

p70 & p70r and Evolution autopilot — overview

This document will guide you through the steps required in setting-up and commissioning your Evolution autopilot system using a Raymarine p70 / p70r autopilot control head.

If you are an existing user of Raymarine autopilot systems, this document will also help you to understand the differences between the commissioning process for existing SPX autopilot systems, and the Evolution autopilot system. For example, there are a number of existing set-up and commissioning steps that you might already be familiar with for SPX systems, which are no longer required or are slightly different for Evolution autopilot systems.

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 appropriate.

Evolution autopilot operation with p70 & p70r

General operation of the p70 / p70r is the same for Evolution autopilot systems as it is with existing SPX autopilot systems.

Refer to document number 81331 for p70 / p70r operation instructions. This document is supplied with all p70 / p70r units.

Autopilot commissioning — main differences between Evolution and SPX systems

The Evolution system provides a number of features to improve upon the commissioning process required by existing SPX and some other autopilot systems.

- **Built-in heading and attitude sensor** — no additional fluxgate compass required.
- **Automatic set-up** — the rudder gain, counter rudder, manual compass calibration and autolearn settings required for existing SPX systems are no longer required. This results in a greatly simplified dockside calibration process for Evolution autopilot systems.

Autopilot response levels

The Evolution autopilot system features a number of different response levels to help you quickly configure the system for optimum performance for the current conditions.

The available response levels are:

- **Leisure** — suitable for long passages where tight heading control is not critical.
- **Cruising** — good course-keeping without overworking the pilot.
- **Performance** — emphasis on tight heading control.

You can change the response level at any time by selecting **MENU > Response Level**. Then select **Save** to keep the changes.

Initial setup and commissioning

Commissioning pre-requisites

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

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

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

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

Initial set-up

Initial set-up involves the following steps:

Important: Before proceeding with the initial set-up or commissioning of a p70 / p70r, ensure that your p70 / p70r is running the latest software. p70 / p70r operation with Evolution systems requires p70 / p70r software version 2 or later.

1. Power-up your p70 / p70r.
2. Specify your preferred language and appropriate vessel type, using the **Set-up wizard**.
3. Complete the dockside calibration process, using the **Dockside wizard**:

Step	For vessels without a rudder reference transducer:	For vessels with a rudder reference transducer:
3a	Drive Type selection	Drive Type selection
3b		Align Rudder (rudder alignment)
3c	Rudder Limit setting	Rudder Limit setting
3d	Hard Over Time (if you do not already know your hard over time, you should skip this step in the Dockside Wizard and enter the value manually afterwards; refer to Steps 3d and 4 described below).	
3e	Rudder Drive check	Rudder Drive check

4. Once the dockside wizard is complete, specify the hard-over time (only applies to systems that do NOT include a rudder reference transducer).
5. Familiarize yourself with the important information in this document related to **compass linearization**. Follow the guidelines provided to ensure that the process is completed successfully.
6. Once you've successfully completed all the steps listed above, you should also familiarize yourself with the information related to **compass lock**.

These procedures are described in detail in this document.

STEP 1

Powering the pilot controller on

Turning on the pilot controller

1. Press and hold the **STANDBY** button for one second until the Raymarine logo appears.
If the unit is being switched on for the first time or after a factory reset the set up wizard will be launched.

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

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

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

STEP 2

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 type and welcome screen. When powering the p70 / p70r for the first time in an unconfigured system, this 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, 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:

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

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.

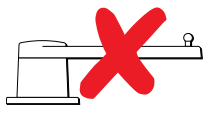
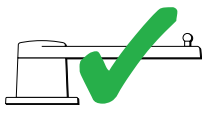
Important: If you change the vessel type **after** completing the Dockside calibration process (using the Dockside wizard), all commissioning settings will be reset to default settings, and you will need to complete the Dockside calibration process again.

STEP 3

Using the Dockside wizard

The dockside calibration process must be completed before the Evolution 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.• 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 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.

To access the wizard, ensure the pilot is in **Standby** mode and then:

1. Select **Menu**.
2. Select **Set-up**.
3. Select **Autopilot Calibration**.
4. Select **Commissioning**.
5. Select **Dockside Wizard**.

STEP 3a

Selecting a drive type

Drive Type selection is available when the pilot is in standby, from either the Dockside wizard, or from the **MENU > Set-up > Autopilot Calibration > Vessel Settings** menu.

With the **Drive Type** menu displayed:

1. Highlight and select your drive type.

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

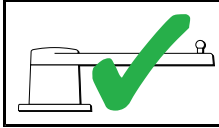
2. Press **OK** to save your setting and display the next set-up page.

STEP 3b

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**.

Note: You can cancel Dockside calibration at any time by selecting **STANDBY**.

STEP 3c

Rudder Limit setting

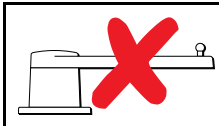
As part of the Dockside calibration process, the system will set-up the rudder limits.

- **For vessels with a rudder reference transducer** — This procedure establishes the rudder limit. The rudder limit will be displayed with a message confirming that the rudder limit has been updated. This value can be changed if required.
- **For vessels without a rudder reference transducer** — a default of 30 degrees is displayed, and can be changed as required.

STEP 3d

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 Step 3e in this document to complete the Dockside wizard procedure. Once the wizard is complete, proceed to Step 4 in this document for information on how to calculate and adjust the hard-over time.

STEP 3e

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, you will be asked to confirm that the rudder has turned to port by selecting **YES** or **NO**.
6. Select **OK** if it is safe to engage the rudder in the opposite direction.
7. You will be asked to confirm the rudder turned to starboard by selecting **YES** or **NO**.
8. 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.

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

STEP 4



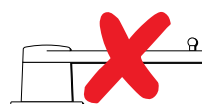
Warning: Rudder check

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

On vessels without a rudder reference transducer, it is important to set the hard-over time limits correctly, to ensure accurate autopilot operation. Hard-over time is the time it takes the vessel's steering system to drive the rudder from full port to full starboard.

Before attempting the following procedure, ensure that you've observed and understood the Rudder check warning provided in this document.



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

1. With the p70 or p70r in Standby mode, manually turn the helm full to port.
2. Engage the pilot in Auto mode.
3. Using a stopwatch, **start the timer**, and then immediately:
4. Press the **+10** and **+1** buttons at the same time **TWICE** (p70), or use the **ROTARY** control (p70r) to turn 180 degrees from your current heading.
5. Once the rudder has reached the rudder limit that was specified as part of the Dockside calibration process, **stop the timer**.
6. To calculate your hard-over time, take the measured time and double it.
7. Now access the Hard Over Time menu to specify this hard-over time:
 - i. Select **MENU**.

- ii. Select **Set-up**.
- iii. Select **Autopilot Calibration**.
- iv. Select **Drive Settings**.
- v. Select **Hard Over Time**.
- vi. Use the **+10** button (p70) or **ROTARY** control (p70r) to specify the hard-over time.

STEP 5

Compass linearization

With Evolution autopilot systems, when the EV unit is first installed and powered-up, its internal compass needs to compensate for local magnetic variations and the earth's magnetic field. This is achieved using an automatic process known as linearization, which forms an important part of the autopilot installation, commissioning and set-up process.

Linearization

In Evolution systems, the linearization process is performed automatically by the EV unit as a background task once the vessel's speed exceeds 3 knots, and no user intervention is required. The process will occur during your first voyage with the autopilot system, and will typically take no more than 30 minutes, but this does 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.
- Undersea cables.

Note: You can speed-up the linearization process by completing a 360 degree 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.

Use the compass deviation indicator

The use of the compass deviation indicator on the pilot control head may be useful in this process, particularly if the EV unit has been installed in a location on the vessel where the levels of magnetic interference are too high for the EV unit to compensate appropriately. If this is the case, the deviation display will indicate a value of 25 degrees or higher. In this scenario, Raymarine highly recommends that the EV unit is moved and re-installed in a location which is subject to less magnetic interference. 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, Raymarine recommends that you check the compass heading value displayed on your autopilot control head or multifunction display, against a good known heading source on various headings. This will help you to determine when the EV unit has completed its linearization process.

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 using the pilot control head or multifunction display, and fine-tune the heading to an accurate value.

Note: Do NOT rely on the heading accuracy until you are satisfied that compass linearization and alignment is complete.

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. Select **MENU**.
2. Select **Set-up**.
3. Select **Autopilot Calibration**.
4. Select **Vessel Settings**.
5. Select **Compass Offset**.
6. Use the **+/- 10** button (p70) or **ROTARY** control (p70r) to adjust the compass offset as appropriate.

STEP 6

Compass lock

Once you are satisfied with the compass accuracy, you can lock the setting to prevent the autopilot 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 continuous linearization to restart. 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 continuously compensate for the changes, ensuring you maintain accurate heading data throughout the voyage.