p70 / p70r
Pilot controller

Installation instructions

ENGLISH

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Raymarine®

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Chapter 1: Important information

Safety notices

Warning: Autopilot system Installation

As correct performance of the vessel's steering is critical for safety, we STRONGLY RECOMMEND that an Authorized Raymarine Service Representative fits this product. You will only receive full warranty benefits if you can show that an Authorized Raymarine Service Representative has installed and commissioned this 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: Maintain a permanent watch

Always maintain a permanent watch, this will allow you to respond to situations as they develop. Failure to maintain a permanent watch puts yourself, your vessel and others at serious risk of harm.

Warning: Ensure safe navigation

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

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: Product grounding

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

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: Use the sun covers

To protect your product against the damaging effects of ultra violet light, always fit the sun covers when the product is not in use.

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.

TFT LCD 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 Liquid Crystal Displays (LCDs).

In common with all Thin Film Transistor (TFT) LCD units, the screen may exhibit a few (less than 7) wrongly illuminated pixels. These may appear as black pixels in a light area of the screen or as colored pixels in black areas.

Water ingress

Water ingress disclaimer

Although the waterproof rating capacity of Raymarine products exceeds that called for by the IPX6 standard, water intrusion and subsequent equipment failure may occur if any Raymarine equipment is subjected to commercial high pressure washing. Raymarine will not warrant equipment 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.

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.

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

- Raymarine equipment and cables connected to it are:
  - At least 1 m (3 ft) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 7 ft (2 m).
  - More than 2 m (7 ft) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.
- Raymarine specified cables are used.
- Cables are not cut or extended, unless doing so is detailed in the installation manual.

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

Suppression ferrites

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

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

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 Ltd. declares that this product is compliant with the essential requirements of EMC directive 2004/108/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.

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.

Chapter 2: Planning the installation

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- 2.1 Handbook information on page 12
- 2.2 Installation checklist on page 12
- 2.3 Pilot system on page 13
- 2.4 System protocols on page 17
- 2.5 Pack contents on page 18
- 2.6 Tools on page 19

2.1 Handbook information

This handbook contains important information regarding the p70 and p70r Pilot controller.

p70 / p70r Handbooks

The p70 / p70r Pilot controller has the following handbooks available:

Description	Part number
Installation and commissioning instructions	87132
Operating instructions (quick reference)	86142
User reference handbook	81331
Mounting template	87130

Additional handbooks

Description	Part number
SeaTalkng reference manual	81300
SPX system installation guide	87072
SeaTalk to SeaTalkng converter	87121

The latest version of documents are available to download as PDF's from www.raymarine.com.

Please check the website to ensure you have the latest version.

2.2 Installation checklist

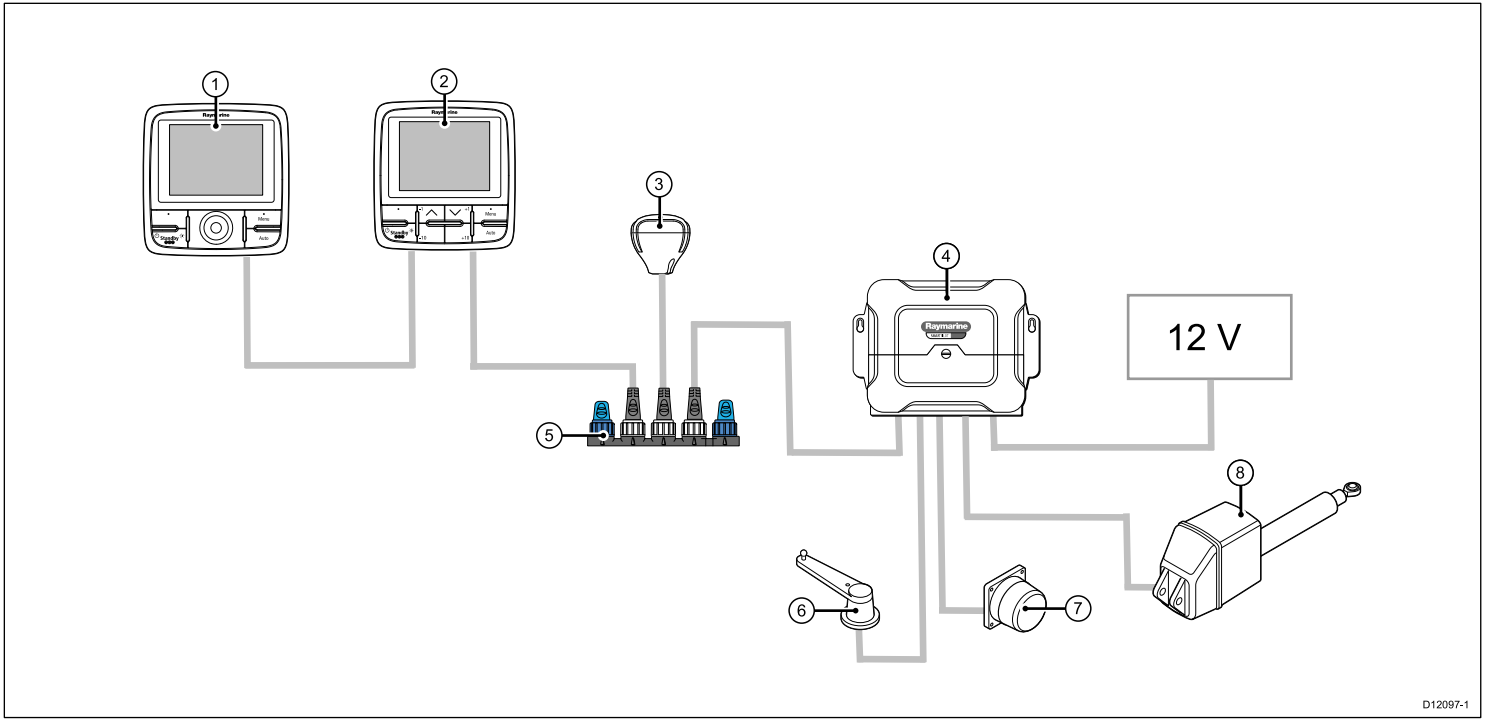
Installation includes the following activities:

	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 test the system.

2.3 Pilot system

The p70 / p70r pilot controller is connected to the vessel's data system, which could be SeaTalk^{ng} or SeaTalk.

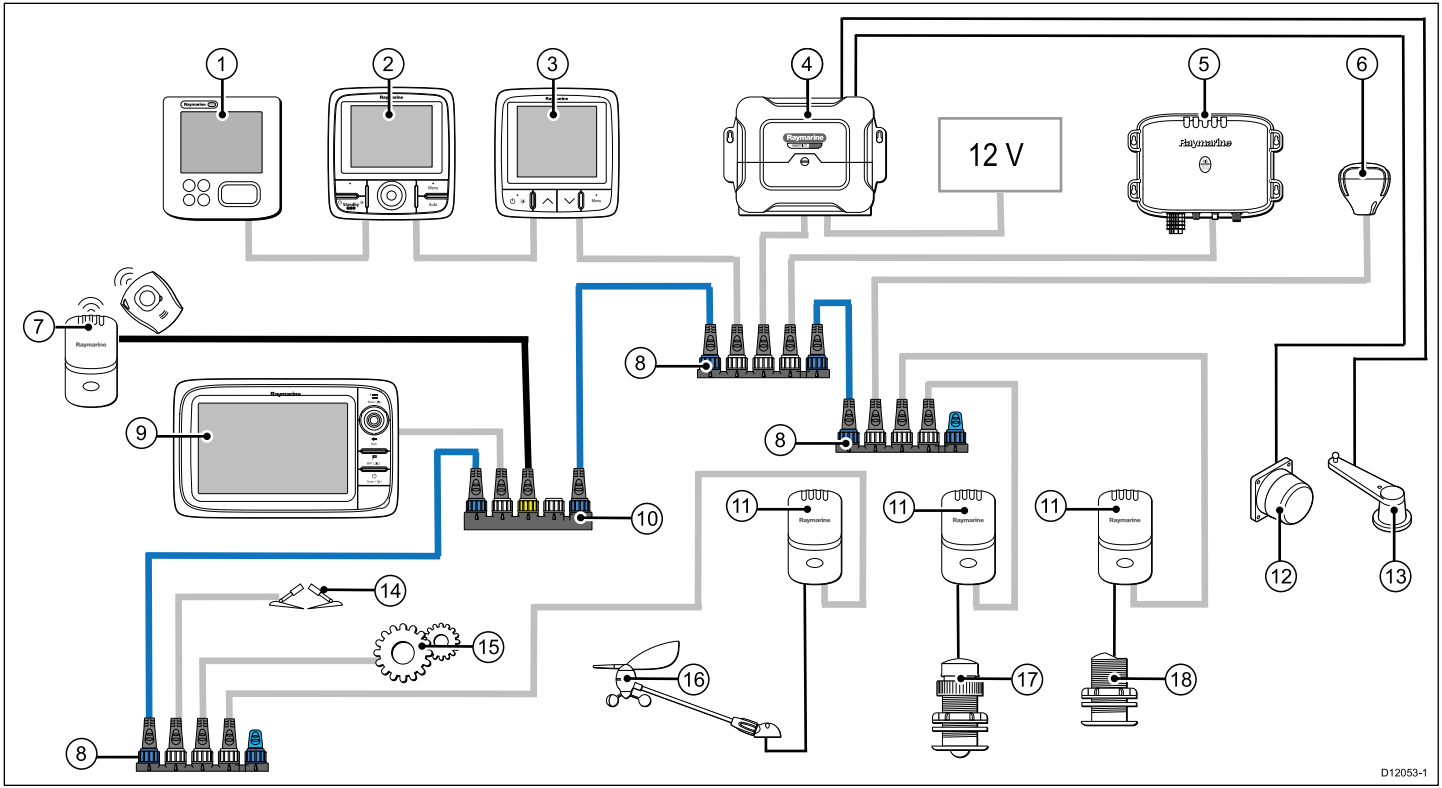
Basic SeaTalk^{ng} system example



Note: Note: The p70 / p70r has the capability of connecting to SeaTalk or SeaTalk^{ng} networks however if data bridging is required a SeaTalk to SeaTalk^{ng} converter is required.

Item	Description
1.	p70r Pilot controller
2.	p70 Pilot controller
3.	SeaTalkng GPS receiver
4.	SPX course computer (supplying 12V power to SeaTalkng network.)
5.	SeaTalkng 5–way connector with terminators
6.	Rudder reference
7.	Fluxgate compass
8.	Drive unit

Extended SeaTalkng system example.



Note: The system allows up to 3 instrument displays to be daisy chained as shown in the example above.

Item	Description
1.	ST70 Instrument display
2.	p70r Pilot Controller
3.	i70 Instrument display
4.	SPX course computer (supplying 12V power to SeaTalkng network.)
5.	AIS receiver/transceiver
6.	SeaTalkng GPS receiver
7.	Man Over Board (connected via SeaTalk to SeaTalkng converter.)
8.	SeaTalkng 5–way connectors with terminators
9.	Multifunction display
10.	SeaTalk to SeaTalkng converter
11.	Transducer pods
12.	Fluxgate compass
13.	Rudder reference transducer
14.	Trim tab control
15.	Engine data via devicenet spur
16.	Wind vane transducer
17.	Speed transducer
18.	Depth transducer

2.4 System protocols

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

- SeaTalk^{ng}
- NMEA 2000
- SeaTalk

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

Seatalk^{ng}

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

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

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

NMEA 2000

NMEA 2000 offers significant improvements over NMEA 0183, most notably in speed and connectivity. Up to 50 units can simultaneously transmit and receive on a single physical bus at any one time, with each node being physically addressable. The standard was specifically intended to allow for a whole network of marine electronics from any manufacturer to communicate on a common bus via standardized message types and formats.

SeaTalk

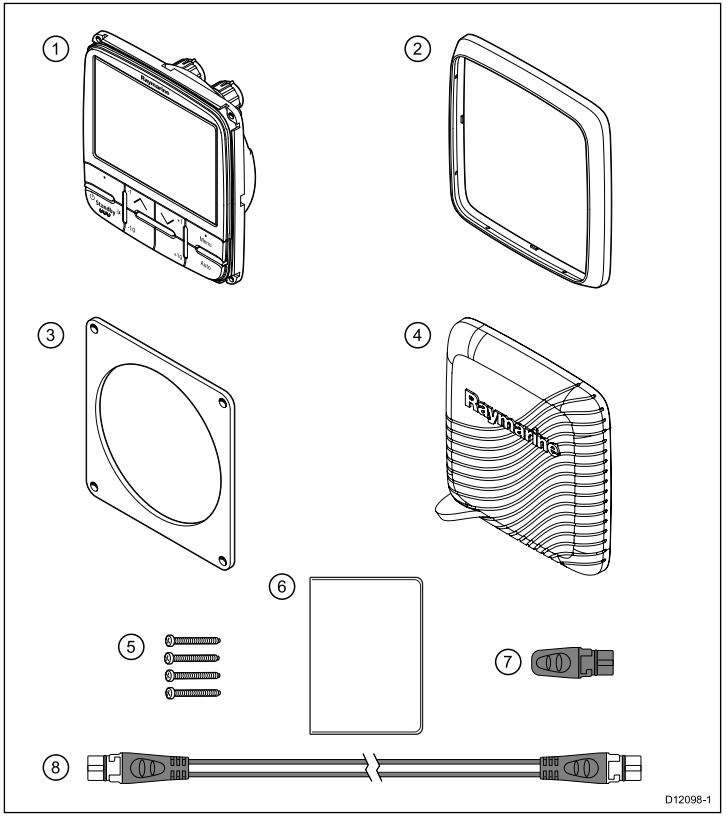
SeaTalk is a protocol which enables compatible instruments to connect to each other and share data.

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.

2.5 Pack contents

All models contain the following items:

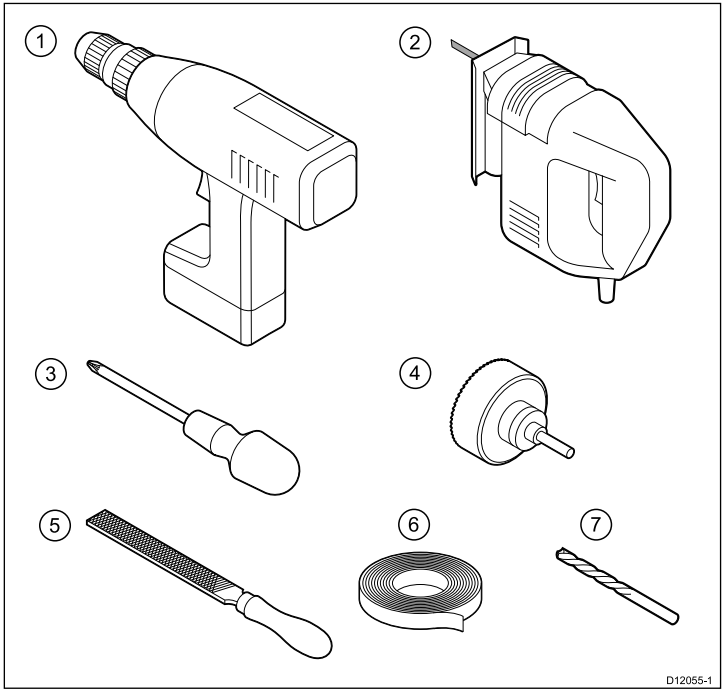


Number	Description
1.	p70 / p70r Pilot controller (p70 8 button controller is shown in diagram above.)
2.	Bezel
3.	Gasket
4.	Suncover
5.	4 x fixing screws
6.	Document pack, includes: • Multilingual CD (including User Reference manual) • Installation and commissioning instructions • Quick reference • Mounting template • Warranty registration card
7.	SeaTalkng Blanking plug
8.	SeaTalkng Spur Cable

Unpack the pilot controller unit carefully to prevent damage. Save the carton and packing in case the unit has to be returned for service.

2.6 Tools

Tools required for installation



1.	Power drill
2.	Jig saw
3.	Screwdriver
4.	Suitable size (10 mm to 30 mm) hole cutter
5.	File
6.	Adhesive tape
7.	Drill bit of appropriate size*

Note: *Drill bit size is dependent on the thickness and type of material that the unit is to be mounted on.

Chapter 3: Cables and connections

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- 3.1 General cabling guidance on page 22
- 3.2 Connections overview on page 23
- 3.3 SeaTalk^{ng} connection on page 24
- 3.4 NMEA2000 connection on page 26
- 3.5 SeaTalk connection on page 26

3.1 General cabling guidance

Cable types and length

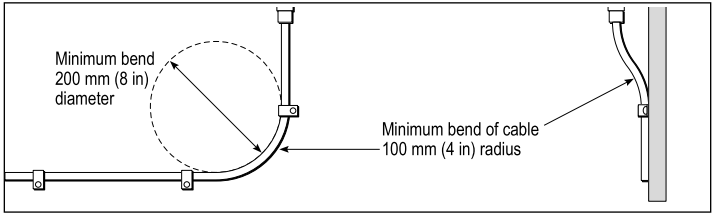
It is important to use cables of the appropriate type and length

- 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 radius of 100 mm.



- 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:

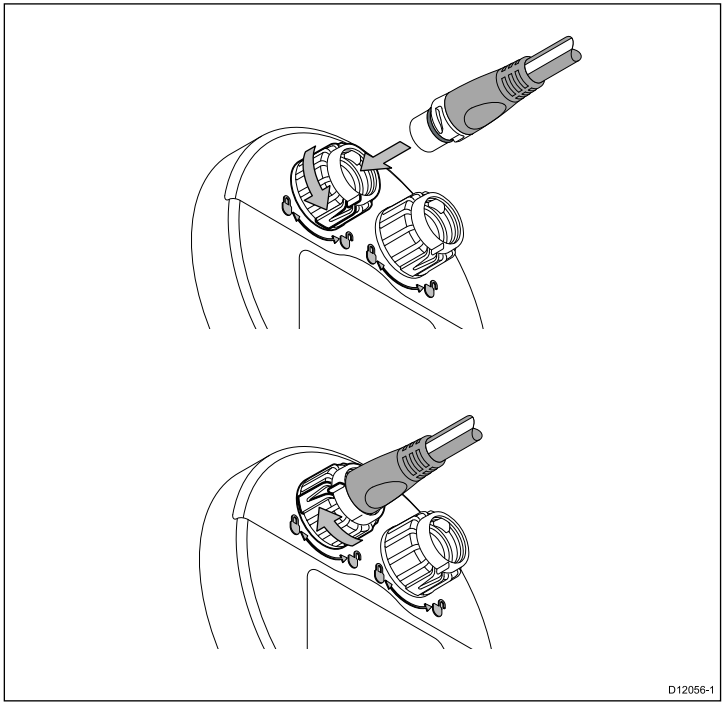
- Always use isolating transformers or a separate power-inverter to run PC's, processors, displays and other sensitive electronic instruments or devices.
- Always use an isolating transformer with Weather FAX audio cables.
- Always use an isolated power supply when using a 3rd party audio amplifier.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

3.2 Connections overview

Cable connectors are on the rear of the product.



The unit has 2 x SeaTalk^{ng} connectors.

Connecting SeaTalk^{ng} cables

1. Rotate the locking collar on the back of the unit to the UNLOCKED position.
2. Ensure the spur cable end connector is correctly oriented.
3. Fully insert the cable connector.
4. Rotate locking collar clockwise (2 clicks) until it snaps into the LOCKED position.

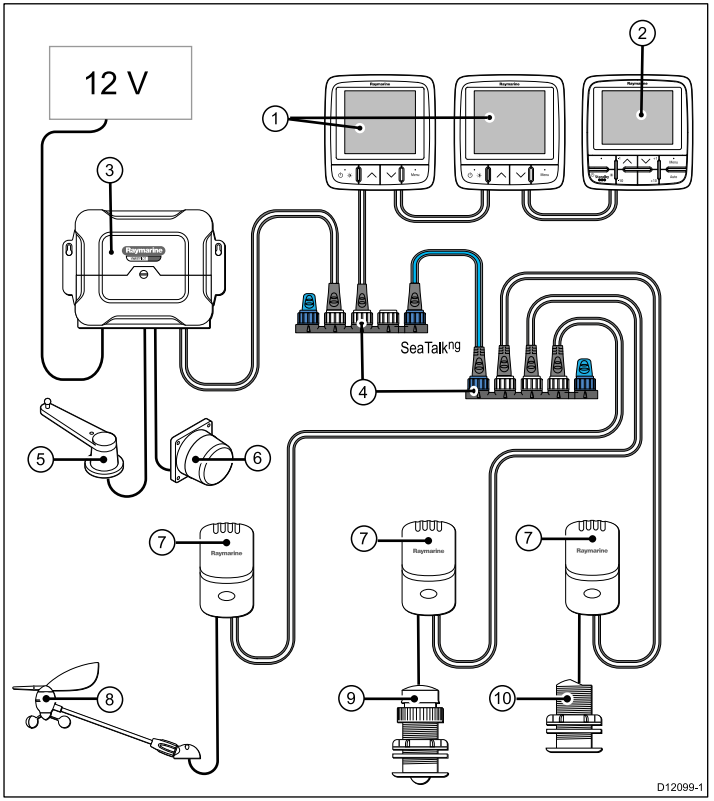
3.3 SeaTalk^{ng} connection

The instrument display can connect as part of a SeaTalk^{ng} network.

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

- SeaTalk^{ng} Course computers.
- SeaTalk equipment via a SeaTalk to SeaTalk^{ng} converter
- SeaTalk^{ng} instruments (e.g. ST70).
- Raymarine Multifunction displays
- Transducers via transducer pods
- Fluxgate compass and rudder reference transducers via a SPX course computer

Typical SeaTalk^{ng} system



Item	Description
1.	2 x i70 Instrument displays
2.	p70 Pilot controller

Item	Description
3.	SPX course computer (supplying 12V to SeaTalkng network.)
4.	SeaTalkng 5–way connectors with terminators
5.	Rudder reference transducer
6.	Fluxgate compass
7.	Transducer pods
8..	Wind transducer
9.	Speed transducer
10.	Depth transducer

SeaTalkng cabling

SeaTalkng cables and connectors

Connection / Cable	Notes
Backbone cables (various lengths)	The main cable carrying data. Spurs from the backbone are used to connect SeaTalkng devices.
T-piece connectors	Used to make junctions in the backbone to which devices can then be connected.
Terminators	Required at either end of the backbone.
Spur cables	Used to connect devices. Devices may be daisy chained or connected directly to the T-pieces
SeaTalkng 5–way connector	Used to branch, split, or make additional connections in SeaTalkng networks.

SeaTalkng power

The SeaTalkng bus requires a 12 V power supply. This may be provided from:

- Raymarine SPX course computer, or
- Other separate regulated 12 V supply.

Note: SeaTalkng does NOT supply power to multifunction displays and other equipment with a dedicated power supply input.

SeaTalkng converters

Converters are available which can convert network protocols to enable connectivity of a range of non SeaTalkng devices onto a SeaTalkng network.

SeaTalkng converters

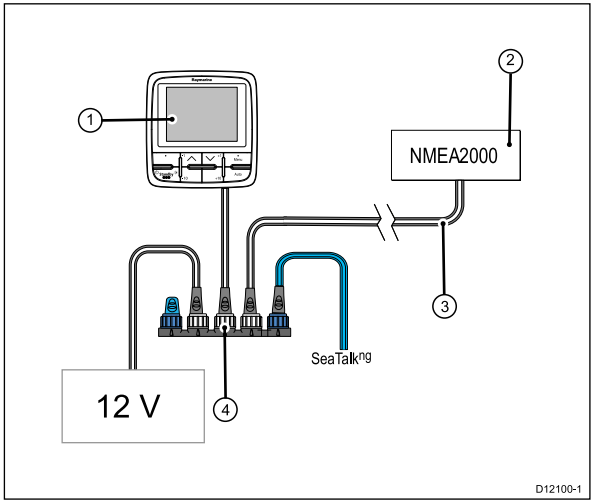
Converter	Notes
SeaTalk to SeaTalkng converter	Used to connect a range of SeaTalk compatible products to a SeaTalkng network.

3.4 NMEA2000 connection

You can connect NMEA2000 devices on a SeaTalkng backbone using a SeaTalkng to Devicenet adaptor cable.

Important: You cannot have any 2 terminated backbones connected together, unless you have an isolation gateway between the two backbones.

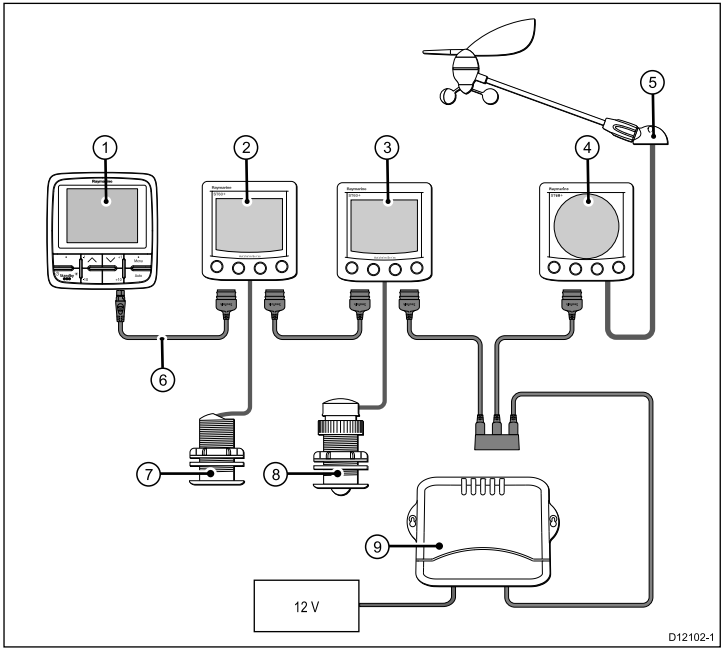
Connecting NMEA2000 equipment to the SeaTalkng backbone



1. p70 Pilot controller.
2. NMEA2000 equipment.
3. SeaTalkng to DeviceNet adaptor cable.
4. SeaTalkng backbone.

3.5 SeaTalk connection

Connections to a SeaTalk network are made using a SeaTalk to SeaTalkng adaptor cable (not supplied).



Item	Description
1.	p70 Pilot controller
2.	ST60+ Depth instrument
3.	ST60+ Speed instrument
4.	ST60+ Wind instrument

Item	Description
5.	Wind transducer
6.	SeaTalk^{ng} to SeaTalk Adaptor cable
7.	Depth transducer
8.	Speed transducer
9.	Course computer (supplying 12V to SeaTalk network.)

For SeaTalk cables and extensions, use Raymarine SeaTalk cable accessories.

Chapter 4: Location and mounting

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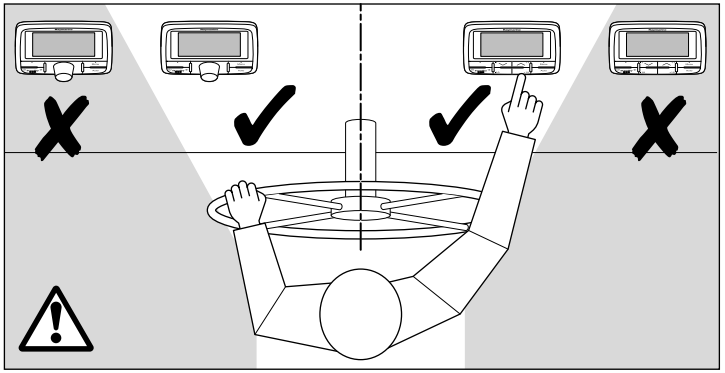
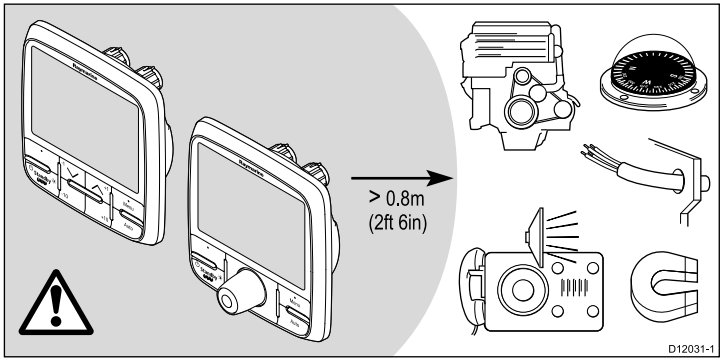
- 4.1 Site Requirements on page 30
- 4.2 Selecting a location on page 31
- 4.3 Mounting on page 32

4.1 Site Requirements





Site requirements for the p70 / p70r Pilot controller are as follows:

- There should be no obstacle between the user and the pilot controller.
- The pilot controller should be situated at least 0.8 m from an engine, compass, high current power cables, or any magnetic device.

4.2 Selecting a location

General location requirements

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

Key factors which can affect product performance are:

- **Ventilation**

  To ensure adequate airflow:

  – Ensure that equipment is mounted in a compartment of suitable size.

  – Ensure that ventilation holes are not obstructed. Allow adequate separation of equipment.

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

- **Mounting surface.**

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

- **Cable entry**

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

  – Minimum bend radius of 100 mm (3.94 in) unless otherwise stated.

  – Use cable supports to prevent stress on connectors.

- **Water ingress**

  The display is suitable for mounting both above and below decks. It is waterproof to IPX6 standard. 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.

- **Magnetic compass**

  Select a location that is at least 3 ft (1 m) away from a magnetic compass.

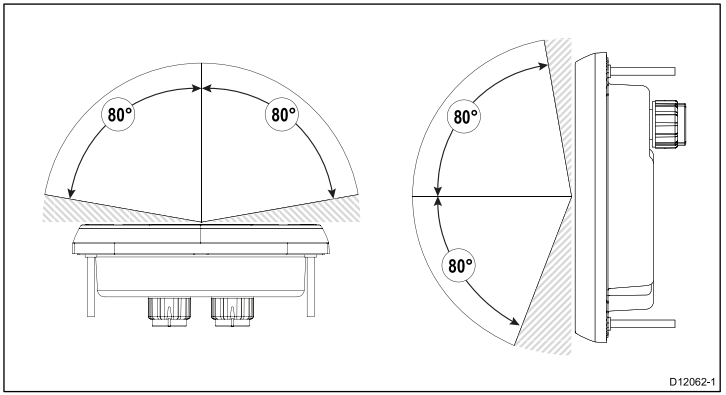
- **Power supply**

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

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.

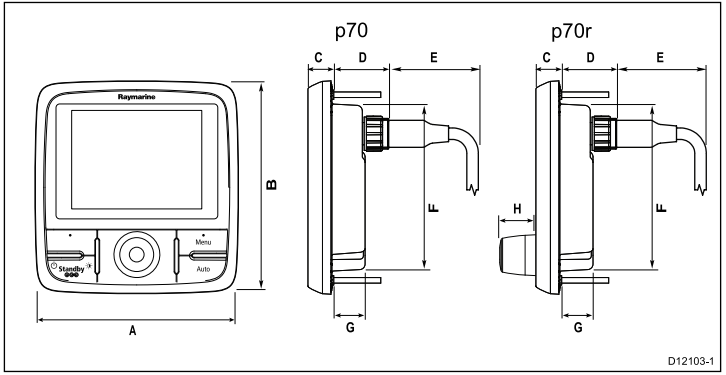
Viewing angle



Note: The angles are provided for a contrast ratio of equal to or greater than 10.

Unit dimensions

p70 and p70r dimensions



Item	Description
A.	110 mm (4.33”)
B.	115 mm (4.52”)
C.	14 mm (0.55”)
D.	30 mm (1.18”)
E.	35 mm (1.38”)
F.	90 mm (3.54”)
G.	17 mm (0.67”)
H.	20.6 mm (0.81”)

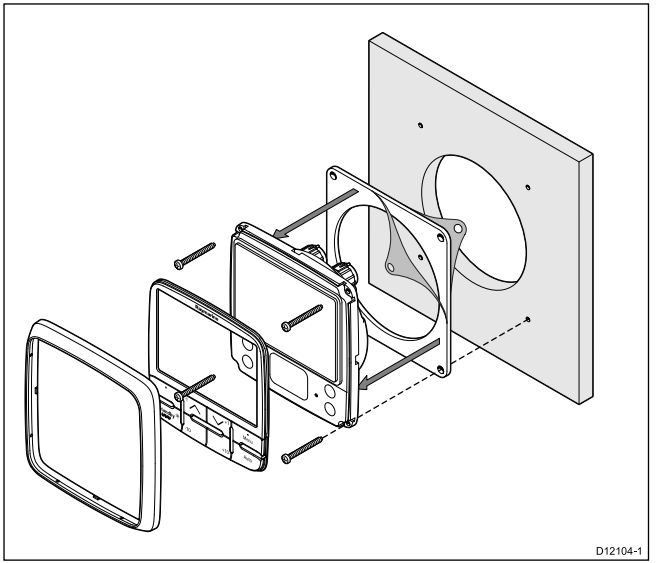
4.3 Mounting

The product is designed to be flush mounted.

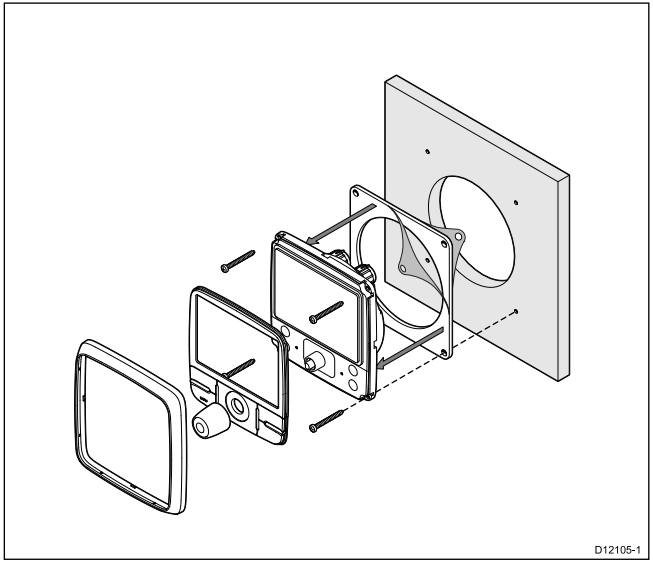
Before mounting the unit, ensure that you have:

- Selected a suitable location.
- Identified the cable connections and route that the cable will take.
- Detached the front bezel.

p70 Mounting



p70r Mounting

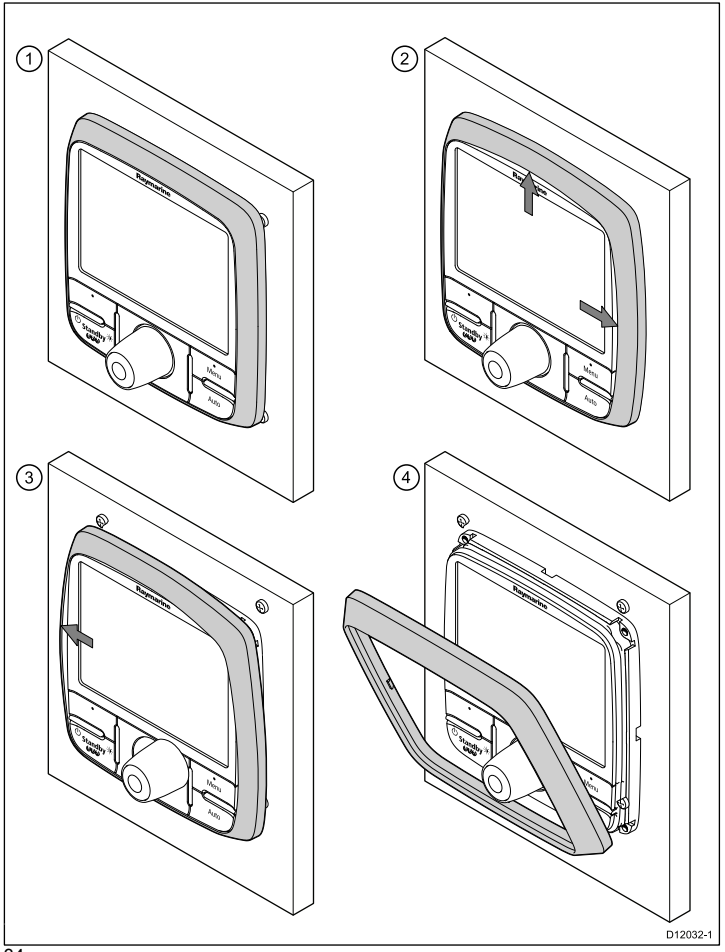


1. Check the selected location for the unit. A clear, flat area with suitable clearance behind the panel, is required.
2. Fix the appropriate cutting template supplied with the product, to the selected location, using masking or self-adhesive tape.
3. Using a suitable hole saw, make a pilot holes in each corner of the cut-out area.
4. Using a suitable saw, cut along the inside edge of the cut-out line.
5. Ensure that the unit fits into the removed area and then file around the cut edge until smooth.
6. Drill four holes as indicated on the template to accept the securing screws.
7. Peel the backing off of the gasket, and place the adhesive side of the gasket onto the display unit and press firmly onto the flange.
8. Connect cables to the unit.
9. Slide the unit into place and secure using screws provided.

Note: Drill, tap size, and tightening torque is dependent on the thickness and type of material the unit is to be mounted on.

Front bezel

Removing the front bezel



Important: Use care when removing the bezel. Do not use any tools to lever the bezel, doing so may cause damage.

1. Using your fingers pull the bezel away from the unit at the top and side, as shown in 2.

   The bezel will start to come away from the unit at the top and side.
2. Now pull the bezel away from the unit on the opposite side, as shown in 3.

   The bezel will now come free from the unit, as shown in 4.

Chapter 5: System checks

Chapter contents

- 5.1 Commissioning pre-requisites on page 36
- 5.2 Commissioning process on page 36
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- 5.4 Using the set up wizard on page 39
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- 5.6 Dealer settings on page 42
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- 5.8 Checking autopilot operation on page 45

5.1 Commissioning pre-requisites

Before commissioning your system for the first time, check that the following processes have been carried out correctly:

- Autopilot system installation completed in accordance with the Installation Guide.
- SeaTalk^{ng} network installed in accordance with the SeaTalk^{ng} Reference Manual.
- Where fitted, GPS installation and connections has been carried out in accordance with the GPS installation guide.

Check also that the commissioning engineer is familiar with the installation and components of the autopilot system including:

- Vessel type.
- Vessel steering system information.
- What the autopilot will be used for.
- System layout: components and connections (you should have a schematic of the vessel's autopilot system).

5.2 Commissioning process

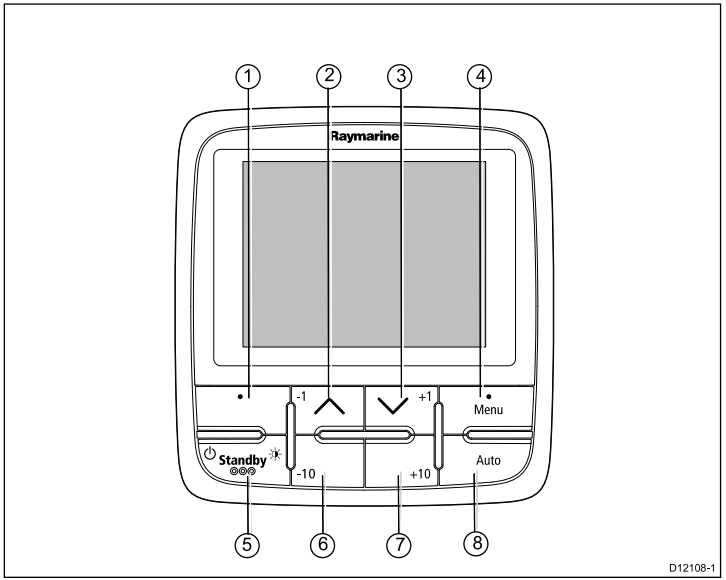
- Check you have adhered to commissioning pre-requisites.
- Initial power on and set up.
- Dockside calibration.
- Seatrial calibration.
- System checks.

5.3 Initial power on test

Pilot controls

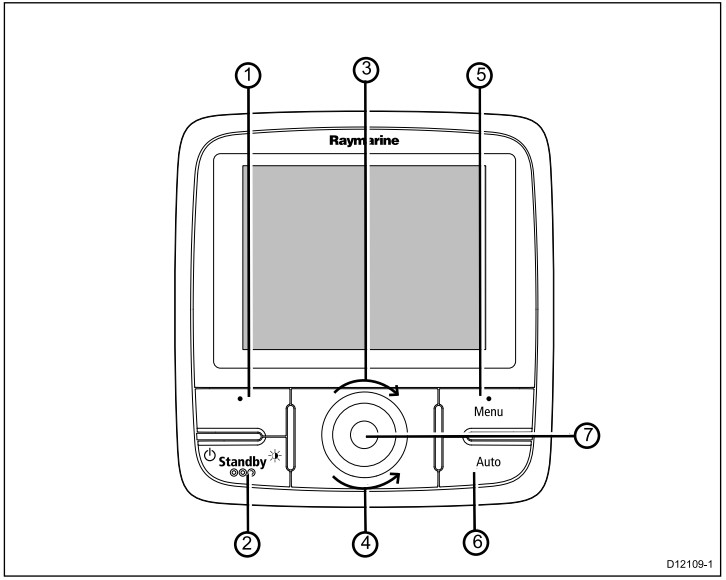
Control layout and functions.

p70 8–button pilot controller



Item	Description
1.	**LEFT SOFT BUTTON** Cancel, Back, mode selection.
2.	**UP BUTTON / -1** Up navigation, Adjust Up, Decrease angle.
3.	**DOWN BUTTON / +1** Down navigation, Adjust Down, Increase angle.
4.	**RIGHT SOFT BUTTON** Menu, Select, OK, Save.
5.	**STANDBY BUTTON** Disengage pilot, Manual control, Power, Brightness.
6.	**–10 BUTTON** Decrease angle.
7.	**+10 BUTTON** Increase angle.
8.	**AUTO BUTTON** Engage Auto pilot.

p70r rotary pilot controller



Item	Description
1.	**LEFT SOFT BUTTON** Cancel, Back, mode selection.
2.	**STANDBY BUTTON** Disengage pilot, Manual control, Power, Brightness.
3.	**ROTARY CLOCKWISE** Down navigation in list, Adjust Up, Increase angle (locked heading), adjust numerical values, power steer.
4.	**ROTARY ANTI-CLOCKWISE** Up navigation in list, Adjust Down, Decrease angle (locked heading), adjust numerical values, power steer.
5.	**RIGHT SOFT BUTTON** Menu, Select, OK, Save.
6.	**AUTO BUTTON** Engage Auto pilot.
7.	**ROTARY END PUSH BUTTON** Menu, Select, OK, Save.

The pilot controller supports the following combination button presses:

Combination button press

Buttons	Action
STANDBY and **AUTO.**	Puts pilot in to Wind Vane mode.
–1 and **–10** or **+1** and **+10**.	AutoTack (in wind vane mode), AutoTurn

Powering the pilot controller on

Turning on the pilot controller

1. Press and hold the **STANDBY** button for one second until the Raymarine logo appears.

   If the unit is being switched on for the first time or after a factory reset the set up wizard will be launched.

Note: The Raymarine logo is not displayed if the unit is in 'sleep mode', the unit may appear off but still has power.

2. To turn the pilot controller off press and hold the **STANDBY** button. After 1 second a pop up will appear.
3. Continue to hold the **STANDBY** button for as further 3 seconds to complete the power off.

Note: You cannot power down the pilot controller whilst in **AUTO** mode.

5.4 Using the set up wizard

First Install Set up Wizard

The set up wizard contains 3 steps: language selection, vessel type and welcome screen.

Note: If the p70 / p70r is being added to an existing autopilot system already containing a SeaTalk^{ng} pilot controller then the set up information will be set automatically to reflect existing settings.

1. Highlight the required language using the **UP** and **DOWN** buttons or **ROTARY** and then press **SELECT**.
2. Highlight the required vessel type using the **UP** and **DOWN** buttons or **ROTARY** and then press **SELECT**.

   The welcome screen shall now be displayed and your choices have been saved.
3. Press the **OK** button to complete the set up wizard.

   You will now be taken to the mode pages.

5.5 Dockside calibration

Dockside calibration (Dealer settings on SeaTalk systems) must be completed before going out on the water and performing the sea trial calibration

Dockside calibration contains the following steps:

- Drive type selection
- Rudder check
- Motor check

You can access the dockside calibration menu at any time from the following **Menu > Set up > Auto pilot calibration > Commissioning**.

Note: You will need to measure the hard over time of you rudder prior to commencing dockside calibration.

Selecting a drive type

1. Using the **UP** and **DOWN** buttons or the **ROTARY** highlight **Dockside calibration** and press **SELECT**.
2. From the **Drive type** menu highlight and select your drive type:

Note: If your drive type is not listed, contact your Raymarine dealer for advice.

3. Press **OK** to save your setting and display the next set up page. This is either:
   - The **Rudder check (center)** page, if the vessel has a rudder reference transducer, or
   - The **Motor phasing non-referenced** page, if a rudder reference transducer is not fitted.
4. Press **OK** to proceed with the Rudder and motor checks.

You can cancel Dockside calibration at any time by pressing **STANDBY**.

Warning: Rudder check

If no rudder reference has been fitted you MUST ensure that adequate provision is made to prevent the steering mechanism from impacting the end stops.

Checking the rudder

This procedure establishes port and starboard rudder limits for systems using a rudder reference transducer. Fine-tuning adjustments to the rudder position may be made during seatrial calibration.

Note: Systems without a rudder reference will go straight to motor checks.

1. Centre the rudder and press **OK**.
2. When prompted, turn the rudder hard to port and press **OK**.
3. When prompted, turn the rudder hard to starboard and press **OK**.
4. When prompted, turn the rudder back to centre and press **OK**.
5. If a rudder reference is installed the rudder limit will be displayed with a message letting you know the rudder limit has been updated.

You can cancel Dockside calibration at any time by pressing **STANDBY**.

Checking the motor (motor phasing checks)

The system will check the drive connection from the SmartPilot. Once it has completed the check successfully, a message will appear asking if it is safe for the system to take the helm.

Note: For systems with a rudder reference transducer installed this check shall follow the rudder checking, for systems without a rudder reference this step shall follow the drive type selection.

1. Centre and let go of the rudder.

2. Disengage any rudder drive clutch.
3. Press **CONTINUE**.
4. Check it is safe to proceed before pressing **OK**.

   If a rudder reference is installed then the autopilot will now automatically move the rudder port and starboard.
5. Where no rudder reference is installed you will be asked to confirm the rudder turned to port by pressing **YES** or **NO**.

   Selecting **NO** will terminate the rudder drive check.
6. Press **OK** if it is safe to engage the rudder in the opposite direction.
7. You will be asked to confirm the rudder turned to starboard by pressing **YES** or **NO**.

   Selecting **NO** will terminate the rudder drive check.
8. Dockside calibration is now complete, press **CONTINUE**.

   Once you have completed all the dockside set up, checks and calibration, you may take your vessel out to an area of calm water to commence the seatrial calibration

Note: If the rudder moves in the opposite direction than expected you may need to reverse the phase of the rudder reference. This can be achieved by accessing the **Reverse rudder reference** option in the **Drive settings** menu.

You can cancel Dockside calibration at any time by pressing **STANDBY**.

Setting the hard over time

On vessels without a rudder reference transducer, it is of critical importance to set the hard over time, to ensure accurate autopilot operation. To do this:

Note: Not applicable to vessels with a rudder reference transducer.

1. Measure the time it takes for the autopilot to drive the rudder from hard over port, to hard over starboard.
2. From the **Drive settings** menu: **Main menu > Set up > Auto pilot calibration > Drive settings** highlight **Hard over time** and press **SELECT**.
3. On the Hard over time page, use the **UP** and **DOWN** buttons to set the appropriate time in the edit box.
4. Press **OK** to save the setting and return to the **Drive settings** menu.

At the end of the autopilot dockside setup, use the **CANCEL** button to return to a Pilot Controller mode page.

5.6 Dealer settings

The dockside calibration wizard is only available on a SeaTalkng system, for SeaTalk systems the **Dealer settings** should be set before going out on the sea.

The dealer settings menu can be accessed from: **Main menu > Set up > Auto pilot calibration > Dealer settings**. Once entered the dealer settings menu will cycle through all available options.

Options and limits are dependent on the course computer installed.

5.7 Seatrial calibration

Once dockside calibration has been completed (Dealer settings for SeaTalk systems), navigate to a place where you have plenty of sea room, then carry out the seatrial calibration procedures to complete the SmartPilot system commissioning.

Seatrial calibration contains the following steps:

- Compass calibration.
- Autolearn.

You can access the Seatrial calibration menu at any time from the following **Menu > Set up > Auto pilot calibration > Commissioning**.

Note: Sailing vessels should perform the sea trial under engine power.

Warning: Seatrial calibration

Ensure you have sufficient sea room for calibration. The seatrial calibration maneuvers require a clear, familiar area of water. Ensure you are not likely to collide with any vessel or other obstruction during calibration.

Warning: Maintain sensible speeds

The autopilot may make unexpected turns.

Calibrating the compass

Before you can use your autopilot you need to do some open water checks. The water must be calm, with light or no wind. Leave plenty of room to maneuver.

1. Using the **UP** and **DOWN** buttons, or the **ROTARY** controller, highlight **Seatrial calibration** and press **CONTINUE**.

2. A warning message will be displayed letting you know you can take control of the helm and cancel the seatrial calibration at any time by pressing **STANDBY**.
3. Press **CONTINUE** to begin compass calibration.

Compass swing

You will need to turn your vessel in slow circles while the system automatically makes adjustments to account for compass deviation. Each 360-degree circle should take no less than two minutes, and you should complete at least two circles.

1. Start moving vessel in slow even circles, then press **START**.
2. Keep speed to below 2 knots. Watch the display to ensure your turn rate is not too fast. If the message 'Slow Down' is displayed reduce your rate of turn, this can be achieved by slowing down and / or steering in a wider circle.

   If a 'Slow Down' message is displayed the current circle will have to be repeated.
3. When the compass has been calibrated, a message will be displayed showing the detected deviation. If this is more than 15 degrees you will need to abort the calibration process and resite the compass further away from metal items, then repeat the calibration process. If you still find a deviation of more than 15 degrees, contact your Raymarine dealer for advice. If the deviation is within acceptable limits, press **CONTINUE**.

You can cancel Seatrial calibration at any time by pressing **STANDBY**.

Aligning compass to GPS

Note: Systems without a GPS will skip this section and go straight to Manual compass alignment.

If your system has a GPS connected to your data network (SeaTalk, SeaTalk^{ng} or NMEA), the autopilot is tuned to the GPS heading while you steer to a known magnetic heading. This step provides a rough alignment and minimizes the amount of compass fine tuning required.

1. Steer the vessel on a steady course with minimal tide, increase speed to more than 3 knots and press **START** to align the compass to GPS.
2. Follow the on-screen instructions until the process completes, press the **CONTINUE** button when it is available to begin autolearn.

You can cancel Seatrial calibration at any time by pressing **STANDBY**.

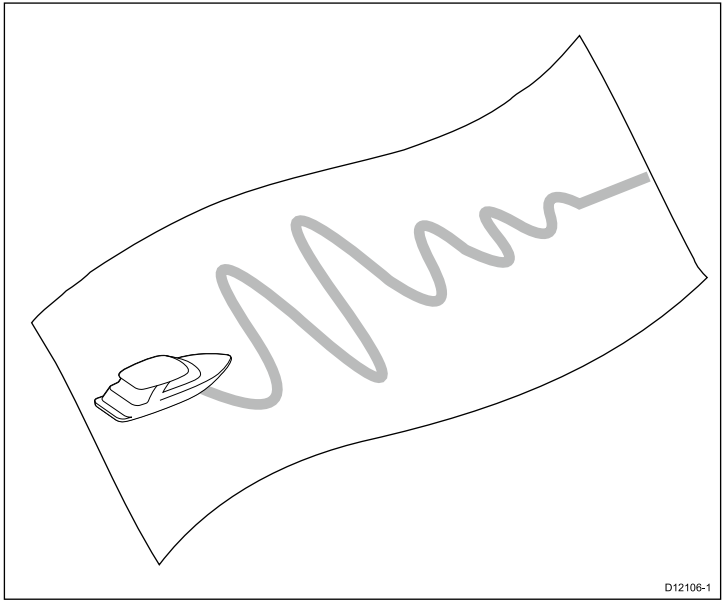
Aligning compass manually

Where no GPS is present manual alignment of the compass is required.

1. Continue to steer on a steady course and use the Use **+1** and **-1** buttons, or the **ROTARY** controller to adjust the heading displayed until it matches the vessel's compass reading.
2. When complete press **CONTINUE** to begin **Autolearn**.

Autolearn

You must have significant clear water in front of the vessel to accommodate a series of maneuvers, which include sudden, sharp turns. There should be a clear area at least 100m wide and 500m ahead.



Caution: Autolearn

Please ensure sufficient free space ahead. (Minimum 100x500m long & significantly more for a high speed vessel.

Performing autolearn

1. Ensure there is sufficient free water in front of the vessel.
2. Press **CONTINUE**.

   A warning message will be displayed letting you know that the vessel will zigzag and make Sudden SHARP TURNS.
3. Maintain a normal cruising speed (at least 3 knots).
4. Remove your hands from the wheel and press **AUTO** to begin.
5. During this procedure the pilot will count through the steps. Ensure that ‘PASS’ is displayed signalling the completion of autolearn.
6. Press **CONTINUE** to finish calibration and return to manual helm control, pilot will be in standby mode.

   You have successfully completed the commissioning process for your SmartPilot system.
7. Where FAIL is displayed after completion of autolearn press **CONTINUE** to retry autolearn.

You can cancel Seatrial calibration at any time by pressing **STANDBY**.

Caution: System changes

Any additional changes you make to your system settings may require you to repeat the calibration process.

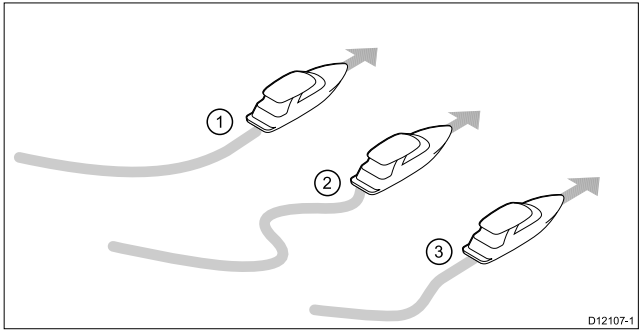
5.8 Checking autopilot operation

After completing calibration, check the basic autopilot operation, as follows:

1. Steer onto a compass heading and hold a steady course at normal cruising speed. If necessary, steer the vessel manually for a short time to check how the vessel steers.
2. Ensure it is safe to engage the autopilot, then press **AUTO** to lock onto the current heading. The autopilot should hold a constant heading in calm sea conditions.
3. Use **-1**, **+1**, **-10** and **+10** or the **ROTARY** controller, to see how the SmartPilot alters the course to port and starboard.
4. Press **STANDBY** to return to manual steering.

Checking rudder gain

To determine whether the rudder gain is set correctly, carry out the following test:



Item	Description
1.	Rudder gain too low
2.	Rudder gain too High
3.	Correct rudder gain

1. Ensure you have set the autopilot response to level 5.
2. Drive your vessel at a typical cruising speed in clear water.

   It is easier to recognize the steering response in calm sea conditions where wave action does not mask steering performance.
3. Press **AUTO** to enter Auto mode, then alter course by 40°:

   - This course change should result in a crisp turn followed by an overshoot of no more than 5°, If the rudder gain is adjusted correctly.
   - If the course change causes a distinct overshoot (more than 5°) and/or there is a distinct ‘S’ in the course the rudder gain is too high.
   - If the vessel’s performance is sluggish and it takes a long time to make the 40° turn, with no overshoot the rudder gain is too low.

   If necessary, adjust the rudder gain.

Checking counter rudder

Counter rudder is the amount of rudder your autopilot applies to try to prevent your vessel from veering off course. Higher counter rudder settings result in more rudder being applied.

To check the counter rudder setting:

1. Ensure you have set the autopilot response to level 5.
2. Drive your vessel at a typical cruising speed in clear water.

3. Press **AUTO** to switch the autopilot to Auto mode, then make a 90° course change:
   - When rudder gain and counter rudder are both set correctly, the vessel performs a smooth continuous turn with minimal overshoot.
   - If the counter rudder is too low, the vessel will still overshoot.
   - If counter rudder is too high, the vessel will ‘fight’ the turn and make a series of short, sharp turns. This results in a very ‘mechanical’ feel as the vessel changes course.

   If necessary, adjust the counter rudder.

Rudder damping

If the autopilot is ‘hunting’, i.e. continuously moving the steering backwards and forwards by small amounts, increase the rudder damping setting.

AutoTrim settings

AutoTrim determines how quickly the autopilot applies ‘standing helm’ to correct for trim changes, caused, for example, by changes in the wind load on the superstructure, or an imbalance of engines. Increasing the AutoTrim level reduces the time the autopilot takes to return to the correct course, but makes the vessel less stable. If the autopilot:

- Gives unstable course keeping and the vessel ‘snakes’ around the desired course, decrease the AutoTrim level.
- Hangs off course for excessive periods of time, increase the AutoTrim level.

Chapter 6: Adjust settings

Chapter contents

- 6.1 Vessel Settings on page 48
- 6.2 Drive settings on page 49
- 6.3 Sailboat settings on page 53
- 6.4 User Settings on page 54
- 6.5 Set up menu on page 55

6.1 Vessel Settings

Vessel settings can be accessed from **Main menu > Set up > Auto pilot calibration > Vessel settings**.

Note: When connected to a SeaTalk system the vessel settings listed below are part of the **Dealer settings** menu, **Main menu > Set up > Auto pilot calibration > Dealer settings**.

Note: Limits are set by the installed course computer and so not all limits may be available.

Item	Description	Options
Vessel type	The vessel type options will normally give optimum performance for typical vessels of each type. However, you may find you can improve the performance of your vessel by selecting an option for a different vessel type.	• Race sail. • Sail cruiser. • Catamaran. • Workboat. • RIB. • Outboard speed boat. • Inboard speed boat. • Power cruiser 1. — vessels capable of speeds up to 12 knots. • Power cruiser 2.— vessels capable of speeds up to 30 knots. • Power cruiser 3 — vessels capable of speeds greater than 30 knots. • Sport fishing.
		• Pro fishing.
Drive type	List of compatible drive types.	• Type 1 linear. • Type 2 linear. • Type 2 hydraulic linear. • Type 3 hydraulic linear. • I/O stern. • CAN. • Wheel drive. • Tiller. • Sport drive. • Rotary drive type 1. • Rotary drive type 2. • Hydraulic pump type 1. • Hydraulic pump type 2. • Hydraulic pump type 3. • Constant running pump. • Verado.
Cruise speed	Set the cruise speed to the vessel's typical cruising speed. If no speed data is available, the SmartPilot system will use the cruise speed value you set here as a default when adjusting autopilot settings.	• 0 — 99 Kts

Item	Description	Options
Auto release	Auto release allows you to override the pilot by taking hold of the wheel or tiller. When you release the wheel or tiller, the pilot will return to the last locked heading. **Note:** Only available on S1, S2, or S3 course computers only with drive type set to I/O stern.	• Enable (default) • Disable
Calibration lock	The calibration lock is used to lock out specific calibration settings which if changed may require re-commissioning of the autopilot system. If your system has been dealer installed then the lock may be turned on.	• On • Off (default)

Caution: Vessel settings determine other parameters

if Vessel Type is changed after you have completed the Autopilot commissioning. This will return the settings to default and the Dockside and Seatrial calibration will have to be carried out again.

6.2 Drive settings

Vessel settings can be accessed from **Main menu > Set up > Auto pilot calibration > Drive settings**.

Note: When connected to a SeaTalk system the vessel settings listed below are part of the **Dealer settings** menu, **Main menu > Set up > Auto pilot calibration > Dealer settings**.

Note: Limits are set by the installed course computer and so not all limits may be available.

Item	Description	Limits
Rudder gain	Rudder gain is a measure of how much helm the SmartPilot will apply to correct course errors. The higher the setting the more rudder will be applied. The rudder gain setting is set automatically as part of the Autolearn process.	• 1 — 9
Counter rudder	Counter rudder is the amount of rudder the SmartPilot system applies to try to prevent the vessel from yawing off course. Higher counter rudder settings result in more rudder being applied.	• 1 — 9 Do not set to 0.

Item	Description	Limits
Rudder damping	On SmartPilot systems with a rudder reference transducer, you can set the rudder damping to prevent autopilot 'hunting'. Increasing the rudder damping value reduces hunting. When adjusting the value, increase the damping one level at a time until the autopilot stops hunting. Always use the lowest acceptable value.	• 1 — 9 • 2 (default)

Item	Description	Limits
Rudder limit	If a rudder reference transducer is fitted, this screen is used to set the limits of the rudder control just inside the mechanical end stops, and thus avoid putting the steering system under unnecessary load. This should be set when commissioning the SmartPilot system. The limit should be set to approximately 5 degrees less than the maximum rudder angle. **Note:** The rudder limit screen is displayed only if a rudder reference transducer is fitted. **Note:** If no rudder reference has been fitted you MUST ensure that adequate provision is made to prevent the steering mechanism from impacting the endstops.	• 10º — 40º • 30º (default)
Rudder offset	This specifies the offset from amidships (zero adjustment).	• 0 (default)

Item	Description	Limits
Reverse rudder ref	This reverses the phase of the rudder reference display. **Note:** This option is not available on SeaTalk systems, so you would need to reverse the RED and GREEN wires on the Rudder Reference connection to the course computer.	• Port • Starboard

Item	Description	Limits
Auto trim	The AutoTrim setting determines the rate at which the SmartPilot system applies 'standing helm' to correct for trim changes caused by varying wind loads on the sails or superstructure. The default AutoTrim is set as part of the Autolearn process. If you need to change the setting, increase the AutoTrim one level at a time and use the lowest acceptable value: • If the SmartPilot X system gives unstable course keeping or excessive drive activity with a change in the heel angle, decrease the AutoTrim level. • If the SmartPilot X system reacts slowly to a heading change due to a change in the heel angle, increase the AutoTrim level. • If the AutoTrim level is too high, the vessel will be less stable and snake around the desired course.	**Setting** • Off • On **Adjustment** • 1 — 4 1 = Slowest, 4 = Fastest • 1 (default)

Item	Description	Limits
Auto turn	This setting defines the amount of course change when performing an auto turn. **Note:** This option cannot be changed when connected over SeaTalk. **Note:** This option is only available on motor vessels.	• 10º — 125º • 90º (default)
Response level	This sets the default SmartPilot system response level setting. The response level controls the relationship between course keeping accuracy and the amount of helm/ drive activity. You can make temporary changes to response during normal operation.	• 1 — 9 • 5 (default) • Level 1 — 3 Minimize the amount of pilot activity. This conserves power, but may compromise short-term course-keeping accuracy. • Level 4 — 6 Should give good course keeping with crisp, well controlled turns under normal operating conditions. • Level 7 — 9 Gives the tightest course keeping and greatest rudder activity (and power consumption). This can lead to a rough passage in open waters as the SPX system may 'fight' the sea.

Item	Description	Limits
Off course alarm	This screen determines the angle used by the OFF COURSE alarm. The OFF COURSE alarm operates if the pilot strays off course by more than the specified angle for more than 20 seconds.	• 15° to 40° • 20º (default)
Turn rate limit	This limits your vessel's rate of turn under SmartPilot system control. It is only effective if your speed is greater than 12 knots.	• 1° to 30° • 7º (default)
Power steer	This screen determines the behavior of the Rotary or joystick when in power steer mode.	• Off • Proportional The steering will behave in proportion to the movement of the rotary controller or joystick. • Bang Bang (Joystick only) The rudder will move, and stay in the direction a joystick is moved.
Latitude	If no valid latitude data is available, the SmartPilot system will use this setting, which provides the necessary adaptation for higher latitudes.	• 0 — 80
Hard over time	On vessels without a rudder reference transducer, it is of critical importance to set the hard over time, to ensure accurate autopilot operation.	• Value is seconds • 10 seconds (default)

Caution: Drive setting adjustments

Adjustments to the drive settings will require you to re-calibrate the system.

6.3 Sailboat settings

These settings are only available to sailboats.

Sailboat settings can be accessed from **Main menu > Set up > Auto pilot calibration > Sailboat settings**.

Note: When connected to a SeaTalk system the Sailboat settings listed below are part of the **User settings** menu, **Main menu > Set up > Auto pilot calibration > User settings**.

Note: Limits are set by the installed course computer and so not all limits may be available.

Item	Description	Options
Auto tack angle	The Auto Tack Angle is relative to wind angle and is not adjustable.	• Not adjustable
Auto tack delay	Auto tack delay is the delay between actioning a tack and the pilot applying helm.	• 0 — 10 seconds
Auto Turn	Amount of course change to auto turn	• 10º — 125º • 90º (default)
Gybe inhibit	With gybe inhibit on, to prevent accidental gybes, the SmartPilot will prevent the vessel from performing an turn away from the wind. With gybe inhibit off, you can perform an AutoTack into or away from the wind. Gybe inhibit does not effect Auto Turn	• Enable (default) • Disable

Item	Description	Options
Wind trim response	Wind trim response controls how quickly the SmartPilot system responds to changes in the wind direction. Higher wind trim settings will result in a system that is more responsive to wind changes.	• 1 — 9 • 5 (default)
Wind trim type	This option determines whether the vessel steers to apparent or true wind in Wind Vane mode.	• True • Apparent

Note: These features are only available if wind data is available.

6.4 User Settings

When connected to a SeaTalk autopilot system a User settings menu will be available.

The User settings menu can be accessed from: **Main Menu > Set up > Autopilot calibration > User settings**. Once entered the user settings menu will cycle through all available options. These options shall be available to users when calibration lock is turned on.

6.5 Set up menu

The set up menu provides a range of tools and settings to configure the pilot controller.

Menu item	Description	Options
Auto Pilot calibration	Pilot commissioning / calibration settings	**SeaTalkng** • Vessel settings. • Drive settings. • Sailboat settings. • Commissioning. **SeaTalk** • User settings. • Dealer settings. • Seatrial calibration.
User preferences	Set user preferences such as: Time & Date, Units of measurement, Language, Vessel type, Vessel details, and Variation.	User preferences menu.
System set up	Set system grouping, display and system color and brightness, Multiple data sources and about system set up.	System set up menu.
Simulator	Enables or disables simulator mode, which allows you to practice operating your instrument display without any data from any other external unit.	• On • Off
Factory reset	Delete user settings and Restore unit to factory default settings.	• Yes • No
Diagnostics	Information About the display and system and key beep on / off setting.	• Yes • No

System setup menu

The **System setup** menu enables users to customize user settings as detailed in the table below:

Menu item	Description	Options
Network group	This allows you to add multiple units together in a group so that when the color scheme or brightness is changed on one unit the changes are applied to all units in the group.	**Pre-defined groups** • None • Helm 1 • Helm 2 • Cockpit • Flybridge • Mast **Undefined** • Group-1 — Group-5
Brightness / color group	This enables you to synchronize the displays brightness and color to be the same as the other units in the same network group.	**Sync brightness / color** • This display • This group

Menu item	Description	Options
Multiple data sources	This allows you to view and select preferred data sources. • **Select data source** • **Data source found** • **Data source details**	**Select data source** • GPS position • Heading • Depth • Speed • Wind **Data source found** • model name — serial number Port ID **Data source details** • Device name • Serial No. • Port ID • Status or No data
About system setup	System set-up provides the option to add instruments or pilot head to a group. Once in a group, tasks like changing brightness and color can be done from a single device. Multiple Data source allows you to view & manage which Data source is used on your pilot head. Data types include: GPS Position, Heading, Depth, Speed & Wind.	

User preferences menu

The **User preference** menu enables users to customize user settings as detailed in the table below:

Menu item	Description	Options
Time & date	These options enable you to customize the date and time format to your requirements. You can also specify a local time offset from Universal Time Constant (UTC), to compensate for any time zone difference.	**Date format:** • mm/dd/yy • dd/mm/yy **Time format:** • 12hr • 24hr **Time offset:** • –13 to +13 hours
Units	Enables you to specify the units used for the following key measurements: • **Speed** • **Distance** • **Depth** • **Wind speed** • **Temperature** • **Flow rate** • **Heading** • **Pressure** • **Volume** • **Barometric**	**Speed:** • kts — knots. • mph — miles per hour. • km/h — Kilometres per hour. **Distance:** • nm — Nautical miles. • km — Kilometres. • sm — Statute miles. **Depth:** • ft — Feet • fa—Fathoms • m— Metres **Wind speed:**

Menu item	Description	Options
		• kts — knots. • m/s — metres per second. **Temperature:** • ºC — degrees centigrade. • ºF — degrees fahrenheit. **Flow rate** • g/h (UK) — UK gallons per hour. • g/h (US) — US gallons per hour. • ltr/h — Litres per hour. **Heading:** • True • Mag — magnetic. **Pressure** • psi — pounds per square inch. • Bar — bar. • kpa — Kilo pascals. **Volume:** • Gal — (US) — US gallons.

Menu item	Description	Options
		• Gal — (UK) — UK gallons. • ltr — litre. **Barometric** • psi — pounds per square inch. • Bar — bar. • kpa — Kilo pascals.

Menu item	Description	Options
Language	Determines the language that will be used for all on-screen text, labels, menus and options.	• Chinese • Croatian • Danish • Dutch • English — UK • English — US • Finnish • French • German • Greek • Italian • Japanese • Korean • Norwegian • Polish • Portuguese (Brazilian) • Russian • Spanish • Swedish • Turkish

Menu item	Description	Options
Arrival alarm	Sets the radius for the arrival alarm.	**Alarm** • Off • On **Adjust radius** • 0 nm — 10 nm • 3 nm (default)
Vessel type	Determines the default setup of the unit and favorite pages	• Race sail • Sail cruiser • Catamaran • Workboat • RIB • Outboard speed boat • Inboard speed boat • Power cruiser 1 • Power cruiser 2 • Power cruiser 3 • Sport fishing • Pro fishing

Diagnostics

You can access diagnostics details from the **Setup > Diagnostics** menu option and can view information relating to:

Menu item	Description	Options
About display	Allows you to view information about the instrument display you are using:	• Software version • Hardware version • Bootloader version • Temperature • Volts • Max. volts • Current • Max. current • Run time • Deviation (If available)
About system	Allows you to view information about products on the system you are using:	• Model number • Serial number • Software version • Hardware version • Volts

Menu item	Description	Options
Key beep	Enables you to turn on and off the audible beeps when keys are pressed	• On • Off
Self test	The product has a built in self test which can help to diagnose faults.	• Memory test • Button test • Display test • Buzzer test • Illumination test

Chapter 7: Troubleshooting

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- 7.2 Power up troubleshooting on page 65
- 7.3 System data troubleshooting on page 66
- 7.4 Miscellaneous troubleshooting on page 67

7.1 Troubleshooting

The troubleshooting information provides possible causes and corrective action required for common problems associated with marine electronics installations.

All Raymarine products are, prior to packing and shipping, subjected to comprehensive test and quality assurance programs. However, if you experience problems with the operation of your product this section will help you to diagnose and correct problems in order to restore normal operation.

If after referring to this section you are still having problems with your unit, please contact Raymarine Technical Support for further advice.

7.2 Power up troubleshooting

Problems at power up and their possible causes and solutions are described here.

Problem	Possible causes	Possible solutions
The system (or part of it) does not start up.	Power supply problem.	Check relevant fuses and breakers.
		Check that the power supply cable is sound and that all connections are tight and free from corrosion.
		Check that the power source is of the correct voltage and sufficient current.

7.3 System data troubleshooting

Aspects of the installation can cause problems with the data shared between connected equipment. Such problems, their possible causes and solutions are described here.

Problem	Possible causes	Possible solutions
Instrument, engine or other system data is unavailable at all displays.	Data is not being received at the display.	Check the data bus (e.g. SeaTalk^{ng}) wiring and connections.
		Check the overall integrity of the data bus (e.g. SeaTalk^{ng}) wiring.
		If available refer to the reference guide for the data bus. (e.g. SeaTalk^{ng} reference manual)
	Data source (e.g ST70 instrument or engine interface) is not operating.	Check the source of the missing data (e.g. ST70 instrument or engine interface).
		Check the power to the SeaTalk bus.
		Refer to the manufacturer's handbook for the equipment in question.
	Software mismatch between equipment may prevent communication.	Contact Raymarine technical support.
Instrument or other system data is missing from some but not all displays.	SeaTalk^{hs} network problem	Check that all required equipment is connected to the SeaTalk^{hs} switch.
		Check the status of the SeaTalk^{hs} Switch.
		Check that SeaTalk^{hs} cables are free from damage.
	Software mismatch between equipment may prevent communication.	Contact Raymarine technical support

7.4 Miscellaneous troubleshooting

Miscellaneous problems and their possible causes and solutions are described here.

Problem	Possible causes	Possible solutions
Display behaves erratically: • Frequent unexpected resets. • System crashes or other erratic behavior.	Intermittent problem with power to the display.	Check relevant fuses and breakers.
		Check that the power supply cable is sound and that all connections are tight and free from corrosion.
		Check that the power source is of the correct voltage and sufficient current.
	Buttons trapped by front bezel.	Ensure that the front bezel is fitted correctly and that all buttons are free to operate correctly.
	Software mismatch on system (upgrade required).	Go to www.raymarine.com and click on support for the latest software downloads.
	Corrupt data / other unknown issue.	Perform a factory reset. This option can be found within **Menu > System Setup > Settings and Data Reset** . **Important:** This will result in the loss of any settings and data (such as waypoints) stored on the display. Please save any important data to a CF card before resetting.

Chapter 8: Technical support

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- 8.2 Viewing product information on page 70

8.1 Raymarine customer support

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

Web support

Please visit the customer support area of our website at:

www.raymarine.com

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

Telephone and email support

In the USA:

- **Tel:** +1 603 881 5200 extension 2444
- **Email:** Raymarine@custhelp.com

In the UK, Europe, the Middle East, or Far East:

- **Tel:** +44 (0)23 9271 4713
- **Email:** ukproduct.support@raymarine.com

Product information

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

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

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

8.2 Viewing product information

1. From the main menu scroll to **Set Up** and press the **SELECT** key.
2. From the Set Up menu scroll to **Diagnostics** and press the **SELECT** key.
3. Select **About system**.

   A range of information is displayed, including the software version and Serial number.

Chapter 9: Technical specification

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9.1 Technical specification

Nominal supply voltage	12 V dc
Operating voltage range	9 to 16 V dc
Current	132 mA
Power consumption	1.6 W
LEN (Refer to the SeaTalk^{ng} reference manual for further information.)	3
Environmental	Operating temperature: -25°C to 55°C (-13°F to 131°F) Storage temperature range: -30°C to 70°C (-22°F to 158°F) Relative humidity: max: 93% Water proof to IPX6
Display screen	TFT LCD display, 16bit color (64k colors) Resolution: 320x240 Brightness: 700 cd/m^2
Data connections	2 x SeaTalk^{ng} ports (fulling compliant with NMEA2000 & SeaTalk specifications).
Conformance	• Europe 2004/108/EC • Australia and New Zealand C-Tick, compliance level 2

Chapter 10: Options and accessories

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10.1 SeaTalkng cables and accessories

SeaTalkng cables and accessories for use with compatible products.

Description	Part No	Notes
Backbone Kit	A25062	Includes: • 2 x 5 m (16.4 ft) Backbone cable • 1 x 20 m (65.6 ft) Backbone cable • 4 x T-piece • 2 x Backbone terminator • 1 x Power cable
SeaTalkng 0.4 m (1.3 ft) spur	A06038	
SeaTalkng 1 m (3.3 ft) spur	A06039	
SeaTalkng 3 m (9.8 ft) spur	A06040	
SeaTalkng 5 m (16.4 ft) spur	A06041	
SeaTalkng 0.4 m (1.3 ft) backbone	A06033	
SeaTalkng 1 m (3.3 ft) backbone	A06034	
SeaTalkng 3 m (9.8 ft) backbone	A06035	
SeaTalkng 5 m (16.4 ft) backbone	A06036	
SeaTalkng 20 m (65.6 ft) backbone	A06037	
SeaTalkng to bare ends 1 m (3.3 ft) spur	A06043	
SeaTalkng to bare ends 3 m (9.8 ft) spur	A06044	
SeaTalkng to SeaTalk2 0.4 m (1.3 ft) spur	A06048	
SeaTalkng Power cable	A06049	
SeaTalkng Terminator	A06031	
SeaTalkng T-piece	A06028	Provides 1 x spur connection
SeaTalkng 5–way connector	A06064	Provides 3 x spur connections
SeaTalk1 to SeaTalkng converter	E22158	
SeaTalkng Inline terminator	A80001	
SeaTalkng Blanking plug	A06032	

10.2 Converters

Part number	Description
E22158	SeaTalk to SeaTalk^{ng} Converter

10.3 SeaTalk accessories

SeaTalk cables and accessories for use with compatible products.

Description	Part No	Notes
NMEA / SeaTalk converter	E85001	
3 m (9.8 ft) SeaTalk extension cable	D285	
5 m (16.4 ft) SeaTalk extension cable	D286	
9 m (29.5 ft) SeaTalk extension cable	D287	
12 m (39.4 ft) SeaTalk extension cable	E25051	
20 m (65.6 ft) SeaTalk extension cable	D288	

10.4 Spares and accessories

Part number	Description
R22168	Spare bezel
R22169	p70 Sun cover
R22174	p70r Sun cover

Owner notes:

Owner notes:

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