



a Series
c Series
e Series



Installation and operation instructions

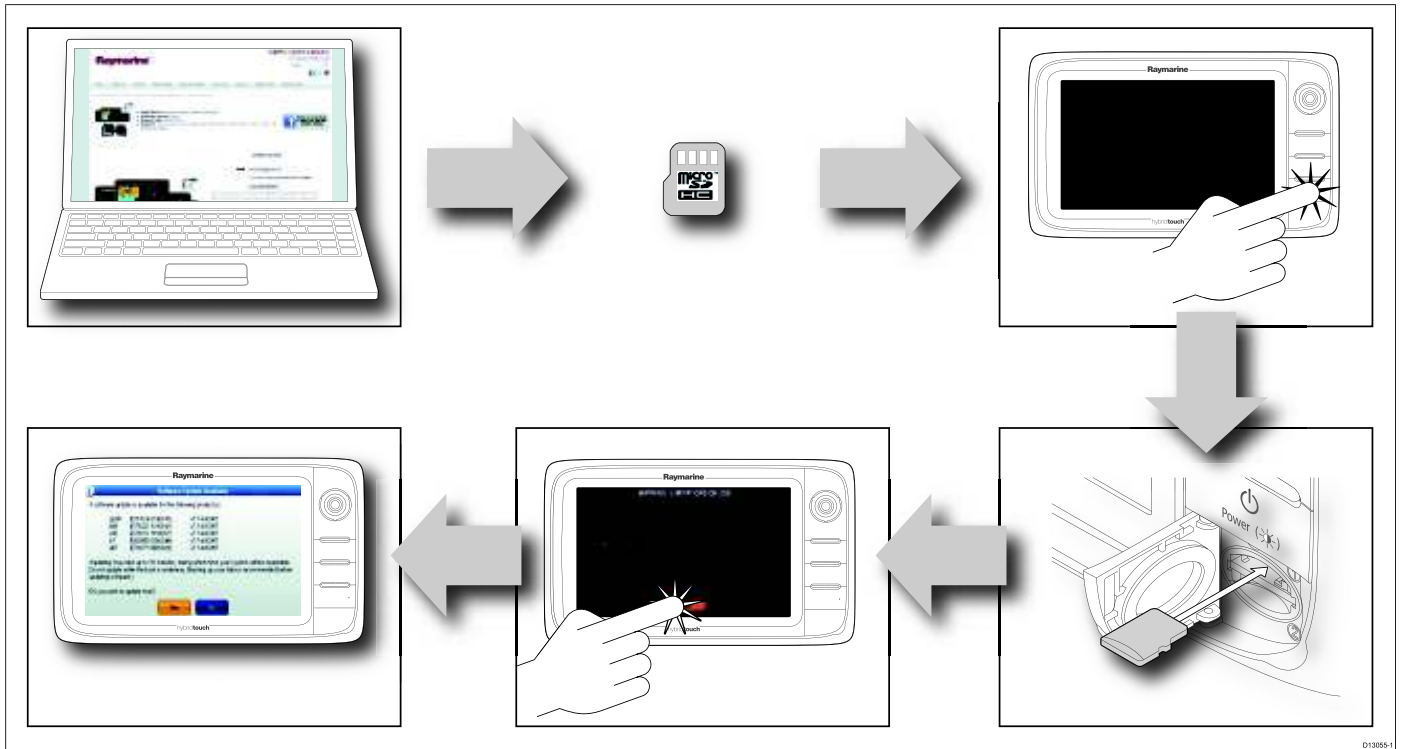
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Update your product software



Raymarine regularly updates its product software to bring you new features or fix existing issues.

- Before using your product for the first time, visit www.raymarine.com/software to obtain the latest software for your product.
- Certain combinations of old and new software on a networked Raymarine system may cause compatibility problems. To obtain the latest features for your product and ensure compatibility with other Raymarine equipment in your system, update the software for all your Raymarine products to the latest version.
- [Visit the website](#) on a regular basis to ensure you are always using the latest software for all your Raymarine products.
- To identify the current software version of your MFD and any connected devices, from the **Homescreen**, select **Set-up > Maintenance > Diagnostics > Select Device**.
- For instructions on how to update the software for your Raymarine products, refer to www.raymarine.com/software.
- Before upgrading MFD software, always backup your MFD user data and settings to an empty memory card (NOT chart card). For instructions on how to do this, refer to the [Saving user data and user settings](#) section of this document.

Note: The illustration above shows a MicroSD card being inserted into a LightHouse MFD. Some LightHouse MFD models require the card to be inserted with the contacts facing UP, others with the contacts facing DOWN. Refer to the information relevant to your particular MFD model in the [Managing display data](#) chapter.

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Software updates

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


Product handbooks


<p>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.</p>

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Chapter 1: Important information

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: High voltages

This product contains high voltages. Do NOT remove any covers or otherwise attempt to access internal components, unless specifically instructed in this document.



Warning: Product grounding

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



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: FCC Warning (Part 15.21)

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



Warning: Radar scanner safety

Before rotating the radar scanner, ensure all personnel are clear.



Warning: Radar transmission safety

The radar scanner transmits electromagnetic energy. Ensure all personnel are clear of the scanner when the radar is transmitting.



Warning: Sonar operation

- NEVER operate the sonar with the vessel out of the water.
- NEVER touch the transducer face when the sonar is powered on.
- SWITCH OFF the sonar if divers are likely to be within 7.6 m (25 ft) of the transducer.



Warning: Touchscreen display temperature

If the display is mounted in an above-decks location that will be exposed to prolonged periods of direct sunlight, the touchscreen may get very hot. In such conditions, Raymarine recommends that you avoid using the touchscreen:

- For HybridTouch displays, use the unit's physical buttons instead.
- For touch-only displays, use an external keypad (for example, the RMK-9) instead.



Warning: Touchscreen display

Exposure to prolonged rain may cause erroneous touch performance, in these situations keep touch activity to a minimum and wipe the screen with a dry non-abrasive cloth before using the touchscreen.

Caution: Transducer cable

- Do NOT cut, shorten, or splice the transducer cable.
- Do NOT remove the connector.

If the cable is cut, it cannot be repaired. Cutting the cable will also void the warranty.

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: Care of chart and memory cards

To avoid irreparable damage to and / or loss of data from chart and memory cards:

- DO NOT save data or files to a card containing cartography as the charts may be overwritten.
- Ensure that chart and memory cards are fitted the correct way around. DO NOT try to force a card into position.
- DO NOT use a metallic instrument such as a screwdriver or pliers to insert or remove a chart or memory card.

Caution: Ensure card reader door is securely closed

To prevent water ingress and consequent damage to the product, ensure that the card reader door is firmly closed.

Caution: Sun covers

- To protect your product against the damaging effects of ultraviolet (UV) light, always fit the sun covers when the product is not in use.
- Remove the sun covers when travelling at high speed, whether in water or when the vessel is being towed.

Caution: Cleaning

When cleaning this product:

- Do NOT wipe the display screen with a dry cloth, as this could scratch the screen coating.
- Do NOT use abrasive, or acid or ammonia based products.
- Do NOT use a jet wash.

- Micro Secure Digital High-Capacity (MicroSDHC)

Note:

- The maximum supported memory card capacity is 32 GB.
- MicroSD cards must be formatted to use either the FAT or FAT 32 file system format to enable use with your MFD.

Speed class rating

For best performance it is recommended that you use Class 10 or UHS (Ultra High Speed) class memory cards.

Chart cards

Your product is pre-loaded with electronic charts (worldwide base map). If you wish to use different chart data, you can insert compatible chart cards into the unit's memory card reader.

Use branded chart cards and memory cards

When archiving data or creating an electronic chart card, Raymarine recommends the use of quality branded memory cards. Some brands of memory card may not work in your unit. Please contact customer support for a list of recommended cards.

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

RF exposure

This transmitter with its antenna is designed to comply with FCC / IC RF exposure limits for general population / uncontrolled exposure. The WiFi / Bluetooth antenna is mounted behind the front fascia on the left hand side of the screen. It is recommended to maintain a safe distance of at least 1 cm from the left hand side of the screen.

TFT Displays

The colors of the display may seem to vary when viewed against a colored background or in colored light. This is a perfectly normal effect that can be seen with all color Thin Film Transistor (TFT) displays.

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.

Disclaimers

This product (including the electronic charts) is intended to be used only as an aid to navigation. It is designed to facilitate use of official government charts, not replace them. 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. This product supports electronic charts provided by third party data suppliers which may be embedded or stored on memory card. Use of such charts is subject to the supplier's End-User Licence Agreement included in the documentation for this product or supplied with the memory card (as applicable).

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.

This product uses digital chart data, and electronic information from the Global Positioning System (GPS) which may contain errors. Raymarine does not warrant the accuracy of such information and you are advised that errors in such information may cause the product to malfunction. 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 chart data or information utilized by the product and supplied by third parties.

Memory cards and chart cards

MicroSD memory cards can be used to back up / archive data (e.g. Waypoint, and Tracks). Once data is backed up to a memory card old data can be deleted from the system, creating capacity for new data. The archived data can be retrieved at any time. Chart cards provide additional or upgraded cartography.

It is recommended that your data is backed up to a memory card on a regular basis. Do NOT save data to a memory card containing cartography.

Compatible cards

The following types of MicroSD cards are compatible with your display:

- Micro Secure Digital Standard-Capacity (MicroSDSC)

FCC

Compliance Statement (Part 15.19)

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

FCC Interference Statement (Part 15.105 (b))

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 of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio / TV technician for help.

Industry Canada

This device complies with Industry Canada License-exempt RSS standard(s).

Operation is subject to the following two conditions:

1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

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

Industry Canada (Français)

Cet appareil est conforme aux normes d'exemption de licence RSS d'Industry Canada.

Son fonctionnement est soumis aux deux conditions suivantes:

1. cet appareil ne doit pas causer d'interférence, et
2. cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

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

Japanese approvals

In the frequency band used for this device, campus radio stations (radio stations that require a license) and specified low power radio stations (radio stations that do not require license) for mobile identification and amateur radio stations (radio stations that require license) used in industries such as microwave ovens, scientific, medical equipment devices and production line of other factories are also being operated.

1. Before using this device, please make sure that campus radio stations and specified low power radio stations for mobile identification and amateur radio stations are not being operated nearby.
2. In case there is any case of harmful interference to campus radio stations for mobile identification caused by this device, please immediately change the frequency used or stop the transmission of radio waves and then consult about the measures to avoid interference (for example, the installation of partitions) through the contact information below.
3. Besides, when in trouble, such as when there is any case of harmful interference to specified low power radio stations for mobile identification or amateur radio stations caused by this device, please consult through the following contact information.

Contact information: Please contact your local authorized Raymarine dealer.

Third party software license agreements

This product is subject to certain third party software license agreements as listed below:

- GNU — LGPL/GPL
- JPEG libraries
- OpenSSL
- FreeType

The license agreements for the above can be found on the website www.raymarine.com and on the accompanying documentation CD if supplied.

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.

Pixel defect policy

In common with all TFT units, the screen may exhibit a few wrongly-illuminated ("dead") pixels. These may appear as black pixels in a light area of the screen or as colored pixels in black areas.

If your display exhibits MORE than the number of wrongly-illuminated pixels allowed (refer to the product *technical specification* for details), please contact your local Raymarine service center for further advice.

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 Handbook information on page 14](#)
- [2.2 Product overview on page 15](#)
- [2.3 Handbook illustrations on page 17](#)
- [2.4 Handbook conventions on page 18](#)

2.1 Handbook information

This handbook contains important information regarding your multifunction display.

The handbook is applicable to the following 3rd generation Raymarine multifunction displays:

- a Series
- c Series
- e Series

About this handbook

This handbook describes how to operate your multifunction display in conjunction with compatible electronic cartography and peripheral equipment.

It assumes that all peripheral equipment to be operated with it is compatible and has been correctly installed. This handbook is intended for users of varying marine abilities, but assumes a general level of knowledge of display use, nautical terminology and practices.

Software revision

Raymarine regularly updates product software to add new features and improve existing functionality.



This handbook covers multifunction display software version — LightHouse II Release 10. Please refer to the *Software Releases* section for details on software releases. Check the Raymarine website to ensure you have the latest software and user manuals. www.raymarine.com.

Handbooks

The following handbooks are applicable to your multifunction display:

Handbooks

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

a Series Handbooks

Description	Part number
a Series Mounting and getting started guide	88012
a Series / c Series / e Series Installation and operation handbook	81337
a6x Mounting template	87165
a7x Mounting template	87191

c Series Handbooks

Description	Part number
c Series / e Series Mounting and getting started guide	88001
a Series / c Series / e Series Installation and operation handbook	81337
e95 / e97 / c95 / c97 Mounting template	87144
e125 / e127 / c125 / c127 Mounting template	87145

e Series Handbooks

Description	Part number
e7 / e7D Mounting and getting started guide	88011
c Series / e Series Mounting and getting started guide	88001

Description	Part number
a Series / c Series / e Series Installation and operation handbook	81337
e7 / e7D Mounting template	87137
e95 / e97 / c95 / c97 Mounting template	87144
e125 / e127 / c125 / c127 Mounting template	87145
e165 Mounting template	87166

Additional handbooks

Description	Part number
SeaTalk ^{ng} reference manual	81300

User manuals Print Shop

Raymarine provides a Print Shop service, enabling you to purchase a high-quality, professionally-printed manual for your Raymarine product.

Printed manuals are ideal for keeping onboard your vessel, as a useful source of reference whenever you need assistance with your Raymarine product.

Visit <http://www.raymarine.co.uk/view/?id=5175> to order a printed manual, delivered directly to your door.

For further information about the Print Shop, please visit the Print Shop FAQ pages: <http://www.raymarine.co.uk/view/?id=5751>.

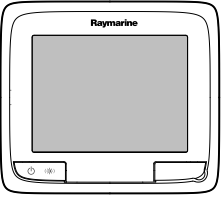
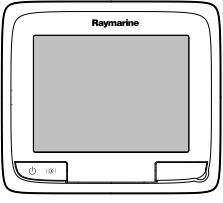


Note:

- Accepted methods of payment for printed manuals are credit cards and PayPal.
- Printed manuals can be shipped worldwide.
- Further manuals will be added to the Print Shop over the coming months for both new and legacy products.
- Raymarine user manuals are also available to download free-of-charge from the Raymarine website, in the popular PDF format. These PDF files can be viewed on a PC / laptop, tablet, smartphone, or on the latest generation of Raymarine multifunction displays.

2.2 Product overview

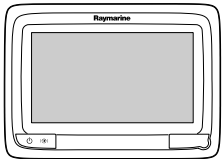
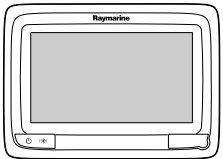


a6x Display variants

a6x multifunction displays are available in the following variants:

		
Non-sonar variant	a65 (E70076)	a65 Wi-Fi (E70162)
Sonar variant	a67 (E70077)	a67 Wi-Fi (E70163)
DownVision variant	a68 (E70206)	a68 Wi-Fi (E70207)
Features	<ul style="list-style-type: none"> • Bluetooth • Internal GPS 	<ul style="list-style-type: none"> • Bluetooth • Internal GPS • Wi-Fi
Controls	 Multi-Touch touchscreen (HybridTouch when paired with a remote keypad.)	 Multi-Touch touchscreen (HybridTouch when paired with a remote keypad.)

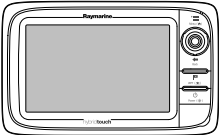

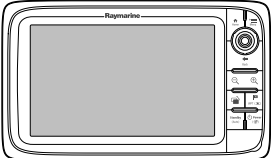

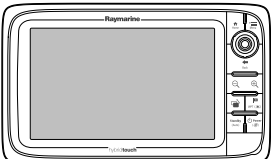

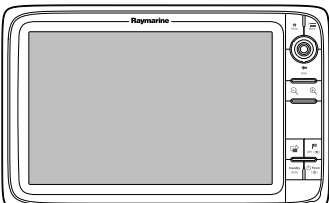

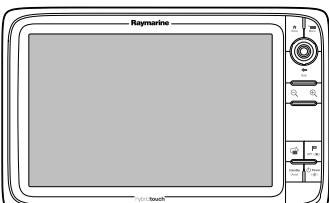

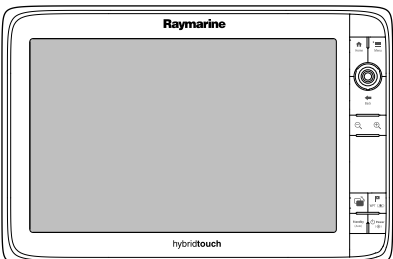

a7x Display variants

a7x multifunction displays are available in the following variants:

		
Non-sonar variant	a75 (E70164)	a75 Wi-Fi (E70166)
Sonar variant	a77 (E70165)	a77 Wi-Fi (E70167)
DownVision variant	a78 (E70208)	a78 Wi-Fi (E70209)
Features	<ul style="list-style-type: none"> • Bluetooth • Internal GPS 	<ul style="list-style-type: none"> • Bluetooth • Internal GPS • Wi-Fi
Controls	 Multi-Touch touchscreen (HybridTouch when paired with a remote keypad.)	 Multi-Touch touchscreen (HybridTouch when paired with a remote keypad.)

c Series and e Series display variants

The following c Series and e Series multifunction display variants are available

	Non-sonar	Sonar	Series	Controls	Features
	e7 (E62354)	e7D (E62355)	e Series	 HybridTouch (Touchscreen and physical buttons)	<ul style="list-style-type: none"> • Bluetooth. • Wi-Fi • NMEA 0183 • NMEA 2000 (via SeaTalk^{ng}) • Internal GPS. • Video input.
	c95 (E70011)	c97 (E70012)	c Series	 Physical buttons only	<ul style="list-style-type: none"> • Bluetooth. • Wi-Fi • NMEA 0183 • NMEA 2000 (via SeaTalk^{ng}) • Internal GPS. • Video input.
	e95 (E70021)	e97 (E70022)	e Series	 HybridTouch (Touchscreen and physical buttons)	<ul style="list-style-type: none"> • Bluetooth. • Wi-Fi • NMEA 0183 • NMEA 2000 (via SeaTalk^{ng}) • Internal GPS. • Video input x2. • Video output.
	c125 (E70013)	c127 (E70014)	c Series	 Physical buttons only	<ul style="list-style-type: none"> • Bluetooth. • Wi-Fi • NMEA 0183 • NMEA 2000 (via SeaTalk^{ng}) • Internal GPS. • Video input.
	e125 (E70023)	e127 (E70024)	e Series	 HybridTouch (Touchscreen and physical buttons)	<ul style="list-style-type: none"> • Bluetooth. • Wi-Fi • NMEA 0183 • NMEA 2000 (via SeaTalk^{ng}) • Internal GPS. • Video input x2. • Video output.
	e165 (E70025)	n/a	e Series	 HybridTouch (Touchscreen and physical buttons)	<ul style="list-style-type: none"> • Bluetooth. • Wi-Fi • NMEA 0183 • NMEA 2000 (via SeaTalk^{ng}) • Video input x2. • Video output.

HybridTouch overview

If your multifunction display features HybridTouch, this enables you to operate the unit using the touchscreen and the physical buttons.

A HybridTouch display has physical buttons which can be used in addition to the touchscreen. Touchscreen only multifunction displays (which do not have physical buttons) can be connected to a remote keypad which allows HybridTouch functionality.

All functions can be accessed using the touchscreen. However, there may be situations (such as rough sea conditions) when it is not appropriate to use the touchscreen. In these situations, Raymarine strongly recommends that you activate the touch lock and use the physical buttons to operate your multifunction display.

Touchscreen overview

The touchscreen provides an alternative to using physical buttons to control your multifunction display.

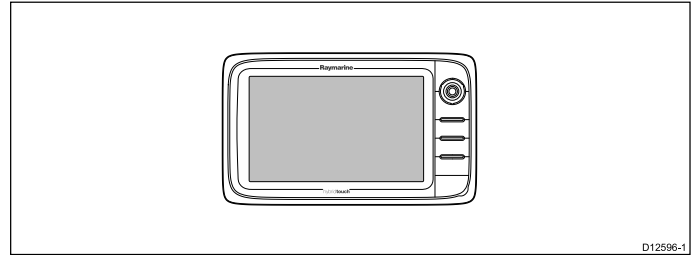
All functions can be accessed using the touchscreen

Note: Raymarine strongly recommends that you familiarize yourself with touch operations while your vessel is anchored or moored. You may find it helpful to use the simulator mode (accessible from **Homescreen > Set-up > System Settings**) in these situations.

2.3 Handbook illustrations







The illustrations and screenshots used in this handbook may differ slightly from your display model.

The illustration of the multifunction display below is used throughout this manual and unless otherwise stated can apply to all 3rd generation variant of Raymarine multifunction displays (i.e. a Series, c Series and e Series).



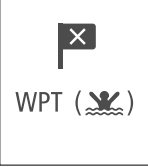

2.4 Handbook conventions

The following conventions are used throughout this handbook when referring to:

Type	Example	Convention
Icons		<p>The term "select" is used in procedures involving icons to refer to the action of selecting an on-screen icon, either using touch or physical buttons:</p> <ul style="list-style-type: none"> • Touch — Press your finger on the icon to select. • Physical buttons — Use the Joystick to highlight the icon and press the Ok button.
Menus		<p>The term "select" is used in procedures involving menus to refer to the action of selecting a menu item, either using touch or physical buttons:</p> <ul style="list-style-type: none"> • Touch — Press your finger on the icon to select. • Physical buttons — Use the Joystick to highlight the icon and press the Ok button.
		<p>The term "scroll" is used in procedures involving menus and dialogs to refer to the action of scrolling a list or menu, either by touch or physical buttons:</p> <ul style="list-style-type: none"> • Touch — Press your finger on the menu and slide up or down to scroll. • Physical buttons — Turn the Rotary control clockwise or anti-clockwise to scroll.
Applications		<p>The term "select" is used in procedures involving applications to refer to the action of selecting a location, object or target on-screen using touch or physical buttons:</p> <ul style="list-style-type: none"> • Touch — Press and hold your finger on a location to select, or • Touch — Press and release your finger on an object or target. • Physical buttons — Use the Joystick to highlight the location, object or target and press the Ok button.
Numeric adjust controls		<p>The term "adjust" is used in procedures involving numerical adjust controls to refer to the action of changing the numeric value using touch or physical buttons:</p> <ul style="list-style-type: none"> • Touch — Press your finger on the up or down arrow to increase or decrease the numeric value. • Physical buttons — Use the Rotary control to increase or decrease the numeric value. <p>With the Numeric adjust control displayed you can also select on the keypad icon or press and hold the Ok button to open a numeric keypad to enter a new value for the setting.</p>
Slider bar controls		<p>The term "adjust" is used in procedures involving slider bar controls to refer to the action of changing the associated numeric value using touch or physical buttons:</p> <ul style="list-style-type: none"> • Touch — Press your finger on the up or down arrow to increase or decrease the numeric value. • Physical buttons — Use the Rotary control to increase or decrease the numeric value.

Waypoint (MOB) button / icon

Depending on the multifunction display variant there will be either a Waypoint (MOB) button or an on-screen icon.



WPT button		<ul style="list-style-type: none"> • c Series • e Series • RMK-9 keypad
WPT icons		<ul style="list-style-type: none"> • a Series • gS Series

Throughout this manual the term: Select **WPT**, refers to pressing the physical **WPT** button or pressing the on-screen **WPT** icon.

Touch and non-touch operations

This handbook applies to both touch and non-touch operations.

This handbook uses icons to identify whether a particular task is specifically a touch or a non-touch operation. Where a task does not have a touch or non-touch icon then the task can be performed using either.

	<p>Touch (Touchscreen operation) — Touch operations apply to multifunction displays which have a touchscreen.</p>
	<p>Non-touch (physical button operation) — Non-touch operations apply to multifunction displays with physical buttons or multifunction displays that have a remote keypad connected and paired to it.</p>

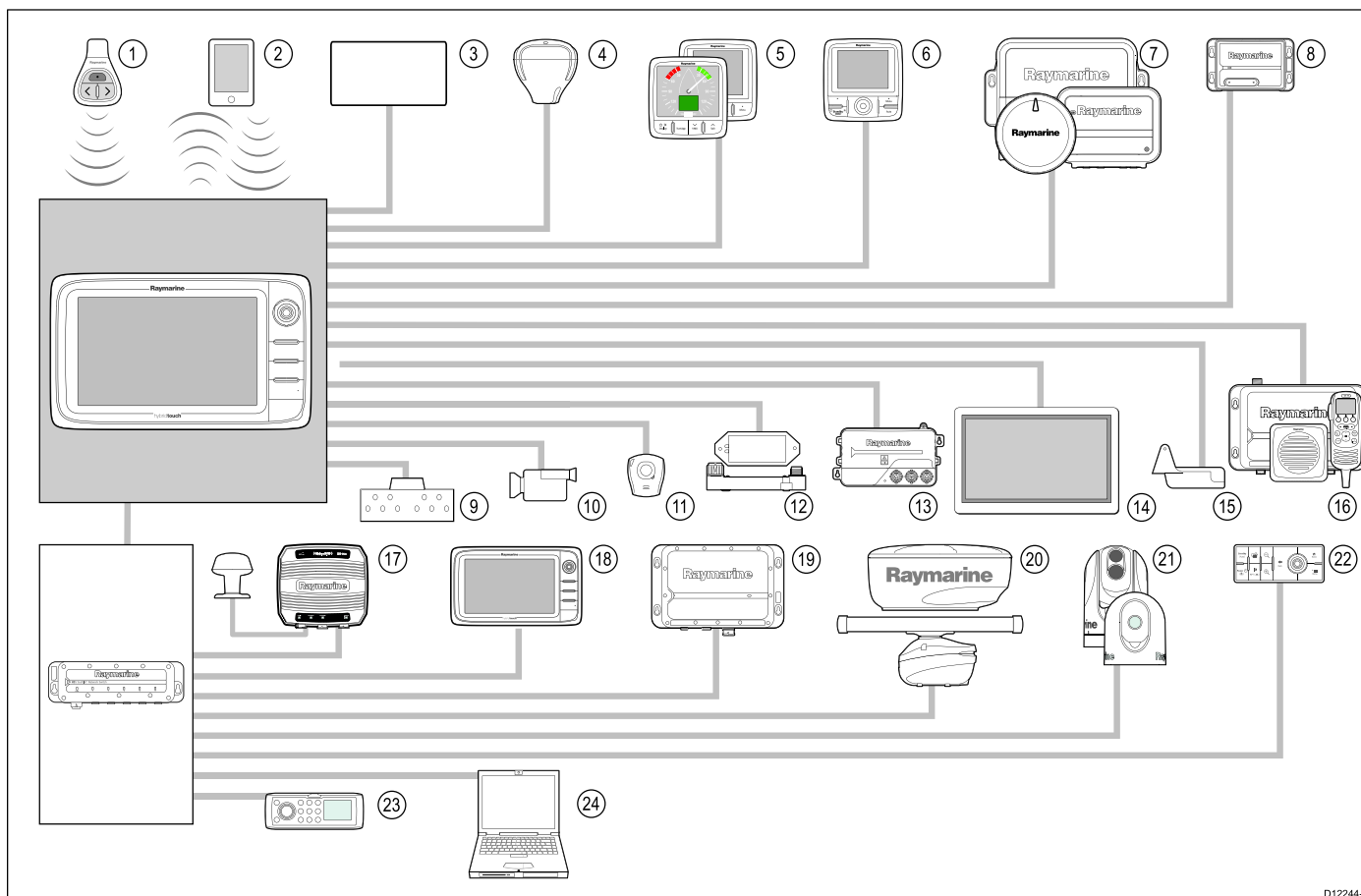
Chapter 3: Planning the installation

Chapter contents

- [3.1 System integration on page 22](#)
- [3.2 Installation checklist on page 26](#)
- [3.3 System Limits on page 26](#)
- [3.4 Multiple data sources \(MDS\) overview on page 27](#)
- [3.5 Identifying your display variant on page 27](#)
- [3.6 Networking constraints on page 28](#)
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- [3.8 System protocols on page 31](#)
- [3.9 Data master on page 32](#)
- [3.10 New a Series parts supplied on page 32](#)
- [3.11 e7 / e7D Parts supplied on page 33](#)
- [3.12 New c Series and New e Series parts supplied on page 33](#)
- [3.13 Tools required for installation on page 34](#)
- [3.14 Selecting a location on page 34](#)

3.1 System integration

Your multifunction display is compatible with a wide range of marine electronics devices.



D12244-4

The display uses a number of protocols to transfer data between the various devices in your system. The following table details which devices may be connected to your display, and the type of connections (in terms of protocols and physical interfaces):

Item	Device Type	Maximum quantity	Suitable Devices	Connections
1	Remote control	1 per multifunction display.	Raymarine RCU-3	Bluetooth
2	Smartphone / Tablet device	1 per multifunction display.	<p>For Raymarine wireless video streaming and remote control apps:</p> <ul style="list-style-type: none"> • Apple iPhone 4 (or later) or iPad 2 (or later) • Android device with minimum 1GHz processor and running android 2.2.2 (or later) • Amazon Kindle Fire <p>For chartplotter sync with Navionics Marine app:</p> <ul style="list-style-type: none"> • Apple iPhone or iPad • Android-compatible smartphone or tablet <p>For media player control (a, e and gS Series only):</p> <ul style="list-style-type: none"> • Any Bluetooth-enabled device that supports Bluetooth 2.1+ EDR power class 1.5 (supported profile: AVRCP 1.0) 	<ul style="list-style-type: none"> • Chartplotter sync with Navionics Marine app: Wi-Fi • Video streaming and remote control: Wi-Fi • Media player control: Bluetooth 2.1+ EDR power class 1.5 (supported profile: AVRCP 1.0) or later
3	Vessel tank sensors — third-party	<ul style="list-style-type: none"> • Up to 5 x fuel. • 1 x fresh water. • 1 x waste water. • 1 x sewage. • 1 x bait / fish. 	Third-party NMEA 2000 interfaces	NMEA 2000 (via optional DeviceNet adaptor cables)

Item	Device Type	Maximum quantity	Suitable Devices	Connections
4	GPS (external) — Raymarine	1	Any combination of the following: <ul style="list-style-type: none"> • RS130 • Raystar125 GPS • Raystar125+ GPS (via optional SeaTalk to SeaTalk^{ng} converter) 	SeaTalk, SeaTalk ^{ng} , or NMEA 0183
5	Instruments — Raymarine	As determined by SeaTalk ^{ng} bus bandwidth and power loading.	SeaTalk ^{ng} : <ul style="list-style-type: none"> • i50 Depth, Speed, or Tridata • i60 Wind, CH Wind • i70 • ST70+ • ST70 SeaTalk (via optional SeaTalk to SeaTalk ^{ng} converter): <ul style="list-style-type: none"> • i40 Wind, Speed, Depth, or Bidata • ST60+ Wind, Speed, Depth, Rudder, or Compass • ST40 Wind, Speed, Depth, Rudder, or Compass 	SeaTalk, SeaTalk ^{ng}
6	Pilot control heads — Raymarine	As determined by SeaTalk or SeaTalk ^{ng} bus bandwidth and power loading, as appropriate.	SeaTalk ^{ng} : <ul style="list-style-type: none"> • p70 • p70R • ST70 (SeaTalk^{ng} course computer only.) • ST70+ (SeaTalk^{ng} course computer only.) SeaTalk (via optional SeaTalk to SeaTalk ^{ng} converter): <ul style="list-style-type: none"> • ST6002 • ST7002 • ST8002 	SeaTalk, SeaTalk ^{ng}
7	Autopilots — Raymarine	1	SeaTalk ^{ng} : <ul style="list-style-type: none"> • Evolution autopilots • All SPX course computers SeaTalk (via optional SeaTalk to SeaTalk ^{ng} converter): <ul style="list-style-type: none"> • ST1000 • ST2000 • S1000 • S1 • S2 • S3 	SeaTalk, SeaTalk ^{ng} , or NMEA 0183
8	AIS — Raymarine	1	<ul style="list-style-type: none"> • AIS 350 • AIS 650 • AIS 950 • AIS 250 • AIS 500 	SeaTalk ^{ng} , or NMEA 0183
8	AIS — third-party	1	Third-party NMEA 0183-compatible AIS Class A or Class B receiver / transceiver	NMEA 0183
9	Vessel trim tabs — third-party	1 pair	Third-party NMEA 2000 interfaces	NMEA 2000 (via optional DeviceNet adaptor cables)

Item	Device Type	Maximum quantity	Suitable Devices	Connections
10	Video / camera	<ul style="list-style-type: none"> • a Series = 0 • e7, e7D, c Series = 1 • e Series (excluding e7 and e7D) = 2 	Composite PAL or NTSC video source	BNC connectors
10	IP camera — third-party	Multiple <div style="border: 1px solid black; padding: 2px; width: fit-content;"> Note: Only 1 IP camera can be viewed at a time. </div>	Third party IP camera <div style="border: 1px solid black; padding: 2px; width: fit-content;"> Note: IP cameras must be able to assign IP address via DHCP and allow unauthenticated, anonymous ONVIF access. </div>	Via SeaTalk ^{ng} network.
11	Lifetag (Man overboard alert)	1 basestation	All Raymarine Lifetag basestations	SeaTalk (via optional SeaTalk to SeaTalk ^{ng} converter)
12	Engine interface — Raymarine	1 unit for each engine CAN bus	ECI-100	SeaTalk ^{ng}
12	Engine interface — third-party	1	Third-party NMEA 2000 interfaces	NMEA 2000 (via optional DeviceNet adaptor cables)
13	Transducers and sensors — Raymarine	1	Analog transducers: <ul style="list-style-type: none"> • Wind • Speed • Depth • Rudder reference 	SeaTalk ^{ng} (via optional iTC-5 converter)
13	Transducers and sensors — Airmar	1	<ul style="list-style-type: none"> • DT800 Smart Sensor • DST800 Smart Sensor • PB200 weather station 	SeaTalk ^{ng} (via optional iTC-5 converter)
14	External display	e Series (excluding e7 and e7D) = 1	External display	15 pin D-Type connector (VGA Style)
15	Sonar transducer	1	Direct connection to sonar variant displays <ul style="list-style-type: none"> • Raymarine P48 • Raymarine P58 • Raymarine P74 • Raymarine B60 20° • Raymarine B60 12° • Raymarine B744V ; OR: <ul style="list-style-type: none"> • Any 600 watt / 1Kw compatible transducer (via optional E66066 adaptor cable) ; OR: <ul style="list-style-type: none"> • Any Minn Kota transducer (via optional A62363 adaptor cable) Connection via external Raymarine Sonar Module: <ul style="list-style-type: none"> • Any sonar module-compatible transducer 	Raymarine transducer connection, OR Minn Kota transducer connection
16	DSC VHF radio — Raymarine	1	SeaTalk ^{ng} : <ul style="list-style-type: none"> • Ray260 • Ray260 AIS NMEA 0183: <ul style="list-style-type: none"> • Ray49 • Ray55 • Ray218 • Ray240 	<div style="border: 1px solid black; padding: 2px; width: fit-content;"> Note: a Series requires an NMEA 0183 to SeaTalk^{ng} converter. </div>

Item	Device Type	Maximum quantity	Suitable Devices	Connections
17	Raymarine Sirius marine weather / satellite radio receiver (North America only)	1	SeaTalk ^{hs} : <ul style="list-style-type: none"> • SR150 • SR100 • SR6 SeaTalk ^{ng} : <ul style="list-style-type: none"> • SR50 	SeaTalk ^{hs} , SeaTalk ^{ng} .
18	Additional multifunction display(s) — Raymarine	9	3rd generation Raymarine multifunction displays SeaTalk ^{hs} (recommended): <ul style="list-style-type: none"> • a Series • c Series • e Series • gS Series <div style="border: 1px solid black; padding: 2px; margin-top: 5px;">Note: You can connect Raymarine multifunction displays using NMEA 0183 or SeaTalk^{ng} but not all functions are supported.</div> <div style="border: 1px solid black; padding: 2px; margin-top: 5px;">Note: Visit www.raymarine.com to download the latest software version for your display.</div>	SeaTalk ^{hs} .
18	Additional multifunction display(s) — third-party	<ul style="list-style-type: none"> • Connections to multifunction display NMEA outputs: 4 • Connections to multifunction display NMEA inputs: 2 <div style="border: 1px solid black; padding: 2px; margin-top: 5px;">Note: a Series multifunction displays do not support direct connection of NMEA 0183 devices.</div>	NMEA 0183-compatible chartplotters and multifunction displays	NMEA 0183
19	Sonar Modules (Fishfinder) — Raymarine	Multiple	<ul style="list-style-type: none"> • CP450C • CP300 • CP100 • Sonar variant multifunction displays 	SeaTalk ^{hs}
20	Radar — Raymarine	1	All Raymarine Non-HD Digital Radomes and HD or SuperHD radar scanners. <div style="border: 1px solid black; padding: 2px; margin-top: 5px;">Note: Please ensure your radar scanner is using the latest software version.</div>	SeaTalk ^{hs}
21	Thermal camera — Raymarine	1 <div style="border: 1px solid black; padding: 2px; margin-top: 5px;">Note: a Series multifunction displays do not support thermal cameras.</div>	<ul style="list-style-type: none"> • T200 Series • T300 Series • T400 Series • T800 Series • T900 Series 	SeaTalk ^{hs} (for control), BNC connector (for video)
22	Remote keypad	Multiple	<ul style="list-style-type: none"> • RMK-9 	SeaTalk ^{hs}
23	Fusion entertainment systems	Multiple	Fusion 700 series entertainment systems: <ul style="list-style-type: none"> • MS-IP700 • MS-AV700 	SeaTalk ^{hs}
24	PC / laptop	1	Windows-compatible PC or laptop running Raymarine Voyager planning software.	SeaTalk ^{hs}

3.2 Installation checklist

Installation includes the following activities:

Installation Task	
1	Plan your system.
2	Obtain all required equipment and tools.
3	Site all equipment.
4	Route all cables.
5	Drill cable and mounting holes.
6	Make all connections into equipment.
7	Secure all equipment in place.
8	Power on and test the system.

3.3 System Limits

The following limits apply to the number of system components that can be connected in a Raymarine multifunction display system.

Component	Maximum
Maximum number of SeaTalk ^{hs} devices	25
Maximum number of SeaTalk ^{ng} devices	50
Raymarine multifunction displays.	10

3.4 Multiple data sources (MDS) overview

Installations that include multiple instances of data sources can cause data conflicts. An example is an installation featuring more than one source of GPS data.

MDS enables you to manage conflicts involving the following types of data:

- GPS Position.
- Heading.
- Depth.
- Speed.
- Wind.

Typically this exercise is completed as part of the initial installation, or when new equipment is added.

If this exercise is NOT completed the system will automatically attempt to resolve data conflicts. However, this may result in the system choosing a source of data that you do not want to use.

If MDS is available the system can list the available data sources and allow you to select your preferred data source. For MDS to be available all products in the system that use the data sources listed above must be MDS-compliant. The system can list any products that are NOT compliant. It may be necessary to upgrade the software for these non-compliant products to make them compliant. Visit the Raymarine website (www.raymarine.com) to obtain the latest software for your products. If MDS-compliant software is not available and you do NOT want the system to automatically attempt to resolve data conflicts, any non-compliant product(s) can be removed or replaced to ensure the entire system is MDS-compliant.

3.5 Identifying your display variant

To discover which model display you have follow the steps below:



From the homescreen:

1. Select **Set-up**.
2. Select **Maintenance**.
3. Select **Diagnostics**.
4. Select **Select Device**.
5. Search the Network column for the **'This Device'** entry.
6. The Device column for this record will list the model of your display.

3.6 Networking constraints

Raymarine's 3rd generation LightHouse powered multifunction displays (a Series, c Series, e Series and gS Series) can be networked together.

General

- Multifunction displays should be connected together using SeaTalk^{hs}.
- Multifunction displays can also be connected via SeaTalk^{ng} or NMEA 0183, but not all functions are supported.
- All networked a Series, c Series and e Series displays must contain software version 4.xx or later.
- All networked gS series displays must contain software version 7.xx or later.

Note: The a Series cannot be networked using NMEA 0183.

Master / repeater operation

- Any network featuring more than 1 multifunction display must have 1 of the displays designated as the data master.
- The data master display will receive data through NMEA 0183 and / or SeaTalk^{ng}, and bridge the data over SeaTalk^{hs} to other networked displays.

Homescreen sharing

- When networked multifunction displays can share a homescreen.

Cartography sharing

- The cartography contained on chart cards is always used in preference to embedded cartography when a chart card is inserted into a card slot.
- Chart card cartography can be shared between multifunction displays.

Radar operation

- Multifunction Displays support the use of 1 radar scanner at a time.
- The data supplied by a connected radar scanner is repeated to any networked displays.

Sonar / DownVision™ operation

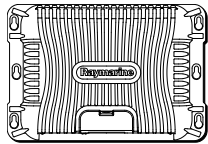
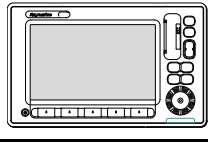
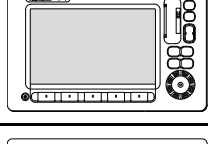
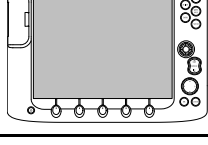
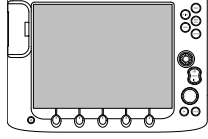
- You can connect an external sonar module unit to the multifunction display via the SeaTalk^{hs} network.
- Sonar and DownVision™ variant multifunction displays include an internal sonar module which enables direct connection to a compatible transducer.
- You can have multiple active sonar modules (internal and external) on a network. You must select the sonar module / channel you want to use from the Fishfinder application menu.
- The data supplied by the sonar module is repeated to all networked displays.

Note: All multifunction displays must have LightHouse II Release 10.xx software or later to enable multiple sonar support.

Incompatible displays

If you connect a multifunction display to your system that is not compatible a warning message will be displayed until you disconnected the incompatible device from your network.

3rd generation multifunction displays are not compatible with the following Raymarine displays:

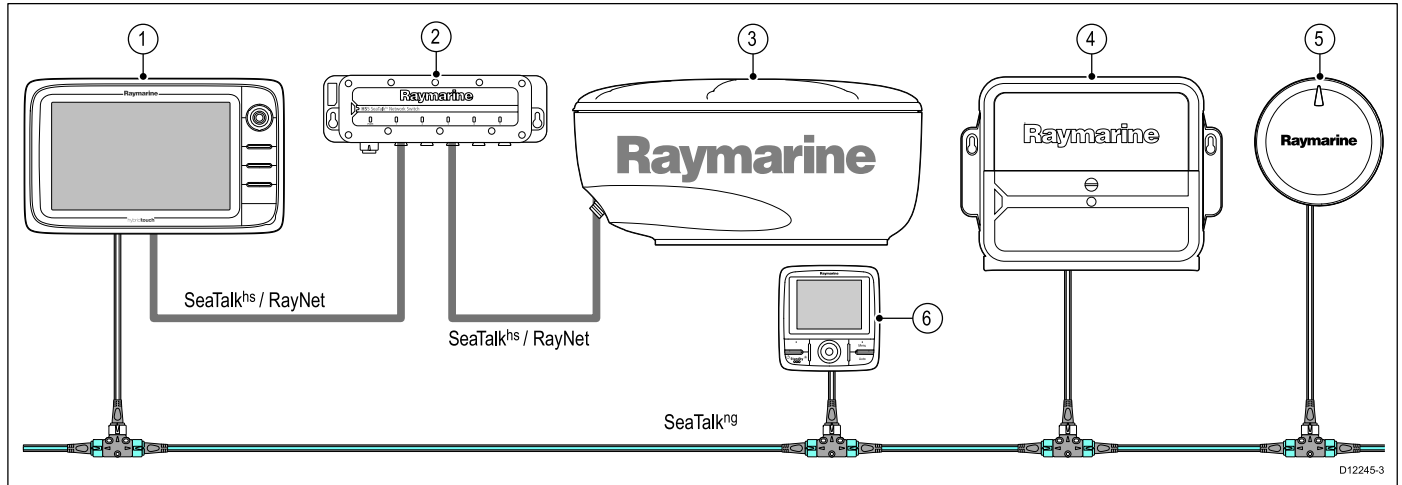
Product Image	Multifunction display	Generation
	G-Series	2 nd generation
	E-Series Widescreen	2 nd generation
	C-Series Widescreen	2 nd generation
	E-Series Classic	1 st generation
	C-Series Classic	1 st generation

3.7 Typical systems

The illustrations below show examples of possible system configurations, for more details on compatible Raymarine devices please refer to the *System integration* section.

Note: In the examples below the multifunction display(s) could be any variant of Raymarine's 3rd generation multifunction displays e.g. a Series, c Series, e Series or gS Series.

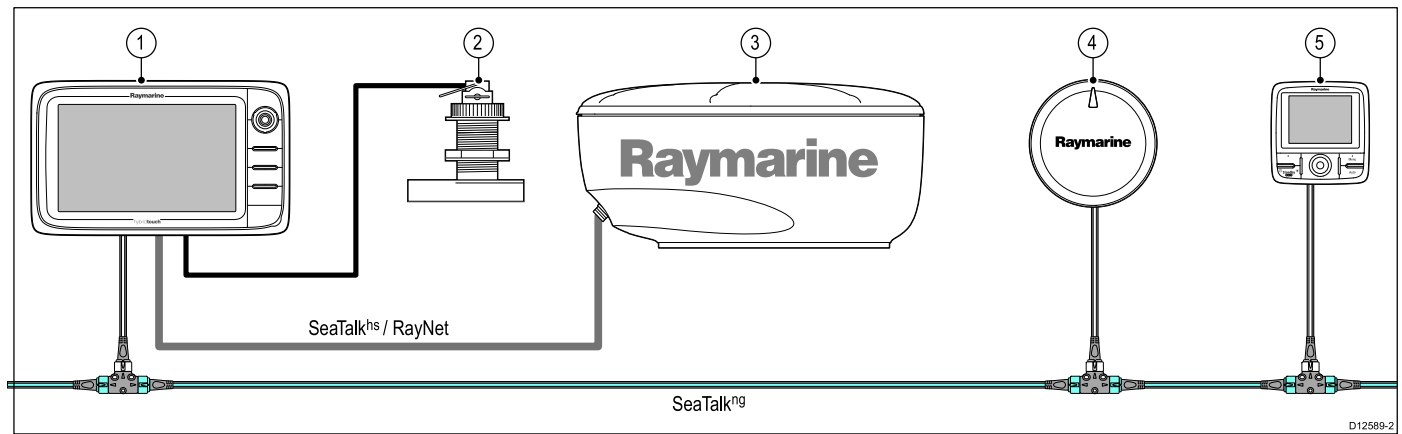
Example: Basic system



1. Multifunction display
2. Network switch
3. Radar scanner
4. Actuator Control Unit (ACU)
5. Evolution autopilot
6. SeaTalk^{ng} pilot controller (optional)

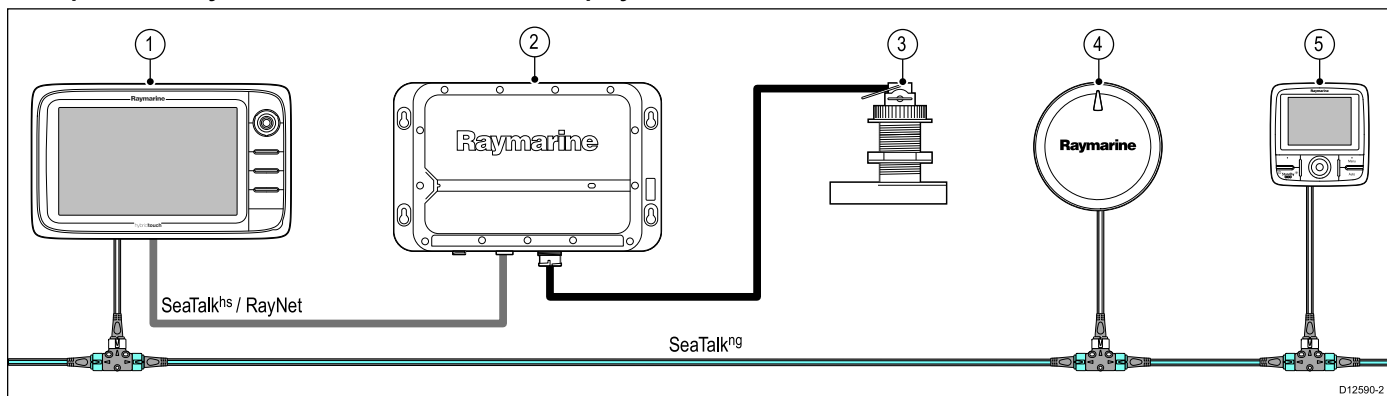
Note: A network switch is only required if multiple devices are connected using SeaTalk^{hs} / RayNet.

Example: Basic system with sonar variant display



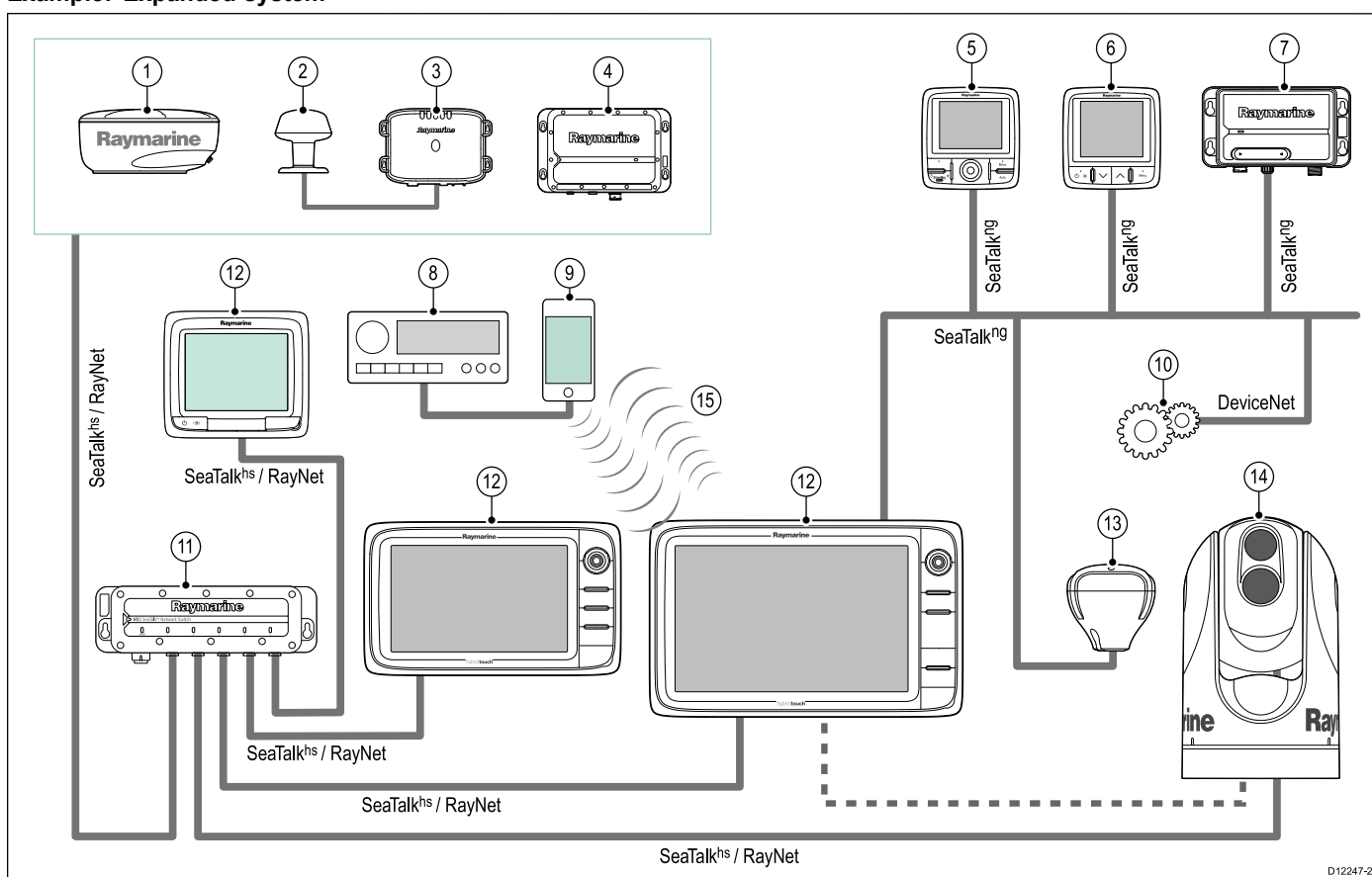
1. Multifunction display
2. Sonar transducer
3. Radar scanner
4. Evolution autopilot
5. SeaTalk^{ng} pilot controller (optional)

Example: Basic system with non-sonar variant display



1. Multifunction display
2. Sonar module
3. Sonar transducer
4. Evolution autopilot
5. SeaTalk^{ng} pilot controller

Example: Expanded system



1. Radar scanner
2. Weather sensor
3. Sirius weather receiver
4. Sonar module
5. SeaTalk^{ng} Pilot controller
6. SeaTalk^{ng} Instrument display
7. AIS receiver / transceiver
8. Audio system
9. Smartphone / tablet
10. DeviceNet spur (for NMEA 2000 devices)
11. Network switch
12. Multifunction displays
13. GPS receiver
14. Thermal camera
15. Wireless connection

3.8 System protocols

Your Multifunction Display can connect to various instruments and displays to share information and so improve the functionality of the 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^{hs}
- SeaTalk^{ng}
- NMEA 2000
- SeaTalk
- NMEA 0183

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

SeaTalk^{hs}

SeaTalk^{hs} is an ethernet based marine network. This high speed protocol allows compatible equipment to communicate rapidly and share large amounts of data.

Information shared using the SeaTalk^{hs} network includes:

- Shared cartography (between compatible displays).
- Digital radar data.
- Sonar data.

Seatalk^{ng}

SeaTalk^{ng} (Next Generation) is an enhanced protocol for connection of compatible marine instruments and equipment. It replaces the older SeaTalk and SeaTalk² 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 / SeaTalk² 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.

SeaTalk

SeaTalk is a protocol which enables compatible instruments to connect to each other and share data.

The SeaTalk cable system is used to connect compatible instruments and equipment. The cable carries power and data and enables connection without the need for a central processor.

Additional instruments and functions can be added to a SeaTalk system, simply by plugging them into the network. SeaTalk equipment can also communicate with other non-SeaTalk equipment via the NMEA 0183 standard, provided a suitable interface is used.

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.

NMEA Baud rates

The NMEA 0183 standard operates at a number of different speeds, depending upon the particular requirement or equipment capabilities. Typical examples are:

- 4800 baud rate. Used for general purpose communications, including FastHeading data.
- 38400 baud rate. Used for AIS and other high speed applications.

3.9 Data master

Any system containing more than one networked multifunction display must have a designated data master.

The data master is the display which serves as a primary source of data for all displays, it also handles all external sources of information. For example the displays may require heading information from the autopilot and GPS systems, usually received through a SeaTalk^{ng} or NMEA connection. The data master is the display to which the SeaTalk, NMEA and any other data connections are made, it then bridges the data to the SeaTalk^{hs} network and any compatible repeat displays. Information shared by the data master includes:

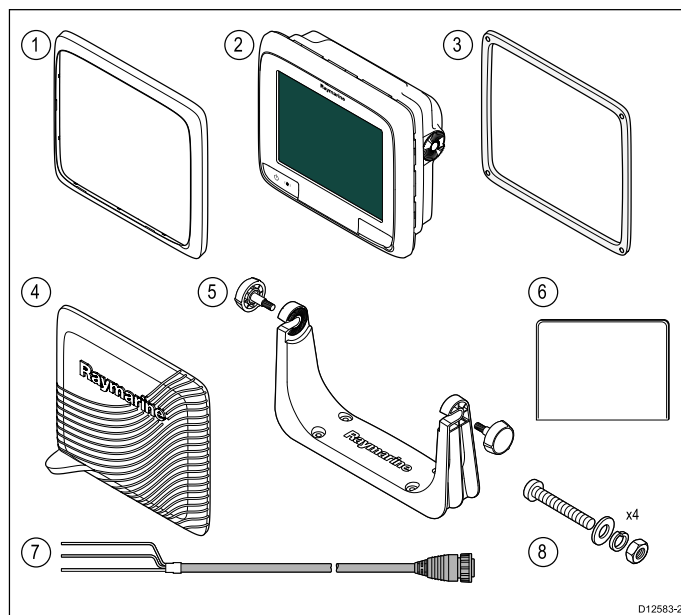
- Cartography
- Routes and waypoints
- Radar
- Sonar
- Data received from the autopilot, instruments, the engine and other external sources.

Your system may be wired for redundancy with data connections made to repeat displays. However these connections will only become active in the event of a fault and/or reassignment of the data master.

In an autopilot system which does not contain a dedicated pilot control head the Data master also acts as the control for the autopilot.

3.10 New a Series parts supplied

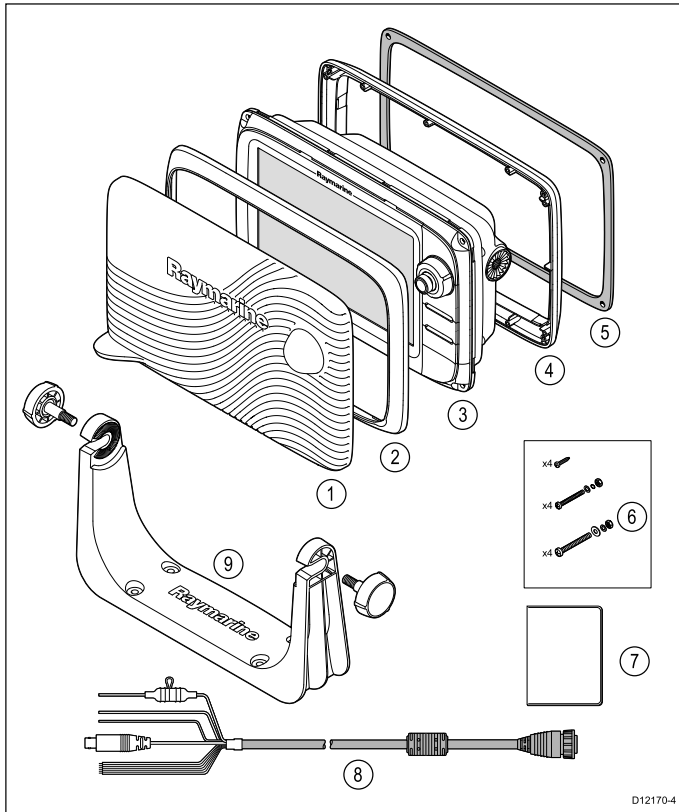
The following items are supplied with your multifunction display.



1	Front bezel
2	Multifunction display
3	Mounting gasket
4	Sun cover
5	Trunnion bracket kit
6	Documentation pack
7	Power cable
8	4x Nuts, bolts, spring washers and washers (can be used for either surface or bracket mounting.)

3.11 e7 / e7D Parts supplied

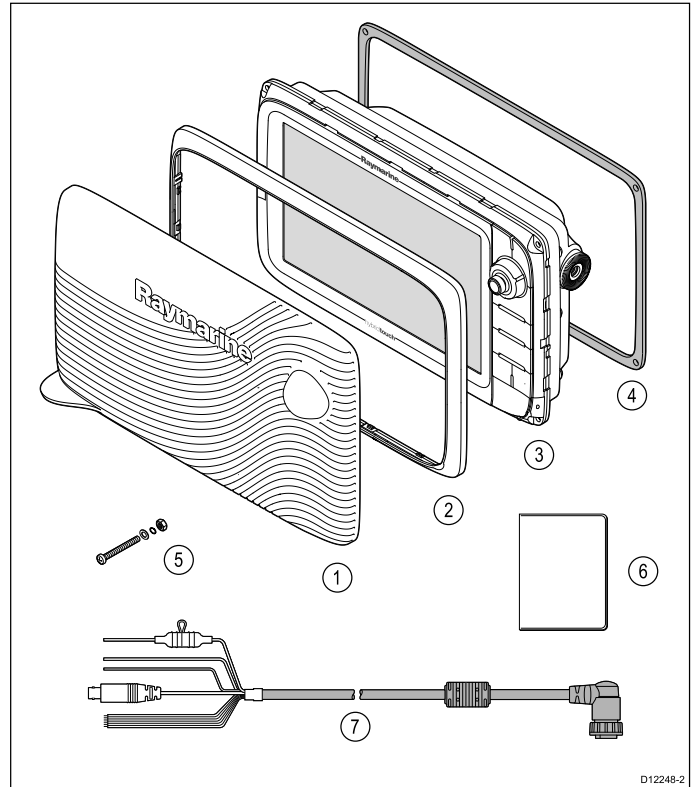
The parts shown below are supplied with the e7 / e7D multifunction display.



1. Sun cover.
2. Front bezel.
3. Multifunction display.
4. Rear bezel (required for trunnion bracket mounting).
5. Gasket (required for flush mounting).
6. Screw pack, includes:
 - 4 x rear bezel fixing screws.
 - 4 x sets of fixings (for surface mounting).
 - 4 x sets of fixings (for trunnion bracket mounting).
7. Documentation pack, includes:
 - Multilingual CD.
 - Mounting and getting started multilingual guide
 - Mounting template.
 - Warranty policy
8. Power and data cable.
9. Trunnion bracket kit.

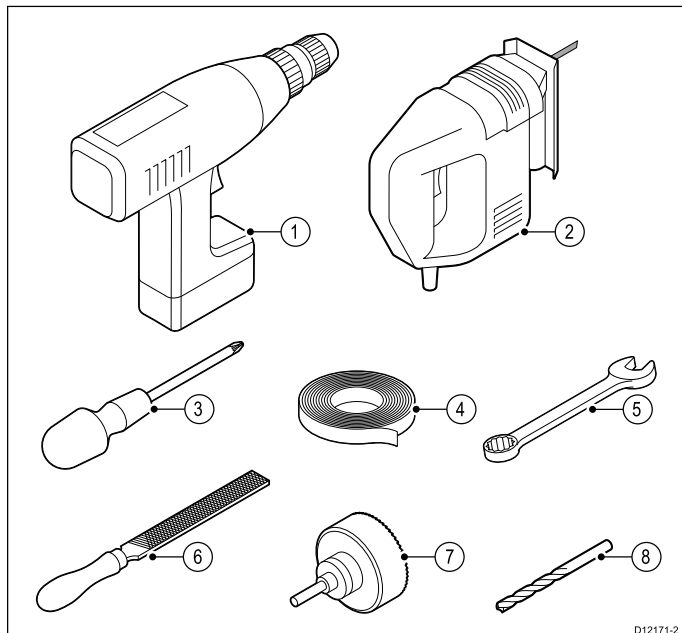
3.12 New c Series and New e Series parts supplied

The parts shown below are supplied with the New c Series and New e Series (Excluding e7 and e7D) multifunction displays.



1. Sun cover.
2. Front bezel.
3. Multifunction display.
4. Gasket (required for surface mounting).
5. 4 x sets of fixings (for surface mounting).
6. Documentation pack, includes:
 - Multilingual CD.
 - Mounting and getting started multilingual guide
 - Mounting template.
 - Warranty policy
7. Power and data cable.

3.13 Tools required for installation



1. Power drill.
2. Jigsaw.
3. Pozidrive screwdriver.
4. Adhesive tape.
5. Spanner for surface mounting or bracket mounting fixings.
6. File.
7. Hole saw for flush mounting (For hole saw size refer to your product's mounting template).
8. Drill bit for surface mounting or bracket mounting.

3.14 Selecting a location



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).

General location requirements

When selecting a location for your product it is important to consider a number of factors.

Key factors which can affect product performance are:

• Ventilation

To ensure adequate airflow:

- Ensure that product is mounted in a compartment of suitable size.
- Ensure that ventilation holes are not obstructed. Allow adequate separation of all equipment.

Any specific requirements for each system component are provided later in this chapter.

• Mounting surface

Ensure product is adequately supported on a secure surface. Do not mount units or cut holes in places which may damage the structure of the vessel.

• Cabling

Ensure the product is mounted in a location which allows proper routing, support and connection of cables:

- Minimum bend radius of 100 mm (3.94 in) unless otherwise stated.
- Use cable clips to prevent stress on connectors.
- If your installation requires multiple ferrites to be added to a cable then additional cable clips should be used to ensure the extra weight of the cable is supported.

• Water ingress

The product is suitable for mounting both above and below decks. Although the unit is waterproof, it is good practice to locate it in a protected area away from prolonged and direct exposure to rain and salt spray.

• Electrical interference

Select a location that is far enough away from devices that may cause interference, such as motors, generators and radio transmitters / receivers.

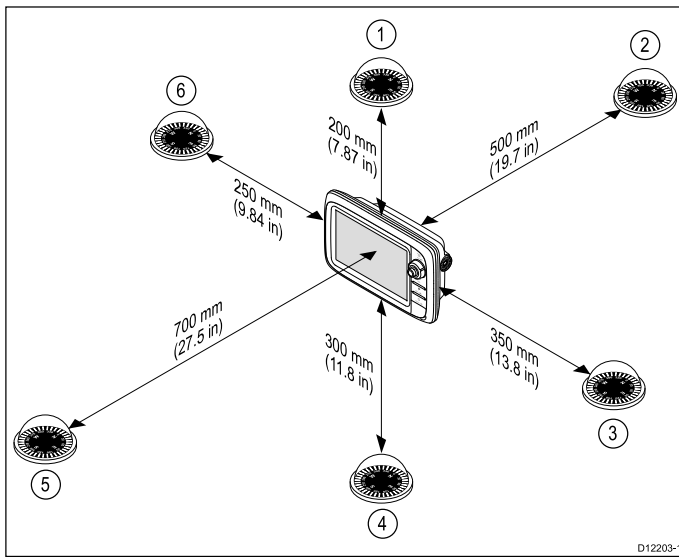
• Power supply

Select a location that is as close as possible to the vessel's DC power source. This will help to keep cable runs to a minimum.

Compass safe distance

To prevent potential interference with the vessel's magnetic compasses, ensure an adequate distance is maintained from the display.

When choosing a suitable location for the multifunction display you should aim to maintain the maximum possible distance between the display and any compasses. Typically this distance should be at least 1 m (3 ft) in all directions. However for some smaller vessels it may not be possible to locate the display this far away from a compass. In this situation, the following figures provide the minimum safe distance that should be maintained between the display and any compasses.



D12203-1

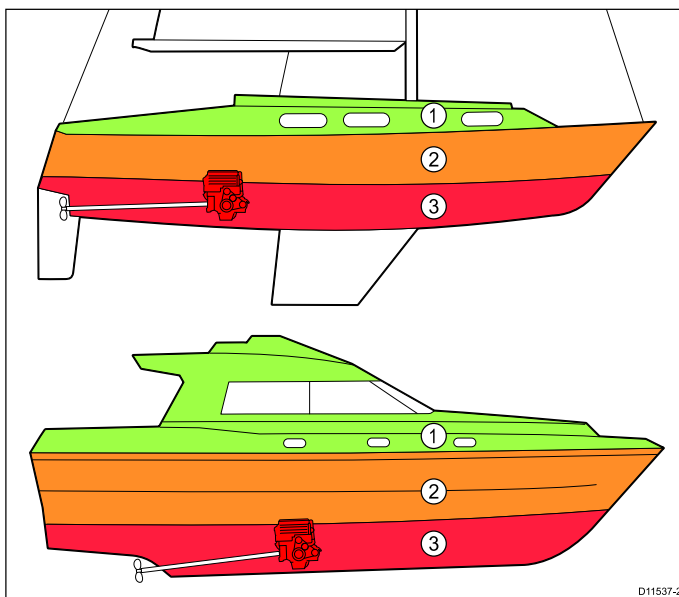
Item	Compass position in relation to display	Minimum safe distance from display
1	Top	200 mm (7.87 in.)
2	Rear	500 mm (19.7 in.)
3	Right-hand side	350 mm (13.8 in.)
4	Underside	300 mm (11.8 in.)
5	Front	700 mm (27.5 in.)
6	Left-hand side	250 mm (9.84 in.)

GPS location requirements

In addition to general guidelines concerning the location of marine electronics, there are a number of environmental factors to consider when installing equipment with an internal GPS antenna.

Mounting location

- Above Decks mounting:**
 Provides optimal GPS performance. (For equipment with appropriate waterproof rating.)
- Below Decks mounting:**
 GPS performance may be less effective and may require an external GPS antenna mounted above decks.



D11537-2

1.		This location provides optimal GPS performance (above decks).
2.		In this location, GPS performance may be less effective.
3.		This location is NOT recommended for GPS antenna.

Vessel construction

The construction of your vessel can have an impact on GPS performance. For example, the proximity of heavy structure such as a structural bulkhead, or the interior of larger vessels may result in a reduced GPS signal. Before locating equipment with an internal GPS antenna below decks, seek professional assistance and consider use of an external GPS antenna mounted above decks.

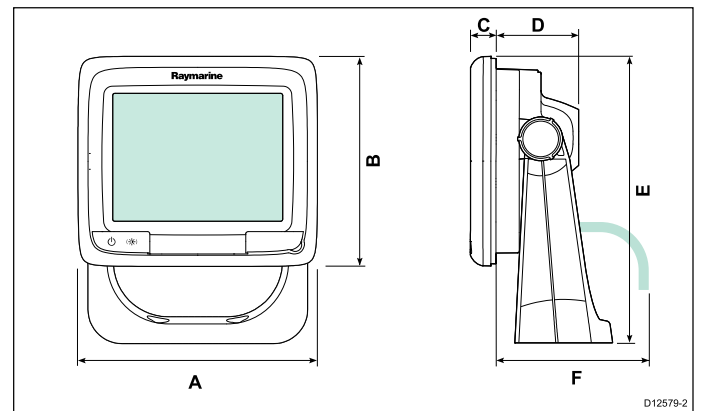
Prevailing conditions

The weather and location of the vessel can affect the GPS performance. Typically calm clear conditions provide for a more accurate GPS fix. Vessels at extreme northerly or southerly latitudes may also receive a weaker GPS signal. GPS antenna mounted below decks will be more susceptible to performance issues related to the prevailing conditions.

Viewing angle considerations

As display contrast, color and night mode performance are all affected by the viewing angle, Raymarine recommends you temporarily power up the display when planning the installation, to enable you to best judge which location gives the optimum viewing angle.

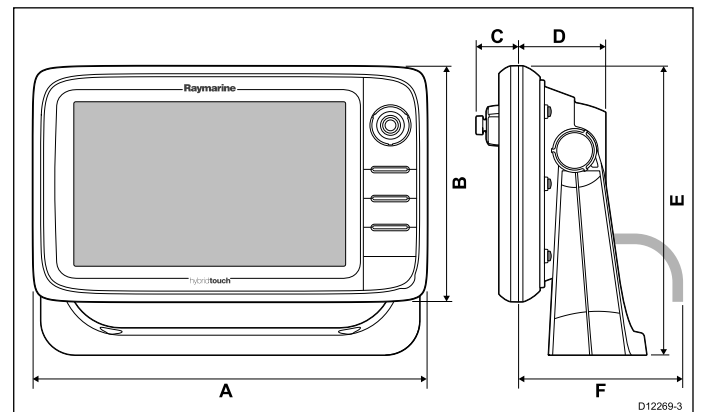
a Series product dimensions



D12579-2

Item	a6x	a7x
A	163.6 mm (6.4 in.)	205.1 mm (8 in.)
B	143.5 mm (5.6 in.)	147.1 mm (5.8 in.)
C	17.5 mm (0.7 in.)	14.5 mm (0.57 in.)
D	56.6 mm (2.2 in.)	59.1 mm (2.3 in.)
E	162.4 mm (6.4 in.)	163.3 mm (6.4 in.)
F	150 mm (5.9 in.)	150 mm (5.9 in.)

c Series and e Series product dimensions



D12269-3

	e7 / e7D	e95 / e97 / c95 / c97	e125 / e127 / c125 / c127	e165
A	233 mm (9.17 in.)	289.6 mm (11.4 in.)	353.6 mm (13.92 in.)	426 mm (16.8 in.)
B	144 mm (5.67 in.)	173.1 mm (6.81 in.)	222 mm (8.74 in.)	281.4 mm (11.1 in.)

	e7 / e7D	e95 / e97 / c95 / c97	e125 / e127 / c125 / c127	e165
C	30 mm (1.18 in.)	31.4 mm (1.24 in.)	31.9 mm (1.26 in.)	31.4 mm (1.24 in.)
D	63.5 mm (2.5 in.)	63.9 mm (2.5 in.)	68.9 mm (2.71 in.)	69.8 mm (2.75 in.)
E	177 mm (6.97 in.)	212 mm (8.35 in.)	256.5 mm (10.1 in.)	292 mm (11.5 in.)
F	160 mm (6.29 in.)	160 mm (6.29 in.)	160 mm (6.29 in.)	160 mm (6.29 in.)

Chapter 4: Cables and connections

Chapter contents

- [4.1 General cabling guidance on page 38](#)
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- [4.3 Power connection — New a Series on page 40](#)
- [4.4 Power connection — New c Series and New e Series on page 41](#)
- [4.5 Network connections on page 43](#)
- [4.6 GPS connection on page 50](#)
- [4.7 AIS connection on page 51](#)
- [4.8 Fastheading connection on page 51](#)
- [4.9 SeaTalk^{ng} connections on page 52](#)
- [4.10 NMEA 2000 connection on page 52](#)
- [4.11 SeaTalk connection on page 53](#)
- [4.12 NMEA 0183 connection on page 53](#)
- [4.13 a Series to NMEA 0183 DSC VHF radio connection on page 54](#)
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- [4.15 Camera / video in-out connection on page 55](#)
- [4.16 Media player connection on page 56](#)
- [4.17 Bluetooth remote control connection on page 58](#)
- [4.18 Remote control functions on page 59](#)
- [4.19 WiFi connections on page 61](#)

4.1 General cabling guidance

Cable types and length

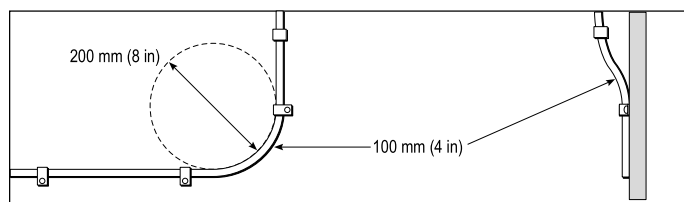
It is important to use cables of the appropriate type and length

- 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:

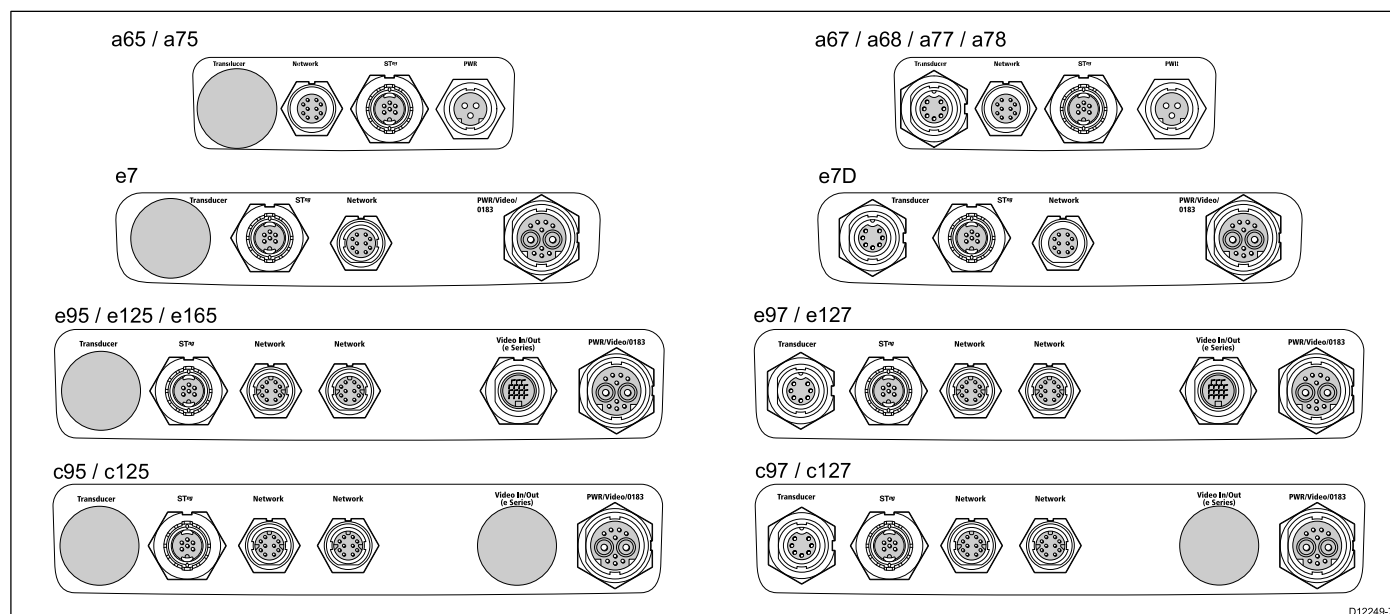
- Always use isolating transformers or a separate power-inverter to run PC's, processors, displays and other sensitive electronic instruments or devices.
- Always use an isolating transformer with Weather FAX audio cables.
- Always use an isolated power supply when using a 3rd party audio amplifier.
- 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).

4.2 Connections overview

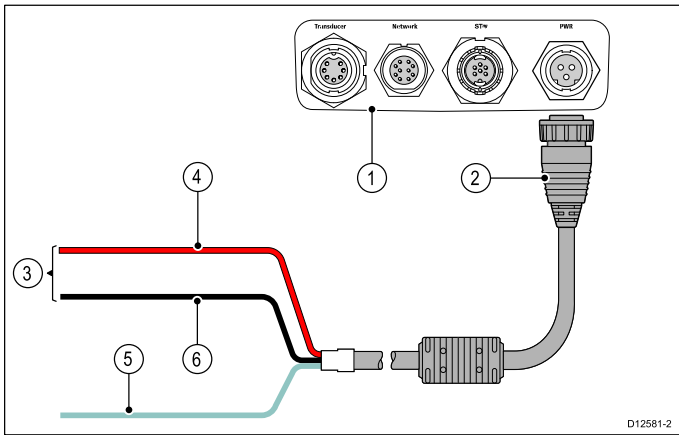
Details of the connections available on Raymarine multifunction displays are shown below.



D12249-7

	Transducer	DownVision transducer	SeaTalk ^{ng}	SeaTalk ^{hs} / RayNet Network 1	SeaTalk ^{hs} / RayNet Network 2	Video in / out	Power / Data	
							Power	Video / NMEA 0183
a65 a65 Wi-Fi	✗	✗	✓	✓	✗	✗	✓	✗
a67 a67 Wi-Fi	✓	✗	✓	✓	✗	✗	✓	✗
a68 a68 Wi-Fi	✗	✓	✓	✓	✗	✗	✓	✗
a75 a75 Wi-Fi	✗	✗	✓	✓	✗	✗	✓	✗
a77 a77 Wi-Fi	✓	✗	✓	✓	✗	✗	✓	✗
a78 a78 Wi-Fi	✗	✓	✓	✓	✗	✗	✓	✗
e7	✗	✗	✓	✓	✗	✗	✓	✓
e7D	✓	✗	✓	✓	✗	✗	✓	✓
e95	✗	✗	✓	✓	✓	✓	✓	✓
e97	✓	✗	✓	✓	✓	✓	✓	✓
e125	✗	✗	✓	✓	✓	✓	✓	✓
e127	✓	✗	✓	✓	✓	✓	✓	✓
e165	✗	✗	✓	✓	✓	✓	✓	✓
c95	✗	✗	✓	✓	✓	✗	✓	✓
c97	✓	✗	✓	✓	✓	✗	✓	✓
c125	✗	✗	✓	✓	✓	✗	✓	✓
c127	✓	✗	✓	✓	✓	✗	✓	✓

4.3 Power connection — New a Series



1. Multifunction display rear panel connections.
2. Power cable.
3. Connection to 12 V power supply
4. Red cable (positive).
5. Shield (drain) wire (thin black wire; must be connected to RF ground point).
6. Black cable (negative).

Power distribution

Raymarine recommends that all power connections are made via a distribution panel.

- All equipment must be powered from a breaker or switch, with appropriate circuit protection.
- All equipment should be wired to individual breakers if possible.



Warning: Product grounding

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

Grounding — Dedicated drain wire

The power cable supplied with this product includes a dedicated shield (drain) wire for connection to a vessel's RF ground point.

It is important that an effective RF ground is connected to the system. A single ground point should be used for all equipment. The unit can be grounded by connecting the shield (drain) wire of the power cable to the vessel's RF ground point. On vessels without an RF ground system the shield (drain) wire should be connected directly to the negative battery terminal.

The dc power system should be either:

- Negative grounded, with the negative battery terminal connected to the vessel's ground.
- Floating, with neither battery terminal connected to the vessel's ground



Warning: Positive ground systems

Do not connect this unit to a system which has positive grounding.

Power cable

The display is supplied with a power cable, this can be extended if required.

Power cables available

For flush mount installations a right angled power cable (not supplied) is available.

Cable	Part number	Notes
Right angled power cable	A80221	

Cable extension

The following restrictions apply to any extension to the power cable:

- Cable must be of a suitable gauge for the circuit load.
- Each unit should have its own dedicated power cable wired back to the distribution panel.

Total length (max)	Supply voltage	Cable gauge (AWG)
0–5 m (0–16.4 ft)	12 V	18
5–10 m (16.4–32.8 ft)	12 V	14
10–15 m (32.8–49.2 ft)	12 V	12
15–20 m (49.2–65.5 ft)	12 V	12

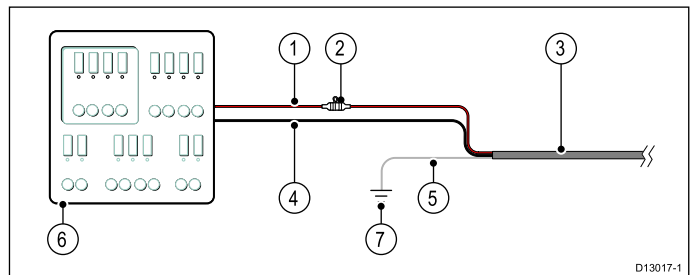
Note: These distances are for a 2 wire power cable run from the battery to the display (approximately the distance from the battery to the display). To calculate the round trip length, double the figure stated here.

Breakers, fuses and circuit protection

The information below is provided as guidance to help protect your product. The example illustrations provided are for common vessel power arrangements, if you are unsure how to provide the correct level of protection then please consult a Raymarine authorized dealer for support.

Distribution panel connection

It is recommended that your product is wired through your vessel's distribution panel via a thermal breaker or fuse.



1. Vessel power supply positive (+)
2. In-line fuse (your product may contain a fuse already built in to the power cable.)
3. Product power cable
4. Vessel power supply negative (-)
5. * Drain wire
6. Vessel distribution panel
7. * Vessel RF ground point connection

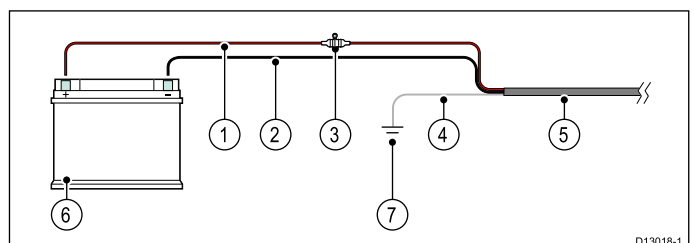
Note: * Only applicable to products that include a drain wire on the product's power cable.

Thermal breaker rating

5 A (if only connecting one device)

Battery connection with RF ground

If your vessel does not have a distribution panel then your product may be wired directly to the battery with the drain wire connected to the vessel's RF ground point.



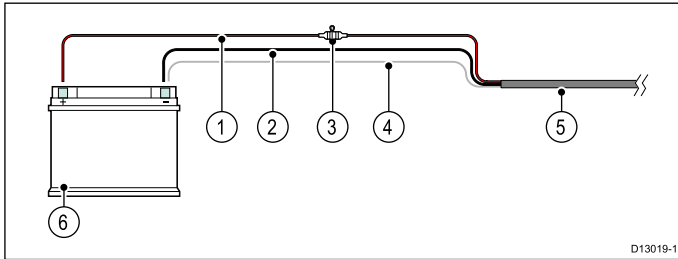
1. Vessel power supply positive (+)

2. Vessel power supply negative (-)
3. In-line fuse (If your products power cable does not have a built in fuse then an in-line fuse should be fitted.)
4. * Drain wire
5. Product power cable
6. Vessel battery
7. * Vessel RF ground point connection

Note: * Only applicable to products that include a drain wire on the product's power cable.

Battery connection with no RF ground

If your vessel does not have a distribution panel or an RF ground point then your product may be wired directly to the battery with the drain wire also connected to the battery's negative terminal.

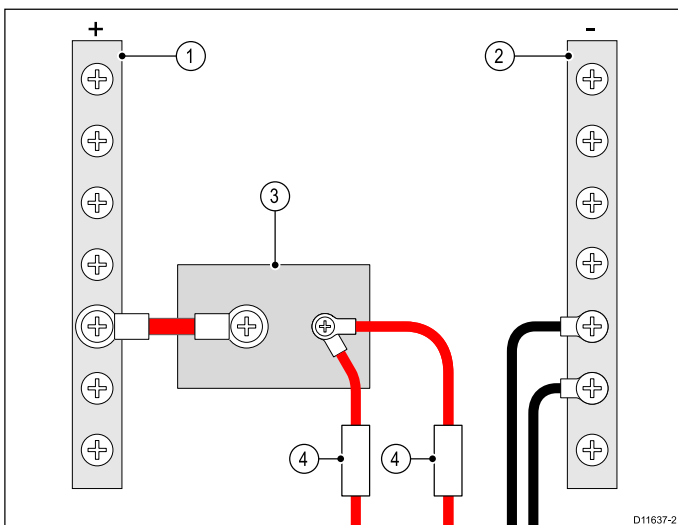


1. Vessel power supply positive (+)
2. Vessel power supply negative (-)
3. In-line fuse (If your products power cable does not have a built in fuse then an in-line fuse should be fitted.)
4. * Drain wire connected to vessel negative power supply.
5. Product power cable
6. Vessel battery

Note: * Only applicable to products that include a drain wire on the product's power cable.

Sharing a breaker

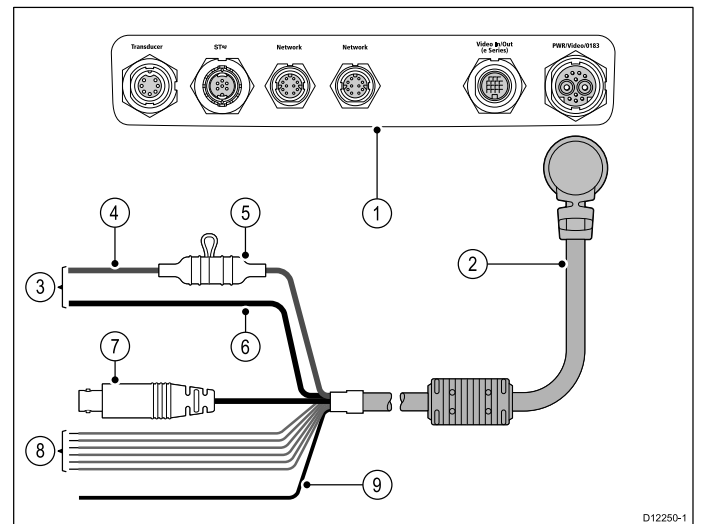
Where more than 1 piece of equipment shares a breaker you must provide protection for the individual circuits. E.g. by connecting an in-line fuse for each power circuit.



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.

4.4 Power connection — New c Series and New e Series



1. Multifunction display connections.
2. Power and data cable.
3. Connection to 12/24 V power supply (e7/e7D is 12V only).
4. Red cable (positive).
5. Fuse.
6. Black cable (negative).
7. Video input cable.
8. NMEA 0183 data cables.
9. Shield (drain) wire (thin black wire; must be connected to RF ground point).

Power distribution

Raymarine recommends that all power connections are made via a distribution panel.

- All equipment must be powered from a breaker or switch, with appropriate circuit protection.
- All equipment should be wired to individual breakers if possible.



Warning: Product grounding

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

Grounding — Dedicated drain wire

The power cable supplied with this product includes a dedicated shield (drain) wire for connection to a vessel's RF ground point.

It is important that an effective RF ground is connected to the system. A single ground point should be used for all equipment. The unit can be grounded by connecting the shield (drain) wire of the power cable to the vessel's RF ground point. On vessels without an RF ground system the shield (drain) wire should be connected directly to the negative battery terminal.

The dc power system should be either:

- Negative grounded, with the negative battery terminal connected to the vessel's ground.
- Floating, with neither battery terminal connected to the vessel's ground



Warning: Positive ground systems

Do not connect this unit to a system which has positive grounding.

Power cable

The display is supplied with a combined power and data multi cable, this can be extended if required.

Power cables available

Cable	Part number	Notes
1.5 m (4.9 ft) Straight power and data cable	R62379	
1.5 m (4.9 ft) Right angled power and data cable	R70029	

Cable extension

The following restrictions apply to any extension to the power cable:

- Cable must be of a suitable gauge for the circuit load.
- Each unit should have its own dedicated power cable wired back to the distribution panel.

Total length (max)	Supply voltage	Cable gauge (AWG)
0–5 m (0–16.4 ft)	12 V	18
	24 V	20
5–10 m (16.4–32.8 ft)	12 V	14
	24 V	18
10–15 m (32.8–49.2 ft)	12 V	12
	24 V	16
15–20 m (49.2–65.5 ft)	12 V	12
	24 V	14

Note: These distances are for a 2 wire power cable run from the battery to the display (approximately the distance from the battery to the display). To calculate the round trip length, double the figure stated here.

Breakers, fuses and circuit protection

The information below is provided as guidance to help protect your product. The example illustrations provided are for common vessel power arrangements, if you are unsure how to provide the correct level of protection then please consult a Raymarine authorized dealer for support.

Fuse and breaker rating

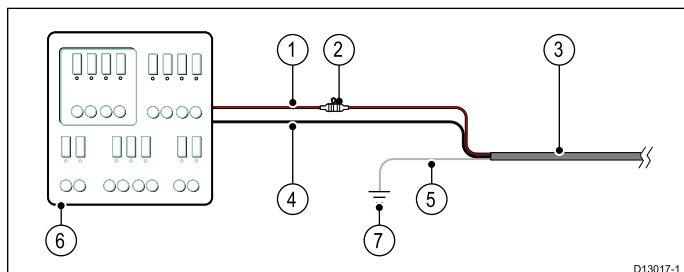
Fuse rating	Thermal breaker rating
7 A in-line fuse fitted within power cable.	5 A (if only connecting one device)

The suitable fuse rating for the thermal breaker is dependent on the number of devices you are connecting. If in doubt consult an authorized Raymarine dealer.

Note: Your product's power cable may have an in-line fuse already fitted, if not then you will need to add an in-line fuse to the positive wire of your products power connection.

Distribution panel connection

It is recommended that your product is wired through your vessel's distribution panel via a thermal breaker or fuse.

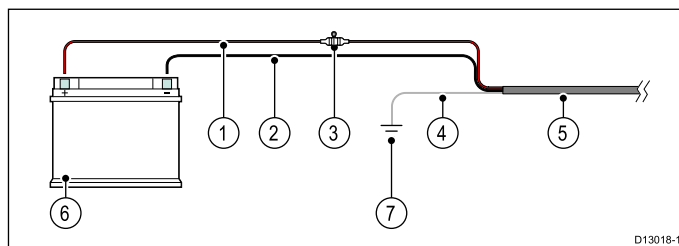


1. Vessel power supply positive (+)
2. In-line fuse. (If your products power cable does not have a built in fuse then an in-line fuse should be fitted.)
3. Product power cable
4. Vessel power supply negative (-)
5. * Drain wire
6. Vessel distribution panel
7. * Vessel RF ground point connection

Note: * Only applicable to products that include a drain wire on the product's power cable.

Battery connection with RF ground

If your vessel does not have a distribution panel then your product may be wired directly to the battery with the drain wire connected to the vessel's RF ground point.

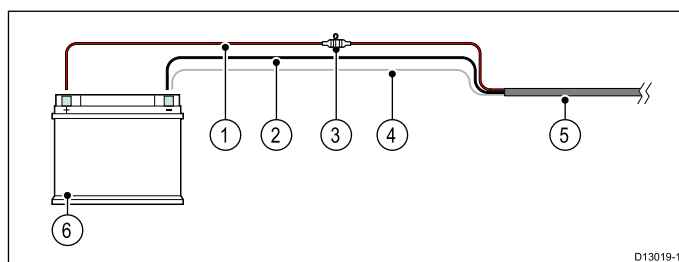


1. Vessel power supply positive (+)
2. Vessel power supply negative (-)
3. In-line fuse (If your products power cable does not have a built in fuse then an in-line fuse should be fitted.)
4. * Drain wire
5. Product power cable
6. Vessel battery
7. * Vessel RF ground point connection

Note: * Only applicable to products that include a drain wire on the product's power cable.

Battery connection with no RF ground

If your vessel does not have a distribution panel or an RF ground point then your product may be wired directly to the battery with the drain wire also connected to the battery's negative terminal.

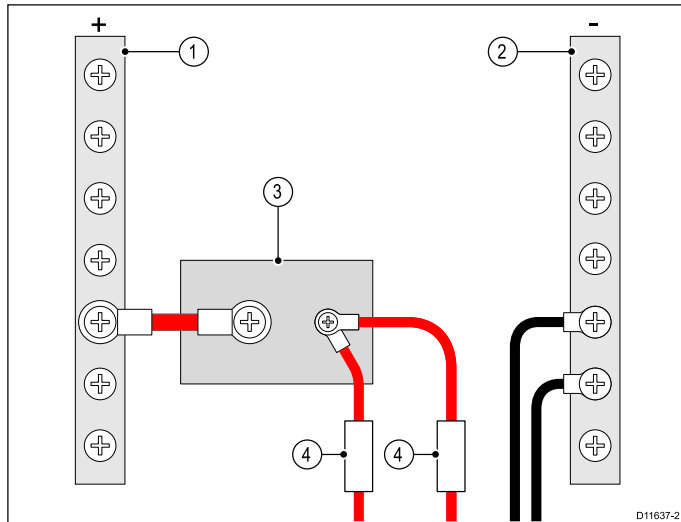


1. Vessel power supply positive (+)
2. Vessel power supply negative (-)
3. In-line fuse (If your products power cable does not have a built in fuse then an in-line fuse should be fitted.)
4. * Drain wire connected to vessel negative power supply.
5. Product power cable
6. Vessel battery

Note: * Only applicable to products that include a drain wire on the product's power cable.

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.

4.5 Network connections

You can connect compatible devices to your multifunction display using the Network connector(s) at the rear of the unit.

A typical network of digital devices may include:

- Up to 6 Raymarine multifunction displays.
- RayNet or SeaTalk^{hs} digital devices such as a sonar module and radar scanner.
- Thermal or IP cameras.

Note: Your multifunction display includes the following network connectors:

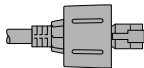
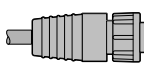
- e7, e7D and a Series = 1 x RayNet network connector.
- c Series and e Series (excluding the e7 and e7D) = 2 x RayNet network connectors.

Networks requiring additional network connections will require a Raymarine network switch.

Please refer to [Chapter 32 Spares and accessories](#) for details of available network cables and hardware.

Network cable connector types

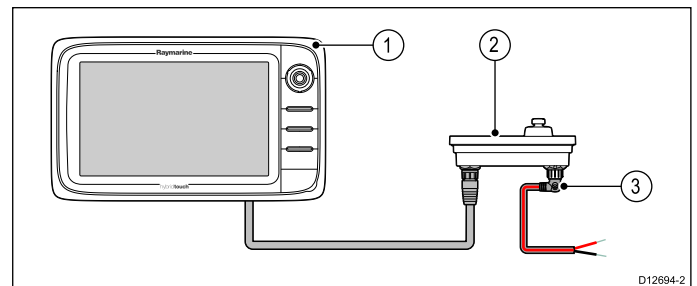
There are 2 types of network cable connector — SeaTalk^{hs} and RayNet.

	SeaTalk^{hs} connector — used for connecting SeaTalk ^{hs} devices to a Raymarine network switch via SeaTalk ^{hs} cables.
	RayNet connector — used for connecting Raymarine network switches and SeaTalk ^{hs} devices to the multifunction display via RayNet cables. Also required for connecting a crossover coupler if only one device is being connected to the display's Network connector.

Keypad connection

A remote keypad such as the RMK-9 can be connected directly to the multifunction display's network connector or via a network switch. Multiple keypads can be connected to a system. Each keypad can be used to control up to 4 multifunction displays.

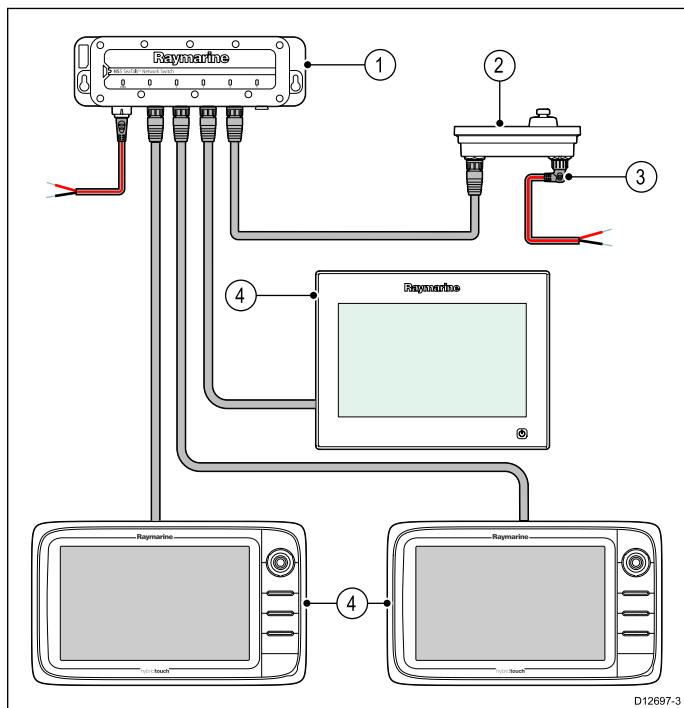
Direct connection



1. Multifunction display.
2. Keypad.
3. Right angled power cable.

When connecting the keypad directly to a New a Series, New c Series or New e Series multifunction display the keypad must be powered separately, using the alternate power connector.

Network connection



1. Network switch.
2. Keypad.
3. Right angled power cable.
4. Networked multifunction displays.

When connecting the keypad via a network switch the keypad must be powered separately, using the alternate power connector.

Once connected the keypad must be paired with the each multifunction display you want to control using the keypad.

Radar connection

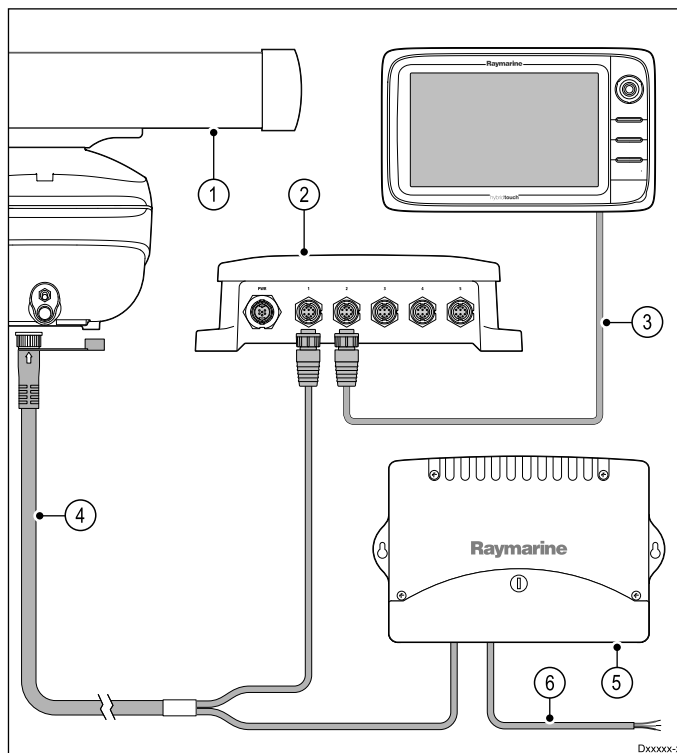
The multifunction display is compatible with Raymarine Non-HD digital radomes and HD / SuperHD radar scanners. The scanner is connected using over SeaTalk^{hs}.

Note:

- New c Series and New e Series displays (excluding the e7 and e7D) can connect 2 SeaTalk^{hs} / RayNet devices directly to the display.
- New a Series and the e7 / e7D displays can connect 1 SeaTalk^{hs} / RayNet device directly to the display.

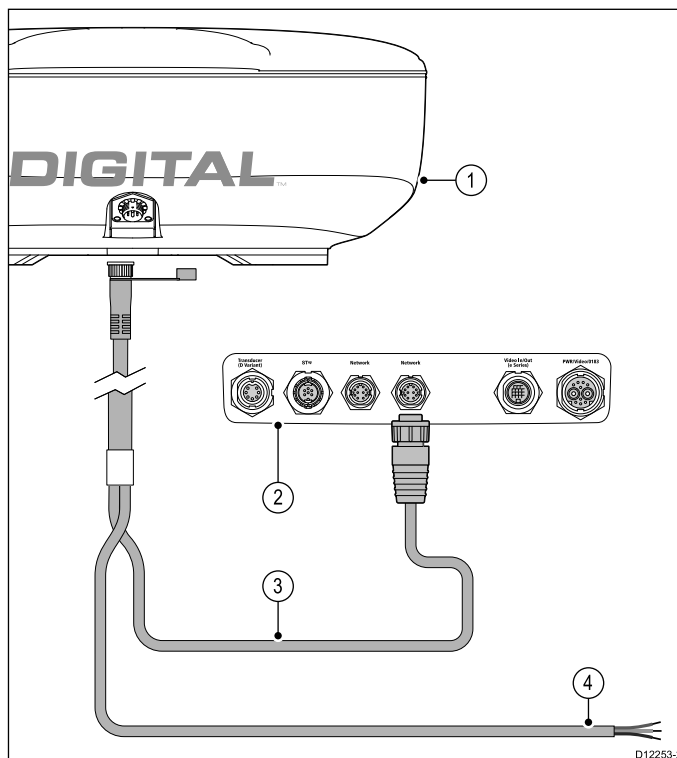
The radar is usually connected via a Raymarine network switch. On smaller systems (with only one display and no other digital devices) the radar may be connected to the display directly.

Radar connected using Raymarine network switch



1. Radar scanner.
2. Raymarine network switch.
3. RayNet cable.
4. RayNet radar cable.
5. VCM (Voltage Converter Module) — **required for Open Arrays.**
6. Power connection.

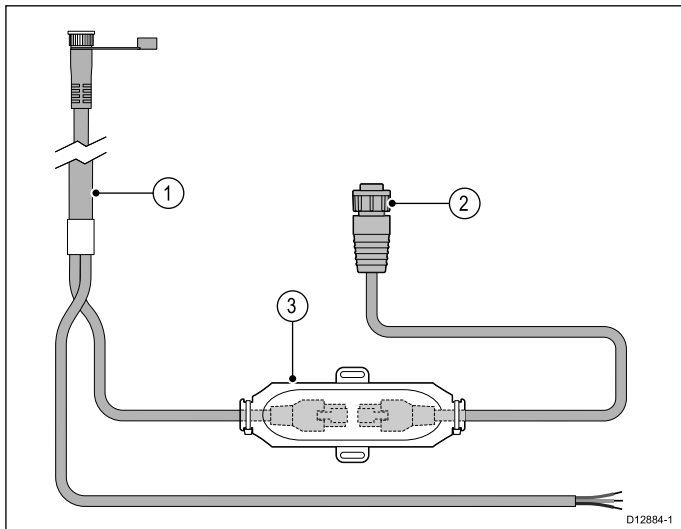
Radar connected directly to the display



1. Radar scanner
2. Multifunction display rear connector panel.
3. RayNet Radar cable.
4. Connection to power supply — **Open array scanners require a VCM (Voltage Converter Module).**

RJ45 SeaTalk^{hs} Radar cable connection

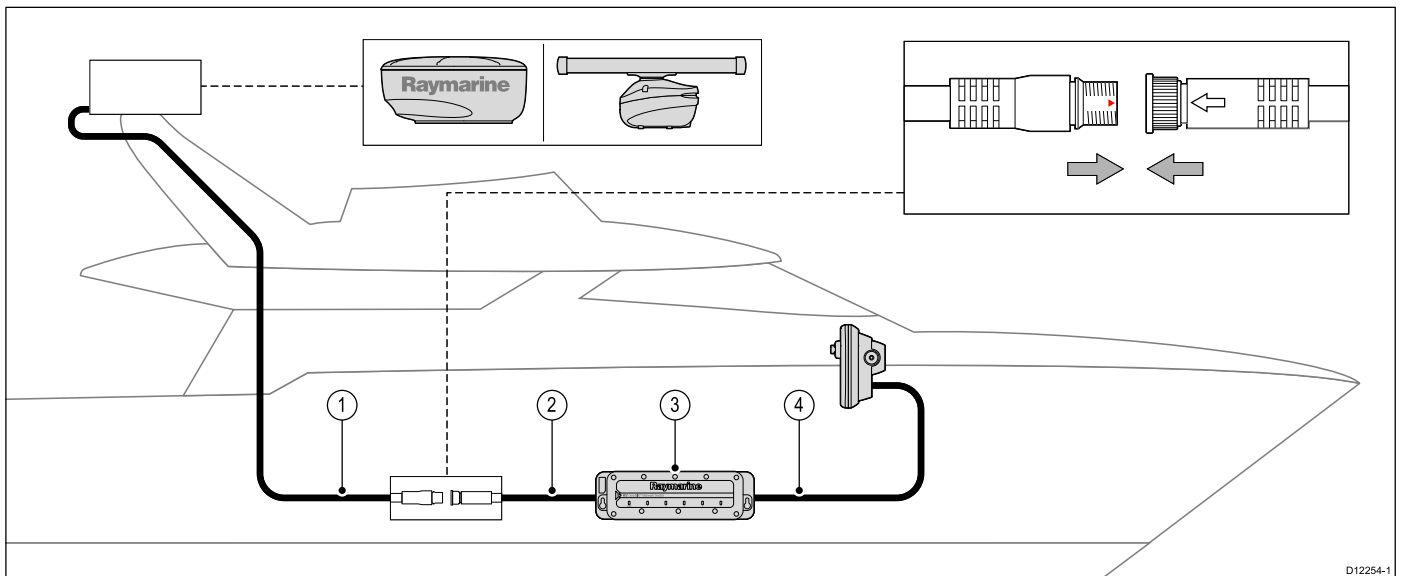
To connect a Radar using an RJ45 SeaTalk^{hs} radar cable additional accessories are required.



1. RJ45 SeaTalk^{hs} Radar cable.
2. RayNet to RJ45 SeaTalk^{hs} adaptor cable.
3. SeaTalk^{hs} crossover coupler.

Radar cable extension

For longer cable runs a radar power and data digital cable extension is required.



1. Radar extension cable.
2. Radar power and data digital cable.
3. Raymarine network switch (or crossover coupler if connecting radar directly to display).
4. RayNet cable (or RayNet to SeaTalk^{hs} cable if connecting via crossover coupler).

Note: The extension cable connects to the radar scanner.

Note: The power connection is NOT shown in the diagram. If using an Open Array scanner a VCM (Voltage Converter Module) must be connected between the scanner and the power supply.

Digital radar cables

You will need a dedicated radar power and data digital cable and appropriate network cables to connect your scanner to your system.

Connection	Required cable
Radar scanner to power supply and Raymarine network switch.	Power and data digital cable. For longer cable runs, extensions are available in a variety of lengths.
Raymarine network switch to multifunction display.	Network cables, available in a variety of cable lengths.

SeaTalk^{hs} Radar power and data digital cables

These cables contain the wires for a scanner's power and data connections.

Cable	Part number
RJ45 SeaTalk ^{hs} 5 m (16.4 ft) Power and data digital cable	A55076D
RJ45 SeaTalk ^{hs} 10 m (32.8 ft) Power and data digital cable	A55077D

Cable	Part number
RJ45 SeaTalk ^{hs} 15 m (49.2 ft) Power and data digital cable	A55078D
RJ45 SeaTalk ^{hs} 25 m (82.0 ft) Power and data digital cable	A55079D

Note: The maximum length for the radar power and data digital cable (including any extensions) is 25 m (82 ft).

RayNet Radar power and data digital cables

These cables contain the wires for a scanner's power and data connections.

Cable	Part number
RayNet 5 m (16.4 ft) Power and data digital cable	A80227
RayNet 10 m (32.8 ft) Power and data digital cable	A80228
RayNet 15 m (49.2 ft) Power and data digital cable	A80229
RayNet 25 m (82.0 ft) Power and data digital cable	A80230

Note: The maximum length for the radar power and data digital cable (including any extensions) is 25 m (82 ft).

Radar power and data digital extension cables

These cables extend the power and data digital cables for a scanner's power and data connections.

Cable	Part number
2.5 m (8.2 ft) Power and data digital cable	A92141D
5 m (16.4 ft) Power and data digital cable	A55080D
10 m (32.8 ft) Power and data digital cable	A55081D

Note: The maximum length for the radar power and data digital cable (including any extensions) is 25 m (82 ft).

Sonar connection

A sonar connection is required for fishfinder applications.

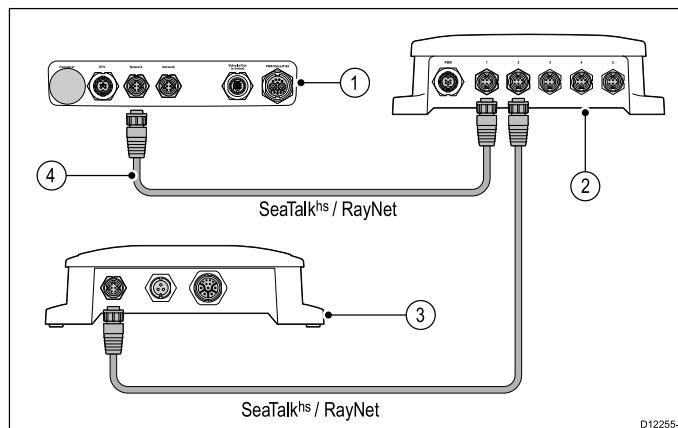
The multifunction display can be used with the following Raymarine sonar modules:

- CP450C
- CP300
- CP100

There are 2 types of connection required for fishfinder applications:

- **Sonar module connection** — converts the sonar signals provided by the sonar transducer into data suitable for a marine electronics system. The sonar variant multifunction displays feature a built-in sonar, enabling you to connect the display directly to a compatible sonar transducer. Non-sonar variants require a connection to an external Raymarine sonar module. Internal and external sonars require a connection to a compatible sonar transducer.
- **Sonar transducer connection** — provides sonar signals to the sonar module.

Sonar module connection



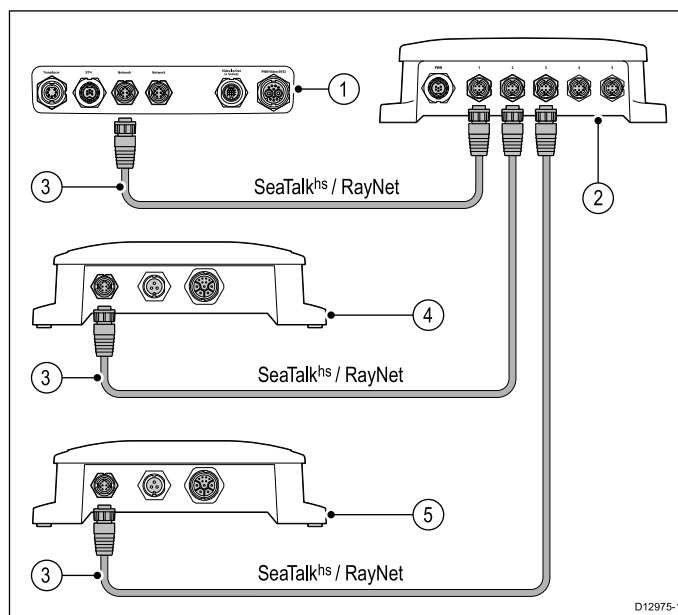
1. Rear connector panel of multifunction display (Non-sonar variant).
2. Raymarine network switch.
3. Raymarine sonar module.
4. RayNet cable.

If a spare network connection is available on your multifunction display then a sonar module may be connected directly to the display, without using a Raymarine network switch.

Note: You can also connect a sonar variant multifunction display to a Raymarine sonar module. This is useful in circumstances where you need a higher powered sonar module for example.

Multiple active sonar modules

Multiple active sonar modules can be present on the same network, you must select which sonar module / channel you want to use in the Fishfinder application.



1. Rear connector panel of multifunction display (Sonar variant).
2. Raymarine network switch.
3. RayNet network cables.
4. CP450C CHIRP sonar module
5. CP100 DownVision™ sonar module

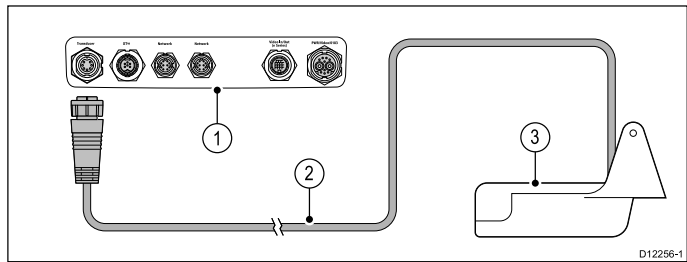
Compatible sonar transducers

The multifunction display is compatible with the following sonar transducers:

- Raymarine P48.
- Raymarine P58.
- Minn Kota transducers Sonar variant Raymarine displays only), via optional A62363 adaptor cable.

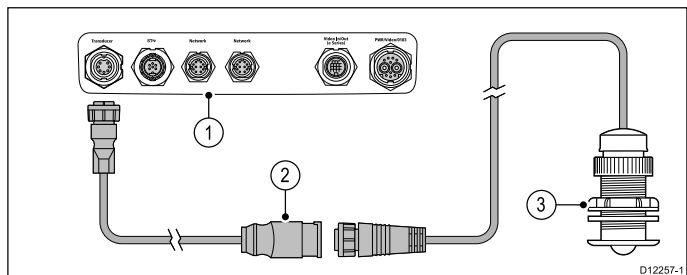
- Any 600 watt sonar-compatible transducer, via optional E66066 adaptor cable.

Sonar transducer connection — Sonar variant multifunction displays



- Rear connector panel of multifunction display (Sonar variant).
- Sonar transducer cable.
- Sonar transducer.

600 watt sonar-compatible sonar transducer connection via optional adaptor — Sonar variant multifunction displays

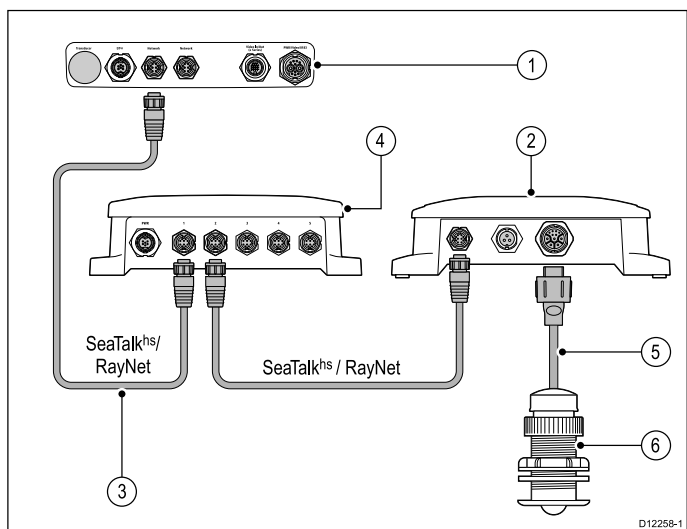


- Rear connector panel of multifunction display (Sonar variant).
- E66066 adaptor cable.
- Sonar transducer.

Transducer adaptor cable

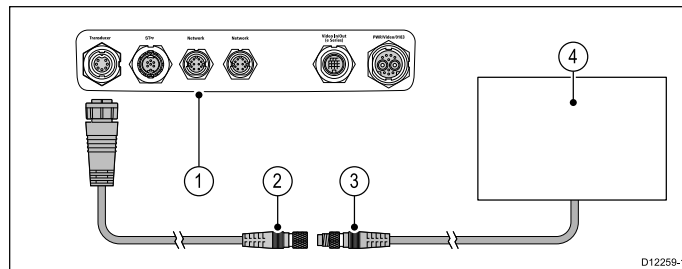
Cable	Part number
0.5 m (1.64 ft) transducer adaptor cable	E66066

Sonar transducer connection — Non-Sonar variant multifunction displays



- Rear connector panel of multifunction display (Non-sonar variant).
- Raymarine network switch (only required if connecting more than one device using SeaTalk^{hs} / RayNet).
- RayNet cable.
- Raymarine sonar module.
- Sonar transducer cable.
- Sonar transducer.

Minn Kota sonar transducer connection via optional adaptor cable (Sonar variant multifunction displays only)



- Rear connector panel of multifunction display (Sonar variant).
- Minn Kota transducer adaptor cable.
- Minn Kota transducer cable.
- Minn Kota transducer.

Sonar variant multifunction displays

The table below details which multifunction display variants feature a built-in sonar module and can be connected directly to compatible sonar transducers.

Non-sonar variants	Sonar variants	DownVision variants
a65	a67	a68
a65 Wi-Fi	a67 Wi-Fi	a68 Wi-Fi
a75	a77	a78
a75 Wi-Fi	a77 Wi-Fi	a78 Wi-Fi
e7	e7D	
c95	c97	
c125	c127	
e95	e97	
e125	e127	
e165		

Minn Kota transducer adaptor cable

Connects a Minn Kota sonar transducer to a compatible Raymarine multifunction display.

Cable	Part number
1 m (3.28 ft) Minn Kota transducer adaptor cable	A62363

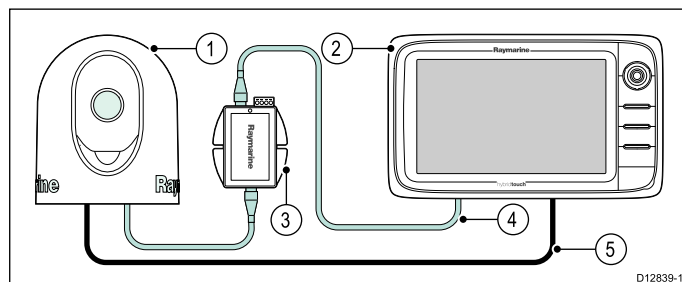
Thermal camera connection

You can connect a thermal camera to your New c Series or New e Series multifunction displays.

Note: New a Series does not support thermal cameras.

The camera is usually connected via a Raymarine network switch. If you want to use the optional Joystick Control Unit (JCU) with the camera this must also be connected to the network switch. A composite video connection is required between the camera and the multifunction display.

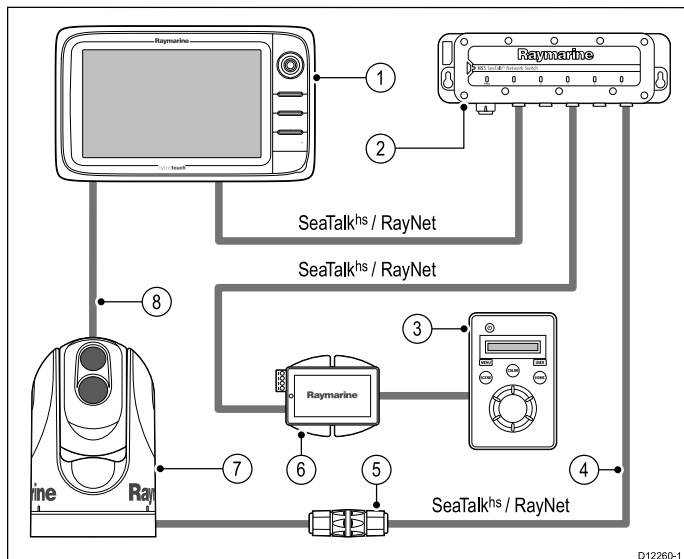
T200 Series thermal camera connection



- T200 Series fixed mount thermal camera.
- Multifunction display.

3. Power over Ethernet (PoE) Injector.
4. RayNet to RJ45 SeaTalk^{hs} adaptor cable.
5. Video cable.

T300 / T400 Series thermal camera connection.



1. Multifunction display
2. Raymarine network switch
3. Joystick Control Unit (JCU), optional
4. SeaTalk^{hs} to RayNet cable
5. Ethernet cable coupler.
6. PoE (Power over Ethernet) injector (only required if using the optional JCU).
7. Thermal camera
8. Video connection

Important notes

- You can control the thermal camera using your multifunctional display. The Joystick Control Unit (JCU) is optional, but can be used in conjunction with the multifunctional display to control the thermal camera if required.
- “Dual payload” thermal cameras include 2 independent lenses; 1 for thermal (infrared) and 1 for visible light. If you only have 1 display you should only connect the video cable labelled “VIS / IR” (visible light / infrared) to the display. If you have 2 or more displays you should connect 1 cable to each display.
- You can only view the thermal camera image on the multifunction display to which the camera is physically connected. If you want to view the thermal camera image on more than 1 display you must obtain a suitable third-party video distribution unit.
- For further information regarding the camera’s installation (including connections and mounting), refer to the installation instructions that accompany the camera.

Thermal camera cables

Cabling requirements for thermal cameras.

Camera to network switch

A network patch cable is required to connect the camera to the network switch. The connection is made between the camera cable tail and the network switch via the coupler (supplied with the camera). Network patch cables are available in a variety of lengths.

Joystick Control Unit (JCU)

An Ethernet (with power) cable is used to connect the JCU. The JCU is supplied with a 7.62 m (25 ft) Ethernet cable for this connection. If you require a different length contact your dealer for suitable cables.

Power over Ethernet (PoE) injector to network switch

A network patch cable is required for connecting the PoE injector to the network switch. Network patch cables are available in a variety of lengths.

Video cables

Video cables are not supplied with the product. Please contact your dealer for suitable cables and adaptors.

Raymarine recommends the use of a BNC terminated RG59 75ohm (or better) coaxial cable.

IP Camera connections

You can connect IP cameras to your multifunction display.

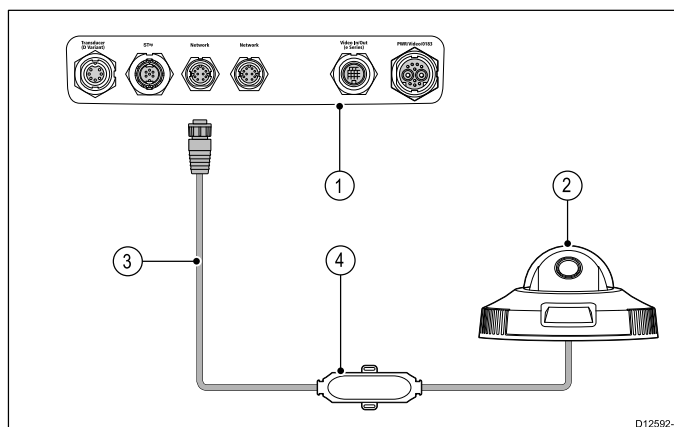
Compatible IP cameras must be able to be configured to:

- automatically assign an IP address via DHCP prior to connecting to your multifunction display or network.
- allow unauthenticated, anonymous ONVIF access.

Please refer to the instructions supplied with your IP camera for configuration details.

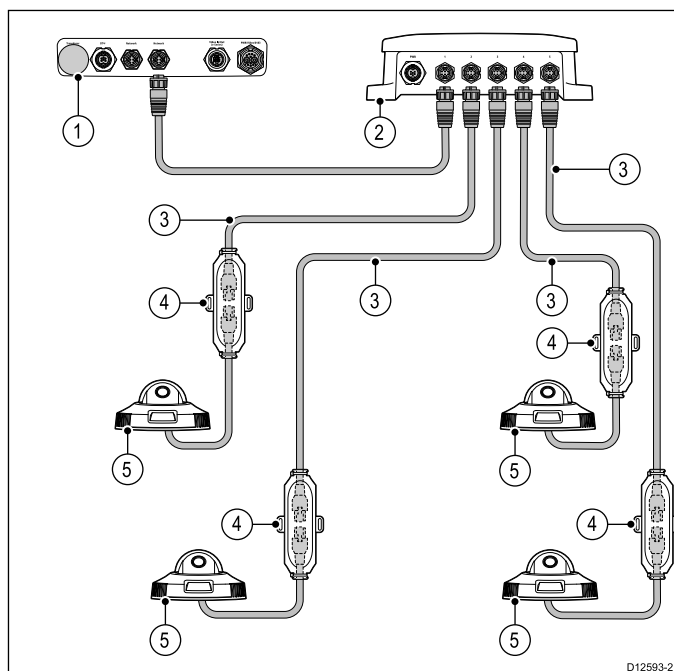
Note: The connection panel on your product may look slightly different from that shown, depending on variant. The network connection method remains the same for all products featuring RayNet connectors.

IP camera(s) can be connected directly to the SeaTalk^{hs} RayNet connector on your multifunction display.



Item	Description
1	Multifunction display rear connector panel
2	IP camera
3	RayNet to RJ45 cable
4	SeaTalk ^{hs} cross over coupler

You can also connect multiple IP cameras via the SeaTalk^{hs} network



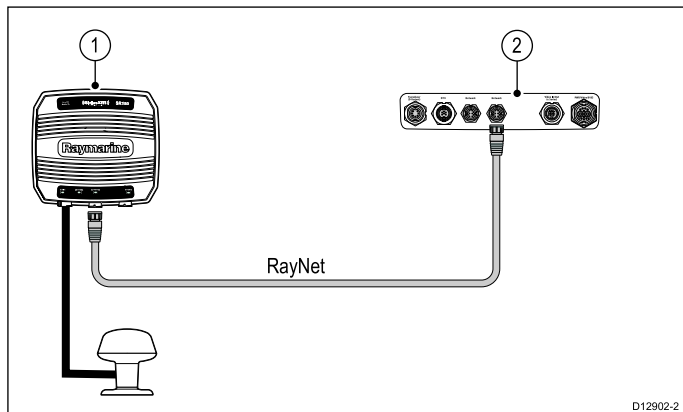
Item	Description
1	Multifunction display
2	Raymarine network switch
3	RayNet to RJ45 adaptor cable
4	SeaTalk ^{hs} cross over couplers
5	IP Cameras

Note: a, c and e Series multifunction displays do not provide power over ethernet (PoE); Connected cameras must have their own power supply.

Tip If your IP camera(s) are not detected by your multifunction display, try power cycling the IP camera(s) whilst leaving your multifunction display powered up.

Weather receiver connection

You can connect a Sirius XM weather receiver to your multifunction display.



1. Raymarine weather receiver.
2. Multifunction display.

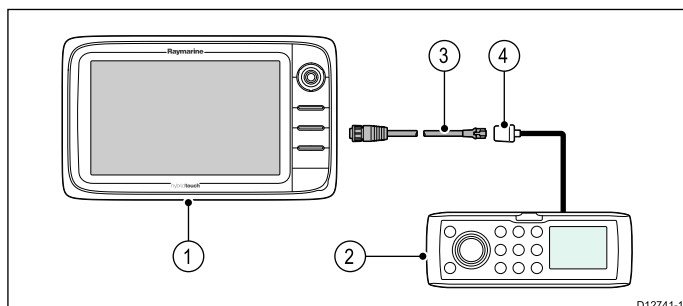
The weather receiver can also be connected to a Raymarine network switch.

For information on connecting an SR50 using SeaTalk^{ng} please refer to 82257 – SR50 operation which can be downloaded from the Raymarine website: www.raymarine.com.

Fusion link connection

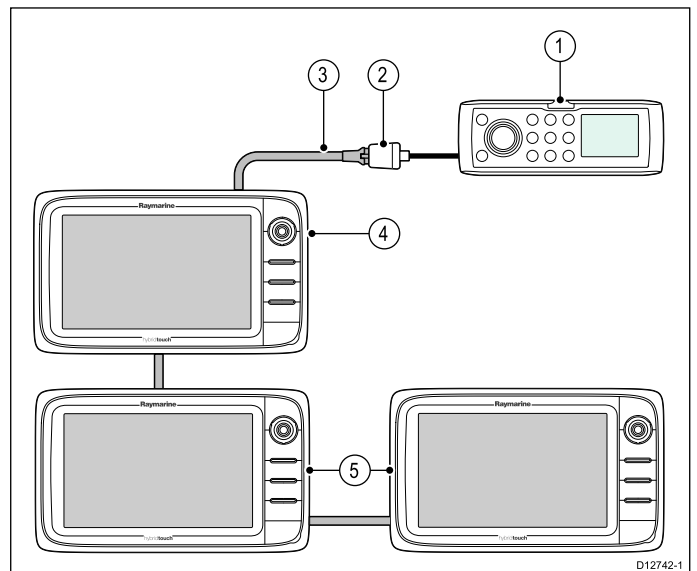
You can connect a Fusion 700 series marine entertainment system to your multifunction display.

Direct connection



1. Multifunction display.
2. Fusion system.
3. RayNet to SeaTalk^{hs} cable.
4. Fusion ethernet connector.

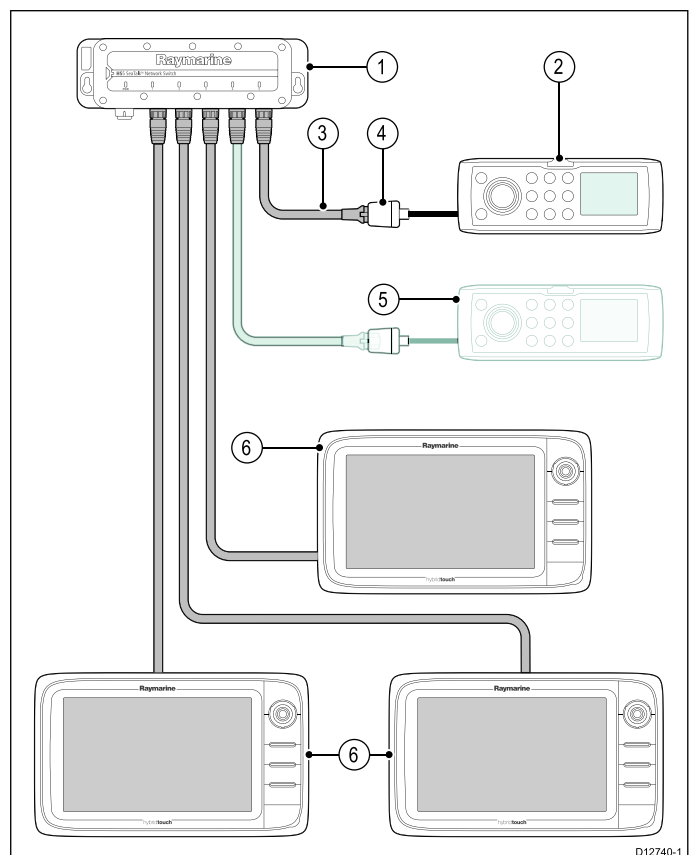
Direct connection with networked multifunction displays



1. Fusion system.
2. Fusion ethernet connector.
3. RayNet to SeaTalk^{hs} cable.
4. Directly connected multifunction display.
5. Networked multifunction displays.

Note: The Fusion entertainment system can be controlled by a directly connected multifunction display or by a networked multifunction display.

Network connection



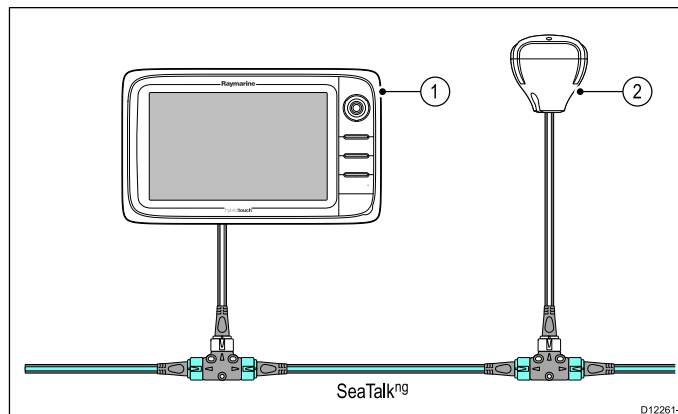
1. Network switch.
2. Fusion system.
3. RayNet to SeaTalk^{hs} cable.
4. Fusion ethernet connector.
5. Second Fusion system (the multifunction display can be connected to multiple Fusion entertainment systems).
6. Networked multifunction displays.

Note: The Fusion entertainment system can be controlled by any compatible networked multifunction display when connected using a network switch.

4.6 GPS connection

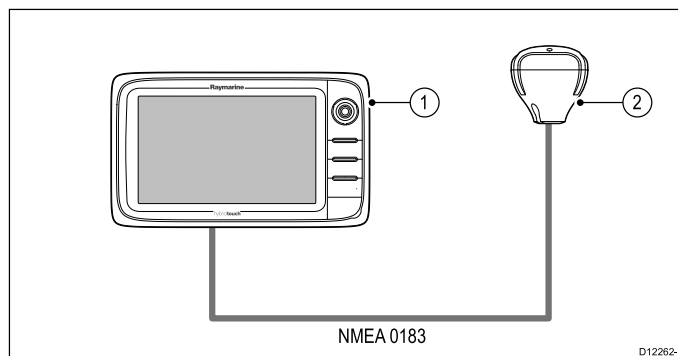
Depending on display variant, your multifunction display may include an internal GPS receiver. If required the multifunction display can also be connected to an external GPS receiver, using SeaTalk^{ng} or NMEA 0183.

GPS connection — SeaTalk^{ng}



1. Multifunction display.
2. SeaTalk^{ng} GPS receiver.

GPS connection — NMEA 0183

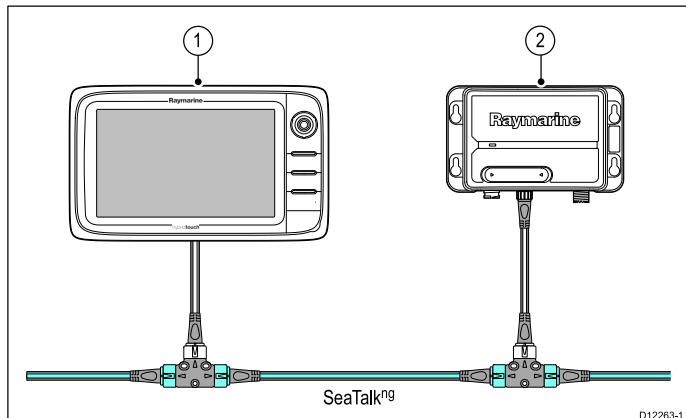


1. Multifunction display.
2. NMEA 0183 GPS receiver.

4.7 AIS connection

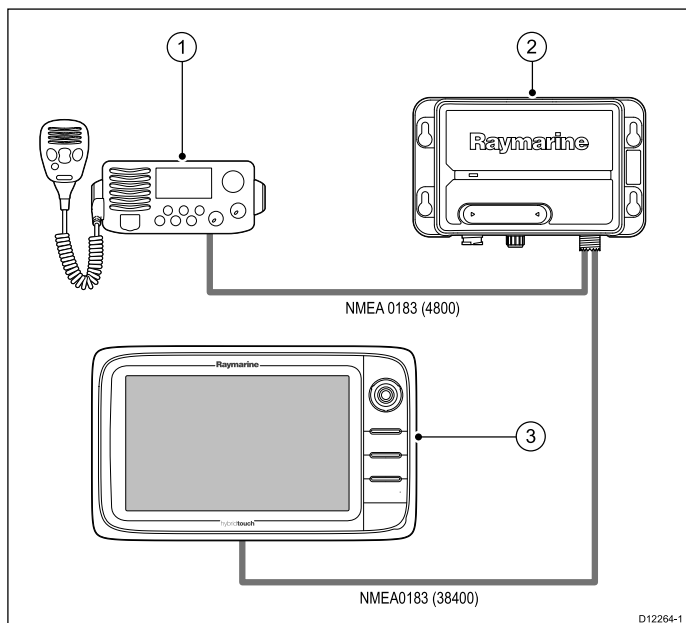
A compatible AIS can be connected using SeaTalk^{ng} or NMEA 0183.

Connection using SeaTalk^{ng}



1. Multifunction display.
2. SeaTalk^{ng} AIS receiver / transceiver.

Connection using NMEA 0183



1. VHF radio.
2. AIS unit.
3. Multifunction display.

4.8 Fastheading connection

If you wish to use MARPA (radar target acquisition) functions on your multifunction display you need either:

- An autopilot connected to the multifunction display via SeaTalk^{ng} or NMEA 0183. The compass is connected to the course computer and calibrated via the pilot control head; or:
- A Raymarine or third-party fastheading sensor connected to the multifunction display via NMEA 0183.

Note: Please contact your dealer or Raymarine technical support for more information.

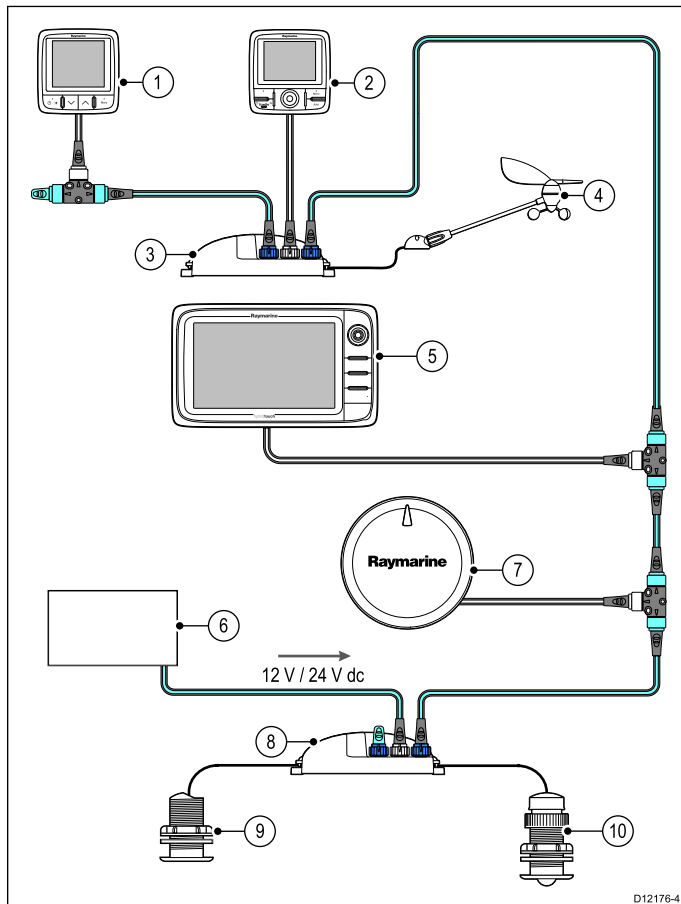
4.9 SeaTalk^{ng} connections

The display can connect to a SeaTalk^{ng} network.

The display can use SeaTalk^{ng} to communicate with:

- SeaTalk^{ng} instruments
- SeaTalk^{ng} autopilots
- SeaTalk equipment via the optional SeaTalk to SeaTalk^{ng} converter
- NMEA 2000 equipment via optional DeviceNet adaptor cables

Typical SeaTalk^{ng} system



1. SeaTalk^{ng} instrument
2. SeaTalk^{ng} pilot control head
3. iTC-5 converter
4. Wind transducer
5. SeaTalk^{ng} multifunction display
6. Power supply
7. SeaTalk^{ng} autopilot
8. iTC-5 converter
9. Depth transducer
10. Speed transducer

For details of SeaTalk^{ng} cabling please refer to [Chapter 32 Spares and accessories](#).

SeaTalk^{ng} power requirements

The SeaTalk^{ng} bus requires a 12 V power supply.

Power may be provided from:

- Raymarine equipment with a regulated 12 V power supply (for example, a SmartPilot SPX course computer); or
- Other suitable 12 V power supply.

Note: SeaTalk^{ng} does NOT supply power to multifunction displays and other equipment with a dedicated power supply input.

4.10 NMEA 2000 connection

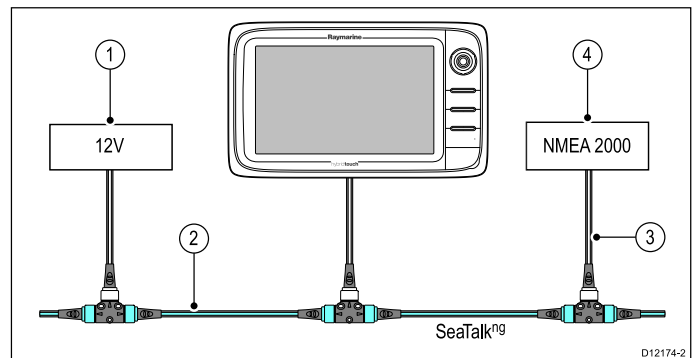
The display can receive data from NMEA 2000 devices (e.g. data from compatible engines). The NMEA 2000 connection is made using SeaTalk^{ng} and appropriate adaptor cables.

You can EITHER:

- Use your SeaTalk^{ng} backbone and connect each NMEA 2000 device on a spur, OR
- connect the display on a spur into an existing NMEA 2000 backbone.

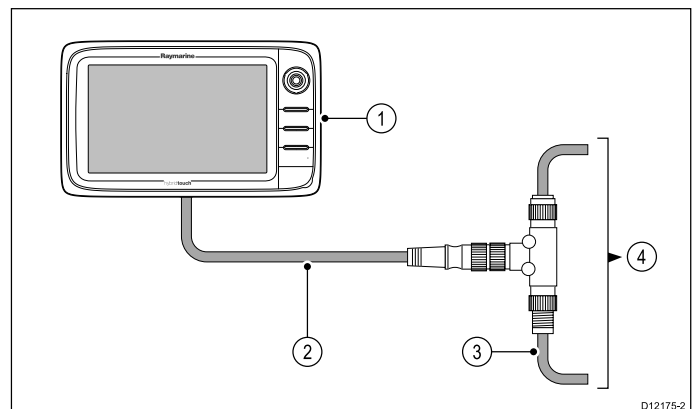
Important: You cannot have 2 backbones connected together.

Connecting NMEA 2000 equipment to the SeaTalk^{ng} backbone



1. 12 V supply into backbone.
2. SeaTalk^{ng} backbone.
3. SeaTalk^{ng} to DeviceNet adaptor cable.
4. NMEA 2000 equipment.

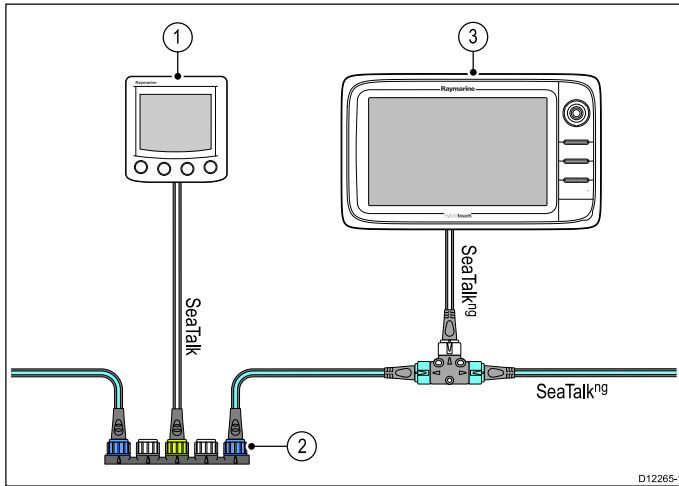
Connecting the display to an existing NMEA 2000 (DeviceNet) backbone



1. Multifunction display.
2. SeaTalk^{ng} to DeviceNet adaptor cable.
3. DeviceNet backbone.
4. NMEA 2000 equipment.

4.11 SeaTalk connection

You can connect SeaTalk devices to your multifunction display using the optional SeaTalk to SeaTalk^{ng} converter.

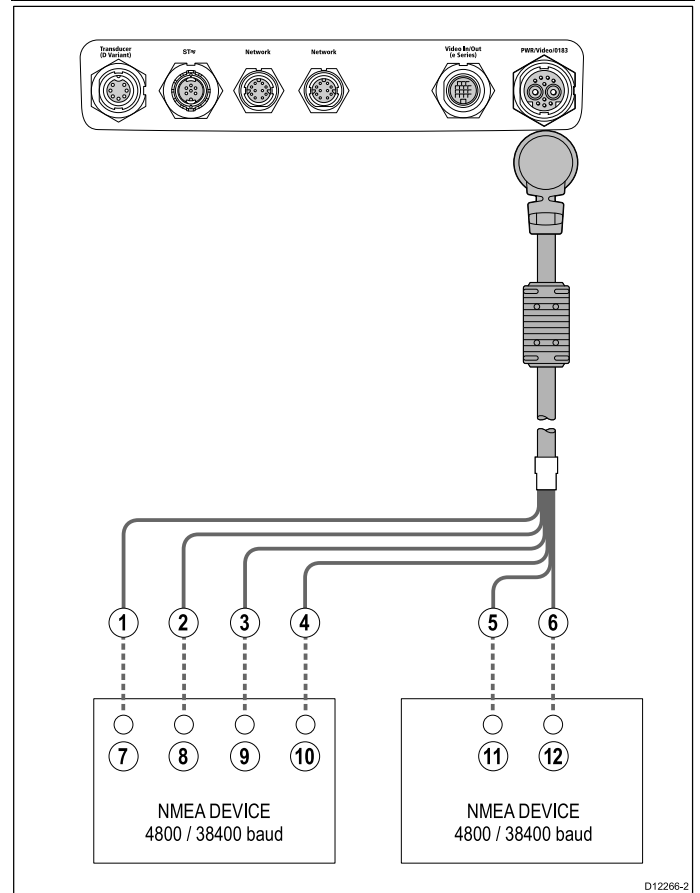


1. SeaTalk device.
2. SeaTalk to SeaTalk^{ng} converter.
3. Multifunction display.

4.12 NMEA 0183 connection

NMEA 0183 devices can be connected to New c Series and New e Series multifunction displays using the power and data cable.

Note: New a Series does not support connection of NMEA 0183 devices.



NMEA 0183 devices are connected using the supplied power and data cable.

The display has 2 NMEA 0183 ports:

- **Port 1:** Input and output, 4800 or 38400 baud rate.
- **Port 2:** Input only, 4800 or 38400 baud rate.

Note: The baud rate you want to use for each port input must be specified in the System Settings menu (**Homescreen: > Set-up > System Settings > NMEA Set-up > NMEA Input Port**).

Note: For Port 1, both the input and output communicate at the same baud rate. For example, if you have one NMEA 0183 device connected to the display's Port 1 INPUT, and another NMEA 0183 device connected to the display's Port 1 OUTPUT, both NMEA devices must be using the same baud rate.

You can connect up to 4 NMEA 0183 devices to the display's NMEA 0183 OUTPUT (Port 1). You can connect a total of 2 NMEA 0183 devices to the display's NMEA 0183 INPUT ports.

Item	Device	Cable color	Port	Input / output	Positive (+) / negative (-)
1	Multifunction display	White	1	Input	Positive
2		Green	1	Input	Negative
3		Yellow	1	Output	Positive
4		Brown	1	Output	Negative
5		Orange / white	2	Input	Positive
6		Orange / green	2	Input	Negative

Item	Device	Cable color	Port	Input / output	Positive (+) / negative (-)
7	NMEA device	*	*	Output	Positive
8		*	*	Output	Negative
9		*	*	Input	Positive
10		*	*	Input	Negative
11	NMEA device	*	*	Output	Positive
12		*	*	Output	Negative

Note: *Refer to instructions provided with NMEA device.

NMEA 0183 cable

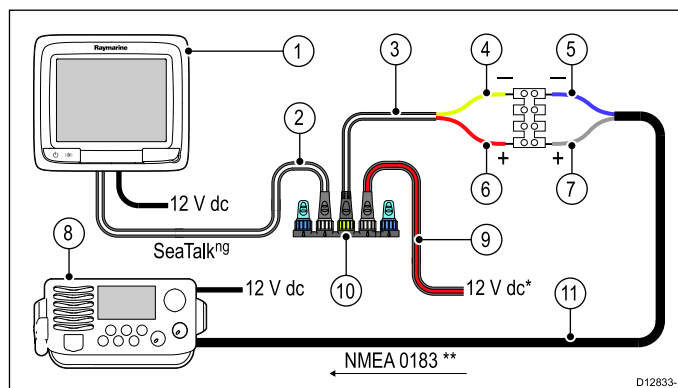
You can extend the NMEA 0183 wires within the supplied power and data cable.

Data cable extension

Total length (max)	Cable
Up to 5 m	High quality data cable: <ul style="list-style-type: none"> • 2 x twisted pair with overall shield. • 50 to 75 pF/m capacitance core to core.

4.13 a Series to NMEA 0183 DSC VHF radio connection

The a Series multifunction display requires an NMEA 0183 to SeaTalk^{ng} converter and a powered SeaTalk^{ng} backbone to enable connection to an NMEA 0183 DSC VHF radio.



1	a Series multifunction display.
2	SeaTalk ^{ng} spur cable.
3	SeaTalk ^{ng} to NMEA 0183 bare wires spur cable.
4	Converter NMEA 0183 negative connection (yellow wire).
5	NMEA 0183 device input negative connection (purple wire).
6	Converter NMEA 0183 positive connection (red wire).
7	NMEA 0183 device input positive connection (grey wire).
8	NMEA 0183 DSC VHF Radio.
9	SeaTalk ^{ng} power cable.
10	Converter.
11	NMEA 0183 connection (use cable supplied with VHF radio).

Note: * If the converter is connected to a powered SeaTalk^{ng} backbone, a dedicated power connection to the converter as shown in the illustration above is NOT required.

Note: ** The connection at the VHF radio must be to the NMEA 0183 input only. It is a uni-directional (one-way) connection only.

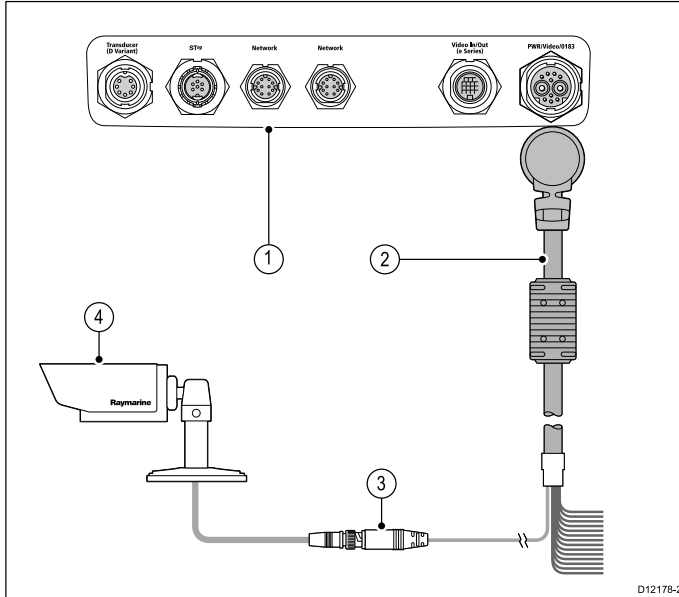
4.14 Camera / Video connection

A camera or a video device can be connected directly to New c Series and New e Series multifunction displays using the video connector on the power and data cable.

Note: Video devices cannot be directly connected to New a Series multifunction displays. For camera connections to a New a Series display please refer to the *IP camera connection* section.

Examples of video sources that you can connect to the display include:

- Video camera.
- Thermal camera.
- DVD player.
- Portable digital video player.



1. Rear connector panel of multifunction display.
2. Power and data cable.
3. BNC video connector (input 1).
4. Video source — for example, video camera.

Note: To listen to a movie's audio track, any connected DVD or digital video player will require speakers to be connected to the player's audio output.

4.15 Camera / video in-out connection

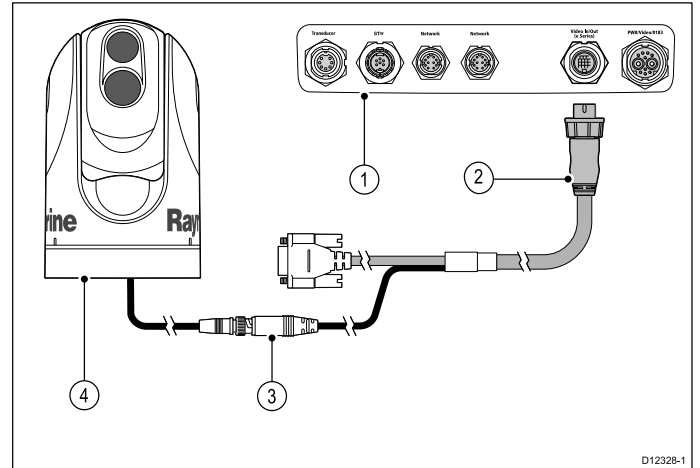
A camera / video device or external display can be connected to New e Series multifunction displays (excluding the e7 / e7D) using the dedicated video in/out connector.

Note: New a Series and New c Series multifunction displays do not have a dedicated video in/out connector.

Video In

Examples of video input sources that you can connect to the display include:

- Video camera.
- Thermal camera.
- DVD player.
- Portable digital video player.



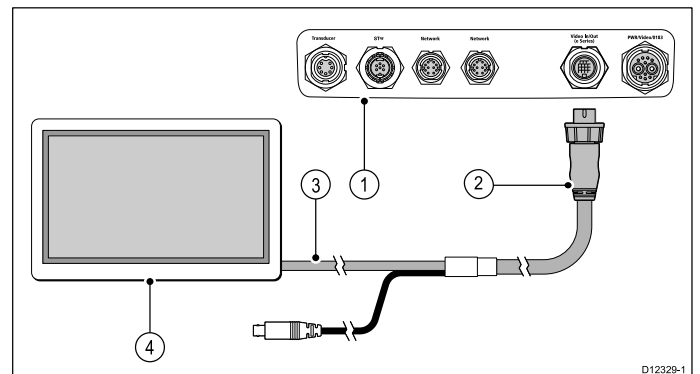
1. Rear connector panel of multifunction display.
2. Video accessory cable.
3. BNC video connector (input 2).
4. Thermal camera.

Note: To listen to a movie's audio track, any connected DVD or digital video player will require speakers to be connected to the player's audio output.

Video out

Examples of video output devices that you can connect to the display include:

- HDTV with VGA input.
- VGA monitor.



1. Rear connector panel of multifunction display.
2. Video accessory cable.
3. VGA cable to external display.
4. External display.

Video specification

Signal type	Composite
Format	PAL or NTSC

Connector type	BNC (female)
Output resolution	720p

4.16 Media player connection

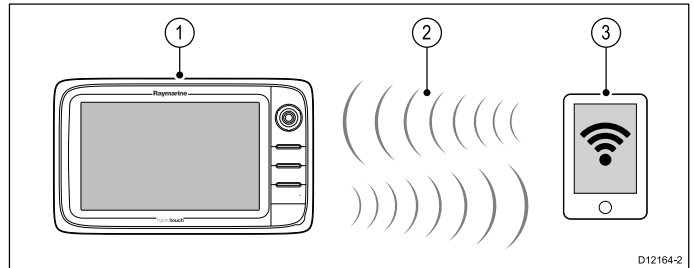
You can use your multifunction display to wirelessly control a Bluetooth-compatible media player (such as a smartphone).

The media player must be compatible with the Bluetooth 2.1+EDR power class 1.5 (supported profile: AVRCP 1.0) or higher.

Video cables

The following video cable is required for the video in / out connector on the e95 / e97 / e125 / e127 variant multifunction displays.

Part number	Description	Notes
R70003	e-series accessory video cable	



1. Multifunction display.
2. Bluetooth connection.
3. Bluetooth-compatible media player.

To use this feature you must first:

- Enable Bluetooth in the System Settings on the multifunction display.
- Enable Bluetooth on the media player device.
- Pair the media player device with the multifunction display.
- Enable Audio Control in the System Settings on the multifunction display.
- Connect an RCU-3 remote and assign the shortcut key to Start/Stop audio playback (Only required on a New c Series display).

Note: If your media player does not include built-in speakers it may be necessary to connect the media player's audio output to an external audio system or a pair of headphones. For more information refer to the instructions that accompany the media player device.

Enabling Bluetooth

With the homescreen displayed:

1. Select **Set-up**.
2. Select **System Settings**.
3. Select **Wireless Connections**.
4. Select **Bluetooth > On**.

Pairing a Bluetooth media player

With the homescreen displayed and Bluetooth turned on:

1. Select **Set-up**.
2. Select **System Settings**.
3. Select **Wireless Connections**.
4. Select **New Bluetooth Connection**.
A message is displayed prompting you to put your media player device into discovery mode.
5. Ensure Bluetooth is enabled on your external media player device and ensure it is ready to be paired. For more information, consult the instructions that accompany the device.
6. On the multifunction display, select **OK** in the message dialog.
The multifunction display will search for active Bluetooth devices.
7. Select **Stop Discovery** when your device appears in the list.
8. Select the media player device in the list.
A pairing request message is displayed on the external media device.
9. On the external media device, select Pair (or equivalent) to accept the pairing request message.
The multifunction display shows a message asking you to confirm the Pairing code.
10. If the pairing code displayed on the multifunction display matches the code displayed on the external media device,

select **Ok** on the multifunction display. If the code does NOT match, repeat steps 4 to 8.

11. If the pairing was successful the multifunction display will confirm the pairing.

The external media device is now paired with the multifunction display.

1. Select **Set-up**.
2. Select **System Settings**.
3. Select **Wireless Connections**.
4. Select **Connection Manager**.
5. Select the media player device in the list.
6. Select **Unpair / Forget this device**.

Enabling audio control

With the homescreen displayed:

1. Select **Set-up**.
2. Select **System Settings**.
3. Select **Wireless Connections**.
4. Select **Connection Manager**.
5. Select the media player device in the list.
6. Select **Audio Control > On**.



Media player controls

Touchscreen multifunction displays enable you to use the on-screen media player controls to control the audio playing on your external media player.



1. Touch this icon to display the audio controls.
2. Previous track.
3. Play track.
4. Pause track.
5. Next track.

Selecting **Back** will hide the audio controls.



Media player controls using a remote control

You can control audio wirelessly using a Raymarine RCU-3 remote control unit.

The Shortcut key on the RCU-3 must be set to Start/Stop audio playback, refer to the *Using a Remote control* section for further details.

1. Press **UP** arrow for next track.
2. Press **DOWN** arrow for previous track.
3. Press **SHORTCUT** button to play/pause audio.

Note: On New c Series multifunction displays, whilst the audio controls appear on the screen you cannot interact with them. To control audio you must use a connected RCU-3.

Unpairing a Bluetooth device

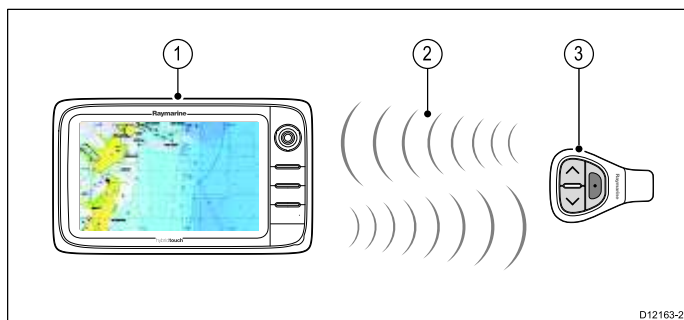
If you are experiencing problems when attempting to use a Bluetooth device with the multifunction display it may be necessary to unpair the device (and any other paired Bluetooth devices) and then retry the pairing procedure.

With the homescreen displayed:

4.17 Bluetooth remote control connection

You can control the multifunction display wirelessly using a Raymarine remote control unit.

The remote control uses a Bluetooth wireless connection.



1. Multifunction display.
2. Bluetooth connection.
3. Raymarine Bluetooth remote control (for example, RCU-3).

To use the remote control you must first:

- Enable Bluetooth in the System Settings on the multifunction display.
- Pair the remote control unit with the multifunction display.

Operating principles

Remote control operating principles.

- Only 1 multifunction display may be operated by a remote control unit at any one time. You cannot pair a multifunction display to more than 1 remote control at the same time.
- The 3 buttons on the remote control unit have different functions depending on the CONTEXT in which you are using it. For example, in the chart application the buttons control different functions than they do in the homescreen.
- All functions are accessed using a combination of the 3 buttons. For some functions you must press a button MOMENTARILY. You can also HOLD a button for continuous response (for example, continuous ranging in the chart application).
- The main methods of operation involve the use of the **UP** and **DOWN** “arrow” buttons to highlight different on-screen options. The **SHORTCUT** button is used to select (execute) them.
- During the pairing process you must define which of the arrow buttons you want to be the “UP” button.
- The **SHORTCUT** button is customizable and can be configured to operate one of a number of functions, using the System Settings menu on your multifunction display.

Pairing the remote and configuring the UP and DOWN buttons

The remote control unit must be “paired” with the multifunction display that you want to control. On your multifunction display, with the homescreen displayed:

1. Select **Set-up**.
2. Select **System Settings**.
3. Select **Wireless Connections**.
4. Select **Bluetooth > On**.
5. Select **New Bluetooth Connection**.
A pop-up message will be displayed to confirm that the device you are connecting to is discoverable.
6. Select **OK** to confirm.
A list of discovered devices is displayed.
7. On your **remote control unit**, hold down the UP and DOWN buttons together for 10 seconds.
8. Select the remote control unit in the list of devices.

9. When prompted, press the arrow button on your remote that you wish to be configured as the UP button. The other arrow button will automatically be configured as the DOWN button.

If the pairing was successful a “Pairing Success” message will be displayed. If a “Pairing Failure” or “Pairing Timeout” message is displayed, repeat steps 1 to 8.

Customizing the SHORTCUT button

On your multifunction display, with the homescreen displayed:

1. Select **Set-up**.
2. Select **System Settings**.
3. Select **External Devices**.
4. Select **Remote Control**.
5. Select **Customize shortcut key**.
6. Select the function that you want to assign to the **SHORTCUT** key.