10.1 Engine integrations

Engine integration allows data and notifications from compatible engine systems to be received by the chartplotter and displayed onscreen.

Pre-requisites:

- The engine system and LightHouse chartplotter must be connected to the same NMEA 2000 network.
- The chartplotter must support the data that it receives from the engine system.

There are different methods for integrations, these are:

- **Standard NMEA 2000** — Engines that transmit data using standard NMEA 2000 sentences that are supported by the chartplotter.
- **ECI-100 integrations** — The ECI-100 can convert certain proprietary and J1939 data to supported NMEA 2000 sentences.
- **Manufacturer gateway integrations** — Some engine manufacturers provide gateways which convert their proprietary data to NMEA 2000 sentences that is supported by the chartplotter.
- **Manufacturer specific integrations** — Raymarine has performed engine system integrations with some specific manufacturers. The chartplotter is able to receive and display the manufacturer's proprietary data. These integrations include a manufacturer specific engine app that are intended to be used to display engine data.

Data received by the chartplotter can be displayed in the *[Dashboard]* app, *[Sidebars]* and app *[Data overlays]*.

Notifications are system wide and displayed regardless of app or menu that is currently displayed.

ECI-100

The ECI-100 (part number: E70227) is a universal engine and control interface that bridges Raymarine chartplotters with compatible engine systems. It enables real-time monitoring of engine data, fuel usage, and performance metrics directly on your Raymarine chartplotter.

Note:
If your vessel has multiple engines and each engine has a separate, dedicated CAN bus network, you will need one ECI-100 per network. However, if all engines are connected to a single, common CAN bus network, only one ECI-100 is required. Check with your local engine dealer if you are unsure.

10.2 Autopilot control

Autopilot and steering control is available from the chartplotter on compatible systems which include either an EV-2 sensor and / or compatible manufacturer's autopilot/steering systems.

10.3 Compatible engine manufacturers

List of compatible engine manufacturers.

Note:
Only supported engine data from compatible engine systems can be displayed.

Engine manufacturer	Integration method	Autopilot control
Caterpillar®	ECI-100	No
ePropulsion	NMEA 2000	No
Honda®	NMEA 2000	No
Mercury Marine	Manufacturer specific	Yes
Suzuki	• Manufacturer gateway • Manufacturer specific	No

Engine manufacturer	Integration method	Autopilot control
Volvo Penta	• Manufacturer gateway • ECI-100	Yes
Yamaha	• ECI-100 • Manufacturer specific	Yes
Yanmar	ECI-100	Yes

It may be possible to display data from other manufacturer's engines, if they use standard NMEA 2000 sentences that are supported by the chartplotter, or J1939 sentences that are supported by a connected ECI-100.

Manufacturer specific integrations

Manufacturer specific integration provides a higher level of integration than with other integration methods. Manufacturer specific apps are included on the chartplotter.

For full details of manufacturer specific apps, refer to the relevant chapter:

- *[Suzuki]* — For details refer to: **p.479 — Suzuki app**
- *[Mercury]* — For details refer to: **p.486 — Mercury app**
- *[Yamaha]* / *[Yamaha HDMI]* — For details refer to: **p.501 — Yamaha app**

10.4 Caterpillar engine systems

Compatible Caterpillar® engine systems

The ECI-100 can convert Caterpillar® engine system data that is transmitted using supported J1939 sentences.

Note:

• Each Cat® engine must have a dedicated Marine Powered Display (MPD). Engines without an MPD are not supported.

• The Cat® Messenger MPD is not supported.

Compatible engines
CAT C7 to 3500C Series
CAT 3126B to 2500B Series

Compatible MPDs
Color MPD
MPD
Mini MPD

Caterpillar® engine data

The following engine data and alarms can be displayed on a LightHouse chartplotter:

Engine data	
Engine Speed (RPM)	Engine Fuel Pressure
Engine Load	Engine Fuel Flow Rate
Engine Hours	Engine Boost Pressure
Engine Oil Temperature	Battery Voltage
Engine Coolant Temperature	Transmission Oil Temperature
Engine Oil Pressure	Transmission Oil Pressure
Engine Coolant Pressure	Fuel Level
Transmission Gear Position	

Engine alarms	
High Coolant Temperature	Low Coolant Level
Low Oil Pressure	High Boost Pressure
Low Oil Level	Engine Over Speed
Low Fuel Pressure	High Transmission Oil Temperature
Low Battery Voltage	Low Transmission Oil Pressure

10.5 Honda

Compatible Honda® engine systems

Engine data from Honda® outboard engines (40hp and greater) that transmit data using standard NMEA 2000 messages can be received by the chartplotter, when it is connected to the same NMEA 2000 network.

Compatible engines		
BF50D	BF60D	BF80
BF100	BF115D	BF135A
BF140D	BF150A	BF350
BF200AKI	BF225A	BFP60A

Required cables — Honda® mechanical control outboards

Mechanical control outboards require one of the following Honda® supplied cables to connect the engine(s) to an NMEA 2000 network:

- 06653-ZZ3-730HE (9.8ft)
- 06653-ZZ3-760HE (19.5ft)

Honda® iST outboards

Digital control outboards (iST) have the necessary cabling pre-installed to connect to an NMEA 2000 network.

Important:
If the chartplotter is connected to a different NMEA 2000 network (e.g.: a SeaTalk NG network) an ECI-100 is required to ensure that the networks are electrically isolated from each other.

Honda® engine data

The following engine data and alarms can be displayed on a LightHouse chartplotter:

Engine data	
Engine Speed (RPM)	Engine Fuel Flow Rate
Engine Hours	Engine Boost Pressure
Engine Oil Temperature	Battery Voltage
Engine Coolant Temperature	Transmission Oil Pressure
Engine Oil Pressure	Transmission Oil Temperature
Engine Coolant Pressure	Fuel Level

Engine alarms	
Over Temperature	Low Coolant Level
Low Oil Pressure	Water In Fuel
Low Oil Level	

10.6 Mercury engine systems

Compatible Mercury® engines systems

Engine data from Mercury® engine systems can be received by LightHouse chartplotters, when connected via a compatible Mercury® gateway.

Note:
Additional supported Mercury® features are available, depending on your chartplotter's software version. For further details refer to: **p.177 — Mercury features**

Compatible gateways:

- SmartCraft Connect gateway.

Compatible engines:

- Engines of 40hp or greater manufactured from 2004.
- Engines of 25hp or greater manufactured from 2022.

Mercury engine data

The following engine data and alarms can be displayed on a LightHouse chartplotter:. A dedicated *[Mercury]* app is available to view the received data.

Engine data	
Alternator Voltage	Engine Boost Pressure
Engine Coolant Pressure	Engine Coolant Temperature
Engine Hours	Engine Load
Engine Oil Level	Engine Speed (RPM)
Engine Trim	Fuel Flow
Fuel level	System status
Steering Angle	Total Fuel
Transmission Fluid Level	Transmission Gear
Transmission Oil Pressure	Transmission Oil Temperature
Vessel Trim	

Alerts
The chartplotter supports all alerts received from compatible engine systems. The database of supported alerts is regularly updated.

Mercury® features

Raymarine's Mercury® integration allows Raymarine chartplotters running LightHouse 4 v4.1.75 (or later) to replace the dedicated Mercury® VesselView display, when it is connected to a SmartCraft Connect gateway.

Supported features:

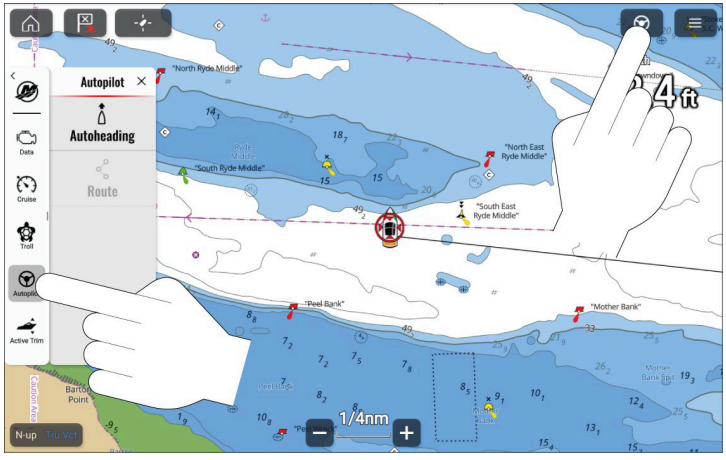
- Support for up to 4 engines
- Mercury app
- Engine data
- Fault code notifications
- Software update
- Bluetooth and Wi-Fi (SmartCraft Connect connection to SmartCraft Manager mobile app)
- Fuel tank level
- Skyhook (Activated using joystick)
- Engine fluid levels V12 / V8 / V6 (only available on 350hp to 400hp, and 600hp V10 / V12 engines)
- Steering angle
- Cruise control
- Troll control
- Autopilot control: Autoheading (LightHouse 4, v4.3.42 or later)
- Autopilot control: Active route (LightHouse 4, v4.3.42 or later)
- Active Trim control (LightHouse 4, v4.3.42 or later)
- Primary helm display selection (LightHouse 4, v4.3.42 or later)
- SkyHook, BowHook, DriftHook control (LightHouse 4, v4.6.42 or later)

Autopilot control

Compatible Mercury® autopilots connected to the SmartCraft® Connect gateways via the SmartCraft® bus can be integrated with the chartplotter so that the autopilot can be controlled from the chartplotter. On these systems the autopilot control will be available.

Autopilot controls can be accessed from the Autopilot sidebar. Performing a *[Goto]* or *[Follow route]* in the Chart app will also provide options to engage your autopilot.

Autopilot sidebar selection



When the autopilot is engaged, the Autopilot sidebar is displayed automatically. With the autopilot disengaged (i.e.: in Standby mode), you can display the Autopilot sidebar by selecting the Autopilot icon located on the top right of the screen, or by manually selecting the Autopilot sidebar icon from the Mercury sidebar options.

Autopilot sidebar states

1. With the autopilot in standby, the Autopilot sidebar has *[Autoheading]* or *[Route]* options. You can select *[Autoheading]* to engage the autopilot and maintain the current heading.. If you are already following a route, you can select *[Route]* to engage the autopilot in Route mode. In Route mode, the boat will follow the route and when a waypoint is reached the boat will automatically proceed to the next waypoint in the route.
2. **Autoheading** — When Autoheading is engaged, the sidebar displays the current target heading and provides controls to increase and decrease the heading angle in 1° or 10° increments.
3. **Route mode** — In Route mode, the sidebar displays navigation data and provides controls to switch to *[Autoheading]*, advance to the next waypoint (*[Advance wpt.]*), or restart the “route follow” command (*[Restart here]*).

10.7 Suzuki

Compatible Suzuki engine systems

The following Suzuki engine systems are compatible when used in conjunction with a compatible Suzuki-supplied gateway, or the SMG4 display.

Note:

• A dedicated Suzuki app is available on chartplotters running LightHouse 4 v4.10.149, or later.

Mechanical engine models

Engine model	Model year	Configuration
DF9.9B / DF15A / DF20A	2015 to 2025	**1**
DF25A / DF30A	2015 to 2025	**1**
DF40A / DF50A / DF60A	2015 to 2022	**2**
DF40A / DF50A / DF60A	2023 or later	**3**
DF70A / DF75 / DF80A / DF90A / DF100B	2015 to 2022	**2**
DF70A / DF75 / DF80A / DF90A / DF100B	2023 or later	**3**
DF100A / DF115A / DF140A	2015 to 2021	**2**

Engine model	Model year	Configuration
DF100C / DF115B / DF140B	2012 to 2022	**2**
DF100C / DF115B / DF140B	2023 or later	**3**
DF150 / DF175	2015 to 2022	**2**
DF150A / DF175A / DF200A	2015 to 2022	**2**
DF150A / DF175A / DF200A	2023 or later	**3**
DF200 / DF225 / DF250	2015 to 2024	**2**
DF200T / DF225T / DF250T	2025 or later	**3**

SPC engine models

Engine model	Model year	Configuration
DF115BG / DF140BG	2022 or later	**4**
DF150AP / DF175AP / DF200AP	2015 to 2021	**5**
DF150AP / DF175AP / DF200AP	2022 or later	**4**
DF250AP / DF300AP	2015 to 2021	**5**
DF250AP / DF300AP	2022 or later	**4**
DF300B / DF325A / DF350A	2015 to 2021	**5**
DF300B / DF325A / DF350A	2022 or later	**4**

Configurations

Compatible engines require the correct configuration, this can include: a harness, an adaptor and a gateway. Check the configuration number for your engine(s) in the table above and then check the required components in the table below. These components should be available from the engine manufacturer, or their authorized dealers.

Configurations	
Configuration 1: • Harness: 36660–89L0x • Adaptor: 36661–96L3x • Gateway: 34923–96L02 — The gateway can be used for single engine vessels. • SMG4: 34011–96L4x — Multi-engine vessels require one SMG4 per engine, instead of the gateway.	**Configuration 2:** • Harness: 36620–93J7x/8x/9x • Adaptor: 36661–96L3x • Gateway: 34923–96L02 — The gateway can be used for single engine vessels. • SMG4: 34011–96L4x — Multi-engine vessels require one SMG4 per engine, instead of the gateway.
Configuration 3: • Harness: 36620–93JAx/Bx/Cx • Adaptor: Not required • Gateway: 34923–96L13 — one gateway is required per vessel (Data for up to 4 engines can be displayed). • SMG4: 34011–96L4x — The SMG4 can be used instead of the gateway.	**Configuration 4:** • Harness: 36623–98L0x/3x/4x • Adaptor: Not required • Gateway: 34923–96L13 — one gateway is required per vessel (Data for up to 4 engines can be displayed). • SMG4: 34011–96L4x — The SMG4 can be used instead of the gateway.
Configuration 5: • Harness: 36623–98J2x/3x/4x • Adaptor: 36661–96L2x • Gateway: 34923–96L02 — The gateway can be used for single engine vessels. • SMG4: 34011–96L4x — Multi-engine vessels require one SMG4 per engine, instead of the gateway.	

Supported Suzuki engine data

The following engine data and alarms can be displayed on a LightHouse chartplotter. A dedicated *[Suzuki]* app is available to view the received data.

Engine data	
[Alternator Voltage] (PGN 127489)	*[Engine Coolant Temperature]* (PGN 127489)
[Engine Hours] (PGN 127489)	*[Engine Oil Pressure]* (PGN 127489)
[Engine Oil Temperature] (PGN 127489)	*[Engine Speed (RPM)]* (PGN 127488)
[Engine Trip Distance] (PGN 128275)	*[Engine Trip hours]* (PGN 127496)
[Fuel Level] (PGN 127489)	*[Fuel Flow Total]*
[Fuel Economy]	*[Fuel Economy Average]*
[Tilt / Trim angle] (PGN 127488)	*[Total fuel used]*
[Transmission gear] (PGN 127493)	

Engine alerts	
Check 2nd Station	Check Control Unit C
Check Engine	Check ESA
Check ETV	Check Remote Key
Check Shift Control	Check Thermostat
Check Throttle System	Engine over rev
Engine over temperature (PGN 127489)	High oil temperature
Keyless unit battery low	Low battery voltage (PGN 127489)
Low oil pressure (PGN 127489)	Rev limit exceeded (PGN 127489)
Remote key battery low	Water in fuel (PGN 127489)

10.8 Volvo® Penta engine systems

Compatible Volvo® Penta engine systems

Engine data from Volvo® Penta engine systems can be received by LightHouse chartplotters, when connected via a compatible gateway. The required gateway is dependent on engine system.

Volvo® Penta EVC engine systems

Engine systems that include a compatible EVC (Engine Vessel Control) system can be connected using one of the following gateways:

- ECI-100
- Volvo® Penta-supplied NMEA interface (part number: 22813366).

The following EVC systems are compatible:

Compatible EVC systems		
EVC-C	EVC-D	EVC-E

Note:
Not all engines have an EVC system fitted as standard. Please check to see if a compatible EVC is fitted to your system.

Engine data (diesel engines equipped with an EVC system as standard):

Compatible engines		
D3	D4	D6
D9	D11	D12
D13		

Engine data (if the optional EVC system is fitted):

Compatible engines		
V6 Gasoline stern drive	V8 Gasoline stern drive	D1 Sail drive
D2 Sail drive	D3 Sail drive	D4-180 Sail drive

Volvo® Penta EVC and non-EVC engine systems

The Volvo® Penta Easy Connect interface can be used on EVC and non-EVC engine systems.
For a list of compatible engines, refer to: **https://www.volvopenta.com/en-gb/marine/accessories/easy-connect/easy-connect-compatibility-list**

Volvo® Penta engine data

The following engine data and alarms can be displayed on a LightHouse chartplotter:

Engine data	
Engine Speed (RPM)	Engine Boost Pressure (1)
Engine Hours	Battery Voltage
Engine Oil Temperature (1)	Transmission Oil Pressure (1)
Engine Coolant Temperature (1)	Transmission Oil Temperature (1)
Engine Oil Pressure (1)	Fuel Level (1)
Engine Coolant Pressure (1)	Boat Speed (1)
Engine Fuel Delivery Pressure (1)	Power Trim (1)
Engine Fuel Flow Rate	Rudder Angle (IPS systems only)

Note:
(1) Only available if a compatible Volvo® Penta sensor is fitted.

Engine alarms	
[Over Temperature]	*[Low System Voltage]*
[Low Oil Pressure]	*[Low Coolant Level]*
[Low Oil Level]	*[Water In Fuel]*

Volvo® Penta autopilot control

When the ECI-100 is combined with an EV-2 sensor, full autopilot control of IPS or Aquamatic systems is available using the chartplotter's *[Autopilot]* control functions.

Compatible engines:

Compatible engines		
D3 Aquamatic	D4 Aquamatic	D6 Aquamatic
V6 Aquamatic	V8 Aquamatic	IPS350
IPS400	IPS450	IPS500
IPS550G	IPS600	IPS800
IPS900	IPS1050	IPS1200

Engine data will also be available.

10.9 Yamaha engine systems

Compatible Yamaha® engine systems

Engine data from Yamaha® engine systems can be received by LightHouse chartplotters, when connected via a compatible gateway. The required gateway is dependent on the engine control system.

Control systems compatible with the ECI-100:

The ECI-100 can be connected to the following engine control systems:

Compatible control systems		
Command-Link	Command-Link Plus	Helm Master

Note:

• Not all engines have a Command-Link, Command-Link Plus or Helm Master systems fitted as standard. Check with your local engine dealer if you are unsure.

• The ECI-100 is not compatible with **Helm Master EX** systems.

• The ECI-100 is not compatible with the **Yamaha app** and **Yamaha HDMI app**. Installation utilizing the ECI-100 can display engine data in the *[Dashboard]* app, *[Data overlays]* and *[Sidebars]*.

Compatible engines		
F50	F60	F75
F90	F115	F150
F200	F225	F250
F300	F350	LF115
LF150	LF200	LF250
LZ150	LZ200	LZ250
LZ300	T50	T60
VZ150	VZ225	VZ250
VZ300	Z150	Z175
Z200	Z250	Z300

Compatible Yamaha® gateways

The following Yamaha® supplied gateways are compatible with the chartplotter's *[Yamaha]* app and / or *[Yamaha HDMI]* app:

Vessels with electric steering

- The **Yamaha app** is compatible with **Yamaha Command Link** and **Command Link Pro** when connected to the chartplotter via a Yamaha® NMEA 2000 gateway or CL7 gauge.
- The **Yamaha HDMI** app is compatible with **Yamaha Command Link** and **Command Link Pro** when connected to the chartplotter via a Yamaha® **Helm Master EX** 6YG gateway and MFD interface (MFDI).

Vessels with no electric steering

If the vessel does not have electric steering then the following gateway is compatible:

- 6YG-8A2D0-11-00 Command link gateway — Gateway is required for vessels with no electric steering.

Vessels with electric steering and a CL screen

If the vessel has electric steering and a CL screen, the following gateways are compatible:

- CL7 screen — The CL7 screen acts as the gateway.
- CL5 screen and 6YG-8A2D0-11-00 Command link gateway — CL5 screens require a compatible gateway.

Vessels with no CL screen

For vessels with no CL screen the following gateway kit is compatible:

- 6YM-762G0-54-00 — This includes both gateways: 6YG-8A2D0-11-00 Command link gateway, and the 6YM-8A201-00-00 HDMI gateway.

The HDMI gateway (6YM-8A201-00-00) provides a video feed, and the 6YG-8A2D0-11-00 Command Link gateway provides data. The Yamaha remote is also required for these installations.

Yamaha® engine data

The following engine data and alarms can be displayed on a LightHouse chartplotter:

Engine data	
Engine Speed (RPM)	Transmission Gear Status
Engine Hours	Battery Voltage
Engine Coolant Temperature	Transmission Oil Pressure
Engine Oil Pressure	Transmission Oil Temperature
Engine Coolant Pressure	Fuel Level
Engine Fuel Flow Rate	Power Trim
Engine Boost Pressure	

Engine alarms	
Over Temperature	Low System Voltage
Low Oil Pressure	Low Coolant Level
Low Oil Level	Water In Fuel

Yamaha® autopilot control

When the ECI-100 is combined with an EV-2 sensor, full autopilot control of Helm Master steering control systems is available, using the chartplotter's Autopilot control functions.

10.10 Yanmar® engine systems

Compatible Yanmar® engine systems

The ECI-100 can convert Yanmar® engine system data that is transmitted using J1939 sentences.

Compatible engines:

Compatible engines		
4BY3–150	4BY3–150Z	4BY3–180
4BY3–180Z	4BY3–220	4BY3–220Z
4JH45	4JH45C	4JH57
4JH57C	4JH80	4JH80C
4JH110	6BY3–260	6BY3–260Z
6LY3–ETP	6LY3–STP	6LY3–UTP
8LV320	8LV320Z	8LV370
8LV370Z		

Note:
Multi-engine vessels include a J1939 network for each engine. Each engine network and the ECI-100 must all be connected to a separate NMEA 2000 network. The SeaTalk NG™ side of the ECI-100 must be connected to the same NMEA 2000 / SeaTalk NG™ network as the chartplotter.

Yanmar® engine data

The following engine data and alarms can be displayed on a LightHouse chartplotter:

Engine data	
Engine Speed (RPM)	Engine Fuel Flow Rate
Engine Hours	Engine Boost Pressure
Engine Oil Temperature	Battery Voltage
Engine Coolant Temperature	Transmission Oil Pressure
Engine Oil Pressure	Transmission Oil Temperature
Engine Coolant Pressure	Fuel Level
Engine Fuel Delivery Pressure	

Engine alarms	
Over Temperature	Low System Voltage
Low Oil Pressure	Low Coolant Level
Low Oil Level	Water In Fuel

Yanmar® autopilot control

Yanmar® JC-10 and VC-10 systems can be controlled using a LightHouse chartplotter when an EV-2 sensor is included in the system.

10.11 Electric engine systems NMEA 2000 compatibility

Electric engine manufacturers (such as ePropulsion) providing engine systems which transmit data using standard NMEA 2000 messages can be received by the chartplotter when it is connected to the same NMEA 2000 network. The engine data can be displayed in the *[Dashboard]* app.

Details of the data that can be displayed for electric engine systems can be found in the *[Motor data]* category in the Dashboard app.

The Dashboard app also includes a dedicated Electric propulsion page to display the data.

Motor data

When the display has been configured for *[Electric]* propulsion the *[Motor]* data category will be available.

Note:
The Motor data category and related data items are not available when *[Combustion]* has been selected for the vessel's *[Propulsion system]* during the initial start up wizard or in the *[Boat details]* settings menu.

The following data items are available in the *[Motor]* category for each motor:

Data items:	
Controller temperature (PGN 127490)	*Motor hours* (PGN 127494)
Voltage (PGN 128002)	*Temperature* (PGN 127490)
RPM (PGN 128002)	*Gear* (PGN 128002)
Motor power (PGN 127494)	

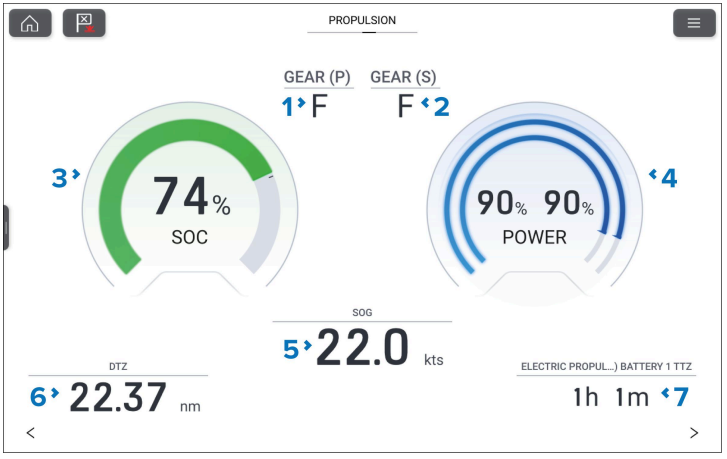
Motor quantity can be set in the *[Boat details]* settings menu: *[Homescreen > Settings > Boat details > Num of motors]*.

Electric propulsion page

The electric Propulsion page is available when the *[Propulsion system]* has been set to *[Electric]*. The number of motors (1 or 2) displayed on the page is based on the number of motors selected during the display's initial start up wizard. The Propulsion page includes data relevant to electric propulsion system and includes the graphical dials.

The *[Propulsion system]* and number of motors can be configured during the initial Start up wizard and also at anytime from the *[Boat details]* settings menu.

Example Propulsion page



1. **Port motor gear**.
2. **Starboard motor gear**.
3. **SOC** (State Of Charge) dial.
4. **Power** dial.
5. **SOG** (Speed Over Ground).
6. **DTZ** (Distance To Zero)
7. **TTZ** (Time To Zero)

The dials and their contents are unique to the propulsion page and cannot be reproduced on other data pages. The dials cannot be removed or hidden.

The Propulsion page will show transmission gear and power for up to 2 motors.

CHAPTER 11: AUTOPILOT INTEGRATION

CHAPTER CONTENTS

11.1 Autopilot control

Your display can be used to control a Raymarine Evolution-Series autopilot. The display can be used as the autopilot's only controller, or can be used in conjunction with dedicated controllers such as p70-Series controllers.

Important:
Before using your autopilot for navigation it must be correctly commissioned. For details on how to commission your autopilot refer to: **p.191 — Commissioning - Evolution autopilot system**

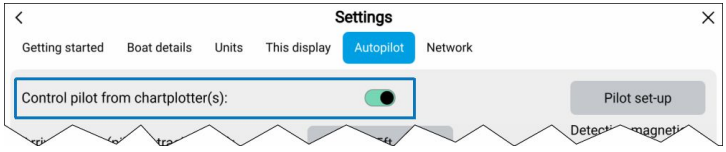
Autopilot connection:

The display (or data master display, when more than 1 display is connected) must be connected to the same SeaTalk NG/NMEA 2000 network as the display. Please refer to the documentation supplied with your autopilot for details on installing and connecting your autopilot to your display.

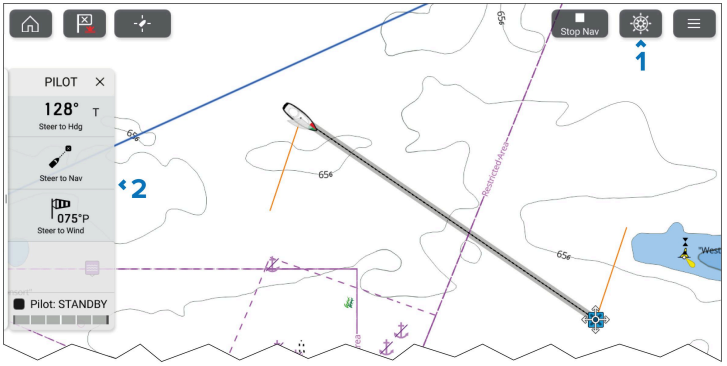
On multi-display networks, all display's on the same Ethernet/RayNet network as the data master display can control the autopilot.

Autopilot control:

Autopilot control must be enabled from the display's *[Autopilot]* settings: *[Homescreen > Settings > Autopilot > Control pilot from chartplotter(s)]*.



When autopilot control is enabled the *[Pilot]* sidebar and *[Pilot]* icon will be available:



1. *[Pilot]* icon — With autopilot control enabled, the *[Pilot]* icon is displayed onscreen; selecting the icon opens the *[Pilot]* sidebar. When the autopilot is engaged the *[Pilot]* icon is replaced with the *[Disengage pilot]* icon.
2. *[Pilot]* sidebar — The *[Pilot]* sidebar provides controls and information relating to your autopilot system. When the autopilot is engaged the *[Pilot]* sidebar's content is expanded to provide further controls and information. The *[Pilot]* sidebar can be hidden by swiping the sidebar to the left. The sidebar can be displayed again by swiping from the left of the screen towards the center of the screen.

Warning: Maintain a permanent watch

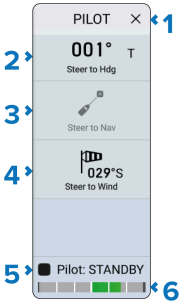
Always maintain a permanent watch, this will allow you to respond to situations as they develop. Failure to maintain a permanent watch puts yourself, your vessel and others at serious risk of harm.

Warning: Autopilot usage

Autopilots navigate a preset course and do NOT respond to hazards automatically. The operator must remain at the helm at all times and be ready to avoid hazards and warn passengers of course changes.

Pilot sidebar — Standby

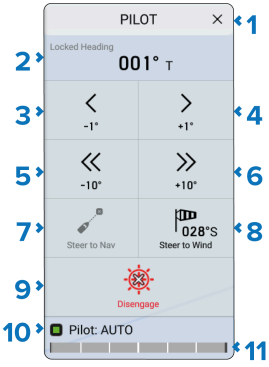
When the autopilot is in *[Standby]* the *[Pilot]* sidebar will provide options to engage the autopilot.



	Description
1	*[X]* (Close) — Closes the *[Pilot]* sidebar.
2	*[Steer to Hdg]* — Enables you to engage the autopilot in *Locked heading (Auto)* mode.
3	*[Steer to Nav]* — Enables you to engage the autopilot in *Navigation (Track)* mode. **Note:** *[Steer to Nav]* mode will only be enabled when there is *Active navigation*.
4	*[Steer to Wind]* — Enables you to engage the autopilot in *Steer to Wind (Wind vane)* mode. **Note:** *[Steer to Wind]* mode will only be available if *Sailing* was selected as the display's *Boating activity* during the initial start up wizard.
5	*[Pilot status]* — Provides the status of the autopilot.
6	*[Rudder bar]* — Provides visual indication of rudder position.

Pilot sidebar — Locked heading (Auto)

When the autopilot is engaged in *Locked heading (Auto)* mode the *[Auto]* pilot sidebar will be displayed.



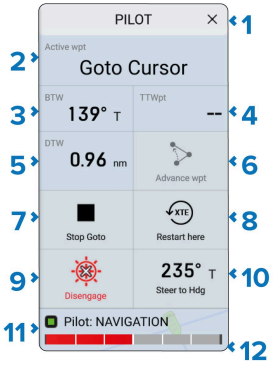
	Description
1	*[X]* (Close) — Closes the *[Pilot]* sidebar.
2	*[Locked heading]* — Indicates the current course in degrees.
3	*[< –1°]* — Selecting will adjust your course by minus 1°.
4	*[> +1°]* — Selecting will adjust your course by plus 1°.
5	*[<< –10°]* — Selecting will adjust your course by minus 10°.
6	*[>> +10°]* — Selecting will adjust your course by plus 10°.
7	*[Steer to Nav]* — Enables you to engage the autopilot in *Navigation (Track)* mode. **Note:** *[Steer to Nav]* mode will only be enabled when there is *Active navigation*.

	Description
8	*[Steer to Wind]* — Enables you to engage the autopilot in *Steer to Wind (Wind vane)* mode. **Note:** *[Steer to Wind]* mode will only be available if *Sailing* was selected as the display's *Boating activity* during the initial start up wizard..
9	*[Disengage]* — Allows you to disengage the autopilot and return to *Standby (manual control)*.
10	*[Pilot status]* — Provides the status of the autopilot.
11	*[Rudder bar]* — Provides visual indication of rudder position.

Pilot sidebar — Navigation (Track)

When the autopilot is engaged in *Navigation (Track)* mode the *[Auto]* sidebar will be displayed.

Note:
Navigation (Track) mode will only be enabled when there is *Active navigation*.

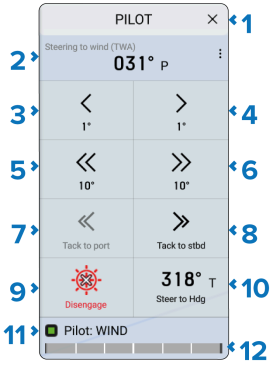


	Description
1	*[X]* (Close) — Closes the *[Pilot]* sidebar.
2	*[Active Wpt]* — Indicates the destination waypoint/goto.
3	*[BTW]* — Indicates the BTW (Bearing To Waypoint).
4	*[TTWpt]* — Indicates the Time To Waypoint.
5	*[DTW]* — Indicates the DTW (Distance To Waypoint).
6	*[Advance wpt]* — Advances navigation to the next waypoint in a route. **Note:** *[Advance wpt]* will only be available when following a route.
7	*[Stop Goto]**[Stop Route]* — Stops *Active navigation* and provides options to *[Disengage pilot]* or *[Maintain Hdg]* (Locked heading).
8	*[XTE Restart here]* — Restarts the cross track error from your current location.
9	*[Disengage]* — Allows you to disengage the autopilot and return to *Standby (manual control)*.
10	*[Steer to Hdg]* — Enables you to engage the autopilot in *Locked heading (Auto)* mode.
11	*[Pilot status]* — Provides the status of the autopilot.
12	*[Rudder bar]* — Provides visual indication of rudder position.

Pilot sidebar — Steer to Wind

When the autopilot is engaged in *Steer to Wind* mode the *[Wind]* pilot sidebar will be displayed.

Note:
[Steer to Wind] mode will only be available if *Sailing* was selected as the display's *Boating activity* during the initial start up wizard.



	Description
1	*[X]* (Close) — Closes the *[Pilot]* sidebar.
2	*[Steer to Wind]* mode — Indicates the current *Steer to Wind* mode and course in degrees. Selecting the data cell allows you to change the *[Steer to Wind]* mode.
3	*[< –1°]* — Selecting will adjust your course by minus 1°.
4	*[> +1°]* — Selecting will adjust your course by plus 1°.
5	*[<< –10°]* — Selecting will adjust your course by minus 10°.
6	*[>> +10°]* — Selecting will adjust your course by plus 10°.
7	*[<< Tack to port]* — Selecting will turn the boat to port so that the boat's course mirrors the same offset angle on the opposite side of the wind.
8	*[<< Tack to starboard]* — Selecting will turn the boat to starboard so that the boat's course mirrors the same offset angle on the opposite side of the wind.
9	*[Disengage]* — Allows you to disengage the autopilot and return to *Standby (manual control)*.
10	*[Steer to Hdg]* — Enables you to engage the autopilot in *Locked heading (Auto)* mode.
11	*[Pilot status]* — Provides the status of the autopilot.
12	*[Rudder bar]* — Provides visual indication of rudder position.

Engaging the autopilot — Locked heading (Auto)

For Wheel and Tiller pilots, ensure that the mechanical drive is engaged by either engaging the wheel drive's clutch or attaching the pushrod onto the tiller pin.

1. Select the *[Pilot icon]* to open the *[Pilot]* sidebar.
2. Select *[Steer to Hdg]*.
3. Select *[Engage pilot]*.

Locked heading (Auto) mode can also be engaged using the physical *[Pilot]* button on an Axiom Pro, Axiom 2 Pro or a RMK-Series keypad.

Engaging the autopilot — Navigation (Track)

For Wheel and Tiller pilots, ensure that the mechanical drive is engaged by either engaging the wheel drive's clutch or attaching the pushrod onto the tiller pin.

1. Initiate a *[Goto]* or *[Follow route]* from the chart app.
2. Select the *[Pilot icon]* to open the *[Pilot]* sidebar.
3. Select *[Steer to Nav]*.
4. Select *[Engage pilot]*.

Engaging the autopilot — Steer to wind (Wind vane)

For Wheel and Tiller pilots, ensure that the mechanical drive is engaged by either engaging the wheel drive's clutch or attaching the pushrod onto the tiller pin.

1. Select the *[Pilot icon]* to open the *[Pilot]* sidebar.
2. Select *[Steer to wind]*.
3. Select *[Engage pilot]*.
4. Select the *[Steer to wind]* data cell at the top of the sidebar.
5. Select the relevant *Steer to wind* mode.

Engaging the autopilot using the physical pilot button

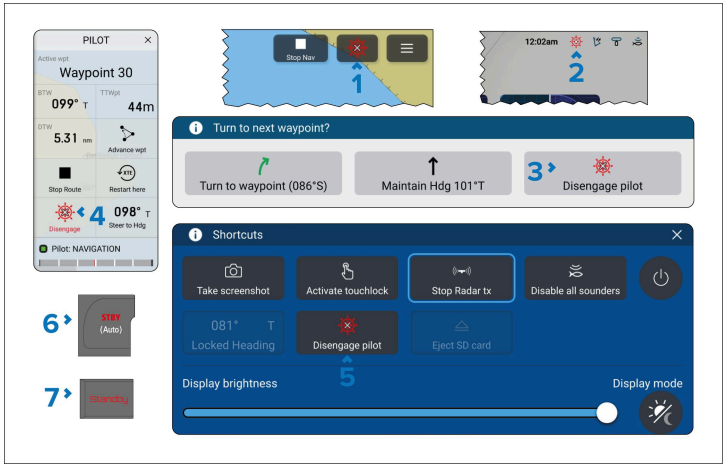
The autopilot can be engaged in *Locked heading (Auto)* mode using the physical *[Pilot]* button.

- Axiom 2 Pro — Press the *[Pilot]* button.
- Axiom Pro — Press and hold the *[STBY (Auto)]* button.
- RMK-Series — Press and hold the *[STBY (Auto)]* button.

Disengaging the autopilot

The autopilot can be disengaged using the *[Disengage pilot]* icon or a physical standby button.

Disengage pilot control locations



1. Top right corner of app pages.
2. Status area of Homescreen.
3. Waypoint arrival notification.
4. Pilot sidebar.
5. Shortcuts page.
6. Axiom Pro/RMK-Series keypad physical *[STBY (Auto)]* button.
7. Axiom 2 Pro *[Standby]* button.

11.2 Pilot version keypad LED status (Axiom 2 Pro only)

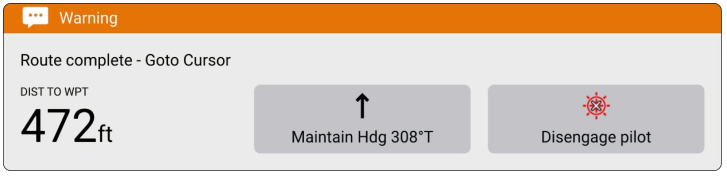
The *Pilot version* lower keypad on an Axiom 2 Pro display includes an autopilot status LED.

LED indication	Status and required action
	Solid green = Autopilot active/on.
	Off = Autopilot in standby.
	Flashing red = Autopilot calibrating, Autopilot error.

11.3 Pilot notification

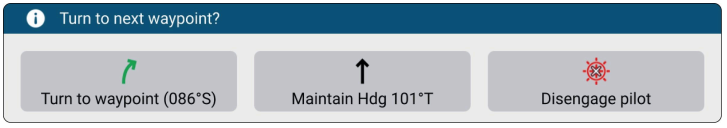
During active navigation, when you reach your current destination a notification is displayed.

Goto



When performing a *[Goto]* the notification provides options to disengage the autopilot or to maintain the current course in *Locked heading (Auto)* mode.

Follow



When following a route the notification provides options to make the required turn to the next waypoint, disengage the autopilot or to maintain the current course in *Locked heading (Auto)* mode.

11.4 Commissioning — Evolution autopilot system

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.

Note:
Commissioning must be performed using the datamaster MFD.

1. Power-up all of the components that make up your autopilot system.
2. Select the relevant vessel hull type for your vessel.
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 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 *[Pilot set-up]* menu: *[Homescreen > Settings > Autopilot > Pilot set-up > Vessel Hull Type]*.

The option that most closely matches your vessel's hull type and steering characteristics should be selected from the available hull types:

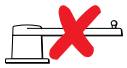
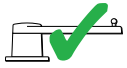
- *[Power]*
- *[Power (slow turn)]*
- *[Power (fast turn)]*
- *[Sail]*
- *[Sail (Slow turn)]*
- *[Sail Catamaran]*

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.

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:

	The following Dockside wizard procedures apply to vessels that do not have a rudder reference transducer: 1. Drive Type selection. 2. Rudder Limit setting. 3. 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). 4. Rudder Drive check.
	The following Dockside wizard procedures only apply to vessels that include a rudder reference transducer: 1. Drive Type selection 2. Rudder alignment (Align Rudder) 3. Rudder Limit 4. Rudder Drive check.

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

1. Select *[Dockside Wizard]* from the *[Advanced settings]* menu *[Homescreen > Settings > Autopilot > Pilot set-up > Dockside wizard]*.
2. Select *[Continue]* to initiate the dockside wizard and follow the onscreen instructions.

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*

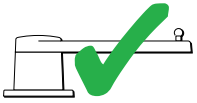
Important:
If your drive type is not listed, contact your Raymarine dealer for advice.

2. Select *[Continue]*.

Drive type selection is also available when the autopilot is in standby, from the *[Advanced settings]* menu: *[Homescreen > Settings > Autopilot > Pilot set-up > Drive type]*.

Aligning the rudder

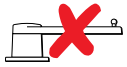
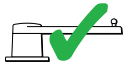
For systems that have a rudder reference transducer fitted, Rudder alignment is included in the dockside wizard and occurs after drive type selection. For systems without a rudder reference transducer fitted, rudder alignment is not required.

Scenario	Description
	**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 or drive selection depending on whether a rudder reference transducer is fitted.

	• For vessels without a rudder reference transducer • Rudder limit are set to 30 degrees and can be adjusted as required.
	• 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.

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. If required adjust the limit by selecting the rudder limit value box.

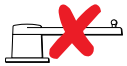
Important:
It is recommended that the limit is set to approximately 5 degrees less then the maximum rudder angle.

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

Note:
The rudder limit can be adjusted when the autopilot is in standby, from the *[Pilot set-up]* menu: *[Homescreen > Settings > Autopilot > Pilot set-up > Rudder Limit]*.

Hard over time

The hard over time setting can be specified as part of the Dockside wizard and comes after setting the rudder limit.

	• 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 in the Hard over time value box and select Continue.
- If you do NOT know the hard-over time for your vessel's steering system, select *[Continue]*, proceed with the Checking the rudder drive procedure and complete the Dockside wizard. Once the wizard is complete, proceed to the Setting the hard-over time instructions for information on how to calculate and set the hard-over time.

Setting the hard-over time

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. Open the sidebar by swiping right from the left side of the screen.
3. Switch to the Pilot sidebar.
4. Engage *[Auto]* mode.
5. Press the *[+10]* button on the Pilot bar 9 times to ensure that the rudder moves hard over to starboard.
6. Count how many seconds it takes for the rudder to move from hard over port to hard over starboard. This is your hard over time.
7. Enter your hard over time in the. The hard over time setting can be accessed from the *[Pilot set-up]* menu: *[Homescreen > Settings > Autopilot > Pilot set-up > Hard over time]*.
8. After setting the hard over time, observe the autopilot's behavior and if required, make small adjustments to the Hard over time value until a satisfactory result it achieved.

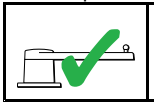
Warning: Rudder check

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.

Checking the rudder drive (rudder reference fitted)

As part of the dockside wizard, 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 proceeding.



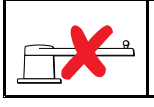
- The following procedure only applies to vessels with a rudder reference transducer.

1. Center and let go of the rudder.
2. Disengage any rudder drive clutch.
3. Select *[Continue]*.
4. Check it is safe to proceed and then select *[OK]*.
   The autopilot will now automatically move the rudder.
5. Select *[OK]* when the rudder has moved to port.
6. Select *[OK]* when the rudder has moved to starboard.
7. Select *[Continue]* when the rudder has centered.
8. Dockside calibration is now complete, select *[Continue]*.

Checking the rudder drive (no rudder reference fitted)

As part of the dockside wizard, 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 proceeding.



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

1. Center and let go of the rudder.
2. Disengage any rudder drive clutch.
3. Select *[Continue]*.
4. Check it is safe to proceed and then select *[OK]*.
   The autopilot will now automatically move the rudder.
5. 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.

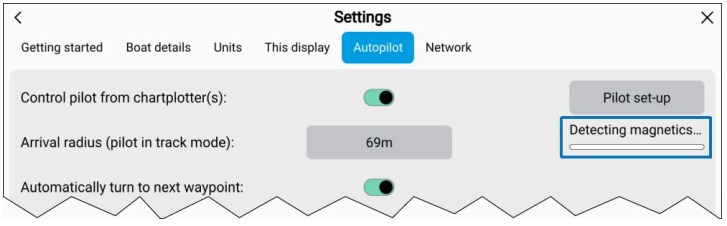
Important:
If you have not already done so, now set your Hard-over time using the following instructions: Setting the hard-over time

Compass linearization — Evolution autopilots

The EV sensor’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 sensor is first installed and powered-up (or after a factory reset or compass restart) linearization is required. During linearization the *[Detecting magnetics]* progress bar is displayed under the *[Pilot set-up]* button in the *[Autopilot]* settings menu: *[Homescreen > Settings > Autopilot]*.



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. The time it takes to complete the

linearization process 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 between 3 – 15 knots). You can also restart the linearization process at any time by selecting the *[Restart Compass]* from the Pilot set-up menu: *[Homescreen > Settings > Autopilot > Pilot set-up]*.
Once the initial linearization is completed the Maximum compass deviation value is displayed under the *[Pilot set-up]* button on the Autopilot settings page.

Compass deviation

If the reported deviation is 45° or higher, it is highly recommended that the EV sensor is moved and re-installed in a location which is subject to less magnetic interference.

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 sensor cannot be properly aligned to the vessel's longitudinal axis. In this case, it is possible to manually adjust the *[Compass offset]* value.

The compass offset can be adjusted from the Pilot set-up menu: *[Homescreen > Settings > Autopilot > Pilot set-up > Compass offset]*.

Important:
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.

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 Pilot set-up menu: *[Homescreen > Settings > Autopilot > Pilot set-up]*.

1. Select the *[Compass Lock]* toggle option so that it is enabled (Green)..

The compass linearization is now locked and automatic linearization will no longer be performed.

11.5 Rudder damping levels and deadband angles

For autopilot systems which include a rudder angle reference sensor / transducer, rudder damping is used to prevent Evolution-Series 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 the ACU-Series 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-Series software:

Rudder damping level	Existing Deadband angle (ACU-100, ACU-150, ACU-200, ACU-400)	Existing Deadband angle (ACU-300)	New Deadband angle (ACU-Series software version v3.11 or later)
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. *[Homescreen > Settings > Autopilot > Advanced settings > Rudder Damping].*