between decrements of the tracking threshold value. The actual threshold and rate settings are always sent after a valid message is received (see above). Values between decimal 1-7 may be sent. Any other value forces a return to the default value of three seconds.

Typical threshold values for tt correspond with signal input sensitivities as follows:
19 = 1 μVolt
29 = 10 μVolt
40 = 100 μVolt

hh = Checksum as defined in NMEA 0183
<CR><LF> = Carriage Return, Line Feed sequence as defined in NMEA 0183

Transmission priority (PC to Engine)

If the PC transmits a command to the receiver at the same time as the Engine is receiving a packet on-air, the command will not be implemented in the Engine until after the completion of the packet reception.