AIS 350 / 650

Installation instructions

INNOVATION • QUALITY • TRUST

Raymarine®

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Software updates

Check the website www.raymarine.com for the latest software releases for your product.

Product handbooks

The latest versions of all English and translated handbooks are available to download in PDF format from the website www.raymarine.com.
Please check the website to ensure you have the latest handbooks.

Contents

Chapter 1: Important information

Applicability

The information in this book applies to all geographical areas unless otherwise stated.

Certified Installation

Raymarine recommends certified installation by a Raymarine approved installer. A certified installation qualifies for enhanced product warranty benefits. Contact your Raymarine dealer for further details, and refer to the separate warranty document packed with your product.

> **Warning: Product installation and operation**
>
> This product must be installed and operated in accordance with the instructions provided. Failure to do so could result in personal injury, damage to your vessel and/or poor product performance.

> **Warning: Potential ignition source**
>
> This product is NOT approved for use in hazardous/flammable atmospheres. Do NOT install in a hazardous/flammable atmosphere (such as in an engine room or near fuel tanks).

> **Warning: Product grounding**
>
> Before applying power to this product, ensure it has been correctly grounded, in accordance with the instructions in this guide.

> **Warning: Do NOT connect a USB device with an AC power source**
>
> Your Raymarine product includes a USB data connection. To prevent potential grounding problems and possible damage to equipment:
>
> • Do NOT connect a device with an AC power source (such as a PC or laptop) via USB to your Raymarine product.
>
> • If you need to connect external equipment (such as a laptop) to your Raymarine product via USB, ensure that the external equipment is powered only by a DC power source (such as a laptop battery).
>
> • Disconnect any AC power source from the external equipment before attempting to connect it via USB to your Raymarine product.

> **Warning: Positive ground systems**
>
> Do not connect this unit to a system which has positive grounding.

> **Warning: Power supply voltage**
>
> Connecting this product to a voltage supply greater than the specified maximum rating may cause permanent damage to the unit. Refer to the *Technical specification* section for voltage rating.

Warning: Switch off power supply

Ensure the vessel's power supply is switched OFF before starting to install this product. Do NOT connect or disconnect equipment with the power switched on, unless instructed in this document.

Warning: Ensure all equipment has isolated power supply

This product features an isolated power supply. To prevent potential damage to equipment, Raymarine recommends that any external equipment connected to this product also features an isolated power supply.

Warning: Ensure safe navigation

This product is intended only as an aid to navigation and must never be used in preference to sound navigational judgment. Only official government charts and notices to mariners contain all the current information needed for safe navigation, and the captain is responsible for their prudent use. It is the user's responsibility to use official government charts, notices to mariners, caution and proper navigational skill when operating this or any other Raymarine product.

Caution: Power supply protection

When installing this product ensure the power source is adequately protected by means of a suitably-rated fuse or automatic circuit breaker.

Caution: Service and maintenance

This product contains no user serviceable components. Please refer all maintenance and repair to authorized Raymarine dealers. Unauthorized repair may affect your warranty.

RF safety notice

RF radiation statement

AIS **transceivers** generate and radiate radio frequency (RF) electromagnetic energy (EME).

Safe compass distance

Safe compass distance is 1 meter minimum for any compass. Some compass types may require greater distances. To be sure, you should locate your AIS unit as far as possible from the compass. Test your compass to verify proper operation while the AIS unit is also operating.

Water ingress

Water ingress disclaimer

Although the waterproof rating capacity of this product meets the stated IPX standard (refer to the product's *Technical Specification*), water intrusion and subsequent equipment failure may occur if the product is subjected to commercial high-pressure washing. Raymarine will not warrant products subjected to high-pressure washing.

Disclaimer

Raymarine does not warrant that this product is error-free or that it is compatible with products manufactured by any person or entity other than Raymarine.

Raymarine is not responsible for damages or injuries caused by your use or inability to use the product, by the interaction of the product with products manufactured by others, or by errors in information utilized by the product supplied by third parties.

AIS disclaimer

All information presented by the Raymarine AIS device is advisory only, as there is a risk of incomplete and erroneous information. By placing this product into service you acknowledge this and assume complete responsibility for any associated risks, and accordingly release Raymarine and SRT Marine Technology Ltd from any and all claims arising from the use of the AIS service.

EMC installation guidelines

Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) regulations, to minimize electromagnetic interference between equipment and minimize the effect such interference could have on the performance of your system

Correct installation is required to ensure that EMC performance is not compromised.

Note: In areas of extreme EMC interference, some slight interference may be noticed on the product. Where this occurs the product and the source of the interference should be separated by a greater distance.

For **optimum** EMC performance we recommend that wherever possible:

• Raymarine equipment and cables connected to it are:

– At least 1 m (3 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 7 ft (2 m).

– More than 2 m (7 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.

• The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.

• Raymarine specified cables are used.

• Cables are not cut or extended, unless doing so is detailed in the installation manual.

Note: Where constraints on the installation prevent any of the above recommendations, always ensure the maximum possible separation between different items of electrical equipment, to provide the best conditions for EMC performance throughout the installation

Suppression ferrites

Raymarine cables may be fitted with suppression ferrites. These are important for correct EMC performance. If a ferrite has to be removed for any purpose (e.g. installation or maintenance), it must be replaced in the original position before the product is used.

Use only ferrites of the correct type, supplied by Raymarine authorized dealers.

Where an installation requires multiple ferrites to be added to a cable, additional cable clips should be used to prevent stress on the connectors due to the extra weight of the cable.

Connections to other equipment

Requirement for ferrites on non-Raymarine cables

If your Raymarine equipment is to be connected to other equipment using a cable not supplied by Raymarine, a suppression ferrite MUST always be attached to the cable near the Raymarine unit.

Declaration of conformity

Raymarine UK Ltd. declares that this product is compliant with the essential requirements of R&TTE directive 1999/5/EC.

The original Declaration of Conformity certificate may be viewed on the relevant product page at www.raymarine.com.

Product disposal

Dispose of this product in accordance with the WEEE Directive.

The Waste Electrical and Electronic Equipment (WEEE) Directive requires the recycling of waste electrical and electronic equipment. Whilst the WEEE Directive does not apply to some Raymarine products, we support its policy and ask you to be aware of how to dispose of this product.

Unit cleaning instructions

The unit does not require regular cleaning. However, if you find it necessary to clean the unit, please follow the steps below:

1. Ensure power is switched off.
2. Wipe unit clean with a damp cloth.
3. If necessary, use a mild detergent solution to remove grease marks.

Warranty registration

To register your Raymarine product ownership, please visit www.raymarine.com and register online.

It is important that you register your product to receive full warranty benefits. Your unit package includes a bar code label indicating the serial number of the unit. You will need this serial number when registering your product online. You should retain the label for future reference.

IMO and SOLAS

The equipment described within this document is intended for use on leisure marine boats and workboats NOT covered by International Maritime Organization (IMO) and Safety of Life at Sea (SOLAS) Carriage Regulations.

Technical accuracy

To the best of our knowledge, the information in this document was correct at the time it was produced. However, Raymarine cannot accept liability for any inaccuracies or omissions it may contain. In addition, our policy of continuous product improvement

may change specifications without notice. As a result, Raymarine cannot accept liability for any differences between the product and this document. Please check the Raymarine website (www.raymarine.com) to ensure you have the most up-to-date version(s) of the documentation for your product.

Chapter 2: Document and product information

Chapter contents

2.1 Document information

This document contains important information related to the installation of your Raymarine product.

The document includes information to help you:

• plan your installation and ensure you have all the necessary equipment;

• install and connect your product as part of a wider system of connected marine electronics;

• troubleshoot problems and obtain technical support if required.

This and other Raymarine product documents are available to download in PDF format from www.raymarine.com.

2.2 Applicable products

This document is applicable to the following products:

	Part number	Name	Description
	E32157	AIS 350	AIS receiver
	E32158	AIS 650	Class B AIS transceiver.

2.3 Document illustrations

Your product may differ slightly from that shown in the illustrations in this document, depending on product variant and date of manufacture.

All images are provided for illustration purposes only.

2.4 Installation guide

Information scope

This document gives introductory, installation and troubleshooting information for your Raymarine Automatic Identification System (AIS) device.

Refer to the *proAIS2 User Manual* and the operating manual for your Raymarine Multifunction Display, for instructions on how to configure and operate your AIS system.

All documents are available to download as PDFs from www.raymarine.com

2.5 AIS overview

Your AIS device uses digital radio signals to exchange 'real-time' information between vessels, shore based stations, or aids to navigation (AToNs) on dedicated VHF frequencies. This information is used to identify and track vessels in the surrounding area and to provide fast, automatic and accurate collision avoidance data.

Although AIS augments your radar application by operating in radar blind spots and detecting smaller AIS-fitted vessels, it does not replace radar, as it relies on receiving transmitted AIS information and therefore cannot detect objects such as landmasses and navigational beacons.

NEVER assume that AIS is displaying information from all vessels in the area, because:

• Not all vessels are fitted with AIS

• Although it is mandatory for larger commercial vessels to carry AIS, it is not mandatory to use it.

AIS should be used only to augment radar information, not substitute it.

> ⚠️ **Warning: AIS limitation**
>
> Never assume that your AIS is detecting all vessels in the area. Always exercise due prudence and do not use AIS as a substitute for sound navigational judgement.

2.6 Classes of AIS

The AIS350 is a **receiver** that receives messages from vessels, land base stations, or aids to navigation (AToNs) carrying Class A or Class B transceivers.

The AIS650 is a Class B **transceiver** that receives messages from and transmits messages to vessels, land base stations, or aids to navigation (AToNs) carrying Class A or Class B transceivers.

Class A transceivers

Class A AIS transceivers transmit and receive AIS signals. AIS transceivers are currently mandatory on all commercial vessels exceeding 300 tons that travel internationally (SOLAS vessels).

The following information can be transmitted by a Class A AIS system:

• Static data. Includes information such as vessel name, vessel type, MMSI number, call sign, IMO number, length, beam and GPS antenna location.

• Voyage related data. Includes information such as draft, cargo, destination, ETA and other relevant information.

• Dynamic data. Includes information such as time (UTC), ship's position, COG, SOG, heading, rate of turn and navigational status.

• Dynamic reports. Ship's speed and status.

• Messages. Alarms and safety messages.

Remember that not all vessels will transmit all of the information.

Class B transceivers

Class B AIS transceivers transmit and receive AIS signals, but use a reduced set of data compared to Class A (see *Data Summary*). A Class B AIS transceiver can be fitted on any vessel not fitted with a Class A transceiver, but is not mandatory aboard any vessel.

Data Summary

Data	Receiver (receive)	Transceiver (transmit)	Transceiver (receive)
Ship's name	Yes	Yes	Yes
Type	Yes	Yes	Yes
Call sign	Yes	Yes	Yes
IMO number	Yes	No	Yes
Length and beam	Yes	Yes	Yes
Antenna location	Yes	Yes	Yes
Draft	Yes	No	Yes
Cargo Information	Yes	Yes	Yes
Destination	Yes	No	Yes
ETA	Yes	No	Yes
Time	Yes	Yes	Yes
Ship's position	Yes	Yes	Yes
COG	Yes	Yes	Yes
SOG	Yes	Yes	Yes
Gyro heading	Yes	Yes*	Yes
Rate of turn	Yes	No	Yes
Navigational status	Yes	No	Yes
Safety message	Yes	No	Yes

*Class B transceivers do not transmit a Gyro heading unless the transceiver is receiving an NMEA HDT sentence from an external source.

Data reporting intervals

AIS information is classed as either static or dynamic. Static information is broadcast, when data has been amended, or upon request, or by default, every 6 minutes.

The reporting rates for dynamic information depend on speed and course change, and are given in the following tables.

Note: The reporting rates shown here are for reference and may not be the rate at which information is actually received by your AIS transceiver. This is dependent on a number of factors, including but not limited to antenna height, gain and signal interference.

Class A systems

Ships Dynamic Conditions	Reporting rate
At anchor or moored	3 Minutes
0-14 knots	10 Seconds
0-14 knots and changing course	$3\frac{1}{3}$ Seconds
14-23 knots	6 Seconds
14-23 knots and changing course	2 seconds
Faster than 23 knots	2 seconds
Faster than 23 knots and changing course	2 seconds

Class B systems

Ships Dynamic Conditions	Reporting rate
0 to 2 knots	3 Minutes
Above 2 knots	30 Seconds

Other AIS sources

Source	Reporting rate
Search and Rescue (SAR) aircraft	10 seconds
Aids to navigation	3 minutes
AIS base station	10 seconds or 3.33 seconds, depending on operating parameters

2.7 System protocols

Your product can be connected to various products and systems to share information and so improve the functionality of the overall system. These connections may be made using a number of different protocols. Fast and accurate data collection and transfer is achieved by using a combination of the following data protocols:

• SeaTalk^{ng}

• NMEA2000

• NMEA0183

Note: You may find that your system does not use all of the connection types or instrumentation described in this section.

Seatalk^{ng}

SeaTalk^{ng} (Next Generation) is an enhanced protocol for connection of compatible marine instruments and equipment. It replaces the older SeaTalk and SeaTalk^2 protocols.

SeaTalk^{ng} utilizes a single backbone to which compatible instruments connect using a spur. Data and power are carried within the backbone. Devices that have a low draw can be powered from the network, although high current equipment will need to have a separate power connection.

SeaTalk^{ng} is a proprietary extension to NMEA 2000 and the proven CAN bus technology. Compatible NMEA 2000 and SeaTalk / SeaTalk^2 devices can also be connected using the appropriate interfaces or adaptor cables as required.

NMEA 2000

NMEA 2000 offers significant improvements over NMEA 0183, most notably in speed and connectivity. Up to 50 units can simultaneously transmit and receive on a single physical bus at any one time, with each node being physically addressable. The standard

was specifically intended to allow for a whole network of marine electronics from any manufacturer to communicate on a common bus via standardized message types and formats.

NMEA 0183

The NMEA 0183 Data Interface Standard was developed by the National Marine Electronics Association of America. It is an international standard to enable equipment from many different manufacturers to be connected together and share information.

The NMEA 0183 standard carries similar information to SeaTalk. However it has the important difference that one cable will only carry information in one direction. For this reason NMEA 0183 is generally used to connect a data receiver and a transmitter together, e.g. a compass sensor transmitting heading to a radar display. This information is passed in 'sentences', each of which has a three letter sentence identifier. It is therefore important when checking compatibility between items that the same sentence identifiers are used some examples of which are:

• VTG - carries Course and Speed Over Ground data.

• GLL - carries latitude and longitude.

• DBT - carries water depth.

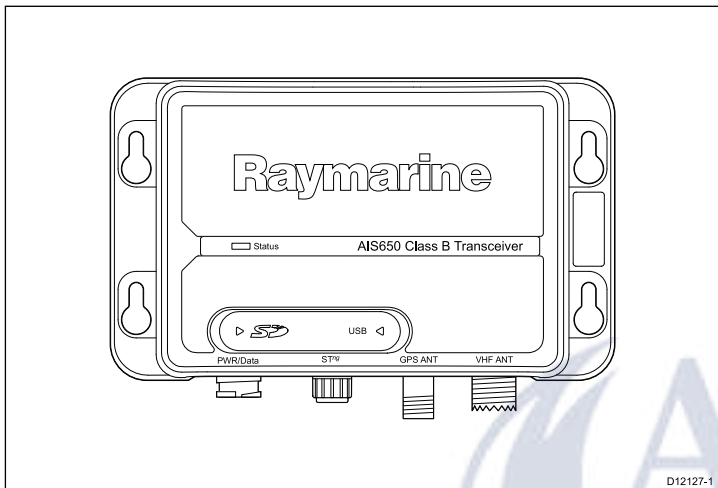• MWV - carries relative wind angle and wind speed data.
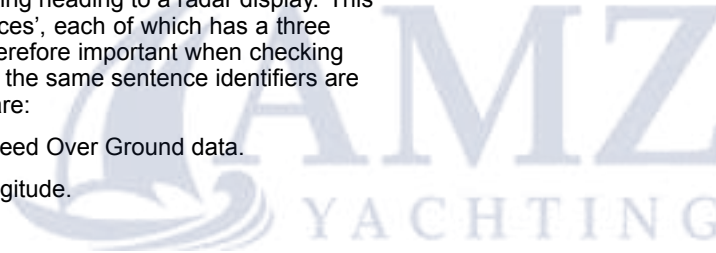
Chapter 4: AIS650 Class B transceiver

Chapter contents

4.1 Product overview — AIS650

D12127-1

The AIS650 is an AIS transceiver unit that uses digital radio signals to exchange 'real-time' information with other vessels, land base stations, or aid to navigation (AToNs) stations equipped with Class A or Class B AIS transceivers.

This information is used to identify and track vessels in the surrounding area and to provide fast, automatic and accurate collision avoidance data.

4.2 Static data requirement

The AIS transceiver needs to be correctly programmed with the following vessel data (static data) before use:

• Vessel Maritime Mobile Service Identity (MMSI) number

• Vessel name

• Vessel call sign

• Vessel dimensions including AIS GPS antenna location

• Vessel type

A MMSI number comprises 9 digits, and a full, valid 9 digit value must be entered in order to be accepted during setup. Any number that does not meet these criteria will not be accepted by the system. All other fields (i.e. vessel type, name etc.) are optional.

If your vessel already has an MMSI number (used for a VHF DSC radio) then the same MMSI number must be used to program the transceiver.

If a valid MMSI number is not entered, the device will enter Silent Mode and will not transmit. However, it will still operate as a receiver.

> **Important:** In the United States of America, the MMSI and Static Data must be entered only by a Raymarine dealer or other appropriately qualified installer of marine communications equipment on board vessels. The user is NOT authorized to do this.

In Europe and other parts of the world outside of the United States of America, the MMSI and Static Data can be set up by the user.

For further details, refer to the requirements for the area in which you are operating.

4.3 Requirements for USA & Canada

Important information

Your AIS transceiver conforms to the relevant FCC requirements

Raymarine AIS transceivers comply with the Federal Communications Commission (FCC) and Industry Canada requirements that regulate marine AIS and VHF radio usage for the US and Canada, respectively. Marine AIS users in the US must comply with all applicable FCC rules and regulations, some of which are described in this handbook. This information was current at the time this handbook was printed. Up-to date information, including licensing requirements, can be obtained on the FCC website at: www.fcc.gov/wtb/marine

Official FCC forms can be obtained on the FCC website at: www.fcc.gov/formpage.html

FCC Notice

Compliance statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between the equipment and receiver.

• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

• Consult your Raymarine dealer.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved in writing by Raymarine Incorporated could violate compliance with FCC rules and void the operator's authority to operate the equipment.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. l'appareil nedoit pas produire de brouillage, et

2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Station Licence

FCC station license requirement

An FCC Ship Radio Station License and Call Sign are not required for most recreational vessels travelling in US waters. However, you must obtain a license if your vessel travels to foreign ports.

Ships that use MF/HF single side-band radio, satellite communications, or telegraphy must be licensed by the FCC. You can obtain a Station License by filing FCC Form 605, which is available from the FCC website listed above.

Operator License

FCC operator license requirement

An Operator License is not required to operate a Class B AIS Transceiver within US territorial waters. However, a license is required to operate the transceiver if you dock in a foreign port (including Canada and Mexico) or leave a foreign port to dock in a US. port. You can request a Restricted Radiotelephone Operator Permit from the FCC by filing Form 753.

Industry Canada

Industry Canada license requirement

This Class B AIS digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B AIS est conforme à la norme NMB-003 du Canada.

You do not need a license to operate this product within sovereign waters of Canada or the US. You will need a license to operate this radio outside of Canada or the US. To obtain Industry Canada licensing information, contact the nearest field or regional office, or write:

> Industry Canada Radio Regulatory Branch
>
> Attention: DOSP
>
> 300 Slater Street
>
> Ottawa, Ontario
>
> Canada, KIA OC8

AIS650 Certification details

The following information about the radio is required to complete license applications:

• Industry Canada Certification Number: IC:4069B-AIS650

• FCC Type Number: FCC:PJ5–AIS650

• FCC Type Accepted: Parts 15 and 80

• Output Power: 2 Watts

• Modulation: GMSK

• Frequency Range: 156.025 MHz to 162.025 MHz

Maritime Mobile Service Identity (MMSI)

A nine-digit Maritime Mobile Service Identity (MMSI) number is required to operate this product.

Note: You can request an MMSI number from the FCC when you apply for a Station License. If your vessel does not require a license, you may obtain an MMSI by contacting BoatUS (www.boatus.com). Once obtained, you can program the MMSI number into the transceiver as described in the documentation which accompanied your product.

Programming the MMSI & static data

Important: In the United States of America, it is a violation of the rules of the Federal Communications Commission to input an MMSI that has not been properly assigned to the end user or to otherwise input any inaccurate data in this device. The MMSI and Static Data must be entered only by a Raymarine dealer or other appropriately qualified installer of marine communications equipment on board vessels. Instructions for entering the MMSI and static data are given in the documentation on the CDROM supplied with the AIS transceiver.

Once static data has been programmed, you must not change it. If the information programmed is no longer correct, contact the Raymarine help desk or the dealer or retailer from whom you purchased the transceiver, to arrange reprogramming.

Antenna Mounting & EME Exposure

This system has a Maximum Permissible Exposure (MPE) Radius of 1.5 meters (per OET Bulletin 65), assuming the maximum power of the radio and antennas with a maximum gain of 3 dBi. Accounting for the height of an average adult (2 meters) the minimum height of the antenna above the deck to meet RF exposure compliance requirements is 3.5 meters. Do not operate the transceiver when anyone is within the MPE radius of the antenna, unless shielded from the antenna field by a grounded metallic barrier.

Warning: Maximum Permissible Exposure

Failure to observe these guidelines may expose those within the maximum permissible exposure (MPE) radius to RF radiation absorption that exceeds the FCC MPE limit. It is the radio operator's responsibility to ensure that no one comes within this radius.

For optimal radio performance and minimal human exposure to radio frequency electromagnetic energy, make sure the antenna is:

• connected to the radio before transmitting

• located where it will be away from people

• located at least 1.5 meters (5 feet) from the radio's main unit

4.4 Requirements for areas outside of USA & Canada

Maritime Mobile Service Identity (MMSI)

A nine-digit Maritime Mobile Service Identity (MMSI) number is required to operate your AIS Transceiver. In some areas, a radio operator licence is required before an MMSI number will be issued. You can request an MMSI number from same agency that issues radio or Ship Radio licences in your area. Once obtained, you can program the MMSI number into your AIS Transceiver as described in the documentation on the CDROM supplied with your product.

Antenna Mounting & EME Exposure

For optimal radio performance and minimal human exposure to radio frequency electromagnetic energy, make sure the antenna is:

• connected to the radio before transmitting

• properly mounted

• located where it will be away from people

• located at least 1.5 metres (5 feet) from the radio's main unit

List of Countries

In the European Union, your AIS transceiver may be used in the following countries:

Austria	Liechtenstein
Belgium	Lithuania
Bulgaria	Luxembourg
Cyprus	Malta
Czech Republic	Netherlands
Denmark	Norway
Estonia	Poland
Finland	Portugal
France	Romania
Germany	Slovakia
Greece	Slovenia
Hungary	Spain
Iceland	Sweden
Ireland	Switzerland
Italy	Turkey
Latvia	United Kingdom

4.5 Planning the installation

Installation checklist

Installation includes the following activities:

	Installation Task
1	Plan your installation.
2	Obtain all required equipment and tools.
3	Mount the system components.
4	Route all cables.
5	Drill cable and mounting holes.
6	Make all connections to equipment.
7	Secure all equipment in place.
8	Complete the post-installation check.

Schematic diagram

A schematic diagram is an essential part of planning any installation. It is also useful for any future additions or maintenance of the system. The diagram should include:

• Location of all components.

• Connectors, cable types, routes and lengths.

Required additional components

This product forms part of a system of electronics. Depending on your requirements and system configuration, some or all of the following additional components will also be required for full operation.
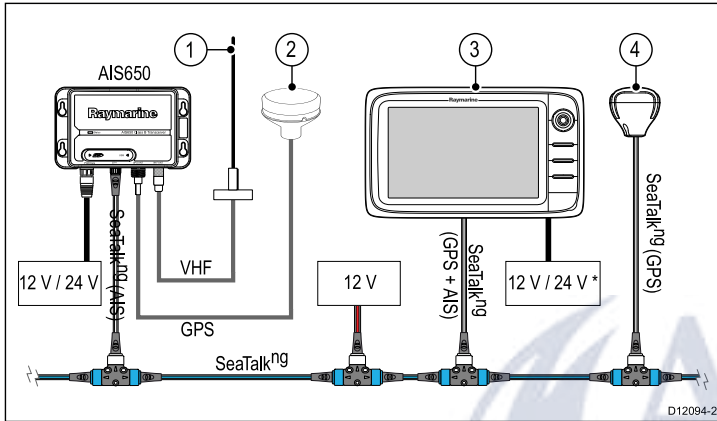
• **For displaying AIS targets** — AIS-capable SeaTalk^{ng} or NMEA 0183 device (for example, multifunction display or instrument).

• **VHF antenna.** If you only have one antenna and you are using the AIS unit in a system that also includes a VHF radio, Raymarine recommends the use of a suitable AIS / VHF splitter (for example, the Raymarine AIS100). This will enable you to use a single VHF antenna for both the AIS and VHF radio units.

• **For repeating GPS data to external NMEA 0183 devices** — NMEA 0183-compatible GPS receiver connected to the NMEA 0183 input on the AIS unit.

Note: For AIS650 units, do NOT attempt to use the included GPS receiver to provide GPS data to an external device. Doing so may cause erratic and degraded GPS performance. The GPS receiver supplied with the AIS650 is intended to provide GPS data for the AIS unit only. For more information, refer to the GPS data for external devices section.

• **Power and data cables** — refer to 3.3 Cables and connections for suitable cables. Some installations may also require extensions to data, power or antenna cables. Refer to the 3.3 Cables and connections and Chapter 6 Options and accessories sections for more information.

Typical Systems

## AIS650 Basic system example (SeaTalkng only)

D12094-2

	Description	Notes
1	VHF antenna	
2	GPS receiver	Supplied with AIS unit. Provides GPS data to the AIS unit only.
3	SeaTalkng Multifunction display	To avoid potential data conflicts, do NOT connect the multifunction display to the AIS unit by NMEA 0183 and SeaTalkng at the same time.
4	SeaTalkng GPS receiver	If your multifunction display includes an internal GPS, a dedicated external GPS receiver may not be required.

Note:

- For more information on which types of data are supported by the various connections and also the related supported baud rates for NMEA 0183 connections, refer to the Data connections matrix.

- For more information on making general connections, refer to the 3.3 Cables and connections section.

- For more information on available cables and accessories (including part numbers), refer to Chapter 6 Options and accessories.

- * Some Raymarine SeaTalkng Multifunction displays are 12 V only. Refer to the product's documentation for more information.

- For more information on general power requirements and connections, refer to the Power connection section.
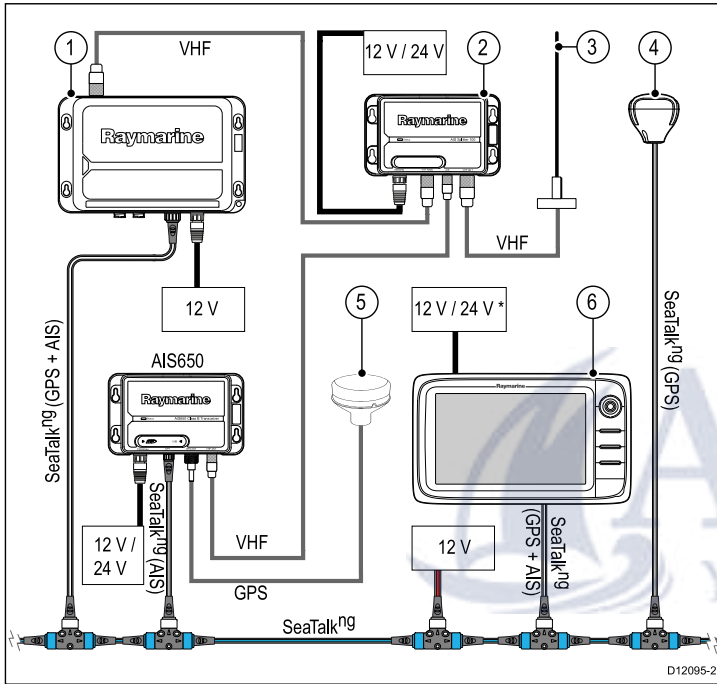
AIS650 Basic system example (NMEA 0183 only)

D13034-1
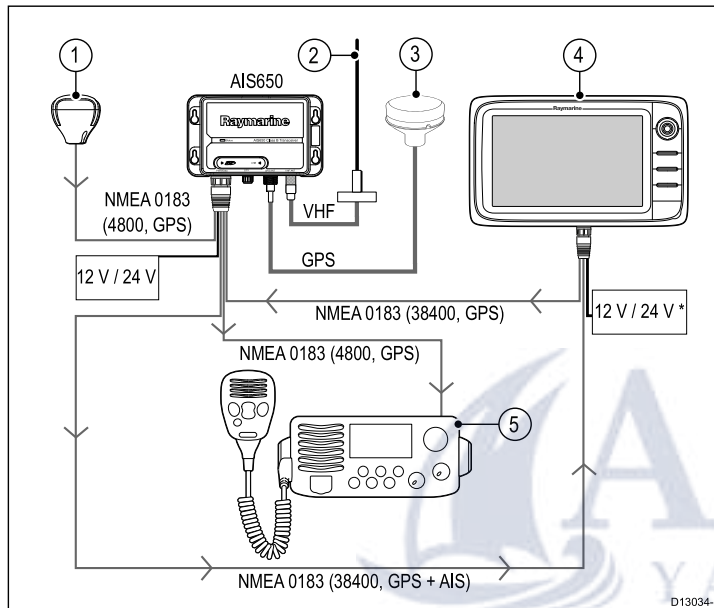
	Description	Notes
1	NMEA 0183 GPS receiver	
2	GPS receiver	Supplied with AIS unit. Provides GPS data to the AIS unit only.
3	VHF antenna	

	Description	Notes
4	NMEA 0183 compatible Multifunction display	To avoid potential data conflicts: If the multifunction display has SeaTalk^{ng} and NMEA 0183 connections, do NOT connect the multifunction display to the AIS unit by NMEA 0183 and SeaTalk^{ng} at the same time.
5	NMEA 0183 VHF radio	

Note:

• For more information on which types of data are supported by the various connections and also the related supported baud rates for NMEA 0183 connections, refer to the Data connections matrix.

• For more information on making general connections, refer to the 3.3 Cables and connections.

• For more information on available cables and accessories (including part numbers), refer to Chapter 6 Options and accessories.

• * Some Raymarine SeaTalk^{ng} Multifunction displays are 12 V only. Refer to the product's documentation for more information.

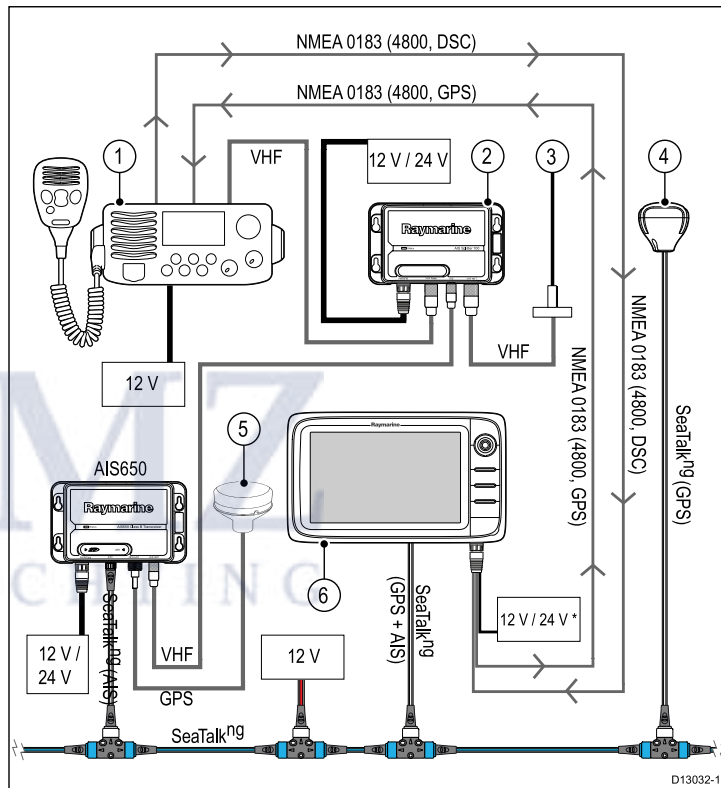• For more information on general power requirements and connections, refer to the Power connection section.

AIS650 Expanded system example (SeaTalkng only)

D12095-2

	Description	Notes
1	SeaTalkng VHF radio	• If your VHF radio is AIS-capable, the AIS functions on the radio should be disabled if connecting the radio to the AIS unit. For instructions on how to do this, refer to the documentation that accompanies your VHF radio. • To avoid potential data conflicts, do NOT connect the VHF radio to the AIS unit by NMEA 0183 and SeaTalkng at the same time. **Note:** For clarity, only the VHF radio base station is shown in the illustration. Additional components are required for operation of the VHF radio. Refer to the product's documentation for more information.
2	AIS / VHF splitter	For example, AIS100 splitter.
3	VHF antenna	
4	SeaTalkng GPS receiver	For example, RS130 GPS receiver. If your multifunction display includes an internal GPS, a dedicated external GPS receiver may not be required.

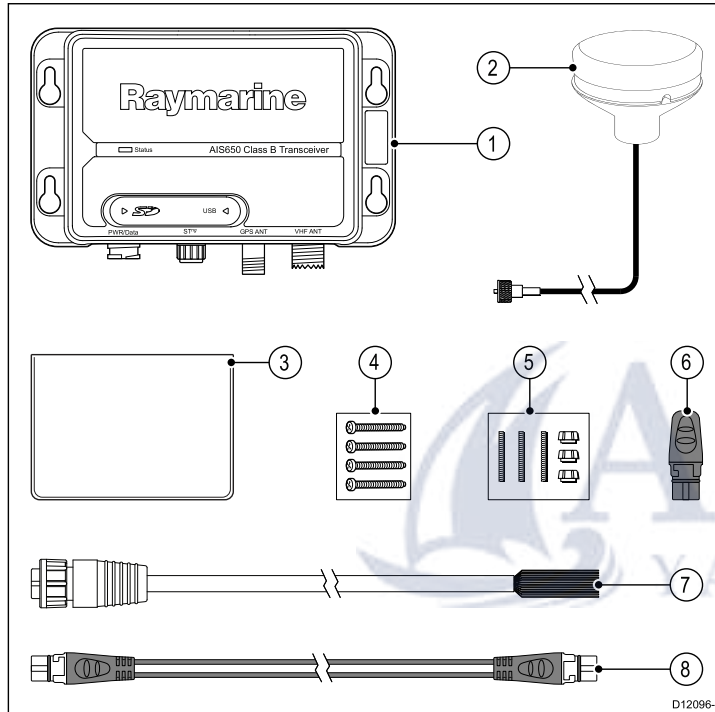|	Description	Notes
5	GPS receiver	Supplied with AIS unit. Provides GPS data to the AIS unit only.
6	SeaTalkng Multifunction display	To avoid potential data conflicts, do NOT connect the multifunction display to the AIS unit by NMEA 0183 and SeaTalkng at the same time.

Note:

- For more information on which types of data are supported by the various connections and also the related supported baud rates for NMEA 0183 connections, refer to the Data connections matrix.

- For more information on making general connections, refer to the 3.3 Cables and connections section.

- For more information on available cables and accessories (including part numbers), refer to Chapter 6 Options and accessories.

- * Some Raymarine SeaTalkng Multifunction displays are 12 V only. Refer to the product's documentation for more information.

- For more information on general power requirements and connections, refer to the Power connection section.

AIS650 Expanded system example (SeaTalkng and NMEA 0183)

NMEA 0183 (4800, DSC)
NMEA 0183 (4800, GPS)
VHF
12 V / 24 V
1 2 3 4
12 V
VHF
NMEA 0183 (4800, GPS)
NMEA 0183 (4800, DSC)
SeaTalkng (GPS)
5
AIS650
6
12 V / 24 V
VHF
GPS
SeaTalkng (GPS + AIS)
SeaTalkng (GPS/AIS)
12 V
12 V / 24 V *
SeaTalkng
D13032-1

	Description	Notes
1	NMEA 0183 VHF radio	• If your VHF radio is AIS-capable, the AIS functions on the radio should be disabled if connecting the radio to the AIS unit. For instructions on how to do this, refer to the documentation that accompanies your VHF radio. • To avoid potential data conflicts, do NOT connect the VHF radio to the AIS unit by NMEA 0183 and SeaTalk^{ng} at the same time.
2	AIS / VHF splitter	For example, AIS100 splitter.
3	VHF antenna	
4	SeaTalk^{ng} GPS receiver	For example, RS130 GPS receiver. If your multifunction display includes an internal GPS, a dedicated external GPS receiver may not be required.
5	GPS receiver	Supplied with AIS unit. Provides GPS data to the AIS unit only.
6	SeaTalk^{ng} Multifunction display	To avoid potential data conflicts, do NOT connect the multifunction display to the AIS unit by NMEA 0183 and SeaTalk^{ng} at the same time.

Note:

• For more information on which types of data are supported by the various connections and also the related supported baud rates for NMEA 0183 connections, refer to the Data connections matrix.

• For more information on making general connections, refer to the 3.3 Cables and connections section.

• For more information on available cables and accessories (including part numbers), refer to Chapter 6 Options and accessories.

• * Some Raymarine SeaTalk^{ng} Multifunction displays are 12 V only. Refer to the product's documentation for more information.

• For more information on general power requirements and connections, refer to the Power connection section.

Parts supplied — AIS650

	Description	Quantity
1	AIS650 transceiver unit	1
2	GPS antenna (with 10 m coaxial cable)	1
3	Documentation pack	1
4	Fixing screws	4
5	Fixing studs and nuts for GPS receiver (supplied fixings may differ slightly from those shown in the illustration).	3 studs, 3 thumb nuts
6	SeaTalk^{ng} dust cap	1
7	2 m power / data cable	1
8	1 m SeaTalk^{ng} spur cable	1

Tools required

Tools required for product installation.
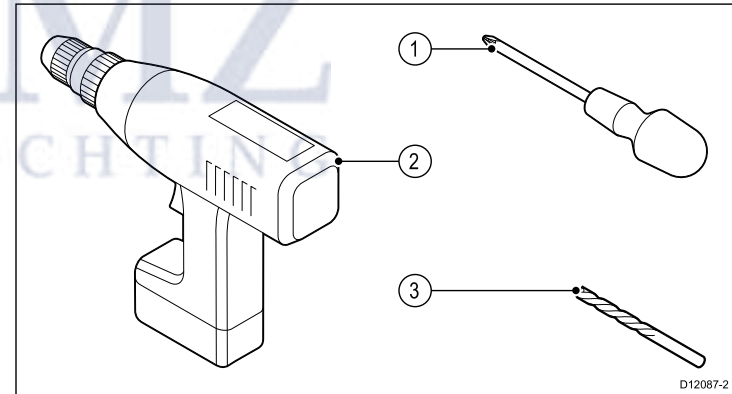
1. Screwdriver.

2. Power drill.

3. 3.2 mm (1/8") drill bit.

4.6 Cables and connections

General cabling guidance

Cable types and length

It is important to use cables of the appropriate type and length

- Unless otherwise stated use only standard cables of the correct type, supplied by Raymarine.
- Ensure that any non-Raymarine cables are of the correct quality and gauge. For example, longer power cable runs may require larger wire gauges to minimize voltage drop along the run.

Routing cables

Cables must be routed correctly, to maximize performance and prolong cable life.

- Do NOT bend cables excessively. Wherever possible, ensure a minimum bend diameter of 200 mm (8 in) / minimum bend radius of 100 mm (4 in).
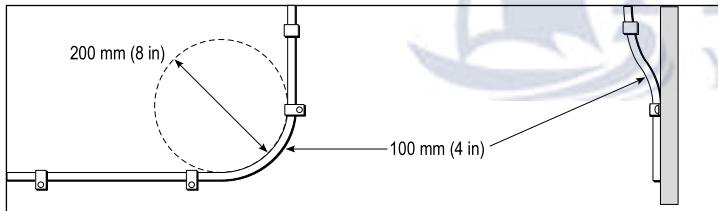
- Protect all cables from physical damage and exposure to heat. Use trunking or conduit where possible. Do NOT run cables through bilges or doorways, or close to moving or hot objects.
- Secure cables in place using tie-wraps or lacing twine. Coil any extra cable and tie it out of the way.
- Where a cable passes through an exposed bulkhead or deckhead, use a suitable watertight feed-through.

- Do NOT run cables near to engines or fluorescent lights.

Always route data cables as far away as possible from:

- other equipment and cables,
- high current carrying ac and dc power lines,
- antennae.

Strain relief

Ensure adequate strain relief is provided. Protect connectors from strain and ensure they will not pull out under extreme sea conditions.

Circuit isolation

Appropriate circuit isolation is required for installations using both AC and DC current:

- Always use isolating transformers or a separate power-inverter to run PC's, processors, displays and other sensitive electronic instruments or devices.
- Always use an isolating transformer with Weather FAX audio cables.
- Always use an isolated power supply when using a 3rd party audio amplifier.
- Always use an RS232/NMEA converter with optical isolation on the signal lines.
- Always make sure that PC's or other sensitive electronic devices have a dedicated power circuit.

Cable shielding

Ensure that all data cables are properly shielded that the cable shielding is intact (e.g. hasn't been scraped off by being squeezed through a tight area).

Connections overview
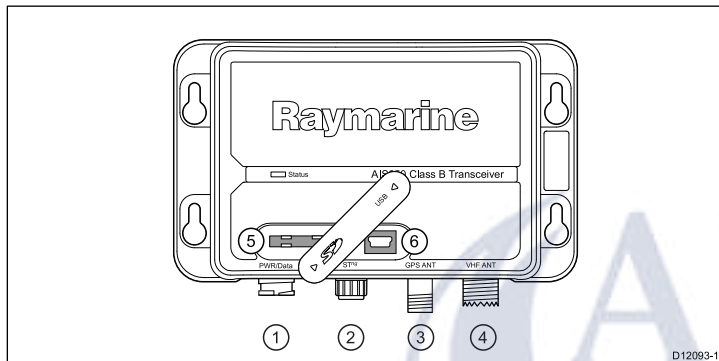
1. Power / NMEA 0183 (4800 & 38400 baud).

2. SeaTalkng.

3. GPS antenna.

4. VHF antenna.

5. SD card slot (for unit configuration).

6. Mini-B type USB (for PC connectivity).

Important: With the SD card / USB cover open the unit will not be water resistant.

Making data connections — AIS650

To connect your AIS unit to a wider system of electronics including a multifunction display and / or VHF radio:

Connections checklist
1   Refer to the drawings in the *Typical systems* section to understand how the various devices connect together in a system and how the various data signals flow between these devices.
2   Refer to the Data connections matrix to understand the types of data (GPS and / or AIS) that can be exchanged by the various combinations of connections supported by the AIS unit, as well as the supported baud rates (if using NMEA 0183).
3   For information on how to make SeaTalkng connections, refer to the Connecting SeaTalkng topic in this section.
4   For information on how to make NMEA 0183 connections, including an explanation of the power cable wire colors that relate to the low and high baud NMEA 0183 connections on the AIS unit, refer to the NMEA 0183 connections topic in this section.
5   For NMEA 0183 wire colors for all other devices in your system, refer to the documentation for the relevant product.
6   For information on the AIS silent mode connection, refer to the AIS Silent mode connection section.
7   For information on how to make the GPS connection refer to the GPS antenna connection section. Refer also to the important information detailed in the GPS data for external devices section.
8   For information on how to make VHF antenna connections, refer to the VHF connection section.

	Connections checklist
9	For information on how to make USB connections, refer to the USB connection topic in this section. Refer also to the important information provided in the Do NOT connect a USB device with an AC power source topic.
10	If using NMEA 0183 / 2000, refer to the 3.7 NMEA sentences section to understand which data sentences (PGNs) are supported by the AIS unit. Your external NMEA devices must also support the data sentences that you want to exchange with the AIS unit.

Data connections matrix

The following table details the types of data (GPS and / or AIS) that can be exchanged using the various combinations of data connections (Low / High baud rate NMEA 0183; NMEA 2000 / SeaTalk^{ng}; USB).

It is important to choose the right combination of connections in order to exchange the types of data you require.

As an example of how to use the table below, you can see that you can feed GPS data into the AIS unit via NMEA 0183 (low baud rate), and then output it to other NMEA 0183 devices using the AIS unit's NMEA 0183 (high baud rate) connections. With this particular combination of connections, the AIS unit will also add AIS data to the output data stream:

| AIS unit INPUTS (GPS data)	AIS unit OUTPUTS							
	NMEA 0183 (4800 low baud rate)		NMEA 0183 (38400 high baud rate)		NMEA 2000* / SeaTalk^{ng}		USB	
	GPS	AIS	GPS	AIS	GPS	AIS	GPS	AIS
NMEA 0183 (4800 low baud rate)	✘	✘	✔	✔	✘	✔	✘	✘
NMEA 0183 (38400 high baud rate)	✔	✘	✘	✘	✘	✔	✘	✘
NMEA 2000* / SeaTalk^{ng}	✘	✘	✘	✔	✘	✔	✘	✔

Important:

- As detailed in the table above, the 38400 high baud rate NMEA 0183 input and output connections on the AIS unit are NOT linked. This means that the AIS unit cannot receive NMEA 0183 data on the 38400 high baud rate input and then feed it to the 38400 high baud rate output.

- To avoid potential data conflicts:

  – Do NOT use the AIS unit's NMEA 0183 and USB connections at the same time.

  – Do NOT connect a SeaTalkng multifunction display to the AIS unit's NMEA 0183 and SeaTalkng connections at the same time.

  – Do NOT connect a SeaTalkng VHF radio to the AIS unit's NMEA 0183 and SeaTalkng connections at the same time.

  – If you have an AIS-capable VHF radio connected to the AIS unit, you must disable the AIS functions on the VHF radio. For more information on how to do this, refer to the documentation that accompanies your VHF radio.

- *NMEA 2000 connections require the use of suitable adapter cables.

Connecting SeaTalkng

The SeaTalkng connector enables you to connect the AIS unit to a SeaTalkng system.

Before connecting via SeaTalkng, refer to the instructions and guidelines provided in the *SeaTalkng Reference Manual* (81300), and ensure that with this product connected, the maximum permitted Load Equivalence Number (LEN) value for the SeaTalkng system will not be exceeded.

Note: Your AIS unit has a SeaTalkng LEN value of 1.
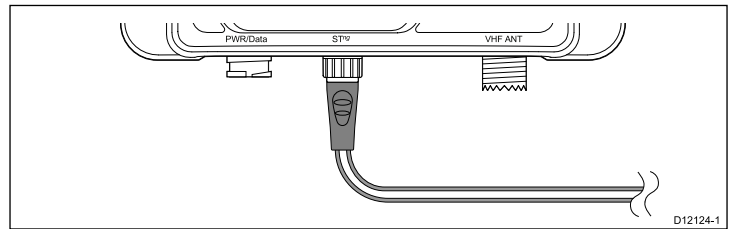
1. Connect the supplied SeaTalkng spur cable to the AIS unit's SeaTalkng connector.
2. Connect the other end of the SeaTalkng spur cable to your vessel's SeaTalkng system using one of the following methods:
   i. SeaTalkng 5-way connector.
   ii. SeaTalkng T-Piece connector.
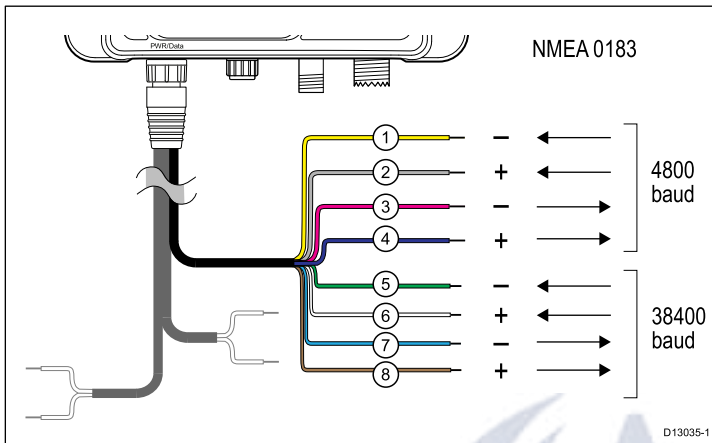   iii. Spare SeaTalkng spur on a SeaTalkng converter.

NMEA 0183 connections

Your AIS unit can provide GPS and / or AIS data to external devices via NMEA 0183 connections. These connections are made via the AIS unit's power / data cable.

Typically NMEA 0183 connections are used to connect the AIS unit to a VHF radio and / or multifunction display. Refer to the *Typical systems* section for system examples.

The AIS unit features a type of multiplexer NMEA 0183 bus which enables you to feed GPS data into the unit via NMEA 0183 and then feed both GPS and AIS data out of the unit via the NMEA 0183 outputs. This is useful in systems where only one NMEA 0183 input exists on your external equipment, eliminating the need for a separate multiplexer. However, only certain combinations of low and high speed NMEA 0183 inputs and outputs are supported for GPS and / or AIS data exchange. Refer to the Data connections matrix for a list of the possible combinations.

The NMEA 0183 connections on the power and data cable are as follows:

NMEA 0183

4800 baud

38400 baud

D13035-1

	Wire color (AIS unit)	Signal	NMEA 0183 baud rate
1	Yellow	IN —	4800
2	Grey	IN +	4800
3	Pink	OUT —	4800
4	Purple	OUT +	4800
5	Green	IN —	38400
6	White	IN +	38400
7	Blue	OUT —	38400
8	Brown	OUT +	38400

VHF connection

The AIS unit requires a VHF antenna connection.

- In systems which do NOT include a VHF radio, connect a VHF antenna directly to the **VHF ANT** connection on the AIS unit.

- In systems which include a VHF radio, a separate AIS / VHF splitter (such as the Raymarine AIS100) is recommended. This splitter device is capable of taking a VHF signal from a single antenna and providing the signal to 2 separate devices (e.g. AIS unit and VHF radio) at the same time. The "AIS" output from the splitter should be connected to the **VHF ANT** connection on the AIS unit.

- Refer to the *Typical systems* section for examples on how to make these connections.

GPS antenna connection

The GPS supplied as part of your AIS transceiver system has a fitted 10 m (33ft) cable to connect to the transceiver's GPS antenna connector.

Connect the cable from the GPS antenna to the GPS connector on the underside of the AIS transceiver.

If the GPS is not connected, the transceiver will operate in **Silent Mode** and an alarm message will be generated. You must acknowledge all alarm messages. The transceiver will not transmit, but will still receive.

GPS data for external devices

The GPS receiver supplied with the AIS650 unit is intended to provide GPS data to the AIS unit only.

To prevent potential GPS data conflicts and / or performance issues, the GPS receiver supplied with the AIS650 unit should NOT be used to provide GPS data to multifunction displays or any other external device. The ability to configure the ProAIS2 software to output GPS data from the AIS unit on its NMEA0183 connection is intended for diagnostic purposes only. Raymarine recommends
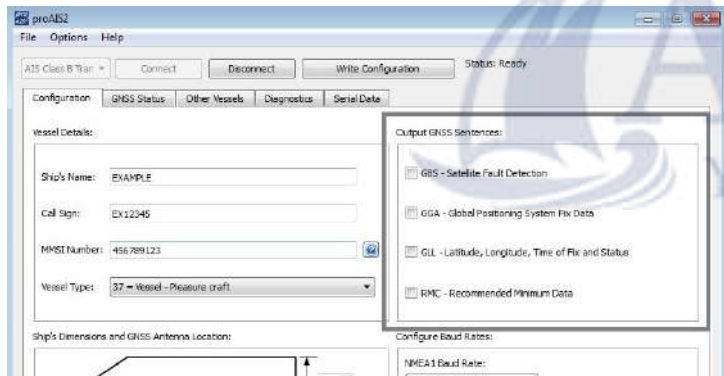
that an additional NMEA 0183 or SeaTalk^{ng} GPS receiver is used to provide GPS data to external devices, as shown in the system examples provided in this document.

You can check the GPS output status of your AIS650 by connecting it to the ProAIS2 software (via the USB connection). Ensure that the following GNSS sentences are disabled:

• **GBS** – Satellite Fault Detection;

• **GGA** – Global Positioning System Fix Data;

• **GLL** – Latitude, Longitude, Time of Fix and Status;

• **RMC** – Recommended Minimum Data.

To do this, ensure that these options are NOT ticked (NOT selected) in the **Configuration** tab of the ProAIS2 software, as shown in the following screenshot:

Note: Raymarine recommends that you make this check before you use the AIS unit for the first time.
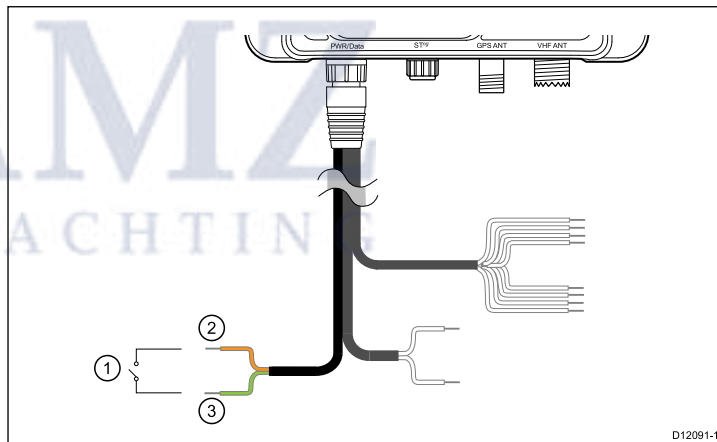
AIS Silent mode connection

In addition to enabling AIS silent mode via a connected multifunction display. The Power/data cable on the AIS unit includes 2 wires which can be connected to a bespoke switch placed at a suitable location on the vessel's dashboard to enable manual switching of AIS silent mode.

Note: The AIS silent switch, where fitted will override a multifunction displays AIS silent setting.

Connecting AIS silent wires

To connect a manual AIS silent switch to your system follow the steps below:

	Wire color	Signal / Description
1	—	Bespoke switch
2	Orange	AIS Silent +
3	Light Green	AIS Silent –

1. Run cable from switch location to AIS unit.
2. Crimp or solder wire connections to the switch.
3. Crimp or solder switch wires to the orange and light green AIS silent wires on the power / data cable.
4. Ensure cables are adequately shielded.

Power connection

Power supply protection

Always protect the power supply by connecting the red (positive) wire to the supply via a 5 A fuse or equivalent automatic circuit breaker.

Sharing a breaker

Where more than 1 piece of equipment shares a breaker you must provide protection for the individual circuits. E.g. by connecting an in-line fuse for each power circuit.
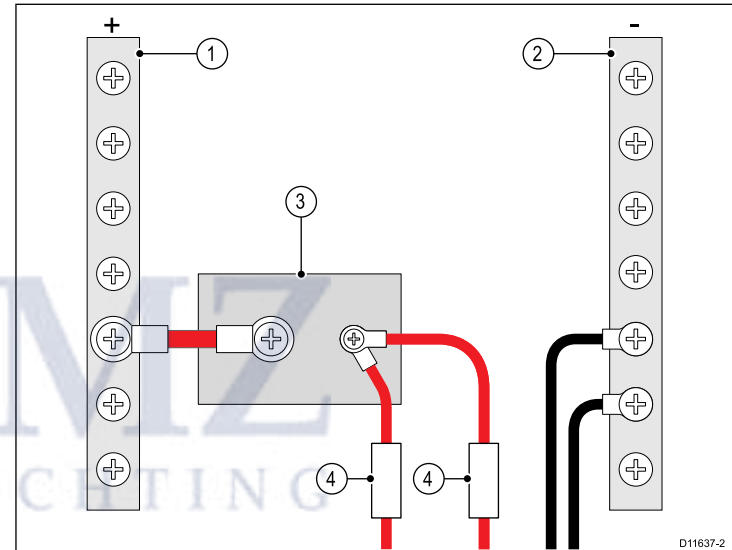
1	Positive (+) bar
2	Negative (-) bar
3	Circuit breaker
4	Fuse

Where possible, connect individual items of equipment to individual circuit breakers. Where this is not possible, use individual in-line fuses to provide the necessary protection.

Warning: Product grounding

Before applying power to this product, ensure it has been correctly grounded, in accordance with the instructions in this guide.

Grounding

The following requirements apply when grounding Raymarine equipment which does not have a dedicated drain wire or shield:

Common ground point

The negative wire must be connected to a bonded common ground point, i. e. with the ground point connected to battery negative, and situated as close as possible to the battery negative terminal.
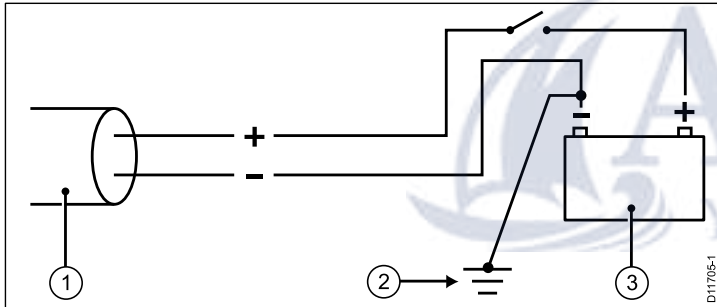
1. Power cable to display
2. Bonded common ground connection
3. Battery

Implementation

If several items require grounding, they may be first be connected to a single local point (e.g. within a switch panel), with this point connected via a single, appropriately-rated conductor, to the boat's common ground.

The preferred minimum requirement for the path to ground (bonded or non-bonded) is via a flat tinned copper braid, with a 30 A rating (1/4 inch) or greater. If this is not possible, an equivalent stranded wire conductor may be used, rated as follows:

- for runs of <1 m (3 ft), use 6 mm^2 (#10 AWG) (6 mm) or greater.

- for runs of >1 m (3 ft), use 8 mm^2 (#8 AWG) or greater.

In any grounding system, always keep the length of connecting braid or wires as short as possible.

Important: Do NOT connect this product to a positively-grounded power system.

References

- ISO 10133/13297

- BMEA code of practice

- NMEA 0400

Connecting power

The use of crimped and soldered lugs is recommended, to provide optimum connection to the power source.

Connect your AIS unit's power cable to either a 12 V dc or 24 V dc power source as follows:

1. Connect the red wire to the 5 A fuse or equivalent automatic circuit breaker to the supply's positive terminal.
2. Connect the black wire to the supply's negative terminal.
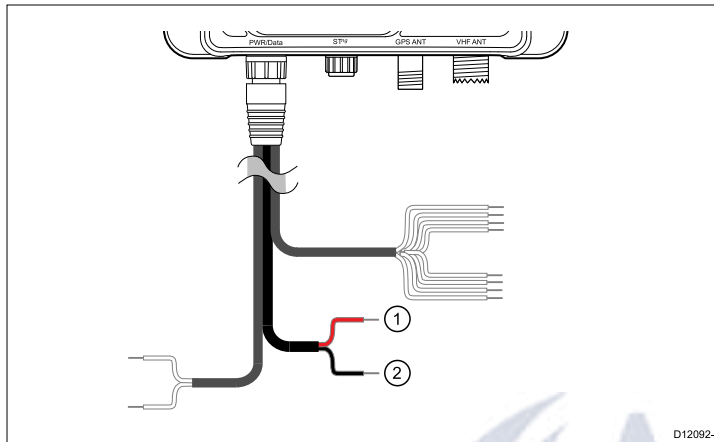
D12092-1

	Wire color	Description
1	Red	Power Supply +
2	Black	Power supply –

USB connection

The AIS unit includes a Mini-B USB port which provides PC connectivity. To enable connection of the AIS unit to a PC the USB drivers, supplied on the software CDROM must be installed on the PC. Please follow the **Installing proAIS2 and USB driver** instructions below to install the USB drivers before connecting the AIS unit to a PC.

The USB port can be used to:

• configure static vessel data using the included proAIS2 software.

• Use of PC based charting software when connected to AIS.

• Perform software update

Note: When configuring static vessel data via USB you do not need to power up the AIS unit, the USB shall provide sufficient power to complete the data configuration.

⚠ **Warning: Do NOT connect a USB device with an AC power source**

Your Raymarine product includes a USB data connection. To prevent potential grounding problems and possible damage to equipment:

• Do NOT connect a device with an AC power source (such as a PC or laptop) via USB to your Raymarine product.

• If you need to connect external equipment (such as a laptop) to your Raymarine product via USB, ensure that the external equipment is powered only by a DC power source (such as a laptop battery).

• Disconnect any AC power source from the external equipment before attempting to connect it via USB to your Raymarine product.

Installing proAIS2 and USB drivers

Before connecting the AIS unit to a PC the proAIS2 application and USB drivers must be installed. To install follow the steps below:

1. Insert the supplied CDROM and navigate to the proAIS folder.

2. Double click on the setup.exe file to launch the installer.

3. Follow the on screen installation instructions, ensuring that the option to install USB drivers is selected when presented.

4. Once installed the AIS unit can be connected to the PC. The USB drivers will be installed automatically and the AIS unit will appear as a new COM port device.

5. Launch proAIS2 by navigating to the proAIS2 folder accessible from the start menu.

6. The proAIS2 user manual is available from the help menu from within the application.
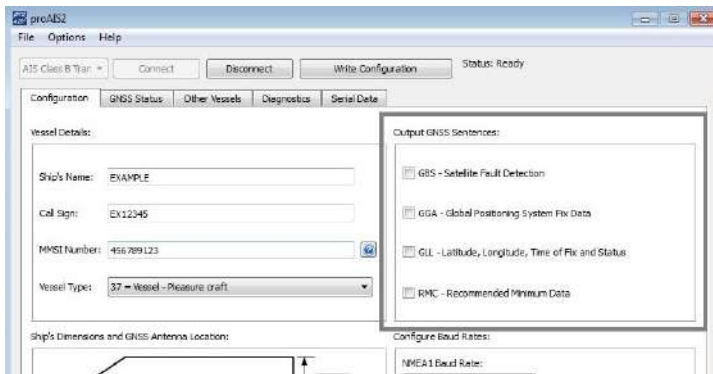
GPS data for external devices

The GPS receiver supplied with the AIS650 unit is intended to provide GPS data to the AIS unit only.

To prevent potential GPS data conflicts and / or performance issues, the GPS receiver supplied with the AIS650 unit should NOT be used to provide GPS data to multifunction displays or any other external device. The ability to configure the ProAIS2 software to output GPS data from the AIS unit on its NMEA0183 connection is intended for diagnostic purposes only. Raymarine recommends that an additional NMEA 0183 or SeaTalk^{ng} GPS receiver is used to provide GPS data to external devices, as shown in the system examples provided in this document.

You can check the GPS output status of your AIS650 by connecting it to the ProAIS2 software (via the USB connection). Ensure that the following GNSS sentences are disabled:

• **GBS** – Satellite Fault Detection;

• **GGA** – Global Positioning System Fix Data;

• **GLL** – Latitude, Longitude, Time of Fix and Status;

• **RMC** – Recommended Minimum Data.

To do this, ensure that these options are NOT ticked (NOT selected) in the **Configuration** tab of the ProAIS2 software, as shown in the following screenshot:

Note: Raymarine recommends that you make this check before you use the AIS unit for the first time.

Performing a software update using a SD card

To perform a software update using a SD card follow the steps below:

1. Copy software files to your SD card.

2. Apply power to your AIS unit.

3. The software update will now take place.

4.7 Location and mounting

Site requirements

When planning the installation, take the following site requirements for the AIS transceiver and GPS antenna, into account.

AIS requirement

This product is NOT approved for use in hazardous/flammable atmospheres. Do NOT install in a hazardous/flammable atmosphere (such as in an engine room or near fuel tanks).

The AIS unit must be fitted in a location where it is not likely to be stepped on or tripped over, and which:

- Is close enough to allow connection to the vessel's VHF with the 3 ft (1 m) RF cable supplied.
- Is at least 3 ft (1 m) from an engine, compass or any magnetic device.
- Has at least 6 in (100 mm) of clear space below, to allow access for cabling and adequate cable bends.
- Is maintained at a temperature between -15°C (5°F) and +55°C (130°F).

GPS antenna location requirements

A GPS antenna is supplied with the transceiver and must be installed in accordance with the instructions provided. Do NOT connect any other GPS antenna to the AIS unit's GPS ANT (antenna) connector.

The GPS antenna can be mounted either on a flat horizontal surface or on a suitable pole.

- If you intend to surface mount the antenna, ensure you have access to the underside of the mounting surface.
- If you intend to pole-mount the antenna, the pole needs to have a 1 inch 14 TPI thread.

> **Important:** The GPS antenna must be mounted in a location that provides a good direct line of site to the entire sky, around the horizon.

Ensure that the selected mounting location is:

- Open and clear of any obstructions (such as masts, search lights, or other structures) that could block line-of-sight to the sky.
- As low as possible, to keep the antenna as stable as possible. The more stable the antenna, the more effectively it will track satellites and provide stable data.
- As far as possible (at least 1 m (3 ft)) from other antennae and electronic equipment.

Do NOT mount the antenna:

- In any area where it could be stepped on or tripped over.
- Up a mast. This will cause the antenna to swing and give significant errors in position data.
- In the direct path of a radar beam.

Unit dimensions — AIS650

D12045-1
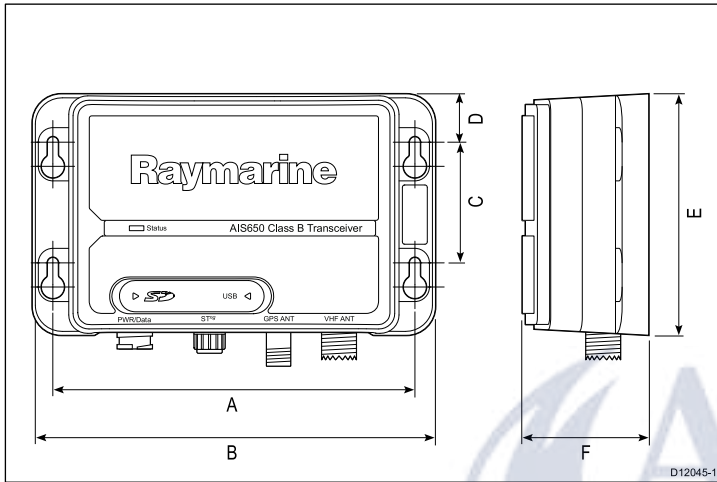
	Dimension
A	150 mm (5.90 in)
B	167 mm (6.57 in)
C	50 mm (1.95 in)
D	20.3 mm (0.8 in)
E	99.5 mm (3.92 in)
F	54 mm (2.12 in)

Mounting

Fitting the AIS unit

Note: To ensure water resistance the unit must be mounted vertically with the connectors facing down.

Note: If you are fitting the AIS unit to fiberglass that has a gelcoat surface, overdrill the surface to prevent the gelcoat from damage when securing the screws. Before drilling the pilot holes, hand drill the marked locations with an oversized bit and countersink to approximately 9.5 mm (3/8in) diameter.

D12043-1
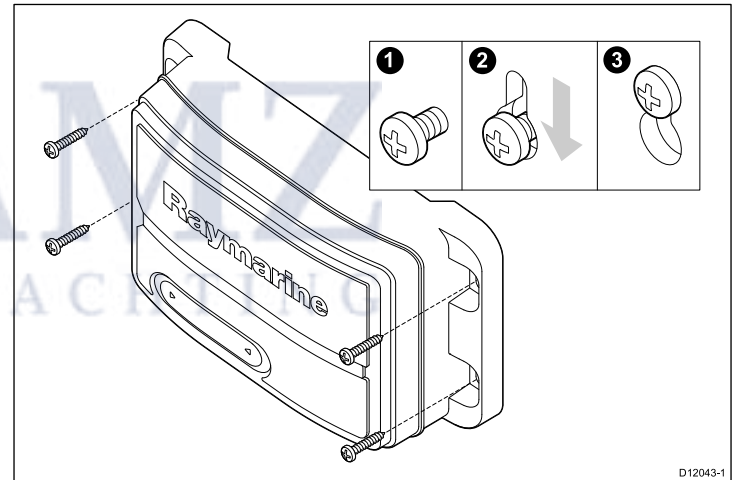
1. Ensure that the intended installation site meets the conditions described under Site requirements.
2. Using a pencil, offer up the unit and mark the location of the screw holes on the mounting surface.
3. Drill the mounting holes using a 3.2 mm (1/8") drill bit.
4. Part fit the screws.

5. Place the unit over the screws and move unit down to lock in position

6. Fully tighten the screws.

Fitting GPS antenna

To fit the GPS antenna:

1. Select a suitable location for the GPS antenna as described under *GPS antenna location requirements*.

2. Fit your GPS antenna using either the *Surface mounting* or *Pole mounting* procedure, as appropriate.

3. Ensuring that cable routing and connection requirements as detailed in the AIS installation instructions are followed.

Surface mounting

When surface mounting the GPS antenna, you can route the cable either centrally (Option A) or from the side of the antenna (Option B).

1. Remove the 3 screws securing the GPS antenna to its pole mount adaptor, then remove the adaptor from the antenna.

2. Using the supplied gasket, mark the three 6 mm (0.25 in) mounting holes.

   • OPTION A: If the cable is going to pass through the mounting surface, drill a 19 mm (0.75 in) center hole.

   • OPTION B: If the cable is to be routed from the side of the antenna (i.e. above the mounting surface), run the cable through the cable channel (1). If you do not route the cable through the channel, you could damage the cable.


D11638-2
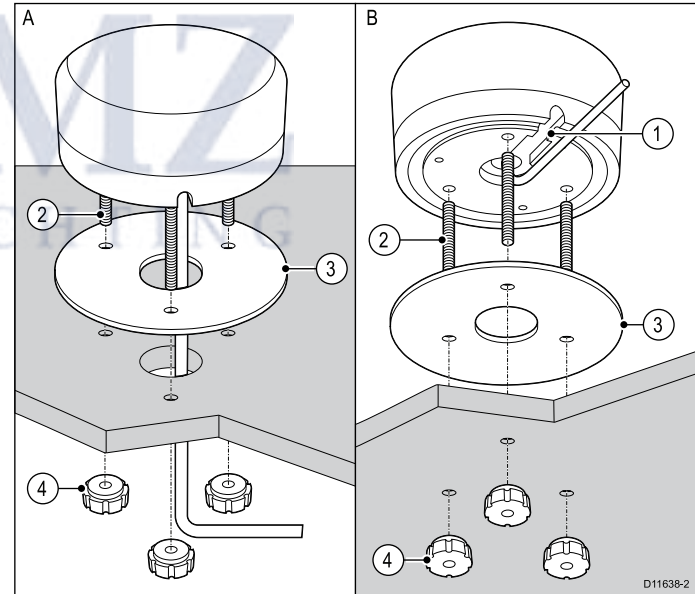
3. Screw the 3 mounting studs (2) into the underside of the antenna.

4. Stick the supplied gasket (3) to the mounting surface, ensuring that the holes on the gasket correspond with the drilled holes.

5. Route the cable as follows:

   • For Option A, feed the cable down through the center hole.

   • For Option B, route the cable along the cable channel.

6. Carefully place the antenna so the mounting studs pass through the holes in the mounting surface.

7. Secure the antenna to the surface using the 3 thumb nuts (4).

Note:

• The thumb nuts supplied with your product may differ slightly from those shown in the illustration.

• Only use the studs and thumb nuts supplied with your product.

• If you are replacing an older version of the GPS receiver, you must mount the newer GPS receiver using only the studs and thumb nuts supplied with the newer GPS receiver.

Pole mounting

If you want to pole-mount the GPS antenna, obtain a pole of suitable length with a 1 inch 14 TPI thread.
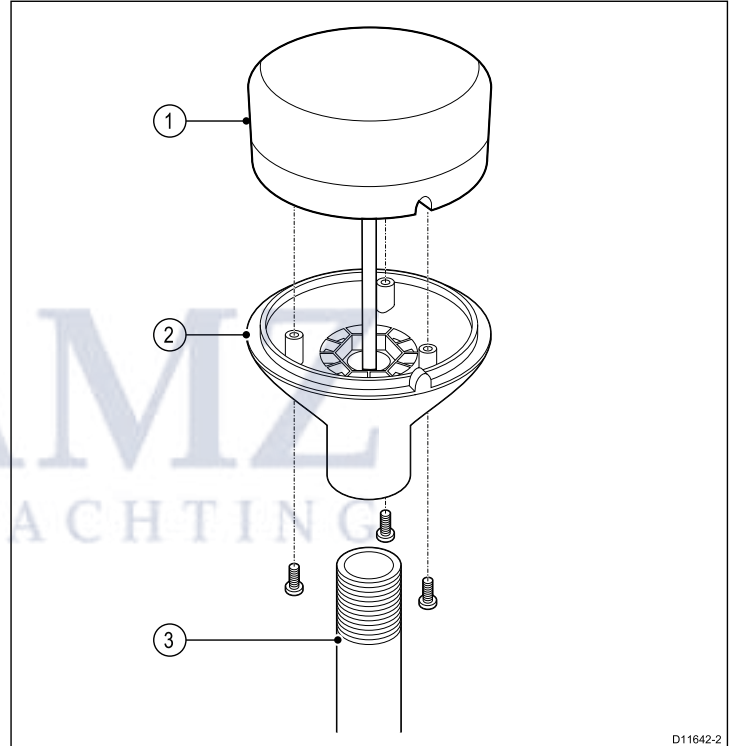
D11642-2

1	GPS antenna
2	Pole mount adaptor
3	Mounting pole (not supplied)

1. Ensuring that the *GPS location requirements* are met, securely attach the pole to a suitable, secure point.

2. Remove and retain the screws securing the GPS antenna to the pole mount adaptor, then separate these two items.

3. Screw the pole mount adaptor fully onto the pole and ensure it is secure.

4. Feed the antenna cable through the center of the pole mount adaptor and then down through the center of the mounting pole.

5. Ensuring you do not trap the cable, place the GPS antenna on the pole mount adaptor so the screw holes are aligned, then secure the antenna with the 3 screws removed during step 2.

4.8 System checks

Switching on

When the installation is complete, observe the STATUS indicator and:

1. Switch on power to the AIS transceiver.

2. Check that:

   i. When power is switched on, the **STATUS** indicator flashes RED, then after a few seconds goes AMBER.

   The amber condition continues while the transceiver acquires a GPS fix then transmits a position report. This can take up to 2 minutes.

   ii. When the first position report has been transmitted, the **STATUS** indicator goes GREEN.

   This condition remains all the time the transceiver is operating normally and transmitting.

> **Note:** If the indicator is BLUE it means that the AIS unit is in Silent Mode. Refer to the 4.10 Troubleshooting section for more information.

Configuration

> ⚠️ **Warning: Configure before use**
>
> This Raymarine product must be correctly configured, to ensure optimum performance and minimize the chances of unsafe or other erroneous data.

Configuration requirement

After installation and successful switch on, the AIS transceiver must be configured for optimum performance aboard the vessel. The person configuring the AIS transceiver needs to know the following vessel information:

- MMSI number

- Name

- Call sign

- Dimensions

- Type

- GPS antenna position

The manner in which configuration is carried out depends on the legal requirements of the geographical area you are.

Important: Before starting any AIS configuration procedure, SWITCH OFF all associated multifunction displays, otherwise you will not be able to correctly configure your AIS transceiver.

USA

In the USA, it is a legal requirement that the configuration is performed by a suitable dealer.

You can use the supplied proAIS2 PC software, to check the vessel data programmed into your AIS transceiver. If this information is incorrect please contact your Raymarine dealer before using the transceiver.

Areas outside of USA

In areas outside of the USA, use the supplied proAIS2 PC software to configure your AIS transceiver, as described in the *proAIS2 User Manual* which can be found in the proAIS2 applications help menu.

Checking for interference

Post installation check

If you have installed any system aboard a boat or made other changes to the boat's electronic systems (radar, VHF radio etc.), you need to check before casting off, that all electrical systems

operate satisfactorily without any undue electrical interference, in order to conform with Electro Magnetic Compatibility (EMC) regulations. To do this:

1. Ensuring it is safe to do so, turn on all electronic systems aboard your vessel.

2. Check that the electronic systems all operate satisfactorily.

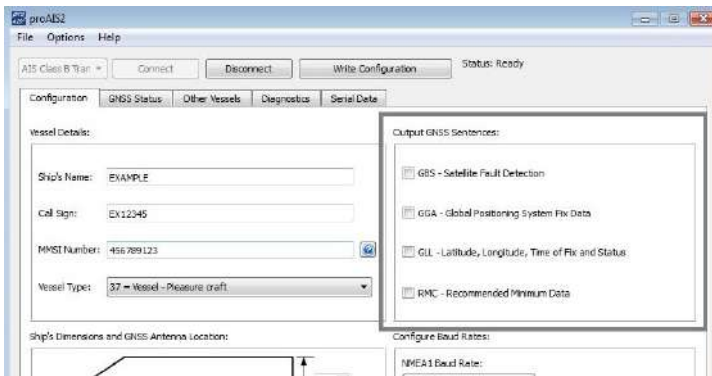**GPS data for external devices**

The GPS receiver supplied with the AIS650 unit is intended to provide GPS data to the AIS unit only.

To prevent potential GPS data conflicts and / or performance issues, the GPS receiver supplied with the AIS650 unit should NOT be used to provide GPS data to multifunction displays or any other external device. The ability to configure the ProAIS2 software to output GPS data from the AIS unit on its NMEA0183 connection is intended for diagnostic purposes only. Raymarine recommends that an additional NMEA 0183 or SeaTalk^{ng} GPS receiver is used to provide GPS data to external devices, as shown in the system examples provided in this document.

You can check the GPS output status of your AIS650 by connecting it to the ProAIS2 software (via the USB connection). Ensure that the following GNSS sentences are disabled:

- **GBS** – Satellite Fault Detection;

- **GGA** – Global Positioning System Fix Data;

- **GLL** – Latitude, Longitude, Time of Fix and Status;

- **RMC** – Recommended Minimum Data.

To do this, ensure that these options are NOT ticked (NOT selected) in the **Configuration** tab of the ProAIS2 software, as shown in the following screenshot:

Note: Raymarine recommends that you make this check before you use the AIS unit for the first time.

Using AIS

The exact method of using AIS depends on which type of Raymarine multifunction display you are using.

Refer to the handbook for your multifunction display for information on using your AIS.

4.9 Diagnostics

LED Status indicator

LED Status indicator

The LED **STATUS** indicator on the transceiver provides an indication of product status.

LED	Color	Status
🟢	GREEN	Transceiver is operating normally.
🟢	GREEN flash x 5	Static data configuration via SD card has commenced.
🟠	AMBER	Either: • The transceiver is starting up, or • The transceiver has not transmitted for more than 2 reporting periods. This could be due to high AIS traffic or loss of GPS fix.
🔴	RED	Fault condition. Refer to the 4.10 Troubleshooting section.
🔴	RED flash x 5	Static data configuration via SD card failed.
🔵	BLUE	Transceiver is running in silent mode. Refer to the 4.10 Troubleshooting section.

4.10 Troubleshooting

Problem	Action required
No power	Check: • All power connections. • Check relevant fuses. • That power supply is at the correct voltage (12 V or 24 V).
AIS configuration data is not saved	Switch off all associated multifunction displays, then re-configure.
No data	Check that: • Connections are secure throughout the system. • The VHF antenna cable is securely connected.
No vessel data	Using the relevant Raymarine multifunction display: • In the Chart application, place the cursor over the targeted vessel and ensure the **AIS DATA** option is not set to **OFF**. • Ensure the AIS layer is set to **ON**. • Ensure displayed target types are set to **ALL**.
No AIS data	Check the NMEA and / or SeaTalk^{ng} output from the multifunction display to the transceiver input, and ensure: • The wires are correctly connected. • The baud rate for NMEA is 38400 baud.

Problem	Action required
Status indicator remains amber	Wait at least 30 minutes to check that a 'Quiet time' has not been requested by the local authority. Check that the: • GPS antenna is properly connected. • GPS antenna has a clear view of the sky, without any obstructions. • MMSI number has been properly configured (use the supplied proAIS application to check this).
Status indicator is red	Check that: • The VHF antenna is properly connected and in particular it is not short circuiting to the vessel structure. • That power supply is at the correct voltage (12 V or 24 V) • MMSI number has been properly configured (use the supplied proAIS application to check this).
Status indicator is blue	Indicates that the AIS unit is in Silent Mode, meaning that the unit is not transmitting. If you do not want the unit to be in Silent Mode, check that: • AIS Silent Mode is not enabled on the connected multifunction display. • The light green and orange wires on the AIS unit's power cable are not electrically shorting.

4.11 NMEA sentences

Your product transmits and receives the following NMEA 2000 Parameter Group Numbers (PGNs) and NMEA 0183 sentences:

NMEA 2000

PGN	Title
129038	Class A position report
129039	Class B position report
129040	Class B extended position report
129793	AIS UTC and date report
129794	AIS class A static and voyage related data
129801	AIS address safety messages
129802	AIS broadcast safety message
129041	AtoN position report
129809	AIS class B static data part A
129810	AIS class B static data part B
126996	Product info
059904	ISO request
059392	ISO acknowledge
060928	ISO address claim
065240	ISO address command
126208	NMEA group functions

NMEA 0183

Sentence	Title
AIVDM	Received AIS message
AIVDO	Own vessel AIS report
AIALR	Alarm condition state
AIACK	Alarm acknowledgement
DUAIQ	MMSI query and programming
HDT	True Heading. **AIS650 only**. Received on the low baud rate (4800) NMEA 0183 input only. Any talker ID is supported. When a valid HDT sentence is received on NMEA 0183, True Heading will be transmitted from the AIS650 as part of the AIS data stream.

4.12 Technical specification

Transceiver specification

Waterproofing	IPX2
Operating temperature range	-15˚C to +55˚C (5˚F to 131˚F)
Storage temperature range	-20˚C to +75˚C (-4˚F to 167˚F)
Humidity	Up to 93% at 40˚C (104˚F)
Nominal supply voltage	12 V to 24 V dc,
Operating voltage range	9.6 V to 31.2 V dc (rated supply -20%, +30%)
Peak current in normal operation	2A
Average power consumption	<3W
LEN (Refer to SeaTalk^{ng} reference manual for further information)	1
Fuse / Breakers	In-line fuse • 5 A
Operating frequency range	156.025 MHz to 162.025 MHz
Channel spacing	25 KHz
Transmitter	1 transmitter
Receiver sensitivity	–107 dBm
Receivers	2 receivers
Weight	285 grams

Connectors	• VHF Antenna — SO-239 co-axial connector • GPS antenna — TNC co-axial connector • SeaTalk^{ng} • NMEA0183 HS — stripped wires • NMEA0183 LS — stripped wires • Power — stripped wires • AIS silent — stripped wires • SD card • USB — NMEA0183
Transceiver standard	Class B IEC62287-1

GPS receiver specification

Receiver channels	50
Nominal time to first fix	36 seconds

Chapter 5: Technical support

Chapter contents

5.1 Raymarine customer support

Raymarine provides a comprehensive customer support service. You can contact customer support through the Raymarine website, telephone and e-mail. If you are unable to resolve a problem, please use any of these facilities to obtain additional help.

Web support

Please visit the customer support area of our website at:

www.raymarine.com

This contains Frequently Asked Questions, servicing information, e-mail access to the Raymarine Technical Support Department and details of worldwide Raymarine agents.

Telephone and e-mail support

In the USA:

- **Tel:** +1 603 324 7900
- **Toll Free:** +1 800 539 5539
- **E-mail:** support@raymarine.com

In the UK, Europe, and the Middle East:

- **Tel:** +44 (0)13 2924 6777
- **E-mail:** ukproduct.support@raymarine.com

In Southeast Asia and Australia:

- **Tel:** +61 (0)29479 4800
- **E-mail:** aus.support@raymarine.com

Product information

If you need to request service, please have the following information to hand:

- Product name.
- Product identity.
- Serial number.
- Software application version.
- System diagrams.

You can obtain this product information using the menus within your product.

Chapter 6: Options and accessories

Chapter contents

6.1 SeaTalkng cables and accessories

SeaTalkng cables and accessories for use with compatible products.

Description	Part No	Notes
SeaTalkng starter kit	T70134	Includes: • 1 x 5 Way connector (A06064) • 2 x Backbone terminator (A06031) • 1 x 3 m (9.8 ft) spur cable (A06040) • 1 x Power cable (A06049)
SeaTalkng Backbone Kit	A25062	Includes: • 2 x 5 m (16.4 ft) Backbone cable (A06036) • 1 x 20 m (65.6 ft) Backbone cable (A06037) • 4 x T-piece (A06028) • 2 x Backbone terminator (A06031) • 1 x Power cable (A06049)
SeaTalkng 0.4 m (1.3 ft) spur	A06038	
SeaTalkng 1 m (3.3 ft) spur	A06039	
SeaTalkng 3 m (9.8 ft) spur	A06040	

Description	Part No	Notes
SeaTalkng 5 m (16.4 ft) spur	A06041	
SeaTalkng 0.4 m (1.3 ft) elbow spur	A06042	
SeaTalkng 0.4 m (1.3 ft) backbone	A06033	
SeaTalkng 1 m (3.3 ft) backbone	A06034	
SeaTalkng 3 m (9.8 ft) backbone	A06035	
SeaTalkng 5 m (16.4 ft) backbone	A06036	
SeaTalkng 9 m (29.5 ft) backbone	A06068	
SeaTalkng 20 m (65.6 ft) backbone	A06037	
SeaTalkng to bare ends 1 m (3.3 ft) spur	A06043	
SeaTalkng to bare ends 3 m (9.8 ft) spur	A06044	
SeaTalkng Power cable	A06049	
SeaTalkng Terminator	A06031	
SeaTalkng T-piece	A06028	Provides 1 x spur connection
SeaTalkng 5–way connector	A06064	Provides 3 x spur connections

Description	Part No	Notes
SeaTalk^{ng} backbone extender	A06030	
SeaTalk to SeaTalk^{ng} converter kit	E22158	Allows the connection of SeaTalk devices to a SeaTalk^{ng} system.
SeaTalk^{ng} Inline terminator	A80001	Provides direct connection of a spur cable to the end of a backbone cable. No T-piece required.
SeaTalk^{ng} Blanking plug	A06032	
ACU / SPX SeaTalk^{ng} spur cable 0.3 m (1.0 ft)	R12112	Connects an SPX course computer or an ACU to a SeaTalk^{ng} backbone.
SeaTalk (3 pin) to SeaTalk^{ng} adaptor cable 0.4 m (1.3 ft)	A06047	
SeaTalk to SeaTalk^{ng} spur 1 m (3.3 ft) spur	A22164	
SeaTalk2 (5 pin) to SeaTalk^{ng} adaptor cable 0.4 m (1.3 ft)	A06048	
DeviceNet adaptor cable (Female)	A06045	Allows the connection of NMEA 2000 devices to a SeaTalk^{ng} system.
DeviceNet adaptor cable (Male)	A06046	Allows the connection of NMEA 2000 devices to a SeaTalk^{ng} system.

Description	Part No	Notes
DeviceNet adaptor cable (Female) to bare ends.	E05026	Allows the connection of NMEA 2000 devices to a SeaTalk^{ng} system.
DeviceNet adaptor cable (Male) to bare ends.	E05027	Allows the connection of NMEA 2000 devices to a SeaTalk^{ng} system.

6.2 Spares and accessories

The following spares are available for the AIS receiver / transceiver:

Part number	Description
R62241	GPS antenna — passive (with 10 m coaxial cable) — AIS650 only
R32162	2 m power/Data cable

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