

## Evolution autopilot set-up and commissioning with p70 / p70s / p70R / p70Rs

### Evolution autopilot installation

For information on installing and connecting an Evolution autopilot system, refer to the installation instructions that accompany the EV-1 and EV-2 units, as well as the instructions that accompany your drive unit, as appropriate.

### Commissioning pre-requisites

**Before commissioning your autopilot system for the first time, ensure that you have read through and understood the entire commissioning instructions for your autopilot system.**

Before commissioning, you should also ensure 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 versions, available on the Raymarine website.
- A system schematic is available 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]**

#### Note:

*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.

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### 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 **[Standby]** for approximately 2 seconds, to power the display on again.
2. To power the display off, press and hold the **[Standby]** button for approximately 5 seconds.

After 1 second, a 3 second countdown is displayed. **The display cannot be powered off when the autopilot is engaged.**

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### 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, 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]**.

Select the option that most closely matches your vessel's hull type and steering characteristics:

- **[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. It may be possible to improve the steering performance of your vessel by selecting a different vessel hull type.

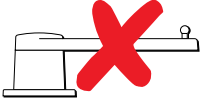
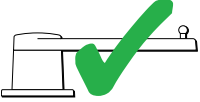
When choosing a suitable vessel hull type, the emphasis should be on a safe and dependable steering response.

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 a 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"> <li>• Drive Type selection.</li> <li>• Rudder Limit setting.</li> <li>• 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).</li> <li>• Rudder Drive check.</li> </ul>	<p>The following Dockside wizard procedures only apply to vessels that include a rudder reference transducer:</p> <ul style="list-style-type: none"> <li>• Drive Type selection</li> <li>• Rudder alignment (Align Rudder)</li> <li>• Rudder Limit</li> <li>• Rudder Drive check.</li> </ul>

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.

3.1

### Selecting a drive type

Drive type selection is included in the dockside wizard. **If your drive type is not listed, contact your Raymarine dealer for advice.**

With the [**Drive Type**] menu displayed:

1. Select your drive type.
 

*The drive types available are:*

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

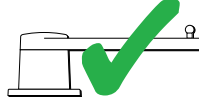
- Tiller
- Sport Drive
- Verado
- Rotary Drive Type 1 / Type 2
- Hydraulic Pump Type 1 / Type 2 / Type 3

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**].

3.2

### Checking the rudder alignment (Align Rudder)

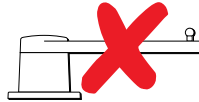
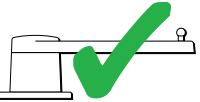
This procedure establishes port and starboard rudder limits for systems using a rudder reference transducer.

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

3.3

### Rudder Limit setting

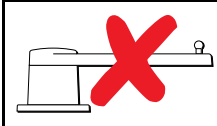
	
<p>For vessels <b>without</b> a rudder reference transducer: Rudder limit is set to 30 degrees and can be adjusted as required(*) using the [<b>Up</b>] and [<b>Down</b>] buttons or the [<b>Rotary controller</b>].</p>	<p>For vessels with a rudder reference transducer: The rudder alignment process establishes 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 [<b>Up</b>] and [<b>Down</b>] buttons or the [<b>Rotary controller</b>].</p>

**Note:** \*In systems with an ACU-300 and a Constant Running pump, the rudder limit is set to 30 degrees, and cannot be changed.

3.4

## 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 in this document for information on how to calculate and adjust the hard-over time.



3.5

## 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.



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### 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.

## 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.



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## 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 this:

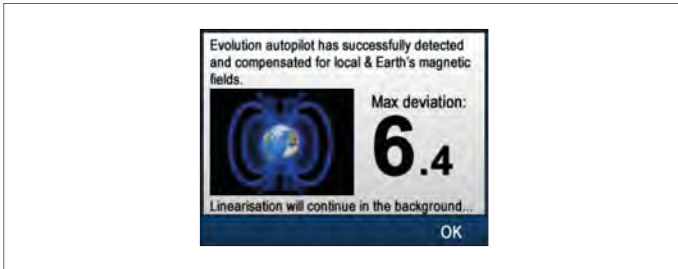


The linearization process will start automatically after your vessel has turned approximately 100° at a speed of between 3 –15 knots. Linearization requires no user input, however at least a 270° turn is required before linearization can complete. The progress bar displays the

progress, and will turn Red if the process is paused or otherwise interrupted. The time to complete linearization varies 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, and 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 complete, 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 any time 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. **Do NOT rely on the reported heading until compass linearization and alignment is complete.**

#### 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.

### 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  $-10^\circ$  and  $+10^\circ$ .



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## 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.