

18 AIS units tested

AIS is now an established technology with a wide range of equipment options, but which are the best? Tim Thornton tests and compares a selection of blackbox AIS receivers and transponders

ABOUT THE AUTHOR



Tim Thornton has spent many years developing onboard electronics and computer systems. Currently running a software company and carrying out R&D and consultancy, he previously had 12 years experience of developing and installing onboard computer systems.



We individually tested 11 receivers and 7 transponders which, if you include re-branded duplicates, totals 22 units

PBO photos

AIS, which stands for Automatic Identification System, is a VHF-based system which transmits a wide range of data from a vessel to facilitate port operations, communication at sea and safe navigation.

For leisure boat users, the most important items of information transmitted are the vessel name, Maritime Mobile Service Identity number (MMSI), position, heading, course over ground and speed over ground. These allow boat owners to monitor and plot shipping traffic and, if they have a transponder, identify themselves to other traffic in return.

Leisure boat AIS equipment falls into two main categories: receivers which merely collect data from other vessels, and transponders which both receive and transmit data, allowing your boat to be seen and identified by others.

How AIS works

There are two types of AIS: Class A and Class B. Class A units have been mandatory for ships over 300 gross tonnes and for all passenger vessels since 2000, and require input from several data sources. Class B is a cut-down version based on GPS data which uses a lower priority transmission method, and is available as an optional installation for all vessels not legally required to carry a Class A unit.

Both Class A and Class B units transmit on two VHF channels, which they use alternately to double the bandwidth available to the system. Single channel receivers monitor both channels by switching between them, and hence may take longer to pick up a new target. Dual receivers, and all the transponders tested, tend to be faster as they monitor both AIS channels simultaneously.

Antenna options

The conventional choice is to install a separate AIS antenna, but splitters are available to allow one antenna to be used for multiple devices such as the VHF radio or even your FM radio entertainment system.

Splitters can either be standalone devices such as those from Comar and Weatherdock, or incorporated into an AIS device. More recently, some manufacturers have combined AIS with VHF units, among them the Navicom RT-650 VHF radio tested, and the Icom IC-M505A (£520). Icom also produce the MXA-5000 dual channel receiver (£320).

Although antenna splitters or combined units save clutter, they do have a major drawback: when you are transmitting on the VHF radio, you will not be receiving AIS messages as the VHF will have sole use of the antenna.

GPS and NMEA interfaces

Some AIS units can output GPS data with the AIS information, particularly useful if you have a plotter without its own GPS. However, bear in mind that AIS data is output at 38,400bps (bits per second), so you will need an additional, lower speed (4,800bps) port to accept NMEA data from other instruments. Some AIS units solve this problem by including an NMEA input, which will combine the AIS and input data into a single output. All transponders and some receivers have a port for a GPS active antenna.

The Raymarine AIS500 is unique in having a SeaTalk^{NG} interface. Obviously this allows connection to other SeaTalk^{NG} instruments, but as it is essentially the same as NMEA2000, this should allow display of AIS data on any NMEA2000 device that supports it. If you have Furuno Navnet instruments, then the Furuno receiver offers a Navnet interface.

The final point to check is whether the outputs are NMEA (for a chart plotter) or RS232 (serial) or USB (for a PC). Although NMEA output can generally be plugged into a PC's serial port, and vice versa, this is not good practice, and problems may arise unless a NMEA/RS232 converter is used.

Software

Many of the devices tested come with a software package. For the transponders, this is necessary for entering the MMSI number and other vessel details. In general, the software offers diagnostic tools, and also displays AIS data. Some supplied software, such as SeaClear and the SOB demo, can be downloaded for free from the internet.

How we tested them

We used each device connected to a laptop, tested live with the same antenna from the waterfront at the entrance to Southampton Water. We looked at the data interfaces and specifications. The software packages used for testing were AIS Analyser (www.kagstrom.no) and Ship Plotter (www.coaa.co.uk).

We logged data from each receiver to measure maximum range and sensitivity, using the same VHF and GPS antennas. Our antenna height was low, so the ranges we logged will be lower than for a masthead antenna, but similar to the popular pushpit-mounted antennas. During the tests we used the Comar AIS-2-USB as a reference model, giving a known performance level against which to measure the other units.

AIS can transmit 26 different message types, which allows differentiation between sources such as ships, class B transmitters and SAR aircraft. We monitored Type 1 messages, which are received by all our test units. To check sensitivity we counted the number of messages/minute, which we then divided by the number of vessels within range to give an average rate of reception. It should be borne in mind that our results are only approximate, and will be skewed by factors such as vessel speed and rate of turn: ships send more messages when changing speed or course.

We checked the transponders' broadcast range by driving away from a fixed receiver. The range for all units was between 4½-5 miles.

Single Channel Receivers

NASA AIS Engine 2

PRICE: £110

Contact: www.nasamarine.com



NASA have pared down functionality on the AIS Engine 2 to produce a budget-priced unit. The device receives message types 1-5, 11, 18, 21 and 24, so receives all the messages likely to be of interest to leisure yachtsmen including SAR aircraft and aids to navigation. AIS is expected to be used increasingly on buoys, weather stations and tide gauges. The NASA unit also has the ability to pass GPS RMC messages.

True Heading SR161

PRICE: £215

Contact: www.trueheading.se



Basic connections for power, GPS and an RS232 serial cable



A well engineered but basic receiver with an RS232 output (not NMEA, so it may not work with some electronic plotters), the True Heading SR161 is a rebadged unit from Smart Radio, a Chinese manufacturer who sell AIS and other equipment for rebranding in much the same way as many laptops are rebadged units from third-party manufacturers.

Raymarine AIS250

PRICE: £450

Contact: www.raymarine.co.uk



The AIS250 receiver offers good interfacing: the antenna has a splitter with outputs for both your VHF and FM radios, and there are NMEA inputs and outputs at both 4,800bps and 38,400bps. All inputs are multiplexed to the outputs, with AIS data being on the 38,400bps output only. Also, if installed by a Raymarine dealer, there is the benefit of on-site warranty. However, it is expensive for a single channel receiver.

WeatherDock EasyAIS

PRICE: £255

Contact: www.easais.com



This receiver uses WeatherDock's S2C (Simultaneously Two Channels) technology that scans both channels simultaneously, quickly switching to the channel with a transmission on it, which makes performance better than other single channel receivers. It also has the advantage of having a built-in multiplexer that takes in NMEA data at 4,800bps, and outputs it at 38,400bps with the AIS data.

Dual Channel Receivers

Amec Cypho

PRICE: FROM £190

Contact: www.alltekmarine.com



Amec's compact, rugged Cypho receiver

This receiver is just being launched in Europe with three variants. The entry level 101-E has NMEA input and output, accepting data from an external GPS and adding the AIS data to it for output. The 101 adds to this a PC interface (USB or RS232), and if USB is used for data then it can also be used for power. The 101-G model includes a GPS antenna, instead of accepting GPS data over the NMEA input. The unit comes with Amec's AIS Viewer software, which is a good tool for tracking vessels.



A range of connections is available

Comar

PRICE: FROM £180

Contact: www.comarsystems.com



Comar produce a range of three receivers, all based on the same core electronics but with different interfaces. The AIS-2-NMEA has an NMEA output, while the AIS-2-USB uses a PC's USB port for both power and data output. The AIS-Multi adds an antenna splitter, an NMEA multiplexer, and both NMEA and USB outputs.

Furuno FA-30

PRICE: £736

Contact: www.furuno.co.uk



The FA-30's big advantage is support for Furuno's Navnet Ethernet interface. It also comes with a cut-down version of Maxsea for AIS tracking (which only works with Navnet).

Although there is an NMEA input, this is for when the receiver is used with the AIS display unit (not tested here), and incoming NMEA data is not output with the AIS data. The FA-30 is bulky compared with other receivers.

Furuno's warranty covers parts and labour for two years and if a Furuno dealer installs the

unit for you, the warranty also covers their visiting your boat on her berth to carry out any repair work in situ.

SevenStar SeaVieweR

PRICE: £360

Contact: www.sevenstarelectronics.com

A key feature of the SeaVieweR is that it can be upgraded to the SeaTraceR transponder for about £200, ideal if you think you may want a transponder later. The unit is designed to take a GPS antenna for outputting position data with the AIS data stream – the NMEA input is just for acknowledging alarm messages that may be in the NMEA output. Included is the proAIS software, which is more of a configuration and diagnostics tool than a tracking tool.



True Heading SR162

PRICE: £297

Contact: www.trueheading.se

This is the dual channel version of the SR161. As well as the RS232 output, it also has a 4,800bps input, so all incoming NMEA data can be passed through to the output stream. As an RS232 interface is used, and not NMEA, there is a common ground to the input and output – this is not compliant with the NMEA spec, though will generally work OK.



True Heading RX Yacht

PRICE: £297

Contact: www.trueheading.se



This receiver has an NMEA input at 4,800bps and also a port for a GPS antenna, with both the GPS and incoming NMEA data being multiplexed to the output port. As with the SR162, an RS232 interface is used instead of NMEA.

Navicom RT-650 VHF

PRICE: £280

Contact: www.mantsbrite.com

Navicom's RT-650 VHF radio has dual AIS receivers inside. It can show the AIS data on the display either as a list of vessels, or as full details on a vessel, or as a basic plot. Although useful as a backup, this is too limited for normal use, so you will need to link the unit to a plotter. Data is output as either NMEA or RS232. Although it takes GPS input for the DSC capabilities, this is not output with the AIS data.



Transponders



1. True Heading AIS CTRX

PRICE: £430

www.trueheading.se

2. Raymarine AIS 500

PRICE: £820

www.raymarine.co.uk

3. Digital Yacht AIT250

PRICE: £500

www.digitalyacht.co.uk

4. SevenStar SeaTraceR

PRICE: £488

www.sevenstarelectronics.com

5. Amec Camino

PRICE: £480

www.alltekmarine.com

6. Comar CSB200

PRICE: £500

www.comarsystems.com

7. EasyTRX

PRICE: £640

www.easyais.com

There is not a great deal of difference in the core functionality of the transponders. Most of the products are based on identical circuit boards made by Software Radio Technology (SRT), as shown by their use of the proAIS software.

The exceptions are Amec, who have developed their own board and are included in this test, and Furuno, who use their own board in their FA-50 transponder. Unfortunately the Furuno FA-50 and ACR Nauticast-B units were not available to test.

Let's look at what is common to all of the transponders before going on to look at differentiating features. All have ports for VHF and GPS antennas, and RS232 and NMEA output (at 38,400bps). In general there is no NMEA multiplexing, the only input being an acknowledgement to an alarm message. Note that in all cases the unit needs to be plugged in to a PC for configuring with the vessel details before it can be used. The receiver sensitivity is the same on all units, at -107dBm.

All devices except the Amec Camino have the facility for a button which can be configured to switch to silent mode (transmission switched off) or to send a Mayday message over AIS (though it is not clear who is responsible for listening and responding to this message). They have LEDs to show power, fault status, no transmission (whether due to no GPS fix or controlled from

the coast station), transmit and receive.

All SRT-based transponders are supplied with their proAIS software except EasyTRX, which supplies Link2AIS, a package developed by ACR. This gives slightly more information about the AIS unit than ProAIS, and is a little better for use as a tracking tool.

SRT-based transponders

The Digital Yacht AIT250 and the TrueHeading AIS CTRX are rebadged versions of the same product, manufactured in China using the SRT circuit board, although Digital Yacht has since switched product sourcing to Europe. This unit has the switch mounted on the front panel, instead of remotely, which will make access awkward if the box is installed somewhere out of sight.

The Digital Yacht package includes a Vtronix VHF antenna and a GPS antenna.

The EasyTRX is a rebadged version of ACR's Nauticast B. This is another SRT-based unit, but comes with Link2AIS software.

Raymarine's AIS500 adds value with its NMEA interfacing capabilities. There are inputs and outputs for NMEA0183 at 4,800bps and 38,400bps, as well as for SeaTalk^{NG} (their branding of NMEA2000). NMEA inputs on both ports are multiplexed with the AIS data, and all is output (with AIS data just on the NMEA 38,400bps and SeaTalk^{NG} ports). The NMEA 38,400bps port can be used over

NMEA or RS232 interfaces. There is also a VHF splitter, so you can use your existing VHF radio antenna. All of this, plus the on-board warranty if installed by a Raymarine dealer, goes towards justifying the significant price differential compared to the other units.

The Comar CSB200 is a competent unit which is notable for being the first to repackage the SRT board from the chunky waterproof box still used by the AIT250 and AIS CTRX. The SevenStar SeaTraceR is the upgraded version of the SeaVieweR receiver and the only unit tested to offer this upgrade path, although Digital Yacht will launch a similar unit at the London Boat Show.

Breaking the mould

Amec are one of the few manufacturers to invest in developing their own hardware. In addition to standard functionality, the Camino will accept and multiplex NMEA input (though the input data must be at 38,400bps). Also, there is an optional Bluetooth interface for the RS232 port, which is useful if you are using a laptop on board. LEDs show power, Rx/Tx on each channel, and silent mode, whether this is due to a lack of GPS data or imposed by the shore station. The AIS Viewer software is a good tool for AIS tracking.

The Camino is a new device and is awaiting UK/EU type approval, so prices are only approximate at present.

AIS comparison tables

Model	Size	Power	Warranty	LEDs	VHF/FM connections	GPS Antenna	Interfaces	Sensitivity
SINGLE (SWITCHING) RECEIVERS								
NASA AIS Engine 2	115x100x30	12V	1 yr	Power, Rx	-	No	GPS in, NMEA out	<-107dBm
Raymarine AIS250	219x171x63	12/24V	2 yr	Power, Rx, VHF Tx	VHF/FM	No	NMEA in/out, SeaTalk ^{NG}	-109dBm
TrueHeading SR161	125x90x30	12V	2 yr	Rx	-	No	RS232 out	-112dBm
WeatherDock EasyAIS	150x150x30	12/24V	2 yr	Power, Ch A, Ch B	-	No	NMEA in/out	-112dBm
DUAL (PARALLEL) RECEIVERS								
Amec Cypho-101E	140x150x50	12/24V	1 yr	Power, ChA, ChB	-	No	NMEA in/out	-114dBm
Amec Cypho-101	140x150x50	USB/12/24V	1 yr	Power, ChA, ChB	-	No	NMEA in/out, USB/RS232	-114dBm
Amec Cypho-101G	140x150x50	USB/12/24V	1 yr	Power, ChA, ChB	-	Yes	NMEA out, USB/RS232	-114dBm
Comar AIS-2-NMEA	120x86x37	12/24V	1 yr	Power, ChA, ChB	-	No	NMEA out	-112dBm
Comar AIS-2-USB	120x86x37	USB	1 yr	Power, ChA, ChB	-	No	USB	-112dBm
Comar AIS-Multi	120x86x37	12/24V	1 yr	Power, ChA, ChB	VHF	No	NMEA in/out, USB	-112dBm
Furuno FA-30	219x 255x90	12/24V	2 yr	None	-	No	NMEA in, NMEA out (AIS only), Navnet	-107dBm
Navicom RT-650	71x161x147	12V	1 yr	Display	VHF unit	No	NMEA out, RS232	-107dBm
SevenStar SeaVieweR	180x110x40	12V	2 yr	Power, fault, no GPS, Rx	-	Yes	NMEA in (alarm ack only), NMEA out	-107dBm
TrueHeading SR162	125x90x30	12V	2 yr	Rx	-	No	RS232	-112dBm
TrueHeading AIS RX Yacht	136x94x38	12V	2 yr	Rx, GPS	-	Yes	RS232	-112dBm

TRANSPONDERS						
Model	Size	Power	Warranty	Interfaces	Switch	Software
Amec Camino-101	220x140x50	12/24V	1 yr	NMEA in/out, RS232, Bluetooth	Remote alarm	Amec AIS Viewer
Comar CSB200	190x128x50	12V	1 yr	NMEA out, RS232	Remote silent/MAYDAY	proAIS
Digital Yacht AIT250	190x135x83	12V	2 yr	NMEA out, RS232	Silent/MAYDAY	proAIS
Raymarine AIS500	273x187x62	12/24V	2 yr	NMEA in/out, SeaTalk ^{NG} , VHF	None	proAIS
SevenStar SeaTraceR	180x110x40	12V	2 yr	NMEA out, RS232	Remote silent/MAYDAY	proAIS
True Heading AIS CTRX	190x135x83	12V	2 yr	NMEA out, RS232	Silent/MAYDAY	proAIS, SeaClear
WeatherDock EasyTRX	198x158x47	12V	2 yr	NMEA out, RS232	Remote silent/MAYDAY	Link2AIS

PBO'S VERDICT

For a receiver, we would strongly recommend a dual channel (parallel) unit if you want to use it for navigation and collision avoidance.

On our test, the Comar and Amec models combined low price and performance – just take your pick according to the features you need.

The Furuno has advantages if you have a Navnet system, or if you think you may want to upgrade to a transponder later, think about the SevenStar SeaVieweR or upcoming Digital Yacht AIS400 receiver.

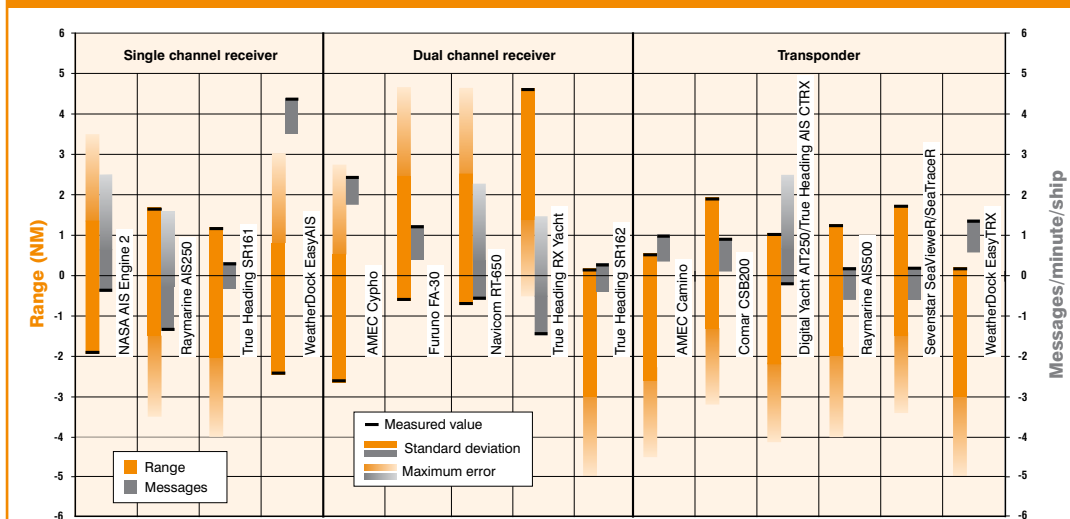
The idea of incorporating an AIS receiver into a VHF radio is attractive, as long as you don't mind losing data when transmitting. With its dual channel receiver and competitive price, the Navicom is a good choice.

For a transponder, there is little to choose between the different products, unless you want to pay

a premium for the extensive interfacing capabilities of the Raymarine AIS500, or need the Bluetooth interface of the Amec Camino. Shop around for the best deals.



RECEPTION RANGE AND MESSAGE COUNT COMPARED TO COMAR AIS-2-USB REFERENCE UNIT



The number of messages received per minute is divided by the number of vessels within range to give an average value. The black bars show the measured performance of each unit compared to the Comar AIS-2-USB receiver (the Comar being the zero line on the graph). Solid colour indicates one standard deviation of error, while the maximum error is shown by the graded tint.

Upcoming AIS products

Digital Yacht are launching a complete new AIS range comprising the AIS200 dual channel receiver with multiplexer and an option to upgrade to the AIS200 Pro with a USB interface; the AIS400 receiver which can be upgraded to the AIT1000 transponder and has both NMEA and USB outputs; and the ANT200, which is similar to the AIS200 but with the

electronics mounted inside the antenna.

True Heading are launching a new Class B transponder with an optional built-in VHF splitter and USB interface, and both True Heading and SevenStar have new, inexpensive dual channel receivers coming out with target prices of less than £200.

