

Raymarine®



p70 / p70R / p70s / p70Rs

PILOT CONTROLLER

Commissioning & Operation
instructions

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Software updates



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

Product documentation



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

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Chapter 1: Important information



Warning: Aid to navigation

This product is intended only as an aid to navigation and must never be used in preference to sound navigational judgment. 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: 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.

Caution: Sun covers

- If your product is supplied with a sun cover, to protect against the damaging effects of ultraviolet (UV) light, always fit the sun cover when the product is not in use.
- To avoid potential loss, sun covers must be removed when travelling at high speed, whether in water or when the vessel is being towed.

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 water ingress protection standard (refer to the product's *Technical Specification*), water intrusion and subsequent equipment failure may occur if the product is subjected to high-pressure washing. Raymarine will not warrant products subjected to high-pressure washing.

Disclaimer

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

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

Declaration of conformity

FLIR Belgium BVBA declares that the products listed below are in compliance with the EMC Directive 2014/30/EU:

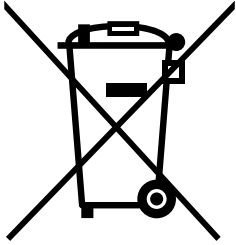
- **p70s**, part number E70328
- **p70Rs**, part number E70329

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 which contains materials, components and substances that may be hazardous and present a risk to human health and the environment when WEEE is not handled correctly.



Equipment marked with the crossed-out wheeled bin symbol indicates that the equipment should not be disposed of in unsorted household waste.

Local authorities in many regions have established collection schemes under which residents can dispose of waste electrical and electronic equipment at a recycling center or other collection point.

For more information about suitable collection points for waste electrical and electronic equipment in your region, refer to the Raymarine website:

www.raymarine.eu/recycling.



Warranty registration

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

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

IMO and SOLAS

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

Technical accuracy

To the best of our knowledge, the information in this document was correct at the time it was produced. However, Raymarine cannot accept liability for any inaccuracies or omissions it may contain. In addition, our policy of continuous product improvement may change specifications without notice. As a result, Raymarine cannot accept liability for any differences between the product and this document. Please check the Raymarine website (www.raymarine.com) to ensure you have the most up-to-date version(s) of the documentation for your product.

Chapter 2: Document and product information

Chapter contents

- [2.1 Document information on page 12](#)
- [2.2 Compatible autopilot systems on page 13](#)

2.1 Document information

This document contains important information related to the installation of your Raymarine product. The document includes information to help you:

- plan your installation and ensure you have all the necessary equipment;
- install and connect your product as part of a wider system of connected marine electronics;
- troubleshoot problems and obtain technical support if required.

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

Product documentation

The following documentation is applicable to your product:

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

p70s / p70Rs documentation:

- **81402** — p70 / p70R / p70s / p70Rs Commissioning and Operation Instructions (This document)
- **87424** — p70s / p70Rs Pilot Controller Installation Instructions
- **87426** — p70 / p70R Pilot Controller Installation Instructions

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.

Document illustrations

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

All images are provided for illustration purposes only.

Document conventions

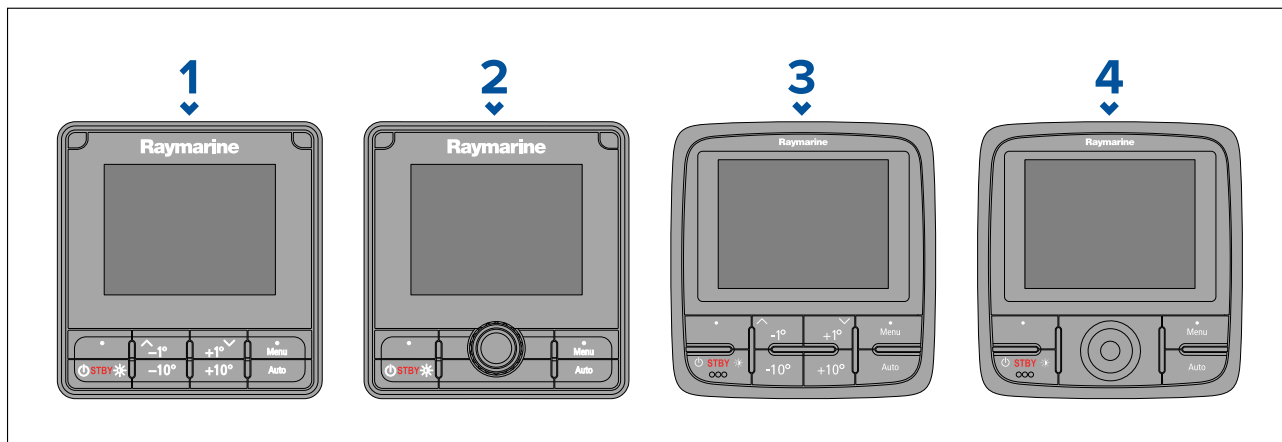
The following conventions are used throughout this document:

- **Highlight** — The term 'highlight' refers to using the **UP** or **DOWN** buttons to highlight an item.
- **Select** — The term 'select' refers to using the **UP** or **DOWN** buttons to highlight an item, and then pressing the **OK** button to select the item.
- **Scroll** — The term 'scroll' refers to using the **UP** or **DOWN** buttons to move up or down a menu to an item that is not currently shown onscreen.
- **Adjust** — The term 'adjust' is used to denote using the **UP** or **DOWN** buttons to change a numeric value or slider bar control.
- **Enable** — The term 'enable' refers to using the **UP** or **DOWN** buttons to highlight a toggle switch and press **OK** to activate the switch (when activated the switch background will turn green and the toggle is positioned to the right).

- **Disable** — The term ‘disable’ refers to using the **UP** or **DOWN** buttons to highlight a toggle switch and press **OK** to deactivate the switch (when deactivated the switch background will turn gray and the toggle is positioned to the left).

Applicable products

This document is applicable to the products shown below.



1. **p70s** (E70328) — 8 button pilot controller (sail).
2. **p70Rs** (E70329) — Rotary pilot controller (power).
3. **p70** (E22166) — 8 button pilot controller (sail).
4. **p70R** (E22167) — Rotary pilot controller (power).

Applicable software version

Product software is updated regularly to add new features and improve existing functionality.

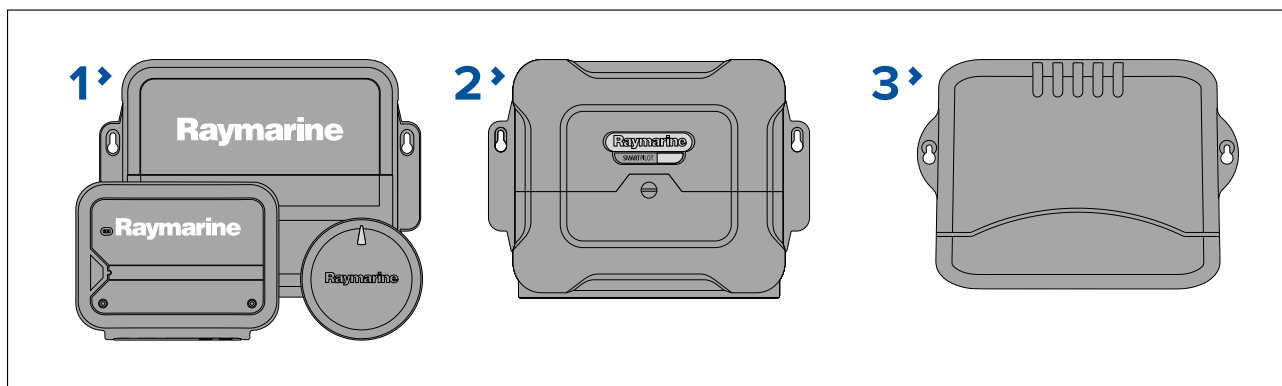
This document is applicable to LightHouse™ version 3.09 pilot controller software.

Check the website for the latest software and user manuals:

- www.raymarine.com/software
- www.raymarine.com/manuals

2.2 Compatible autopilot systems

Your product is compatible with the following autopilot systems:



1. Evolution™ autopilots (Connects via SeaTalkng®)
2. SPX SmartPilot (Connects via SeaTalkng®)
3. S1, S2 & S3 SmartPilot (Connects via SeaTalk® to SeaTalkng® converter E22158)

Chapter 3: Getting started

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- [3.1 Commissioning on page 16](#)
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- [3.3 Powering on and off on page 17](#)
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- [3.6 Autopilot response levels on page 18](#)
- [3.7 Display settings on page 19](#)
- [3.8 Multiple data sources \(MDS\) on page 23](#)
- [3.9 Software updates on page 24](#)

3.1 Commissioning

Before using your pilot controller to command your autopilot system, ensure that it has been correctly commissioned in accordance with the instructions provided in this document or the instructions provided with your autopilot system.

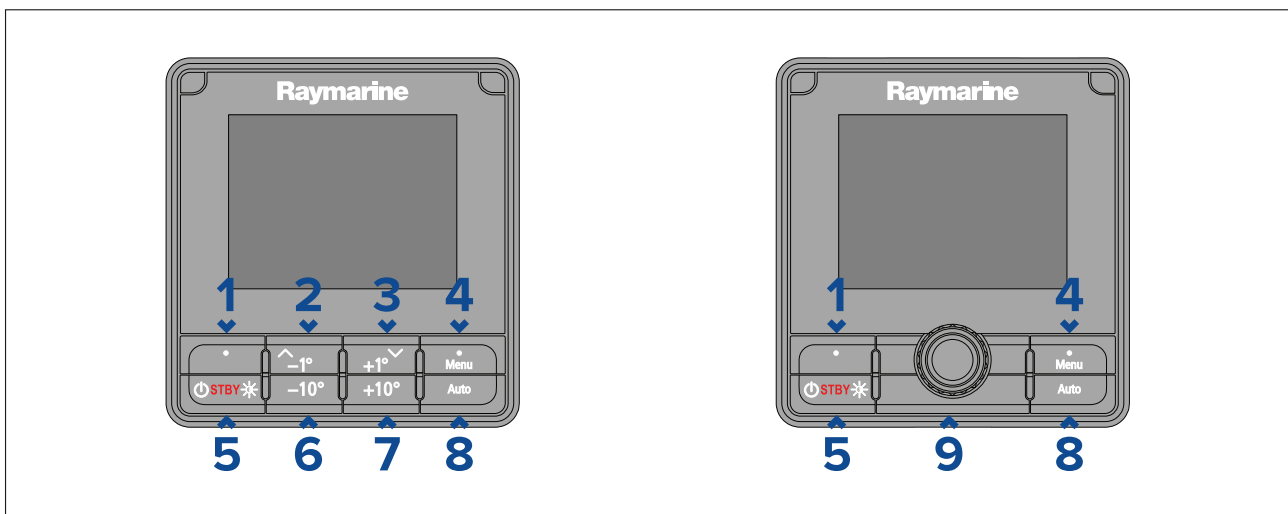
- For commissioning your pilot controller and Evolution™ autopilot system refer to:
[p.25 – Commissioning - Evolution autopilot system](#)
- For commissioning your pilot controller and SPX autopilot system refer to:
[p.33 – Commissioning - SPX and SmartPilot systems](#)

3.2 Controls

Use the buttons to operate the display. Each button has multiple functions.

Note:

The p70s and p70Rs are pictured below. The p70 and p70R have the same control buttons as the p70s and p70Rs.



1. **Left soft button**
 - Cancel
 - Back
 - Select pilot mode
2. **Up / -1°**
 - Decrease heading by 1 degree
 - Move up in menu
 - Increase numerical value
3. **Down / +1°**
 - Increase heading by 1 degree
 - Move down in menu
 - Decrease numerical value
4. **Menu / Right soft button**
 - Open menu
 - Select menu item
 - OK
 - Save
5. **Standby / Power**
 - Disengage autopilot (standby)
 - Power on

- Power off
 - Open Brightness page
 - Cancel
 - Back
6. **-10°** — Decrease heading by 10°
 7. **+10°** — Increase heading by 10°
 8. **Auto** — Engage autopilot
 9. **Rotary controller**
 - Turn clockwise to increase heading, move down through menu items or to increase a numerical value.
 - Turn counter-clockwise to decrease heading, move up through menu items or to decrease a numerical value.
 - Press the end of the rotary controller to select a menu option or save a change to a menu setting.

The p70s also supports the following combination button presses:

- **-1°** and **-10°**
 - Perform an AutoTurn 90° to port.
 - In wind vane mode, perform an AutoTack to port.
- **+1°** and **+10°**
 - Perform an AutoTurn 90° to starboard.
 - In wind vane mode, perform an AutoTack to starboard.

Note:

Any combination button press that includes the **Standby** button will disengage your autopilot.

3.3 Powering on and off

The p70s / p70Rs automatically powers on when power is supplied to the network it is connected to, unless it has been powered off using the **Standby** button.

1. If the display has been powered off using the standby button, press and hold the **Standby** button for approximately 2 seconds, to power the display on.
2. To power the display off, press and hold the **Standby** button for approximately 5 seconds. After 1 second a 3 second count down is displayed.

Note:

The display cannot be powered off when the autopilot is engaged.

3.4 Completing the set up wizard

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

The set up wizard guides you through the following basic configuration settings:

1. Language selection
2. Boat type selection
3. Welcome message

Note:

The set up wizard may be skipped if these settings have already been configured another display in the system.



1. Select the user interface language that you want to use.
2. Select the boat type that closely matches your vessel's hull type.
3. Select **Continue**.

The large pilot view page is displayed.

3.5 Autopilot functions and modes

Your autopilot has the following functions and modes.

Pilot modes can be assigned to the **Left soft button** (Shortcut key).

Functions

- **Auto** — Automatically steers the vessel to a heading. Auto is activated by pressing the **Auto** button.
- **Standby** — In Standby the autopilot is disengaged and you are free to steer the vessel manually.
- **Power Steer** — Power steer enables you to steer the vessel using the p70Rs or p70RRotary controller.

Note: Power steer is not available on the p70s or p70.

- **Jog steer** — Jog steer enables moving the tiller drives ram in and out using the + and - buttons on the p70s or p70.

Note:

- Jog steer is not available on the p70Rs or p70R.
- Jog steer is only available when a sailing vessel hull type and the Tiller drive type has been selected during commissioning.

Pilot modes

- **Wind vane** — Automatically steers the vessel, maintaining a specified apparent or true wind angle. Wind vane mode is activated from the **Mode** menu.

Note: Wind vane mode is only available when a sailing vessel hull type has been selected during commissioning.

- **Track** — Automatically steers the vessel to a waypoint. Track mode is activated from the **Mode** menu.
- **Pattern** — Automatically steers the vessel in a specified pattern. Pattern mode is activated from the **Mode** menu.

Note: Pattern mode is only available when a power vessel hull type has been selected during commissioning.

3.6 Autopilot response levels

The Evolution™ autopilot system includes autopilot response levels so that the system can be quickly configured for optimum performance in your current situation.

The available response levels are:

- **Leisure** — suitable for long passages where tight heading control is not critical.

- **Cruising** — good course-keeping without overworking the system.
- **Performance** — emphasis on tight heading control.

You can change the response level by selecting an option from the **Response Level** menu: **Menu > Response Level**, and then selecting **Save**.

Note:

In wind vane mode the wind trim setting is automatically set by the selected autopilot response level.

3.7 Display settings

Adjusting the display's brightness

The display's brightness level can be adjusted.

1. Press the **Power** button.
The Display Brightness page is displayed.
2. Use the **Up** and **Down** buttons or the **Rotary controller** to adjust the brightness to the required level.
3. Select **Ok**.

The display brightness page will time-out after 2 seconds, saving the new brightness level.

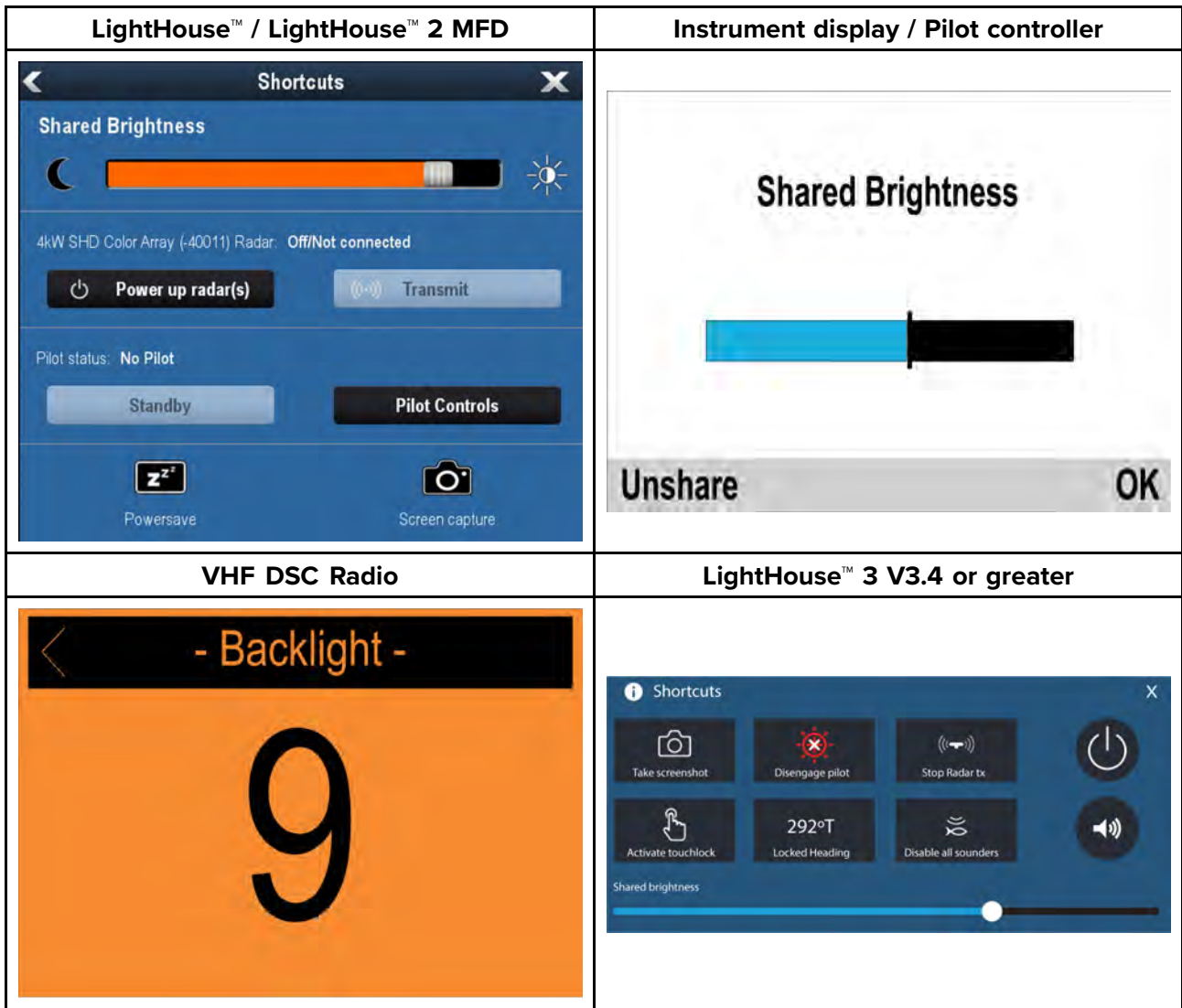
Shared Brightness

Shared brightness enables simultaneous brightness adjustment of all products that are part of the same group.

The following products are compatible with shared brightness:

- LightHouse™ 3 MFDs using software version 3.4 or greater.
- LightHouse™ or LightHouse™ 2 powered MFDs.
- SeaTalkng® Instrument displays and Pilot controllers.
- SeaTalkng® VHF DSC Radios.
- RMK-9 and RMK-10 remote buttonpads.

Any adjustments to the shared brightness level will be applied to all products assigned to the same group.



Multiple brightness groups can be configured. For example, these groups could be used to reflect the physical location of products on your vessel e.g.: helm and flybridge.

Shared brightness requires:

- all products to be compatible with the shared brightness function (see list of compatible products above).
- the **Shared brightness** setting set to On for all products in the brightness group.
- products to be assigned to network groups.
- all the products in each group to be synchronized.

Assigning A Network Group

To enable the shared brightness and color, displays must be assigned to the same network group.

Compatible instrument displays and pilot controllers will also share their color scheme.

From the **Network Group** menu: (**Menu > Set-up > System Set-up > Network Group**)

1. Select the network group that you want to assign the display to.

Available groups are:

- None (default)
- Helm 1
- Helm 2
- Cockpit
- Flybridge
- Mast
- Group 1 — Group 5

2. Select **Brightness/Color Group**.
3. Select **This Group**.
4. Select **Sync**.

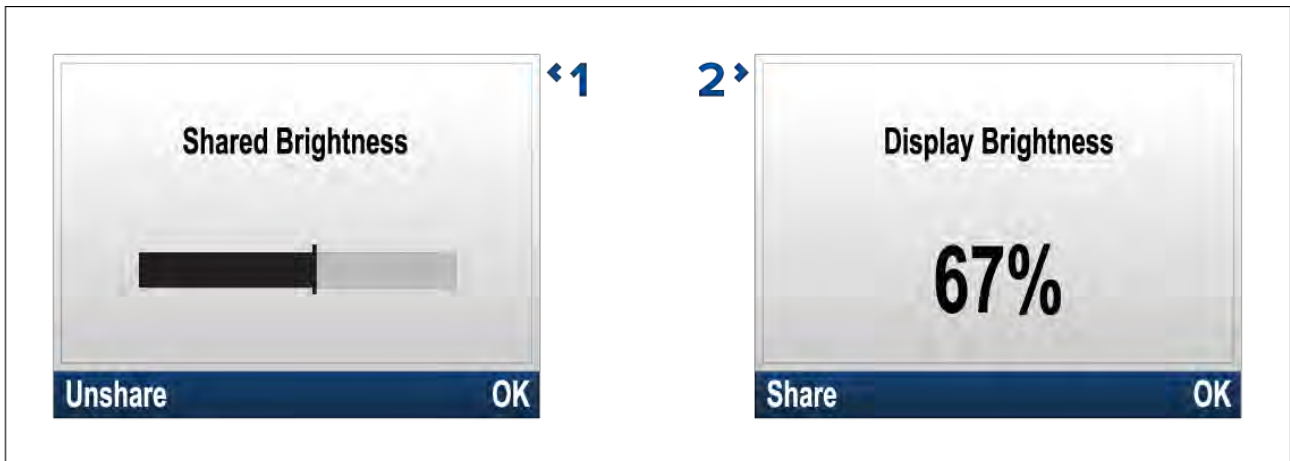
The System will now synchronize all displays assigned to the same group.

5. Select **OK**.
6. Carry out steps 1 to 5 on all displays.

When the brightness level is adjusted it will effect all displays assigned to the same group.

Unsharing the display

Displays can be removed from shared brightness so that brightness is individual to the display.

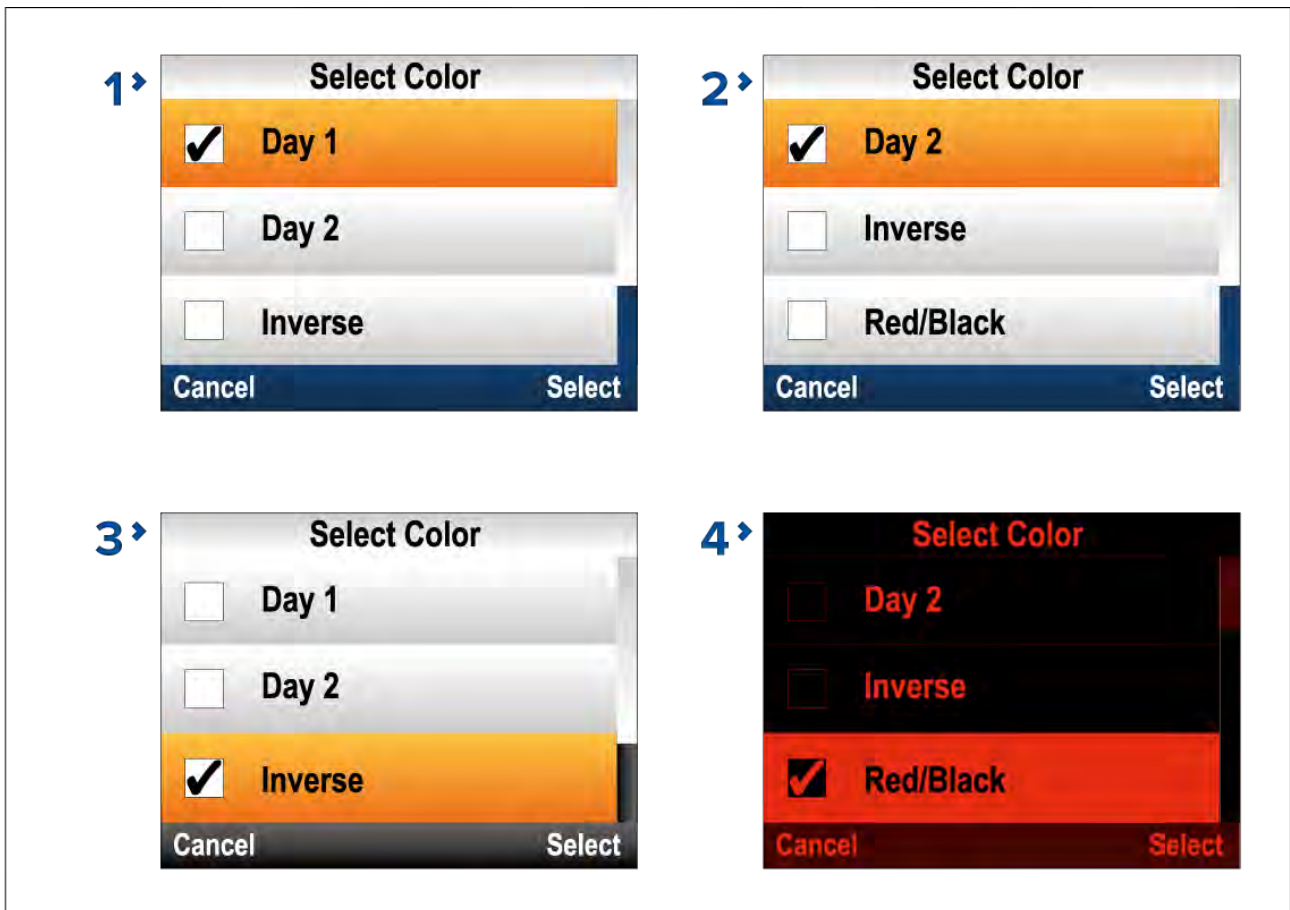


1. With the Shared brightness adjustment page displayed, select **Unshare** to revert to individual display brightness.
2. With the Display brightness page displayed, select **Share** to switch back to shared brightness.

Color schemes

The display's color scheme can be changed.

The available color schemes can be accessed from the **Colors** menu: (**Menu > Display Settings > Colors**)



1. **Day 1** (light background)
2. **Day 2** (blue background)
3. **Inverse**
4. **Red/Black**

Note:

If the display is part of a shared brightness network group the color scheme will change on all displays that support color schemes and are assigned to the same network group.

Setting the display response

Display response determines how quickly the values displayed onscreen are changed when changes occur in the received data. Setting the display response to a low value will dampen data fluctuations to provide a more stable reading. Setting the display response to a higher value will reduce the damping to make readings more responsive.

From the **Display Settings** menu: (Menu > Display Settings)

1. Select **Display Response**.
2. Select the data type:
 - Speed
 - Depth
 - Wind Speed
 - Wind Angle
 - Heading
3. Adjust the value as required.

By default response values are set to 12.

4. Select **Save**.

3.8 Multiple data sources (MDS)

MDS is a Raymarine scheme for managing multiple sources of identical data types on the same network (e.g.: in an MFD network you may have more than one source of GPS / GNSS position data). The MFD will automatically select a preferred data source (device) to use for that data type.

MDS can be used for the following data types:

- Depth
- Speed through water
- Heading
- GPS
- GPS Datum
- Wind
- Time & Date

If you do not want to use the automatically selected data source you can manually select your preferred data source.

Note:

For MDS to be available on your system, all products in the system that report data must be MDS-compliant. The system will report any products that are NOT MDS-compliant. It may be possible 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 for the product and you do NOT want to use the system's preferred data source, you must remove any non-compliant products from the system. You should then be able to select your preferred data source.

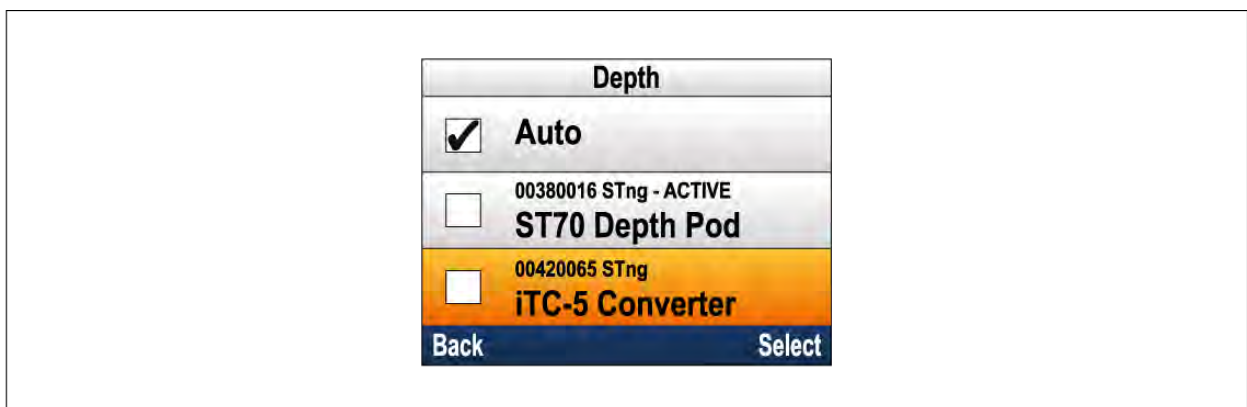
Once you have completed setting up your preferred data sources, you may be able to add non-compliant products back into the system.

Selecting a preferred data source

You can select your preferred data source for data items that can be shown on the display. From the **System Set-up** menu: (**Menu > Set-up > System Set-up**)

1. Select **Data Sources**.
2. Select the Data type.

The unit will now search for and display a list of all sources for the selected data type.



3. Select your preferred data source, or
4. Select **Auto** to allow the system to decide.

'ACTIVE' is displayed next to the data source that is the current source for the data type.

3.9 Software updates

The software running on the product can be updated.

- Raymarine periodically releases software updates to improve product performance and add new features.
- The software on many products can be updated using a connected and compatible multifunction display (MFD).
- Refer to www.raymarine.com/software/ for the latest software updates and the software update procedure for your specific product.

Important:

- To prevent potential software-related issues with your product, always follow the relevant update instructions carefully and in the sequence provided.
- If in doubt as to the correct procedure for updating your product software, refer to your dealer or Raymarine technical support.

Caution: Installing software updates

- The software update process is carried out at your own risk. Before initiating the update process ensure you have backed up any important files.
- Ensure that the unit has a reliable power supply and that the update process is not interrupted.
- Damage caused by an incomplete update is not covered by Raymarine warranty.
- By downloading the software update package, you agree to these terms.

Evolution software updates

The components of the Evolution autopilot system (EV sensor and ACU) must be upgraded in the correct order.

To ensure that the system components are updated in the correct order, use the system software update process, available on:

- LightHouse™ 2 powered MFD running Release 15 or greater
- LightHouse™ 3 powered MFD
- LightHouse™ Sport powered display

If you are using another method or are updating the system components individually then the EV Sensor **MUST** be updated before the ACU.

Note:

- Updating in the wrong order may cause the autopilot to cease to function.
- After successful completion of the software update process the autopilot system will require re-calibration.

Chapter 4: Commissioning - Evolution autopilot system

Chapter contents

- 4.1 Autopilot commissioning — main differences between Evolution™ and SPX systems on page 26
- 4.2 Commissioning on page 26
- 4.3 Using the Dockside wizard on page 27
- 4.4 Adjusting the hard-over time — Evolution on page 29
- 4.5 Compass linearization — Evolution autopilots on page 30
- 4.6 Compass lock on page 32

4.1 Autopilot commissioning — main differences between Evolution™ and SPX systems

The Evolution system provides a number of features which improve upon the commissioning process required by traditional autopilot systems.

- **Built-in heading and attitude sensor** — no additional fluxgate compass is required.
- **Automatic set up** — the rudder gain, counter rudder, manual compass calibration and AutoLearn settings required on older systems are no longer required. This results in a greatly simplified dockside calibration process.

4.2 Commissioning

Commissioning pre-requisites

Before commissioning your autopilot system for the first time, check that the necessary processes have been carried out correctly.

Important:

You should read through and understand the entire commissioning instructions for your autopilot system before beginning the commissioning process.

Before commissioning, check the following:

- all autopilot system components have been installed in accordance with the installation instructions supplied with the system components.
- all autopilot system components have been updated to the latest available software revisions. Check the Raymarine website for available software updates: <http://www.raymarine.co.uk/software>
- a system schematic is available or has been created which includes all system components and required connections.
- the commissioning engineer is familiar with the vessel's hull type, drive type and steering system.

Commissioning steps

The required commissioning steps should be carried out in the correct order using the pilot controller display.

1. Power-up all of the components that make up your autopilot system.
2. Select the relevant vessel hull type for your vessel from the **Vessel Hull Type** menu: **Menu > Set-up > Autopilot Calibration > Vessel Settings > Vessel Hull Type**

Important:

Vessel hull type may have already been selected as part of the start-up wizard.

3. Complete the dockside calibration process., using the **Dockside wizard**:
4. If the system does NOT include a rudder reference transducer then, specify the hard-over time.
5. Complete compass linearization.
6. If required, lock the compass.

Vessel hull type selection

The vessel hull type options are designed to provide optimum steering performance for typical vessel s.

It is important to complete the vessel hull type selection, prior to performing dockside calibration, as it forms a key part of the commissioning process. The vessel hull type options can be accessed at any time, when the autopilot is in Standby from the **Vessel Hull Type** menu: **Menu > Set-up > Autopilot Calibration > Vessel Settings > Vessel Hull Type**.

The option that most closely matches your vessel's hull type and steering characteristics should be selected.

The available hull types are:

- **Power**

- **Power (slow turn)**
- **Power (fast turn)**
- **Sail**
- **Sail (Slow turn)**
- **Sail Catamaran**

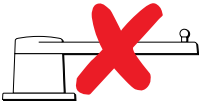
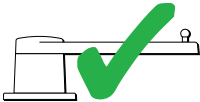
Note: It is important to be aware that steering forces (and therefore rate-of-turn) vary significantly depending on the combination of vessel hull type, steering system, and drive type. The available vessel hull type options are provided for guidance only. You may wish to experiment with the different vessel hull type options, as it might be possible to improve the steering performance of your vessel by selecting a different vessel hull type.

When choosing a suitable vessel hull type, the emphasis should be on a safe and dependable steering response.

4.3 Using the Dockside wizard

The dockside calibration process must be completed before the autopilot system can be used for the first time. The Dockside wizard guides you through the steps required for dockside calibration.

The Dockside wizard contains different steps depending on whether the system includes rudder reference transducer:

| | |
|---|--|
|  |  |
| <p>The following Dockside wizard procedures apply to vessels that do not have a rudder reference transducer:</p> <ul style="list-style-type: none"> • Drive Type selection. • Rudder Limit setting. • Hard-over time setting (Raymarine recommends that this information is specified once the dockside wizard and Rudder Drive check is complete, using the Hard Over Time menu option). • Rudder Drive check. | <p>The following Dockside wizard procedures only apply to vessels that include a rudder reference transducer:</p> <ul style="list-style-type: none"> • Drive Type selection • Rudder alignment (Align Rudder) • Rudder Limit • Rudder Drive check. |

To access the wizard, ensure the autopilot is in standby and then:

1. Select **Dockside Wizard** from the **Commissioning** menu **Menu > Set-up > Autopilot Calibration > Commissioning**.
2. Select **Continue** to initiate the dockside wizard.

Selecting a drive type

Drive type selection is included in the dockside wizard.

With the **Drive Type** menu displayed:

1. Select your drive type.

The drive types available are:

- *Type 1 Linear*
- *Type 2 Linear*
- *Type 2 Hydraulic Linear*
- *Type 3 Hydraulic Linear*
- *I/O Stern*
- *Wheel Drive*
- *Tiller*

- Sport Drive
- Verado
- Rotary Drive Type 1
- Rotary Drive Type 2
- Hydraulic Pump Type 1
- Hydraulic Pump Type 2
- Hydraulic Pump Type 3

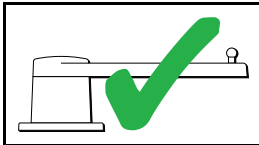
Important:

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

Drive type selection is also available when the autopilot is in standby, from the **Drive Type** menu: **Menu > Set-up > Autopilot Calibration > Vessel Settings > Drive type.**

Aligning the rudder

For systems that have a rudder reference transducer fitted, Rudder alignment is included in the dockside wizard and comes after drive type selection. For systems without a rudder reference transducer fitted rudder alignment is not required.

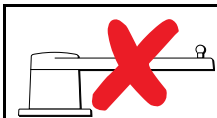


- The following procedure only applies to vessels with a rudder reference transducer.

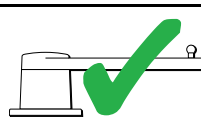
1. Select **Continue**.
2. Center the rudder and select **OK**.
3. Put the rudder all the way to port and press **OK**.
4. Put the rudder all the way to starboard and press **OK**.
5. Center the rudder and select **OK**.
6. Select **Continue** when the task complete message is displayed to progress to the rudder limit page.

Setting the rudder limit

Rudder limit setting is included in the dockside wizard and comes after rudder alignment.



For vessels without a rudder reference transducer
Rudder limit are set to 30 degrees and can be adjusted as required using the **Up** and **Down** buttons or the **Rotary controller**.



For vessels with a rudder reference transducer
The rudder alignment process establishes the rudder limit. The rudder limit will be displayed with a message confirming that the rudder limit has been updated.
If required, the limit can be adjusted using the **Up** and **Down** buttons or the **Rotary controller**.

1. Ensure that the rudder limit is sufficient to prevent the steering mechanism impacting the end stops and placing the steering system under unnecessary load.

Important:

It is recommended that the limit is set to approximately 5 degrees less than the maximum rudder angle.

2. Select **Continue** to move to the next step.

Note:

The rudder limit can be adjusted when the autopilot is in standby, from the **Drive Settings** menu: **Menu > Set-up > Autopilot Calibration > Drive Settings > Rudder Limit.**

Checking the rudder drive

As part of the dockside calibration process, the system will check the drive connection. Once it has completed the check successfully, a message will appear asking if it is safe for the system to take the helm.

During this procedure the autopilot will move the rudder. Ensure it is safe to proceed before pressing OK.

When in dockside calibration mode, with the Motor Check page displayed:

1. Centre and let go of the rudder.
2. Disengage any rudder drive clutch.
3. Select **CONTINUE**.
4. Check it is safe to proceed before selecting **OK**.
For vessels **with** a rudder reference transducer, the autopilot will now automatically move the rudder to port and then starboard.
5. For vessels **without** a rudder reference transducer:
 - i. You will be asked to confirm that the rudder has turned to port by selecting **YES** or **NO**.
 - ii. Select **OK** if it is safe to engage the rudder in the opposite direction.
 - iii. You will be asked to confirm the rudder turned to starboard by selecting **YES** or **NO**.
6. Dockside calibration is now complete, select **CONTINUE**.

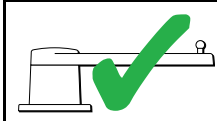
Note:

If you confirmed a “NO” response for the rudder movement to both port and starboard, the wizard will exit. It is possible that the steering system did not move the rudder in any direction, and it will be necessary to check the steering system before completing the Dockside wizard procedure again.

Checking the rudder alignment (Align Rudder)

This procedure establishes port and starboard rudder limits for systems using a rudder reference transducer.

The rudder check forms part of the dockside calibration process.

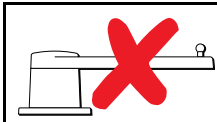


The following procedure only applies to vessels with a rudder reference transducer.

1. Center the rudder and select **OK**.
2. When prompted, turn the rudder hard to port and select **OK**.
3. When prompted, turn the rudder hard to starboard and select **OK**.
4. When prompted, turn the rudder back to the center and select **OK**.

Hard over time

The hard over time setting can be specified as part of the Dockside wizard.



The following information only applies to vessels without a rudder reference transducer.

- **If you already know the hard-over time** for your vessel’s steering system: enter this time during the Dockside wizard procedure.
- **If you do NOT know the hard-over time** for your vessel’s steering system: skip this step during the Dockside wizard procedure by selecting **SAVE**, then proceed to [Checking the rudder drive](#) section in this document to complete the Dockside wizard procedure. Once the wizard is complete, proceed to [5.8 Adjusting the hard-over time — SmartPilot and SPX](#) in this document for information on how to calculate and adjust the hard-over time.

4.4 Adjusting the hard-over time — Evolution

On vessels without a rudder reference transducer, it is important to set a Hard Over Time.

Before attempting to follow this procedure ensure you have read and understood the Rudder Check warning provided in this document.

To estimate your hard over time follow the steps below:

1. With the autopilot in **Standby**, manually turn the rudder / engine full to port. (For vessels with power steering the engine should be running when turning the rudder.)
2. Engage **Auto** mode.
3. Press the **+10** and **+1** buttons at the same time (p70/p70s) or use the **Rotary** (p70R/p70Rs) to alter your locked heading by 90 degrees. Use a stop watch to time the movement of the rudder / engine.
4. Estimate how long it would take to move the rudder from full port to full starboard. This estimate is your **Hard Over Time**.
5. Enter this estimate as your Hard Over Time. The Hard Over time setting can be accessed from the Drive Settings menu: **Menu > Set-up > Autopilot Calibration > Drive Settings > Hard Over Time**.
6. After setting your Hard Over Time, observe your autopilot's behavior and if required, make small adjustments to the Hard Over Time value until a satisfactory result is achieved.



Warning: Rudder check

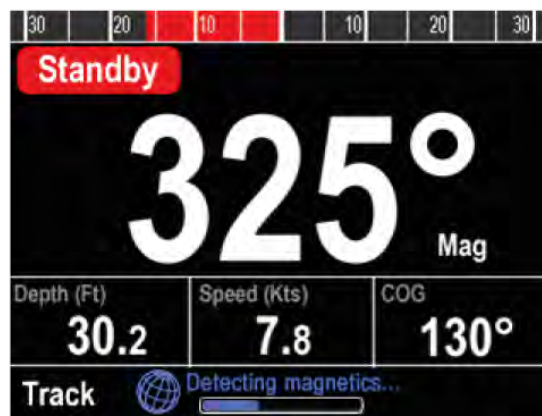
If no rudder reference has been fitted you **MUST** ensure that adequate provision is made to prevent the steering mechanism from impacting the end stops.

4.5 Compass linearization — Evolution autopilots

The EV unit's internal compass needs to compensate for local and the Earth's magnetic fields. This is achieved using an automatic process known as linearization.

Initial linearization

When the EV unit is first installed and powered-up (or after a factory reset or compass restart) linearization is required. A progress bar is displayed to indicate linearization is required.



The linearization process will start automatically after your vessel has turned approximately 100° at a speed of between 3 –15 knots. Linearization requires no user input, however at least a 270° turn is required before linearization can complete. The progress bar will fill to indicate progress, the progress bar will turn Red if the process is paused or otherwise interrupted. Time it takes to complete the linearization will vary according to the characteristics of the vessel, the installation environment of the EV unit, and the levels of magnetic interference at the time of conducting the process. Sources of significant magnetic interference may increase the time required to complete the linearization process. Examples of such sources include:

- Marine pontoons
- Metal-hulled vessels
- Underwater cables

You can speed-up the linearization process by completing a full 360° turn (at a speed of 3 – 15 knots). You can also restart the linearization process at any time by selecting the **Restart Compass** menu item.

Once the initial linearization is completed the Deviation page is displayed and the current maximum compass deviation is shown.



Compass deviation

If the reported deviation is 45° or higher, it is highly recommended that the EV unit is moved and re-installed in a location which is subject to less magnetic interference. After the linearization process has successfully completed you can check the current deviation value at anytime from the diagnostics pages.

Note:

If “- -” is displayed as the Deviation value, it means that linearization has not been successfully completed yet.

Check the compass heading data

As part of the autopilot system commissioning process, it is recommended that you check the compass heading value displayed, against a good known heading source on various headings.

Note:

Once the linearization process has completed, it is possible that the heading value may have a slight offset of 2 to 3 degrees. This is common where installation space is limited, and the EV unit cannot be properly aligned to the vessel's longitudinal axis. In this case, it is possible to manually adjust the Compass Offset value.

Note:

Do NOT rely on the reported heading until compass linearization and alignment is complete.

System monitoring and adaptation

To ensure optimum performance, after the initial linearization process is complete the EV continues to monitor and adapt the compass linearization to suit current conditions.

If the conditions for linearization are less than ideal, the automatic linearization process temporarily pauses until conditions improve again. The following conditions can cause the linearization process to temporarily pause:

- Boat speed < 3 knots.
- Boat speed > 15 knots.
- Rate-of-turn is too slow.
- Significant magnetic interference is present.

Accessing the compass deviation indicator

1. Select **MENU**.
2. Select **Set-up**.
3. Select **Diagnostics**.
4. Select **About Pilot**.

The details related to the pilot diagnostics are displayed.

5. Scroll down to the bottom of the list to view the entry for **Deviation**.

Note: If “- -” is displayed as the Deviation value, it means that linearization has not been successfully completed yet.

Adjusting the Compass Offset

With the pilot in Standby:

1. From the **Vessel Settings** menu: (**Menu > Set-up > Autopilot Calibration > Vessel Settings**).
2. Select **Compass Offset**.
3. Use the +/- **10** button (p70/p70s) or **ROTARY** control (p70R/p70Rs) to adjust the compass offset as appropriate.

*The **Compass Offset** can be adjusted between -10° and $+10^{\circ}$.*

4.6 Compass lock

Once you are satisfied with the compass accuracy, you can lock the setting to prevent the system from completing a further automatic linearization in the future.

This feature is particularly useful for vessels in environments that are exposed to strong magnetic disturbances on a regular basis (such as offshore wind farms or very busy rivers, for example). In these situations it may be desirable to use the Compass lock feature to disable the continuous linearization process, as the magnetic interference may build a heading error over time.

Note: The compass lock may be released at any time, to allow the compass continual monitoring and adaptation to re-commence. This is particularly useful if planning a long voyage. The earth's magnetic field will change significantly from one geographical location to another, and the compass can continually compensate for the changes, ensuring you maintain accurate heading data throughout the voyage.

Locking the compass

Follow the steps below to lock the compass linearization.

From the Commissioning menu: (**Menu > Set-up > Autopilot Calibration > Commissioning**)

1. Select **Compass Lock**.
2. Select **On**.

The compass linearization is now locked.

Chapter 5: Commissioning - SPX and SmartPilot systems

Chapter contents

- 5.1 SPX and SmartPilot autopilot installation on page 34
- 5.2 Pilot response on page 34
- 5.3 Commissioning on page 34
- 5.4 Powering on and off on page 35
- 5.5 Using the Set-up Wizard on page 35
- 5.6 Dockside calibration on page 36
- 5.7 Dealer settings on page 38
- 5.8 Adjusting the hard-over time — SmartPilot and SPX on page 38
- 5.9 Sea trial calibration on page 38
- 5.10 Checking autopilot operation on page 41

5.1 SPX and SmartPilot autopilot installation

For information on installing and connecting an SeaTalk^{ng} SPX autopilot system or a SeaTalk SmartPilot autopilot system, refer to the installation instructions that accompanied your course computer.

5.2 Pilot response

The response level controls the relationship between course keeping accuracy and the amount of helm/ drive activity. Range is from 1 to 9.

Making temporary changes to pilot response

Pilot response is set up during commissioning of the SmartPilot system however you can make temporary changes to the pilot response at any time using the **Pilot response** menu: **Menu > Pilot Response**.

The Pilot response level can be adjusted from level 1 to 9.

- **Levels 1 to 3** — Minimize the amount of pilot activity. This conserves power, but may compromise short-term course-keeping accuracy.
- **Levels 4 to 6** — Should give good course keeping with crisp, well controlled turns under normal operating conditions.
- **Levels 7 to 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.

To adjust Pilot response follow the steps below:

1. From the Main menu highlight **Pilot response** and press **Select**.
2. Use the **UP** and **DOWN** buttons to change the response value to the required level.
3. Press **Save** to save the response value.

5.3 Commissioning

Commissioning pre-requisites

Before commissioning your autopilot system for the first time, check that the necessary processes have been carried out correctly.

Important:

You should read through and understand the entire commissioning instructions for your autopilot system before beginning the commissioning process.

Before commissioning, check the following:

- all autopilot system components have been installed in accordance with the installation instructions supplied with the system components.
- all autopilot system components have been updated to the latest available software revisions. Check the Raymarine website for available software updates: <http://www.raymarine.co.uk/software>
- a system schematic is available or has been created which includes all system components and required connections.
- the commissioning engineer is familiar with the vessel's hull type, drive type and steering system.

Commissioning process

- Check you have adhered to commissioning pre-requisites
- Initial power on and set-up
- Dockside calibration (Dealer Settings on SeaTalk systems)
- Set hard over time (non-rudder reference systems only)
- Sea trial calibration

- System checks

5.4 Powering on and off

The p70s / p70Rs automatically powers on when power is supplied to the network it is connected to, unless it has been powered off using the **Standby** button.

1. If the display has been powered off using the standby button, press and hold the **Standby** button for approximately 2 seconds, to power the display on.
2. To power the display off, press and hold the **Standby** button for approximately 5 seconds. After 1 second a 3 second count down is displayed.

Note:

The display cannot be powered off when the autopilot is engaged.

5.5 Using the Set-up Wizard

The set-up wizard guides you through the steps for setting important preferences, such as preferred language and correct vessel type.

The Set-up Wizard contains 3 steps: Language Selection, Vessel Hull Type selection and Welcome Screen. When powering the Pilot Controller for the first time, in an unconfigured system, the Set-up Wizard is displayed automatically, and the first 3 steps listed below will not be required.

With the pilot in **Standby** mode:

1. Select **Menu**.
2. Select **Set-up**.
3. Select **Set-up Wizard**.
4. Select the required language.
5. Select the required vessel type.
The welcome screen will now be displayed and your choices have been saved.
6. Select **OK** to complete the Set-up Wizard.

Vessel hull type selection

The vessel hull type options are designed to provide optimum steering performance for typical vessels.

It is important to complete the vessel hull type selection as part of the initial set-up wizard, as it forms a key part of the autopilot calibration process. You can also access the options at any time with the pilot in Standby by selecting **MENU > Set-up > Autopilot Calibration > Vessel Settings > Vessel Hull Type**.

As a general guide, select the option that most closely matches your vessel type and steering characteristics. The options are:

- **Race Sail.**
- **Sail Cruiser.**
- **Catamaran.**
- **Workboat.**
- **RIB.**
- **Outboard Speedboat**
- **Inboard Speedboat**
- **Power Cruiser 1 (<12 kts)**
- **Power Cruiser 2 (<30 kts)**
- **Power Cruiser 3 (>30 kts)**
- **Sport Fishing**
- **Pro Fishing**



It is important to be aware that steering forces (and therefore rate-of-turn) vary significantly depending on the combination of vessel type, steering system, and drive type. Therefore, the available vessel hull type options are provided for guidance only. You may wish to experiment with the different vessel hull type options, as it might be possible to improve the steering performance of your vessel by selecting a different vessel type.

When choosing a suitable vessel type, the emphasis should be on safe and dependable steering response.

Important: If you change the vessel type **after** completing the Dockside calibration process (using the Dockside wizard), all commissioning settings will be reset to default settings, and you will need to complete the Dockside calibration process again.

5.6 Dockside calibration

The dockside calibration process must be completed before your SPX autopilot system can be used for the first time. The Dockside wizard guides you through the steps required for dockside calibration. The Dockside wizard contains different steps depending on whether you have a rudder reference transducer fitted to your vessel:

| | |
|---|--|
|  |  |
| <p>The following Dockside wizard procedures only apply to vessels without a rudder reference transducer:</p> <ul style="list-style-type: none"> • Drive Type selection. • Rudder Limit setting. • Rudder Drive check. | <p>The following Dockside wizard procedures only apply to vessels with a rudder reference transducer:</p> <ul style="list-style-type: none"> • Drive Type selection. • Align Rudder (rudder alignment). • Rudder Limit setting. • Rudder Drive check. |

On older SeaTalk SmartPilot systems the Dockside wizard is named Dealer Settings. Please refer to [5.7 Dealer settings](#) for calibration details.

Using the Dockside wizard

To access the dockside wizard follow the steps below:

Ensure the pilot is in **Standby**.

1. Select **Menu**.
2. Select **Set-up**.
3. Select **Autopilot Calibration**.
4. Select **Commissioning**.
5. Select **Dockside Wizard**.
6. Follow the on-screen instructions.

Note: You can cancel the Dockside wizard at any time by pressing the **Standby** button.

Selecting a drive type

Drive type selection is included in the dockside wizard.

With the **Drive Type** menu displayed:

1. Select your drive type.

The drive types available are:

- Type 1 Linear
- Type 2 Linear
- Type 2 Hydraulic Linear
- Type 3 Hydraulic Linear
- I/O Stern

- Wheel Drive
- Tiller
- Sport Drive
- Verado
- Rotary Drive Type 1
- Rotary Drive Type 2
- Hydraulic Pump Type 1
- Hydraulic Pump Type 2
- Hydraulic Pump Type 3

Important:

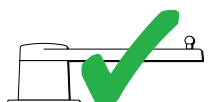
If your drive type is not listed, contact your Raymarine dealer for advice.

Drive type selection is also available when the autopilot is in standby, from the **Drive Type** menu: **Menu > Set-up > Autopilot Calibration > Vessel Settings > Drive type.**

Checking the rudder alignment (Align Rudder)

This procedure establishes port and starboard rudder limits for systems using a rudder reference transducer.



The rudder check forms part of the dockside calibration process.

| | |
|--|--|
|  | <p>The following procedure only applies to vessels with a rudder reference transducer.</p> |
|--|--|

1. Center the rudder and select **OK**.
2. When prompted, turn the rudder hard to port and select **OK**.
3. When prompted, turn the rudder hard to starboard and select **OK**.
4. When prompted, turn the rudder back to the center and select **OK**.

Rudder Limit setting

Rudder limit setting is included in the dockside wizard and comes after rudder alignment.

| | |
|--|---|
|  |  |
| <p>For vessels without a rudder reference transducer Rudder limit are set to 30 degrees and can be adjusted as required using the Up and Down buttons or the Rotary controller.</p> | <p>For vessels with a rudder reference transducer The rudder alignment process establishes the rudder limit. The rudder limit will be displayed with a message confirming that the rudder limit has been updated. If required, the limit can be adjusted using the Up and Down buttons or the Rotary controller.</p> |

Checking the rudder drive

As part of the dockside calibration process, the system will check the drive connection. Once it has completed the check successfully, a message will appear asking if it is safe for the system to take the helm.

During this procedure the autopilot will move the rudder. Ensure it is safe to proceed before pressing OK.

When in dockside calibration mode, with the Motor Check page displayed:

1. Centre and let go of the rudder.
2. Disengage any rudder drive clutch.
3. Select **CONTINUE**.

4. Check it is safe to proceed before selecting **OK**.
For vessels **with** a rudder reference transducer, the autopilot will now automatically move the rudder to port and then starboard.
5. For vessels **without** a rudder reference transducer:
 - i. You will be asked to confirm that the rudder has turned to port by selecting **YES** or **NO**.
 - ii. Select **OK** if it is safe to engage the rudder in the opposite direction.
 - iii. You will be asked to confirm the rudder turned to starboard by selecting **YES** or **NO**.
6. Dockside calibration is now complete, select **CONTINUE**.

Note:

If you confirmed a “NO” response for the rudder movement to both port and starboard, the wizard will exit. It is possible that the steering system did not move the rudder in any direction, and it will be necessary to check the steering system before completing the Dockside wizard procedure again.

5.7 Dealer settings

The dockside calibration wizard is only available on a SeaTalk^{ng} 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.

5.8 Adjusting the hard-over time — SmartPilot and SPX

On vessels without a rudder reference transducer, it is important to set a Hard Over Time.

Before attempting to follow this procedure ensure you have read and understood the Rudder Check warning provided in this document.

To estimate your hard over time follow the steps below:

1. Adjust your Rudder Gain setting to the maximum value, making a note of the original value. The Rudder Gain setting can be accessed from the Drive Setting menu: **Menu > Set-up > Autopilot Calibration > Drive Settings > Rudder Gain**.
2. With the autopilot in **Standby**, manually turn the rudder / engine full to port. (For vessels with power steering the engine should be running when turning the rudder.)
3. Engage **Auto** mode.
4. Press the **+10** and **+1** buttons at the same time (p70/p70s) or use the **Rotary** (p70R/p70Rs) to alter your locked heading by 90 degrees, use a stop watch to time the movement of the rudder / engine.
5. Estimate how long it would take to move the rudder from full port to full starboard. This estimate is your **Hard Over Time**.
6. Enter this estimate as your Hard Over Time. The Hard Over time setting can be accessed from the Drive Settings menu: **Menu > Set-up > Autopilot Calibration > Drive Settings > Hard Over Time**.
7. Change your Rudder Gain back to its original value.
8. After setting your Hard Over Time, observe your autopilot’s behavior and if required, make small adjustments to the Hard Over Time value until a satisfactory result is achieved.



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.

5.9 Sea trial calibration

Before you can use the autopilot open water checks are required. The water must be calm, with light or no wind. Leave plenty of room to manoeuvre. The Sea Trial wizard guides you through the steps required for Sea trial calibration.

The Sea trial wizard includes the following steps:

- Swing compass
- Align compass to GPS
- Align compass manually
- Auto Learn.

You can access the Sea trial wizard at any time from the Commissioning menu: **Menu > Set-up > Autopilot calibration > Commissioning.**

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

Note: The Sea trial wizard can be cancelled at any time by pressing the **Standby** button.



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.

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 re-site 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: If you have a system without a source of GPS data, 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. As part of the align to GPS process, the autopilot system will compare the average heading with the average COG (Course Over Ground) value reported by the source of GPS data, and set an offset value so that the heading matches the COG value provided by the GPS.

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, then press the **CONTINUE** button when displayed, to begin the AutoLearn process.

You can cancel the Sea trial calibration process at any time by pressing **STANDBY**.

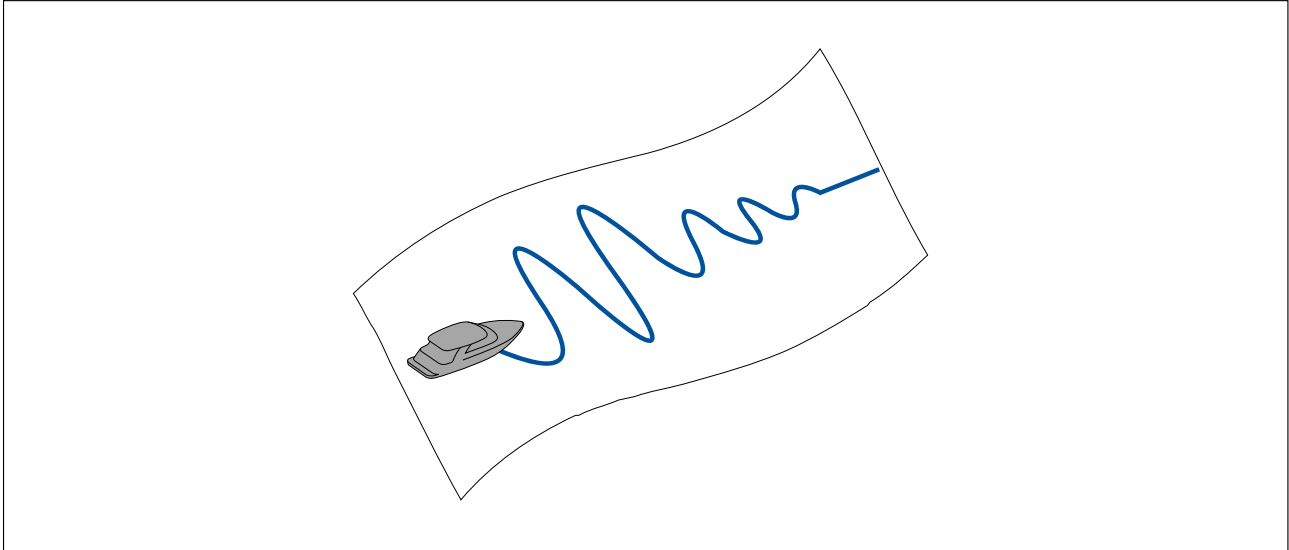
Aligning compass manually

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**.

Auto Learn

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 100 m wide and 500 m ahead.



Caution: Autolearn

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

Performing Auto learn

Auto learn is available from the Sea trial wizard, or from the **Commissioning menu**.

Maintain a normal cruising speed (at least 3 kts) throughout the auto learn process.

1. Ensure there is sufficient free water in front of the vessel and select **continue**.
A warning message is displayed.
2. Select **Continue** or press the **Ok** button.
A warning message will be displayed letting you know that the vessel will zigzag and make Sudden SHARP TURNS.
3. Remove your hands from the wheel and press **Auto** to begin.
During this procedure the autopilot will progress through the required steps.
4. If 'PASS' is displayed then select **Continue** or press the **Ok** button to return to manual helm control.
The autopilot will be placed in Standby mode. You have successfully completed the commissioning process for your SmartPilot system.
5. If 'FAIL' is displayed after completion of the Auto learn process then select **Continue** or press the **Ok** button.
The Auto learn retry message is displayed.
6. You can retry the Auto learn process by selecting **Yes** or to cancel select **No**.

Note: The Sea trial wizard can be cancelled at any time by pressing the **Standby** button.

Caution: System changes

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

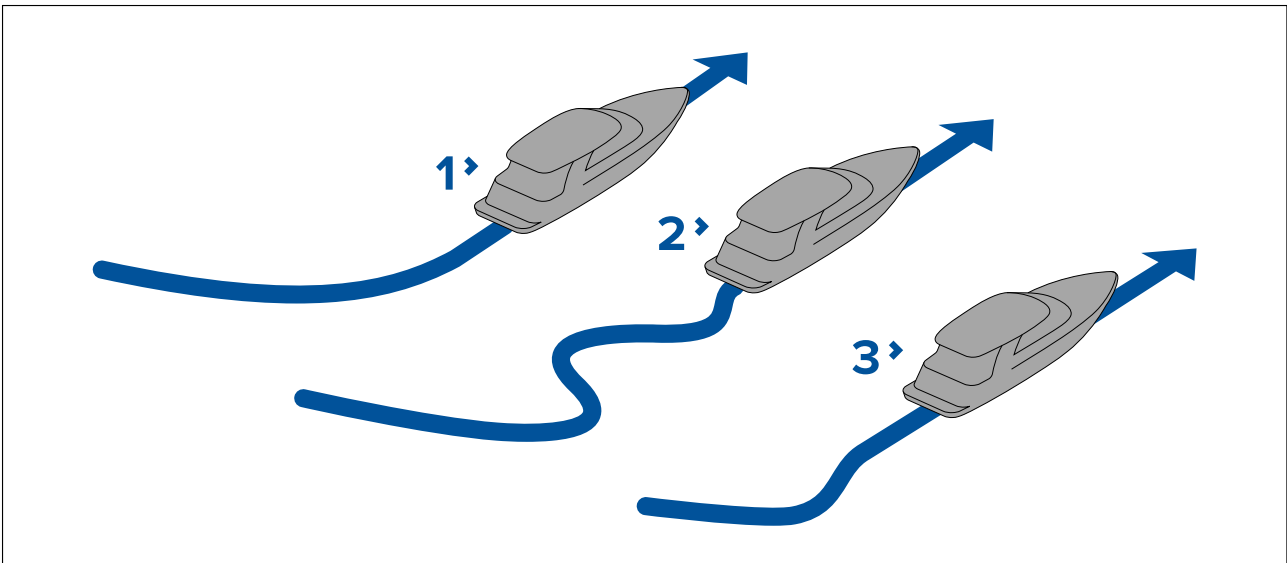
5.10 Checking autopilot operation

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:



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 over steering. A higher counter rudder setting results 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** and if necessary engage the autopilot.

4. 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 overshoot before returning slowly to the course.
- 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.

5. If necessary, adjust the counter rudder setting.

*Counter Rudder is available from the **Drive Settings** menu: **Menu > Set-up > Autopilot Calibration > Drive Settings > Counter Rudder.***

Rudder Damping

If the autopilot is 'hunting' (i.e. continuously moving the steering backwards and forwards by small amounts) when trying to position the rudder, the rudder damping setting will require adjustment to minimize this.

Increasing the rudder damping value reduces hunting. The rudder damping value should be increased 1 level at a time until the autopilot stops hunting. Always ensure the lowest acceptable value is used.

If required the Rudder Damping setting can be adjusted from the Drive Settings menu: **Menu > Set-up > Autopilot Calibration > Drive Settings > Rudder Damping.**

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: Pilot modes

Chapter contents

- 6.1 Auto on page 44
- 6.2 Mode menu on page 45
- 6.3 Patterns on page 45
- 6.4 Track mode on page 46
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- 6.6 Power steer on page 53
- 6.7 Jog steer (tiller pilots only) on page 54
- 6.8 Shortcut key on page 54

6.1 Auto

Caution: Maintain a permanent watch

Automatic course control makes it easier to steer your vessel, but it is NOT a substitute for good seamanship. ALWAYS maintain a permanent watch by the helm.

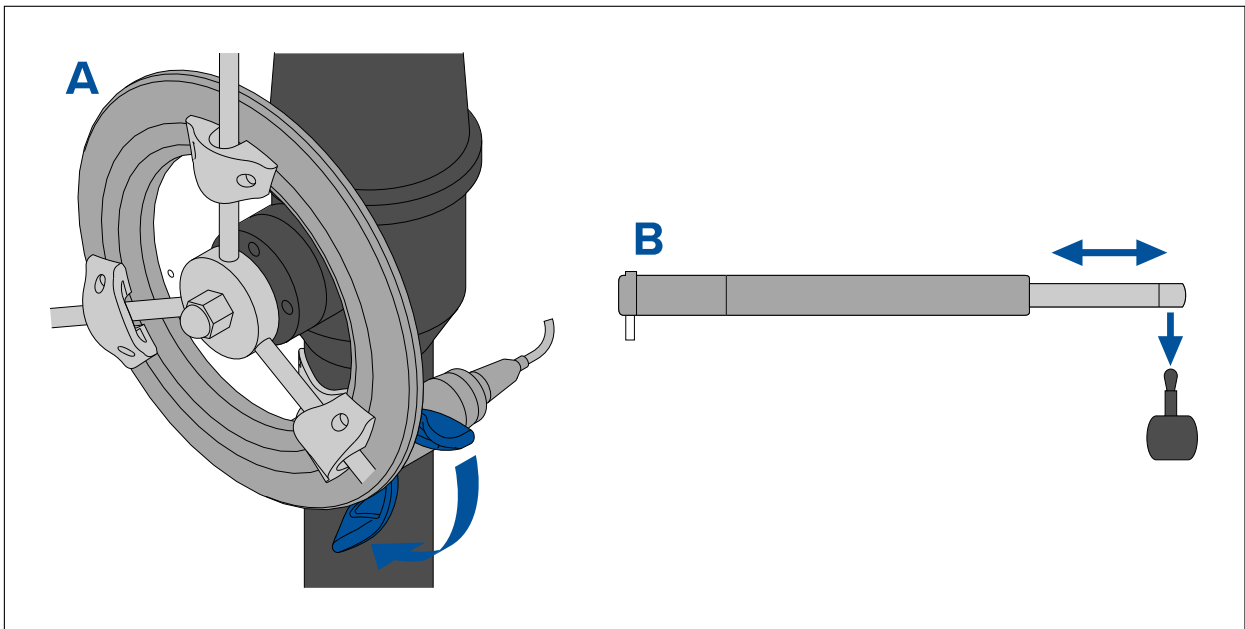
Automatically steering to a heading

1. Steady the vessel on the required heading.
2. For Wheel and Tiller drive systems see below instructions for engaging the autopilot.
 - **A – Wheel Pilot:** Engage the wheel drive clutch by rotating the clutch lever clockwise (so the lever fully engages onto the locating pip).

Important: Always reach around (not through) the wheel to operate the wheel pilot's clutch lever.

Always reach around (not through) the wheel to operate the wheel pilot's clutch lever.

- **B – Tiller Pilot:** Place the pushrod end over the tiller pin. If necessary, extend or retract the pushrod using the **-1, +1, -10,+10** buttons or the **Rotary** control.



3. Press **AUTO**.
The autopilot is now in Auto mode and will steer to the chosen locked heading.

Changing course in auto mode

To change course whilst in AUTO mode:

1. Use the **-1** and **-10** button, or turn the rotary controller anticlockwise to change the vessel's course to port.
Pressing **-1** button will increment the course to port by 1° and **-10** will increment by 10°.
Turning the rotary controller 1 click anticlockwise will increment the course to port by 1° .
2. Use the **+1** and **+10** buttons, or turn the rotary controller clockwise to change the vessel's course to starboard.

Pressing **+1** button will increment the course to starboard by 1° and **+10** will increment by 10°.

Turning the rotary controller 1 click clockwise will increment the course to Starboard by 1° .

e.g. pressing the **-1** button four times, or turning the rotary 4 clicks anticlockwise will result in a 4° course change to port.

Disengaging the autopilot (Standby mode)

The autopilot can be disengaged by following the steps below.

1. Press **Standby**.
2. For Wheel and Tiller drive systems see below instructions for disengaging the autopilot to return to manual steering
 - **Wheel Pilot:** Disengage the wheel drive clutch by rotating the clutch lever anti-clockwise (so the lever disengages fully from the locating pip).
 - **Tiller Pilot:** Remove the drive unit from the tiller pin. If necessary, extend or retract the pushrod using the **-1, +1, -10,+10** buttons or the **Rotary** control.

On wheel drive systems, always make sure that the clutch is fully disengaged before you leave the vessel.

6.2 Mode menu

Pilot modes are accessed from the **Mode** menu. The available modes are determined by the autopilot system and the selected Vessel Hull Type.

The following modes are available:

Evolution™ autopilots

- **Pattern** — Available for Power vessels.
- **Track** — Available for all vessels.
- ⁽¹⁾**Wind vane** — Available for Sailing vessels.
- ⁽²⁾**Power Steer** — Available on p70R / p70Rs and joystick only.

SPX SmartPilot autopilots

- **Pattern** — Available for Motor and Fishing vessels.
- **Track** — Available for all vessels.
- ⁽¹⁾**Wind vane** — Available for Sailing vessels.
- ⁽²⁾**Power Steer** — Available on p70R / p70Rs and joystick only.

Note:

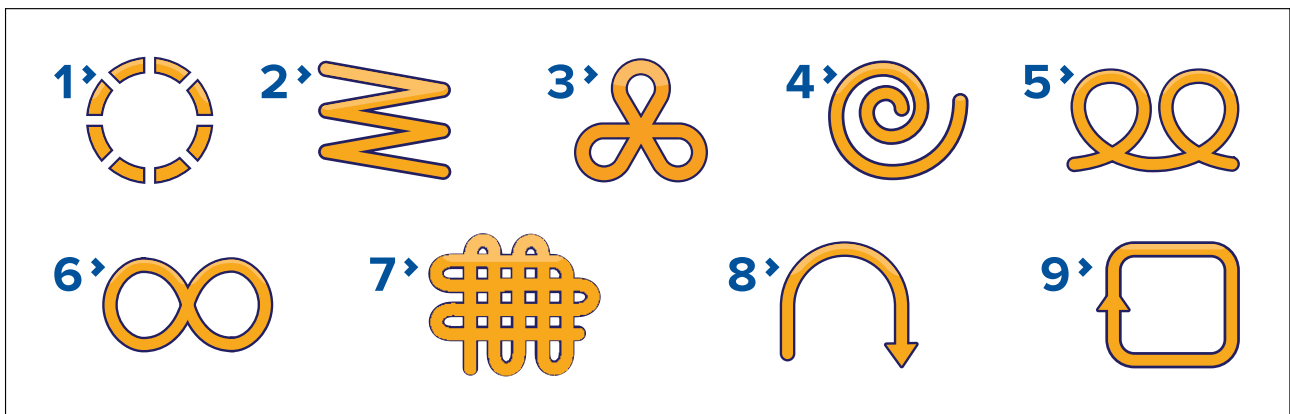
1. Wind vane mode is only available if there is a connect source of wind data.
2. Power steer mode is only available on vessels fitted with a rudder reference transducer.

The mode menu also provides a shortcut key option that enables a mode to be assigned to the **Left Soft** button (The default option is Track).

6.3 Patterns

Fishing patterns are available, that can be used with their default settings or adjusted to your own preference. Fishing patterns require GNSS (GPS) data to be available on your system.

The following patterns are available:



1. **Circle** — The direction and radius of the pattern can be adjusted.
2. **Zig Zag** — The direction, angle and length of the pattern can be adjusted.
3. **Cloverleaf** — The direction and radius of the pattern can be adjusted.
4. **Spiral** — The direction, radius and increment of the pattern can be adjusted.
5. **Circle against** — The direction, radius and distance of the pattern can be adjusted.
6. **Figure 8** — The direction and radius of the pattern can be adjusted.
7. **Pattern search** — The direction, width, height, width increment and height increment of the pattern can be adjusted.
8. **180 turn** — The direction and radius of the pattern can be adjusted.
9. **Box search** — The direction, width and height of the pattern can be adjusted.

Using a fishing pattern

1. Press the **RIGHT SOFT** button to open the menu.
2. Using the **UP** and **DOWN** buttons highlight **Mode** and press **SELECT**.
3. Using the **UP** and **DOWN** buttons highlight **Pattern** and press **SELECT**.
4. Using the **UP** and **DOWN** buttons highlight the fishing pattern you wish you use and press **SELECT**.
5. The pattern settings screen shall be displayed, showing the parameters currently set for the selected pattern. If you want to change any of the parameters:
 - i. Select the parameter you want to change, then press **EDIT**.
 - ii. Use the **UP** and **DOWN** buttons to set the value you want, then press **SAVE** to save the setting and return to the Pattern settings screen.
 - iii. Repeat steps i and ii as necessary, for the other parameters.
6. Where appropriate, engage the wheel pilot clutch or attached the tiller pushrod.
7. With the pattern settings screen displayed, press **AUTO**. The autopilot then steers the boat over the fishing pattern you selected.

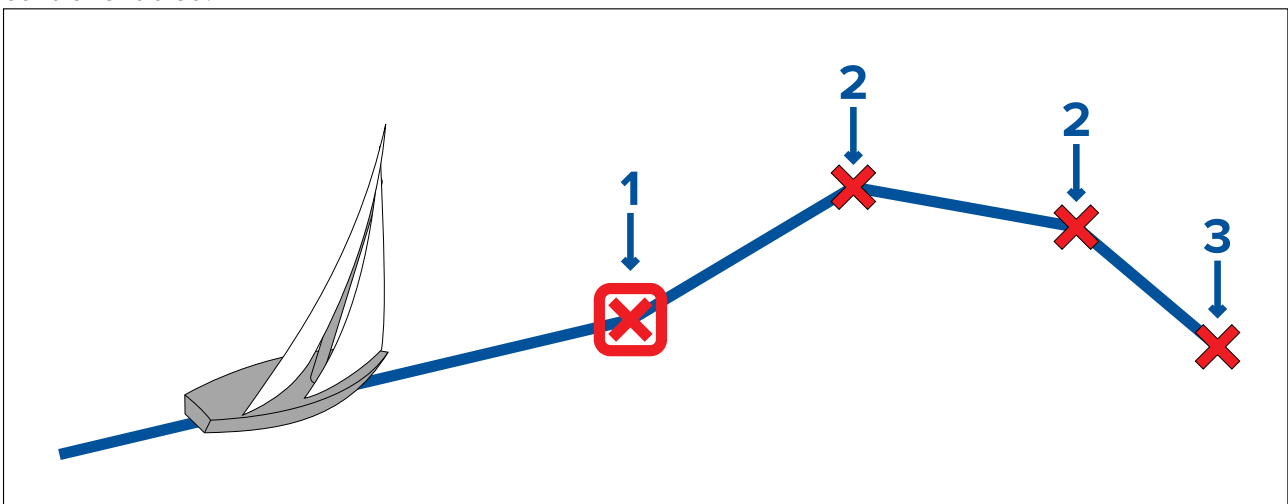
To return to manual steering at any time, press **STANDBY** and then, where appropriate, disengage the wheel pilot clutch or tiller pushrod.

The 2 most commonly used fishing patterns are available from the **Mode** menu as **Pattern 1** and **Pattern 2**, you may select and then complete steps 5 and 6 above to quickly use your favorite patterns.

6.4 Track mode

In Track mode, the autopilot automatically steers your vessel to a target waypoint or along a route plotted on your MFD. It makes any course corrections necessary to keep your vessel on course, automatically compensating for tidal streams and leeway.

Track mode is available only if you have connected the autopilot to a suitable MFD that has autopilot control enabled.



1. Current goto / waypoint.

2. Subsequent waypoints in a route.
3. Final waypoint in route.

Using track mode

Start with your connected chartplotter following a route.

From the menu:

1. Select **Mode**.
2. Select **Track**.

The display will show the bearing to the next planned waypoint, and the direction in which the vessel will turn onto the track line.

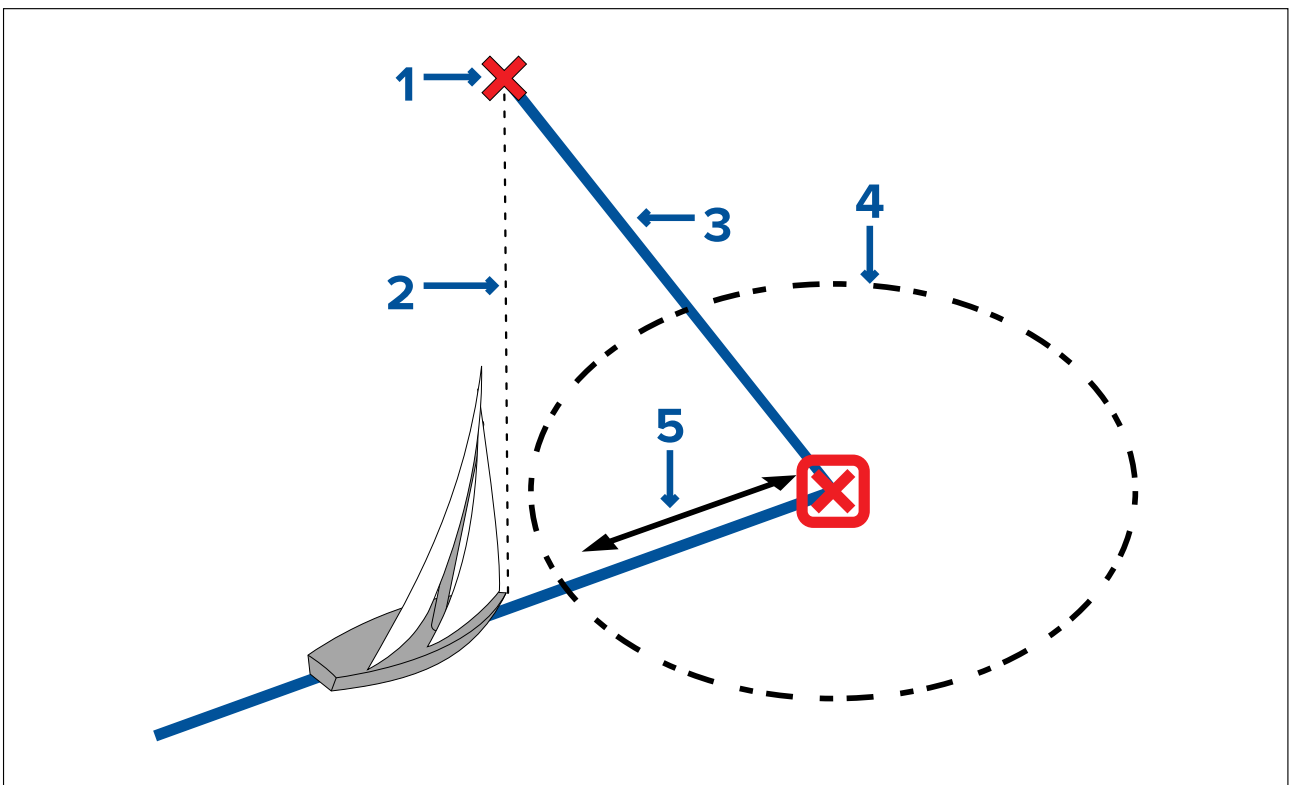
3. If it is safe for the vessel to turn onto the new course, select **Track**.

The autopilot turns your vessel onto the new course with the display showing the heading required for the correct track.

Note: If the vessel is more than 0.3 nm from the track, the Large Cross Track Error warning will sound.

Waypoint arrival circle

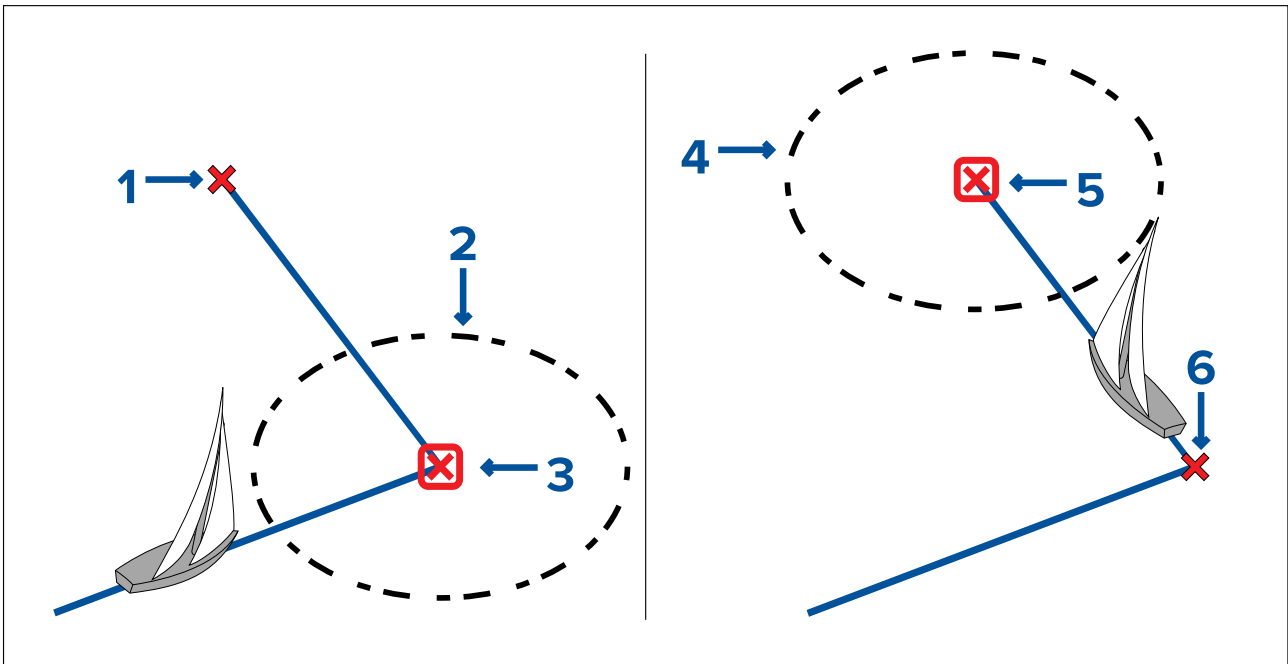
The Waypoint arrival circle is an imaginary boundary line placed around a waypoint which, when reached, triggers the waypoint arrival alarm. As the alarm is triggered by the waypoint arrival circle and not the waypoint your vessel may still be some distance from the actual waypoint when the alarm sounds. The size of the waypoint arrival circle can be customized, if the arrival circle is changed so that the radius is 0.3 nm or greater from the waypoint this can result in a cross track error alarm.



1. Next waypoint
2. Bearing to next waypoint
3. Track line
4. Waypoint arrival circle
5. Cross track error

Waypoint arrival

As the vessel arrives at the target waypoint's arrival circle the MFD will select the next target waypoint in the route and transmit this to the autopilot. A Waypoint advance warning is displayed that will identify the bearing to the next waypoint and the direction the vessel will turn to acquire the new track.



1. Next waypoint
2. Waypoint arrival circle
3. Target waypoint
4. Next waypoint arrival circle
5. Next target waypoint
6. Previous waypoint

Waypoint advance warning

The autopilot activates the Waypoint Advance warning in track mode whenever the target waypoint name changes. This occurs when:

- you select automatic acquisition by pressing **Track** from Auto.
- you request waypoint advance by pressing **Track** for 1 second in track mode (with SeaTalk navigators only).
- the boat arrives at the target and the navigator accepts the next waypoint.
- you activate the Man Overboard (MOB) function.

When the warning sounds, the autopilot continues on its current heading but displays:

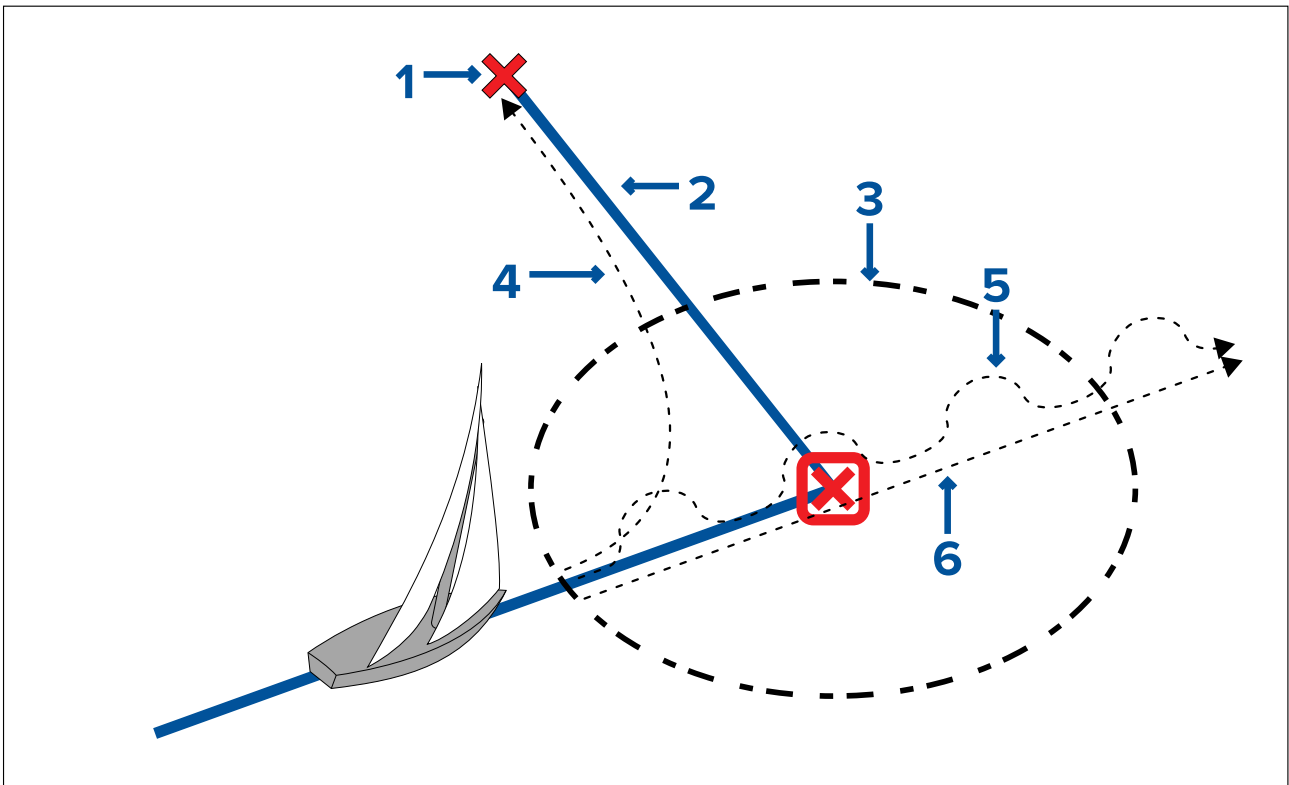
- the bearing to the next waypoint.
- the direction the boat will turn to take up that bearing.

Arriving at a waypoint

As you approach each waypoint, an alarm sounds and the waypoint arrival notification is displayed. The notification includes options so you can choose how to proceed.

When the waypoint arrival alarm is triggered:

1. Check that it is safe to turn onto the new heading.
2. If it is NOT safe or you do not want to advance to the next waypoint you can:
 - i. Select **Cancel** or **Auto** to remain on the same heading, or
 - ii. Select **Standby** to return to manual steering.
3. If it is safe select **TRACK** to accept the new heading and proceed to the next waypoint.



1. Next waypoint.
2. Track line.
3. Waypoint arrival circle.
4. **Track** — Track to next waypoint.
5. **Standby** — Manual helm control.
6. **Auto** or **Cancel** — Maintain current locked heading.

Note:

If you do not press **Track** to accept the Waypoint advance, the autopilot will maintain the current heading and continue sounding the warning.

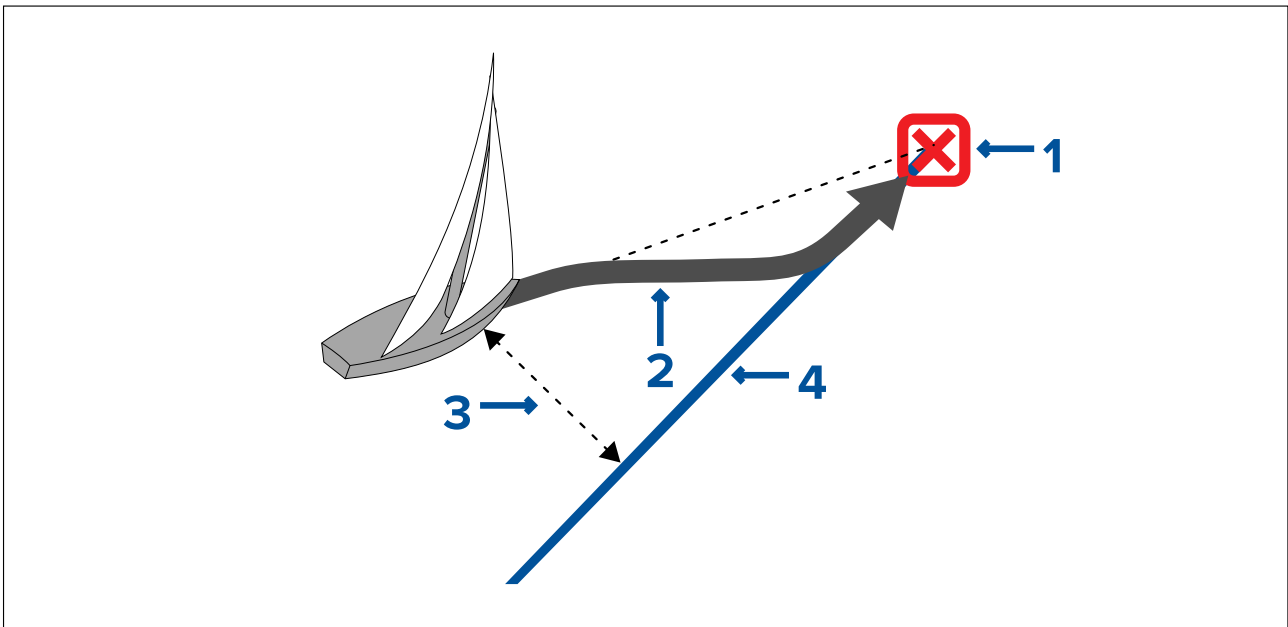
Cross track error

Cross track error (XTE) is the distance between the current position and a planned track line.

There are a number of reasons why you may have a cross track error (XTE), for example:

- Pressing the track button at a position some distance from the route.
- Course change to avoid an obstacle.
- Waypoint arrival under certain conditions.

If the cross track error is greater than 0.3 nm, the SmartPilot will sound the Large cross track error alarm and show whether you are to the port (Pt) or starboard (Stb) of the planned track.



1. Target waypoint
2. Course correction that will initially turn away from the actual waypoint in order to reacquire the track line.
3. Cross track error
4. Track line

Note:

The cross track error alarm will continue to display and sound until it is reduced to less than 0.3 nm.

Caution: Cross track error correction

When returning to TRACK mode the autopilot will correct the XTE in order to keep to the defined track leg. The direction of turn may not coincide with the bearing to waypoint and may be different from that expected.

Route completion

The autopilot displays the Route Complete warning when you have reached the last waypoint on a route.

Note: The 'Route Complete' alarm only sounds and displays in conjunction with a multifunction display.

Manual course change

To avoid obstacles in your path, in track mode you can manually alter your course and then resume track mode.

In track mode:

1. Make the required course change using the appropriate **-1**, **+1**, **-10**, **+10** or using the **Rotary controller**.
2. Once clear of the obstacle select **Track** to resume track mode.

Leaving track mode

To leave Track mode:

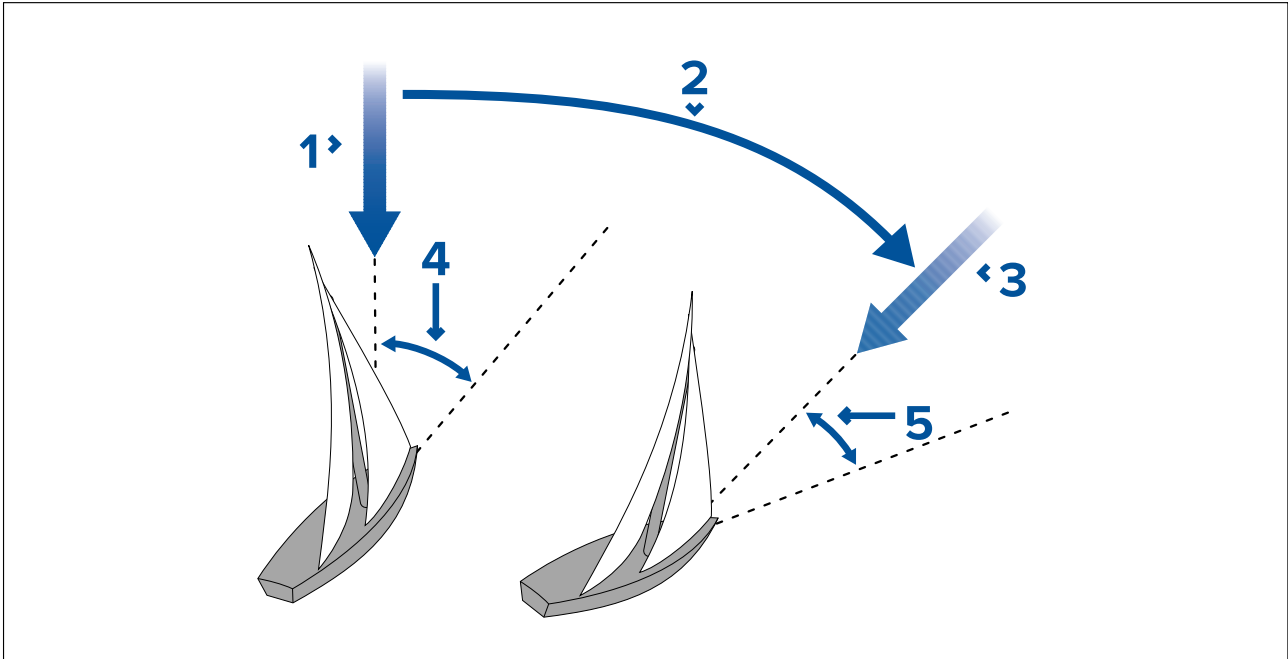
1. Press **AUTO** to return to Auto mode (autopilot control), or.
2. Press **STANDBY** to return to Standby mode (manual steering).

6.5 Wind vane mode

When the autopilot is in Wind Vane mode it uses the wind angle as the primary heading reference. As changes in the true or apparent wind angle occur, it adjusts the locked heading to maintain the original wind angle.

Note:

Wind vane mode is only available when a sailing vessel has been selected as the vessel hull type.



1. Initial wind direction
2. Wind shift
3. New wind direction
4. Relative wind angle
5. Vessel turns to maintain same relative wind angle

You can only select **Wind Vane** mode if your autopilot is receiving suitable wind data.

Autopilots can maintain a course relative to either an Apparent or True wind angle. The default setting is Apparent wind. If required, you can change this to True wind from the **Wind Type** menu.

Using wind vane mode

You can select **Wind vane** mode from either **STANDBY** or **AUTO** mode:

1. Steady the vessel onto the required wind angle.
2. Select **Wind vane** mode:
 - i. Wind vane mode can be selected by pressing the **Auto** and **Standby** buttons together, or
 - ii. selecting **Wind vane** mode from the modes menu: **Menu > Mode > Wind vane**.

This will enable Wind vane mode and lock the current wind angle. The display shows the locked heading (e.g. 128°) and the wind angle (e.g. WIND 145P indicates a wind angle of 145° to port).

3. The autopilot will then adjust the vessel's heading to maintain the locked wind angle.

Adjusting the locked wind angle

1. You can adjust the locked wind angle by using the **-1**, **+1**, **-10** and **+10** buttons, or the **ROTARY** controller to change course. For example, to bear away by 10° when the boat is on a starboard tack:
 - i. press -10 to turn the boat 10° to port – the locked wind angle and locked heading will both change by 10°.
 - ii. the autopilot will then adjust the locked heading as required to maintain the new wind angle.

Note: Because turning the vessel affects the relationship between the true and apparent wind angles, you should only use this method to make minor adjustments to the wind angle. For major changes, return to **STANDBY** mode, steer onto the new heading, then re-select **Wind Vane** mode.

Leaving wind vane mode

To leave wind vane mode:

1. Press **AUTO** to return to Auto mode (autopilot control), or.
2. Press **STANDBY** to return to Standby mode (manual steering).

Wind Shift Alarm

Evolution autopilot

If the autopilot detects a wind shift of more than 30° for 60 seconds it will trigger the Wind Shift Alarm.

SPX and SmartPilot

If the autopilot detects a wind shift of more than 15° it will trigger the Wind Shift Alarm.

Enabling and disabling the Wind Shift alarm

The Wind Shift alarm is turned on by default, you can enable and disable the Wind Shift alarm at anytime.

In Wind Vane Mode:

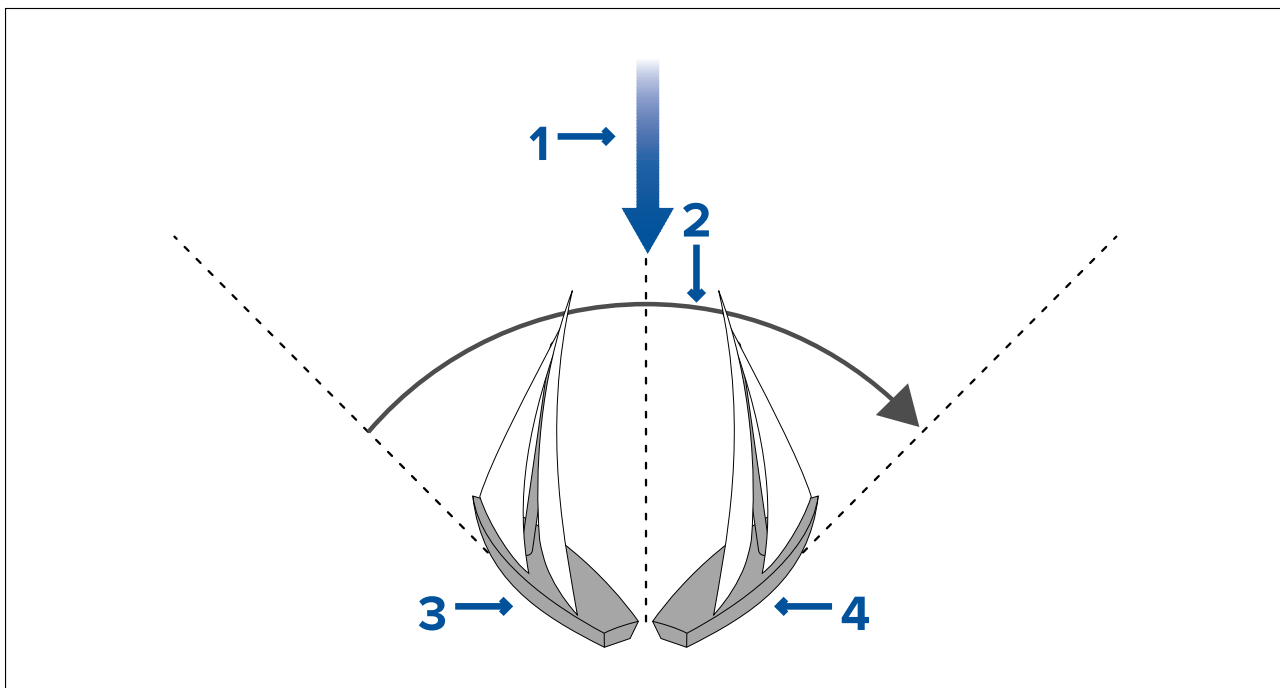
1. Select **Sail Boat Settings** from the **Autopilot Calibration** menu: (**Menu > Set-up > Autopilot Calibration > Sail Boat Settings**).
2. Select **Wind Shift Alarm**.
3. Select Off to disable the alarm or On to enable the alarm.

Responding to the wind shift warning

1. To cancel the warning, and retain the existing wind angle and heading, press **Cancel**.
2. Alternatively, to cancel the warning and return to the previous heading:
 - i. adjust the locked wind angle using the **-1**, **+1**, **-10** and **+10** buttons or the **Rotary** controller.
 - ii. press **Standby** to return to manual steering, steer onto the required heading, and press **Cancel** to return to Wind Vane mode with the new wind angle.

Using AutoTack in wind vane mode

The autopilot has a built in automatic tack facility (AutoTack) that turns your vessel "relative" to the wind angle you're currently on, and it tacks the vessel to put you on the opposite relative wind angle.



1. Starting position

2. Tack
3. Wind direction
4. Final position

AutoTack is always relative to wind angle and is not adjustable.

In Wind vane mode:

1. Using a p70/ p70s:
 - i. Press the **-1** and **-10** buttons at the same time to Tack to port.
 - ii. Press the **+1** and **+10** buttons at the same time to Tack to starboard.
2. Using a p70R/ p70Rs:
 - i. Select **Tack Port** from the main menu to Tack to port.
 - ii. Select **Tack Starboard** from the main menu to Tack to Starboard.

When you AutoTack in Wind vane mode, the vessel turns through the AutoTack angle. The autopilot will then trim the heading to mirror the locked wind angle from the previous tack.

Operating hints for wind vane mode

- Always trim your sails carefully to minimize the amount of standing helm.
- Reef the headsail and mainsail a little early rather than too late.
- In Wind Vane mode the autopilot will react to long-term wind shifts, but will not correct for short-term changes such as gusts.
- In gusty and unsteady inshore conditions, it is best to sail a few degrees further off the wind so that changes in wind direction can be tolerated.
- Avoid using Auto Tack in conditions where the wind may shift suddenly.

Caution: Allow time

Allow time for course changes

Caution: Major course changes

When making major course changes, the trim on the boat may change substantially. Due to this, the autopilot may take some time to settle accurately onto the new course.

Accidental gybes

The gybe inhibit feature stops the vessel from turning away from the wind if you accidentally AutoTack in the wrong direction.

Note: For the gybe inhibit feature to work, the autopilot needs suitable wind data.

With gybe inhibit set to **Prevent Gybe**:

- you will be able to perform an AutoTack through the wind.
- the autopilot will prevent the boat from performing an AutoTack away from the wind.

With gybe inhibit set to **Allow Gybe**:

- you can perform an AutoTack through or away from the wind.

Note: Gybe inhibit feature can be changed from the Sail Boat Settings menu: **Menu > Set-up > Autopilot Calibration > Sail Boat Settings > Gybe Inhibit** .

6.6 Power steer

Power steer mode enables you to use the rotary controller of the p70Rs or a connected joystick to directly steer the vessel on manual heading.

Power steer has 2 options:

- Proportional— The rudder will behave in proportion to the movement of the rotary control or joystick.
- Bang Bang (Joystick only)— The rudder will move, and stay in the direction the joystick is moved.

Engaging power steer mode

To engage **Power steer** mode:

1. Go to the **Mode menu** found in **Main menu > Mode**.
2. Highlight **Power steer** and press **SELECT**.

You can change the type of steering at any time i.e. Proportional or Bang Bang by going to the **Power steer** settings in the **Drive settings** menu: **Main menu > Set up > Auto pilot calibration > Drive settings > Power steer**.

Note: In order to use Bang Bang mode a connected joystick is required, the p70Rs rotary will only perform in Proportional mode.

6.7 Jog steer (tiller pilots only)

If you have a tiller drive installed on a SeaTalk network, your vessel you can use the pilot controller to operate the ram in Jog steer mode.

Jog steer mode enables you to use the pilot controllers **-1**, **+1**, **-10**, **+10** buttons, or the **ROTARY** controller to move the ram in and out to aid connecting and disconnecting the ram.

Note: Jog Steer can only be used whilst your vessel is in **STANDBY**.

Using jog steer (tiller drives only)

1. Ensure your vessel pilot is in **STANDBY** mode.
2. Use the **-1** and **-10** buttons, or turn the rotary controller anticlockwise to retract the ram.
3. Use the **+1** and **+10** buttons, or turn the rotary controller clockwise to extend the ram.

6.8 Shortcut key

When in pilot view you can assign pilot modes to the **LEFT SOFT** button as a shortcut depending on which vessel type has been set up.

The following pilot modes can be assigned as shortcuts:

- Track (default) — All vessels
- Pattern — Power and fishing vessels
- Power steer — All vessels (Rotary only)
- Wind vane — Sailing vessels

Assigning the shortcut key

In order to assign a pilot mode as a shortcut mapped to the **LEFT SOFT** button follow the steps below:

1. Navigate to the **Shortcut** menu: **Menu > Mode > Shortcut**.
2. Select the required pilot mode.
3. Press **SAVE**.

Chapter 7: Pilot views

Chapter contents

- 7.1 Available pilot views on page 56
- 7.2 Graphical view on page 56
- 7.3 Large view on page 57
- 7.4 Standard view on page 58
- 7.5 Multiple view on page 59
- 7.6 2D View on page 60
- 7.7 Setting the pilot view on page 60
- 7.8 Setting up data boxes on page 61

7.1 Available pilot views

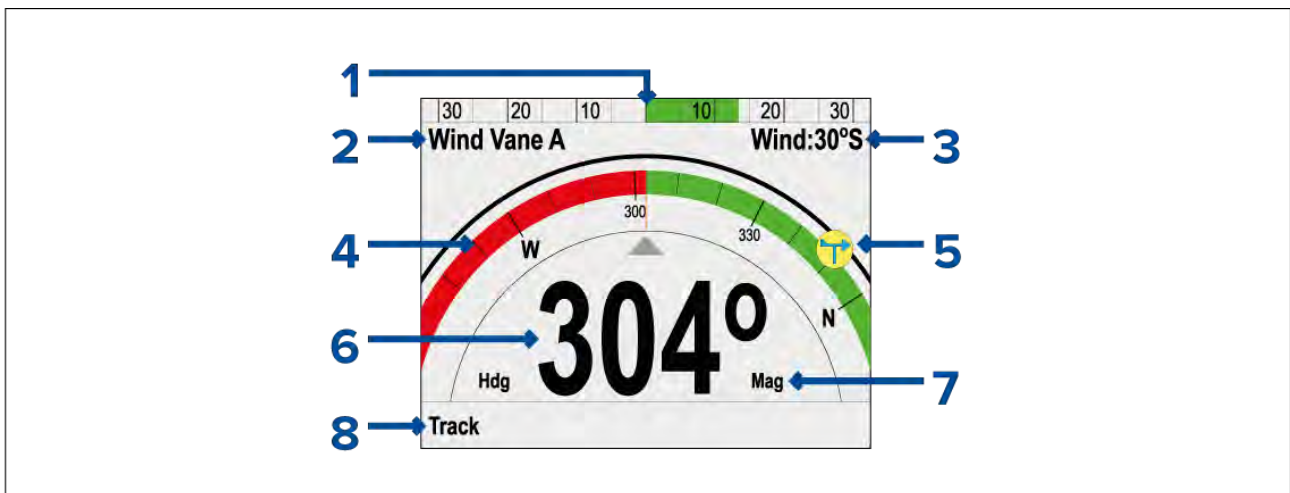
Pilot views are used to display course and system data on the pilot controller's display screen.

The Available Pilot views are:

- Graphical
- Large (default)
- Standard
- Multiple
- 2D View

7.2 Graphical view

The Graphical view displays a (partial) compass.

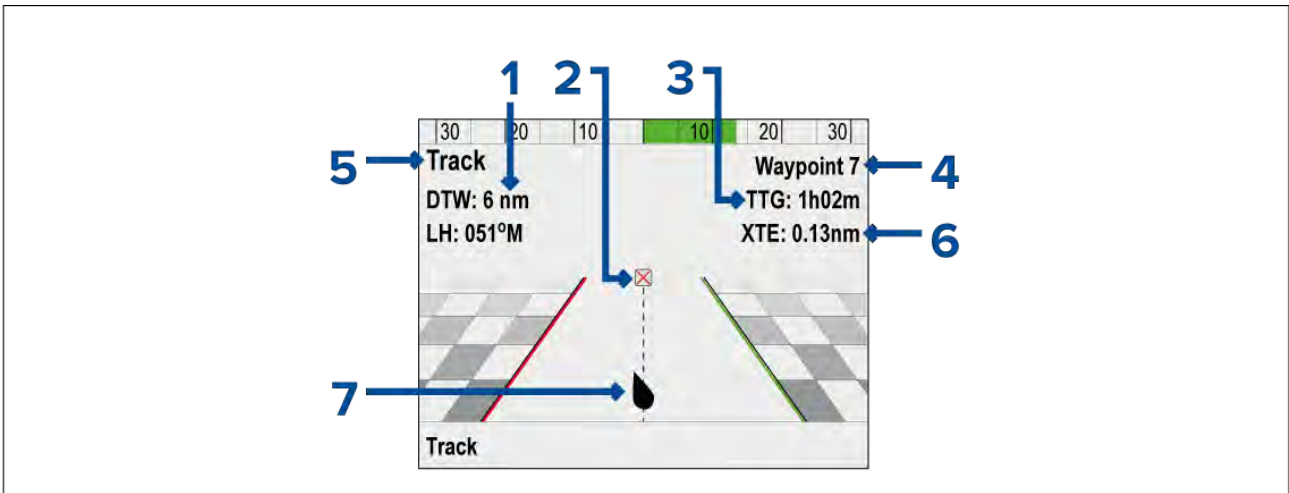


1. Rudder position
2. Pilot Mode
3. Mode status:
 - Locked wind angle — Wind Vane mode.
 - Pattern symbol — Pattern mode.
 - Power Steer symbol — Power Steer mode.
4. Partial compass
5. Wind direction indicator
6. Heading:
 - Current heading — Standby and Power Steer mode.
 - Locked heading — Auto , Wind Vane mode and Pattern mode.
7. Heading type:
 - Magnetic
 - True

Note: The heading type is determined by the language selected during the Set-up Wizard.

8. Shortcut button (Left Soft button)
 - Track (default)
 - Pattern
 - Wind Vane

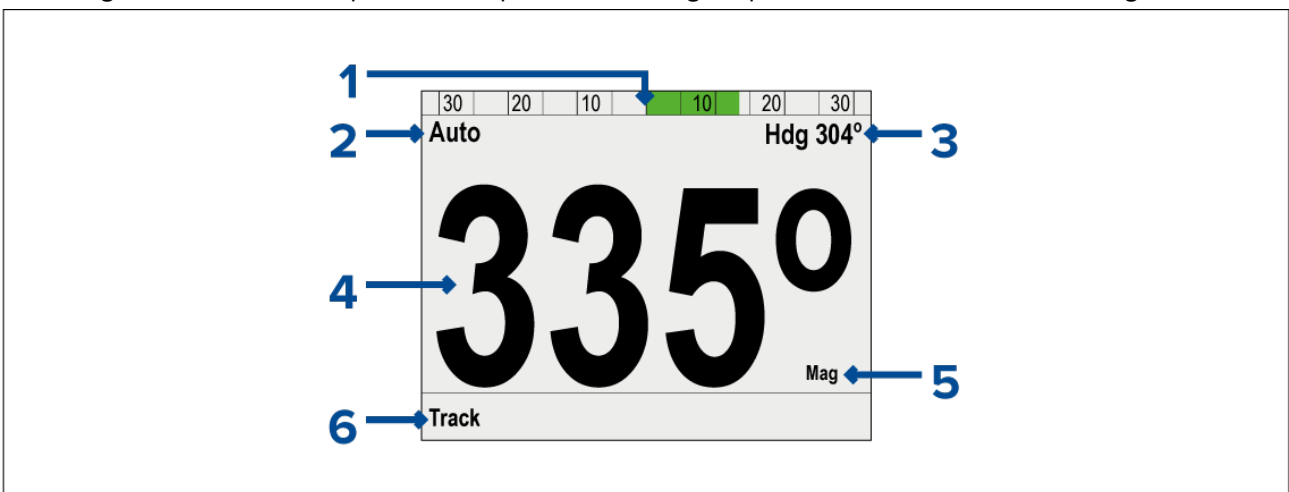
Initiating Track when the pilot view is set to Graphical view will display the rolling road view.



1. DTW (Distance To Waypoint)
2. Destination waypoint
3. TTG (Time To Go)
4. Destination waypoint name
5. Locked Heading
6. XTE (Cross Track Error)
7. Vessel position

7.3 Large view

The Large view has been optimized to provide the largest possible sized text for heading data.

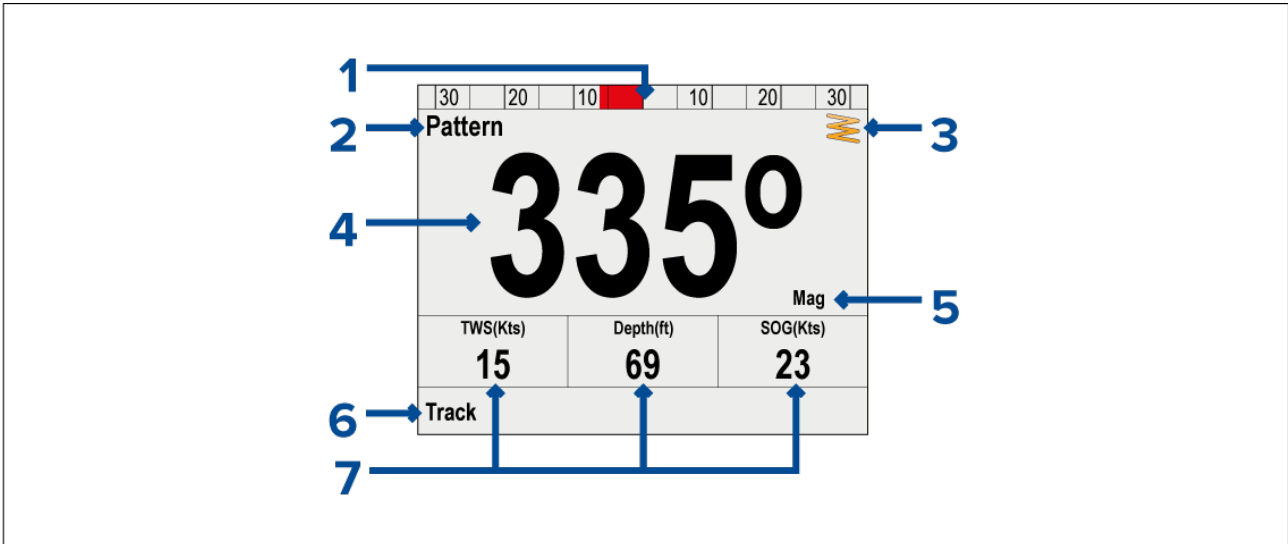


1. Rudder position
2. Pilot mode
3. Mode related info:
 - Current Heading (In Auto)
 - Destination waypoint name (In Track mode)
 - Locked wind angle (In Wind vane mode)
 - Pattern symbol (In Pattern mode)
 - Power Steer symbol (In Power steer mode)
4. Heading:
 - Current Heading — (In Standby and Power steer modes)
 - Locked Heading — (In Auto, Track, Wind vane and Pattern modes)
5. Heading type (Magnetic or True)
6. Shortcut button (Left soft button):

- Track (default)
- Pattern
- Wind Vane

7.4 Standard view

The Standard view provides large-sized heading data combined with data boxes which provide further information.

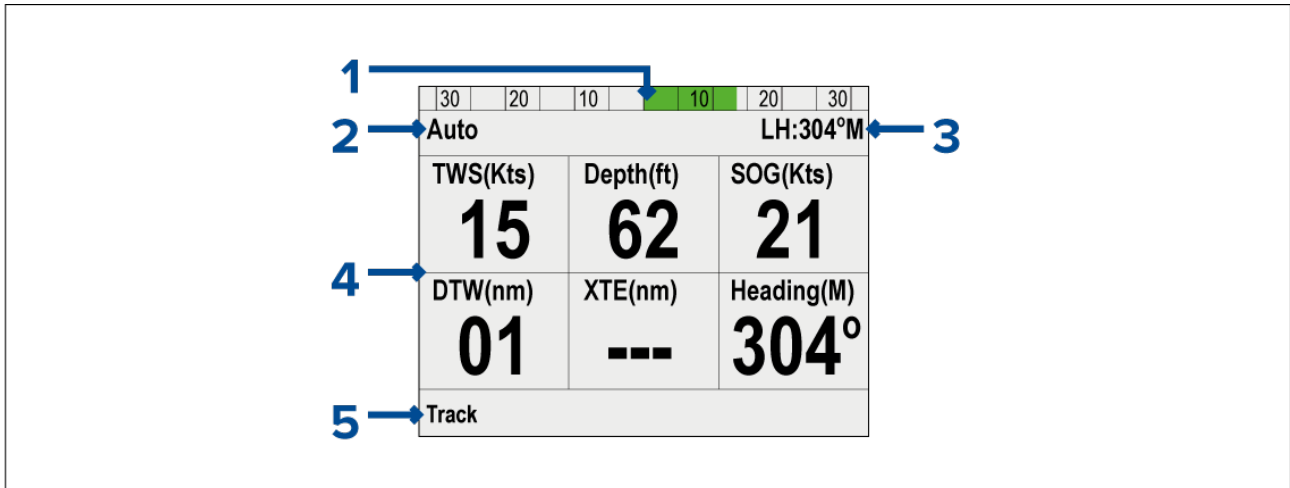


1. Rudder position
2. Pilot mode
3. Mode related info:
 - Current Heading (In Auto)
 - Destination waypoint name (In Track mode)
 - Locked wind angle (In Wind vane mode)
 - Pattern symbol (In Pattern mode)
 - Power Steer symbol (In Power steer mode)
4. Heading:
 - Current Heading — (In Standby and Power steer modes)
 - Locked Heading — (In Auto, Track, Wind vane and Pattern modes)
5. Heading type (Magnetic or True)
6. Shortcut button (Left soft button):
 - Track (default)
 - Pattern
 - Wind Vane
7. Databoxes:
 - TWS (default) (True Wind Direction)
 - Depth (default)
 - SOG (default) (Speed Over Ground)

Note: Data items can be customized from the Pilot view menu: **Menu > Pilot view > Data Boxes**

7.5 Multiple view

The Multiple view includes multiple data boxes for displaying information.



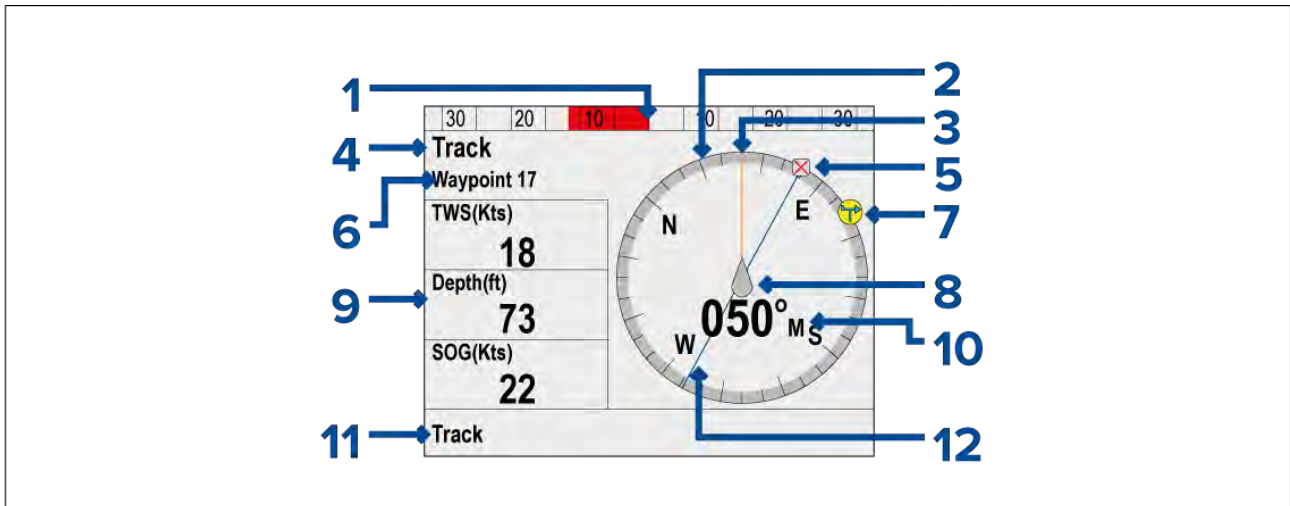
1. Rudder position
2. Mode related info:
 - Current Heading (In Auto)
 - Destination waypoint name (In Track mode)
 - Locked wind angle (In Wind vane mode)
 - Pattern symbol (In Pattern mode)
 - Power Steer symbol (In Power steer mode)
3. Databoxes:
 - TWS (default) (True Wind Direction)
 - Depth (default)
 - SOG (default) (Speed Over Ground)
 - DTW (default) (Distance To Waypoint)
 - XTE (default) (Cross Track Error)
 - Heading (default)

Note: Data items can be customized from the Pilot view menu: **Menu > Pilot view > Data Boxes**

4. Shortcut button (Left soft button):
 - Track (default)
 - Pattern
 - Wind Vane

7.6 2D View

The 2D view includes a full compass dial and data boxes for displaying information.



1. Rudder position
2. Compass
3. Heading line
4. Pilot Mode
5. Destination waypoint
6. Mode related info:
 - Current Heading (In Auto)
 - Destination waypoint name (In Track mode)
 - Locked wind angle (Wind vane mode)
 - Pattern symbol In Pattern mode)
 - Power Steer symbol (In Power steer mode)
7. Wind direction indicator
8. Vessel position indicator
9. Databoxes:
 - TWS (default) (True Wind Direction)
 - Depth (default)
 - SOG (default) (Speed Over Ground)

Note: Data items can be customized from the Pilot view menu: **Menu > Pilot view > Data Boxes**

10. Heading:
 - Current heading — Standby and Power Steer mode.
 - Locked heading — Auto , Wind Vane mode and Pattern mode.
11. Shortcut button (Left Soft button)
 - Track (default)
 - Pattern
 - Wind Vane
12. Track line

7.7 Setting the pilot view

To set the pilot view to your desired layout:

1. Go to the **Pilot view** menu: **Main menu > Pilot view**.
2. Highlight and select **View type**.

3. Highlight the required view:
 - Graphical
 - Large
 - Standard
 - Multiple
 - 2D
4. Press **SELECT** to save the view as default.

7.8 Setting up data boxes

The Standard, Multiple and 2D Pilot views include data boxes which you can customize to display different data.

With your chosen Pilot view displayed:

1. Select **Menu**.
2. Select **Pilot View**.
3. Select **Data Boxes**.
4. Select the Data box that you want to change the data for.
A list of available data is displayed.
5. Select the relevant data type from the list.

Data items

The following data types are available which can be displayed in the data boxes:

- **Heave**
- **Depth**
- **XTE** (Cross Track Error)
- **DTW** (Distance to waypoint)
- **BTW** (Bearing to waypoint)
- **AWA** (Apparent wind angle)
- **AWS** (Apparent wind speed)
- **TWS** (True wind speed)
- **TWA** (True wind angle)
- **COG** (Course Over ground)
- **SOG** (Speed Over ground)
- **Speed** (Speed Through Water)
- **Log**
- **Trip**
- **Sea Temp**
- **Time**
- **Date**
- **Rate of turn**
- **Heading**

Chapter 8: Pilot controller alarms

Chapter contents

- [8.1 Pilot alarms on page 64](#)

8.1 Pilot alarms

Pilot alarms are generated by the connected autopilot. They are also transmitted on the **SeaTalk^{ng}** network.

The following alarms can be displayed on the Pilot controller:

Calibration alarms

- **Calibration required** — Indicates that the autopilot has not been fully calibrated. Initiated in Standby mode, for a few seconds after initial power-up. Resolve by performing Dockside and Seatrial calibration.
- **Detecting magnetics** — Compass linearization required.
- **Magnetic fields detected** — Initial linearization complete, further linearization will be performed in the background.
- **Turn rate too high** — Indicates an excessive rate of turn whilst linearizing the fluxgate compass. Initiated during calibration. To resolve reduce the vessel's rate of turn.

Navigation alarms

- **Auto release** — Triggered when the user has taken back control of the steering whilst the autopilot is engaged (e.g.: Auto, Track mode etc.) using the fly-by-wire steering wheel. The autopilot will drop to standby and the alarm will time out after 10 seconds.
- **Large cross track error** — Indicates cross track error (XTE) is greater than 0.3 nm. Alarm is triggered in Track mode or on entry to Track mode from any other mode. To resolve try:
 - Manually steering back on course and entering track mode again.
 - Reset XTE on the multifunction display.
 - Changing autopilot settings.
- **Loss of waypoint data** — Indicates the source of the waypoint data (i.e.: MFD) has been lost. The autopilot will drop out of track mode and into auto mode and continue on last locked heading.
- **No navigation data** — Indicates absence of one of the following primary control data items:
 - Compass – Auto, Track & Wind modes.
 - XTE – Track mode.
 - Wind angle – Wind vane mode.
- **Off course** — The off course alarm is triggered, during active navigation when your vessel is more than the specified degrees off its track. Resolve by changing pilot mode, change / correct the vessel's course.
- **Route complete** — Triggered by MFD when the last waypoint in a route has been reached.
- **Waypoint advance** — Indicates change in waypoint name or ID and direction to turn to new waypoint. Triggered in Track mode.
- **Wind Shift** — Indicates that TWA (True Wind Angle) has changed by more than 15 degrees. Triggered in Wind vane mode only. Resolve by changing course or changing pilot mode. Will also resolve if TWA reverts back.

Hardware and fault alarms

- **Clutch short** — Indicates a short circuit in the driver unit's clutch. The autopilot will power down.
- **Current limit** — Drive overload current exceeded. The autopilot will drop to standby and the alarm will time out after 10 seconds. To resolve try checking the drive unit and connections for stall or short circuit conditions.
- **Drive short** — Indicates a short circuit in the drive unit. The autopilot will power down.
- **Drive stopped** — Indicates a rudder stall condition has persisted or that the power has been removed from the drive unit. Triggered in Auto, Track & Wind modes. To resolve check output from autopilot, drive unit and connections. The autopilot will drop to standby and the alarm will time out after 10 seconds.
- **EEPROM corruption** — A corruption of critical configuration data has occurred. The autopilot will drop to standby and the alarm will time out after 10 seconds.
- **Pilot start up** — Will display start up for 20 seconds every time the autopilot is powered up
- **Rate gyro fault** — The gyro sensor has failed.

- **Rudder reference unit failure** — Rudder Reference connection has been lost, or exceeded it's limits (The Rudder reference transducer has failed while in auto. Angle is more than 50 degrees or connection to rudder reference is lost). The autopilot will drop to standby and the alarm will time out after 10 seconds.
- **Solenoid short** — Indicates a short circuit in the solenoid. The autopilot will power down.
- **SeaTalk 1 fail** — SeaTalk channel 1 has a communication problem.
- **SeaTalk 2 fail** — SeaTalk channel 2 has a communication problem.
- **SeaTalk fail** — SeaTalk® data transmission problem. The autopilot will drop to standby and the alarm will time out after 10 seconds. To resolve try:
 - Checking connections for short or open circuit.
 - Checking system for a device fault.
- **Power & motor cables are swapped** — If the motor pair and the power pair are swapped. Swap motor and power wires at the course computer.

Device connection or data source alarms

When an alarm is triggered that indicates that a device is not detected or a required data source is missing first check that the device / data source is operational and that all cables and connections are secure and free from damage.

- **No compass** — Compass is not detected.
- **No control head** — The course computer has lost communications with the Pilot controller, this alarm is generated by the course computer. The autopilot will drop to standby and the alarm will time out after 10 seconds.
- **No drive detected** — Communication between the EV unit and ACU has been lost or cannot be established. To resolve try:
 - Check LED diagnostics indicators.
 - Check output from EV and ACU units.
- **No pilot** — The Pilot controller has lost communications with the course computer; this alarm is generated by the Pilot controller.
- **No speed data** — No speed data is being received. Check Speed transducer.
- **No Wind data** — Triggered in Wind vane mode when no Wind angle data has been received for 30 seconds or more. The autopilot will drop out of wind vane mode and revert to auto mode.

AutoLearn alarms

For AutoLearn failures, first try restarting the AutoLearn process.

- **AutoLearn fail 1 (not carried out)** — AutoLearn has not been carried out.
- **AutoLearn fail 2 (Manual intervention)** — Manual intervention during AutoLearn.
- **AutoLearn fail 3 (Compass or drive error)** — Investigate compass fault or drive fault.
- **AutoLearn fail 4** — AutoLearn has failed due to compass or drive error.
- **AutoLearn fail 5** — AutoLearn has failed due to motor going into current limit.
- **AutoLearn fail 6** — AutoLearn has failed as vessel went into spin i.e. motor did not drive the rudder back to opposite side.

Chapter 9: Setup menu

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- [9.1 Set up menu on page 68](#)
- [9.2 Autopilot calibration menu on page 68](#)
- [9.3 User preferences menu on page 70](#)
- [9.4 System Set-up menu on page 71](#)

9.1 Set up menu

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

- **Autopilot Calibration** — Commissioning and calibration settings. **SeaTalkng autopilots:**
 - Vessel settings
 - Drive settings
 - Sailboat settings
 - Commissioning**SeaTalk autopilots:**
 - User settings
 - Dealer settings
 - Seatrial calibration
- **User Preferences** — Configure the following options:
 - Time & Date — Refer to: [p.70 — Time and date](#)
 - Units — Refer to: [p.70 — Units of measure](#)
 - Language — Refer to: [p.71 — User interface languages](#)
 - Variation — Refer to: [p.71 — Variation](#)
 - Key Beep — Refer to: [p.71 — Key beep](#)
- **System set up** — Configure network groups and data sources. The following options are available:
 - Network group — Refer to: [p.71 — Network group](#)
 - Brightness/Color Group — Refer to: [p.71 — Brightness and color group](#)
 - Data Sources — Refer to: [p.72 — Data sources](#)
 - About System Set Up — Provides information about the System set-up menu.
- **Simulator** — Enables and disables simulator mode. The simulator produces simulated data to enable you to practice operating the display.

Note: The simulator will not produce simulated data if live data sources are present on the SeaTalkng® network.

- **Factory reset** — Delete user settings and restore the display to its factory default settings.
- **Diagnostics** — Information About the display, devices connected to the network and the diagnostics self test. The following options are available:
 - About Display — View hardware and software details for your display.
 - About Pilot — View autopilot hardware and software details for your system.
 - About System — Allows you to search the SeaTalkng® network and shows information about the products found.
 - Self Test — The product has a built in self test which can help to diagnose faults. The following tests are performed during a self test:
 - ◆ Memory test
 - ◆ Button test
 - ◆ Display test
 - ◆ Buzzer test
 - ◆ Illumination test
- **Set-up wizard** — Launch the initial set-up wizard.

9.2 Autopilot calibration menu

The Autopilot Calibration menu options are determined by the connected autopilot system.

The settings available in the Calibration menu are shown below. For details on how to calibrate and commission your autopilot refer to the Commissioning chapters:

- Commissioning Evolution autopilots: [p.25 — Commissioning - Evolution autopilot system](#)

- Commissioning SPX autopilots: [p.33 — Commissioning - SPX and SmartPilot systems](#)

Rudder damping levels and deadband angles

For autopilot systems which include a rudder angle reference sensor / transducer, rudder damping is used to prevent Evolution autopilot system over-activity, characterized by “hunting” maneuvers. A number of rudder damping levels are available to address this behavior. Rudder damping levels relate to “deadband angles”, and can be configured using your autopilot control head (e.g. p70s/p70Rs or MFD). A higher damping level is intended to eliminate pilot and helm over-activity.

Typically, the appropriate rudder damping level is the lowest acceptable value. However, it is important to be aware that the rudder damping scaling has been changed in recent versions of ACU units, which include newer processor and software versions (these units can be identified with an “A” appended to their SKU).

Important: The rudder damping levels can have a significant impact on your autopilot performance. If you are unsure as to how to adjust these settings to best suit your autopilot system, please refer to your dealer or Raymarine product support.

The following table lists the rudder damping levels and deadband angles that are available with both old and new versions of the ACU software:

| Rudder damping level | Existing Deadband angle | | New Deadband angle (ACU software version v3.11 onwards) |
|----------------------|---------------------------|---------|---|
| | ACU-100, 150, 200, 400 | ACU-300 | |
| 1 | 0.1° | 0.15° | 0.1° |
| 2 | 0.2° | 0.30° | 0.2° |
| 3 | 0.3° | 0.45° | 0.3° |
| 4 | 0.4° | 0.60° | 0.4° |
| 5 | 0.5° | 0.75° | 0.7° |
| 6 | 0.6° | 0.9° | 0.9° |
| 7 | 0.7° | 1.05° | 1.1° |
| 8 | 0.8° | 1.20° | 1.6° |
| 9 | 0.9° | 1.35° | 2.2° |

It’s important to check the rudder damping level currently configured on your autopilot control head, to ensure it matches your needs. The rudder damping value should be increased one level at a time until the autopilot stops hunting.

Adjusting the Rudder Damping level

Use the following menu path to adjust the Rudder Damping level:

1. **Menu > Set-up > Autopilot Calibration > Drive Settings > Rudder Damping.**

Sail boat settings

These settings are only available to sail boats.

The Sail Boat settings menu can be accessed from: **Menu > Set-up > Autopilot Calibration > Sail Boat Settings.**

Note:

When connected to a SeaTalk[®] system the Sail boat settings listed below are part of the **User settings** menu: **Menu > Set-up > Autopilot Calibration > User Settings.**

Note:

The following features are only available if wind data is available:

- **Gybe inhibit** — With gybe inhibit set to **Allow Gybe**, the autopilot will allow the vessel to tack through / into and away from the wind. With gybe inhibit set to **Prevent Gybe**, you can only tack through / into the wind. Gybe inhibit does not effect AutoTurn.
- **Wind Type** — This option determines whether the vessel steers to Apparent or True wind in Wind vane mode.
- **Wind Trim Response** — Wind Trim Response controls how quickly the autopilot responds to changes in wind direction. Higher wind trim settings will result in a system that is more responsive to wind changes. Wind trim is set to level 5 by default.

Note: Not available on Evolution autopilots.

- **Wind Shift Alarm** — This option enables you to switch the Wind shift alarm On (default) and Off.

Note: Not available on SeaTalk® and SPX smartpilots.

9.3 User preferences menu

Time and date

The **Time & Date** menu provides date and time format options and a time offset setting to compensate for any time zone difference between local time and the Universal Time Constant (UTC).

The following options are available:

| Date format | Time format | Time offset |
|--|--|--|
| <ul style="list-style-type: none"> • mm/dd/yy • dd/mm/yy | <ul style="list-style-type: none"> • 12hr • 24hr | <ul style="list-style-type: none"> • -13 to +13 hours |

Units of measure

The **Units** menu enables you to specify the units of measure used for data items.

The following options are available:

| | | |
|--|---|---|
| Speed units <ul style="list-style-type: none"> • kts — knots • mph — miles per hour • km/h — Kilometers per hour | Distance (long) units <ul style="list-style-type: none"> • nm — Nautical miles • sm — Statute miles • km — Kilometers | Distance (short) units <ul style="list-style-type: none"> • ft — Feet • m — Metres |
| Depth units <ul style="list-style-type: none"> • ft — Feet • m — Metres • fa — Fathoms | Wind speed units <ul style="list-style-type: none"> • kts — knots • m/s — metres per second | Temperature units <ul style="list-style-type: none"> • °C — degrees centigrade • °F — degrees fahrenheit |
| Flow rate units <ul style="list-style-type: none"> • UK Gal/H — UK gallons per hour • US Gal/H — US gallons per hour • LPH — Liters per hour | Heading type <ul style="list-style-type: none"> • Mag — magnetic • True | Pressure units <ul style="list-style-type: none"> • PSI — pounds per square inch • Bar — bar • kPa — Kilo pascals |
| Volume units <ul style="list-style-type: none"> • UK Gallons • US Gallons • ltr — liter | Economy units <ul style="list-style-type: none"> • Distance per volume • Volume per distance • Ltr/100km | |

User interface languages

The **Language** menu allows you to select the language that will be used for the display's user interface.

The following options are available:

| | | | | |
|------------------------|--------------|---------|-----------|---------|
| English (UK) | English (US) | Chinese | Croatian | Danish |
| Dutch | Finnish | French | German | Greek |
| Italian | Japanese | Korean | Norwegian | Polish |
| Portuguese (Brazilian) | Russian | Spanish | Swedish | Turkish |

Variation

Variation is the local difference between True north which does not change and Magnetic north which changes slightly each year. Cartography generally uses True north and Magnetic north is the direction a magnetic compass points. Variation changes depending on your geographic location and date. The **Variation** menu provides options to compensate for variation.

The following options are available:

- **Variation mode** — Variation mode can be set to the following:
 - **On** — With variation switched on you can set the amount of variation using the **Variation range** option.
 - **Off** — With variation switched off variation will be used.
 - **Slave** — When networked to another device (e.g.: an MFD or pilot controller) that provides magnetic variation the display will automatically switch to slave mode and use the variation provided by that device.
- **Variation range** — When **Variation mode** is switched on your magnetic heading readings will be adjusted by the amount specified

Key beep

By default every time a button is pressed the display will beep. The beep can be enabled and disabled using the Key beep option.

9.4 System Set-up menu

Network group

The **Network group** menu allows you to add multiple displays to a group so that when the color scheme or brightness is changed on one display the changes are applied to all displays in that group.

The groups available are:

- None
- Helm 1
- Helm 2
- Cockpit
- Flybridge
- Mast

There are also 5 undefined groups available.

Brightness and color group

The **Brightness / color group** menu enables synchronization of the display's brightness and color scheme to be the same as other displays in the same network group.

The following options are available:

- This display
- This group

Data sources

The **Data sources** menu allows you to view available data sources and if required, to select your referred data sources.

The available data sources are:

- GPS position
- GPS Datum
- Time & Date
- Heading
- Depth
- Speed
- Wind

Chapter 10: System checks and troubleshooting

Chapter contents

- [10.1 Troubleshooting on page 74](#)
- [10.2 Power up troubleshooting on page 74](#)
- [10.3 System data troubleshooting on page 75](#)
- [10.4 Miscellaneous troubleshooting on page 75](#)

10.1 Troubleshooting

The troubleshooting information provides possible causes and corrective action required for common problems associated with installation and operation of your product.

Before packing and shipping, all Raymarine products are subjected to comprehensive testing and quality assurance programs. If you do experience problems with 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 product, please refer to the Technical support section of this manual for useful links and Raymarine Product Support contact details.

10.2 Power up troubleshooting

Product does not turn on or keeps turning off

- **Blown fuse / tripped breaker.**
 1. Check condition of the SeaTalkng backbone power connection 5 A fuse and if applicable distribution panel breaker, replace if necessary.
 2. If the fuse keeps blowing check for cable damage, broken connector pins or incorrect wiring.
- **Poor / damaged / insecure SeaTalkng cabling and connections**
 1. Check the vessel's battery voltage and the condition of the battery terminals and power supply cables, ensuring connections are secure, clean and free from corrosion. Replace if necessary.
 2. Check the SeaTalkng power cable and power supply connection for signs of damage or corrosion, and replace if necessary.
 3. Check the SeaTalkng backbone cabling and connectors for signs of damage or corrosion, and replace if necessary.
 4. Check the SeaTalkng power, backbone and product spur cable connectors are correctly orientated, fully inserted into the spur connectors and in the locked position.
 5. With the display turned on, try flexing the display's spur cable near to the display's connector to see if this causes the display to restart or lose power. Replace if necessary.
 6. With the product under load, using a multi-meter, check for high voltage drop across all connectors / fuses etc, and replace if necessary.
- **Incorrect power connection**
 1. The power supply may be wired incorrectly, ensure the SeaTalkng power connection instructions have been followed and that the backbone has one single source of 12 V dc power..

Product will not start up (restart loop)

- **Power supply and connection**
 1. Refer to 'Product does not turn on or keeps turning off' information above.
- **Software corruption**
 1. In the unlikely event that the product's software has become corrupted, try downloading and installing the latest software from the Raymarine website. refer to your Multifunction Display's operation instructions for details on updating software for SeaTalkng devices.
 2. In the case of a restart loop attempt a factory reset using the following instructions:
[p.74 – Performing a Factory Reset](#)

Performing a Factory Reset

To reset your unit to factory default settings follow the steps below.

Note: Performing a factory reset will erase all saved data and customized settings.

1. Press the **Menu** button.
2. Select **Set Up**.
3. Select **Factory Reset**.

4. Select **Yes**.

Your unit will now reset itself to factory default settings.

10.3 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.

Transducer, instrument, engine or other system data is unavailable at all displays.

- **Data is not being received at the display.**

1. Check the relevant product and or network cabling and connections (e.g. SeaTalkng backbone) for signs of damage or corrosion, and replace if necessary.

- **Data source (e.g. instrument display or engine interface) is not operating.**

1. Check the source of the missing data (e.g. transducer or engine interface) for signs of damage or corrosion, and replace if necessary.
2. If possible, check that the data source is correctly powered and operational.
3. Refer to the instructions provided with the equipment to ensure it has been correctly installed.

- **Software mismatch between equipment may prevent communication.**

1. Ensure all products have the latest software installed.

Transducer, instrument or other system data is missing from some but not all displays.

- **Connection problem.**

1. Check the product's SeaTalkng spur cable and connections for signs of damage or corrosion, and replace if necessary.

- **Software corruption.**

1. In the unlikely event that the product's software has become corrupted, try downloading and installing the latest software from the Raymarine website. refer to your Multifunction Display's operation instructions for details on updating software for SeaTalkng devices.
2. In the case of a restart loop attempt a factory reset using the following instructions:
[p.74 — Performing a Factory Reset](#)

- **Software mismatch between equipment may prevent communication.**

1. Ensure all products have the latest software installed.

Incorrect data reported.

- Transducer calibration error

1. Switch off power supply to system and switch back on again.
2. Re-calibrate or re-configure data source following instructions provided with the relevant devices.

10.4 Miscellaneous troubleshooting

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

Display behaves erratically.

Frequent unexpected resets or system crashes and other erratic behavior:

- **Intermittent problem with power to the display.**

1. Check relevant fuses and breakers.
2. Check that the power supply cable is sound and that all connections are tight and free from corrosion.
3. Check that the power source is of the correct voltage and sufficient current.

- **Software mismatch between equipment may prevent communication.**

1. Ensure all products have the latest software installed.

- **Corrupt data / other unknown issue.**

1. In the unlikely event that the product's software has become corrupted, try downloading and installing the latest software from the Raymarine website. refer to your Multifunction Display's operation instructions for details on updating software for SeaTalkng devices.
2. Check the data source for correct operation.

Chapter 11: Technical support

Chapter contents

- [11.1 Raymarine product support and servicing on page 78](#)
- [11.2 Learning resources on page 79](#)

11.1 Raymarine product support and servicing

Raymarine provides a comprehensive product support service, as well as warranty, service, and repairs. You can access these services through the Raymarine website, telephone, and e-mail.

Product information

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

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

You can obtain this product information using diagnostic pages of the connected MFD.

Servicing and warranty

Raymarine offers dedicated service departments for warranty, service, and repairs.

Don't forget to visit the Raymarine website to register your product for extended warranty benefits: <http://www.raymarine.co.uk/display/?id=788>.

United Kingdom (UK), EMEA, and Asia Pacific:

- E-Mail: emea.service@raymarine.com
- Tel: +44 (0)1329 246 932

United States (US):

- E-Mail: rm-usrepair@flir.com
- Tel: +1 (603) 324 7900

Web support

Please visit the "Support" area of the Raymarine website for:

- **Manuals and Documents** — <http://www.raymarine.com/manuals>
- **Technical support forum** — <http://forum.raymarine.com>
- **Software updates** — <http://www.raymarine.com/software>

Worldwide support

United Kingdom (UK), EMEA, and Asia Pacific:

- Help desk: <https://raymarine.custhelp.com/app/ask>
- Tel: +44 (0)1329 246 777

United States (US):

- Help desk: <https://raymarine.custhelp.com/app/ask>
- Tel: +1 (603) 324 7900 (Toll-free: +800 539 5539)

Australia and New Zealand (Raymarine subsidiary):

- E-Mail: aus.support@raymarine.com
- Tel: +61 2 8977 0300

France (Raymarine subsidiary):

- E-Mail: support.fr@raymarine.com
- Tel: +33 (0)1 46 49 72 30

Germany (Raymarine subsidiary):

- E-Mail: support.de@raymarine.com
- Tel: +49 40 237 808 0

Italy (Raymarine subsidiary):

- E-Mail: support.it@raymarine.com
- Tel: +39 02 9945 1001

Spain (Authorized Raymarine distributor):

- E-Mail: sat@azimut.es

- Tel: +34 96 2965 102

Netherlands (Raymarine subsidiary):

- E-Mail: support.nl@raymarine.com
- Tel: +31 (0)26 3614 905

Sweden (Raymarine subsidiary):

- E-Mail: support.se@raymarine.com
- Tel: +46 (0)317 633 670

Finland (Raymarine subsidiary):

- E-Mail: support.fi@raymarine.com
- Tel: +358 (0)207 619 937

Norway (Raymarine subsidiary):

- E-Mail: support.no@raymarine.com
- Tel: +47 692 64 600

Denmark (Raymarine subsidiary):

- E-Mail: support.dk@raymarine.com
- Tel: +45 437 164 64

Russia (Authorized Raymarine distributor):

- E-Mail: info@mikstmarine.ru
- Tel: +7 495 788 0508

Viewing product information

1. Press the **Menu** button.
2. Select **Set-up**.
3. Select **Diagnostics**.
4. Select **About Display**.
A range of information is displayed, including the software version and Serial number.
5. Use the **Up** and **Down** buttons to cycle through the information.

11.2 Learning resources

Raymarine has produced a range of learning resources to help you get the most out of your products.

Video tutorials

Raymarine official channel on YouTube:

- [YouTube](#)

Training courses

Raymarine regularly runs a range of in-depth training courses to help you make the most of your products. Visit the Training section of the Raymarine website for more information:

- <http://www.raymarine.co.uk/view/?id=2372>

Technical support forum

You can use the Technical support forum to ask a technical question about a Raymarine product or to find out how other customers are using their Raymarine equipment. The resource is regularly updated with contributions from Raymarine customers and staff:

- <https://raymarine.custhelp.com/app/home>

Appendix A Supported NMEA 2000 PGN list

Administration PGNs

- **59392** — ISO Acknowledge (Receive / Transmit)
- **59904** — ISO Request (Receive)
- **60928** — ISO Address Claim (Receive / Transmit)
- **126208** — NMEA — Request, Commanded, Acknowledged Group Function (Receive / Transmit)
- **126464** — PGN Transmit and Receive List (Receive / Transmit)
- **126996** — Product Information (Receive / Transmit)

Raymarine® provides field programmability of the Device and System Instances within PGN 60928 which can be commanded via use of PGN 126208 as required by the latest **NMEA 2000** standard.

Data PGNs

- **126992** — System Time (Receive / Transmit)
- **126993** — Heartbeat (Receive / Transmit)
- **127237** — Heading/Track Control (Receive)
- **127245** — Rudder (Receive / Transmit)
- **127250** — Vessel Heading (Receive)
- **127251** — Rate of Turn (Receive)
- **127257** — Attitude (Receive)
- **127258** — Magnetic Variation (Receive / Transmit)
- **128259** — Speed, (Receive)
- **128267** — Water Depth (Receive)
- **128275** — Distance Log (Receive)
- **129025** — Position, Rapid Update (Receive)
- **129026** — COG & SOG, Rapid Update (Receive)
- **129029** — GNSS Position Data (Receive)
- **129033** — Time & Date (Receive)
- **129044** — Datum (Receive / Transmit)
- **129283** — Cross Track Error (Receive)
- **129284** — Navigation Data (Receive)
- **129291** — Set & Drift, Rapid Update (Receive)
- **130306** — Wind Data (Receive)
- **130310** — Environmental Parameters (Receive)
- **130311** — Environmental Parameters (Receive)
- **130576** — Small Craft Status (Receive)
- **130577** — Direction Data (Receive)

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