

OPERATOR'S MANUAL

D3

ENG

This Operator's Manual may be ordered in a different language free of charge up to 12 months after delivery, via internet.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

If internet access isn't possible, please contact your Volvo Penta dealer.

GER

Diese Betriebsanleitung kann bis zu 12 Monate nach der Lieferung über Internet kostenlos in einer anderen Sprache bestellt werden.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Wenn Sie keinen Internet-Zugriff haben, kontaktieren Sie bitte Ihren Volvo Penta-Händler.

FRE

Ce manuel d'utilisation peut être commandé gratuitement sur Internet en différentes langues, jusqu'à 12 mois après la date de livraison.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Veuillez contacter votre Distributeur Volvo Penta si vous avez un problème d'accès à l'Internet.

SPA

El presente libro de instrucciones puede solicitarse en otro idioma diferente, libre de cargo, hasta 12 meses después de la entrega, mediante internet.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Si no se tiene acceso a internet, contacten al su concesionario Volvo Penta.

ITA

Il manuale per l'operatore può essere ordinato tramite Internet, in varie lingue e per consegna gratuita, entro 12 mesi dalla consegna del prodotto

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Se l'accesso a Internet risulta impossibile, contattare la concessionaria Volvo Penta.

SWE

Denna instruktionsbok kan beställas via internet på ett annat språk gratis i upp till 12 månader efter leverans.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Kontakta din Volvo Penta-återförsäljare om du inte har tillgång till internet.

DUT

Dit instructieboek kan gratis via internet in een andere taal worden besteld tot 12 maanden na aflevering.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Als toegang tot het internet niet mogelijk is, neem dan contact op met uw Volvo Penta dealer.

DAN

Denne instruktionsbog kan bestilles gratis på et andet sprog via Internettet i op til 12 måneder efter leveringen.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Hvis det ikke er muligt at bestille via Internettet, bedes du kontakte din Volvo Penta forhandler.

FIN

Tämä käyttöohjekirja on tilattavissa Internetin kautta veloituksetta eri kielillä 12 kuukauden ajan toimituksen jälkeen.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Jos sinulla ei ole Internet-yhteyttä, ota yhteys lähimpään Volvo Penta jälleenmyyjään.

POR

Este Manual do Operador pode ser encomendado em idiomas diferentes isento de custos até 12 meses após entrega, via internet.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Se não for possível aceder à internet, contacte o seu concessionário Volvo Penta.

GRC

Το παρόν Βιβλίο Χρήσης μπορεί να παραγγελθεί δωρεάν σε άλλη γλώσσα μέχρι 12 μήνες μετά την παράδοση, μέσω διαδικτύου.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Εάν δεν είναι δυνατή η πρόσβαση στο ιαδίκτυο, παρακαλούμε επικοινωνήστε με το δικό σας αντιπρόσωπο της Volvo Penta.

RUS

Данное руководство по эксплуатации можно бесплатно заказать на другом языке по Интернету в течение 12 месяцев после доставки.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Если доступ к Интернету отсутствует, обратитесь к своему дилеру компании Volvo Penta.

TUR

Bu Kullanım Kılavuzu, teslimden 12 ay sonrasına kadar Internet yoluyla ücretsiz olarak farklı bir dilde sipariş edilebilir.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

İnternet mümkün değilse, lütfen Volvo Penta yetkili satıcınızla temas geçin.

CHI

本操作手册可通过互联网以不同的言进行订购，交付后可免费使用达12个月。

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

如果无法访问互联网，请与沃尔沃遍达经销商联系。

BZS

Este Manual de operador pode ser encomendado em um idioma diferente, gratuitamente, até 12 meses após a entrega, via internet.

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

Caso o acesso à internet não for possível, contatar seu distribuidor Volvo Penta.

JPN

このオペレーターズ マニュアルの他言語版が、発行後最高12か月間、インターネットより無料で発注可能です。

[http:// manual.volvopenta.com/coupon/](http://manual.volvopenta.com/coupon/)

インターネットにアクセスできない場合は、担当のボルボペンタディーラーまでご連絡ください。

CALIFORNIA PROPOSITION 65 WARNING

Engine exhaust, some of its constituents, and a broad range of engine parts are known to the State of California to cause cancer, birth defects, and other reproductive harm. Additionally, lubricants, fuels, and other fluids used in engines – including any waste created through the wearing of engine parts – contain or produce chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

Battery posts, terminals, and related accessories contain lead and lead compounds. Wash your hands after handling. Used engine oil contains chemicals that have caused cancer in laboratory animals. Always protect your skin by washing thoroughly with soap and water.

Content

Foreword	2
Safety Information	3
Introduction	8
Instruments and Controls	10
Optional	42
Starting	52
Operation	55
Engine Shutdown	59
Fault Handling	63
Fault Code Register	66
In Case of Emergency	70
Maintenance Schedule	74
Maintenance	81
Storage	115
Calibration and Settings	119
Technical Data	130
Alphabetical index	137

Foreword

Volvo Penta marine engines are used all over the world. They are used in all possible operating conditions for professional as well as leisure purposes. This is not a coincidence. After 100 years as an engine manufacturer the Volvo Penta name has become a symbol of reliability, technical innovation, top of the range performance and long service life. We also believe that this is what you demand and expect of your Volvo Penta engine.

We would like you to read this operator's manual thoroughly and consider the advice we give on running and maintenance before your maiden voyage so that you will be ensured of fulfilling your expectations. Please pay attention to the safety instructions contained in the manual.

As owner of a Volvo Penta marine engine, we would also like to welcome you to a worldwide network of dealers and service workshops to assist you with technical advice, service requirements and replacement parts. Please contact your nearest authorized Volvo Penta dealer for assistance.

You will find your closest dealer at our home page on the Internet www.volvopenta.com - amongst other useful information about your Volvo Penta engine - we invite you to visit!

Safety Information

Read this chapter very carefully. It has to do with your safety. This describes how safety information is presented in the operator's manual and on the product. It also gives you an introduction to the basic safety rules for using and looking after the engine.

Check that you have received the correct operator's manual before you read on. If not, please contact your Volvo Penta dealer.



This symbol is used in the operator's manual and on the product, to call your attention to the fact that this is safety information. Always read such information very carefully.

Safety texts in the operator's manual have the following order of priority:



DANGER!

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING!

Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.



CAUTION!

Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

IMPORTANT!

Indicates a situation which, if not avoided, could result in property damage.

NOTICE! Used to draw attention to important information that will facilitate work or operations.



This symbol is used on our products in some cases and refers to important information in the operator's manual. Make sure that warning and information symbols on the engine are clearly visible and legible. Replace symbols which have been damaged or painted over.

Your new boat

Carefully read through the instructions and other information that come with the new boat. Learn to handle the engine, controls and other equipment in a safe and proper manner.

If this is your first boat or if it is a type of boat you are unfamiliar with, we recommend that you practice maneuvering the boat in your own good time, so that you get to know the boat's seakeeping and maneuvering qualities at different speeds, sea states and load conditions before casting off on the "real" maiden voyage.

Bear in mind that a person in charge of a boat under way bears the legal responsibility of knowing and following the regulations for passage and safety afloat. Learn which regulations apply to you and your waters by contacting the relevant authorities or maritime safety organization.

It is a good idea to complete some type of boat driver's course. We recommend that you contact a regional boat association or maritime safety organization to find a suitable course.

Daily checks

Make it a habit to give the engine and engine bay a visual inspection before operation, before starting the engine and after operation once the engine has stopped. This helps you to quickly discover fuel, coolant, or oil leakages, or any other abnormal event that has, or is about to, happen.

Maneuvering

Avoid extreme and sudden rudder movements and ahead/astern maneuvers. There is a risk of passengers and crew overbalancing or falling overboard. A rotating propeller can cause serious injury. Ensure that nobody is in the water before selecting ahead/astern. Never pass close by bathers or areas where there is reason to believe that people may be in the water.

Avoid extreme stern drive trim as this can result in a serious reduction in steering ability.

Lanyard switch

We recommend that you install and use a lanyard switch (option), especially if you drive a boat capable of high speeds. The lanyard switch stops the engine if the driver overbalances and loses control of the boat.

Fuel filling

There is always a risk of fire and explosion when fueling. Smoking is forbidden, and the engine must be stopped.

Never over-fill the tank. Close the tank cap securely. Only use fuel recommended in the Operator's Manual. The wrong grade of fuel can cause malfunctions or engine shutdown. In diesel engines, fuel of poor quality can cause damage to the fuel system or the engine to over-speed with the risk of engine damage and personal injury.

Do not start the engine

Do not start or run the engine if fuel or propane leaks are suspected in the boat, or in the vicinity of, or close to discharges of, explosive media etc. An explosive environment carries the risk of fire and/or explosion.

Accidents and incidents

Maritime rescue statistics show that inadequate engine and boat maintenance and a lack of safety equipment are often the causes of accidents and incidents afloat.

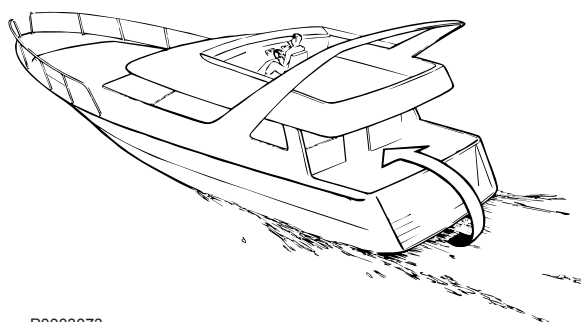
Make sure your boat's engine is maintained according to the instructions in the relevant manual and that the necessary safety equipment is on board and functional.

Carbon monoxide poisoning

When a boat moves forward an area of lower air pressure is formed behind the boat, so-called turbulence. In certain conditions, this turbulence can be powerful enough to draw the boat's own exhaust fumes into the cockpit or cabin, with the risk of carbon monoxide poisoning to those on board.

The turbulence problem is most pronounced on tall, broad-beamed boats with a transom stern. But even on other types of boats turbulence can be a problem in certain circumstances, e.g. under way with cockpit awnings rigged. Other factors that can increase the effect of turbulence are wind conditions, load distribution, swell, trim, open hatches and ventilators etc.

Most modern boats are however designed so that the turbulence problem is very rare. Should turbulence nevertheless occur, forward hatches and ventilators must not be opened. Strangely enough this will exacerbate the problem. Try instead changing the speed, trim or load distribution. Also try taking down or opening or in some other way changing the cockpit awning configuration. Contact your boat dealer for the best solution for your boat.



P0003073

Remember

- Safety equipment: Life jackets for everyone on board, communications equipment, distress rockets, fire extinguishers, first aid kit, life buoy, anchor, paddles, flashlights etc.
- Spare parts and tools: Impeller, fuel filter, fuses, tape, hose clamps, engine oil, propeller and tools for those jobs you might conceivably be forced to do.
- Take out the charts and study the planned course. Calculate the distance and the fuel consumption. Listen to the weather forecasts.
- Inform your relatives about your trip planning for longer voyages. Remember to inform of changed plans or delays.
- Inform those on board of the location of safety equipment and explain how it is used. Ensure that more than one person on board can start and drive the boat in a safe manner.

The list will need to be complemented as safety equipment requirements vary depending on boat type and how and where it is used etc. We recommend that you contact a regional boat association or maritime safety organization for more detailed maritime safety information.

Preparations

Knowledge

The operator's manual contains instructions on how to carry out general maintenance and service operations safely and correctly. Read the instructions carefully before starting work.

Service literature covering more complicated operations is available from your Volvo Penta dealer.

Never carry out any work on the engine if you are unsure of how it should be done, contact your Volvo Penta dealer who will be glad to offer assistance.

Stop the engine

Stop the engine before opening or removing engine hatches. Unless otherwise specified all maintenance and service must be carried out with the engine stopped.

To prevent accidental start of the boat engine, remove the ignition key, turn off the power supply to the engine at the main switches and lock them in the OFF position before starting work. Put up a warning sign in the control position that work on the engine is being carried out.

Approaching or working on an engine which is running is a safety risk. Loose clothing, hair, fingers or a dropped tool can be caught in the rotating parts of the engine and cause serious personal injury. Volvo Penta recommend that all servicing with the engine running should be undertaken by an authorized Volvo Penta workshop.

Lifting the engine

When lifting the engine, use the lifting eyes installed on the engine (reverse gear where installed). Always check that lifting equipment is in good condition and has sufficient load capacity to lift the engine (engine weight including reverse gear and any extra equipment installed). For safety's sake lift the engine using an adjustable lifting beam. All chains and cables should run parallel to each other and as perpendicular as possible in relation to the top of the engine. Bear in mind that extra equipment installed on the engine may alter its center of gravity. Special lifting equipment may then be required in order to maintain the correct balance and make the engine safe to handle. Never carry out work on an engine suspended on a hoist.

Before starting the engine

Reinstall all protective parts removed during service operations before starting the engine. Check that no tools or other items have been left on the engine.

Never start a turbocharged engine without installing the air cleaner (ACL). The rotating compressor in the Turbocharger unit can cause serious personal injury. Foreign objects can also be sucked in and cause mechanical damage to the unit.

Fire and explosion

Fuel and lubrication oil

All fuel, most lubricants and many chemicals are inflammable. Read and follow the instructions on the packaging.

When carrying out work on the fuel system, make sure the engine is cold. A fuel spill onto a hot surface or electrical components can cause a fire.

Store fuel soaked rags and other flammable material so that there is no danger of them catching fire. Fuel-soaked rags can self-ignite under certain conditions.

Do not smoke when filling fuel, oil or in proximity of a filling station or in the engine room.

Non-original components

Components used in the fuel and electrical systems on Volvo Penta products are designed and constructed to minimize the risk of fire and explosion.

Using spare parts other than by Volvo Penta approved spare parts can result in fire or explosion on board.

Batteries

The batteries contain and emit oxyhydrogen gas, especially during charging. This gas is easily ignited and highly volatile.

Do not under any circumstances smoke or use naked flame or allow sparks in the vicinity of the batteries or battery compartment.

An incorrect connection of a battery terminal cable or jump-start cable can cause a spark which in its turn can be sufficient to cause an explosion.

Start spray

Never use start spray or similar agents to start an engine equipped with air pre-heating (glow plugs/ starter element). This may cause an explosion in the inlet manifold. Danger of personal injury.

Hot surfaces and fluids

There is always a risk of burns when working with a hot engine. Beware of hot surfaces. For example: the exhaust pipe, turbo unit, oil pan, charge air pipe, starter element, hot coolant and hot oil in oil lines and hoses.

Carbon monoxide poisoning

Only start the engine in a well-ventilated area. If operating the engine in an enclosed space, ensure that there is proper ventilation in order to remove exhaust gases and crankcase ventilation emissions from the working area.

Chemicals

Most chemicals such as anti-freeze, rustproofing agent, inhibiting oil, degreasing agent etc. are hazardous to health. Read and follow the instructions on the packaging.

Some chemicals such as inhibiting oil are inflammable and dangerous if breathed in as well. Ensure good ventilation and use a protective mask when spraying. Read and follow the instructions on the packaging.

Store chemicals and other hazardous materials out of the reach of children. To protect the environment, please dispose of used or leftover chemicals at a properly designated disposal site for destruction.

Cooling system

There is a risk of flooding when working on the seawater system. Turn off the engine and close the sea cock (where installed) before starting work on the system.

Avoid opening the coolant filler cap when the engine is hot. Steam or hot coolant can spray out and cause burns.

If work must be carried out with the engine at operating temperature and the coolant filler cap or a cock open or a coolant hose disconnected, open the coolant filler cap carefully and slowly to release pressure before removing the cap completely. Note that the coolant may still be hot and can cause burns.

Lubrication system

Hot oil can cause burns. Avoid skin contact with hot oil. Ensure that the lubrication system is not under pressure before commencing work on it. Never start or operate the engine with the oil filler cap removed, oil can spray out.

Fuel system

Always use protective gloves when tracing leaks. Liquids ejected under pressure can penetrate body tissue and cause serious injury. There is a danger of blood poisoning.

Always cover the generator if it is located under the fuel filter. The generator can be damaged by spilled fuel.

Electronic Vessel Control (EVC)

The boat has a advanced control system. Never cut or modify connectors, wiring or splice of the components.

Installing non Volvo Penta components may cause the system to malfunction.

Service must be done by approved workshops.

Electrical system

Cutting off power

Always stop the engine and break the current using the main switches before working on the electrical system. Isolate shore current to the engine block heater, battery charger, or accessories mounted on the engine.

Batteries

The batteries contain an extremely corrosive electrolyte. Protect your skin and clothes when charging or handling batteries. Always use protective goggles and gloves.

If battery electrolyte comes into contact with unprotected skin, wash off immediately using plenty of water and soap. If battery acid comes into contact with the eyes, flush immediately with plenty of water and obtain medical assistance without delay.

Introduction

This Operator's Manual has been prepared to give you the greatest possible benefit from your Volvo Penta marine engine. It contains the information you need to be able to operate and maintain the engine safely and correctly. Please read the Operator's Manual carefully and learn to handle the engine, controls and other equipment in a safe manner before you cast off on your maiden voyage.

Always have the Operator's Manual available. Store it safely and do not forget to hand it over to the next owner if you sell your boat.

The Operator's Manual describes the engine and equipment sold by Volvo Penta. The illustrations in this book covers several varieties and might differ, the essential information is always correct though. The specifications, design features and illustrations in this manual are not binding. We reserve the right to make alterations without prior notification.

Installations with e.g. different controls and instrumentation might occur, in these cases we refer to this products manual.

Warranty

Your new Volvo Penta marine engine is covered by a limited warranty, under the conditions compiled in the Warranty Information.

Please note that AB Volvo Penta's liability is limited to the specification in the Warranty Information. Read it carefully, as soon as possible after delivery. It includes important information about service, maintenance, which it is the responsibility of the owner to know, check and carry out. If this is not done, AB Volvo Penta may fully or partly refuse to honour its warranty undertakings.

Please contact your Volvo Penta dealer if you have not received the Warranty Information or Service Book.

Environmental care

All of us want to live in a clean, healthy environment. Where we can breathe clean air, see healthy trees, have clean water in lakes and seas, and be able to enjoy the sunlight without fearing for our health. Unfortunately, this is not self-evident these days, it is something all of us must work hard for.

As a manufacturer of marine engines, Volvo Penta has particular responsibility and for this reason, environmental care is a core value in our product development. Volvo Penta has a wide engine programme these days, where considerable progress has been made in reducing exhaust fumes, fuel consumption, engine noise etc.

We hope that you will be want to preserve these values. Always observe the advice in the Operator's Manual about fuel grades, operation and maintenance, to avoid unnecessary environmental impact. Please contact your Volvo Penta dealer if you notice any changes such as increased fuel consumption or increased exhaust smoke.

Moderate your speed and distance so that wake and noise do not disturb or damage animal life, moored boats, jetties etc. Leave the archipelago and harbours in the same state you would like to find them.

Remember to always hand in drained oil, coolant, paint and wash residue, used batteries etc. for destruction at a recycling station.

If we all pull together, we can make a valuable contribution to the environment together.

Running in

The engine must be "run in" during its first 10 hours, as follows:

Use the engine in normal operation. Full load should only be applied for short periods. Never run the engine for a long period of time at constant speed during this period.

Higher oil consumption is normal during the running in period. For this reason, check the oil level more frequently than normally recommended.

After the first period of operation, the specified warranty inspection "First service inspection" can be done. For more information: Please refer to the Maintenance Schedule.

Fuel, oils and coolant

Only use the fuels and oils recommended in the Operator's Manual. Other grades can cause malfunctions, increased fuel consumption and eventually even shorten the life of the engine.

Always change the oil, oil filters and fuel filter at the specified intervals.

Future warranty claims related to engine and accessories may be refused if an unsuitable coolant has been used, or if the instructions for coolant mixture have not been followed.

Service and spare parts

Volvo Penta marine engines are designed for high reliability and long life. They are built to withstand a marine environment, but also to have the smallest possible environmental impact. Through regular service and use of by Volvo Penta approved spare parts, these qualities are retained.

Volvo Penta's world-wide network of authorised dealers is at your service. They are Volvo Penta product specialists, and have the accessories, original spares, test equipment and special tools needed for high quality service and repair work.

Always observe the maintenance intervals in the Operator's manual, and remember to note the engine/transmission identification number when you order service and spare parts.

Volvo Penta Electronic Vessel Control system (EVC) Integrity and Modification

The EVC system is a complete vessel control system for engine, gear and vessel steering control. The complete EVC system is developed, tested and verified to comply with Volvo Penta's stringent requirements for safety and reliability based on approved standard configurations. In order to maintain the EVC system integrity, all interaction with external systems (e.g., autopilot) is performed via Volvo Penta designed interfaces. After-market interfaces breach system integrity and may negatively affect vessel performance, safety and warranty coverage. Volvo Penta does not endorse any direct or indirect connection with other systems or components not being fully tested, verified and approved in writing by Volvo Penta. Volvo Penta accepts no responsibility for modification of the Volvo Penta EVC system and/or use of components or interfaces not sold or approved by Volvo Penta.

Certified engines

If you own or operate an emission certified engine it is important to be aware of the following:

Certification means that an engine type has been checked and approved by the relevant authority. The engine manufacturer guarantees that all engines made of the same type are equivalent to the certified engine.

This makes special demands on the care and maintenance you give your engine, as follows:

- Maintenance and service intervals recommended by Volvo Penta must be complied with.
- Only by Volvo Penta approved spares may be used.
- Service on injection pumps, pump settings and injectors must always be done by an authorised Volvo Penta workshop.
- The engine must not be converted or modified, except for the accessories and service kits which Volvo Penta has approved for the engine.
- Installation changes to the exhaust pipe and engine air inlet ducts must not be done.
- No seals may be broken by unauthorised personnel..

The general advice in the Operator's manual about operation, care and maintenance apply.

Late or inadequate maintenance/service or the use of spare parts not approved by Volvo Penta will invalidate AB Volvo Penta's responsibility for the engine specification being in accordance with the certificated variant.

Volvo Penta accepts no responsibility or liability for any damage or costs arising due to the above.

Instruments and Controls

This chapter describes the instruments, panels and controls Volvo Penta sells for your engine.

If you would like to complement your instrumentation, or if your boat is equipped with instruments not described here, we ask that you contact your Volvo Penta dealer.

For information about screens from 8" and above, please refer to the separate manual for Volvo Penta Glass Cockpit.

Ignition Lock

There is always a helm station with an e-Key panel or an ignition switch on the boat. The ignition must be switched on here in order for other helm stations to be used.

Read the starting instructions in *Starting page 52* chapter to make sure you use the correct start procedure.

e-Key panel

The Volvo Penta e-Key consists of a panel and a key fob.

Hold the key fob in front of the  symbol on the panel to unlock the EVC system. A sound confirms the system is unlocked.

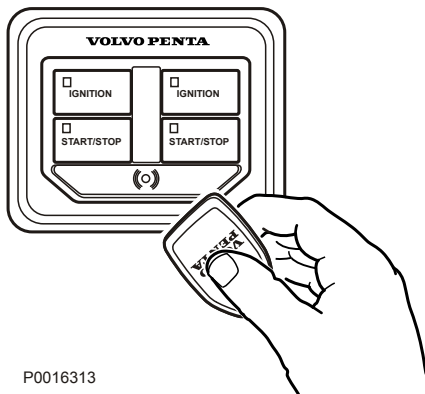
When the electrical system is locked a red light flashes under the symbol. The lamp goes out to indicate the system is unlocked.

Key Management

Two key fobs comes at delivery. It is possible to expand add additional keys, the system allows up to four keys. With a key already registered to the system other keys can be added or removed, see *Key Management page 126*.

Safety Lanyard

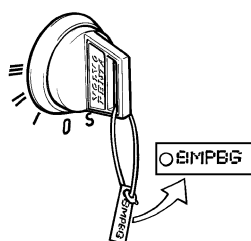
A safety lanyard (optional extra) can be connected to the panel. Should the safety lanyard be removed the engines will stop, the system alerts and a warning message is displayed in the Information Panel.



P0016313

Ignition switch

The start keys are supplied with a plate bearing the start code to be used when ordering spare keys. Keep the code beyond the reach of unauthorized people.



P0003068

- S** = The stop position.
- 0** = The key can be inserted or removed.
- I** = Operating position. System power is connected.
- II** = Not used.
- III** = Start position. Starter motor is engaged.

There is always a main helm station on a boat. It is the only helm station with an ignition lock. The ignition must be switched on here in order for other helm stations to be used.

Read the starting instructions in the *Starting page 52* chapter to make sure you use the correct start procedure.

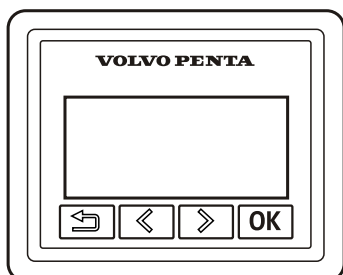
Control Panels

Volvo Penta panels and gauges can be installed in different combinations. There is always one information panel per driveline and helm station if no 7" screen is installed. The control panels can be used together with the tachometer and other accessory equipment.

Information Panel

The information panel shows engine and operational information, messages and alarms. There is one information panel per driveline and helm station if no 7" screen is installed. The information shown can be set up according to personal preferences. Basic settings show:

- Engine speed
- Oil pressure
- Coolant temp
- Battery voltage



P0001306



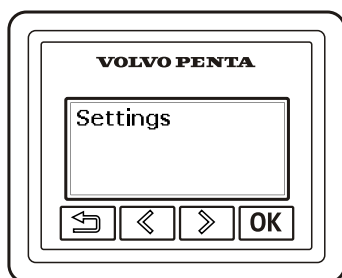
Return to the previous menu by pressing the button. Hold the button down for more than 3 seconds to reach the main menu or browse back to it by pressing the button repeatedly.



Browse backwards and forwards through the information panel menus by pressing the buttons. Hold down a button to scroll through a menu.



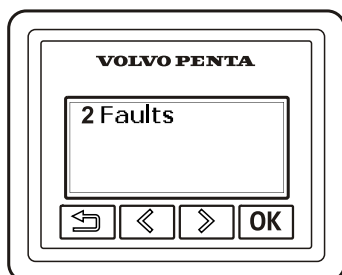
Confirm a selection by pressing the button.



P0012801

Settings

Browse to the settings menu and press "OK" to proceed to the submenu. For further information about settings, refer to *Settings Menu page 119*. To adapt information shown in the main menu to suit your personal preferences, refer to *My View page 119*.



P0012800

Fault messages

If the system discovers a fault, the word Fault is displayed on the screen. To see what faults have been detected, press "OK". For further information on how to handle fault messages and recommended actions, refer to the *Fault Handling page 63* chapter.

Backlighting

Panel backlighting can be adjusted by pressing

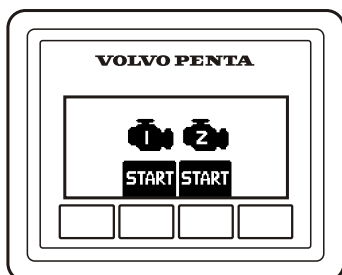
  simultaneously.

Start/Stop Panel

The start/stop panel is used for starting and stopping the engine.

To start the engine it is necessary for the ignition to be switched on at the key panel.

Read the starting instructions in chapter *Starting* page 52 and *Engine Shutdown* page 59 to ensure you use the correct start procedure.



P0001087

Power Trim panel

The Power Trim panel allows you to adjust the angle of the drive with respect to the transom.

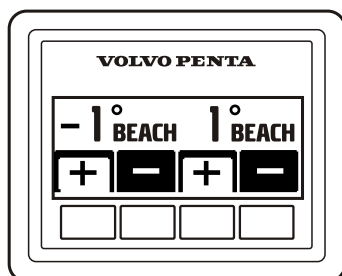
For twin engine installations, the control panel can be used to make individual or simultaneous adjustments to the drives.

By trimming out the drive away from the transom, the bow will be "raised" in relation to the horizontal axis and trimming in the drive will "lower" the bow of the boat

+ Will trim the drive away from the transom, the bow will be "raised" in relation to the horizontal axis.

– Will trim the drive away towards the transom, "lower" the bow of the boat.

For further information on Power Trim refer to *Instruments and Controls* page 32.

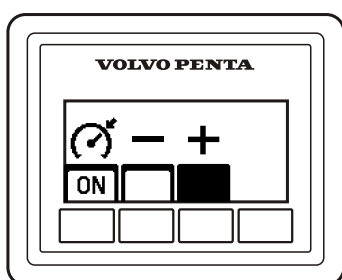


P0001189

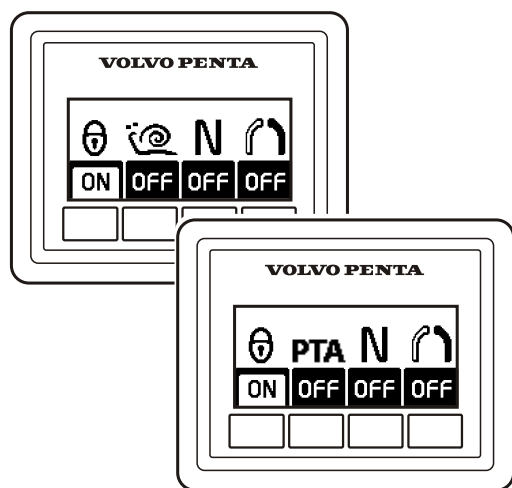
Cruise Control

Switch on cruise control by pressing the  button.

Make fine adjustments to the locked engine speed by pressing the + or – buttons to increase or reduce it.



P0001259



P0012495

Station Panel

Activation

Activate the helm station with a single press of the button.

Further pressure locks the helm station.

To render the helm station inactive, hold the button down for 3 seconds.



Inactive helm station



Active helm station



Locked helm station

Lowspeed and Power Trim Assistant (PTA)

Depending on the installation the optional functions lowspeed or Power Trim Assistant are engaged with the button.



Lowspeed

For further information about the function, refer to *Optional page 42*.

PTA Power Trim Assistant (PTA)

For further information about the function, refer to *Instruments and Controls page 32*.



Neutral button

The gearshift function can be disconnected so that the control lever only operates the throttle. The neutral button disengages the drive/reverse gear so that engine speed may be increased without driving the boat; (warm-up mode).



The drive is disengaged.



Drive engaged for movement ahead/astern.



Single lever

When the single-lever function is activated, the lever that is moved from its position first becomes the control lever for both engines. The other control lever has no function as long as the single-lever function is activated.

In order to activate the single-lever function, the control levers must be in roughly the same position, max 10% difference.

Docking Panel

When the boat is operated from a docking station engines, can be stopped and started and messages can be managed using the docking panel.

The joystick can be used for maneuvering when the docking station is activated; refer to the *Joystick* section for further information.

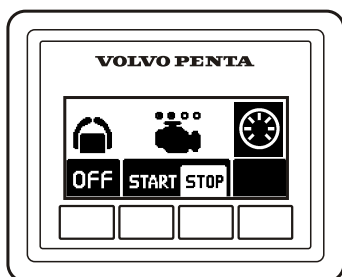
Activation

Activate the helm station by depressing the on/off button. A further pressure on the button locks the helm station.

To switch off the function, hold the button down for 3 seconds.

Twin instalation

Both engines in a twin instalation must be running before the docking station can be activated.



P0012493



The helm station is inactive.



The helm station is active and the docking function is switched on.

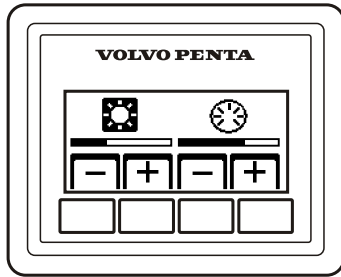


The helm station is locked.

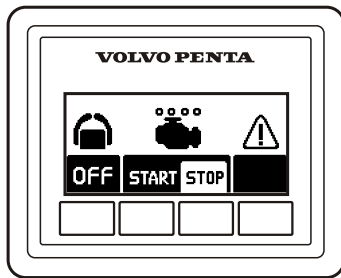
Start/Stop

Press the STOP and START buttons to stop and start all engines.

The circles above the engine symbols show which engines are running. An empty circle means an engine is running.



P0012494



P0001308

Contrast and backlighting

The button on the far right is used to adjust contrast and panel backlighting. The button is also used to confirm fault messages.



Backlighting



Contrast

Press the button to adjust the contrast and the backlighting.
Use + and – to increase or reduce the contrast or backlighting.
Adjustments affect all screens in the system.

Fault message

 is displayed on the screen when the system discovers a fault.

All fault messages must be acknowledged. Acknowledge by pressing the button; if the fault is accompanied by an audible signal, the signal will be silenced. Go to the information panel to get information regarding the alarm.

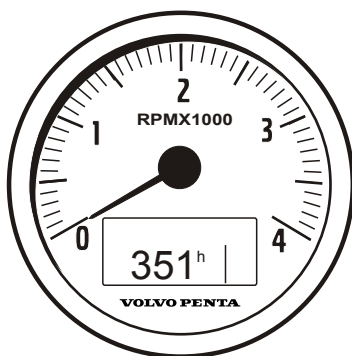
For further information on how to handle fault messages and recommended actions, refer to the *Fault Handling* page 63 and *Fault Code Register* chapters.

Gauges

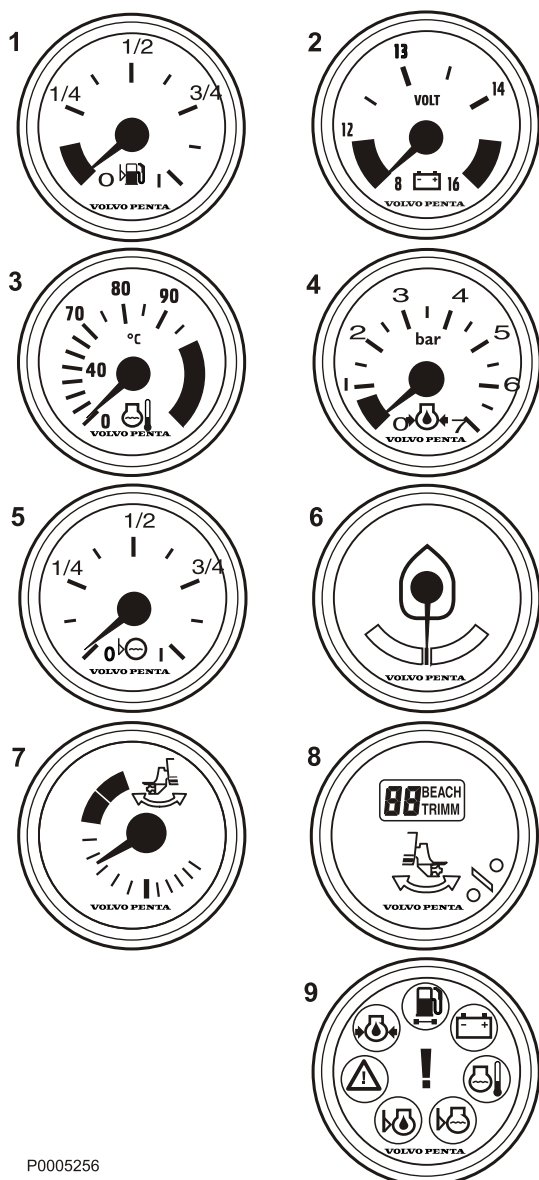
These instruments are sold as engine options by Volvo Penta.

The tachometer displays engine speed; multiply the value shown on the dial by 1,000 to get the number of engine revolutions per minute.

Engine hours is displayed in the tachometer window. When a function is activated a symbol shows shortly in the display.



P0012490



P0005256

1 Fuel level gauge

The fuel level gauge shows the quantity of remaining fuel.

2 Voltmeter, battery charging

The meter shows the alternator charge current. During operations the charge voltage should be around 14 V. When the engine is stopped and electrical power switched on the battery voltage should be around 12 V.

3 Coolant temperature gauge

The instrument shows engine coolant temperature. During operations coolant temperature should normally be between 75-95°C (167-203°F).

4 Oil pressure gauge

The oil pressure gauge displays engine oil pressure. During operations the oil pressure gauge should normally show 3-6 bar. At idle, lower values are normal.

5 Fresh water level sensor

Freshwater tank level gauge.

6 Rudder position indicator

The instrument shows rudder position.

7 Trim indicator, analog, for Aquamatic engines

The analog indicator shows the position of the stern drive in relation to the transom shield.

8 Trim indicator, digital, for Aquamatic engines

The digital indicator shows the position of the stern drive in relation to the transom shield.

9 Alarm monitor

The alarm monitor gives a visual warning to call attention to any alarms that occur.

4" Display

IMPORTANT!

Make a habit of protecting the screen with the protective cover when the boat is not in use. Prolonged exposure to strong sunlight can damage the screen and cause function faults.

The Volvo Penta 4" screen is controlled by means of buttons on the panel:



Return to the previous menu by pressing the button.

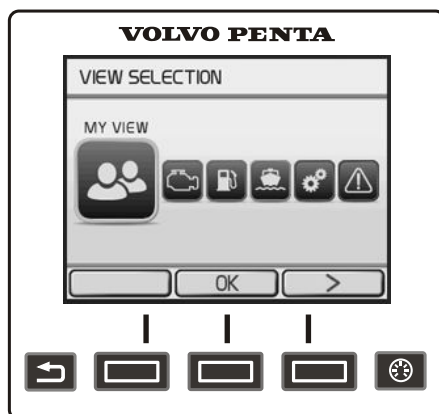


Press the button to adjust the display contrast.

The image reverts automatically a short while after the button is released.

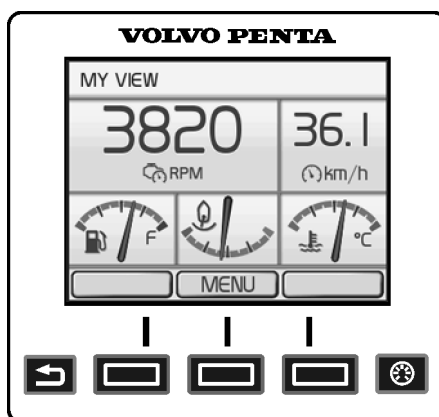


Menu button functions are shown on the display. Scroll back and forth or confirm a selection by pressing the appropriate button.



P0014727

View Selection



P0014748

My View

View Selection

The last selected view is shown on start. To return to the main menu, click . Navigate to the desired screen using the arrow buttons.

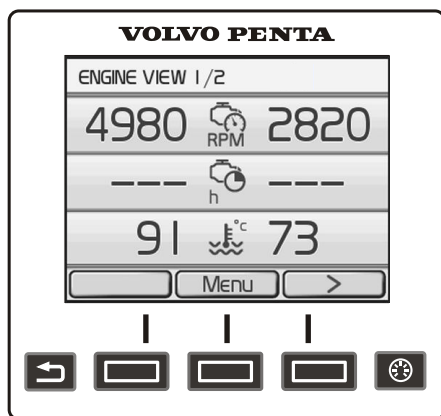
- **My View**, operating information
- **Engine View**, engine information
- **Fuel Economy**, trip computer
- **Vessel**, information regarding the boat's installation
- **Settings**, settings, display and installed functions
- **Warning Manager**, shows system faults detected and describes remedial actions

My View

Gauge and operations information is shown in the My View window.

Some functions are pre-set as quick selections. These can be switched on/off by pressing OK.

To change the gauge and information shown, refer to *Change gauge*. Functions are also switched on and off here.



P0014718

Engine View

Engine View

Information concerning the engine and its transmission is shown in Engine View. The information is shown in two windows; switch between the windows by pressing the arrow buttons.

Up to six different pieces of operations data can be shown on the display. The information shown can be set under *Change gauge*.

Depending on the functions installed in the boat, the following can be displayed:



Engine speed



Engine Hours



Engine Coolant Temperature



Battery voltage



Engine Oil Pressure



Turbo Pressure



Exhaust Temperature



Transmission Oil Pressure



Transmission Oil Temperature



Propeller Rotation



Ahead speed



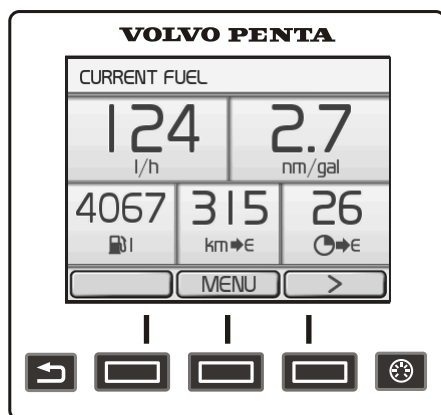
Power Trim angle

Fuel

This is the boat's trip computer and information is shown in two windows, Current Fuel and Average Fuel. Switch between screens by pressing the arrow buttons.

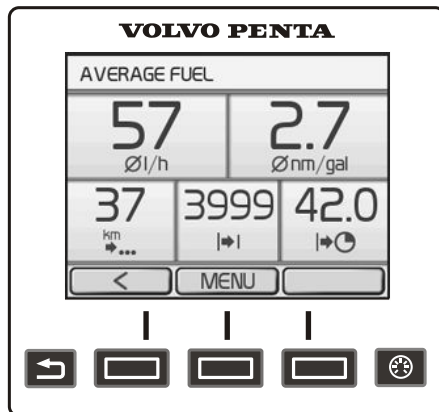
Current Fuel

- **Instant Fuel Rate**, current fuel consumption per hour.
- **Instant Fuel Economy**, based on current fuel consumption.
- **Remaining In Tank**, amount of fuel remaining in the tank.
- **Distance Remaining**, trip distance with fuel remaining in the tank based on current fuel consumption.
- **Time To Empty**, operating time with fuel remaining in the tank based on current fuel consumption..



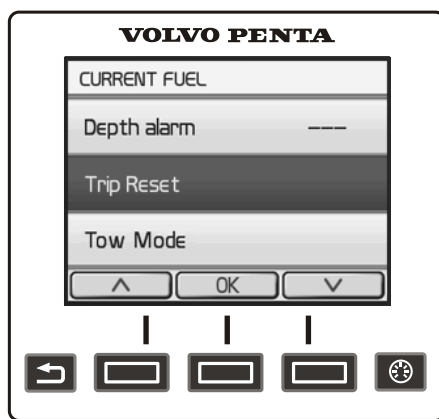
P0014717

Current Fuel



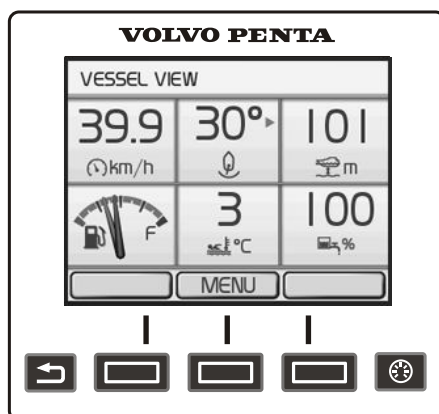
P0014740

Average Fuel



P0014741

Trip Computer Reset



P0014719

Vessel

Average Fuel

- **Average Fuel Rate**, average fuel consumption since the last trip computer zero reset.
- **Average Fuel Economy**, average since the last trip computer zero reset.
- **Trip Distance**, average fuel consumption per unit of distance since the last trip computer zero reset.
- **Trip Fuel**, fuel consumption per unit since the last trip computer zero reset.
- **Trip Hours**, time travelled since the last trip computer zero reset.

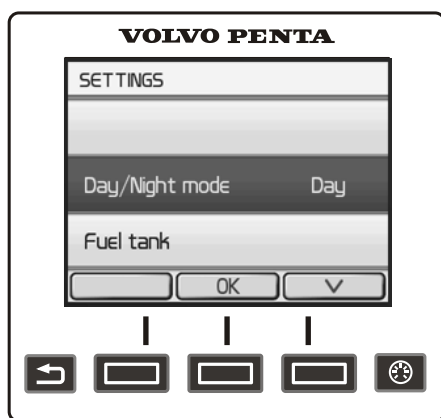
Trip Computer Reset

To zero all values in the trip computer, press the MENU button and select Trip Reset.

Vessel

Shows information regarding the boat's installation. The information shown can be set under *Change gauge*. Functions are also switched on and off here. Depending on the functions installed in the boat, the following can be displayed:

- **Boat Speed**
- **Rudder Angle**
- **Depth**, for setting echo sounder; refer to *Depth Alarm* page 120.
- **Fuel Level**
- **Sea Water Temperature**
- **Freshwater Level**
- **ACP Info**, for further ACP information, refer to *ACP*.
- **Interceptor Position**, for further information, refer to *Volvo Penta Interceptor System*.



P0014723

Settings

Settings

Display and various system function settings are done in the settings menu. The information shown varies depending on the installation.

Navigate to the desired setting or function and press **OK** to reach the sub menu.

Key Management, add and remove keys, refer to *Key Management page 126*.

Day/Night-Mode

Day shows dark text against a light background and Night light text against a dark background.

Fuel Tank

Fuel tank calibration and settings. For information regarding calibration, refer to *Fuel Tank page 125*.

Drive Type

The setting may only be made by authorized Volvo Penta personnel.

Toe-In/Toe-Out Adjustment

The setting may only be made by authorized Volvo Penta personnel.

Neutral Beep

Switches the beeper that sounds when the control is in the neutral position on and off.

Info Beep

Switches the signal that confirms when a function has been activated or deactivated on and off.

Info Beep Level

Sets the volume (%) of the Info Beep that confirms when a function has been activated, or deactivated.

PTA Calibration

Calibration and resetting, PTA. For information regarding calibration, refer to *PTA Calibration page 124*.

Trip Reset

Zeroes all values in the trip computer.

ACP Mode

Setting the ACP protection position. For information on the ACP function, refer to *ACP*.

Depth Alarm

Setting the depth alarm function; refer to *Depth Alarm page 120*.

Display Contrast

Contrast adjustments affect all displays in the system.

Display Type

Select the engines for which the information will be shown in the display, and the type of installation the display forms part of.

Units

Setting the units (metric, US or Imperial) and distance units (km, NM or miles) distances will be shown in.

Language

Setting the language information will be shown in.

Speed Factor

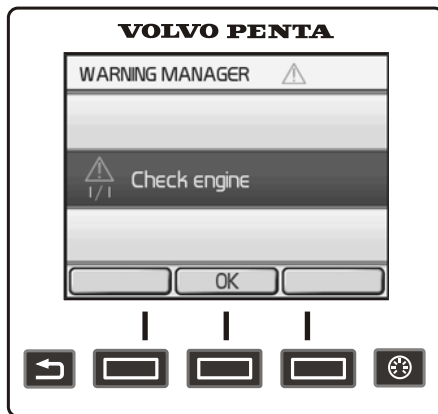
Setting the velocity factor; refer to *Speed Factor* page 126.

EVC Information

Information about components, software and functions installed. Installed functions are checkmarked.

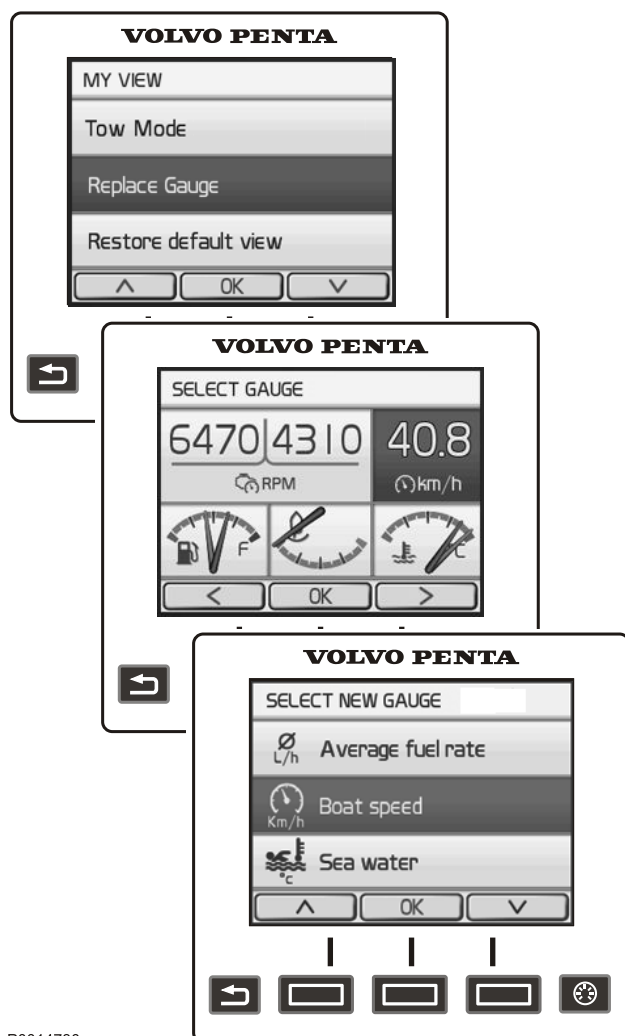
Warning Manager

If the system discovers a fault, the helmsman is informed by a message on the display. The fault message must be acknowledged by pressing OK. All fault messages are stored in Warning Manager; the drivetrain affected is shown, the fault described and suitable actions suggested. For further information on different fault messages, refer to the *Fault Code Register* page 66

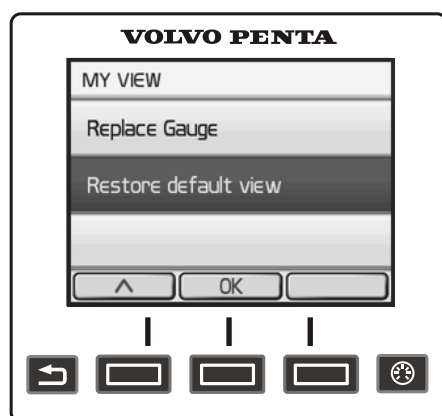


P0014724

Warning Manager



P0014730
Replace Gauge



P0014731
Restore Default View

Replace Gauge

In My View, Engine View and Vessel the owner can decide what information will be shown and where on the display. The procedure is the same for all views.

- 1 Press MENU button and select Replace Gauge.
- 2 Navigate using to the gauge for replacement and press .
- 3 Select the gauge for replacement and press .

Restore Default View

The display has a basic setting that it is always possible to return to..

- 1 Press MENU button and select Restore Default View.
- 2 Press .



P0001165

7" Display

The Volvo Penta 7" screen is controlled by means of buttons:

-  Turn to browse through submenus and to return to the main menu.
-  Return to the previous menu.
-  Confirms selection; also used to access submenus and the *Settings page 30*.
-  Controls boat instrument backlighting. The page automatically returns a few seconds after the button is released.

IMPORTANT!

Make a habit of protecting the screen with the protective cover when the boat is not in use. Prolonged exposure to strong sunlight can damage the screen and cause function faults.

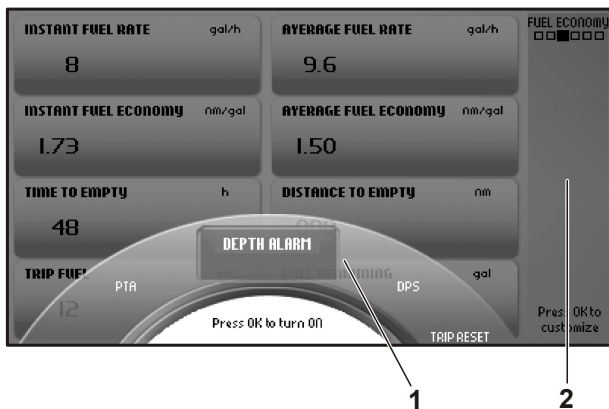
The status field (2) on the right of the screen displays the current view, active functions and repaired faults.

Pop-up

A number of pre-set functions can be switched on and off in a pop-up. Press **OK** and the functions will show in the lower part of the screen (1).

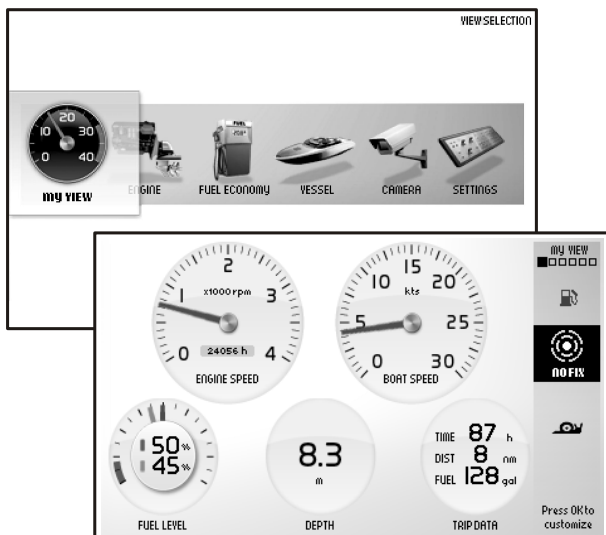
Turn to the desired function and press **OK** to confirm that the function is to be switched on or off. Active functions are displayed by a symbol in the status field (2) on the right.

Trip Reset is also found here; refer to *Fuel Economy page 28*.



P0001050

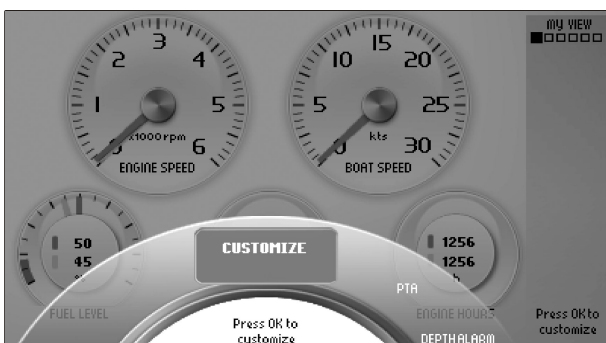
- 1 Pop-up menu
- 2 Status field



P0012481

My View

Boat, engine and transmission data are displayed in My View as analog or digital instruments. Selection of instruments to be displayed and their appearance is made under the **Customize** menu. Information for up to three engines can be displayed on the same screen in boats with multiple engine installations; they are distinguished by different color dials in the instruments.



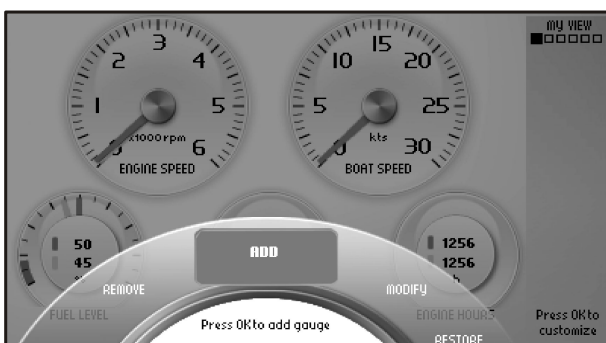
P0001187

Customize

Press **OK** so that the **Customize** menu is displayed.

Press **OK** to access the submenus **Add**, **Remove**, **Modify** and **Return to basic setting..**

Use the knob to browse between menus.

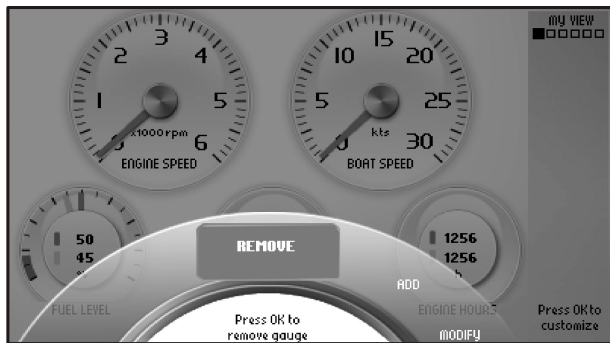


P0001188

Adding instruments

Turn the knob to **Add** and press **OK**.

Select the desired information is displayed and confirm with **OK**. The new instrument will position itself at the bottom right corner.

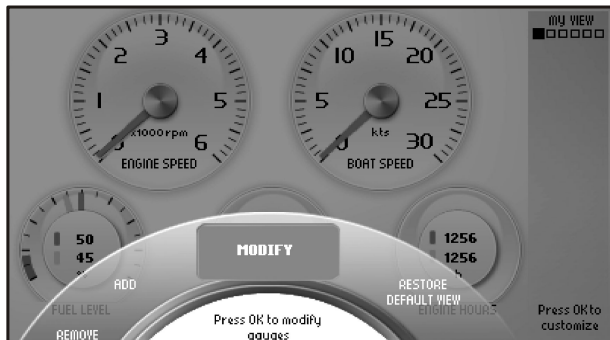


P0001184

Removing instruments

Turn to the **Remove** menu and press **OK**.

Turn to the instrument that is to be removed and confirm with **OK**.



P0001185

Changing instruments

Turn to the **Modify** menu and press **OK**.

Select the instrument that is to be changed and press **OK**.

Choose between:

Remove, removes the instrument.

Replace, changes one instrument for another. Turn to the desired instrument and press **OK**.

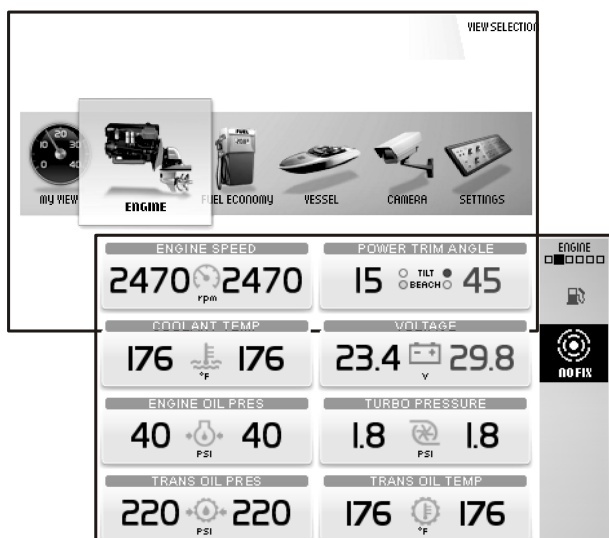
Analogue/Numeric, specify whether the instrument will be displayed as analog or digital.



P0001097

Restore Default View

The screen has a basic setting that can always be returned to by pressing **Restore Default View** in the **Customize menu**.



P0012483

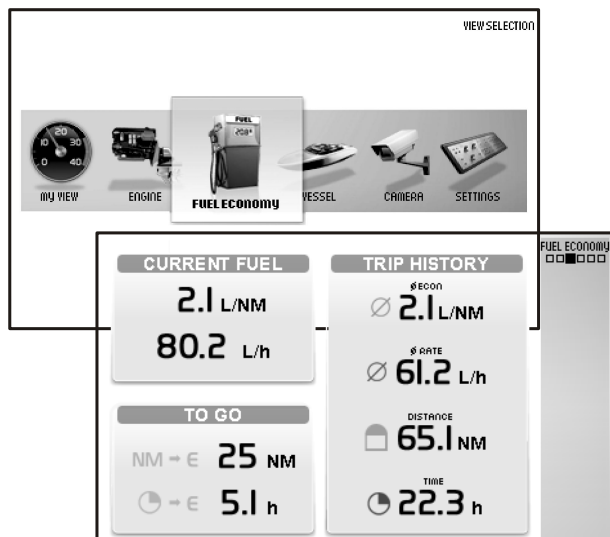
Engine

Information concerning the engine and its transmission is displayed in this view.

Depending on the functions installed in the boat, the following can be displayed:

- **Engine Speed**
- **Power Trim angle**, for further information refer to *Trim Controls page 33* and PTA calibration in the *Settings Menu page 119* chapter.
- **Rudder Angle**
- **Coolant Temperature**
- **Voltage**, battery voltage
- **Engine Oil Pressure**
- **Turbo Pressure**
- **Engine Hours**, total operating hours.

The information in this view cannot be changed.



P0012482

Fuel Economy

This view functions as the boat's trip computer.

Depending on the functions installed in the boat, the following can be displayed:

Current Fuel

Instant Fuel Rate, based on current fuel consumption

Instant Fuel Economy, current fuel consumption per hour.

To Go

Distance Remaining, trip distance with fuel remaining in the tank based on current fuel consumption.

Time To Empty, operating time with fuel remaining in the tank based on current fuel consumption.

Trip History

Average Fuel Rate, average fuel consumption since the last trip computer zero reset.

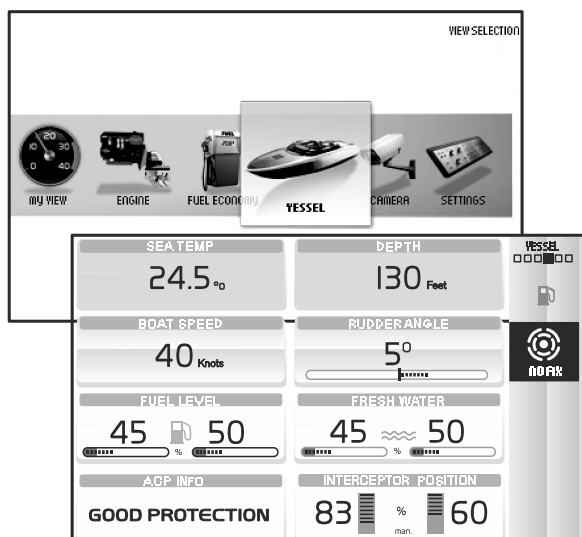
Average Fuel Economy, average since the last trip computer zero reset.

Trip Distance, distance travelled since the last trip computer zero reset.

Trip Time, time travelled since the last trip computer zero reset.

To zero all values in the trip computer press **OK**.

The information in this view cannot be changed.



P0018177

Vessel

Information concerning boat installations is displayed in this view.

Depending on the functions installed in the boat, the following can be displayed:

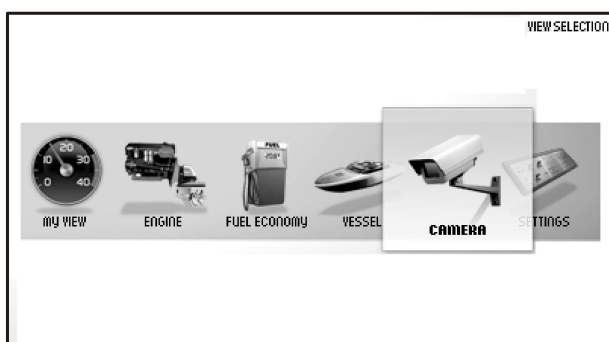
- **Sea Water Temperature**
- **Depth**, to set the echo sounder refer to *Depth Alarm* in chapter *Settings Menu* page 119 .
- **Boat Speed**
- **Rudder Angle**
- **Fuel Level**
- **Freshwater Level**
- **ACP Info**, for further ACP information, refer to the *ACP* chapter.
- **Interceptor Position**, for further information refer to the *Volvo Penta Interceptor System* chapter.

The information in this view cannot be changed.

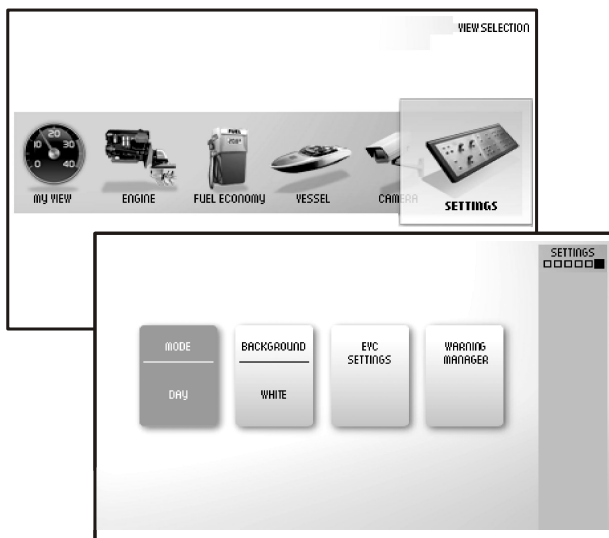
Camera

It is possible to connect a camera to the screen (e.g. for monitoring the engine compartment or swimming platform).

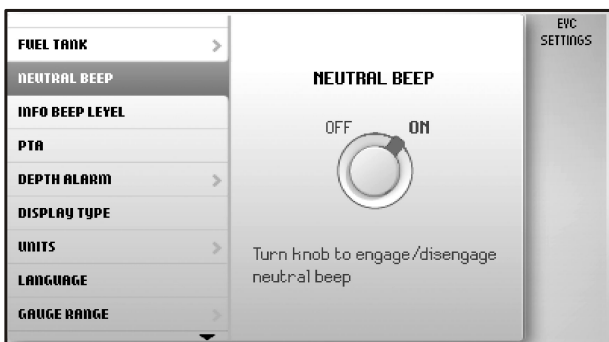
If a camera is installed, images will be displayed in this view.



P0001175



P0001098



P0001043

Settings

Screen settings and different function settings are made in this view. Turn to the desired menu and press **OK** to access the submenus.

Mode

Choose between the modes **Day** (dark text on a white background) or **Night** (light text on a dark background). Press **OK** to switch between modes.

Background

Choose between the background colors Gray, Aqua, White, Carbon and Red.

EVC Settings

Press **OK** to access the settings menu.

Settings for the display, switching functions on and off, audible alarm settings, alarm limits, language and units. Information regarding boat installations is also found here.

Key Management: add and remove keys. Refer to *Key Management page 126*.

Neutral Beep: switching on and off the beeper that sounds when the control is in the neutral position.

Info Beep Level: setting the volume of the signal that confirms when a function has been activated, or deactivated.

Trip Computer Reset: zeroes all values in the trip computer.

Camera: for laterally inverting the image shown or showing the camera at a docking station.

Display Type: for selecting the engines the information in the display concerns, and the type of installation the display forms part of.

Infodisplay Contrast: for adjusting the contrast on all displays at the helm station.

Units: setting units (metric/US/imperial) and unit of distance (km, NM or miles).

Language: selecting the display language.

Gauge Range: setting instrument maximum range.

Boat Speed: 10 – 100 knots in 10 knot stages.

Engine Speed: 2500/3000/4000/5000/6000 rpm.

Propeller speed: 1000/2000/3000 rpm.

EVC Information: this information cannot be changed.

Features: installed functions are marked blue.

Components: press **OK** to see installed components.

Software: information regarding the software ID number.

Calibration

The following is only displayed if the function is installed. For further information refer to the appropriate section in the *Settings Menu page 119* chapter.

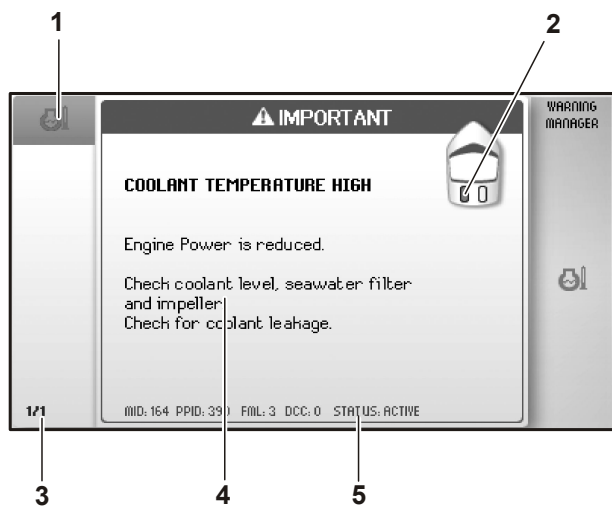
Speed Correction: setting the speed factor.

Depth: setting the echo sounder depth alarm. Follow the instructions on the screen.

Fuel Tank: fuel tank calibration. Follow the instructions on the screen.

ACP Info: setting the ACP protection position.

PTA: PTA calibration. Follow the instructions on the screen.



P0001049

- 1 Symbol
- 2 Shows which driveline the fault was detected in.
- 3 List of registered faults; turn the knob to browse.
- 4 Fault message with description and suggestion for action.
- 5 Service information.

Warning Manager

If the system discovers a fault, the helmsman is informed by a message on the display. The fault message must be acknowledged by pressing **OK**.

All faults are stored in the *Warning Manager*.

A fault message indicates the drivetrain affected, describes the fault and suggests suitable actions.

For further information on fault messages, refer to *Fault Handling page 63*.

Power Trim

Your Volvo Penta drive is equipped with a hydraulic trim system, Power Trim, that allows you to adjust the angle of the drive with respect to the transom from the helm station. The angle of the drive effects the boat's passage through the water and other characteristics, e.g. improved acceleration to planing and planing with a lower throttle opening. Trimming can also be used to give a more gentle passage in short seas.

Running on one engine in twin installations

If only one engine is working, the drive for the engine that is not running must be raised.

To raise the engine:

- 1 Turn the key for the drive that will not start to the run position so that system power is connected and the engine is stopped.
- 2 Using the trim button, raise the drive as high as it will go.
- 3 Turn the key to the stop position.

IMPORTANT!

Failure to raise a faulty drive in a twin installation with one engine running can result in the drives' colliding with each other and suffering damage.

Trim Ranges

To be able to use the information on the trim instrument, it is important to be aware of the three trim ranges and the way they are used.

Trim range

The trim range are used to provide the best comfort when driving – from starting to top speed.

Beach range

The beach range is used for driving at low speed in shallow water or where the depth is unknown. The highest permitted engine speed when in the beach range is 1500 rpm.

IMPORTANT!

Make sure the drive's coolant inlet is never trimmed out of the water when operating in the beach range.

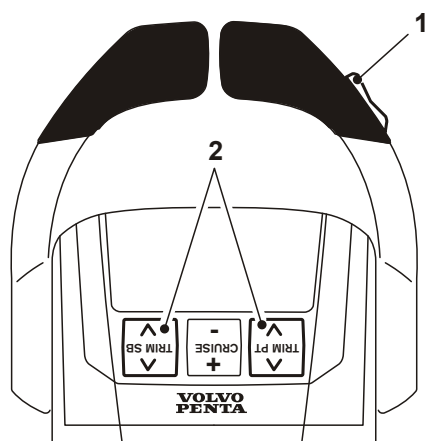
Lift range

The lift range is never used when sailing. It lifts the drive to maximum height and is used for e.g. transporting the boat on a trailer. Power Trim has an automatic stop that turns off the power when the end position is reached. The catch is released automatically when the stern drive is trimmed down.



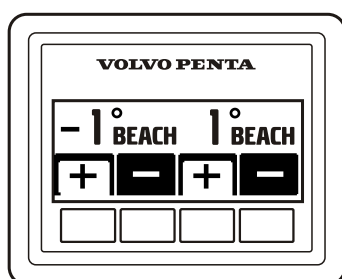
WARNING!

The engine must not be run with the drive in the "lift" range.



P0013214

Top mount control for twin installation



P0001189

Trim Controls

The drive can be trimmed with the Power Trim panel or with the button at the side of the control (1). For twin engine installations, the button at the side adjust the drives simultaneous. There is also a button for individual adjustments to the drives (2) on the control for twin installations.

Power Trim panel

The Power Trim panel is used for both single and twin engine installations. For twin engine installations, the control panel can be used to make individual or simultaneous adjustments to the drives.

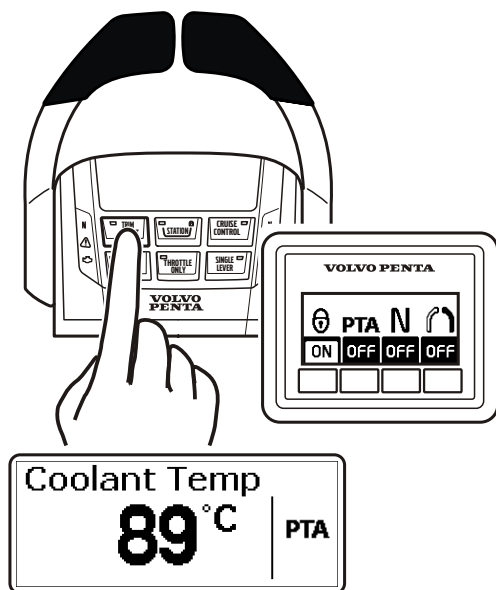
The drive's angle and position is shown on the Power Trim panel. By trimming out the drive away from the transom the bow will be "raised" in relation to the horizontal axis and trimming in the drive will "lower" the bow of the boat.

Trimming out the drive

On the Power Trim panel, press button + to trim the drive out, away from the transom. The bow will be "raised" in relation to the horizontal axis.

Trimming in the drive

Press button – to trim the drive in, towards the transom. The bow will be "lowered" in relation to the horizontal axis.



P0013276

Power Trim Assistant

The Power Trim Assistant, PTA, adjusts the trim angle automatically according to engine speed (rpm). It is possible to set five trim angles at five different engine speeds, idle speed included. To set the angles, please refer to *PTA Calibration page 124*.

Press the PTA button on the helm station panel or the Trim Assist button on the control to activate or de-activate the function.

PTA is shown on the screen if the PTA function is active.

Trim Instruments

WARNING!

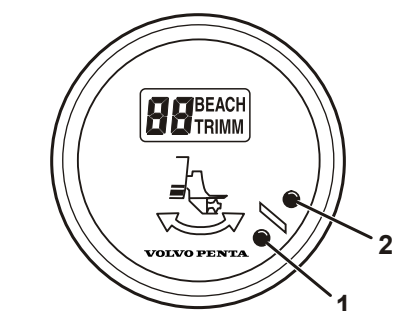
The engine must not be run with the drive in the "lift" range.

Digital trim instrument

The trim instrument shows the drive trim setting. The angle of the drive is given in relation to a horizontal line. The lowest value indicates that the drive is fully trimmed down and the highest value that the drive is fully trimmed up. Note that the lowest value can vary from boat to boat, depending on the angle of the transom. When the drive angle is within the trim range, the text "TRIM" is shown on the display.

When the drive angle is within the beach range, lamp 1 lights orange and the text "BEACH" is shown on the display.

When the drive is in the lift range, the drive angle is greater than +30° and lamp 2 lights red. There is no text on the display.

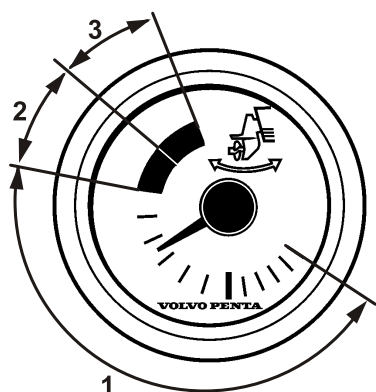


P0002443

Analog trim instrument

The trim instrument shows the drive trim setting. The beach range is marked with an orange zone and the lift range with a red zone.

- 1 Trim ranges
- 2 Beach range (orange)
- 3 Lift range (red)



P0002444

Maneuvering

The correct trim setting provides the best comfort when driving.

Every boat has its own unique characteristics and reacts differently to how you trim it. We can therefore only give general advice about how you reach the best trim angle for your boat. It can generally be said that when the boat feels well balanced, is easy to steer and comfortable to drive - than you have found the optimum trim angle.

Make a few trips at low speed to experience the effect of Power Trim and the different trim ranges, to see what effect they have on the boat. Note how long it takes for the boat to reach planing speed. Check the tachometer, speed and the response of the boat.

Trim the drive down

The bows are pressed down and the boat accelerates faster. It also provides better driving and steering response at speeds below the planing threshold.

Driving with "bow down"

The "bow down" position is normally used during acceleration up to planing speed, at low planing speeds or with a short sea. With full "bow down", the boat has a tendency to self-steer. You may have to compensate with the wheel to keep the boat on the right course. In this position, the bow of the boat tries to go deeper in the water. If the boat is driven at high speed or towards high waves, the bow will plough downwards into the water. The boat can start to steer with the bows or yaw suddenly so that passengers may be thrown overboard.

The boat's trim shall always be adjusted to give well balanced steering. Certain combinations of boat, engine and propeller can cause instability and/or self-steering tendencies when the boat is driven at or close to the maximum "bow up" or "bow down" positions. The stability and steering characteristics of the boat can also vary depending on the sea conditions. Contact your Volvo Penta dealer to correct these tendencies if your boat shows instability and/or self-steering tendencies.

At planing speed

Trim the drive to the angle that gives the most stable and comfortable feeling. If the boat has a twin installation, the drive can be trimmed to different angles to compensate for side winds and, to a certain degree, uneven load distribution.

Driving with "bow down"

The "bow up" position is normally used for driving at cruising speed, in short seas, or at full speed. With full "bow up" the boat can have a tendency to self-steer. You may have to compensate with the rudder to keep the boat on the right course. In this position, the bow of the boat tries to lift out of the water. Excessive "bow up" trim causes propeller cavitation, so that the propeller loses its grip. The engine speed increases without the boat speed increasing, in fact the boat might even sink.

Be careful when driving in short seas. Excessive "bow up" trim may cause the boat to bounce quickly upwards, with the risk of throwing passengers overboard.

In short seas or heavy head seas

Trim the drive down so that the bow drops. This makes for a more comfortable journey. Refer to section *Driving with "bow down"*.

Driving in Beach range

The beach range is used for driving at reduced speed in shallow water or where the depth is unknown.

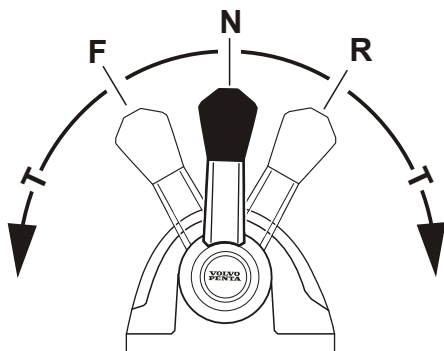
The highest permitted engine speed when in the Beach range is 1500 rpm.

IMPORTANT!

Make sure the drive's coolant inlet is never trimmed out of the water when operating in the beach range..

Controls

This section describes the controls Volvo Penta sells for your engine. Contact your dealer if your boat is equipped with controls other than those described here, and you feel uncertain about their function.



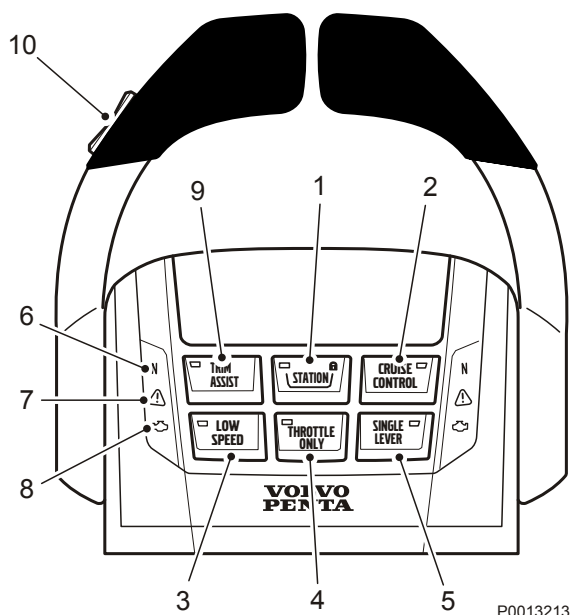
P0012501

A single-lever control operates both gearshift and throttle functions with the same lever.

The engine can only be started with the control lever in the neutral position.

- N** = Neutral position. Reverse gear/drive disengage and engine at idle.
- F** = Reverse gear/drive engaged for forward motion.
- R** = Reverse gear/drive engaged for rearward motion.
- T** = Engine rpm control (throttle).

Engine and drive features are controlled with push buttons on the control. What buttons and functions available is depending on the installation.



P0013213

- 1 STATION**
The button lamp is lit if the helm station is active and lit. Refer to *Helm Stations* page 57 for further information.
- 2 CRUISE CONTROL (optional)**
Switch on cruise control by pressing the button. Fine tune the locked engine speed by increasing (+) or reducing (-) engine rpm with the button at the other side of the control.
- 3 LOW SPEED (optional)**
See *Optional* page 42 for information.
- 4 THROTTLE ONLY**
Disconnects the shift function so that the control lever only affects engine speed; refer to "Disengaging shift function" in this chapter for further information.
- 5 SINGLE LEVER (optional)**
Switch on the single-lever function by pressing the button. The lever that is moved from its position first becomes the control lever for both engines. The other control lever has no function as long as the single-lever function is activated. The button lamp lights up to show that the function is active. Exit the single-lever function by pressing the button again.

6 **N**

Neutral position. The symbol shows that the drive/reverse gear is disengaged.

7

The warning triangle lights up if the system discovers a fault; refer to *Fault Handling page 63* for information.

The warning triangle lights up on the same side as the driveline with the indicated fault.

8 This function is not available.

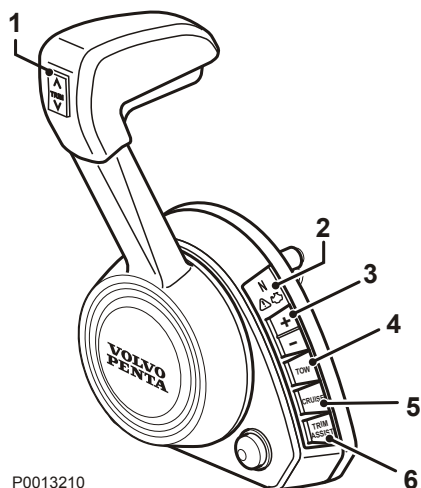
9 TRIM ASSIST

The Power Trim Assistant, PTA, adjusts the trim angle automatically according to engine speed (rpm), see *Power Trim Assistant page 34* for information.

10 TRIM

Trim the drive out//in.

For twin engine installations the adjustment of the drives are synchronized. For further information see *Instruments and Controls page 32*.



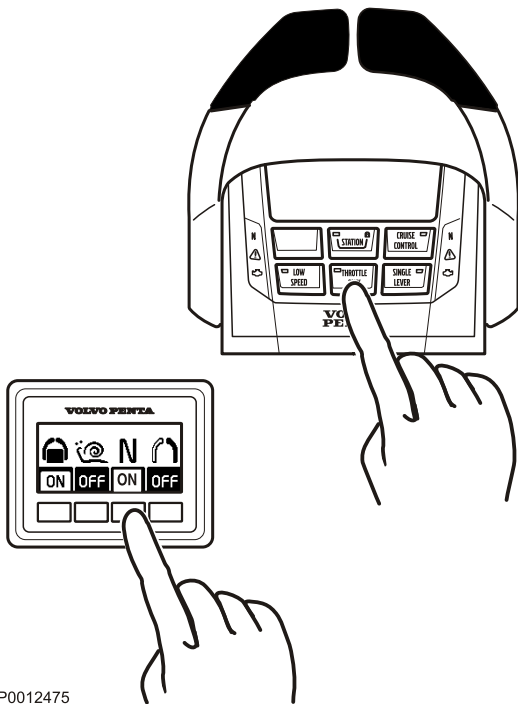
P0013210

Side mounted levers

- 1 **TRIM**
Trim the drive out//in.
For twin engine installations the adjustment of the drives are synchronized.
For further information on Power Trim see *Instruments and Controls* page 32.
- 2 **N**
Neutral position. The symbol shows that the drive/reverse gear is disengaged.

The warning triangle lights up if the system discovers a fault; refer to *Fault Handling* page 63 for information.

This function is not available.
- 3 **+ / -**
Fine tune the locked engine speed for tow mode (4) or cruise control (5) by increasing (+) or reducing (-) engine rpm.
- 4 **TOW MODE**
Accelerates the boat to a preset rpm.
Switch on tow mode by pressing the button.
Fine tune the locked engine speed by increasing (+) or reducing (-) engine rpm with button (3).
- 5 **CRUISE CONTROL (optional)**
Switch on cruise control by pressing the button.
Fine tune the locked engine speed by increasing (+) or reducing (-) engine rpm with button (3).
- 6 **TRIM ASSIST (optional)**
The Power Trim Assistant, PTA, adjusts the trim angle automatically according to engine speed (rpm), see *Power Trim Assistant* page 34 for information.
- 7 **THROTTLE ONLY**
Disconnects the shift function so that the control lever only affects engine speed; refer to "Disengaging shift function" in this chapter for further information.
- 8 **Neutral interlock**
The neutral interlock prevents accidentally moving the throttle out of neutral.
Depress the interlock button to move control out of neutral.
The neutral interlock will automatically re-engage when the control handle is returned to the neutral position.



P0012475

Disengaging the Shift Function

The gearshift function can be disconnected so that the control lever only operates the throttle.

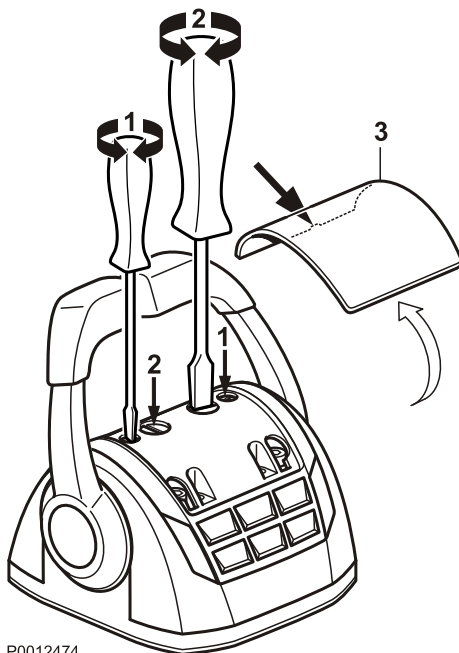
- 1 Put the control levers in neutral.
- 2 Press the control "Throttle Only" button or the neutral button (N) on the helm station panel.
- 3 Release the button. The N symbol on the control will light up as confirmation that the gearshift function is disengaged and that the lever will only affect engine revolutions.

To exit neutral mode, press the button again.

Adjusting the friction brake

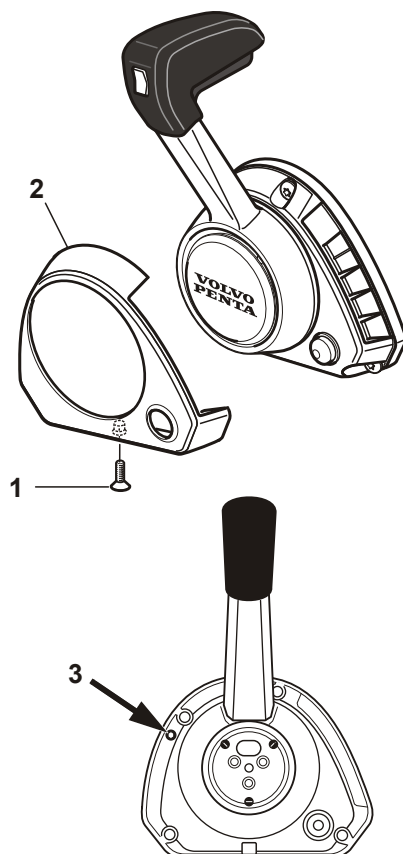
Top mounted lever

The control lever has a friction brake that can be adjusted for lighter or stiffer lever movement. Resistance in click mode can also be adjusted.



P0012474

- 1 Switch off the engine.
- 2 Remove the cover (3).
- 3 Adjust the friction brake (1) and/or click mode (2) by turning the screw clockwise for stiffer lever movement, and counterclockwise for lighter lever movement.
- 4 Replace the cover.

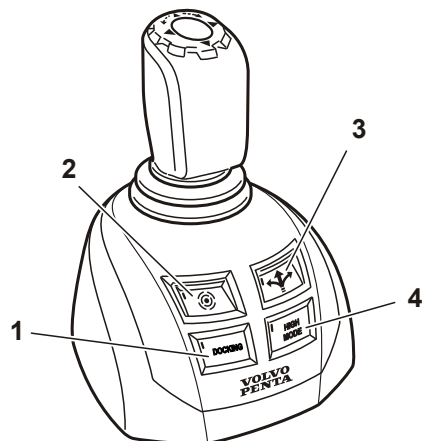


P0013443

Side mounted levers

Adjust the resistance in the lever click mode.

- 1 Switch off the engine.
- 2 Unscrew the screw (1) and remove the cover (2).
- 3 Adjust the detent by turning the screw (3) with a 2.5 mm hex wrench. Turn the screw clockwise for an increased detent, and counterclockwise to decrease the detent.
- 4 Replace the cover.



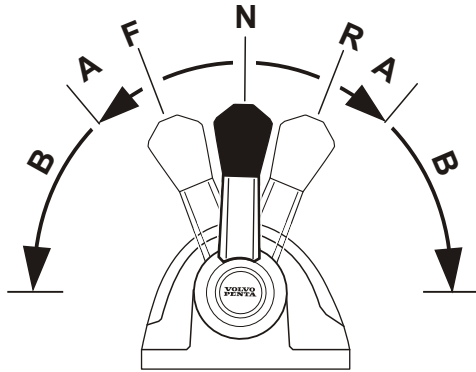
P0016686

Joystick

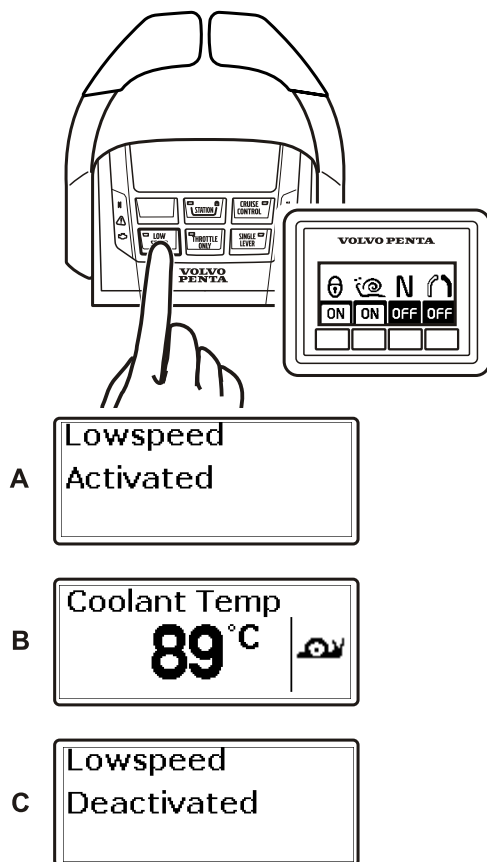
The joystick is optional. The features are controlled with push buttons on the control. What buttons and functions available is depending on the installation.

- 1 Docking
For operation and further function information, refer to *Joystick for docking page 43*.
- 2 Dynamic Positioning System
For operation and further function information, refer to *Dynamic Positioning System*.
- 3 Joystick Driving
For operation and further function information, refer to *Joystick Driving page 46*.
- 4 High Mode
For operation and further function information, refer to *Joystick for docking page 43*.

Optional



P0012499



P0012978

Lowspeed

The Volvo Penta low speed function is available for engines with hydraulic transmissions.

Boats with powerful engines can have high speeds even at low revolutions; the low speed function reduces speed.

- N** = Neutral position.
Transmission is disengaged and engine revolutions are at idle.
- F** = Forward at idle.
The transmission is engaged for operations ahead and the engine is at idle; this involves maximum trolling in the transmission.
- R** = Reverse at idle.
The transmission is engaged for operations astern and the engine is at idle; this involves maximum trolling in the transmission.
- A** = Low speed engaged.
The transmission affects propeller revolutions. The engine is not affected.
- B** = Low speed disengaged.
The control affects engine speed and propeller revolutions.

Engaging the low speed function

- 1 Move the lever to the neutral position.
- 2 Press the Low Speed button on the control or  on the helm station panel to activate the low speed function.

An audible signal and the message "Lowspeed activated" (**A**) will be displayed on screen to confirm that the function is on.

 is shown on the screen if the low speed function is active (**B**).

When the low speed function is engaged a delay may occur when shifting.

Disengage the low speed function

- 1 Move the lever to the neutral position.
- 2 Press the Low Speed button on the control or  on the helm station panel to disengage the low speed function.

Two audible signals confirm that the function is switched off and the "Lowspeed deactivated" (**C**) message is displayed on the screen.

Joystick

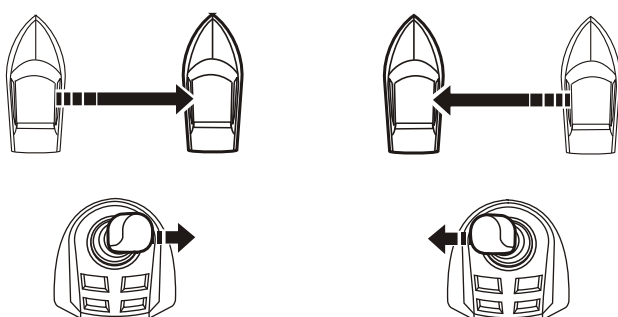
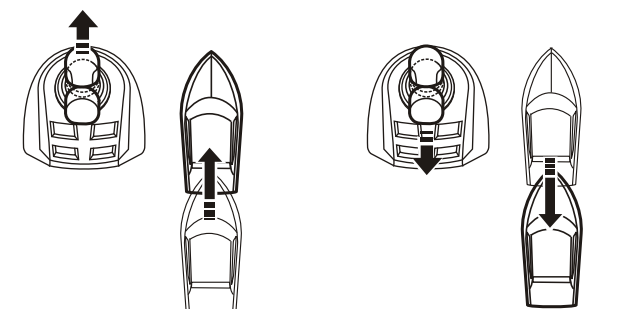
Joystick for docking

Volvo Penta Joystick is a control used for docking and maneuvering. Practise using the joystick and its functions in a safe and proper manner. Practise how to operate the boat with both joystick docking and steering functions.

CAUTION!

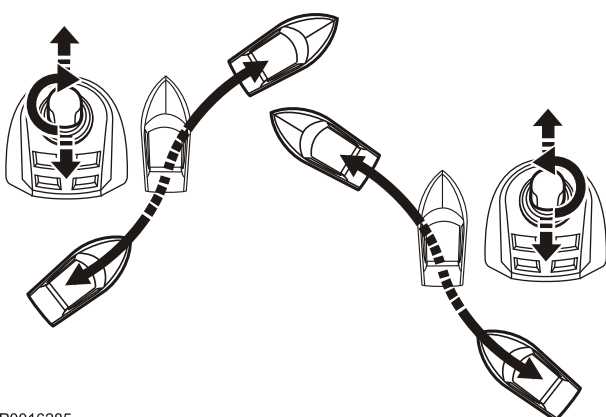
The joystick maneuvering works differently depending on if the docking function or steering function is active.

Practise using all means of steering and throttle under all conditions.

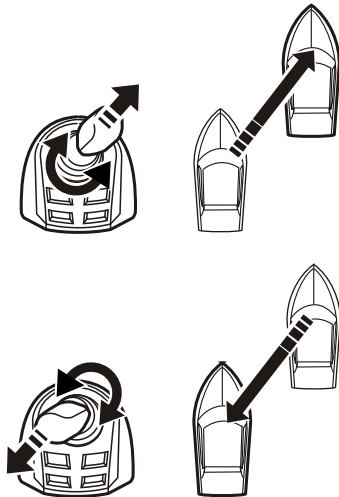


The docking function is designed to be used when docking or maneuvering in close quarters. Use the steering wheel and throttle control levers in all other situations.

The boat is maneuvered by moving the joystick forward, aft, abeam, twisting the top of the joystick and combinations of the movements.



P0016285



P0016286

CAUTION!

The boat will continue to move in the selected direction even when the joystick has been released.

To slow the boat or reverse its direction, move the joystick in the opposite direction. In order to achieve a diagonal movement, move the joystick diagonally and use the joystick knob to adjust the boat's direction accordingly.

When the docking function is activated, engine revolutions are limited and the boat can only be steered by the joystick.

In order to activate the docking function, the following must be fulfilled:

- engines running
- control levers in neutral
- helm station active
- joystick in center position

Activating the docking function

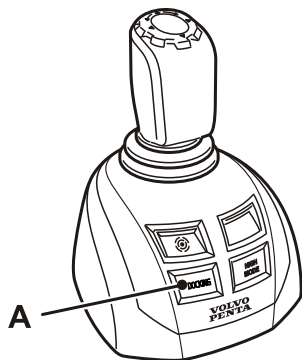
Activate docking mode by depressing the docking button (A) on the joystick.

An audible signal will confirm that docking mode is activated and the docking button lamp will light up.

Exiting the docking function

To exit the function, press the joystick docking button (A). An audible signal will sound twice to confirm that docking mode is deactivated, and the docking light will go out.

The docking function is also deactivated if the controls are moved from the neutral position.



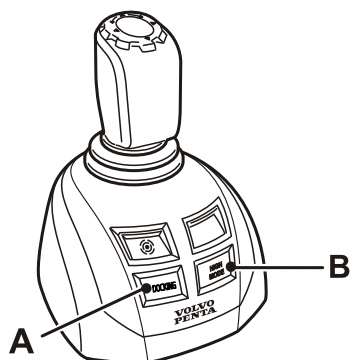
P0012509

High Mode

If extra power, e.g. when there is a strong wind or strong current, the High Mode function may be engaged.

Activate High Mode

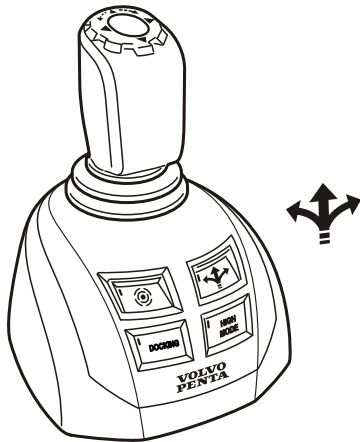
- 1 Activate the joystick by depressing the docking button (A). An audible signal confirms that the joystick is activated and the docking button lights up.
- 2 Activate the High Mode function by depressing button (B) on the joystick.
- 3 An audible signal confirms that the function is activated and the high Mode button lights up.



P0012510

Disengage High Model

Disengage the function by pressing the button again. An audible signal will sound twice to confirm that docking mode is deactivated, and the light will go out. The system is now in normal docking mode.



P0016372

Joystick Driving

NOTICE! Function Joystick Driving only works together with Volvo Penta autopilot.

The Joystick Driving function allows the joystick to be used during passage to adjust the boat's heading and maneuver the boat in the same way as with the autopilot and helm steering unit.

Throttle and gear shift controls work in the normal manner.

Learn to maneuver the boat with the joystick in calm, open waters.

Joystick Driving is activated and de-activated by pressing the  button on the joystick.

When Joystick Driving is activated the autopilot is also started. While the boat is under joystick control the autopilot is in standby mode; when the joystick is released to its central position the autopilot is activated and locks in on the new heading after a few seconds.

Like the autopilot, the helm steering unit is locked when the function is active but it may always be used for e.g. changing course or giving way for an obstacle. Twist the top of the joystick or move it sideways to reengage Joystick Driving.

If the autopilot is put in standby mode manually by means of the STBY button, Joystick Driving switched off and must be reengaged using the button on the joystick.



P0016293

Heading adjustments

Twist the top of the joystick to change heading incrementally. A short twist changes the heading by a fixed increment while a twist held firm will change the heading through several increments.

The autopilot shows the heading with a digital value and an indicator in shape of a blue triangle, a yellow arrow shows the new heading that the boat will be set to.



P0004011

Maneuvering

The joystick can also be used to maneuver the boat in the same manner as with a helm steering unit. Move the joystick sideways to steer the boat in the same direction. When the joystick is released the autopilot will set a new heading that corresponds to boat heading.

NOTICE! Full joystick movement to one side corresponds to full helm. Maneuvering abeam provides a faster response than adjusting the heading by twisting the top of the joystick.

Autopilot

Volvo Penta Autopilot consists of a compass unit and a 4" control panel. The autopilot constantly adjusts boat steering to hold the boat on a straight course. Several different steering patterns can be entered and the autopilot also permits manual steering.

Read the instructions carefully and learn to maneuver the boat with the aid of the autopilot in calm, open waters.

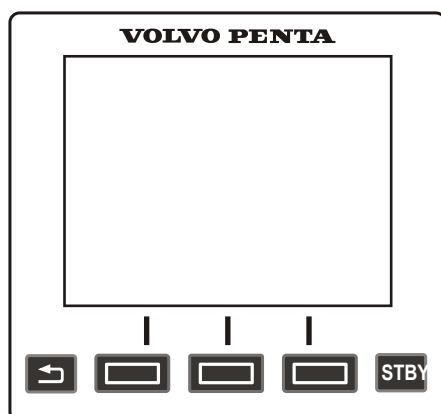
The helmsman is responsible for piloting the boat in a safe, reliable manner. Avoid navigational hazards and never leave the helm unattended. Always be prepared to quickly take over the helm.

The autopilot is automatically stand-by mode when the boat's electrical systems are switched on. The display will show the main menu or the last menu used.

When the autopilot is active the helm steering unit is locked but may always be used for e.g. changing course or giving way to obstacles. The autopilot will then default to stand-by mode and must be activated again.

If the **Shadow Drive** function is activated in the *Settings* menu the autopilot is re-activated automatically after a course change has been made manually (with steering wheel). The autopilot is activated on the new course once the boat has held this course steady for a few seconds. When *Shadow Drive* is activated a symbol is shown in the top right corner of the display.

Menus and settings are controlled by the control panel buttons.

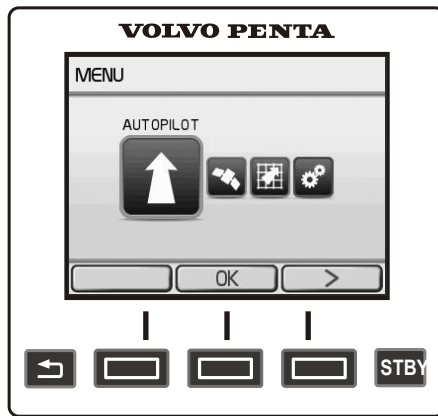


P0016636

 – Return to the previous menu. If the button is held down the display will go to the Autopilot menu.

 – Menu button functions are shown on the display.

 – Sets the autopilot in standby mode.



P0015539

Main menu

- Autopilot
- GPS Steering, a waypoint must be marked in a plotter before this menu can be opened.
- Pattern Steering
- Settings



Autopilot

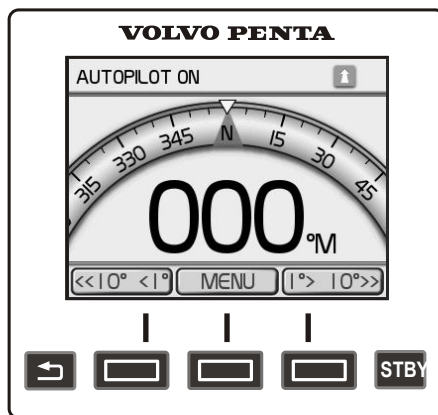
Active or stand-by autopilot status is shown in the top part of the screen. A green arrow in the top right corner of the screen confirms activation; if the autopilot is put in stand-by mode the arrow turns red and flashes for five seconds.

The set course is shown on the display digitally and by means of a course indicator in the form of a blue triangle.

ENGAGE — Activates the autopilot.

MENU — Goes to the main menu.

ROUTE — Activates the autopilot to follow a route on the plotter. This alternative is only shown if a GPS is connected and a route or waypoint has been created in the plotter. The display shows the distance to the next waypoint along the plotted route. Refer to *GPS Steering* for further information and settings.

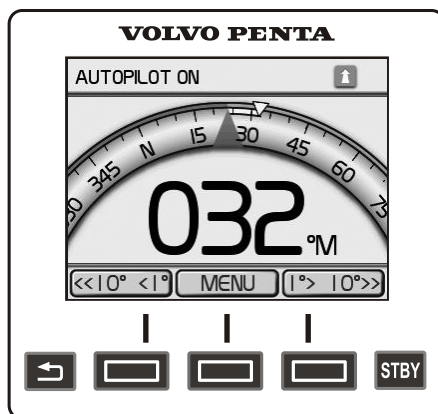


P0015351

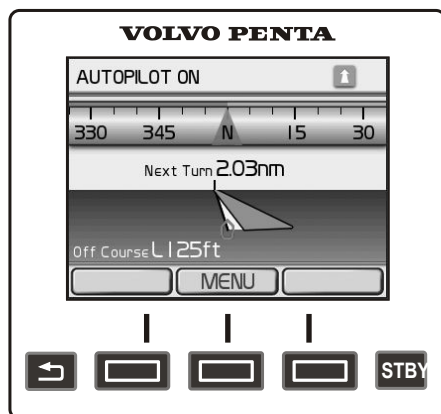
Setting a course

The boat's course is set by means of the arrow buttons, **<<10° <1° 1° >10°>>**. One click on the button changes the course 1° at a time; if the button is held down longer the course is changed in larger steps. A yellow arrow shows the new course the boat will be set on. Step size can be adjusted under the *Settings > Navigation settings > Step size* menu.

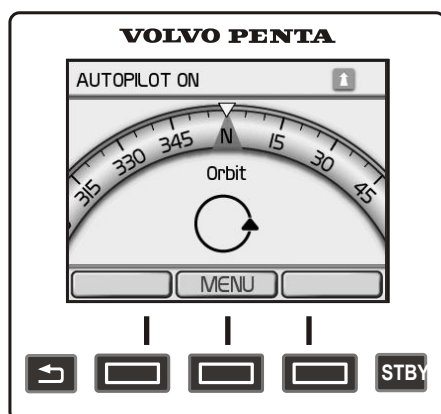
NOTICE! The course shown in the autopilot may deviate from the course shown in a GPS/plotter. This is because the autopilot shows boat heading, i.e. it does not take leeway or drift into consideration. On the other hand, the plotter shows the boats actual track.



P0015791



P0015810



P0015808



GPS Steering

A plotter must be connected for GPS steering to be selected. A route with one or more waypoints can then be created in the plotter to be followed by the autopilot. Different steering patterns can also be set based on a marked waypoint.



Route to

- 1 Create a route using one or more waypoints in the boat's plotter; refer to the plotter manual for settings.
- 2 Select **Route to** to get the autopilot to begin following the set route. The distance to the next waypoint is shown in the autopilot display. If the autopilot is in stand-by mode, press **ROUTE** to get the autopilot to revert to the route.



CAUTION!

Maintain attention to boat operation when approaching final waypoints.

Depending on the chartplotter model connected to the autopilot and the settings input on the chartplotter, the boat may make unanticipated maneuvers when approaching the final waypoint in a series of waypoints.

GPS Pattern

Before a pattern is activated in the autopilot a waypoint must be activated in the plotter; this point will be the pattern's central marker. The selected pattern, helm and any other settings are shown on the display.

Pattern steering is deactivated if the boat's course is changed using the helm or autopilot buttons; reactivation is manual.



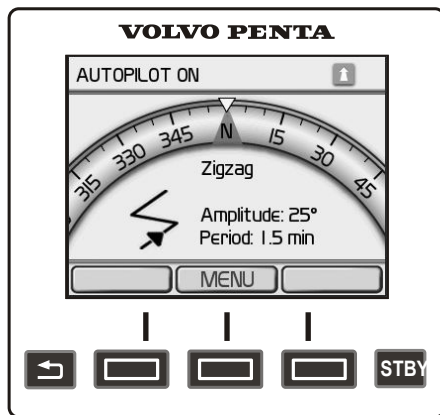
Orbit – The boat is steered on a circular course around the active waypoint. The radius of the circle is determined by the distance to the waypoint when the pattern is activated. Setting orbit helm, port or starboard.



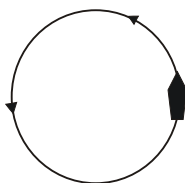
Cloverleaf – The boat is steered to the active waypoint and then follows a cloverleaf pattern with the waypoint as the central marker. Setting pattern helm, port or starboard. The size of the cloverleaf pattern (from waypoint to outer turn points) can be set under *Settings > Cloverleaf, length*; the default setting is 300 m (1000 ft).



Search – The boat is steered to the active waypoint and then follows a spiral pattern with ever greater circles. Setting pattern helm, port or starboard. Spiral distance can be set under *Settings > Search area*; the default setting is 20 m (50 ft).



P0015809



P0016494

Circular pattern



Pattern Steering

The autopilot can be set to follow a fixed pattern even when no GPS unit is connected. The set pattern and its settings are shown on the display.

Pattern steering is deactivated if the boat's course is changed using the helm or autopilot buttons; reactivation is manual.



Zigzag – The boat is steered in a zigzag pattern along the set course. Setting the angle and times the pattern must follow.



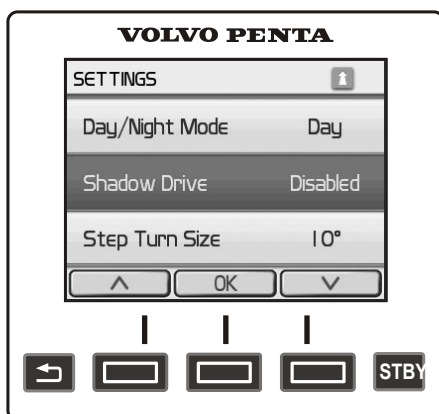
Circles – The boat is steered in a circular pattern based on its position when the pattern is activated. Setting the helm, port or starboard, and the time taken to complete a circle.



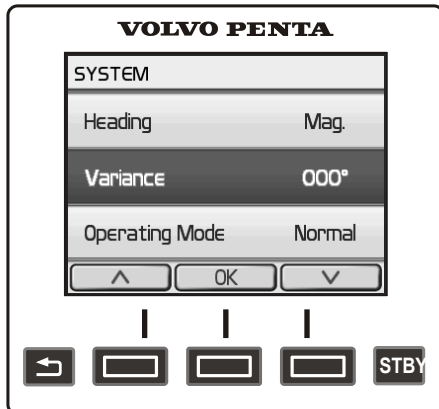
180° turn – The boat turns through 180° and then maintains the new course. Setting the helm, port or starboard, for the direction of the turn.



Man over board (MOB) – Turns the boat to come parallel with the position when MOB was activated. Speed must be below plane speed for this pattern to be activated. Setting the helm, port or starboard, for the direction of the turn.



P0015793



P0015823



Settings

Day/night mode

Setting Day mode (light background) or Night mode (dark background).

Shadow Drive

Switch function on/off *Shadow Drive*. When *Shadow Drive* is activated a symbol is shown in the top right corner of the display.

When the function is active the autopilot is put in stand-by mode when boat steering is taken over manually, but does not need to be reactivated manually. Once the boat has held a fixed course for a few seconds the autopilot is reactivated automatically.

NOTICE! When *Shadow Drive* is activated in the settings menu the autopilot is not automatically reactivated again after the course is adjusted manually (with steering wheel) and the autopilot has assumed stand-by mode. The autopilot must be manually reactivated.

Step size

Setting the number of degrees a course is changed when the Autopilot menu arrow buttons are held down.

Dealer autopilot settings

Settings in this menu may only be changed by an authorized Volvo Penta dealer.

System

Course

Setting a reference for calculating course information.

Magnetic – calculating a course based on magnetic North

True – calculating a course based on true North

Declination

Setting declination based on true North. Declination is only shown if Course is set to *True*.

Auto – automatically sets declination.

User – Declination is entered manually.

Operating position

Setting the display for normal operations or demonstration mode.

Factory reset

Settings will revert to the factory settings and zero the autopilot calibration.

NMEA 2000 devices

List of connected NMEA 2000 units.

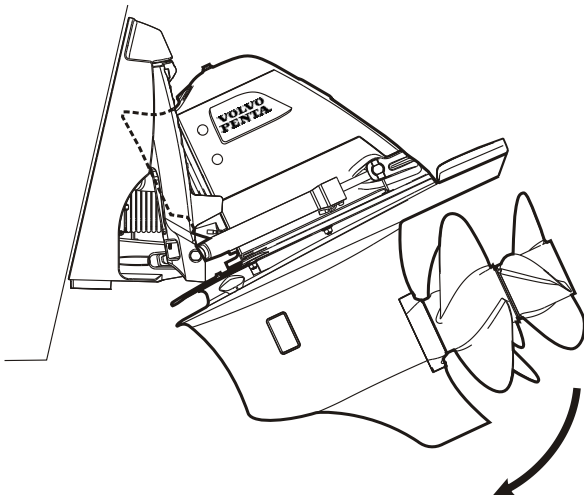
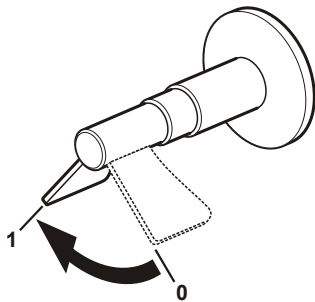
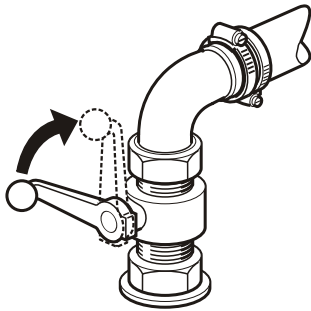
Starting

Make a habit of visually checking the engine, engine bay and transmission before start. This will help you to discover quickly if anything abnormal has happened, or is about to happen. Also check that instruments and warning displays show normal values when you have started the engine.

To minimize cold start smoke we recommend the installation of an engine heater or engine bay heater if temperatures below +5°C (41°F) are encountered.

WARNING!

Never use start spray or similar agents to start an engine. This may cause an explosion in the inlet manifold. Danger of personal injury.



P0005850

Before Starting

- Check the engine and transmission oil level.
- Check the coolant level.
- Open the sea cock where fitted.
- Open the fuel cock.

- Turn the main switch(es) on.

IMPORTANT!

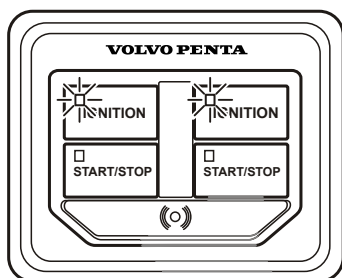
Never disconnect the current with the main switches when the engine is running. The alternator and electronics could be damaged.

- If the boat is fitted with an e-Key; unlock the EVC system with the e-Key.
- Start the engine bay fan, where fitted, and allow it to run for at least four minutes.
- Check that there is sufficient fuel for the planned trip.
- Lower the stern drive if it is up.

Starting the Engine

Shifting and adjusting speed is only possible at an active station. The main station is automatically activated when the EVC-system is unlocked with the e-Key panel and the ignition is switched on.

On a boat with two or more stations the engine(s) can be started from another station with a start/stop panel – if the engine(s) are turned off. The station automatically becomes active when the engine(s) is/are started.

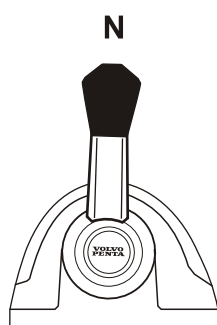


P0016670

Make sure the ignition is on

A green light in the IGNITION button indicates to ignition is on.

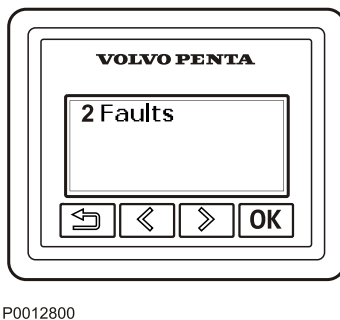
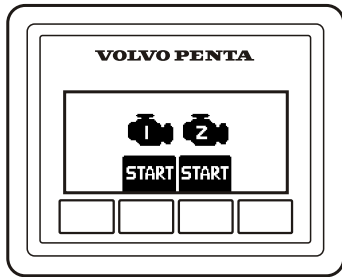
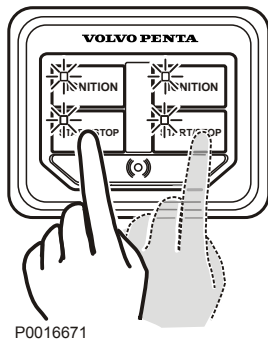
The ignition is switched on via the e-Key panel. Press the IGNITION button to switch the ignition on.



P0012457

Put the gear in neutral

Put the drive/reverse gear in neutral by moving the control lever(s) to neutral at all stations.



Start the engine

Starting with the e-Key panel

To start, press the START/STOP button once for each engine.

If the starter motor is engaged for its maximum activation time (30 seconds), the starter motor circuit is cut automatically to protect the starter motor from overheating. If possible, leave the starter motor to cool for at least five minutes before making a new start attempt.

Starting with the start/stop panel

Press the starter button for each engine. Release the button as soon as the engine has started.

Read the instruments and warm the engine up

Allow the engines to idle for the first ten seconds.

Check that instruments and warning displays show normal values.

Check that no messages are displayed and no warning signs are showing. If a fault is registered, please refer to section *Fault Handling* page 63 for further information and recommended actions.

Warm the engine up at low speed and low load, so normal operating temperature is reached before full power is used.

IMPORTANT!

Never race the engine when it is cold.

Operation

Learn to handle the engine, controls and other equipment in a safe and proper manner before casting off on your maiden voyage. Remember to avoid sudden and extreme rudder maneuvers and gear shifts. There is a risk for passengers and crew falling over or falling overboard.

WARNING!

A rotating propeller can cause serious injury. Check that nobody is in the water before engaging ahead or astern. Never drive near bathers or in areas where people could be in the water.

Reading the Instruments

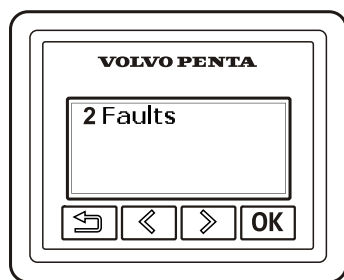
Read all instruments and alarm displays directly after starting, and then regularly during the voyage.

Alarms

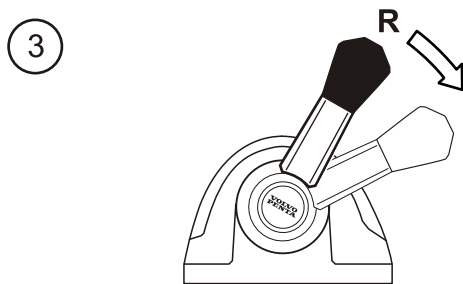
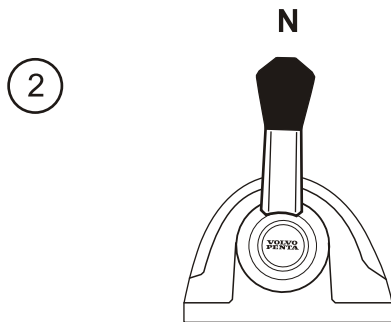
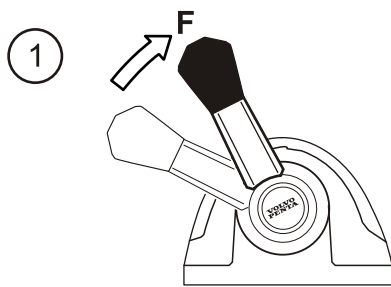
Alarms and messages are shown in the information display, some alarms do also have a sound alarm. Is there an alarm instrument installed the lamp in question will flash.

- 1 Read the message.
- 2 Acknowledge the alarm by pressing OK.
- 3 Take the indicated actions, see chapter *Fault Code Register* page 66.

The fault will be stored as long as the fault remains. It is possible to read out the fault code at an upcoming service.



P0012800



P0012502

Maneuvering

Shifting between forward and reverse should be done at idling. Shifting at higher engine speeds can be uncomfortable for passengers and cause unnecessary stress on the transmission or cause the engine to stop. If you attempt to shift gear at an excessive engine speed, a safety function cuts in automatically, and delays shifting until engine speed has fallen to 1500 rpm.

Always do a forwards/reverse operation as follows:

- 1 Reduce engine speed to idle and let the boat move or lose way.



WARNING!

Never shift to reverse when the boat is planing.

- 2 Move the control lever to neutral with a rapid, distinct movement. Make a brief pause.
- 3 Then move the control lever to reverse with a rapid, distinct movement and increase engine speed.

IMPORTANT!

It is important all engines are running during reversing maneuvers, to avoid the risk of water entry via the exhaust pipe into the stationary engine.

Helm Stations

Changing and activating helm stations

Helm station change

- 1 Move the control lever(s) to neutral.
The neutral lamp (1) on the control lights up when the drive is in neutral.
- 2 Unlock the helm station being vacated, if it is locked, by pressing (2). The padlock (3) is extinguished.
- 3 Activate the helm station being occupied by pressing (2).
The lamp in the control button will light up when the helm station is active.

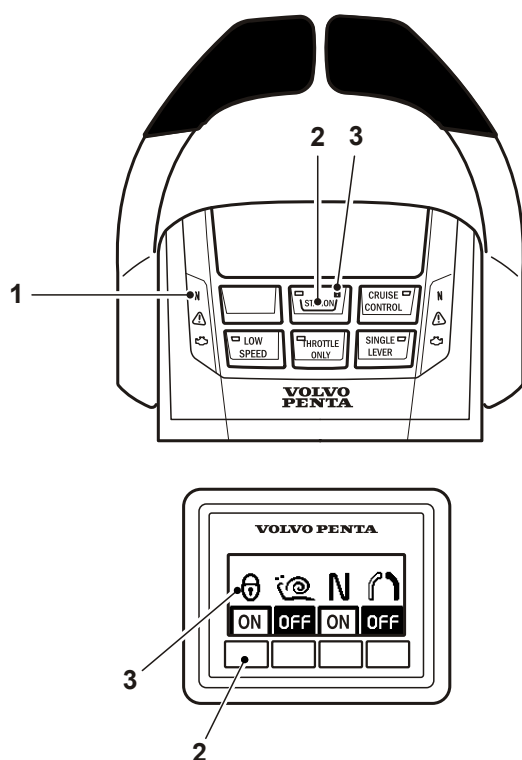
If the helm station is inactive, the lamp will be extinguished.

If the padlock symbol (3) flashes, the helm station cannot be activated. Another helm station is active and locked, or unlocked with a drive selected (not in neutral).

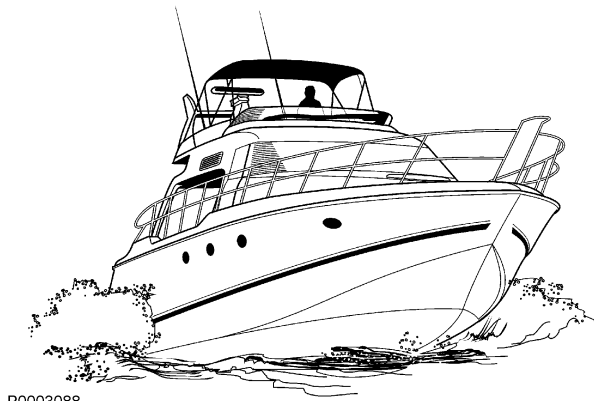
Locking/unlocking helm stations

If a helm station is locked it is only possible to start and stop the engine or change helm stations from there. Lock or unlock an active helm station by depressing (2).

The padlock symbol (3) lights up when the helm station is locked.



P0012976



P0003088

Cruising Speed

For best fuel economy operations at full must be avoided. We recommend a cruising speed that is at least 10% below the maximum engine revolutions at top speed (full throttle).

Depending on hull type, the choice of propeller, the load and sea state etc., the maximum revolutions at top speed may vary, but they should be within the full throttle range; refer to *Technical Data page 130*.

If the engine does not reach its maximum throttle range it can depend on a number of factors mentioned in *Fault Handling page 65*.

Select a propeller with greater pitch if actual engine revolutions exceed the full throttle range. Contact your Volvo Penta dealer for advice.

Synchronizing Engine Speed

When driving with twin engines, both the operating economy and comfort will be increased when the engines are operating at the same engine speed (rpm). When the synchronization function is activated, the engine speed (rpm) of the starboard engine is automatically adjusted to that of the port engine. The synchronization function is activated automatically if the following conditions are met.

- 1 The engine speed levers for both engines are in (approximately) the same position.
- 2 The engine speed on both engines exceeds 800 rpm.

The synchronizer is disengaged as soon as the conditions are no longer met.

Engine Shutdown

Allow the engine to run at low idle, in neutral, for a few minutes after operations are completed. In this way after-boiling is avoided at the same time as temperature equalization takes place. This is especially important when the engine has been run at high rpm or under heavy load.

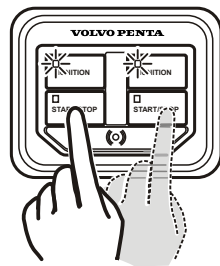
Stop the Engine

IMPORTANT!

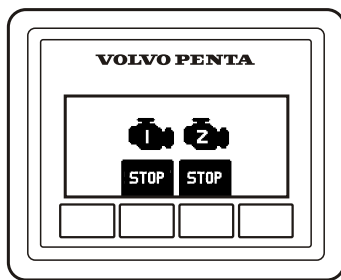
Never disconnect the current with the main switches when the engine is running. The alternator and electronics could be damaged.

Stopping with the e-Key panel

- 1 Disengage the drive/reverse gear by putting the control lever in neutral.
- 2 Stop the engine(s) by pushing the START/STOP button(s).



P0016518



P0013099

Stopping with the start/stop panel

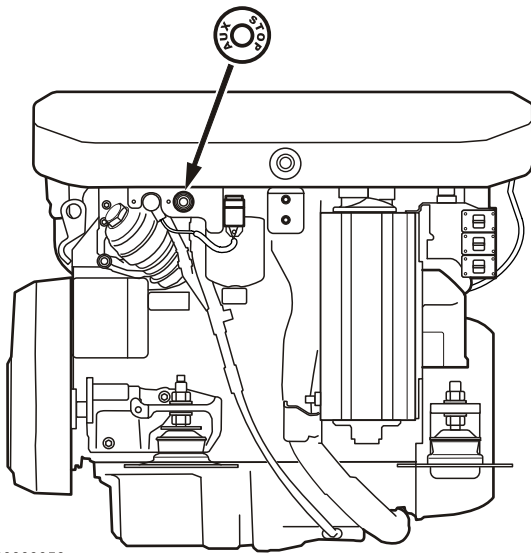
- 1 Disengage the drive/reverse gear by putting the control lever in neutral.
- 2 Push the stop button(s). Release the button(s) when the engine(s) has/have stopped.

Turning the ignition off and locking the EVC system

To turn the ignition off, press the IGNITION button. The green lamp in the IGNITION button goes out to indicate the ignition is off.

To lock the EVC system, hold the key fob in front of the symbol on the e-Key panel.

A flashing red light indicates the system is locked.



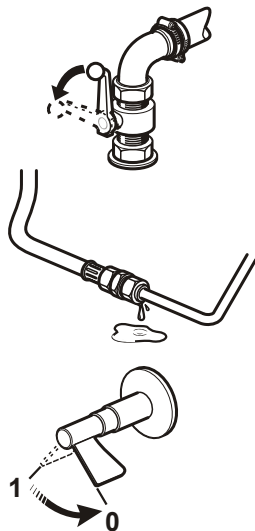
P0009056

Auxiliary stop

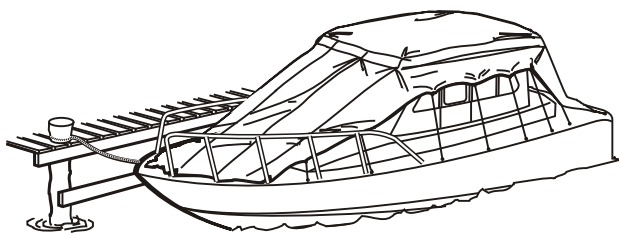
If the engine cannot be stopped in a normal procedure, it is possible to stop the engine via the auxiliary stop mounted on the side of the engine.

After Engine Shutdown

- Check the engine and engine bay for leakages.
- Close the fuel tap.
- Close the sea cock where fitted.
- Take an hour meter reading and carry out preventive maintenance according to the maintenance schedule.
- Boats with stern drives: Trim the stern drive down to maximum to protect the trim ram piston's untreated surfaces from fouling.
If there is a risk of the boat striking bottom with the stern drive, the drive must instead be trimmed up to the maximum lift position.
- Turn off the main switch before any long stoppage.



P0005914



P0002451

Operation Break

Operation break with the boat in water

If the boat is not used, but left in the water, the engine must be warmed up at least once every fortnight. This prevents corrosion damage in the engine.

If you expect the boat to be unused for two months or more, it must be inhibited, please refer to *Storage page 115*.

Operation break with the boat out of water

Where boats are kept laid up on land when not in use, there is a lower level of galvanic corrosion protection due to oxidation on the sacrificial anodes. Before launching the boat the sacrificial anodes on the drive and shield must be cleaned with emery paper to remove any oxidation.

If you expect the boat to be unused for two months or more, it must be inhibited, please refer to *Storage page 115*.

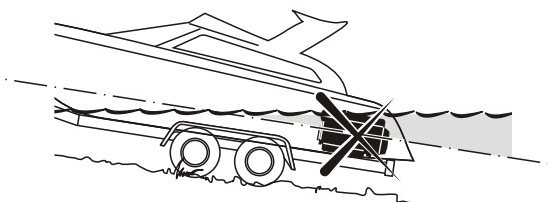
IMPORTANT!

Use emery paper. Do not use a wire brush or other steel tools when cleaning, as these may damage the galvanic protection.

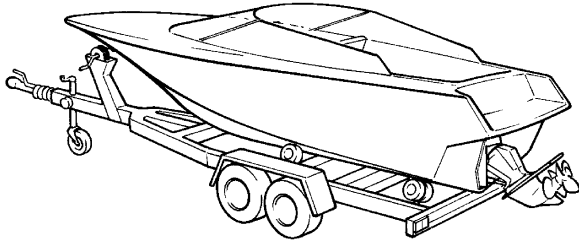
Laying Up and Launching

IMPORTANT!

If the boat submerges significantly below the static waterline when it is laid up or launched there is a risk of water entering the engine through the exhaust system.



P0003798



P0002453

Trailing Your Boat

Check local legislation in respect of boat transportation by trailer - there are differences in various national trailer regulations.

Boats with stern drives

Trim the stern drive up to its "lift position" (maximum lift) before the boat is pulled onto the trailer for transportation. It is possible to trim the stern drive without starting the engine. When the stern drive has reached the highest lift position an automatic catch switches off the current to the trim pump. The catch is released automatically when the stern drive is trimmed down. Always secure the stern drive in the up position with a trailer kit (accessory) or similar so that it cannot fall onto the trailer during transportation.

WARNING!

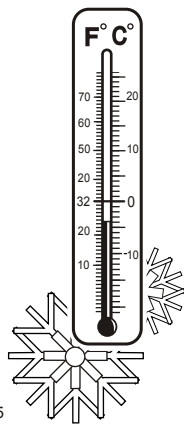
The engine must not be run with the drive in the "lift" range.

Boats with reverse gear

Drain the water from the exhaust system to prevent water entering the engine while the boat is being transported by trailer.

Cold Weather Precautions

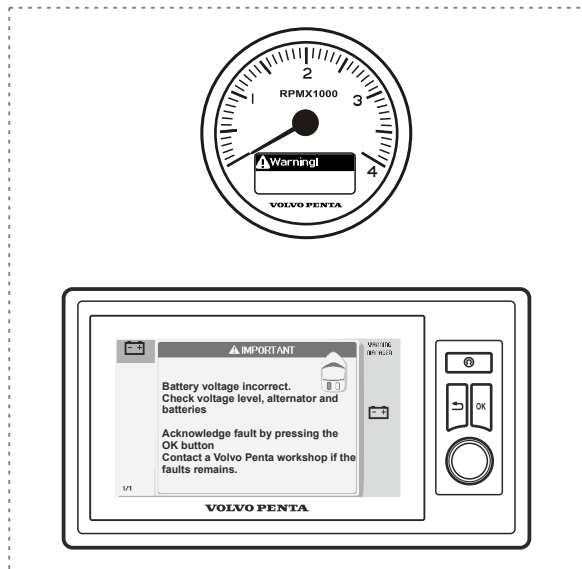
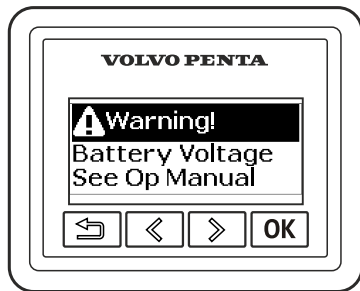
If the engine bay cannot be kept frost free, the raw water system must be drained and the freshwater system coolant must have sufficient frost protection to prevent frost bursting; refer to *Seawater System, Draining page 94* and *Maintenance page 91* respectively for more detailed information. Check the charge status of the battery. A poorly-charged battery can freeze and burst.



P0005905

Fault Handling

Despite regular maintenance according to the maintenance schedule and perfect operation conditions faults may occur which must be attended to before the boat can travel further. This chapter describes alarms and fault handling.



P0012489

Alarm handling

Message from engine and EVC system

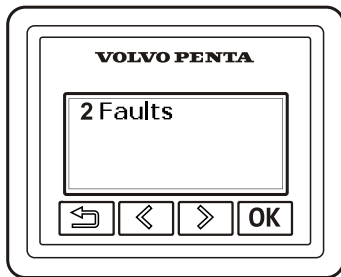
If a malfunction is discovered the driver is warned by a buzzer sounding and a message showing in the display.

The message toggles between cause of fault and tasks to perform.

Information regarding "cause of fault" and "measures to take" is found in chapter *Fault Code Register*.

The engine, transmission and EVC system is monitored by the diagnostic function. Should the diagnostic function discover a malfunction it protects the engine and ensures continued operation by affecting the engine. Depending on how serious the malfunction is the effect on the engine varies.

- Minor malfunction which does not damage the engine or transmission.
Affect on engine: None.
- Serious malfunction which will not immediately damage the engine or transmission e.g. high coolant temperature.
Affect on engine: Engine power is reduced until faulty value becomes normal.
- Serious malfunction which will cause serious damage to engine or transmission.
Affect on engine: Engine power is reduced.
- Serious malfunction which makes it impossible to control the engine or transmission.
Affect on engine: Transmission is disengaged and engine speed is reduced.
It is possible to perform emergency shifting, please refer to *In Case of Emergency* page 72.
- Serious malfunction on transmission or in the engine fuel injection system.
Affect on engine: Engine is stopped.
It is possible to perform emergency shifting, please refer to *In Case of Emergency* page 72. In emergency situations it is also possible to start the engine with gear engaged after acknowledging the alarm.



P0012800

Acknowledge message

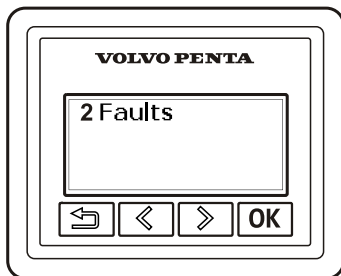
- 1 Push OK to acknowledge the alarm. The buzzer becomes silent.
- 2 Read the message.
- 3 Push OK again and the message disappears.

The alarm has to be acknowledged before the engine can be started.

Acknowledge message

- 1 Push the knob on the control panel to acknowledge the alarm. The buzzer becomes silent.
- 2 Read the alarm or message in the pop-up.
- 3 Push the knob on the control panel again and the pop-up disappears.

The alarm has to be acknowledged before the engine can be started.



P0012800

Faults list

If a fault is registered Faults (Faults) is displayed in the information panel together with the number of faults.

- 1 Press OK to get to the submenu.
- 2 Browse through the fault list using the arrows if more than one fault is registered.
- 3 Press OK twice to see information about the cause of the fault and the remedy.
- 4 Return to the previous menu by pressing .

Deleting faults from the list

Acknowledged faults that have been stored are deleted automatically when the ignition key is turned to the stop position. Stop the engine and check that the ignition key is in position 0 at all helm stations.

When system power is reconnected, the diagnostic function checks if there are any faults in the EVC system. If there are the fault message is shown on the display.

Faults that have been remedied or have disappeared are automatically deleted. Faults that have not been remedied must be acknowledged every time system power is switched on.

Fault Tracing

A number of symptoms and possible causes of engine malfunctions are described in the table below. Always contact your Volvo Penta dealer if problems occur which you can not solve by yourself.

Read through the safety advice for care and maintenance work in chapter *Safety Information page 6* before starting work.

Symptoms and possible causes	
Pop-ups are shown in the tachometer display	See chapter <i>Fault Code Register</i>
Starter motor not turning (or slow)	1, 2, 3, 24
Engine does not start	3, 4, 5, 6, 7, 24
Engine starts but stops again	6, 7, 24
Engine difficult to start	4, 5, 6, 7
Engine does not reach correct speed at wide open throttle (WOT)	5, 6, 7, 8, 9, 10, 11, 15, 18, 19, 20, 21, 24
Engine knocks	4, 5, 6, 7
Engine runs unevenly	4, 5, 6, 7, 10, 11, 17, 18, 20
Engine vibrates	15, 16
High fuel consumption	8, 9, 10, 12, 15, 21
Black exhaust smoke	10
Blue or white exhaust smoke	12, 21, 22
Low oil pressure	13, 14
Engine coolant temperature too high	17, 18, 19, 20, 21
No charge or poor charge	2, 23

1. Flat batteries	13. Lubricating oil level too low
2. Poor contact/open circuit in cables	14. Blocked oil filter
3. Fuse tripped or faulty relay	15. Defective/incorrect propeller
4. Lack of fuel	16. Defective engine mounting
5. Fouled fuel filter	17. Too little coolant
6. Water/contaminants in the fuel	18. Blocked seawater intake/pipe/filter
7. Leakage in the fuel system	19. Circulation pump drive belt slipping
8. Boat abnormally loaded	20. Defective impeller
9. Fouling on underwater hull/propulsion unit/propeller	21. Defective/incorrect thermostat
10. Insufficient air supply	22. Lubricating oil level too high
11. Engine coolant temperature too high	23. Alternator drive belt slipping
12. Engine coolant temperature too low	24. Stored diagnostic fault codes
	The codes can only be read and erased by a service technician.

Fault Code Register

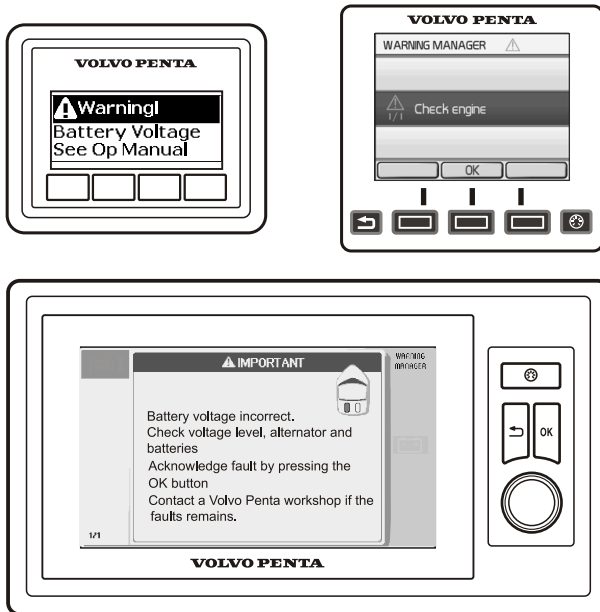


CAUTION!

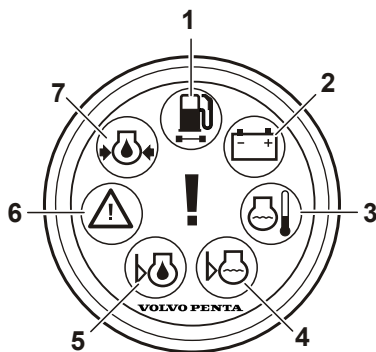
Read the safety precautions for maintenance and service in the Safety Information chapter before starting work.

When a malfunction is discovered the helmsman is warned by a sound alarm and at the same time a message is shown in the display.

This chapter gives a more detailed description of the messages together with suggested actions to take.



P0014895



P0004761

Message

If a malfunction is discovered a message is shown on the display. The message is presented in the list below together with a description of how the system might be affected and suggested actions to take.

Alarm Display (optional)

If a lamp in the alarm monitor flashes a malfunction is detected.

- 1 Is the orange "water in fuel" lamp lit there is too much water in the water separator on the fuel pre-filter.
- 2 Is the charging lamp lit the alternator has stopped charging.
- 3 Is the coolant temperature lamp lit the coolant temperature is too high.
- 4 Is the orange coolant level lamp lit during operation the coolant level is too low.
- 5 Is the orange oil level lamp lit during operation the engine oil level is too low.
- 6 Is the red warning lamp lit during operation a serious malfunction has been discovered.
Is the orange warning lamp lit during operation a malfunction has been discovered.
- 7 Is the red oil pressure lamp lit during operation the engine oil pressure is too low.

Emergency Stop Switch

Reset the external stop button.

Battery voltage

Check belt tension. Refer to *Drive Belt, Check and Change page 84*.

Check battery fluid level. Refer to *Battery, Maintenance page 100*.

Can Not Start, Trim Too High

Can the engine not be started and the message "Can Not Start, Trim Too High" shows this indicates that the drive is tilted too high or a possible trim sender failure. It is possible to override the immobilizer by holding the ignition key in the start position "III" for 5 seconds then letting it return to position "0".

Check Control Lever

Shift and throttle incorrect.

Slip function not available.

Acknowledge fault by moving control to neutral and press OK-button.

Engine power is reduced. Gear automatically set to neutral.

Check Engine

Miscellaneous system faults. Engine performance might be affected.

Some possible explanations to the disturbance listed.

- Battery voltage incorrect.
Check belt tension. Refer to *Drive Belt, Check and Change page 84*.
Check battery fluid level. Refer to *Battery, Maintenance page 100*.
- Fuel pressure incorrect. Engine performance might be affected.
- Communication failure. Gear automatically set to neutral. Engine performance might be affected.
- Oil pressure too low.
Engine power is reduced. Checking Engine Oil Level. Refer to *Oil level, checking and topping up page 86*.
Check that no leakage occurs.

Please contact a Volvo Penta workshop if the fault remains.

Check EVC System

Internal fault in EVC system. Engine performance might be affected.

Some possible explanations to the disturbance listed.

- Limited or no steering. Please contact a Volvo Penta workshop.
- Shift and throttle unavailable. Gear automatically set to neutral. Engine power is reduced. Helm station has lost communication with engine. Use alternative helm station if possible.
- Control panel failure. Check if any button has stuck.

Please contact a Volvo Penta workshop if the fault remains.

Check Joystick

Joystick failure. Check if any button has stuck.

Joystick not available or limited function. Use steering wheel or choose alternative station.

Check Multilink

Limited instrumentation. Control unit has communication fault.

Check transmission

Gear automatically set to neutral. Gear shift not available until fault acknowledged. Acknowledge fault by moving control to neutral and press OK-button.
Gear shift malfunction. Engine is emergency stopped.
Gear shift malfunction.
Limited slip function.
Low speed not available.
Transmission oil pressure not available.
Transmission oil temperature not available.

Check Control Lever

Gear shift unavailable.
Acknowledge fault by moving control to neutral and press OK-button.

Check Steering Wheel

Limited or no steering.
Please contact a Volvo Penta workshop.

Coolant Level

Low coolant level. Check coolant level. Refer to *Coolant Level, Checking and Topping Up* page 93.
Check for coolant leakage.

Coolant Temperature

Coolant temperature too high.
Engine power is reduced.
Check coolant level. Refer to *Coolant Level, Checking and Topping Up* page 93.
Check that the seawater filter is not blocked. Refer to *Seawater Filter, Check and Cleaning* page 97.
Check the impeller in the seawater pump. Refer to *Impeller, Check and Change* page 95.
Check that no leakage occurs.

Engine Oil Pressure

Oil pressure too low.
Engine power is reduced.
Check the oil level in the engine. Refer to *Oil level, checking and topping up* page 86.
Check that no leakage occurs.

Engine Oil Temperature

Engine oil temperature too high.
Engine power is reduced.
Check the oil level. Refer to *Oil level, checking and topping up* page 86.
Check that no leakage occurs.

Engine Speed

Engine performance might be affected.
Engine power is reduced.
Please contact a Volvo Penta workshop.

Exhaust Temperature

Exhaust temperature too high
Engine power is reduced.
Please contact a Volvo Penta workshop.

Fuel pressure

Fuel pressure too low.

Check fuel level.

Check that the fuel filters are not blocked. Replace filters if necessary. Refer to *Maintenance page 88*.

Check for fuel leakage.

Helm Restarted

The engine has lost communication with a helm station.

Engine power is reduced.

Key Failure

A button on the e-Key panel depressed. Verify the button.

Power Trim Faults

Drive unintentionally moved in. Verify power trim angle before you continue your journey.

Not possible to control the power trim. Refer to *In Case of Emergency page 73*.

Primary Battery

Poor batteries or charging. Refer to *Battery, Charging page 101*.

Sensor failure

Engine performance might be affected.

Please contact a Volvo Penta workshop if the fault remains.

Steering failure

Limited functionality.

Self test failed. Verify hydraulic steering oil level. Refer to *Transmission lubricant, checking and topping up page 106*.

Steering failure

Engine power is reduced. Limited steering

The helm station has lost communication with the steering actuator.

Please contact a Volvo Penta workshop.

Steering Oil High Temp

Check hydraulic steering oil cooling system. refer to *Steering System*.

Steering Oil Low Temp

If the temperature of the steering oil is below 5°C (41°F) a message will be displayed every thirty seconds until the oil reaches normal operating temperature.

Water in Bellows

Inspect bellow. Refer to *Drive Unit Bellows page 109*.

Water in Fuel

Empty the water trap underneath the fuel filters. Refer to *Maintenance page 88*.

In Case of Emergency

Despite regular service in accordance with the planned maintenance schedule and perfect operating conditions, faults may occur that must be remedied before the boat can continue its trip. This chapter provides advice on how to remedy a number of conceivable faults.

When certain faults occur safety functions engage to protect the engine. The following may occur:

- Engine cannot be started.
- The gear is in neutral and engine rpm is limited
- The engine stops

If a fault occurs, confirm any fault alarm and take the necessary measures. Refer to this section and *Fault Code Register* page 66.

Running Aground

The automatic kick-up function releases the drive in the event of running aground or colliding with an object in the water. If the function has been triggered and the drive has kicked up, it must be trimmed back to its original position using the control buttons.

The kick-up function only protects the drive when travelling forwards. There is no protection for the drive when travelling backwards.

After running aground, check that the drive and propeller are not damaged and that the drive does not vibrate. If there is damage/vibration, the boat should be driven (if possible) slowly to a harbor and lifted out of the water.

Lift the boat ashore. Check the oil level in the drive. If the oil is gray-colored, water has entered and the drive must be inspected by an authorized Volvo Penta workshop. The same applies if there is damage to the drive. Replace the propeller if it is damaged.

To prevent galvanic corrosion, any paintwork damage on the drive and propeller shall be repaired before launching the boat again, refer to section *Storage* page 118.

Checking the tie rod

Check the tie rod that holds the drive together if you have run aground.

If the tie rod is bent, loose or damaged, it must be checked immediately by an authorized Volvo Penta workshop. Steer the boat to a harbor at low speed.



WARNING!

If the parallel strut (tie bar) shows signs of damage, run at reduced speed to harbor. The parallel strut is a vital safety component, damage may effect steering characteristics. In the worst case steering could be lost altogether. Never align or weld a damaged parallel strut. Please contact your nearest authorized Volvo Penta workshop for assistance.



P0002107

Starting Using Auxiliary Batteries

WARNING!

Explosion hazard. Batteries contain and give off an explosive gas which is highly flammable and explosive. A short circuit, open flame or spark could cause a violent explosion. Ventilate well.

WARNING!

Never confuse the positive and negative poles on the batteries. Risk of arcing and explosion.

- 1 Check that the auxiliary battery has the same voltage as the engine system voltage.
- 2 Connect the red positive cable to the plus (+) terminal on the discharged battery and then to the plus terminal on the auxiliary battery.
- 3 Connect the black start cable to the minus (–) terminal on the auxiliary battery and to a place a little distance away from the discharged battery, e.g. the start motor's negative terminal.

WARNING!

Under no circumstances may the black jumper cable (–) come in contact with the positive connection on the starter motor.

- 4 Start the engine and let it run at fast idle for approximately 10 minutes to charge the batteries. Make sure there is no extra equipment connected to the electrical system.

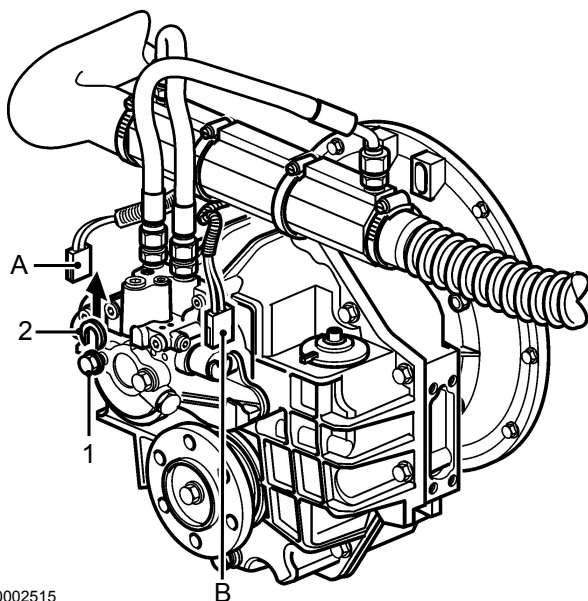
WARNING!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.

WARNING!

Do not touch the connections during the start attempt. Risk of arcing.
Do not bend over any of the batteries either.

- 5 Turn off the engine. Remove the start cables in the exact opposite order to their connection.



P0002515

Emergency Shifting

If a fault occurs that prevents engaging gears with the control lever (shifting), it is possible to engage them manually.

Reverse gear

This description describes electronically shifted reverse gear.

Manual shifting of gears

- 1 Stop the engine and cut the power.
If the boat is fitted with an ignition lock; remove the ignition key from the lock.
- 2 Unscrew the screw (1) on the side where the cable harness marked A is connected.
- 3 Remove the washer (2) and tighten the screw.
- 4 Disconnect the wiring A and B from the solenoid valve connections.

The gears are now engaged for forward drive and cannot be disengaged by the control lever.

Emergency Shifting, Drive

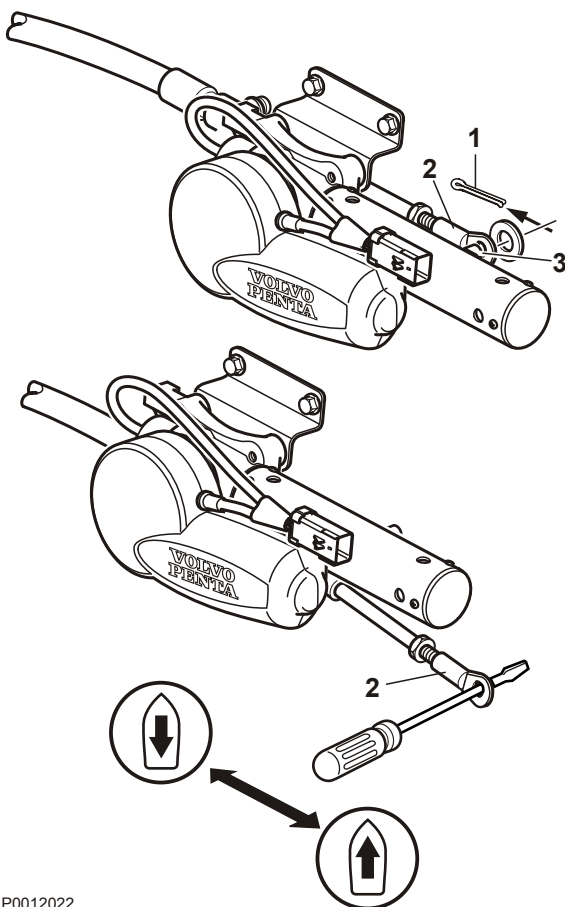
If a fault occurs which prevents the drive from being operated (shifted) with the control lever, it is possible to shift manually, using the description below.

⚠ WARNING!

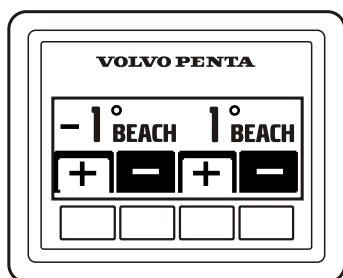
In emergency shifting, the unit is locked in forwards operation. Please note that the drive can not then be disengaged with the control lever. Forward motion can only be cut off by stopping the engine with the ignition key or stop button..

Manual drive engagement

- 1 Stop the engine and take the starter key out of the starter switch.
- 2 Pull out the split pin (1) and lift the adapter (2) from the pin (3).
- 3 Place a screwdriver or similar tool in the adapter (2) hole and move the control wire horizontally.



P0012022



P0001189

Emergency Trimming

If a situation occurs that needs the drive to be trimmed over the trim limit, the drive can be emergency trimmed.

IMPORTANT!

When emergency trimming is performed, the automatic stop will not work. The drive can be trimmed outside the trim ranges, this can damage the boat and drive.

- 1 Press the trim button on the control or power trim panel in the direction the drive needs to be trimmed. Release the button when the trim limit is reached.
- 2 Press the button again and hold it depressed for more than 5 seconds. The drive starts trimming.

Start after crash-stop

If the engine crash-stops, the following routine must be performed before the engine can be started again.

- 1 Move control lever(s) to neutral.
- 2 Acknowledge any alarms and turn the ignition off.
- 3 Wait until the system is completely shut down and all lamps are out.
- 4 Turn the ignition on but do **not** start the engine.
- 5 Acknowledge any alarms. Start the engine.

Maintenance Schedule

Your Volvo Penta engine and its equipment are designed for high reliability and long life. The engines are built to withstand the marine environment, but also to have the smallest possible environmental impact. If the engine and transmission are serviced regularly according to the schedule, these qualities will be retained and unnecessary malfunctions will be avoided.

Warranty inspection

During the initial period of use a special warranty inspection - a First service inspection - must be carried out by an authorized Volvo Penta workshop. Instructions regarding when this must be done can be found in the **Warranty and service book**.

Volvo Penta reserves the right to adjust service interval and content after the printing of the Operator's Manual. The current document can be found at Publication Search/Service Protocol at www.volvopenta.com.

D3-110i-H, D3-140i-H, D3-150i-H, D3-170i-H,
D3-200i-H, D3-220i-H

FSI = First Service Inspection

S1, S2, S3 = Special Interval Service

A - F = Type of service (regular service)

C = Clean

R = Replace

A = Adjustment

L = Lubrication

I = Inspection (includes, if necessary, cleaning, adjustment, lubrication and change)

FSI = First Service Inspection

After the first 50-100 hours ⁽¹⁾	
Transmission, oil and filter	R
Start and warm up engine	
Engine and transmission, abnormal noises	I
Engine and transmission, oil / fuel / water leakage	I

1) Or within 180 days of the date of delivery, or the end of the first season, whichever comes first.

S1

Every 100-200 hours / at least every 12 month ⁽¹⁾	
Engine Oil and Oil Filters / By-pass filter	R

1) Oil change intervals vary, depending on oil grade and sulfur content of the fuel. Change the filters during each oil change.

S2

Oil Analysis	
See dealer's information SB 17-0-2	I

S3

Every 1400 hours / at least every 8 years	
Timing belt, Change	R

A

Every 200 hours /		At least every (month)		
		12	24	48
Inspection with VODIA (Diagnostic Tool) ⁽¹⁾	I	•		
Coolant level and antifreeze mixture	I	•		
Drive belts, belt tensioner and idler wheels	I	•		
Batteries, electrolyte level	I	•		
Air Filter	R		•	
Fuel pre-filter, filter insert	R	•		
Fuel fine filter	R	•		
Seawater filter	C	•		
Seawater pump, impeller and o-ring	I	•		
Transmission, oil and filter	R	•		
Anode - Propeller / Propellershaft. (Must not be painted)	R	•		
Propellershaft seal. (Lubrication of shaft splines)	I	•		
Exhaust hose	I	•		
Seawater Inlet	I	•		
Crankcase ventilation filter	R	•		
Start and warm up engine				
Engine and transmission, abnormal noises	I	•		
Engine and transmission, oil / fuel / water leakage	I	•		

1) Readout if any fault codes and LVD

B

Every 400 hours /		At least every (month)		
		12	24	48
Impeller in seawater pump	R		•	
Control cables and seals ⁽¹⁾	I	•		
Engine and transmission, inspect hoses and cable clamping	I	•		
Engine and transmission, cleaning / painting	I	•		

1) Xact™

C

Every 600 hours /		At least every (month)		
		12	24	48
Exhaust hose	R			•
Drive Belts	R			•
Turbocharger	I		•	

D

Every 1200 hours /		At least every (month)		
		12	24	48
Control cables and seals ⁽¹⁾	R			•

1) Xact™

E

Every 8000 hours /		At least every (month)		
		12	24	48
Coolant VCS (yellow) ⁽¹⁾	R			•

1) Different types of coolant must not be mixed with each other.

D3-140A-H, D3-170A-H, D3-200A-H, D3-220A-H

FSI = First Service Inspection
 S1, S2, S3 = Special Interval Service
 A - F = Type of service (regular service)

C = Clean
 R = Replace
 A = Adjustment
 L = Lubrication
 I = Inspection (includes, if necessary, cleaning, adjustment, lubrication and change)

FSI = First Service Inspection

After the first 50-100 hours ⁽¹⁾	
Start and warm up engine	
Power steering and Power Trim, function and leakage	I
Engine and transmission, abnormal noises	I
Engine and transmission, oil / fuel / water leakage	I

1) Or within 180 days of the date of delivery, or the end of the first season, whichever comes first.

S1

Every 100-200 hours / at least every 12 month ⁽¹⁾	
Engine Oil and Oil Filters / By-pass filter	R

1) Oil change intervals vary, depending on oil grade and sulfur content of the fuel. Change the filters during each oil change.

S2

Oil Analysis	
See dealer's information SB 17-0-2	I

S3

Every 1400 hours / at least every 8 years	
Timing belt, Change	R

A

Every 200 hours /		At least every (month)		
		12	24	48
Inspection with VODIA (Diagnostic Tool) ⁽¹⁾	I	•		
Coolant level and antifreeze mixture	I	•		
Drive belts, belt tensioner and idler wheels	I	•		
Batteries, electrolyte level	I	•		
Air Filter	R		•	
Fuel pre-filter, filter insert	R	•		
Fuel fine filter	R	•		
Seawater filter	C	•		
Seawater pump, impeller and o-ring	I	•		
Transmission Oil	R	•		
Anode - Lower Gear. (Must not be painted)	R	•		
Anode - Transom Shield. (Must not be painted)	R	•		
Propellershaft seal. (Lubrication of shaft splines)	I	•		
Exhaust hose	I	•		
Seawater Inlet	I	•		
Exhaust Bellow	I	•		
U-Joint Bellows	I	•		
U-joint, shaft splines and gimbal bearing	I	•		
Steering Cylinder, Grounding	I	•		
Crankcase ventilation filter	R	•		
Start and warm up engine				
Power steering and Power Trim, function and leakage	I	•		
Engine and transmission, abnormal noises	I	•		
Engine and transmission, oil / fuel / water leakage	I	•		

1) Readout if any fault codes and LVD

B

Every 400 hours /		At least every (month)		
		12	24	48
Impeller in seawater pump	R		•	
Control cables and seals ⁽¹⁾	I	•		
Hydraulic oil and filter (Steering Control Unit)	R		•	
Engine and transmission, inspect hoses and cable clamping	I	•		
Engine and transmission, cleaning / painting	I	•		

1) Xact™

C

Every 600 hours /		At least every (month)		
		12	24	48
Exhaust hose	R			•
Drive Belts	R			•
Turbocharger	I		•	
Exhaust Bellow	R			•
U-Joint Bellows	R			•

D

Every 1200 hours /		At least every (month)		
		12	24	48
Control cables and seals ⁽¹⁾	R			•
Transmission, complete overhaul incl gears, shaft, shifting mechanism and U-joint	I			

1) Xact™

E

Every 8000 hours /		At least every (month)		
		12	24	48
Coolant VCS (yellow) ⁽¹⁾	R			•

1) Different types of coolant must not be mixed with each other.

Maintenance

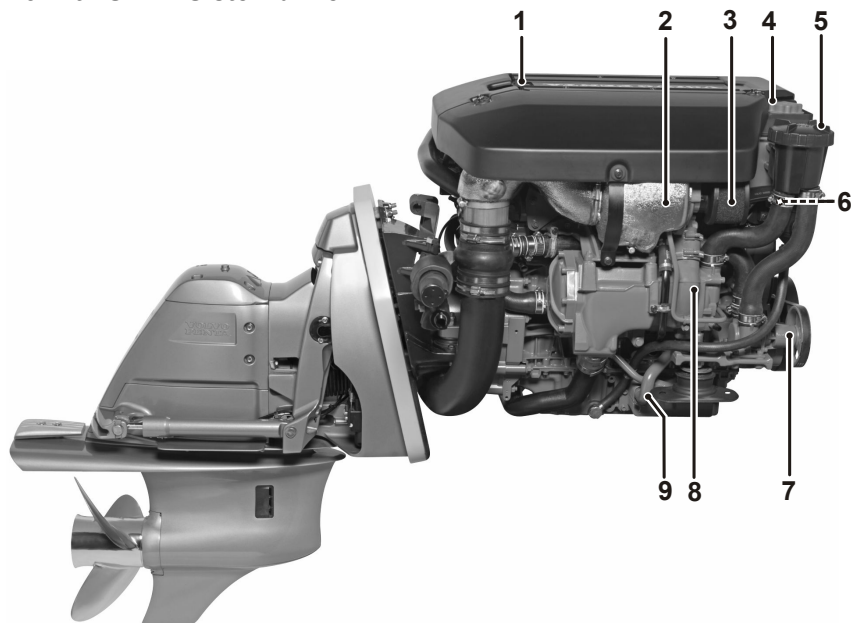
This chapter contains general technical information and instructions on how the prescribed maintenance items must be carried out. Read through the instructions carefully before starting work. The times when maintenance items must be carried are indicated in the *Service Protocol*.

Read through the safety precautions for maintenance and service in the *Safety Information page 4* chapter before work on the engine is begun.

WARNING!

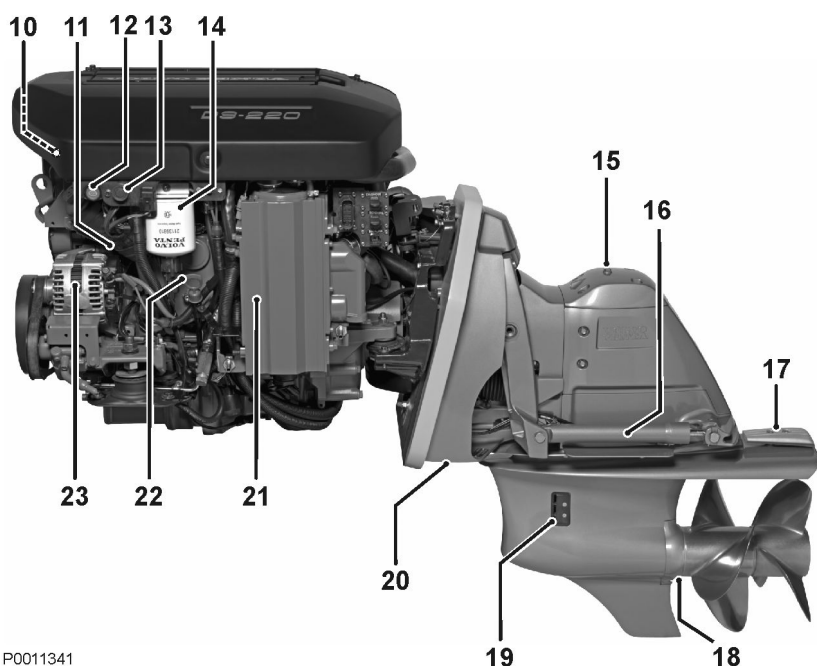
Care and maintenance work should be done with the engine stopped unless otherwise specified. Stop the engine before opening or removing the engine hatch/hood. Make it impossible to start the engine by removing the start key and cutting the system voltage with the main switches.

D3 with SX/DPS sterndrive



P0011340

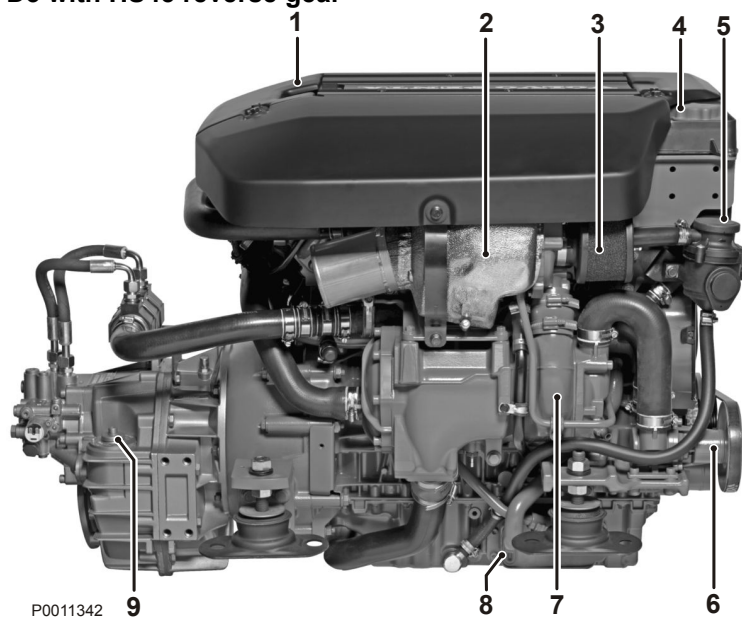
- 1 Oil filler cap, engine
- 2 Turbo
- 3 Air Filter
- 4 Coolant filler cap
- 5 Seawater filter
- 6 Crankcase ventilation
- 7 Seawater Pump
- 8 Charge air cooler
- 9 Oil cooler



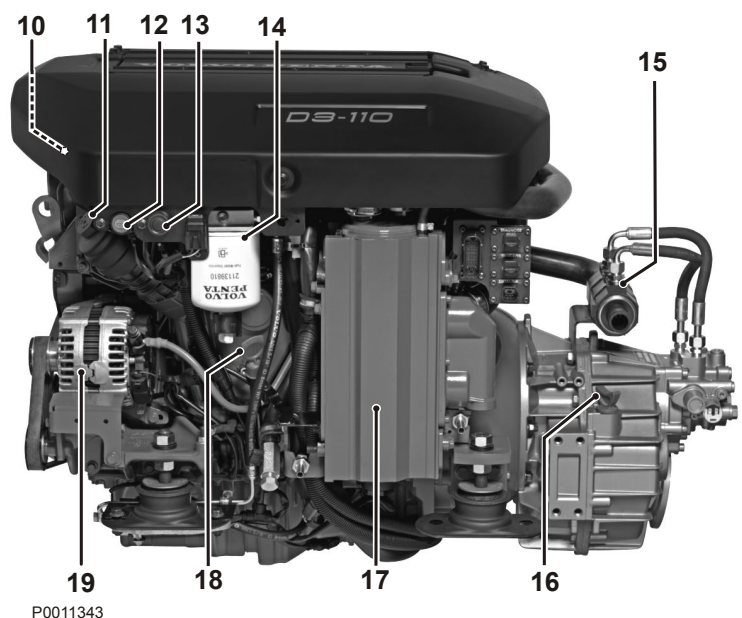
P0011341

- 10 Relays
- 11 Oil filter
- 12 Auxiliary stop
- 13 Fuel feed
- 14 Fuel Filter
- 15 Oil dipstick, drive
- 16 Trim cylinder
- 17 Sacrificial Anode
- 18 Oil draining (behind propeller)
- 19 Seawater intake
- 20 Sacrificial Anode
- 21 Heat exchanger
- 22 Oil dipstick, engine
- 23 Alternator

D3 with HS45 reverse gear



- 1 Oil filler cap, engine
- 2 Turbo
- 3 Air Filter
- 4 Coolant, Filling
- 5 Crankcase ventilation
- 6 Seawater Pump
- 7 Charge air cooler
- 8 Oil cooler
- 9 Oil filter, reverse gear



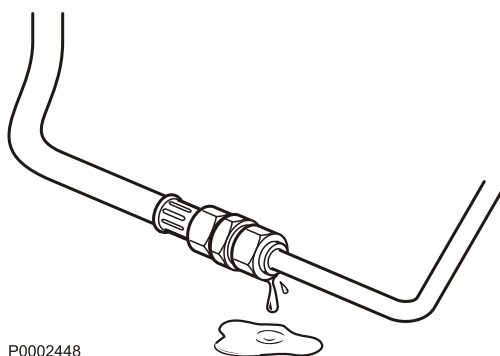
- 10 Relays
- 11 Oil filter
- 12 Auxiliary stop
- 13 Fuel feed
- 14 Fuel Filter
- 15 Oil cooler, reverse gear
- 16 Oil dipstick, reverse gear
- 17 Heat exchanger
- 18 Oil dipstick, engine
- 19 Alternator

Engine, General

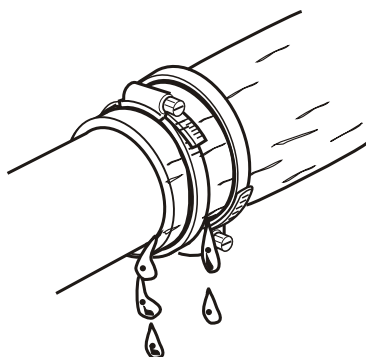
General inspection

Make a habit of visually checking the engine and engine bay before starting, and after operations when you have stopped the engine. This will help you to discover abnormalities quickly, or if something is about to happen.

Look especially carefully for oil, fuel and coolant leakages, loose bolts, worn or poorly-tensioned drive belts, loose cable connections, damaged electrical cables and hoses. This inspection only takes a few minutes and can prevent serious malfunctions and expensive repairs.



P0002448



P0002455

WARNING!

Accumulations of fuel, oil and grease on the engine or in the engine room is a fire hazard and must be removed immediately they are detected.

WARNING!

If an oil, fuel or coolant leak is detected, the cause must be investigated and the fault rectified before the engine is started.

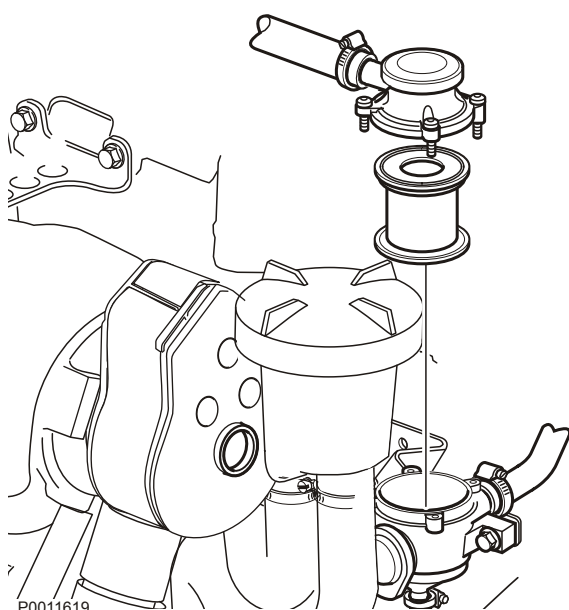
Never direct the jet from a high-pressure washer at seals, rubber hoses or electrical components. Never use the high pressure setting for engine cleaning.

Crankcase Ventilation, Filter Change

- 1 Undo the four cover bolts.
- 2 Move the cover forward/up so that the hose comes loose from the air filter housing.
- 3 Remove the filter and insert a new one.
- 4 Slide the hose back into the air filter housing. Screw the cover back in place.

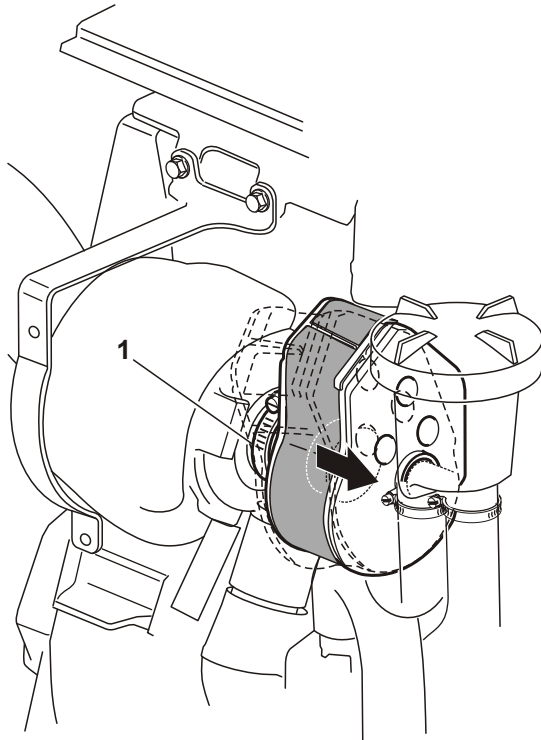
IMPORTANT!

Scrap the old filter; it may not be cleaned.



P0011619

Air Filter, Change



P0009040

- 1 Remove the engine cover attached by three bolts.
- 2 Remove the hose clamp (1). Remove the filter by moving it above the crankcase ventilation union and then working it loose.
Be careful to prevent contamination from entering the engine.
- 3 Install the new filter. Tighten the hose clamp.
Scrap the old filter; it may not be cleaned.

Drive Belt, Check and Change

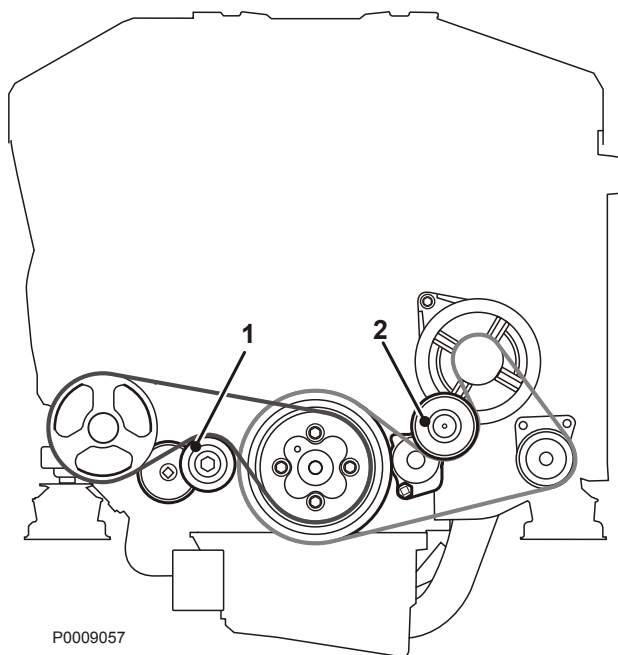
WARNING!

Stop the engine before doing any maintenance work.

Check belt tensions and condition regularly.
The drive belts have automatic belt tensioners and do not need to be adjusted. Check that the belt tensioner does not bottom.

IMPORTANT!

Always replace a belt that appears worn or is cracked.
Belts working in tandem must be replaced simultaneously.



Replacing drive belts

- 1 Remove the protective cover (accessory) over the drive belts, where fitted.
- 2 Turn the belt tensioner (1) out of the way and remove the drive belt.
The belt tensioner can be locked in its bottom position with the aid of a screwdriver to facilitate belt replacement.
Repeat the procedure with the other belt (2).
- 3 Install the new drive belts.
- 4 Check that the drive belts are positioned correctly in the grooves.
- 5 Replace the protective cover (accessory) over the drive belts.

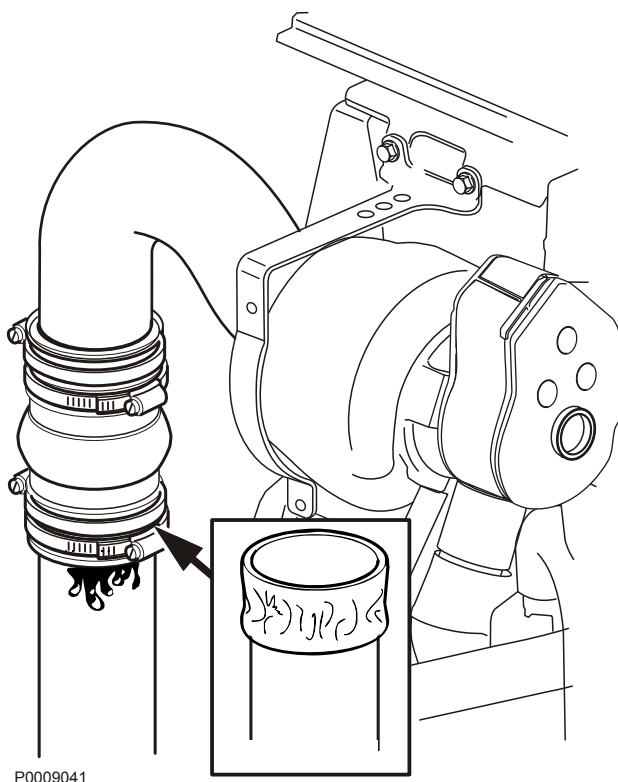
Checking exhaust line

The exhaust line must be checked annually for corrosion between the hose and the pipe.

WARNING!

Risk of water entry. The exhaust line must be inspected while the boat is on land. In case of serious corrosion damage, the pipe must be repaired or replaced with a new one.

- 1 Undo the hose clamps and remove the bellows.
- 2 Check the contact surface. The pipe must be repaired or replaced if there is serious corrosion damage.





P0002089

Lubrication System

Oil change intervals can vary depending on oil grade and sulphur content of the fuel, please refer to *Technical Data page 131*.

Oil change intervals must never exceed a period of 12 months.

If you want longer oil change intervals than given in the table *Technical Data page 131*, the condition of the oil must be checked by the oil manufacturers through regular oil testing.

Oil level, checking and topping up

The oil level must be within the marked area on the oil dipstick and must be checked daily before the first start.

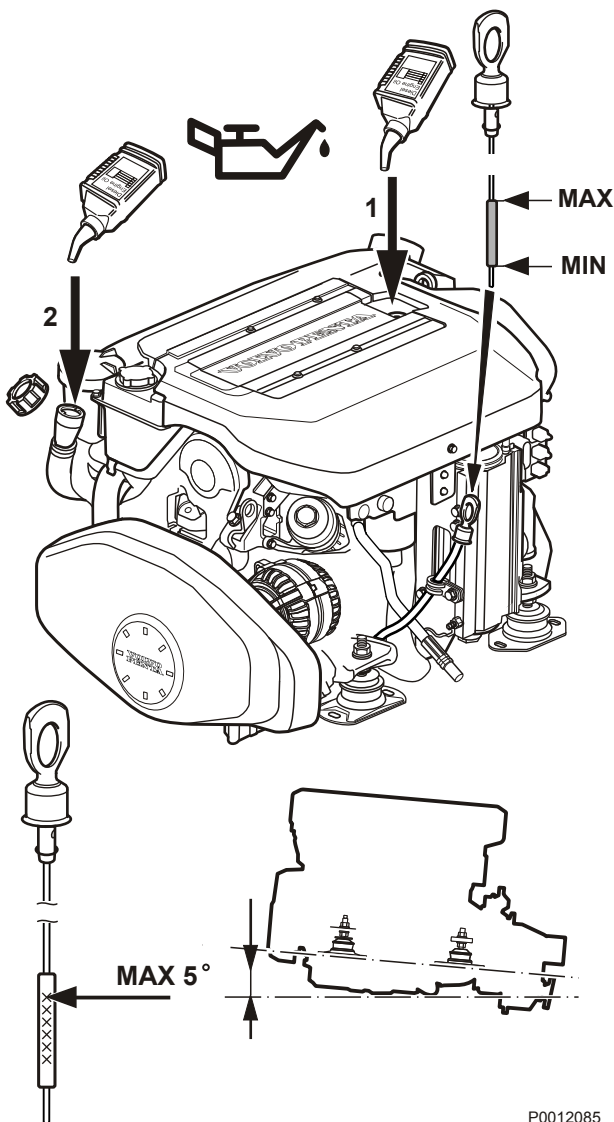
IMPORTANT!

Do not fill over the limit for max. oil level. Use only oil of the recommended grade; refer to *Technical Data page 131*.

- 1 Fill oil slowly through the oil filler on top of the engine (1) or on the side (2), where fitted.
- 2 Wait 20 minutes to allow time for the oil to run down into the sump before checking the level again.
- 3 Check the oil level again.

IMPORTANT!

MAX oil level for engine installations up to 5° inclination is at the upper cross on the oil dipstick.



P0012085

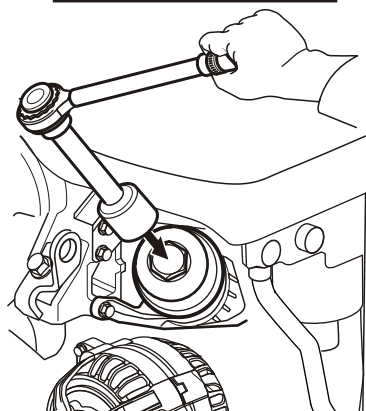
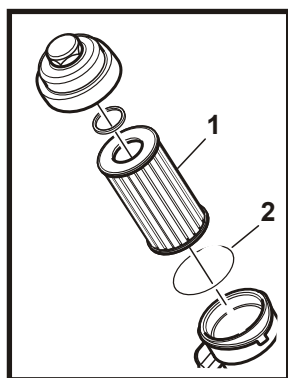
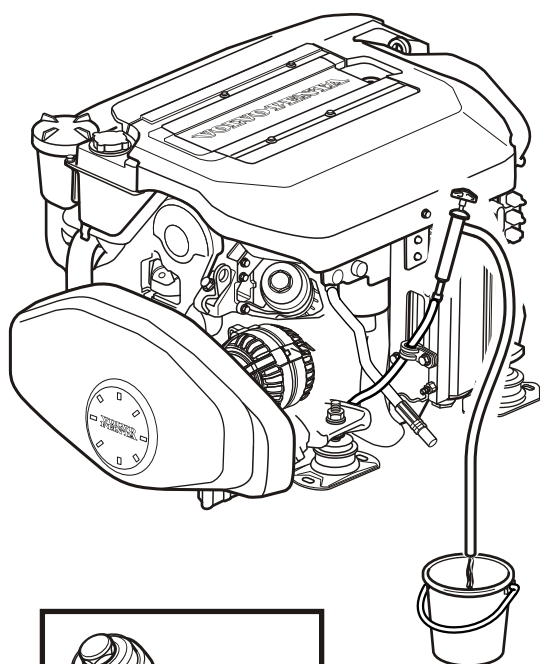
Engine oil and engine oil filter, changing

Always follow the recommended oil change interval. Use only oils of the recommended grades; refer to *Technical Data page 131*.

Change the oil filters at every oil change.

WARNING!

Hot oil and hot surfaces can cause burns.



P0009043

- 1 Idle the engine for around 20 minutes so that the oil is easier to pump out.
Stop the engine. Undo the oil filter cover a couple of turns so that its bottom valve opens and oil runs down into the sump.
Wait 20 minutes.
- 2 Insert the oil drain pump into the oil dipstick tube and pump out the oil.
- 3 Put a newspaper or similar over the alternator to protect it from oil spillage.
- 4 Change the filter insert (1).
Install a new O-ring (2), tighten the cover by hand (25 Nm) using a wrench, size 36.
Remove the newspaper protecting the alternator.
- 5 Fill with oil to the correct level through the oil filler on top or to the side (accessory) of the engine. For oil quantity, refer to section *Technical Data page 131*.
- 6 Start the engine. Run the engine until it reaches operating temperature..
Check that the low oil pressure lamp goes out and that there are no oil leaks around the filter
- 7 Turn off the engine. Wait 20 minutes before checking the oil level. Top up as necessary.
- 8 Carry out a further oil level check the following day when the engine is cold.
Hand in the old oil and oil filter to a re-cycling station.

Fuel System

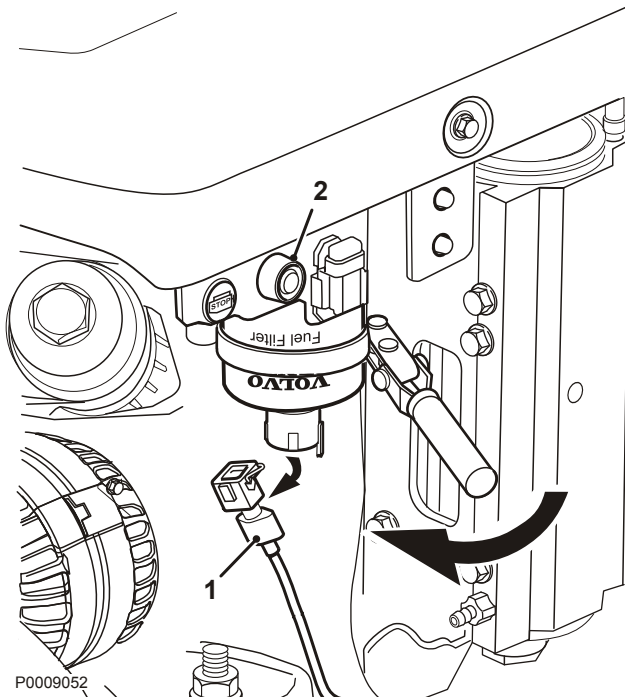
Only use the grades of fuel recommended in the fuel specification, see *Technical Data page 131*. Always observe the greatest cleanliness during re-fuelling and work on the fuel system.

All work on the unit injectors of the engine must be carried out by an authorized workshop.

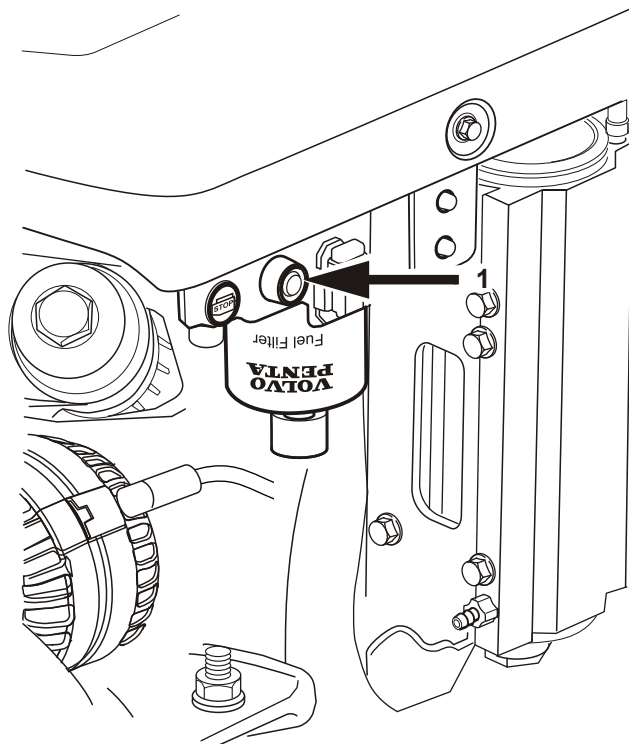
WARNING!

Fire hazard. When carrying out work on the fuel system make sure the engine is cold. A fuel spill onto a hot surface or an electrical component can cause a fire. Store fuel soaked rags so that they cannot cause fire.

Engine Fuel Filter Replacement



- 1 Close the fuel tap(s).
- 2 Clean the filter bracket and place a suitable vessel under the filter.
- 3 Undo the connector (1). Unscrew the filter; use a filter wrench if necessary.
- 4 Clean the sealing surfaces on the filter holder. Make sure that the filter is clean and that the seal rings are undamaged. Moisten the seal rings with engine oil.
IMPORTANT!
Do not fill the new filter with fuel before installation; dirt may get into the system and cause damage and malfunctions.
- 5 Screw on the new filter by hand until the gasket just bottoms on the sealing surface, then tighten a further 1/2 turn.
Replace the connector (1).
- 6 Open the fuel tap.
- 7 Pump up fuel by pressing the fuel feed button (2).
- 8 Start the engine and check that there are no leaks.



P0009053

Fuel system, bleeding

The fuel system is self venting but may still require venting after e.g. fuel filter replacement, when the fuel tank has been run dry or after long breaks in operations.

IMPORTANT!

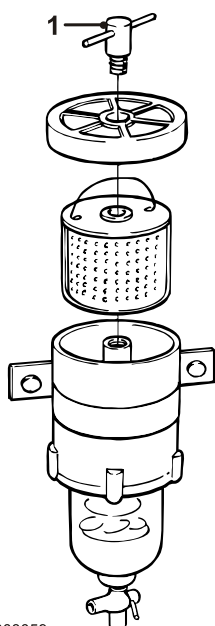
Never disconnect the delivery pipes.

- 1 Pump up fuel by pressing the fuel feed button (1) for around 5 seconds.
- 2 Start the engine and check that no fuel leaks are present.

Fuel Pre-filter, Change

⚠ WARNING!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.



P0003059

- 1 Close the fuel stop cock on the fuel tank. Place a container beneath the fuel filter.
- 2 Remove the cover by loosening screw (1).
- 3 Replace the insert and refit the cover.
- 4 Open the fuel stop cock and bleed the fuel system, see section "*Fuel system, bleeding*".
- 5 Start the engine and check for leaks.
- 6 Hand in the scrapped filter at a recycling depot.

Water in Fuel

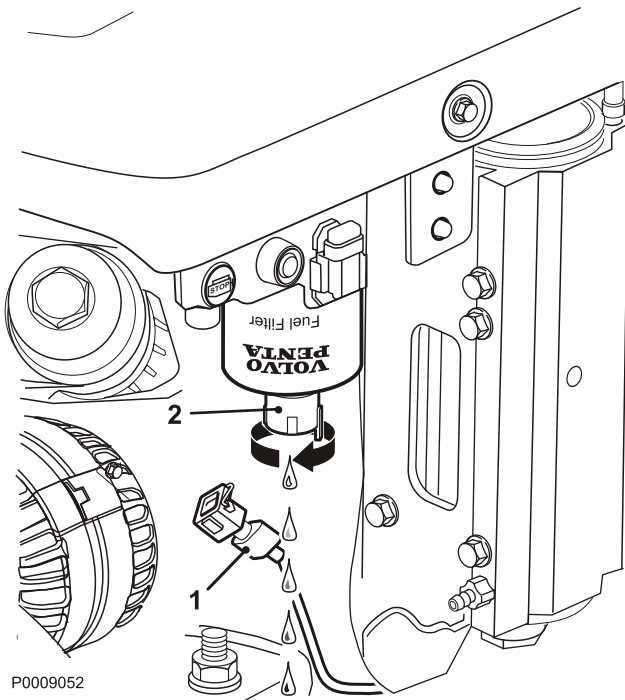
If the EVC system warns for too much water in the fuel filter, the water separator needs emptying.

IMPORTANT!

Do not continue operating if there is water in the water separator, it can damage the engine.

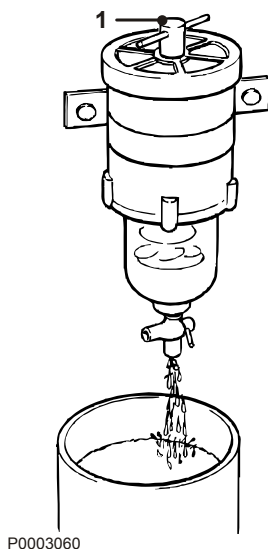
Draining the fuel filter

- 1 Stop the engine and remove the ignition key from the ignition lock.
- 2 Remove the connector piece (1) from the sensor (2).
- 3 Place a container under the fuel filter and carefully unscrew the sensor (2). Let the water run out. When diesel runs out, screw in the water separator until it bottoms against the filter. Then tighten an additional 1/4 to 1/2 turn.
- 4 Refit the connecting piece (1).



Draining the fuel pre-filter (extra equipment)

- 1 Place a container beneath the fuel filter.
- 2 Open the bleed screw (1) on the fuel filter about 4 turns.
- 3 Drain the water and contaminants via the plug in the bottom of the filter.
- 4 Bleed the fuel system.



Freshwater System

The freshwater system is the engine's internal cooling system that ensures that the engine operates at the correct temperature. It is a closed system that must always be filled with a coolant mixture in order to protect the engine against internal corrosion, cavitation and frost bursting.

IMPORTANT!

Coolant of a suitable chemical composition must be used all year round. This applies even when there is no risk for frost damage, so that the engine always has complete corrosion protection.

The use of anti-corrosion agents alone is not permitted in Volvo Penta engines. Never use water alone as the coolant.

The corrosion protection additives become less effective over time, which means that the coolant must be changed at regular intervals; refer to *Maintenance Schedule*. The cooling system must be flushed whenever the coolant is changed, refer to *Freshwater system, Flushing*.

Volvo Penta recommend "Volvo Penta Coolant VCS, Ready Mixed" or the concentrate "Volvo Penta Coolant VCS" mixed with pure water according to specifications, see *Technical Data page 132*.

Volvo Penta Coolant VCS and VCS Ready Mixed are based on organic acid technology (OAT). Using other types of coolant, such as conventional or hybrid types, can drastically reduce the heat transfer and result in overheating of the engine.



P0013077

Coolant, Mixing

WARNING!

All coolant is hazardous and harmful to the environment. Do not consume. Coolant is flammable.

IMPORTANT!

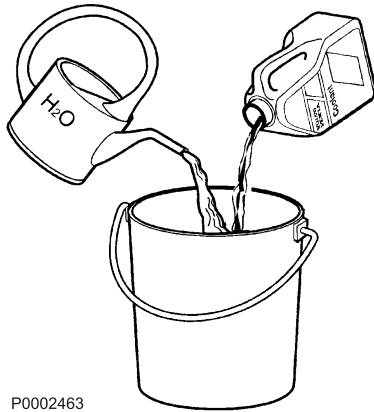
Different types of coolant must not be mixed with each other!

Mix: 40% “Volvo Penta Coolant” (conc. coolant) and 60% water

This mixture protects against internal corrosion, cavitation and frost bursting down to -24°C (-11°F). At 60% glycol concentration, the freezing point is lowered to -46°C (-51°F).

Never mix more than 60% concentrate (Volvo Penta Coolant) in the coolant. A greater concentration provides reduced cooling effect with the risk for overheating and reduced frost protection.

The coolant must be mixed with distilled, deionized water. The water must fulfil the requirements specified by Volvo Penta; refer to *Technical Data page 132*. It is extremely important that the system is filled with the correct coolant concentration. Mix in a separate clean vessel before filling the cooling system. Make sure that the liquids mix.



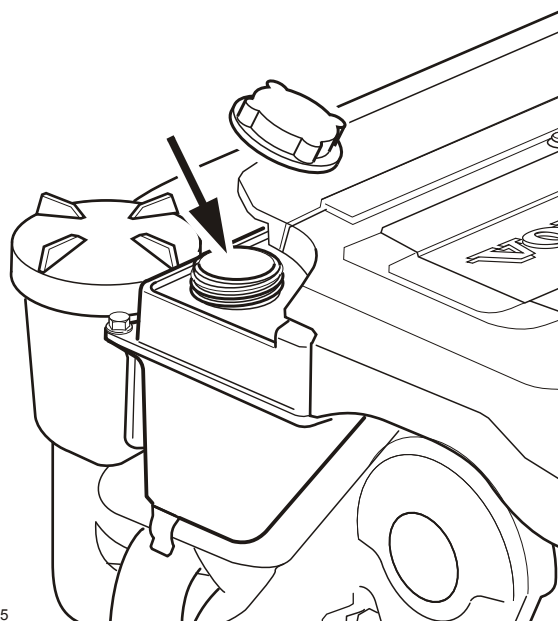
P0002463

Coolant Level, Checking and Topping Up

WARNING!

Do not open the coolant filler cap when the engine is hot, except in emergencies, this could cause serious personal injury. Steam or hot fluid could spray out.

- 1 Turn the filler cover slowly counter-clockwise and release any pressure from the system before removing the cover completely.
- 2 Top the coolant up as necessary. The coolant level shall be between the MAX and MIN marks on the expansion tank.
- 3 Screw the filler cover on.



P0009045

Freshwater System, Draining

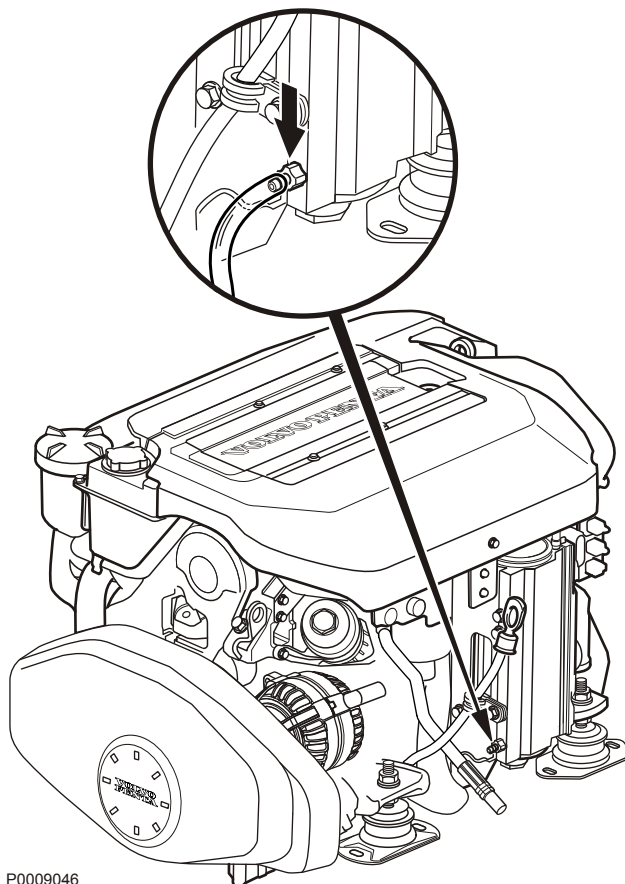
WARNING!

Stop the engine and let it cool before starting work on the cooling system. Hot fluids and hot surfaces can cause burns.

WARNING!

All coolant is hazardous and harmful to the environment. Do not consume. Coolant is flammable.

- 1 Remove the filler cover on the expansion tank to speed up coolant drainage.
- 2 Connect a hose to the heat exchanger drain tap. Open the tap and allow all the coolant to drain into a vessel.
- 3 Screw the tap in.
- 4 Collect the old coolant and hand it to a recycling station.



P0009046

Seawater System

The seawater system is the engine's external cooling system. The seawater pump draws in water via the seawater pump intake. The water is then pumped through the charge air cooler and heat exchanger into the exhaust elbow where it is mixed with exhaust gases.

WARNING!

Risk of water entry. Water will flow into the boat if any hose, plug etc. located below the waterline is removed when the boat is in the water. Always close the sea cocks. If the boat does not have sea cocks the water flow must be blocked in a safe manner. If this is not possible, the boat must be drawn up on land before work starts.

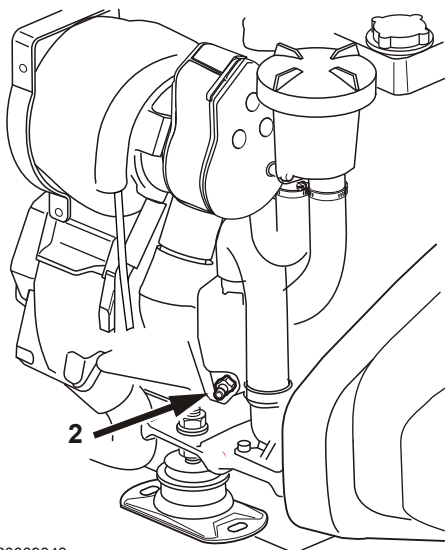
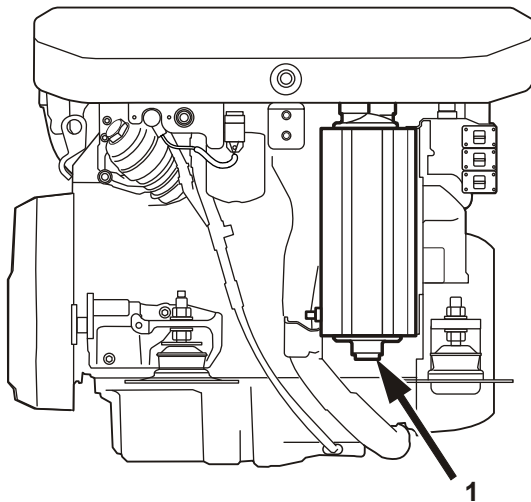
Seawater System, Draining

WARNING!

Risk of water entry. Close the seawater cocks before doing any work on the seawater system.

To prevent frost bursting, the raw water system must be drained in cold weather when there is a risk of frost. An alternative to draining is to keep the engine bay frost free with the aid of an approved heating fan.

- 1 Close the sea cock where fitted.
- 2 Open the heat exchanger drain nipple (1) and let the water out into a container.
- 3 Connect a hose to the charge air cooler purging nipple (2) and drain the coolant.
- 4 Open the sea cock where fitted.



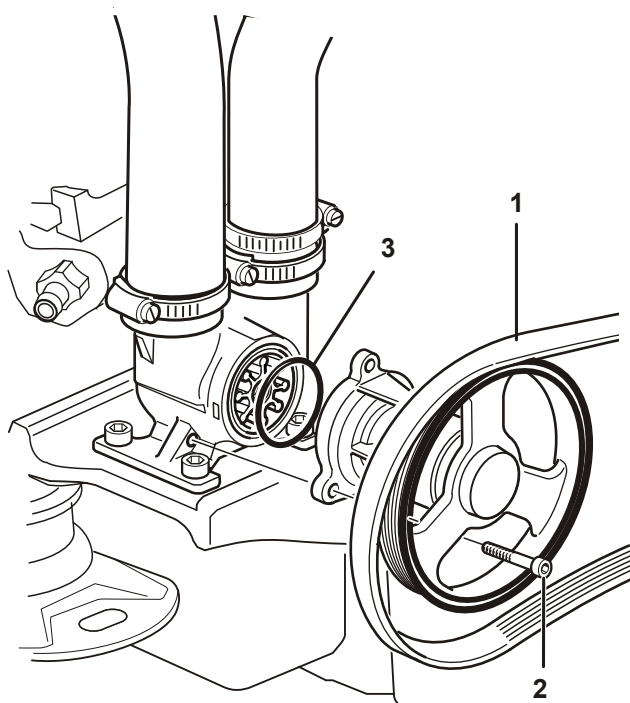
P0009048

Impeller, Check and Change

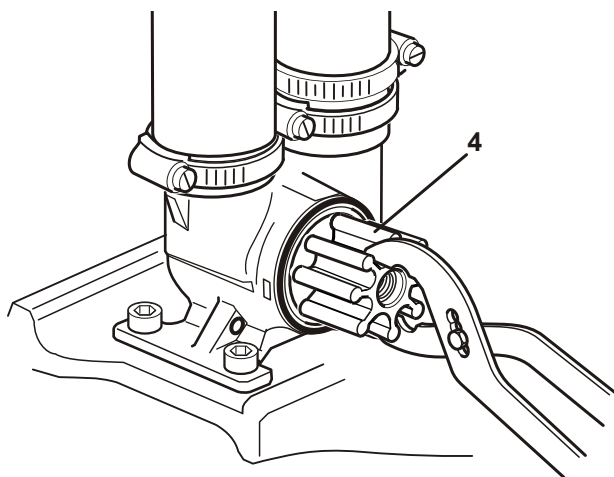


WARNING!

Risk of water entry. Close the seawater cocks before doing any work on the seawater system.



- 1 Remove the protective cover, if fitted, over the drive belt and remove the drive belt (1).
- 2 Remove the three screws (2) keeping the seawater pump cover in place.
- 3 Remove the impeller (3).
If the impeller is cracked or damaged it must be replaced.
- 4 Check if the pump shaft rotates relative to the pulley. In it does the sea water pump must be replaced.
- 5 Lubricate the pump housing and inside of the cover with a little glycerin.
IMPORTANT!
The impeller will be damaged if other types of lubricant than glycerin are used.
- 6 Press the impeller in with an clockwise rotating movement.
- 7 Install the cover with a new O-ring (4).



P0009047

Seawater System, Cleaning and Inhibiting

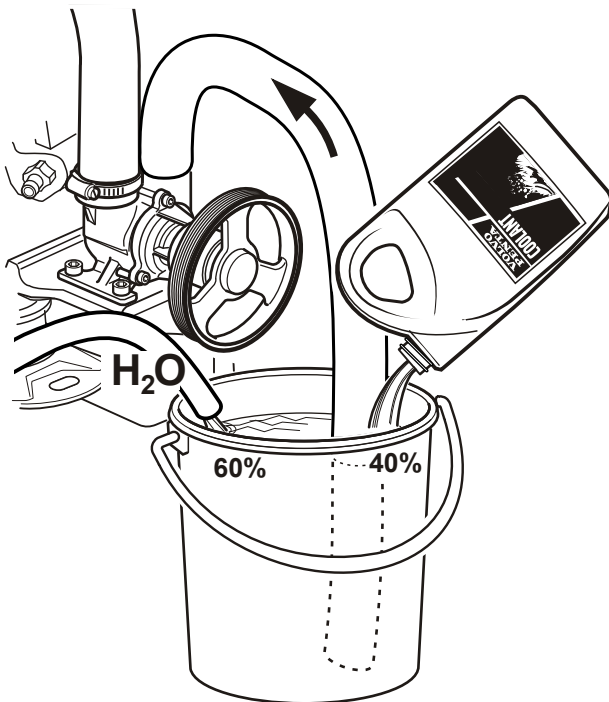
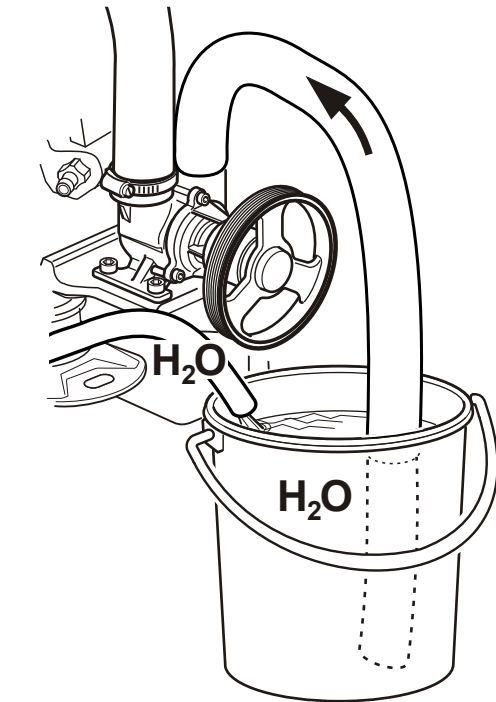
The sea water system must be flushed with fresh water to prevent the build-up of deposits and salt crystals. It must also be conserved when the boat is laid up.

WARNING!

Risk of water entry. Close the seawater cocks before doing any work on the seawater system.

WARNING!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.



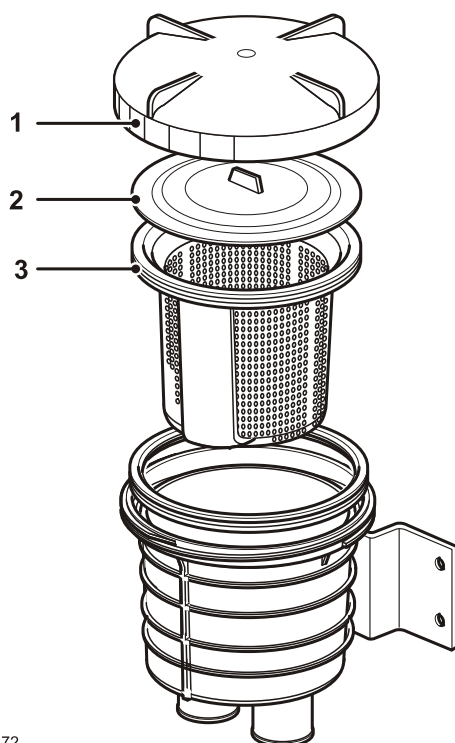
- 1 Disconnect the hose from the seawater pump and install a hose which runs to a bucket filled with fresh water. Make arrangements for topping up.

IMPORTANT!

The impeller will be damaged if it is run dry.

- 2 Check that there is no one in the vicinity of the propeller and that nothing risks being splattered by the exhaust outlet.
- 3 Put the gear selector in neutral. Start the engine and let it run at idle for a few minutes. Stop the engine.
- 4 Fill the bucket with a mixture of 40% glycol and 60% fresh water, to conserve the system. Place a bucket at the exhaust outlet to collect the mixture.
- 5 Start the engine and let it idle. Stop the engine just before the mixture is used up. Repeat until the entire system has been flushed with the mixture.
- 6 Re-install the seawater hose
- 7 The system is now conserved. The glycol mixture must remain in the system during storage. Drain the mixture before the boat is launched. Hand the mixture to a recycling station.

P0009050



P0002472

Seawater Filter, Check and Cleaning

WARNING!

Risk of water entry. Close the seawater cocks before doing any work on the seawater system.

If the water where the boat is used contains contaminants, seaweed, etc. the filter should be checked more frequently than stated in the maintenance schedule. Otherwise there is a risk that the filter may be blocked resulting engine overheating.

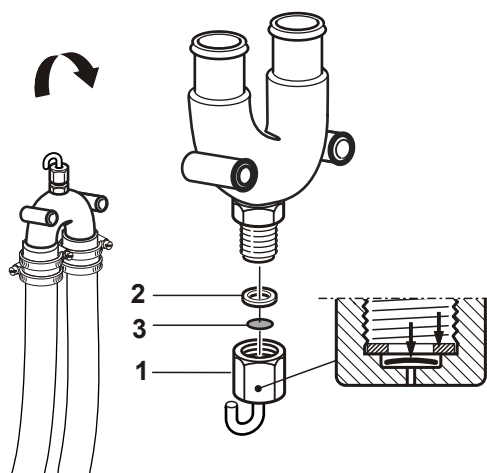
- 1 Close the sea cock.
- 2 Unscrew the cover (1) and remove the sealing plate (2).
- 3 Lift out the insert (3) and clean it.
- 4 Replace parts as illustrated.
- 5 Open the sea cock and check for leaks.

Vacuum Valve, Cleaning

Certain configurations have a vacuum valve installed in the raw water system.

WARNING!

Risk of water entry. Close the seawater cocks before doing any work on the seawater system.



P0009051

- 1 Close the sea cock.
- 2 Remove the valve. Unscrew the hexagonal cover (1).
- 3 The cover contains a membrane (2) and a gasket (3). Clean all components.
- 4 Turn the cover upside down. First insert the membrane and then the gasket.
- 5 Turn the valve housing upside down as well. Screw on the hexagonal cover to around 2 Nm. If the cover is screwed on too tightly the valve may stop working.

Electrical System

The engine is equipped with a 1-pole electrical system and an alternator. System voltage is 12V.

WARNING!

Always stop the engine and break the current using the main switches before working on the electrical system. Isolate shore current to the engine block heater, battery charger or accessories mounted on the engine.

Fuses

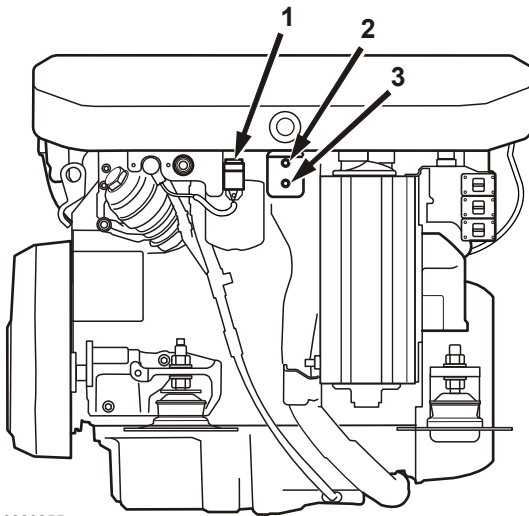
The engine is equipped with a strip fuse (1) and a semi-automatic circuit breaker (2). Engines fitted with a drive has an automatic circuit breaker for the Power Trim engine (3).

The circuit breakers and fuse cut the power if the electrical system becomes overloaded.

If it is not possible to start the engine or if the gauges stop working during operations a circuit breaker or fuse may have deployed. Reset the semi-automatic circuit breakers by pressing the button.

IMPORTANT!

Always investigate the cause of the overload. If the fuse trips frequently, contact an authorized Volvo Penta workshop.



P0009055

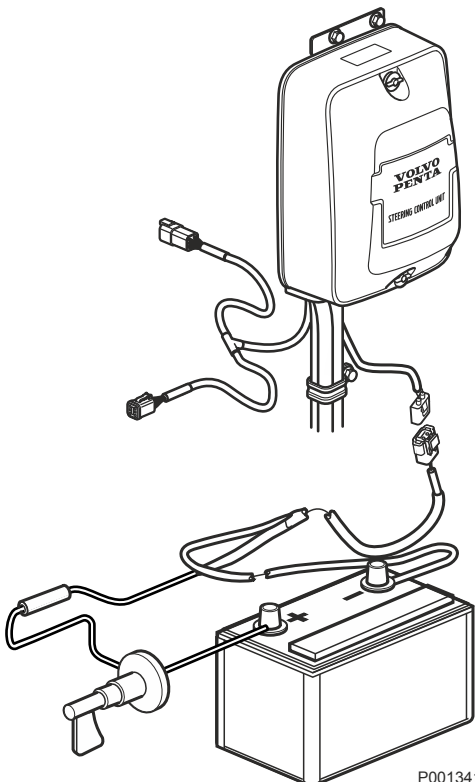
Electronic Steering System

Engines fitted with a drive with electronic steering are equipped with a circuit breaker for the SCU (Steering Control Unit). The circuit breaker is located near the battery or the engine's main battery switch.

The circuit breaker cuts the power if the electrical system for the SCU is overloaded.

IMPORTANT!

Always investigate the cause of the overload. If the fuse trips frequently, contact an authorized Volvo Penta workshop.



P0013413

Stray Current

IMPORTANT!

Leakage currents increase the consumption of cathodic protection on hulls and stemdrives, which can cause severe corrosion in a short period of time.

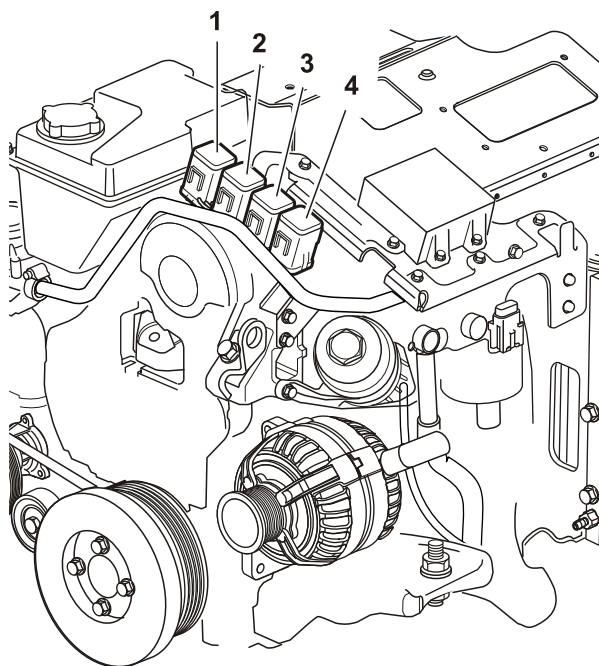
Clean around the alternator regularly; see figure. For boats with aluminum or carbon fiber hulls, it is important to be extra vigilant so that the boat's electrical system remains undamaged and that stray currents cannot arise due to deposits of salt or dirt at the alternator mountings.

An aluminum hull and stemdrive can quickly be damaged by stray currents in the water and carbon fiber hulls serve as good conductors of currents. Also refer to *Electrical Installations* page 102.

Relays

The engine has four relays. If the engine. If it is not possible to start a relay can be broken and need to be changed.

- 1 Main relay
- 2 Fuel pump relay
- 3 External stop relay
- 4 Starter relay



P0012063

Electrical Connections

Check that electrical connections are dry, free from oxide, and that they are securely tightened.



P0002107

Battery, Maintenance

WARNING!

Risk of fire and explosion. Never allow an open flame or electric sparks near the battery or batteries.

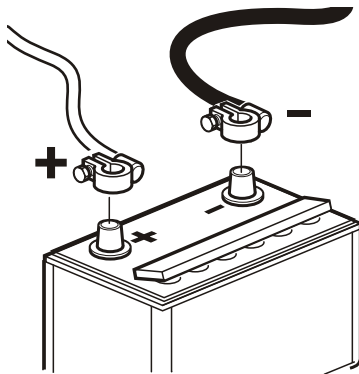
WARNING!

Never confuse the positive and negative poles on the batteries. Risk of arcing and explosion.

WARNING!

The battery electrolyte contains extremely corrosive sulfuric acid. Protect your skin and clothes when charging or handling batteries.

Always use protective goggles and gloves. If battery electrolyte comes into contact with unprotected skin wash off immediately using plenty of water and soap. If battery acid comes in contact with the eyes, flush immediately with plenty of water and obtain medical assistance without delay.



P0016902

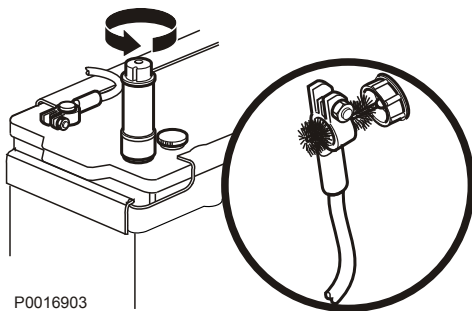
Connecting and disconnecting the battery

Connecting

- 1 Connect the + cable (red) to the + pole on the battery.
- 2 Connect the – cable (black) to the – pole on the battery.

Disconnecting

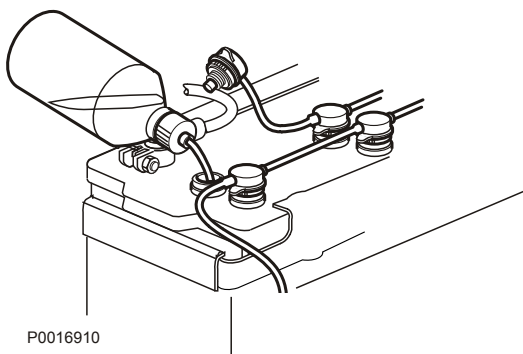
- 1 Remove the – cable (black).
- 2 Remove the + cable (red).



P0016903

Cleaning

Keep the batteries clean and dry. Contamination and oxide on the batteries and battery poles can cause stray currents, voltage drop and discharge, especially in wet weather. Remove oxidation from the battery poles and terminals, using a brass brush. Tighten the terminals securely and grease them with terminal grease or petroleum jelly.



P0016910

Filling

The electrolyte level should be 5–10 mm (0.2–0.4") above the cell plates in the battery. Top up with distilled water as required.

After filling, the battery should be charged for at least 30 minutes by running the engine at idle.

Some maintenance-free batteries have special instructions, which must be followed.



P0002107

Battery, Charging

WARNING!

Risk of fire and explosion. Never allow an open flame or electric sparks near the battery or batteries.

WARNING!

The battery electrolyte contains extremely corrosive sulfuric acid. Protect your skin and clothes when charging or handling batteries.

Always use protective goggles and gloves. If battery electrolyte comes into contact with unprotected skin wash off immediately using plenty of water and soap. If battery acid comes in contact with the eyes, flush immediately with plenty of water and obtain medical assistance without delay.

WARNING!

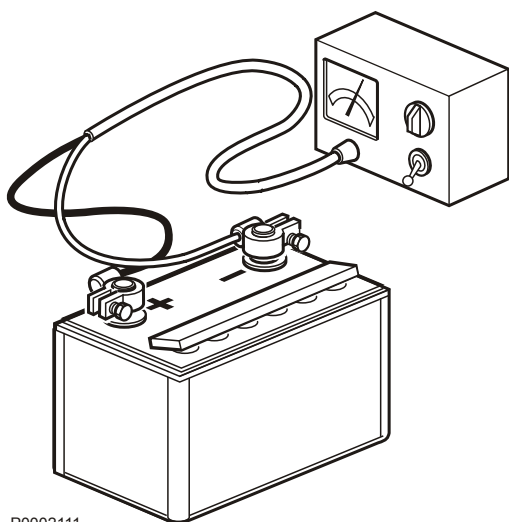
Never confuse the positive and negative poles on the batteries. Risk of arcing and explosion.

IMPORTANT!

Observe the instruction manual for the battery charger carefully. To avoid the risk of electrochemical corrosion when an external charger is connected, the battery cables should be removed from the batteries before the charger is connected.

Always switch off the charging current before the charging clips are removed.

- Charge batteries if they have become discharged. During charging, unscrew the cell plugs but leave them in the plug holes. Ventilate well, especially if the batteries are charged in an enclosed space.
- If the engine is not used for a longer period of time, the batteries should be fully charged, then possibly trickle charged (please refer to the battery manufacturer's recommendations). Batteries are damaged by being left discharged, and can also freeze and burst easier in cold weather.
- Special instructions apply to **boost charging**. Boost charging can shorten battery life, and should therefore be avoided.



P0002111

Electrical Installations

An incorrectly designed electrical installation may generate leakage current from the electrical system. Leakage current can in turn render galvanic protection inadequate in respect of propellers, propeller shafts, rudder posts, the keel etc., and may cause damage through electrochemical corrosion.



WARNING!

Work on the low voltage circuits in the boats should be done by a person with electrical training or knowledge. Installation or work on land current equipment must only be done by a competent electrician, in accordance with local regulations for mains electricity.

The following must always be heeded:

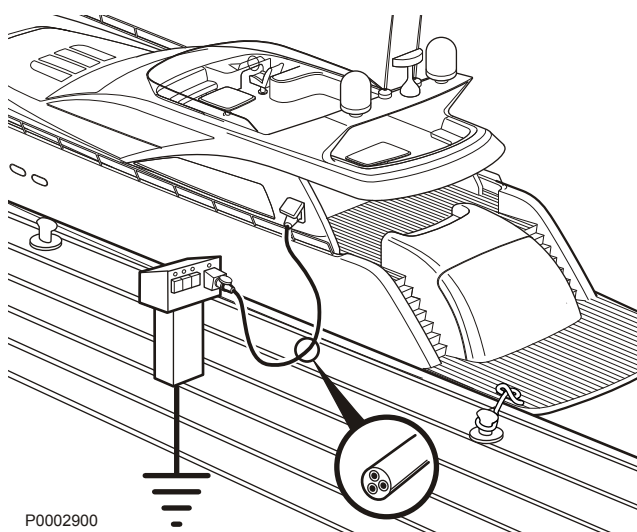
- 1 If shore power is connected it must always be ground protected ashore, never in the boat. Furthermore, the shore power installation should be equipped with a ground fault circuit interrupter. The shore power installation (transformer, inverter, battery charger etc.) must be designed for marine use **where the high-tension side is galvanically separated from the low-tension side.**
- 2 Electrical cables must be run and clamped such that there is no risk of exposure to chafing, damp or bilge water.
- 3 Ground protection for radios, navigation instruments, rudder, boarding ladders or other equipment where separate cables for ground protection are present, must be clustered to a common ground connection that is not connected to the engine or reverser gear.

IMPORTANT!

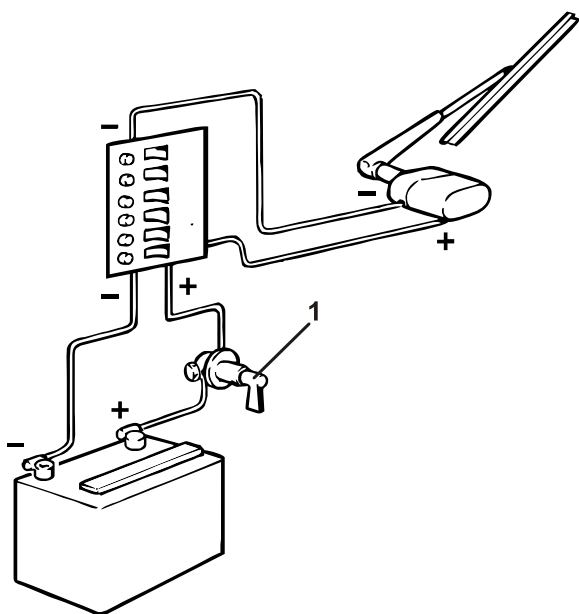
The engine and reverse gear must never be used as earth planes.

- 4 The start battery must have a main switch (1) connected to the battery's positive (+) side. The main switch must break the circuit to all equipment and be switched off when the boat is not in use.
- 5 If an auxiliary battery is used, a main switch must be placed between the auxiliary battery's positive (+) terminal and the circuit breaker panel for the boat's electrical equipment. The main switch must break the circuit to all equipment connected to the auxiliary battery and must be switched off when power is no longer required. All equipment connected to the auxiliary battery must have separate main switches.

For simultaneous charging of two independent battery circuits a separate charging distributor (accessory) should be installed on the standard alternator.



P0002900



P0002486

Electrical Welding

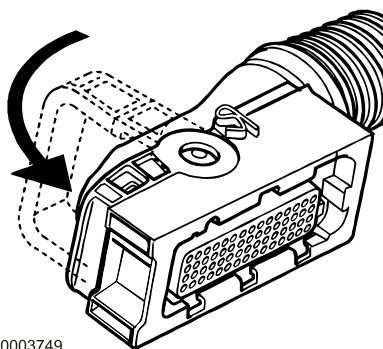
Remove the positive and negative cables from the batteries, then disconnect all cables connected to the alternator.

Always connect the welder ground clamp to the component to be welded, and as close as possible to the weld site. The clamp must never be connected to the engine or in such a way that current can pass through a bearing.

Also remove the connector for the EVC system from the control unit. Press the locking arm down and pull out the connector.

IMPORTANT!

After finished welding, re-connect the EVC connector and the alternator terminals before connecting the battery cables.



P0003749

Reverse Gear

The reverse gear is hydraulic, which means that shifting between ahead/astern and neutral is performed hydraulically. The reverse gear lubrication system is equipped with an oil filter and oil cooler. The reverse gear uses solenoid valves for electronically controlled shifting.

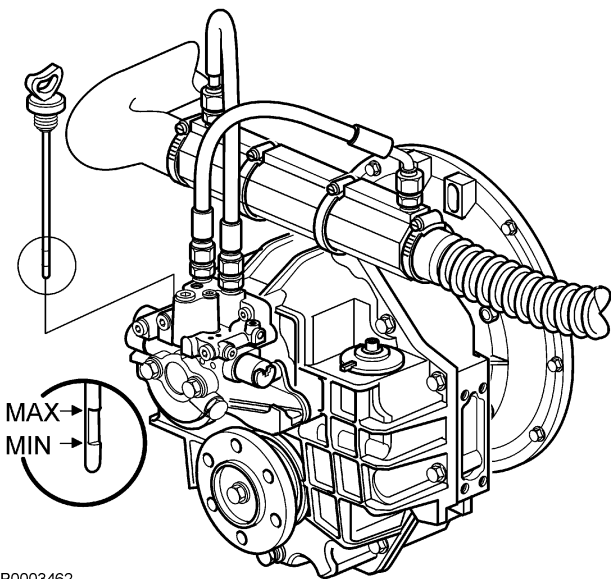
Volvo Penta recommends that a seawater filter be fitted to guarantee the correct cooling water flow to the engine and reverse gear. Otherwise there is a risk of contaminants in the seawater blocking the reverse gear cooler and other cooling system components.

Oil level, checking and topping up

- 1 Start the engine and let it run on idle a few minutes.
- 2 Remove the dipstick by turning counter-clockwise.
- 3 Wipe the dipstick and reinsert it in the reverse gear without screwing it in. Remove the dipstick and check the oil level. The correct oil level is between the MAX and MIN markings.
- 4 Top up the oil as required using the dip stick tube. Please refer to section *Technical Data page 133* for oil quality and capacity.

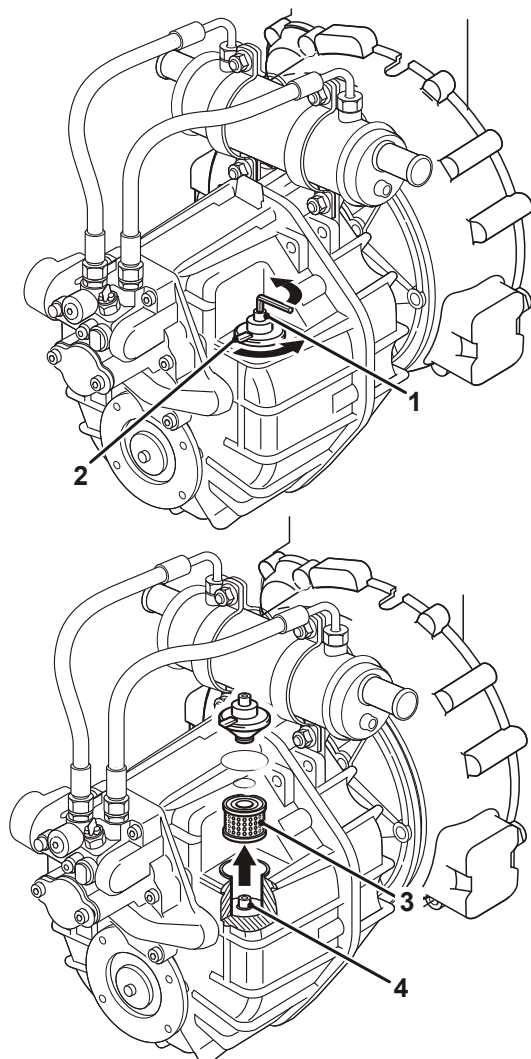
IMPORTANT!

Never over-fill the reverse gear. The oil level must always be within the recommended range.



P0003462

Reverse Gear, Oil och Filter Change

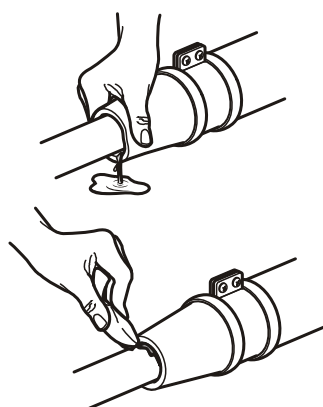


P0003080

- 1 Clean around the cap (2) so that there is no risk of dirt falling into the filter housing.
- 2 Undo the Allen bolt (1) with a 6mm Allen key. Remove the cover (2). Change the O-rings in the cap; lubricate the new ones.
- 3 Remove the filter (3).
- 4 Use an oil drain pump to pump out the oil from the oil filter housing. Connect the hose to the suction tube (4) in the bottom of the housing. Suction hose maximum external diameter is 16 mm.
- 5 Measure out the correct quantity of oil and fill the reverse gear via the oil filter housing. Refer to the *Technical Data* page 133 section for oil grade and quantity.
IMPORTANT!
Never over-fill the reverse gear. The oil level must always be within the recommended range.
- 6 Install the new filter (3) in the filter housing.
- 7 Install the cover. Tightening torque: 5-8 Nm
- 8 Put the control lever in neutral. Start the engine and run it at 1500 rpm for a few minutes so that the reverse gear oil cooler fills with oil.
- 9 Stop the engine and check the oil level. Top up as needed

Propeller Shaft Sealing, Check

If the boat is fitted with a Volvo Penta propeller shaft, the propeller shaft seals must be lubricated before launch and purged directly after launching. Purge the glands by pressing them together, at the same time as they are pressed down onto the shaft. The press approximately 1 cm³ of water resistant grease into the seal.



P0002609

Drive

The drive is protected against galvanic corrosion by several layers of paint, sacrificial anodes and ground braids. The ground braids maintain a connection between the different components of the drive. A broken connection can result in the rapid corrosion of an individual component even though the protection is otherwise effective. Check ground braids every year. Faulty electrical installation can also cause the break down of the galvanic protection. Damage due to electrolytic corrosion occurs rapidly and is often extensive. For further information see the chapter *Maintenance* page 98.

Always repair damage to paintwork immediately. Improperly applied paint or the wrong type of paint on the keel can put the corrosion protection system out of action. For further information on painting see section *Storage* page 118.

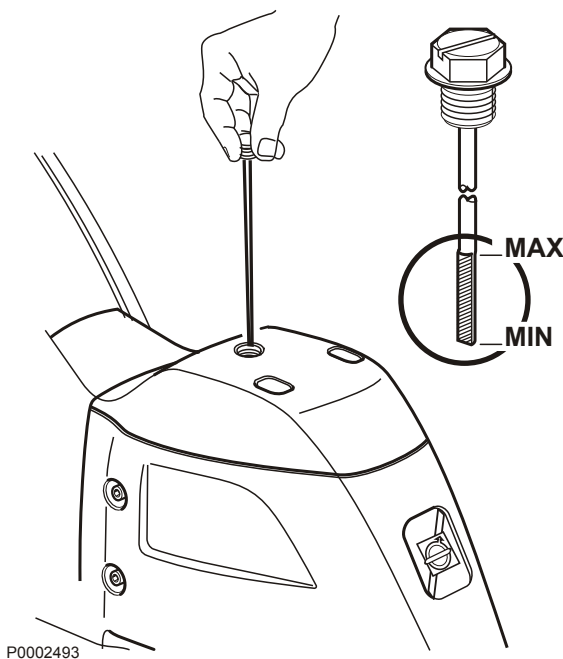
Transmission lubricant, checking and topping up

IMPORTANT!

Never over-fill the drive. The oil level must always be within the recommended range.

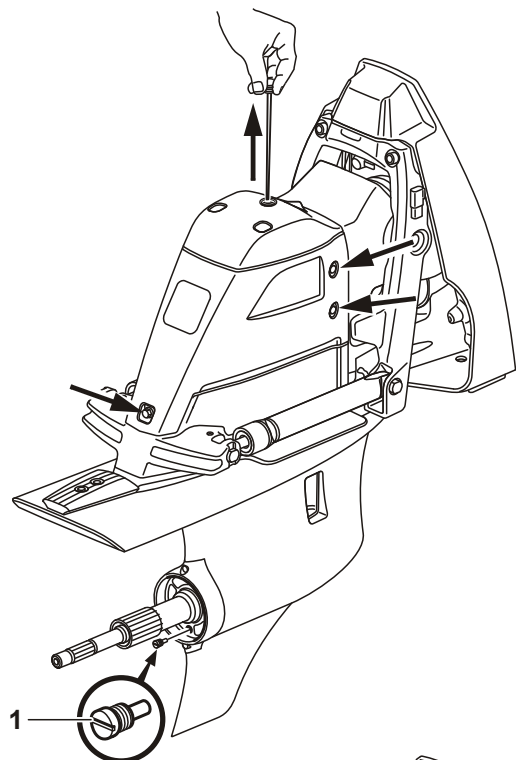
- 1 Screw the oil dipstick all the way down and then remove it.
- 2 Check the oil level on the dipstick. The oil must be on the flat dipstick area
If the oil level is low, fill a little at a time through the oil dipstick opening until the right level is reached. For oil grade and quantity refer to *Technical Data* page 134
If oil level is too high, empty the drive until the correct level is achieved; refer to *Transmission Oil, Change* page 107.
- 3 Check O-ring on dipstick for wear; replace if needed.

The oil must have a golden brown nuance. If the oil is gray, water has entered the stern drive. In this case let a Volvo Penta workshop carry out checks on the stern drive.



P0002493

Transmission Oil, Change



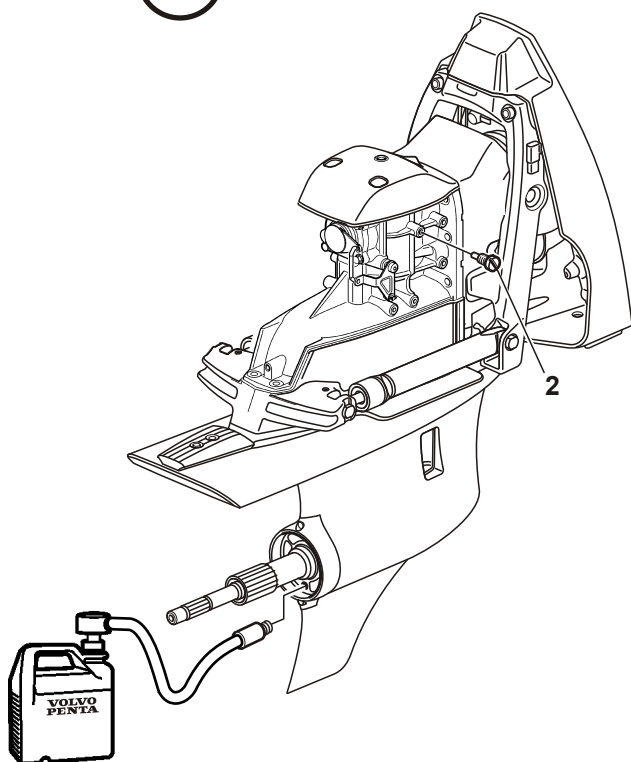
Draining

- 1 Trim the sterndrive down to the drive position.
- 2 Remove the propeller; refer to *Maintenance page 110*.
- 3 Place a container under the sterndrive. Remove the oil dipstick.
- 4 Remove the plug (1). Allow all the oil to drain from the sterndrive.
Hand the oil to a recycling depot.

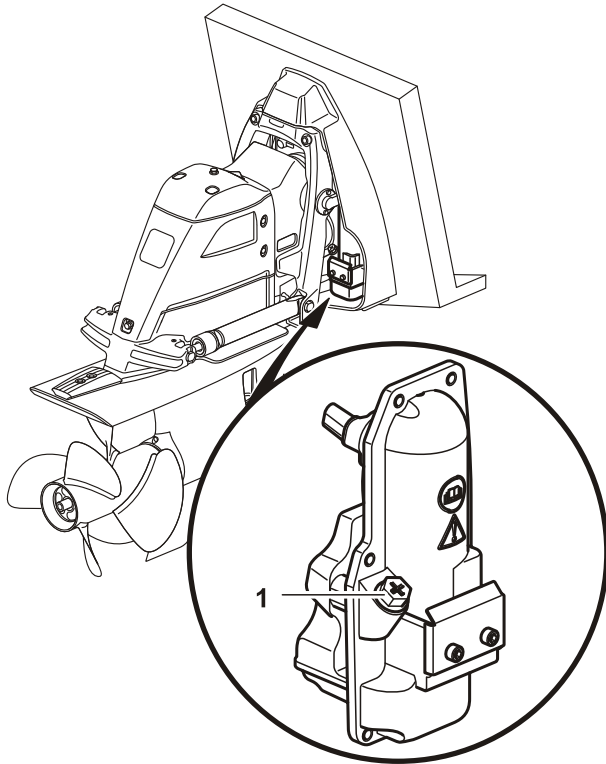
Filling

- 1 Remove the cover and undo the oil level plug (2).
- 2 Fill new oil through the oil drain hole; use a pump with a 3/8–16 UNC union. For oil grade and quantity, refer to *Propulsion Unit*.
Fill slowly to avoid the formation of air bubbles.
When the oil is visible in the oil level hole, the sterndrive is sufficiently full.
- 3 Check the O-rings on the plug and dipstick; replace as necessary.
Reinstall the oil dipstick and oil level plug.
- 4 Remove the oil pump and screw the plug back in.
- 5 Check the oil level on the dipstick. Oil must be visible on the flat part of the dipstick. Top up with oil through the oil dipstick hole if necessary.
- 6 Reinstall the cover and propeller.

If the oil has been completely changed, the oil level must be checked again after the sterndrive has been run for a short while to eliminate air pockets.



P0002498



Checking oil level, power trim

The Power Trim system is a closed center hydraulic system. Regular checks of the fluid level are not necessary, but if functionality deteriorates check the fluid level in the Power Trim system.

- 1 Trim the sterndrive down to maximum.
The sterndrive must be fully trimmed down when the fluid level is checked or fluid is filled in order to show the correct level.
Position the sterndrive hard astarboard to access the trim pump.
- 2 Clean the area around the filler cap (1) to prevent dirt from entering the trim system.
- 3 Remove the filler cap. The fluid must reach all the way up to the hole.
Fill with Volvo Penta Power Trim and steering fluid as necessary.

Corrosion protection, checking and changing

Check the anodes regularly. Replace with new anodes when approximately 1/3 of an anode has corroded away.

When the boat is stored ashore, corrosion protection deteriorates due to anode oxidization. Even new anodes may oxidize on the surface; always clean/sand them before launch.

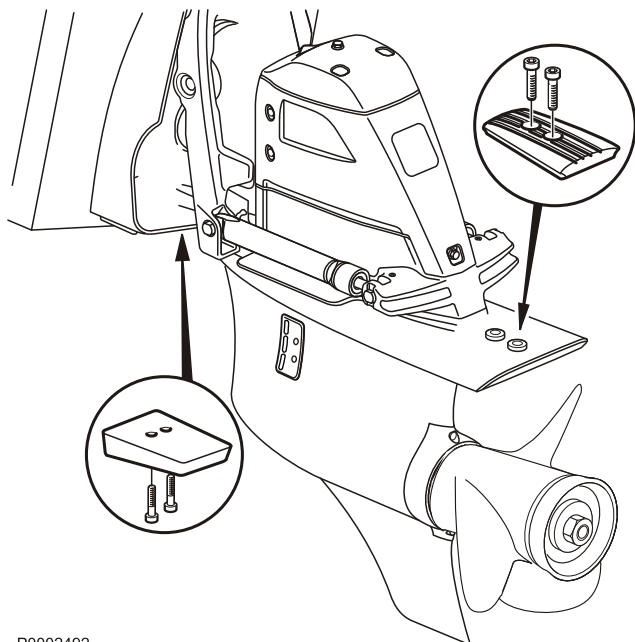
IMPORTANT!

Use emery paper. Do not use a wire brush or other steel tools when cleaning, as these may damage the galvanic protection.

The sterndrive is fitted with aluminum anodes as standard, intended for use in salt water. If the sterndrive is to be used principally in freshwater, the anodes must be magnesium.

Use anodes according to the following:

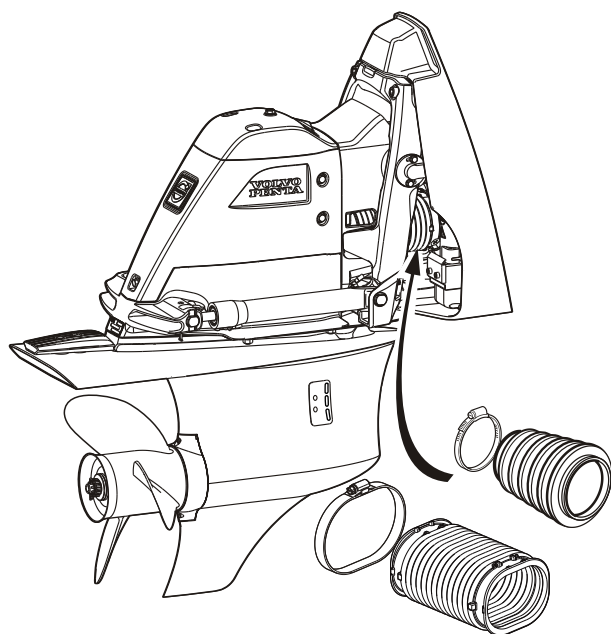
- Zinc in salt water.
- Magnesium in freshwater.
- Aluminum when the boat is used primarily in salt water and sometimes in brackish water.



P0002492

Replacement of anodes

- 1 Remove the anode retaining screws.
- 2 Clean the contact surface.
- 3 Install the new anodes and tighten them so that they make good contact with the underlying metal.



P0002500

Drive Unit Bellows

WARNING!

Secure the drive unit in a raised position in such a way that it cannot fall when working on the drive bellows. A falling drive may cause serious injury.

- Check that there are no splits or damage to the bellows. Replace bellows as necessary. Keep the surfaces clean; fouling on the bellows may puncture them.
- Inspect the inside of the bellows for signs of contact with the universal joint when the drive is removed. Internal wear is a sign that the engine has been run at too high rpm with the stern drive in an inclined position.
- Check that the clamps are correctly installed.

Propeller

For best performance and fuel economy, maximum engine revolutions must correspond to the maximum propeller revolution range; refer to *Engines*. If maximum engine revolutions exceed the propeller revolution range, the propeller must be replaced. Ask your Volvo Penta dealer for advice if you wish to switch to a propeller with a different pitch and diameter. In twin installations one propeller must have right rotation and the other left rotation. Both must have the same pitch and diameter.

Damaged propellers must be replaced as soon as possible. If a boat must be driven with a damaged propeller, do so with extreme caution and only at reduced rpm.

WARNING!

Make sure the engine can not start during work on propeller(s); remove ignition key(s) and shift drive into forward or reverse.

SX propeller

WARNING!

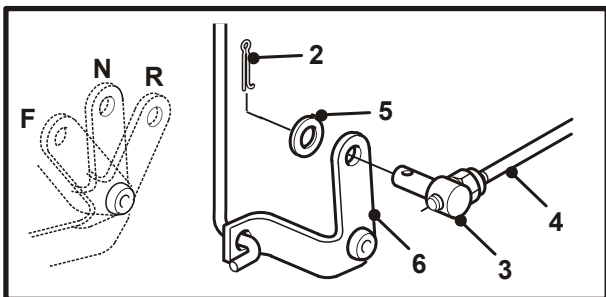
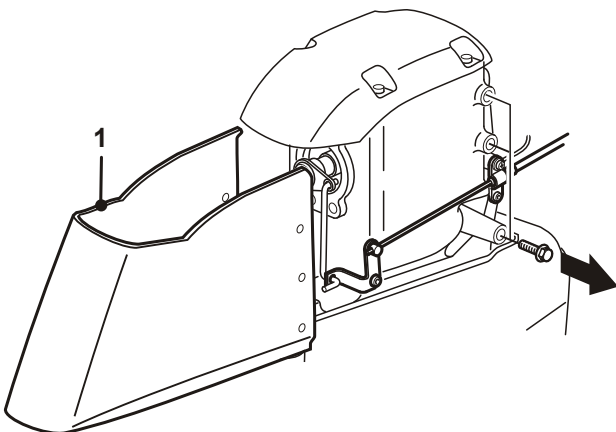
Make sure the engine can not start during work on propeller(s); remove ignition key(s) and shift drive into forward or reverse.

Removing the propeller

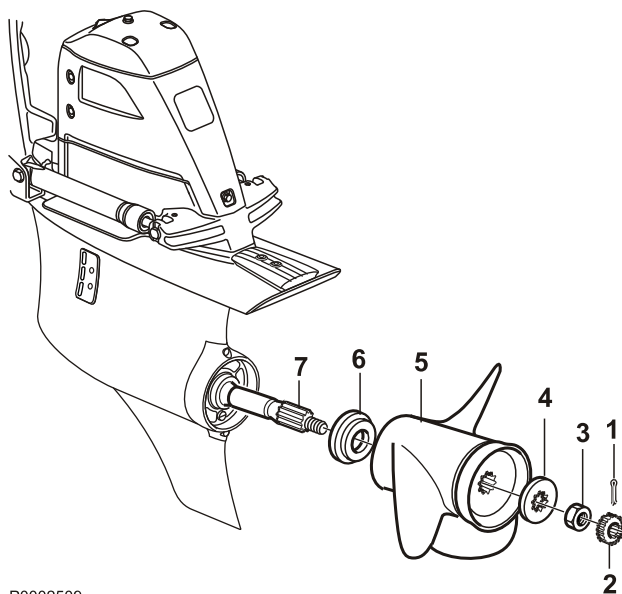
Lock the propeller shaft

- 1 Remove the five bolts and remove the cover (1) from the sterndrive.
- 2 Remove the cotter pin (2) from the shift cube (3) to which the gear shift cable (4) is fastened. Remove the shift cube and washer (5) from the lever (6) without turning the cube.
- 3 Put the sterndrive into gear by hand by pulling the lever to either the forward position (F) or reverse position (R).

Alternatively, the propeller can be locked by putting the transmission in neutral and placing a block of wood between the cavitation plate and one of the propeller blades.



P0010546



P0002509

Removing the propeller

- 1 Remove the cotter pin (1) and the lock washer (2).
- 2 Remove the nut (3).
- 3 Remove the spacer (4), the propeller (5), and the bushing (6).
- 4 Wipe the propeller (7) shaft clean.

Install the propeller

- 1 Switch on the ignition and move the control lever to neutral. Remove the ignition key from the ignition switch.
- 2 Thoroughly lubricate the propeller hub and propeller shaft with Volvo Penta grease (part # 828250).
- 3 Install the bushing (6) with the inner cone facing the sterndrive.
- 4 Install the propeller (5) on the propeller shaft (7); align the splines and slide the propeller toward the bushing until the splines are visible.
- 5 Install the spacer (4) on the propeller shaft splines.
- 6 Install and tighten the propeller nut (3) so that the propeller and the bushing (6) bottom completely.
- 7 Undo the propeller nut and screw it back against the spacer by hand. Then tighten the propeller nut a further 1/3 to 1/2 turn.
Alternatively, use a torque wrench and torque the propeller to 96–108 Nm.
- 8 Align the lock washer (2) against the propeller nut so that it lines up with the cotter pin hole.
- 9 Install the cotter pin (1) and bend out the ends to secure the nut. Use a new cotter pin if necessary.
- 10 Turn the shift lever to the neutral position. Attach the wire to the shift arm. Install a new cotter pin.
- 11 Install the cover and bolt it in place.
- 12 Check that the propeller can be turned easily.

DPS propeller

WARNING!

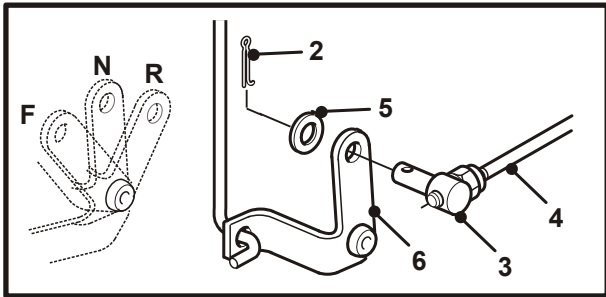
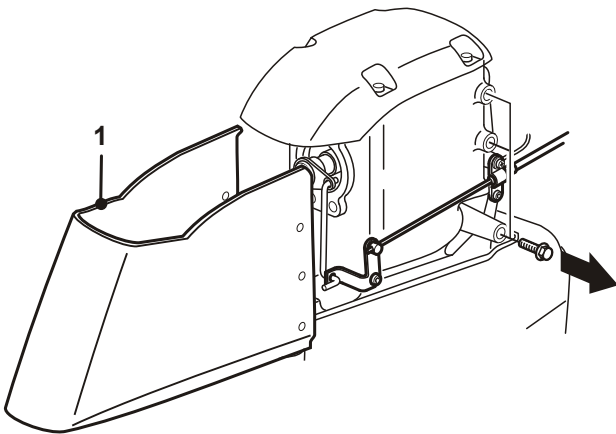
Make sure the engine can not start during work on propeller(s); remove ignition key(s) and shift drive into forward or reverse.

Removing the propeller

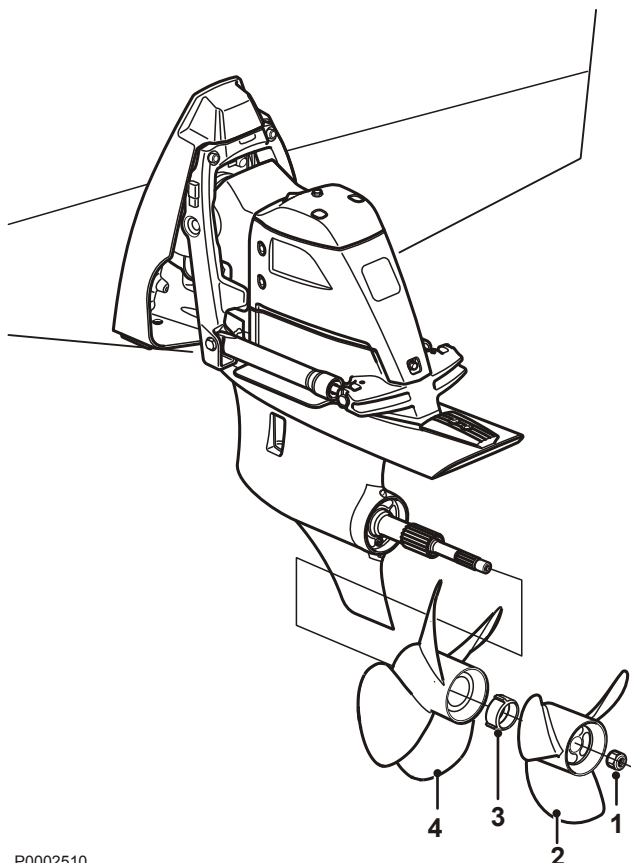
Lock the propeller shaft

- 1 Remove the five bolts and remove the cover (1) from the sterndrive.
- 2 Remove the cotter pin (2) from the shift cube (3) to which the gear shift cable (4) is fastened. Remove the shift cube and washer (5) from the lever (6) without turning the cube.
- 3 Put the sterndrive into gear by hand by pulling the lever to either the forward position (F) or reverse position (R).

Alternatively, the propeller can be locked by putting the transmission in neutral and placing a block of wood between the cavitation plate and one of the propeller blades.



P0010546



P0002510

Removing the propeller

- 1 Undo the aft propeller nut (1) and remove the aft propeller (2).
- 2 Remove the forward propeller nut (3) and remove the forward propeller (4).
- 3 Wipe the propeller shaft clean.

Installation

- 1 Thoroughly lubricate the propeller hub and propeller shaft with Volvo Penta grease (part # 828250).
- 2 Fit the forward propeller (4).
- 3 Install the forward propeller nut (3) and torque to 60 Nm.
- 4 Install the aft propeller (2).
- 5 Install the forward propeller nut (1) and torque to 100 Nm (75 ft.lbs.).
- 6 Turn the shift lever to the neutral position. Attach the wire to the shift arm. Install a new cotter pin.
- 7 Install the cover and bolt it in place.
- 8 Check that the propeller can be turned easily.

Steering

Parallel rod

Check the parallel rods connecting the two stern drives together, especially after running aground or striking an underwater object.

If a parallel rod is bent, loose or damaged it must be checked by your Volvo Penta workshop.

WARNING!

If the parallel strut (tie bar) shows signs of damage, run at reduced speed to harbor. The parallel strut is a vital safety component, damage may effect steering characteristics. In the worst case steering could be lost altogether. Never align or weld a damaged parallel strut. Please contact your nearest authorized Volvo Penta workshop for assistance.

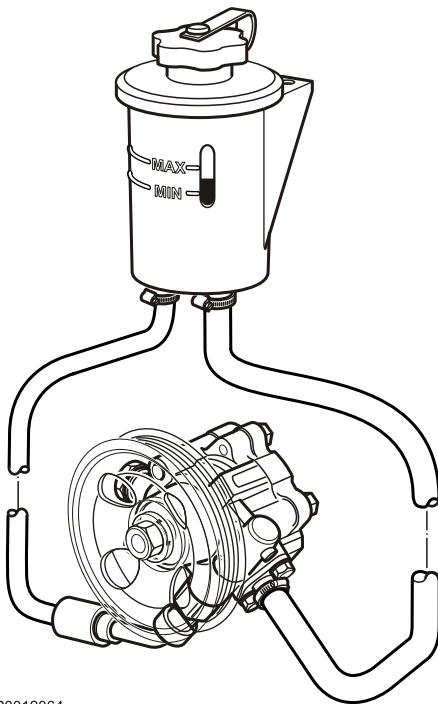
Steering System Operation

Power steering reservoir fluid level

The steering servo tank has a transparent reservoir which makes checking the level possible without opening the cap. The fluid level must be between the "MIN" and "MAX" lines. Whenever you check the engine oil, also check the steering reservoir fluid level.

WARNING!

Use only by Volvo Penta recommended fluid and grade. Any non-approved fluid may cause loss of steering or result in damage to the components used in the steering system.



P0012064

Storage

Have an authorized Volvo Penta workshop carry out checks on the engine and other equipment before the boat is put into winter storage. Make sure all necessary repairs and service are completed so that the boat is in top condition before the next season.

Conservation is performed to ensure that the engine and drive train are not damaged by non-use during winter storage. It is important that conservation is carried out in the correct manner, and that nothing is forgotten. For this reason, we have compiled a check list of the most important points.



CAUTION!

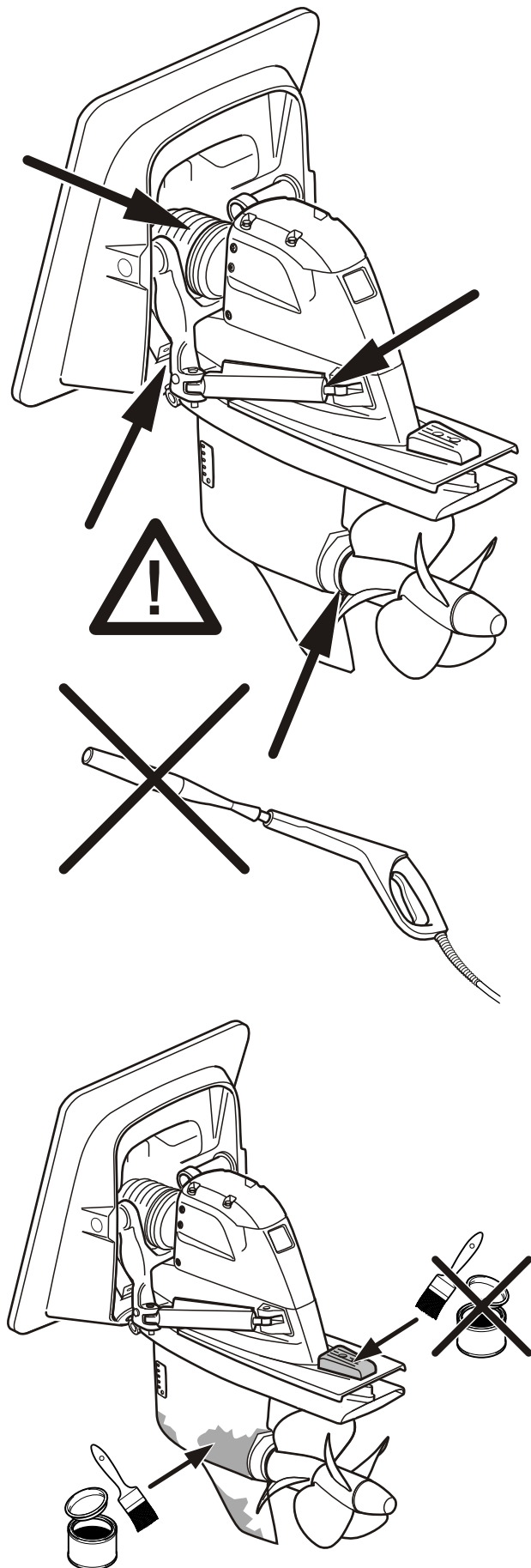
Read the chapter on Maintenance before starting work. It contains instructions on how to carry out maintenance and service operations in a safe and correct manner.

The engine and other equipment must be laid up to prevent damage if they are not to be used for two months or more. It is important that this is done in the correct manner, and nothing is forgotten. For this reason, we have compiled a check list of the most important points.

Conservation

It is best to carry out the following while the boat is still in the water:

- Change engine oil and oil filters.
- Replace oil in the reverse gear.
- Change the fuel filter.
Replace the fuel pre-filter if such is fitted.
- Run the engine until it reaches normal operating temperature.



It is best to carry out the following when the boat is out of the water:

⚠ CAUTION!

Is the boat equipped with Power Trim Assistant the function must be turned off before taking the boat out of the water.

This prevents automatic trimming of the drive/drives if any test runs are performed while the boat is on land.

- Clean the hull and stern drive immediately after the boat is taken out of the water (before they dry). Take care when cleaning with a high pressure jet. The water jet must not be directed at the exhaust and U-joint bellows, trim and steering cylinder seals, propeller shaft seals, hoses and suchlike.
- Change the oil in the drive.
- Clean the seawater filter.
- Clean and conserve the sea water system.
- Remove the impeller from the seawater pump. Store the impeller in a sealed plastic bag and keep cool.
- Check the glycol content of the engine coolant. Top up as necessary.

IMPORTANT!

The use of anti-corrosion agent alone in the engine cooling system does not protect against freeze damage. If there is a risk of the engine being exposed to sub-freezing temperatures, the system must be drained.

- Open the drainage tap on the charge air cooler to release any condensation.
- Empty the fuel tank of fuel, dirt and sludge. Fill the fuel tank completely, to avoid condensation.
- Clean the outside of the engine. Do not use a high pressure washer to clean the engine. Touch up any paint damage with Volvo Penta original paint.
- Check all control cables and treat with conservation agent.
- Make good any areas with damaged paintwork with Volvo Penta original paint. Read the instructions about painting the stern drive in the section "*Painting the stern drive and boat bottom*".
- Disconnect the battery cables. Clean and charge the batteries. An insufficiently charged battery can freeze and burst.
- Remove the propeller before winter storage. Grease the propeller shaft with water resistant grease, VP part # 828250.

P0003712

Bringing Out of Storage

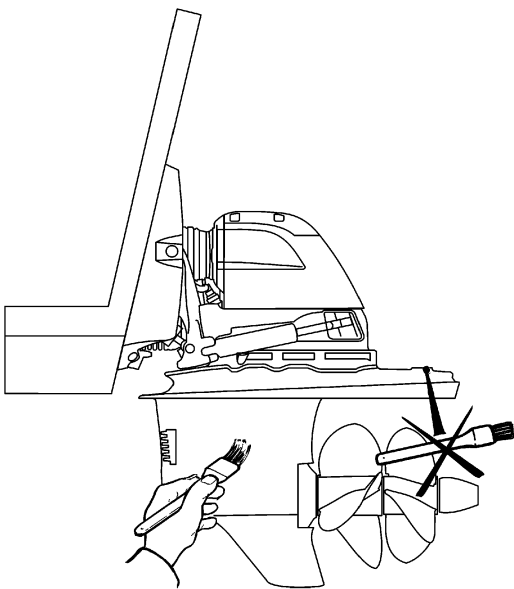
- Check the oil level in the engine and stern drive/ reverse gear. Top up as necessary. If the system contains conservation oil this must be drained, and the system must then be filled with oil. For the correct oil grade, refer to *Technical Data, Lubrication System*. Replace oil filter.
- Drain any antifreeze from the raw water system.
- Install the impeller in the raw water pump. Replace the old one if it displays signs of wear; refer to the chapter *Impeller, Check and Change* page 95.
- Close and tighten drain taps and plugs.
- Check drive belt tensions and conditions.
- Check rubber hoses for condition and tighten hose clamps.
- Check the engine coolant and antifreeze. Top up as necessary.
- Connect the fully-charged batteries.
- Painting the sterndrive and hull bottom.
- Check the sacrificial anode on the stern drive. If less than 2/3 of the anode remain, it must be replaced. Clean with emery cloth shortly before launch.
IMPORTANT!
Use emery paper. Do not use a wire brush or other steel tools when cleaning, as these may damage the galvanic protection.
- Install the propellers
- Launch the boat. Check for leaks.
- Vent and grease the propeller shaft packing box (reverse gear).
- Start the engine. Check that there are no fuel, coolant or exhaust leaks and that all controls function.

Painting the Drive and Underwater Hull

Drive

Varnish damages must be repaired before handling the drive with anti-fouling agents.

Most countries have introduced legislation controlling the use of anti-fouling agents. The paint with anti-fouling properties must be permitted to use in the waters where the boat is to be used. Check the legislation that applies where the boat is to be used. If paint with anti-fouling properties is not allowed we recommend that fine Teflon®* is applied onto the propulsion units coating varnish without previous sanding.



P0003713

- 1 Sand down the metal surfaces lightly with sandpaper grain size 120. Use a more fine-grained paper on the painted surfaces.
- 2 Wash off with thinner or similar.
- 3 Glaze over and sand down possible pits.
- 4 Paint with Volvo Penta original primer and varnish. Let the paint dry.
- 5 Paint the drive with anti-fouling agent for aluminum drives according to the paint manufacturers instruction.

IMPORTANT!

The sacrificial anodes on the drive must not be painted or treated with Teflon. This also applies to stainless or bronze propellers.

*Teflon is a registered trademark from Du Pont Corp.

Underwater hull

All types of paints with anti-fouling properties are poisonous and cause damage to the marine environment. Avoid the use of such agents. Most countries have introduced legislation controlling the use of anti-fouling agents. Always abide by these regulations. In many cases it is completely forbidden to use them on pleasure boats.

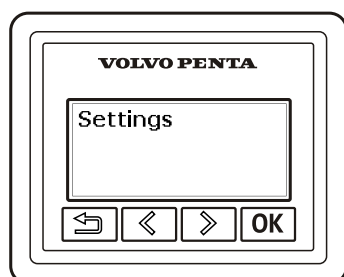
For boats that are relatively easy to get out of the water we recommend only Teflon treatment combined with mechanical cleaning several times per season. For larger craft, this is not practicable. If the boat is in an area where the water quickly produces fouling, then anti-fouling paint must probably be used. In that case, use copper-based paint containing copper cyanide and not copper oxide.

Tin-based agents (TBT) must not be used. Check the legislation that applies where the boat is to be used. Wait for the paint to dry before launching the boat.

IMPORTANT!

Leave a 10 mm unpainted edge on the stern around the transom.

Calibration and Settings



P0012801

Settings

Settings Menu

Settings and calibrations are managed in the Settings menu.

- 1 Navigate to the **Settings** menu.
- 2 Press **OK** to open the settings menu.
- 3 Navigate backwards and forwards in the settings menu by pressing **◀** **▶**.

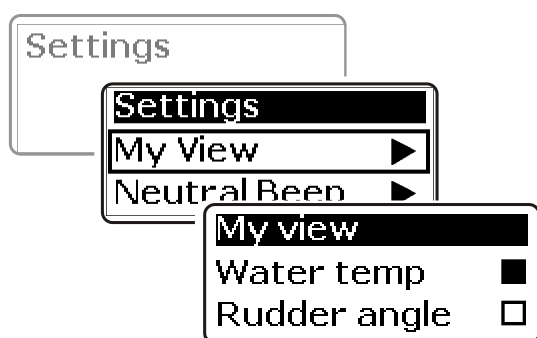


Return to the previous menu by pressing the button. Hold the button down for more than 3 seconds to get to the main menu.

My View

Information shown in the main menu can be adapted to suit personal preferences in **My View**.

- 1 Navigate from the settings menu to **My View**. Press **OK** to get to the submenu.
- 2 Navigate through the menu using **◀** **▶** to see available operating information.
- 3 Press **OK** to add or remove information for display in the main menu.



P0012518

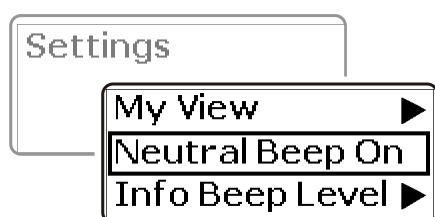
My View

Neutral Beep

The neutral beep is an audible signal that sounds when the control is in the neutral position.

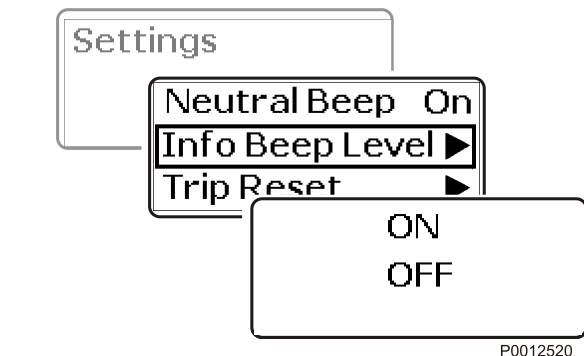
The setting must be entered at each helm station.

- 1 Navigate to **Neutral Beep** in the settings menu.
- 2 Press **OK** to switch the audible signal **On** or **Off**.



P0012519

Neutral Beep



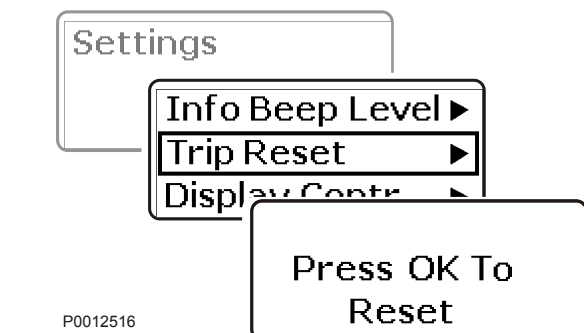
Information Beep

Information Beep

InfoBeep is an audible signal that sounds when there is a message from the system.

- 1 Navigate to **Information Beep** in the settings menu.
- 2 Press **OK** to switch the audible signal on or off. If there is a tachometer (accessory) installed, the volume can be adjusted with the aid of **<>**. Press **OK** to confirm the selection. The setting is confirmed by an audible signal at the set level.

The screen will return automatically to the settings menu.



Trip Reset

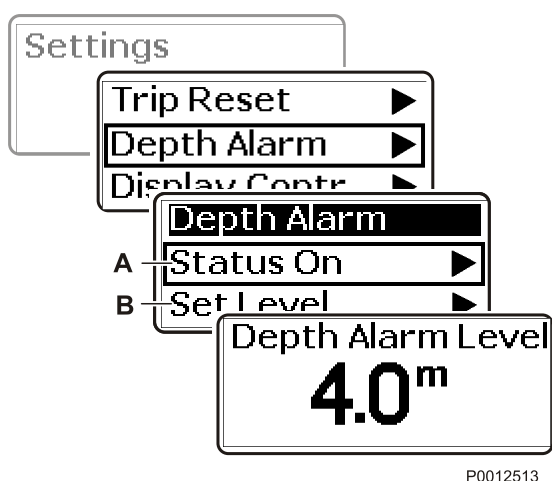
Trip Reset

- 1 Navigate to **Trip Reset** in the settings menu.
- 2 Press **OK** twice to zero the trip information.

Depth Alarm

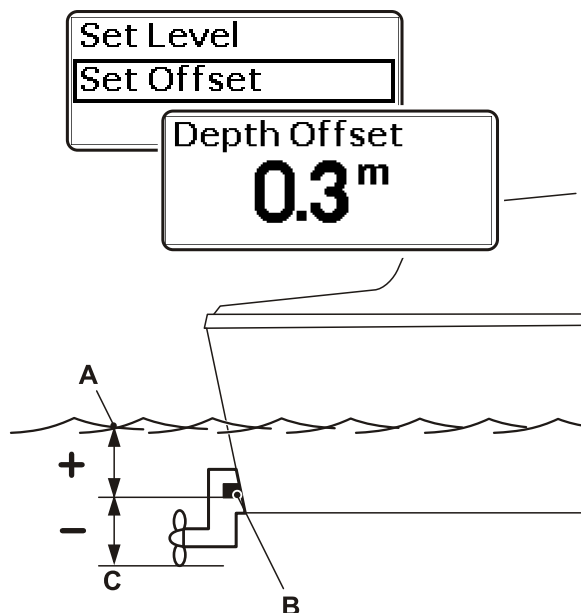
Setting the level for the depth alarm on Volvo Penta echo sounders.

The setting need only be made at one helm station.



Depth Alarm Level

- 1 Navigate to Depth Alarm in the settings menu. Press **OK** to proceed to the submenu.
- 2 Depth Alarm Off/On (A). Press **OK** to switch the alarm on or off.
- 3 Proceed to Set Level (B) and press **OK**. Use **<>** to set the limit where the alarm must begin sounding. Press **OK** to confirm the setting. The depth alarm is dependent on depth compensation; refer to the next section.



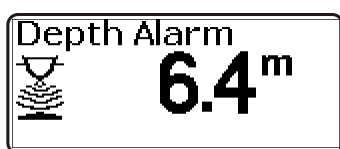
P0012515

Set Offset

- A Waterline
- B Echo-sounder
- C Lowest point

Set Offset

- 1 Go from the settings menu to Set Offset and press **OK** to reach the setting.
- 2 Use **◀** **▶** to set the depth compensation value so that it corresponds to the boat's lowest point or the waterline. The echo-sounder can be placed anywhere between these two points. Set the echo-sounder/waterline or echo-sounder/lowest point distance to the depth to be displayed. The distance between the echo-sounder (B) and the water line (A) has a positive (+) value. The distance between the echo-sounder (B) and the boat's lowest point (C) has a negative (-) number. Press **OK** to confirm the setting.



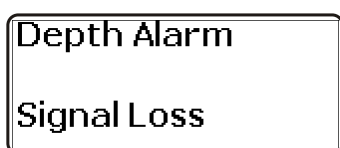
P0005853

Depth Alarm**Depth Alarm**

When the depth is less than the alarm setting a message will be shown on the display, followed by an audible signal.

The message will be displayed every 30 seconds until the depth exceeds the alarm level.

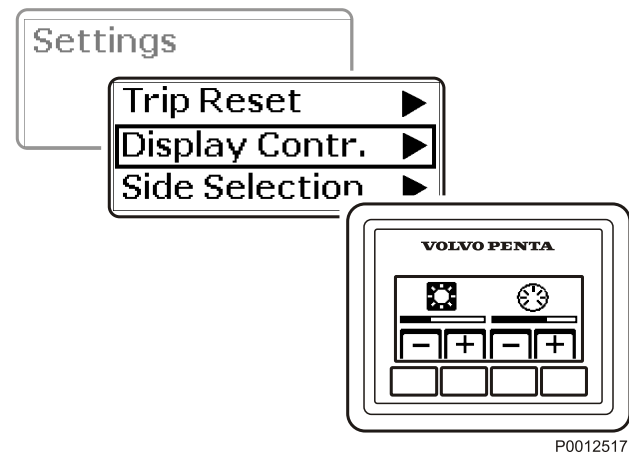
Confirm the alarm by pressing **OK**.



P0005855

Depth Alarm / Signal Loss**Signal fault**

If the signal from the depth alarm is lost, e.g. if the sensor is not working, a message is displayed stating that the signal has been lost.



Display Contrast

Display Contrast

Adjust the screen contrast.
The adjustment will affect all screens.



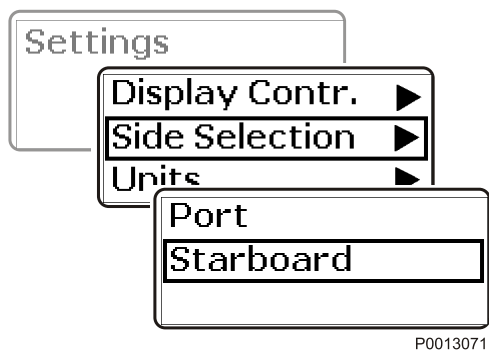
Backlighting



Contrast

- 1 Navigate to **Display Contrast** in the settings menu and press **OK** to open the submenu.
- 2 Use + and – to increase or reduce the contrast or backlighting.

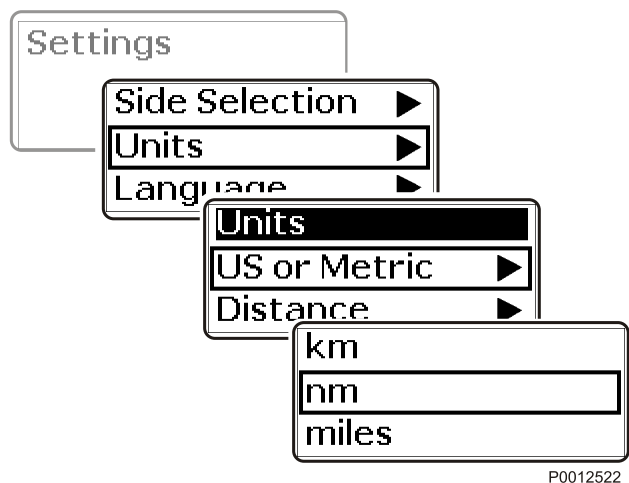
The screen will return automatically to the settings menu.



Side Selection

Side Selection

Set from which engine information is to be show in display.

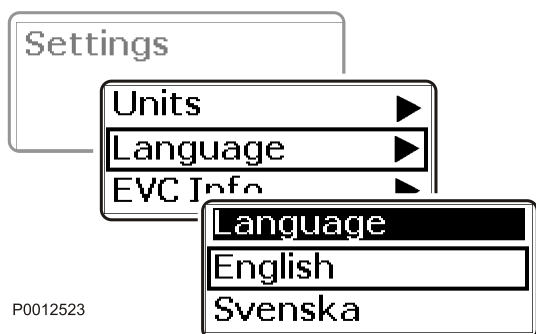


Units

Units

Setting the units information will be shown in.

- 1 Navigate to **Units** in the settings menu. Press **OK** to open the settings menu.
- 2 Open **US or Metric**, press **OK** and select American or metric units.
- 3 Navigate to **Distance**, press **OK** and then select kilometers, nautical miles or miles.
- 4 Press **OK** to confirm the selection.



P0012523

Language

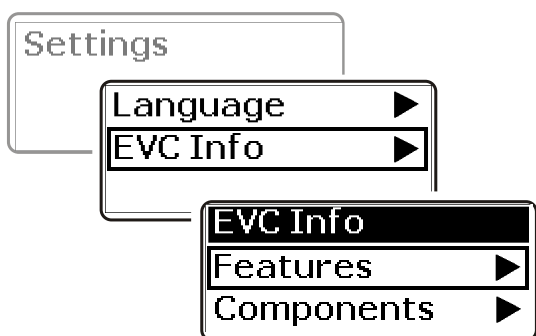
Language

Setting the language the information of the screen will be shown in. There are 10 languages to choose from. On boats with several helm stations and several screens it is enough to select a language in one station for it to be displayed at all of them.

- 1 Navigate to **Language** in the settings menu. Press **OK** to open the language menu.
- 2 Navigate to the desired language and press **OK** to confirm the selection.
The screen will return automatically to the settings menu.

EVC Info

Information regarding accessories, components and the type of software installed in the boat is displayed here.



P0012977

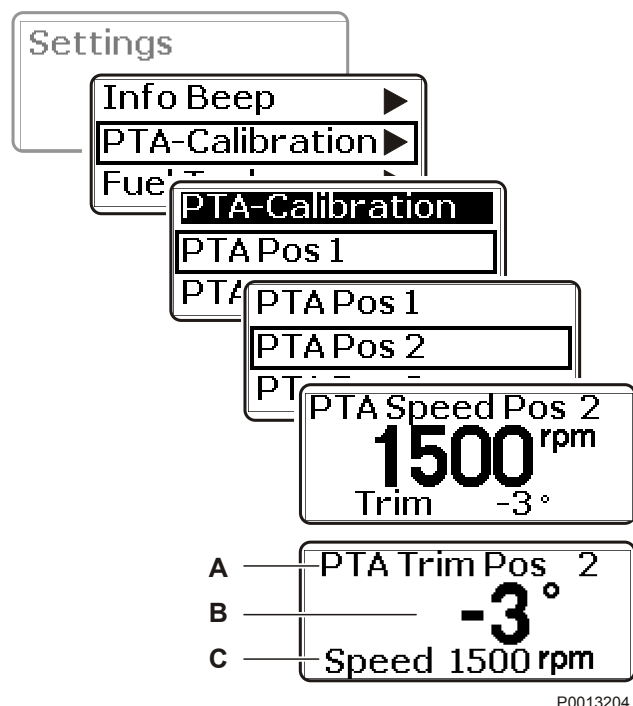
Components

- 1 Navigate to **EVC Info** in the settings menu and press **OK** to open the submenu.
- 2 **Features** shows the accessories that are installed. Press **OK** to open the submenu.
- 3 **Components** shows what hardware components are installed. Press **OK** to open the settings menu.
- 4 **Software** shows what software is installed. Press **OK** to open the submenu.

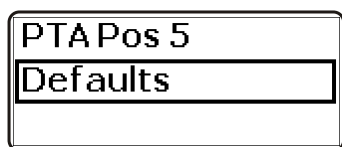
PTA Calibration

PTA (Power Trim Assistant) automatically adjusts the trim angle to boat speed. The system has a basic setting, but it is possible to set five different angles for five different speeds.

On boats with more than one station and with several displays it is enough to do the calibration on one display for it to be shown at all stations and on all displays. For installations with several engines the calibration needs to be made for each engine

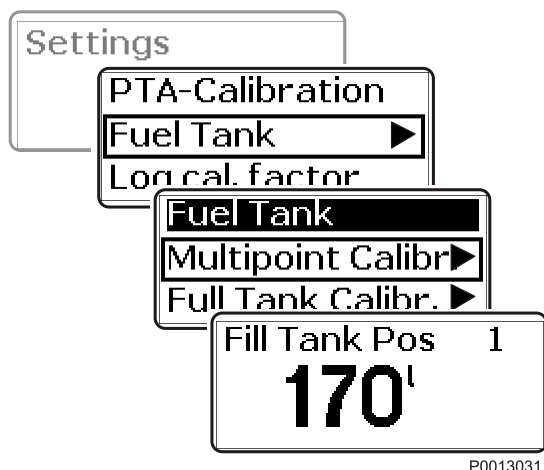


- A Trim position being set
- B Engine rpm
- C Trim angle

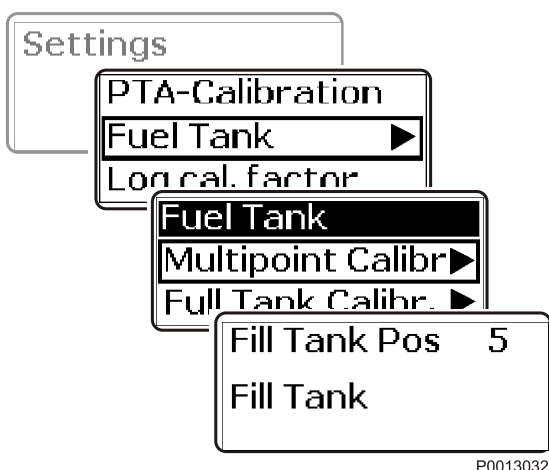


Defaults

- 1 Navigate from the settings menu to **PTA Calibration**. Press **OK** to get to the submenu.
- 2 Use **<** **>** to set the trim angle for idle, PTA Pos 1. Press **OK** to confirm the setting.
- 3 Proceed to **PTA Pos 2**. Use **<** **>** to set the rpm. Press **OK** to confirm the setting.
- 4 Use **<** **>** to set the trim angle. Press **OK** to confirm the setting.
- 5 Repeat steps 4 to 5 for Pos 3, Pos 4 and Pos 5.
- 6 To return to basic settings, select **Defaults** and press **OK** to confirm return to basic settings.



Multipoint



Full Fuel Tank Calibration

Fuel Tank

There are two alternative methods for calibrating the level sensor in the fuel tank.

Multipoint provides more precise results while Full Fuel Tank Calibration is an approximate method.

Multipoint calibration is a prerequisite if the trip computer is to show fully accurate information.

Multipoint

In order for multipoint calibration to be carried out, the fuel tank may not be filled to more than 20% of its total capacity.

- 1 Turn to **Fuel Tank** in the settings menu and press **OK** to access the calibration menu.
- 2 Turn to **Multi Point Calibration** and press **OK**.
- 3 Calibration is carried out in 5 steps.
Fill the tank with the quantity shown in the display, POS).
Wait 10 seconds.
Press **OK** to confirm that the tank has been filled to the indicated level.
- 4 Fill the tank with the quantity shown in the display, POS 2.
Wait 10 seconds.
Press **OK** to confirm that the tank has been filled to the indicated level.
- 5 Repeat the procedure for POS 3, POS 4 and POS 5. Confirm by pressing the wheel at each position. **OK**.

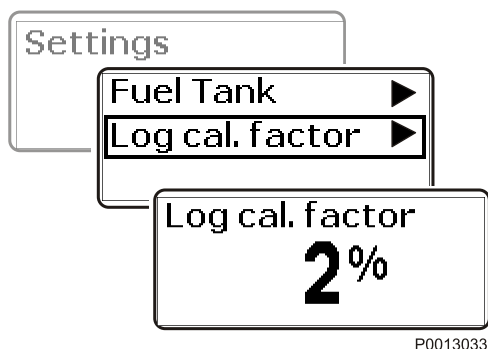
Full Fuel Tank Calibration

For this method the tank must be full and calibration of the fuel level sensor takes place in one step. This means that the fuel level value will be approximate, and therefore all trip data based on remaining fuel must be seen as approximate values.

- 1 Turn to **Fuel Tank** and press **OK** to reach the submenu.
- 2 Select **Full Fuel Tank Calibration** and press **OK**.
- 3 Fill the fuel tank. Confirm that the fuel tank is full by pressing **OK**.

IMPORTANT!

Settings for Fuel Tank Volume, Empty Tank Calibration and Fuel Alarm Level should only be carried out by an authorized Volvo Penta workshop.



Speed Factor

Speed Factor

The speed factor must be set while the boat is under way. Compare the displayed boat speed value with GPS data (or another boat) and adjust the speed factor until the values agree.

The setting just needs to be done on one display for it to be shown at all stations and on all displays

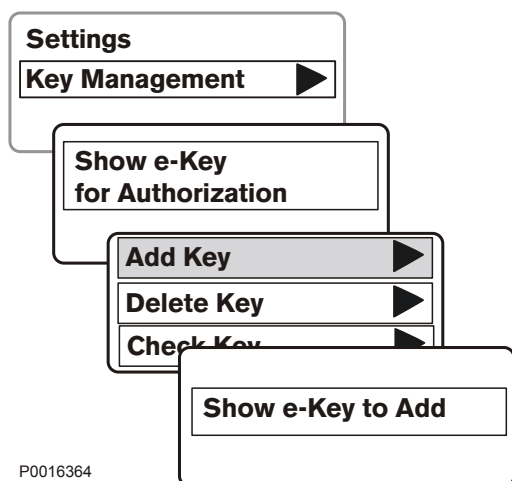
- 1 Go from the settings menu to **Speed Factor** and press **OK** to reach adjustment.
- 2 Use **◀** **▶** to set the value
Press **OK** to confirm the setting.

Key Management

Adding or removing a key to or from the system can be done in either the Battery Control Panel or the 2.5", 4" and 7" displays. A system can have up to four keys, which are numbered from 1-4.

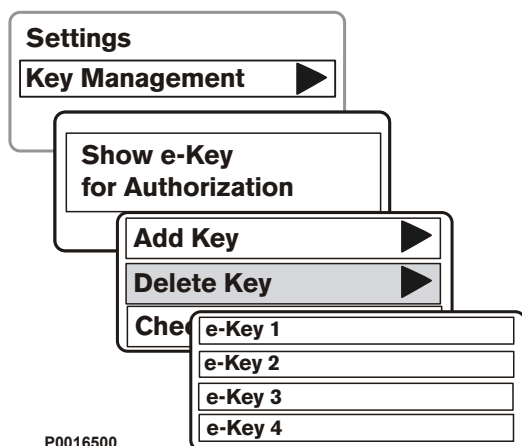
Adding a key

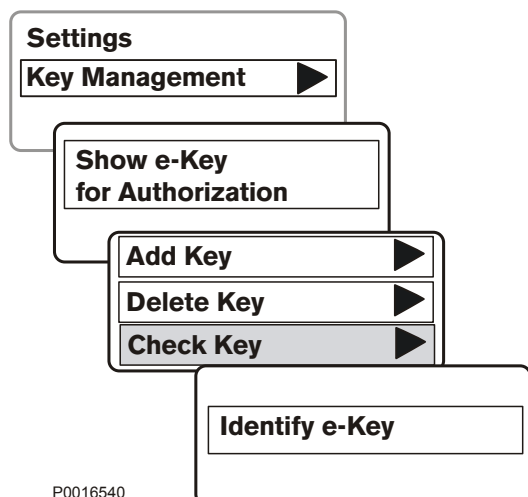
- 1 Navigate to the menu *Settings > Key Management*.
- 2 When the text *Show e-Key For Authorization* is shown hold a key that is already registered in front of the key panel. The system will check that the key ID corresponds to a key registered in the system.
- 3 Select *Add a key*.
- 4 When the text *Show e-Key To Add* is shown hold the new key in front of the panel. The system will store the key ID.
- 5 The addition of the key is confirmed on the display.



Removing a key

- 1 Go to *Settings > Key Management*.
- 2 When the text *Show e-Key For Authorization* is shown hold a registered key in front of the key panel. The system will check that the key ID corresponds to a key registered in the system.
- 3 Select *Remove key*.
- 4 Select which of the keys 1–4 is to be removed. Because the system must contain at least one key, the key used for approval cannot be removed.
- 5 The removal of a key is confirmed on the display.





Checking keys

Checking a key ID

- 1 Go to *Settings > Key Management*.
- 2 When the text *Show e-Key For Authorization* is shown hold a registered key in front of the key panel. The system will check that the key ID corresponds to a key registered in the system.
- 3 Select *Check keys*.
- 4 Hold the key to be checked in front of the panel. The key ID will be shown on the display.

Joystick

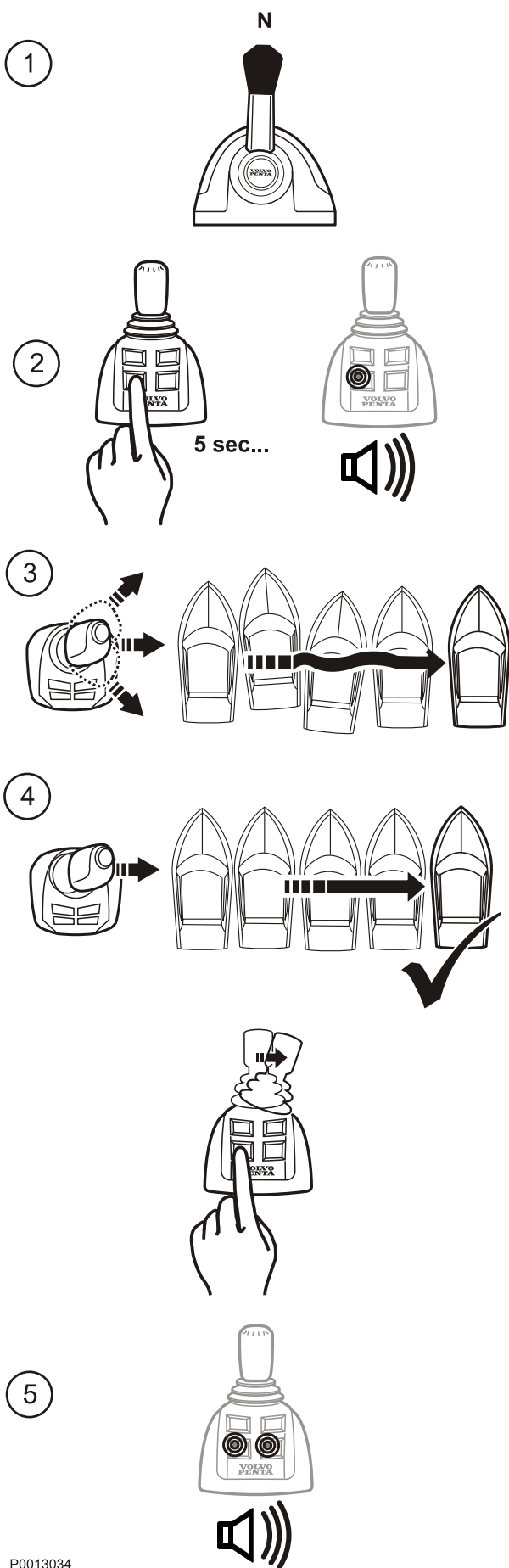
Joystick calibration need only be carried out if boat movements do not correspond to joystick movements.

When calibrating the joystick the boat must be driven on open waters in safe conditions. Avoid calibrating in high winds or currents that can influence the result of the calibration.

Allow the boat to run for a fairly long distance during the calibration. Hold the joystick firmly in position.

Calibration can only be carried out at a helm station that is equipped with both a joystick and a control panel.

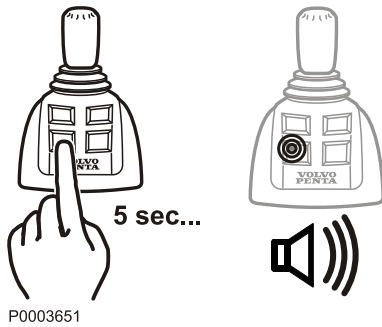
Calibration need only be done in one direction, port or starboard.



- 1 Turn the ignition on and move the control levers to neutral.
- 2 Start the engines.
Activate calibration mode by depressing the docking button for 5 seconds.
An audible signal confirms that docking mode is activated and the docking button lights up.
- 3 Move the joystick sideways as far as it will go in one direction.
Correct boat movements by moving the joystick up and down, and by turning it.
- 4 When the boat is moving straight abeam, depress the docking button once again.
- 5 An audible signal will sound and both lower button lamps on the joystick will flash to confirm that calibration is complete and stored. The system is now in docking mode.

When the joystick returns to the central position the lamps will stop flashing and will instead show continuously.

P0013034



Resetting the calibration

- 1 Turn the ignition on and move the control levers to neutral.
Start the engines.
- 2 Activate calibration mode by depressing the docking button for 5 seconds.
An audible signal will confirm that docking mode is activated and the docking button lamp will light up.
- 3 Press the docking button. Calibration is now reset, which is confirmed by an audible signal.
The system is now in docking mode

Technical Data

Engine

Type designation	Aftermarket designation	Crankshaft power kW (hk) ⁽¹⁾	Propeller shaft kW (hk) ⁽²⁾
D3-110i	D3-110i-H	82 (110)	79 (106)
D3-150i	D3-150i-H	111 (150)	107 (144)
D3-170i	D3-170i-H	127 (170)	122 (163)
D3-200i	D3-200i-H	149 (200)	143 (192)
D3-220i	D3-220i-H	164 (220)	157 (211)
D3-140A	D3-140A-H	104 (140)	99 (135)
D3-170A	D3-170A-H	127 (170)	120 (161)
D3-200A	D3-200A-H	149 (200)	142 (190)
D3-220A	D3-220A-H	164 (220)	156 (209)

1) According to ISO 8665

2) According to ISO 8665

No. of cylinders	5
Bore	81 mm
Displacement	2401 cm ³
Stroke	93,2 mm
Compression ratio	16,5:1
Engine, dry weight	260 kg
Idling speed	700 rpm

Lubrication system

Oil capacity including oil filters, approx.:	
For all allowed installation inclinations	6.3 liters (6.8 US quarts)
Volume difference MIN – MAX	1.5 liters (1.6 US quarts)

Oil quality ⁽¹⁾	Sulfur content in fuel, by weight	
	< 0,5-1,0%	more than 1,0% ⁽²⁾
	Oil change interval, reached first in operation:	
VDS-3 ⁽³⁾	200 hours or 12 months.	100 hours or 12 months

1) Lowest recommended oil grade. Engine oil with higher oil grade is always possible to use.

2) If sulphur content is more than 1.0 per cent by weight, use oil with TBN over 15.

3) VDS = Volvo Drain Specification

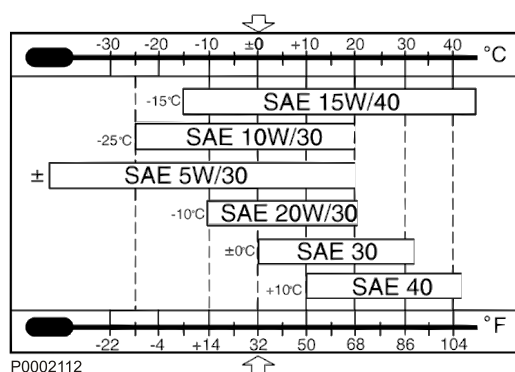
NOTICE! Mineral based oil, either fully or semi-synthetic, can be used on condition that it complies with the quality requirements above.

Viscosity

Select the viscosity according to the table.

The temperature values refer to stable ambient temperatures.

* SAE 5W/30 refers to synthetic or semi-synthetic oils.



Fuel System

Fuel specification

The fuel must comply with national and international standards for commercially supplied fuels, such as:

EN 590 (with national environment and cold requirements)

ASTM D 975 No 1-D and 2-D

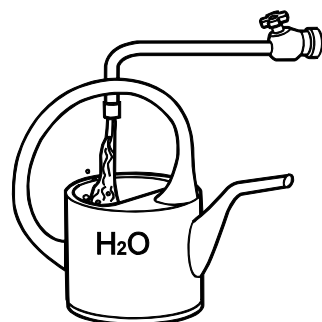
JIS KK 2204

Sulfur content: Complying with legal requirements in each country.

Low density fuel (urban diesel in Sweden and city diesel in Finland) can cause a loss of up to 5% of power and an increase in fuel consumption of about 2–3%.

Cooling System

Volume	
Freshwater system capacity including heat exchanger, approx.	8.7 liter (2.3 US gallon)
Thermostat	
The thermostat begins opening / is fully open	80°C / 95°C (176°F / 203°F)



P0002094

Water Quality

ASTM D4985:

Total solid particles	<340 ppm
Total hardness	<9,5° dH
Chloride	<40 ppm
Sulfate	<100 ppm
pH value	5.5–9
Silica (acc. ASTM D859)	<20 mg SiO ₂ /l
Iron (acc. ASTM D1068)	<0.10 ppm
Manganese (acc. ASTM D858)	<0.05 ppm
Conductivity (acc. ASTM D1125)	<500 µS/cm
Organic content, COD _{Mn} (acc. ISO8467)	<15 mg KMnO ₄ /l

Electrical system

System voltage	12V
Alternator, rated power, max	
voltage/max. amperage	14V/180A
output, approx.	2520W
Battery capacity	
	min. 750CCA 75Ah
	max. 800CCA 110Ah
Battery electrolyte density at +25°C (77°F):	
fully charged battery	1.28 g/cm ³ = 0.0462 lb/in ³ (1.24 g/cm ³ = 0.0448 lb/in ³)*
battery recharged at	1.24 g/cm ³ = 0.0448 lb/in ³ (1.20 g/cm ³ = 0.0434 lb/in ³)*

NOTICE! * Applies to batteries with tropical acid.

Reverse Gear

Type designation	HS25AE-A
Gear ratio	1,92:1 2,48:1
Angle, output shaft	8°
Oil capacity	1.8 liter (1.9 US quarts)
Oil quality	ATF (Dexron II, III)
Weight	32 kg (70 lb)

Type designation	HS45AE-C
Gear ratio	2,43:1 2,03:1
Angle, output shaft	8°
Oil capacity	2.5 liters (2.6 US quarts)
Oil quality	ATF (Dexron II, III)
Weight	37 kg (81 lb)

Type designation	HS63IVE-D
Gear ratio	1,99:1 2,48:1
Angle, output shaft	12°
Oil capacity	4.8 liter (5.1 US quarts)
Oil quality	ATF (Dexron II, III)
Weight	66 kg (145 lb)

Drive

Type designation	DPS-A	SX-A
Gear ratio	1,95:1 2,14:1 1,78:1	1,66:1
Oil capacity	2.25 liter (2.38 US quarts)	2.44 liter (2.58 US quarts)
Oil quality	API GL5 synthetic	API GL5 synthetic
Viscosity	SAE 75W/90	SAE 75W/90
Weight	103 kg (227 lb)	98 kg (216 lb)

Power Trim	
Oil capacity	1.6 liter (1.7 US quarts)
Oil quality	ATF (Dexron II, III)

Steering, power steering	
Oil quality	ATF (Dexron II, III)

Identification Numbers

There are type plates on the engine and transmission, marked with identification numbers. This information must always be used as reference when service and spare parts are ordered. You will probably find similar plates on your boat and its equipment. Note this information below, make a copy of the page and store it in a safe place, so that you can have the information available if the boat is stolen.

The appearance and location of the type plates is shown below. The figures in brackets refer to the location of the identification number on the type plate.

Engine

Product designation (1):

Product number (2):

Serial number (3):

Transmission

Product designation (4):

Gear ratio (5):

Serial number (6):

Product number (7):

Transom (Drive)

Product designation (8):

Serial number (9):

Product number (10):

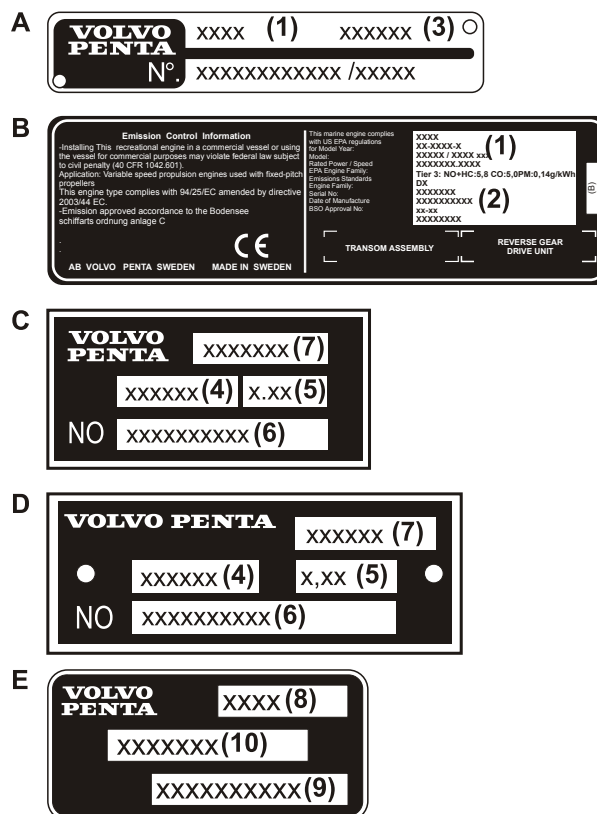
A Engine plate

B Engine and transmission decal

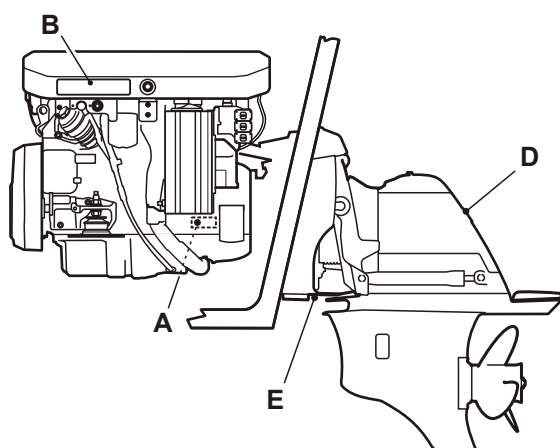
C Reverse gear plate

D Drive plate

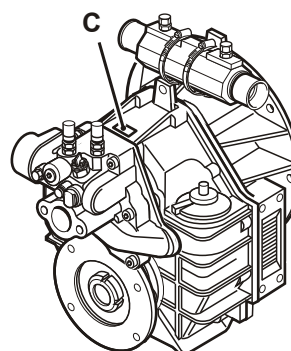
E Transom plate



P0016481



P0006369



P0006359

Reverse Gear

VOLVO PENTA

Declaration of Conformity for Recreational Craft Propulsion Engines with the sound and exhaust emission requirements of Directive 94/25/EC as amended by 2003/44/EC

D3

Engine manufacturer

AB Volvo Penta, Gropegårdsgatan, 405 08 Göteborg, Sweden

Body for exhaust emission assessment

Germanisher Lloyd
Vorsetzen 32/35
20459 Hamburg
Germany
ID-nummer: 0098

Body for sound emission assessment

International Marine Certification Institute
Rue Abbé Cuypres 3
B-1040 Brussels
Belgium
ID Number: 0609

Modules used for exhaust emission assessment

B + C

Module used for sound emission assessment

Aa

Other Community Directives applied: EMC 2004/108/EC

Description of engine(s) and essential requirements: 4 stroke diesel engine and stern drive with integral exhaust

Engine model(s) covered by this declaration

Exhaust		Sound	
Engine model(s)	EC Type certificate number	Engine model(s)/drive	EC Type certificate number
D3-110i	2680-15 HH	D3-140A drev SX, DPS	SDVOLV007
D3-140i/A.....	2680-15 HH	D3-170A drev SX, DPS	SDVOLV007
D3-150i	2680-15 HH	D3-200A drev DPS	SDVOLV007
D3-170i/A.....	2680-15 HH	D3-220A drev DPS	SDVOLV007
D3-200i/A.....	2680-15 HH		
D3-220i/A.....	2680-15 HH		

Essential requirements	Standards Used	Other normative document used
Annex I.B - Exhaust Emissions		
Engine identification	Volvo Penta std	Annex I.B.1
Exhaust emission requirements	EN ISO 8178-1:1996	Annex I.B.2
Durability	Volvo Penta std	Annex I.B.3
Operator's Manual	ISO 10240:2004	Annex I.B.4
Annex I.C – Noise Emissions		
Sound emission levels	EN ISO 14509:2000/prA1:2004	Annex I.C.1
Operator's Manual	ISO 10240:2004	Annex I.C.2
EMC Directive	EN 60945, EN 55012, EN 5022	Volvo Penta TR2135458

This declaration of conformity is issued under the sole responsibility of the manufacturer. I declare on behalf of the engine manufacturer that the engine(s) mentioned above comply(ies) with all applicable essential requirements in the way specified and is in conformity with the type for which above mentioned EC type examination certificate(s) has been issued.

Name and function: Tom Tveitan, Laws and Regulations
(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative)

Signature and title:
(or an equivalent marking)



Date and place of issue: (yr/month/day) 2015/03/25 Göteborg

LR-07/15

Alphabetical index

4		Fuel Pre-filter, Change.....	89
4" Display.....	18	Fuel System.....	88
7		Fuel system, bleeding.....	89
7" Display.....	24	Fuses.....	98
A		H	
Acknowledge message.....	64	Helm Stations.....	57
Adjusting the friction brake.....	40	I	
After Engine Shutdown.....	60	Identification Numbers.....	135
Air Filter, Change.....	84	Ignition Lock.....	10
Alarm handling.....	63	Ignition switch.....	11
Alarms.....	55	Impeller, Check and Change.....	95
Autopilot.....	47	Information Beep.....	120
B		Information Panel.....	12
Battery, Charging.....	101	J	
Battery, Maintenance.....	100	Joystick for docking.....	43
Before Starting.....	52	L	
Bringing Out of Storage.....	117	Laying Up and Launching.....	61
C		Lowspeed.....	42
Camera.....	29	Lubrication System.....	86
Checking exhaust line.....	85	O	
Checking oil level, power trim.....	108	Oil level, checking and topping up.....	86, 104
Cold Weather Precautions.....	62	Operation Break.....	61
Controls.....	37	P	
Coolant Level, Checking and Topping Up.....	93	Painting the Drive and Underwater Hull.....	118
Corrosion protection, checking and changing.....	108	Parallel rod.....	114
Crankcase Ventilation, Filter Change.....	83	Power Trim.....	32
Cruise Control.....	13	Power Trim Assistant.....	34
Cruising Speed.....	58	Power Trim panel.....	13
D		Propeller.....	110
Declaration of Conformity.....	136	Propeller Shaft Sealing, Check.....	105
Disengaging the Shift Function.....	40	R	
Docking Panel.....	15	Reading the Instruments.....	55
DPS propeller.....	112	Reverse Gear.....	104
Drive.....	106	Reverse Gear, Oil och Filter Change.....	105
Drive Belt, Check and Change.....	84	Running Aground.....	70
Drive Unit Bellows.....	109	S	
E		Seawater Filter, Check and Cleaning.....	97
e-Key panel.....	10	Seawater System.....	94
E		Seawater System, Cleaning and Inhibiting.....	96
Electrical Connections.....	99	Seawater System, Draining.....	94
Electrical Installations.....	102	Settings Menu.....	119
Electrical System.....	98	Side mounted levers.....	39
Electrical Welding.....	103	Side Selection.....	122
Emergency Shifting.....	72	Start after crash-stop	73
Emergency Shifting, Drive.....	72	Start/Stop Panel.....	13
Emergency Trimming.....	73	Starting Using Auxiliary Batteries.....	71
Engine.....	27	Station Panel.....	14
Engine Fuel Filter Replacement.....	88	Steering.....	114
Engine oil and engine oil filter, changing.....	87	Steering System Operation.....	114
Engine, General.....	83	Stray Current.....	99
EVC Info.....	123	SX propeller.....	110
F		Synchronizing Engine Speed.....	58
Fault Tracing.....	65	T	
Faults list.....	64	Trailing Your Boat.....	62
Freshwater System.....	91	Transmission lubricant, checking and topping up...	106
Freshwater System, Draining.....	93	Transmission Oil, Change.....	107

Trim Controls.....	33
Trim Instruments.....	34
Trim Ranges.....	32
V	
Vacuum Valve, Cleaning.....	97
Viscosity.....	131
W	
Water Quality.....	132



47705992 English 05-2015