

OPERATOR'S MANUAL

V8-380

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.

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Foreword

Models

This operator's manual covers the following model(s);

V8-380-CE

C = catalyst exhaust

E = EVC, Electronic Vessel Control

A suffix follows the CE. Example; V8-380-CE-**A**. The letter in the suffix is for version control.

The correct manual was delivered with your power package. However if you are unsure whether you have the correct manual, or would like to purchase a new manual, please visit the publication section of our website, (volvopenta.com). Use your serial number at the publication search, the site will provide you with the correct manual.

The publication search will also provide you with all of the other publications that are available for your power package. These publications, such as workshop manuals and parts catalogs can be purchased for a small fee.

When reading sections of this manual that contain headings without model designation below the heading, the information provided in that section applies to all models covered by this manual.

When seeking assistance from your dealer regarding your power package, always provide the serial number for your engine.



Welcome Aboard

Congratulations on choosing a new boat equipped with a Volvo Penta marine engine. Volvo Penta has been building marine engines since 1907. Quality, operating reliability, and innovation have made Volvo Penta a world leader in the marine engine industry. From engineering design and manufacturing to support activities in Parts, Service, and Sales, high standards have been set to ensure your pride and satisfaction as the owner of a Volvo Penta product.

As an 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.

We wish you many pleasant voyages.

Our Core Values: Quality, Safety, Environmental Care

The values and qualities that Volvo Penta expresses are what make the company unique. From the very beginning, safety and quality have stood at the heart of the development of all of our products, processes, and services. It is on these values and qualities that the Volvo Penta corporate identity, brand position and legal status have been founded. Today's core values of quality, safety, and care for the environment remain central to Volvo Penta. They express what we believe in as a company and will ultimately help us to survive.

Quality is a value that traditionally referred to product quality but now encompasses all aspects of our products and services. In today's competitive environment, Volvo Penta's quality commitment extends beyond industrial craftsmanship and engineering ingenuity to embrace care for the customer throughout the life of the product.

Safety will always be our most distinguishing core value. Historically embedded in the quality of all Volvo products, it also encompasses personal, family, business, and environmental values.

Environmental Care in all operations, from design to production, distribution, service, and recycling, is an integral part of the Volvo quality commitment towards customers, employees, and the community. By embracing the environment as a core value, Volvo demonstrates its understanding of the environmental impact its products have upon nature and the shared urban and rural surroundings.

Volvo Penta continually commits a considerable part of its development resources toward minimizing the environmental impact of its products. Examples of areas where we are always looking for improvements are exhaust emissions, noise levels, and fuel consumption.

Regardless of whether your Volvo Penta engine is installed in a boat used for pleasure or commercial operation, incorrect operation or improper maintenance of the engine will result in disturbance or damage to the environment.

In this owner's manual there are a number of service procedures, which, if not followed, will lead to an increase in the engine's impact on the environment, and on running costs and a reduction in service life. Always observe recommended service intervals and make a habit of checking that the engine is operating normally every time you use it. Contact an authorized Volvo Penta dealer if you cannot correct the fault yourself.

Remember that most chemicals used on boats are harmful to the environment if used incorrectly. Volvo Penta recommends the use of biodegradable degreasing agents for all cleaning. Always dispose of engine and transmission oil waste, old paint, degreasing agents and cleaning residue etc. at proper disposal areas so that they do not harm the environment.

Adapt speed and distance during your boat trips so that swell and noise generated by the boat do not disturb or harm wildlife, moored boats, docks, etc. Wherever you land or cruise, please show consideration and always leave the areas you visit as you would like to find them yourself.

Safety Information

General Safety Information

Read this chapter carefully. It concerns your safety. This section describes how safety information is presented in the operator's manual and on the engine. It also gives a general account of basic safety precautions to be taken when operating the boat and maintaining the engine.

Check that you have the correct operator's manual before proceeding. If not, check the publication search on Volvo Penta's website for the correct manual.



This symbol is used in the book and on engines to make you aware of safety information. Always read safety precautions very carefully. Incorrectly performed operations could result in personal injury, property damage, or engine damage. Read this manual carefully before operating or servicing the engine. If anything is unclear, please contact your Volvo Penta dealer for assistance.

In the operator's manual warning texts have the following 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.

NOTICE! Used to address practices not related to personal injury. Special attention should be used to prevent incorrect assembly, disassembly, or use. Failure to comply with a notice may result in equipment failure or damage.

This manual contains information you need to operate your boat, engine, and drive safely. Check that you have the correct manual for your engine and drive.

This manual also contains a considerable amount of information concerning model identification, preventive maintenance recommendations, fuel and oil recommendations, and other important points. Please keep this book with your boat at all times.

It is important that this manual stays with the boat when it is sold. Important safety information must be passed on to the new owner. The service information provided in the manual gives the owner important information about maintaining the engine and sterndrive.

If you do not understand or are uncertain about any operation or information in this owner's manual, please contact your Volvo Penta dealer. Your dealer will be able to help you with an explanation or will demonstrate the operation.

Federal law requires manufacturers to notify owners in the event that a safety related defect is discovered on any of their products. If you are not the original owner of this engine, please notify us at our address or through an authorized Volvo Penta dealer about the change in ownership. This is the only way we will be able to contact you if necessary.

Carefully observe the safety alert symbols shown for dangers, warnings, and cautions. They warn you of possible dangers or important information contained in this manual. However, warnings alone do not eliminate hazards, nor are they a substitute for safe boat handling and proper accident prevention measures!

Maintenance

Performing maintenance on the engine can be a daunting undertaking. We strongly recommend that you consult your dealer. Find the correct information in the following publications: this operator's manual, any applicable workshop manuals and parts catalogs.

Engine Decals

Check that the warning decals on the engine are always clearly visible. Replace decals that have been damaged or painted over.

Fire and Explosion

Fueling

When refueling there is always a danger of fire and explosion. Smoking is forbidden and the engine must be switched off. Never overfill the tank. Close the fuel tank filler cap properly.

DANGER!

Gasoline is extremely flammable and highly explosive. Always turn off the engine before refueling. Do not smoke or allow open flames or sparks near the boat when adding fuel. When filling the gas tank, ground the tank to the source of gasoline by holding the hose nozzle firmly against the side of the deck filler plate, or ground it in some other manner. This action prevents static electricity buildup that could cause sparks and ignite fuel vapors.

DANGER!

Fuel leakage can contribute to a fire and/or explosion. Frequently inspect fuel system parts and replace if fuel leakage or parts deterioration are found.

DANGER!

To prevent fire and explosion, perform all service procedures with the engine turned OFF.

DANGER!

Failure to inspect your work may allow fuel leakage to go undetected. This could become a fire or explosion hazard.

Batteries

Never allow an open flame or electric sparks near the battery or batteries. Never smoke in proximity to the batteries. The batteries give off hydrogen gas during charging which, when mixed with air, can form an explosive gas. This gas is easily ignited and highly volatile.

Operate the boat's bilge blower for at least 5 minutes prior to servicing battery. Always ventilate the battery storage area before carrying out any procedures involving batteries.

Serpentine Belt and Pulley System

CAUTION!

Working around the serpentine belt and pulley system can be hazardous. To prevent possible injury caused by pinching, crushing or entanglement, always observe these precautionary measures when working around the engine:

- Ensure that the engine cannot be started by removing the ignition keys from each starting location. This hazard is especially likely to occur if the engine room or engine compartment cannot be seen from various remote starting positions such as a flybridge or enclosed cabin.
- If work permits, disconnect the batteries.
- At each starting location, always post a sign stating that work on the engine is in progress.

Hot Surfaces and Fluids

There is always a risk of burns when working with a hot engine. Beware of hot surfaces.

Chemicals

If you are using any chemicals on your boat, read all labels and warnings carefully. Always pay special attention to safety related information and follow the manufacturer's instructions.

Safety Precautions While Operating the Boat

Your New Boat

Read the operator's manuals and other information supplied with your new boat. Learn to operate the engine, controls and other equipment safely and correctly. If this is your first boat or it is a boat type with which you are unfamiliar, we recommend that you practice controlling the boat away from other vessels, docks, shallow areas, and other obstacles.

Remember that the person driving a boat is legally required to know and follow the current rules regarding traffic and safety at sea. Make sure you know the rules that apply to you and the waters in which you are boating by contacting the relevant authorities or organization. We strongly recommend you take a course in seamanship. You may contact your local boating organization to find a suitable course.

Basic Safety Rules of Boating

Always be sure to observe the following minimum precautions while boating:

- Insist on the use of personal flotation devices by all passengers at all times.
- NEVER OPERATE THE BOAT IF YOU ARE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL.
- If boating in waters that are unfamiliar, obtain appropriate charts to avoid damage from underwater objects.

We recommend that you contact your local boating organization for more detailed information on safety afloat.

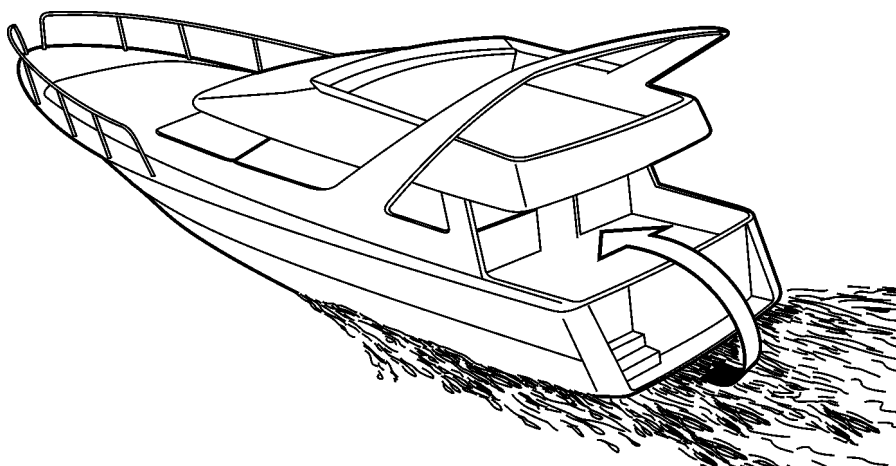
Carbon Monoxide

DANGER!

Do not run the engine while there are people located on or near the swim platform and transom.

DANGER!

Do not tow anyone using water sports equipment (such as skis and inner tubes) closer than twenty feet (6 meters) from the boat. Do not, under any circumstances, allow people to “body surf” using the swim platform as a means of being pulled along.



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For your safety, we recommend that you install a good quality marine carbon monoxide detector aboard your boat, in accordance with ABYC recommended practices.

The remainder of this chapter (information regarding carbon monoxide and respective illustrations) are provided courtesy of the American Boat and Yacht Council.

Properties and Characteristics of Carbon Monoxide

Carbon monoxide (CO) is a colorless, odorless, and tasteless gas that weighs about the same as air. It cannot be expected to rise or fall like some other gases because it will distribute itself throughout the space. Do not rely on the sense of smell or sight of other gases to detect CO as it diffuses in the air much more rapidly than easily detectable vapors, (i.e., visible and aromatic vapors).

What Makes Carbon Monoxide?

Carbon monoxide is produced any time a material containing carbon burns. Examples include, but are not limited to, gasoline, natural gas, oil, propane, coal, or wood. Some common sources of CO are internal combustion engines and open flame appliances such as:

- Gas propulsion engines
- Auxiliary gas engines (gensets)
- Cooking ranges
- Central heating plants
- Space heaters
- Water heaters
- Fireplaces
- Charcoal grills

The carbon monoxide component of diesel exhaust is extremely low relative to the carbon monoxide level found in gasoline engine exhaust.

How is a Person Affected by Carbon Monoxide?

Carbon monoxide is absorbed by the lungs and reacts with blood hemoglobin to form carboxyhemoglobin, which reduces the oxygen carrying capacity of the blood. The result is a lack of oxygen for the tissues, with subsequent tissue death and, if exposure is prolonged, death of the individual.

Carbon monoxide in high concentrations can be fatal in a matter of minutes. Lower concentrations must not be ignored because the effects of exposure to CO are cumulative and can be just as lethal.

Symptoms of CO Poisoning – The sequence of symptoms listed generally reflects the order of occurrence in most people; however, there are many variables that affect this order of symptom manifestation. One or more of the following symptoms can signal the adverse effect of CO accumulation:

- | | |
|----------------------------------|--------------------|
| 1. Watery and itchy eyes | 10. Drowsiness |
| 2. Flushed appearance | 11. Incoherence |
| 3. Throbbing temples | 12. Slurred speech |
| 4. Inattentiveness | 13. Nausea |
| 5. Inability to think coherently | 14. Dizziness |
| 6. Loss of physical coordination | 15. Fatigue |
| 7. Ringing in the ears | 16. Vomiting |
| 8. Tightness across the chest | 17. Collapse |
| 9. Headache | 18. Convulsions |

Emergency Treatment for CO Poisoning – CO toxicity is a life-threatening emergency that requires immediate attention. Following is a list of actions that should be carried out if CO poisoning is suspected. Proceed with caution. Keep in mind that the victim may be in an area of high CO concentration and take care when entering.

- | | |
|---|---|
| • Evaluate the situation and ventilate the area if possible. | • Contact medical help. If the victim is not breathing, perform rescue breathing or approved cardiopulmonary resuscitation (CPR), as appropriate, until medical help arrives. Prompt action can make the difference between life and death. |
| • Evacuate the area and move affected person(s) to a fresh air environment. | • Investigate the source of CO and take corrective action. |
| • Observe the victim(s). | |
| • Administer oxygen, if available. | |

Marine CO Detection Systems

Even with the best of boat design and construction, and scrupulous attention to inspection, operation, and maintenance of boat systems, hazardous levels of CO may, under certain conditions, be present in interior spaces and exterior areas. Vigilant observation of passengers for CO sickness symptoms should be supplemented by marine CO detection devices in any enclosed accommodation spaces. Detection devices should be marked with "Marine Carbon Monoxide Detector" or "A-24."

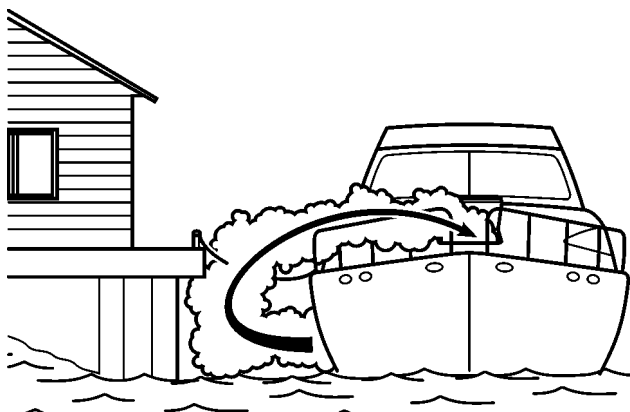
What to do When the Alarm Sounds

Actuation of a CO alarm indicates the presence of Carbon Monoxide (CO) which can kill you. If alarm sounds, take the following actions as appropriate:

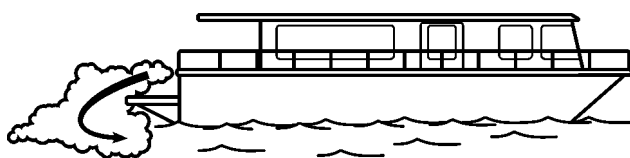
- | | |
|--|--|
| • Shut off sources of CO such as engines (if safe to do so), generators, and open flame stoves. | • Provide fresh air through actions such as opening port lights, hatches, and doors. |
| • Look for sources of CO that may be from other boats and take appropriate steps, which may include moving your boat to a safe area. | • If anyone is exhibiting signs of CO poisoning, move them to fresh air and seek medical assistance. |

Boat Operation

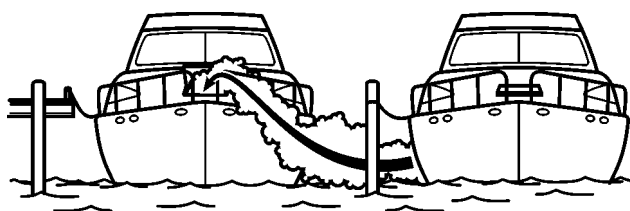
Don't run engine(s) or auxiliary generator(s) on boats with enclosed accommodation compartments unless the boat is equipped with a functioning marine carbon monoxide detector that complies with 2ABYC A-24, *Carbon Monoxide Detection Systems on Boats*.



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Stationary Operation

A boat operator should be aware that dangerous concentrations of CO can accumulate when propulsion engines and/or an auxiliary generator is operated while the boat is stationary. This is especially true when rafted or moored in a confined area such as boat-houses, or when in close proximity to seawalls or other boats.

The risk from CO is greatly increased when there is little or no wind present.

Keep engine room hatches and doors closed when operating engine(s) and/or generator set(s).

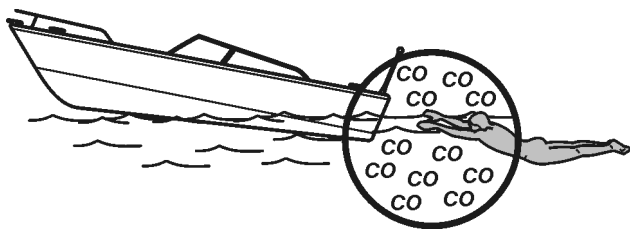
Pay attention to prevailing conditions and provide for ventilation to induce fresh air and minimize exhaust re-entry.

When the propulsion engine or generator is running, CO is produced and may remain in the vicinity of the exhaust outlet. CO accumulation may remain entrapped for some time after the engine or generator is turned off.

- Do not occupy aft lounging area(s) or swim platform,
- Do not swim under or around swim platform,
- Do not swim in the vicinity of exhaust outlet(s).

Since carbon monoxide production is greater when engines are cold versus when they are warm, a boat operator should minimize the time spent on getting underway. In order to minimize CO buildup, do not warm up or run propulsion engine(s) for extended periods while the vessel is stationary.

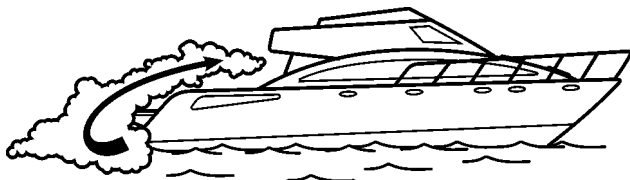
A boat operator should be aware that carbon monoxide is emitted from any boat's exhaust. Boats moored close together can affect each other. Operation, mooring, and anchoring in an area where other boats' engines or generators are running may put your boat in an atmosphere containing CO, even if your boat's engine(s) is(are) not running. Boat operators need to be aware of the effect of their boat on other boats in the area. Of prime concern is the operation of an auxiliary generator where boats are moored alongside each other. Be aware of the effect your exhaust may have on other boats and be aware that the operation of other boats' equipment may affect the carbon monoxide concentration on your boat.



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Underway Operation

Do not sit on, occupy or hang on any stern appendages (e.g., swim platforms, boarding ladders, etc.) while underway. Do not body surf, commonly known as “teak surfing” or “platform dragging,” in the wake of the boat. Do not tow persons in close proximity to the stern of the boat.

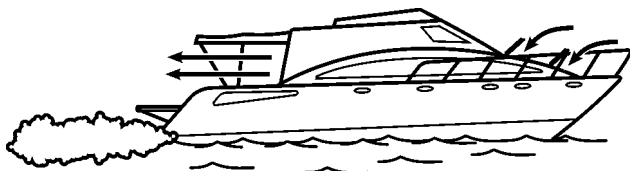


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Backdrafting (Station Wagon Effect)

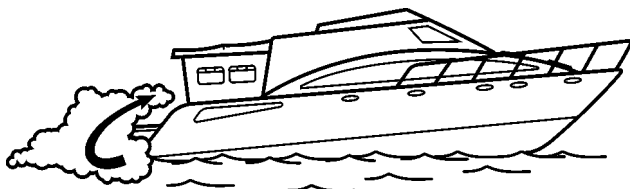
Backdrafting is caused by air movement over or around a boat creating a low pressure or suction area around the stern that can increase CO level on the boat. Backdrafting can be affected by relative wind direction, boat speed, and boat trim angle. At certain speeds and under certain operating conditions the low pressure area may form in other regions and permit carbon monoxide to enter the hull through openings that are not at the back of the boat.

Other factors during boat operation which may affect carbon monoxide concentration include:

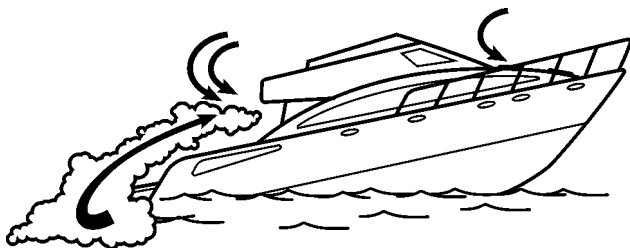


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- Adding or removing canvas may raise or lower CO levels. Image #51618 illustrates desired air-flow through the boat. As shown in image #51619, certain canvas configurations, such as side curtains and position of hatches, can increase backdrafting.

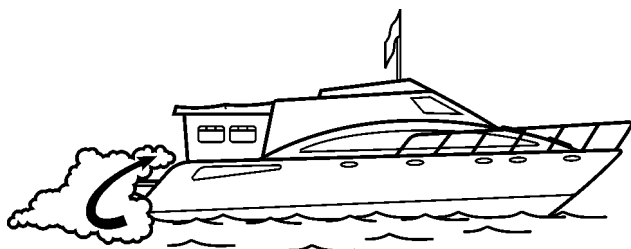


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- Intentional or unintentional excessive trim angle (e.g., high bow angle or excessively unequal distribution of weight) may raise the CO level and should be avoided (see image #51620).



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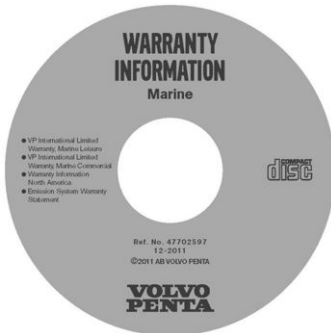
- Opening and closing ports, hatches, doors, and windows may raise or lower CO levels on board a boat. When airflow is moving forward inside the boat, CO may be entering the boat.
- Operating a boat at slow speeds with a following wind should be avoided. Consider changing direction, adjusting speed, or both (see image #51621).
- Be aware that cockpit and deck drains can be a source of CO ingress into boats, especially boats with cockpits or decks enclosed with canvas or permanent boat structures.
- Altitude and Sea Conditions – Operation at altitudes greater than 5,000 ft (1500m) contributes to inefficient engine performance and may require adjustments to ignition systems, fuel systems, or changing the propeller's size or gear ratio. Failure to make adjustments to ignition systems and/or fuel systems for altitude conditions may cause an increase in CO. Reduced power resulting from increased altitude may require adjustments to propeller size. Heavy seas or out of trim conditions tend to load engines, resulting in reduced performance and increased CO production.
- Portable Generator Sets – Do not use this equipment on boats. Gasoline powered portable generator sets produce CO. These sets discharge their exhaust products in locations which can lead to an increase in the accumulation of carbon monoxide in enclosed accommodation spaces.

Maintenance

Engine Performance – Efficient engine performance is vital to minimizing CO production. Efficient engine performance can be ensured through regular maintenance. Refer to the *Maintenance Schedule* and *Maintenance* sections of this manual for instructions on keeping your engine and sterndrive in good condition.

NOTICE! Be sure to see your Volvo Penta dealer for regular inspections.

Introduction



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Warranty Information

Volvo Penta's warranty information can be found on the CD that accompanies this manual. One warranty manual on the CD applies to the North American market while the second applies to all other markets.

Please contact your Volvo Penta dealer if you have not received your warranty booklet CD or a customer copy of the warranty card.

Owner's Identification Card

When you purchased your boat, the dealer was required to register your power package with Volvo Penta. Your dealer should provide you with proof of ownership in the form of an Owner's Registration Card or a print-out of the Volvo Penta computer on-line registration screen. This provides proof of ownership and is required to validate warranty, should warranty service become necessary.

Warranty coverage may be delayed until the warranty and registration form is on file at Volvo Penta. Please refer to your warranty manual for additional information.

Keep your owner's identification card with you at all times; this will facilitate finding parts and providing service when you visit any Volvo Penta authorized dealer.

Volvo Action Service (VAS)

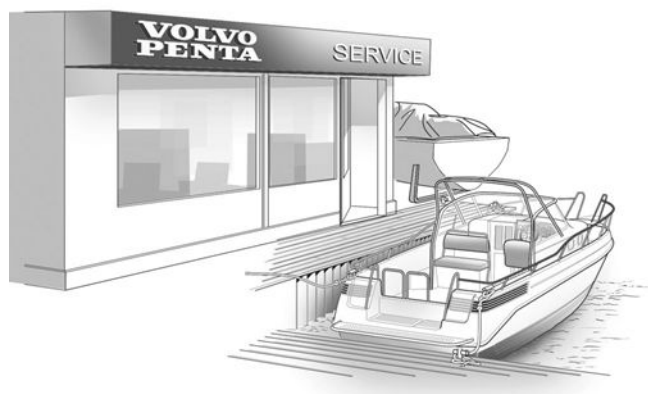
Volvo Action Service (VAS) is a consumer breakdown service available 24 hours each day, 365 days per year. If your engine breaks down, the VAS coordinator will quickly locate your nearest dealer. If you need a tow, parts, or mechanic, the VAS coordinator will make all arrangements necessary to get you back underway as soon as possible. A service charge may apply in some situations.

Membership to Volvo Action Service is provided automatically to all Volvo Penta engine owners. As long as your Volvo Penta engine is under factory warranty, this service covers Volvo Penta-related repairs. Refer to the accompanying warranty literature for detailed information regarding coverage.

If you have a question about Volvo Action Service, or need additional information, please call toll-free 1-877-33-PENTA.



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P0016522

Volvo Penta Dealer Network

The Volvo Penta worldwide network of authorized dealers is at your service. Volvo Penta strongly recommends that you take your product to an authorized Volvo Penta dealer for service or repair. They are specialists in Volvo Penta products and have the accessories, genuine Volvo Penta parts, test equipment, and tools necessary for high quality service and repair work.

Toll-free Dealer Locator Service

If you are away from your home waters and need assistance, take your Volvo Penta product to the nearest Volvo Penta servicing dealer. For the name and location of the nearest Volvo Penta dealers, search the dealer locator on the Volvo Penta's web site, or call 1-800-522-1959 (US only).

Volvo Penta on the Internet

Whether you're trying to replace a lost operator's manual, searching for updated service information about your engine, looking for parts information, or simply attempting to locate the nearest authorized Volvo Penta dealer, Volvo Penta on the Internet is the web site to visit. Additionally, you will find a wealth of information related to our company and all the new and innovative products we have to offer.

The URL address for Volvo Penta of the Americas is:

<http://www.volvopenta.com>

Consumer Affairs Department

The Volvo Penta Consumer Affairs Department may be contacted through the following address and phone numbers:

Volvo Penta of the Americas
1300 Volvo Penta Drive
Chesapeake, Virginia 23320, USA
Phone: (757) 436-5100

Instruments and Controls

This section describes the Volvo Penta instrumentation/controls and their functions.

NOTICE! If you want to supplement the instrumentation, your boat is equipped with instruments not described here, or you are not sure about their functionality, please contact your Volvo Penta dealer or boat dealer.

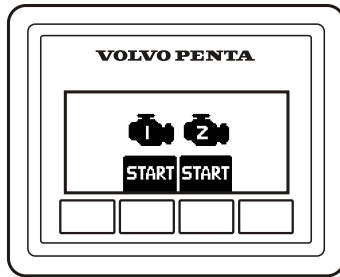
Start/Stop Panel

The start/stop panel is situated on stations other than the main station.

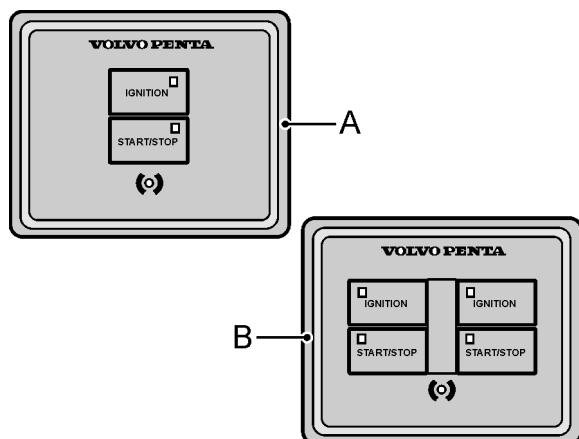
NOTICE! Please refer to the chapters entitled *Starting* and *Operation* before attempting to start the engines.

The ignition key(s) on the main station must be in the ON or RUN position to be able to start the engines with the start buttons on the start/stop panel. The engines can only be started and stopped if no other station is locked.

Always push the buttons firmly for at least one second.



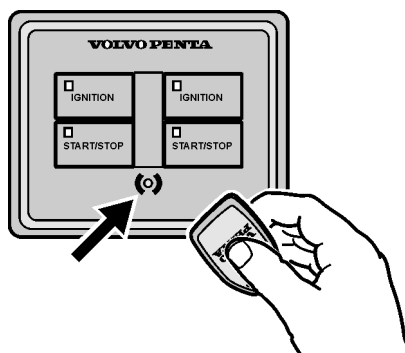
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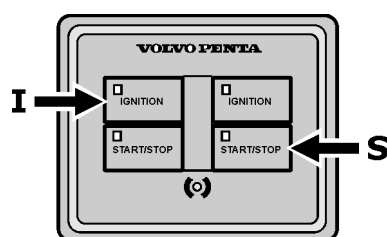
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e-Key

e-Key is a system of panels and RFID keys that control the security and starting of the engines.

The panel options are a single driveline **A** or twin driveline **B**.

The system comes with two keys. Up to four keys can be set up on the system. See a Volvo Penta dealer to add more keys.

Unlocking the system is done by passing the key over the sensor on the panel.

The twin panel only requires one key to activate the panel and start both engines.

The ignition is activated when the system is unlocked. The LED on the Ignition button **I** turns on when the ignition is activated.

Pressing the **Ignition** button **I** turns the ignition on or off.

With the ignition on, press the **Start/Stop** button **S** to start the engine.

The Led on **Start/Stop** turns on when the engine is running.

Press the **Start/Stop** button again to stop the engine.

Pass the key over the sensor to disable the electrical system.

NOTICE! If the system is not locked the engine(s) can be started by pressing the buttons on the panel. To secure the boat the system must be locked, with the key, before leaving the boat.

NOTICE! A technician **MUST** have one of the e-Keys to perform most service work on the driveline. Make arrangements to leave an e-Key with the dealer when scheduling work.

e-Key Remote

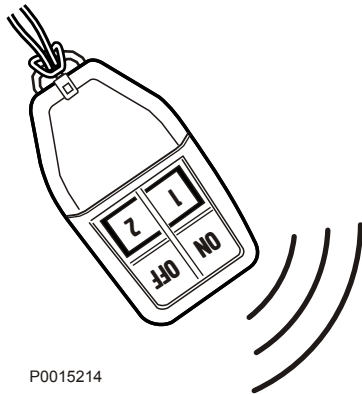
e-Key Remote uses the same panels as the standard e-Key system. However it uses wireless (Wi-Fi) key fobs that can remotely activate the panels.

ON — unlocks the system

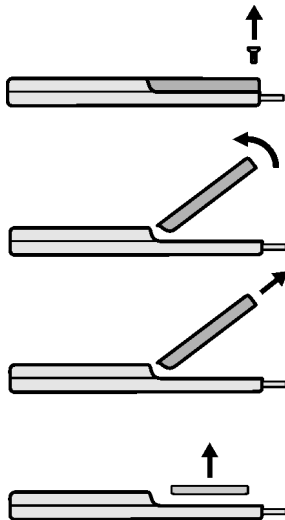
OFF — locks the system

1 and 2 are for control of future accessories and options.

One key is standard, see a Volvo Penta dealer to add additional keys (up to four total).



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P0016616

Battery

The battery for the key is **CR2032**.

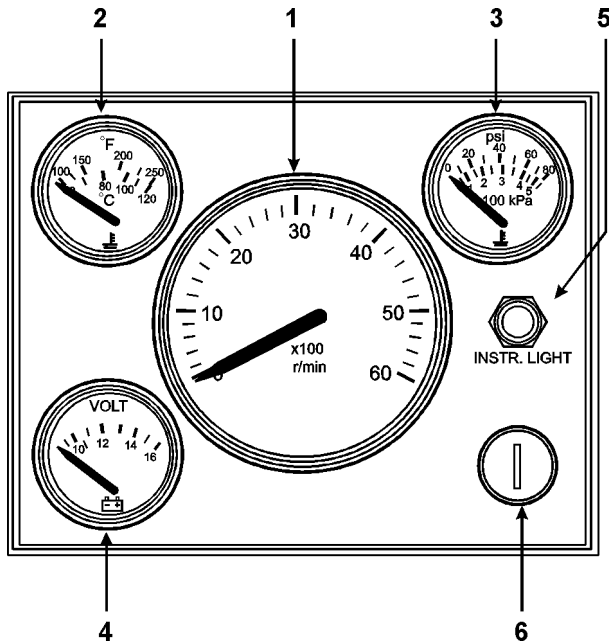
Access the battery by removing the battery cover.

If the remote battery is dead, the e-Key remote has the RFID technology and can lock or unlock the system. Pass the e-Key over the e-Key panel sensor to activate the system.

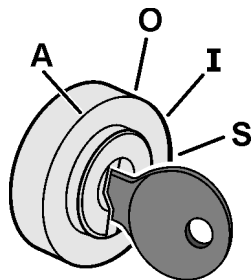
Gauges

The following section contains a general description of the instrument panel. Please note that instrument panels are installed by the boat builder and will vary depending on the model. Commonly, instrument panels are equipped with a tachometer, temperature gauge, oil pressure gauge, voltmeter, instrument panel lighting switch, and an ignition switch.

Instrument panels can also be supplemented with extra Volvo Penta instruments such as: fuel gauge, fresh water gauge, clock, speedometer, or rudder indicator.



P0002036



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The instrument panel and/or gauges depicted below are sample representations only.

- 1 **Tachometer**—Shows the engine RPM. Multiply this value by 100 or 1000 (depending on model) for revolutions per minute. Integral “Hours run” meter (optional and separately installed) displays the engine’s operating time in hours and tenths of an hour.
- 2 **Temperature Gauge**—Indicates engine temperature. Normal operating temperatures are listed in the section entitled *Technical Data*.
- 3 **Oil Pressure Gauge**—Indicates the engine oil pressure. Look for trends or changes in the oil pressure reading. Lower oil pressure is normal and should be expected at idle after a sustained cruise.
- 4 **Voltmeter**—Indicates the charge voltage from the alternator which should normally be approximately 14 Volts. With the engine stopped and the switch on, battery voltage is normally indicated as 12 Volts.
- 5 **Instrument Lighting**—Turns gauge lights on or off.
- 6 **Ignition Switch**—The ignition switch has three positions (varies, depending on switch manufacturer):

A — Accessories: Power is provided to run accessories. Ignition is OFF and engine is OFF. Not present on all ignition switches.

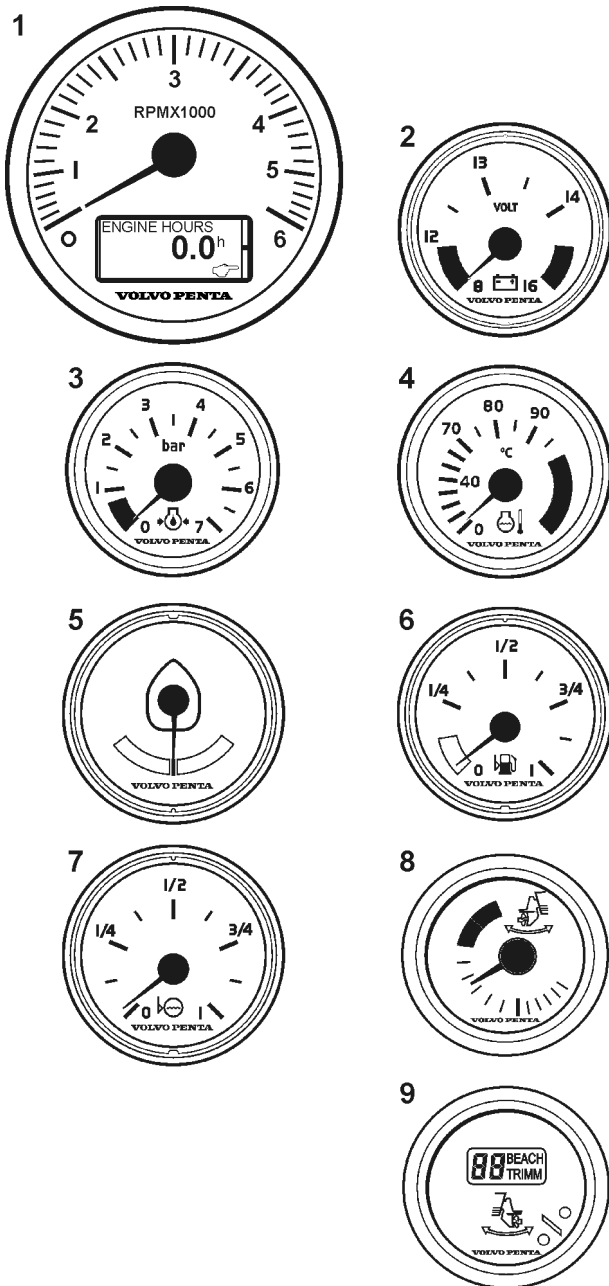
O — The key can be inserted or removed.

I — RUN: Ignition is ON and engine is OFF. System voltage connected.

S — START position (momentary). The starter motor is engaged and starting the engine.

NOTICE! For additional information, please read the starting instructions in the section entitled *Starting*.

Volvo Penta ignition keys are marked with a code for use when ordering extra keys. Record the code so that replacement keys can be ordered. Keep the code in a safe place where unauthorized persons do not have access to it.



51279

Optional Gauges

There is one gauge (of each type) for each engine.

All gauges are optional; however, the boat is always equipped with either an EVC System Tachometer with LCD display or an EVC System Display, since at least one of these instruments is needed when modifying EVC settings.

1. EVC System Tachometer (with LCD display)

Information about the tachometer display and how to handle it can be found in *EVC Menu*.

2. Voltmeter

3. Oil Pressure Gauge

4. Coolant Temperature Gauge

5. Rudder Indicator

6. Fuel Level Gauge

7. Fresh Water Level Gauge

8. Analog Trim Instrument

9. Digital Trim Instrument



50830

Alarm Display (Optional)

There is one alarm display for each engine.

A start-up test checks that all lamps are working when the ignition key is first turned to RUN/ON. All the warning lamps should light up during this test. Check that all lamps function. Once the engine is running, they should have gone out.

If a lamp starts to flash, the diagnostic function has registered a fault. When the fault has been acknowledged, the lamp will light continuously until the fault is rectified. **Warning lamps should never light up during normal operation.**

For more detailed information on which fault has occurred, how to acknowledge the fault, and what measures to take please refer to *Acknowledging Alarms and Messages* and to the *Fault Code Register*.

General Warning: Red or Amber Indicator

Red Warning Indication: Serious Fault

If the red warning indication is shown during operation, a serious fault has occurred.

For additional information, please see *Acknowledging Alarms and Messages* and the *Fault Code Register*.

Amber Warning Indication: Fault

If the amber alarm indication is shown during operation, a fault has occurred.

For additional information, please see *Acknowledging Alarms and Messages* and the *Fault Code Register*.



50831



50832

Oil Pressure: Red Indicator

If the oil pressure lamp lights up during operation, the oil pressure in the engine is too low. Stop the engine at once. Check the oil level in the engine. For additional information, please see *Checking Engine Oil Level*.

For additional information, please see *Acknowledging Alarms and Messages* and the *Fault Code Register*.

NOTICE! Continued operation when the oil pressure is too low can cause serious engine damage.

Water in Fuel

Functionality not available for gasoline engines.



50833



50834

Battery: Amber Indicator

The battery lamp lights up if the alternator is not charging the battery. If possible, stop the engine if this lamp lights up during operation. If the lamp lights up, this can be due to a fault in the electrical system or because the alternator drive belt is loose.

- Check the alternator drive belt. For additional information, please see *Serpentine Belt*.

NOTICE! Do not continue operation if there is any problem with the alternator drive belts. This could cause serious engine damage.

- Check the battery cable connections and wire condition.



50835

Coolant Temperature: Red Indicator

The coolant temperature lamp lights up when the coolant temperature is too high. Stop the engine if this lamp lights up during operation.

- Check the coolant level. For additional information, please see **Step 6** in the section entitled *Before Starting*.

WARNING!

Do not open the coolant filler cap when the engine is warm. Steam or hot fluid could spray out, causing severe burns.

- Check that the sea water filter, if installed, is not blocked.
- Check the impeller in the sea water pump. For additional information, please see the section entitled *Impeller: Checking & Replacing*.

For additional information, please see *Acknowledging Alarms and Messages* and the *Fault Code Register*.



50836

Coolant Level

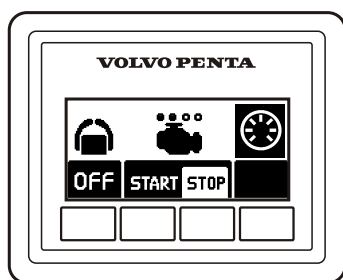
Functionality not available for gasoline engines.



50837

Oil Level

Functionality not available for gasoline engines.



P0012493

Docking Station Panel

The docking station is comprised of a joystick and a docking panel dedicated solely for docking the boat.

Directions for using the joystick are provided in the sections entitled *Controls* and *Operation*.

The docking panel allows station activation/deactivation, stopping and restarting of the engines, and contrast/backlighting control while operating the boat from a docking station. This panel also allows you to acknowledge fault messages. The docking function (maneuvering with the joystick) is enabled when the docking station is activated. The docking station can be activated only when the engines are running.

Activation Button

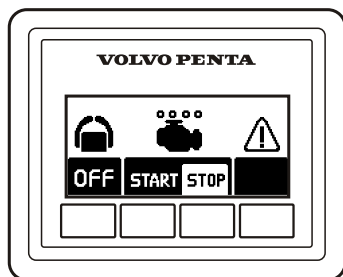
Push the helm station activation button to activate and lock/unlock the station.



The helm station is active. Press button again to lock the helm station.



The helm station is locked.

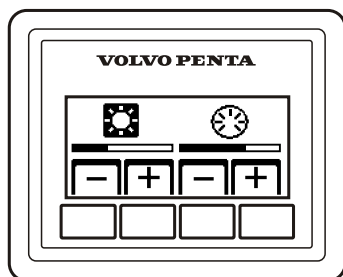


P0001308

Start/Stop Buttons

Push the Start/Stop buttons to start or stop both engines.



The dots above the engine symbol shows which engines are running. A white dot means an engine is running.

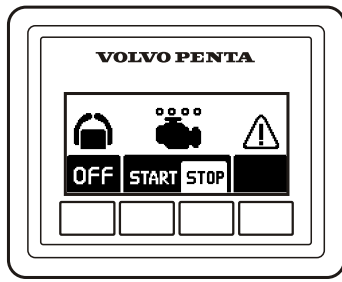


P0012494

Contrast/Backlighting Buttons

The button on the far right of the docking panel is used to adjust contrast and panel backlighting. The button is also used to confirm fault messages (see below).

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



P0001308



Alarm Acknowledge Button

Fault messages are displayed on the screen when the system discovers a fault. All fault messages must be acknowledged. Acknowledge by pressing the far right button; if the fault is accompanied by an audible signal, the signal will be silenced.

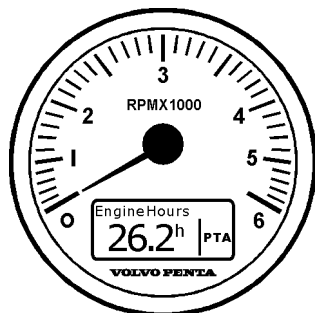
Use the info display panel to see additional information regarding the alarm.

For further information on how to handle fault messages and recommended actions, refer to the chapter entitled *Fault Code Register*.

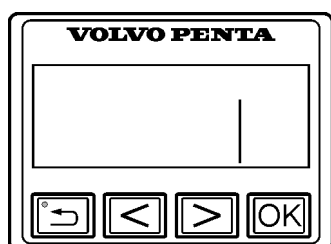
EVC System Display

There are four types of displays.

EVC System Tachometer Display – An LCD display integrated into the EVC System Tachometer. It displays engine hours only.

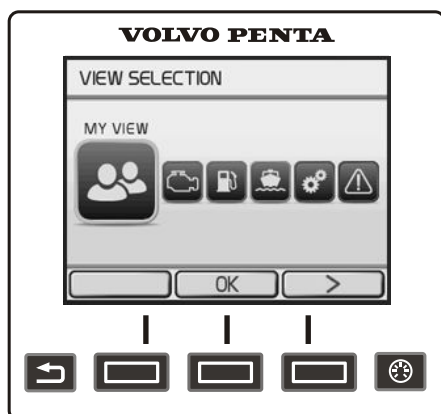


P0009819



P0016524

Info Display Panel – A smaller, 2.5" LCD display. It provides a variety of information. See EVC Menu for functionality.



P0014727

4" Color Display – A color LCD display. It provides a variety of EVC-related information. Additional information about this display may be found in the section entitled *Screens* in this chapter.



P0001165

7" Color Display – A larger, color LCD display. It provides a variety of information in a larger, easier to read format. Additional information about the color display may be found in the section entitled *Screens* in this chapter.


When the EVC system has detected a fault or something else that requires the operator's attention, a pop-up appears in the display(s). For additional instructions on how to handle such alarms and informational messages, please refer to *Acknowledging Alarms and Messages* and to the *Fault Code Register*.


Displays


4" Color Display

NOTICE! Make a habit of protecting the display with the storage cover when the boat is not in use. Prolonged exposure to strong sunlight can damage the screen and cause malfunctions.


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

 Return to the previous menu by pressing the BACK button.

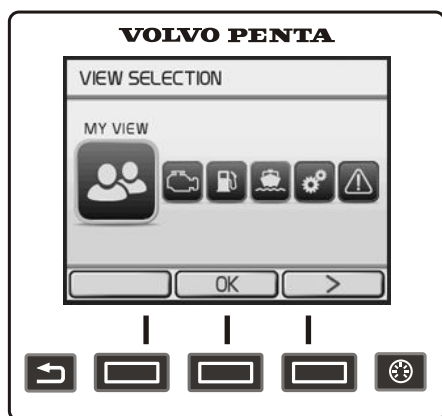
 Press the CONTRAST button to adjust the display contrast. The image reverts automatically a short while after the button is released.

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

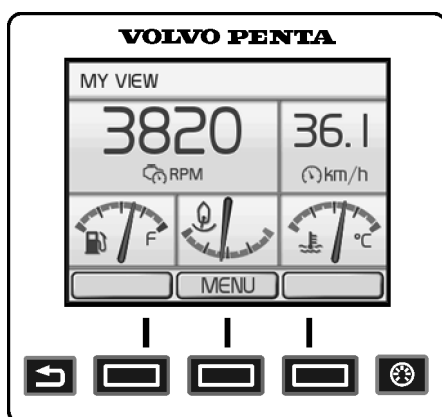
View Selection

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



P0014727



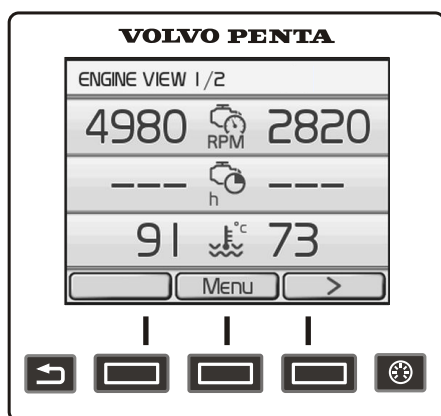
P0014748

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 *Replace Gauge*. Functions are also switched on and off here.








P0014718

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 *Replace Gauge*.

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

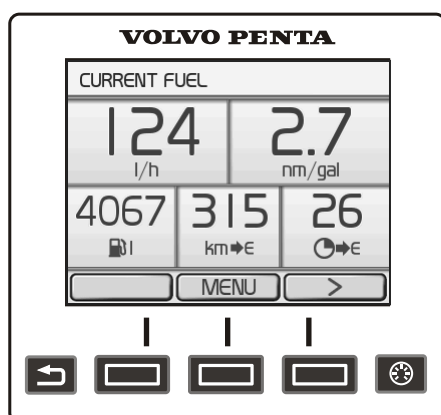
-  Engine Speed
-  Engine Hours
-  Engine Coolant Temperature
-  Battery Voltage
-  Engine Oil Pressure

Fuel Economy

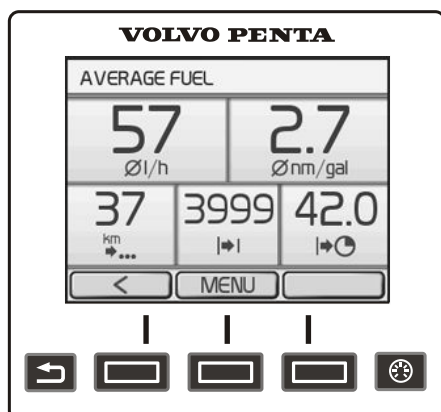
This is the boat's trip computer and information is shown in two windows, **Current Fuel** and **Average Fuel**. Switch between screens by pressing the arrow buttons.

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



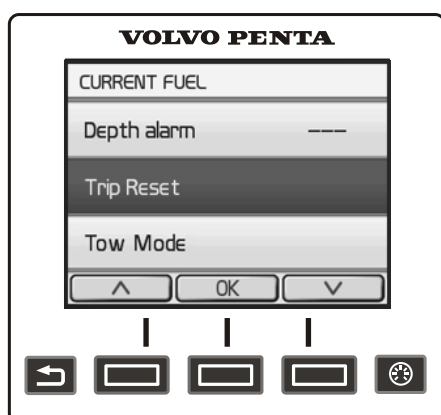
P0014740

Average Fuel

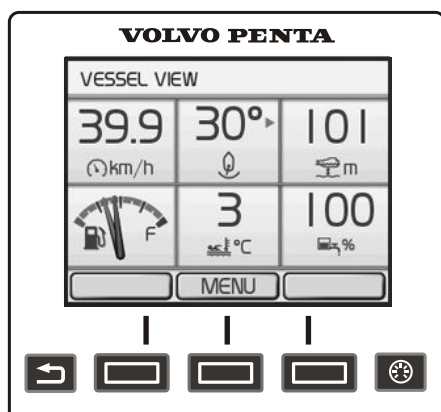
- **Average Fuel Rate:** Average fuel consumption since the last trip computer zero reset.
- **Average Fuel Economy:** Average since the last trip computer zero reset.
- **Trip Distance:** Average fuel consumption per unit of distance since the last trip computer zero reset.
- **Trip Fuel:**, fuel consumption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

Trip Reset

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



P0014741

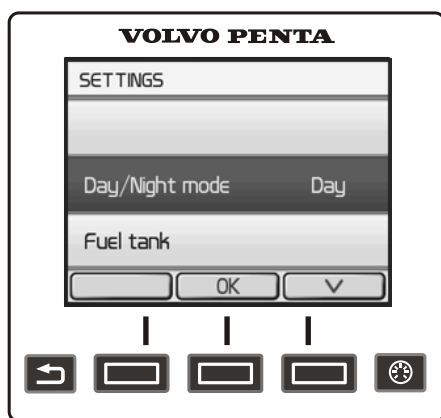


P0014719

Vessel

Shows information regarding the boat's installation. The information shown can be set under *Replace 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 section entitled *Depth Alarm (Optional)* in this chapter.
- **Fuel Level**
- **Sea Water Temperature**
- **Freshwater Level**
- **ACP Info** for further ACP information, refer to the chapter entitled *Optional*.



P0014723

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.

Day/Night-Mode

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

Fuel Tank

Fuel tank calibration and settings. For information regarding calibration, refer to the section entitled *Fuel Tank* in this chapter.

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 the section entitled *PTA Calibration* in this chapter.

Trip Reset

Zeroes all values in the trip computer.

ACP Mode

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

Depth Alarm

Setting the depth alarm function; refer to section entitled *Depth Alarm (Optional)* in this chapter.

Display Contrast

Contrast adjustments affect all displays in the system.

Display Type

Select the which engine's information will be displayed and the type of installation of which the display forms a part.

Units

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

Language

Setting the language in which information will be shown.

Speed Factor

Setting the speed factor; refer to *Log Cal. Factor* in this chapter.

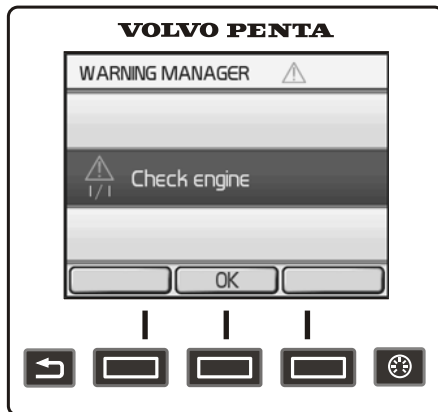
EVC Information

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

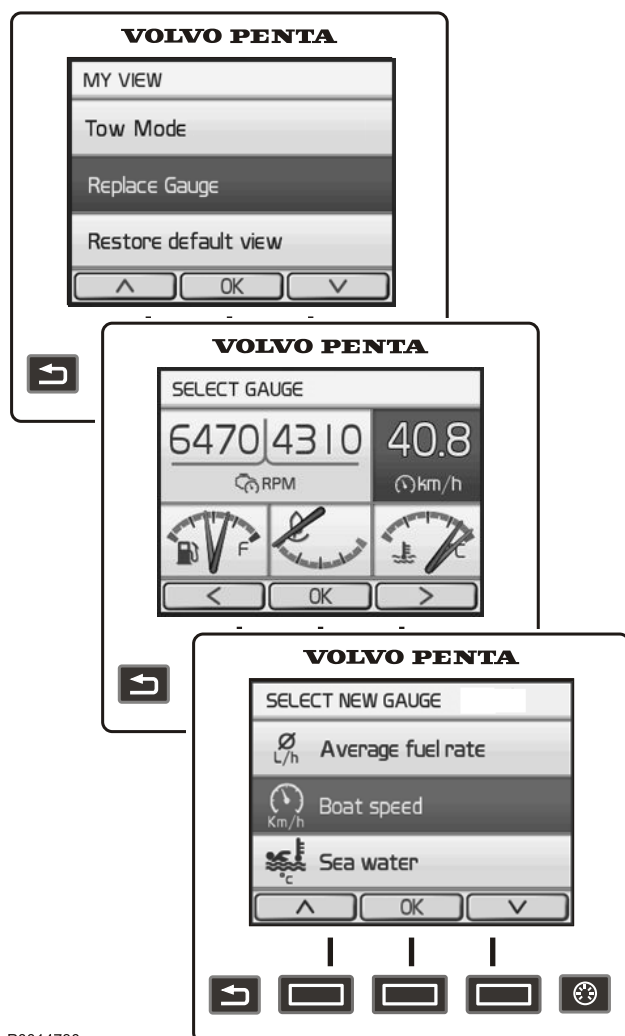
Warning Manager

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 chapter entitled *Fault Code Register*.



P0014724

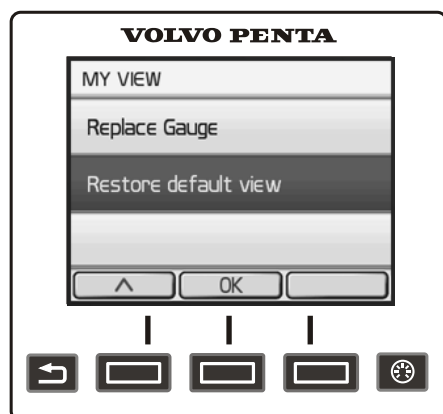


P0014730

Replace Gauge

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

- 1 Press the MENU button and select **Replace Gauge**.
- 2 Navigate using the arrow buttons to the gauge for replacement and press OK.
- 3 Select the gauge to be replaced and press OK.



P0014731

Restore Default View

The display has a basic setting that may be restored.





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



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7" Color Display

The Volvo Penta 7" color display is controlled by buttons:

-  Turn to browse through submenus and to return to the main menu, Select view.
-  Return to the previous menu.
-  Confirms selection; also used to access submenus and the *Settings* menu.
-  Controls boat instrument backlighting.

NOTICE! Prolonged exposure to strong sunlight can damage the screen. Use the cover to protect the screen whenever the display is not in use.

There is a status field on the right of the screen that displays the current view, active functions and repaired faults.

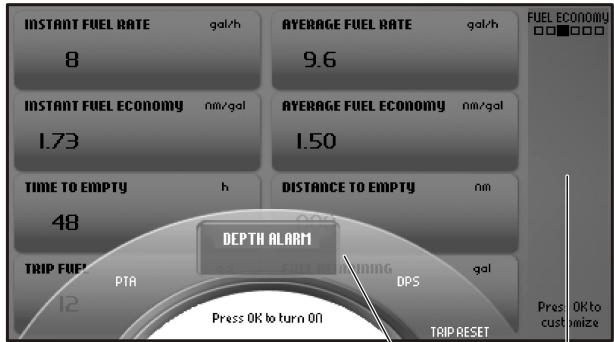
This status field will also indicate whether the safety lanyard is connected **SLY** or disconnected (**SLY**).

Pop-up

A number of functions can be switched on and off in a pop-up by pressing **OK**, which will display the functions in the lower part of the screen.

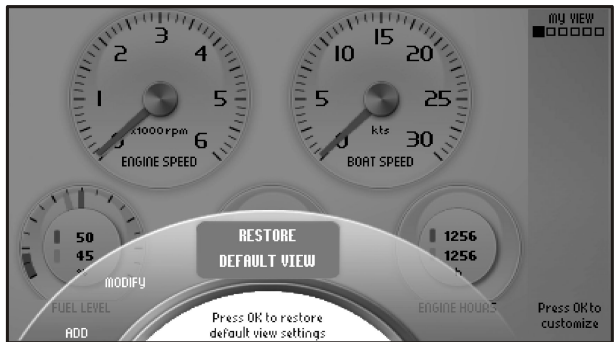
Turn to the desired function and press **OK** to confirm that the function is to be switched on or off. Active functions are displayed by a symbol in the status field on the right.

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



P0001050

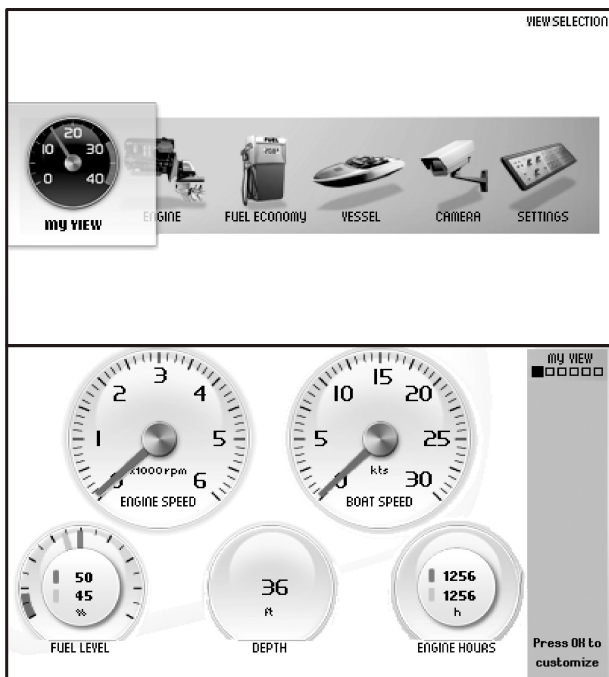
- 1 Pop-up menu
- 2 Status field



P0001097

Restore Default View

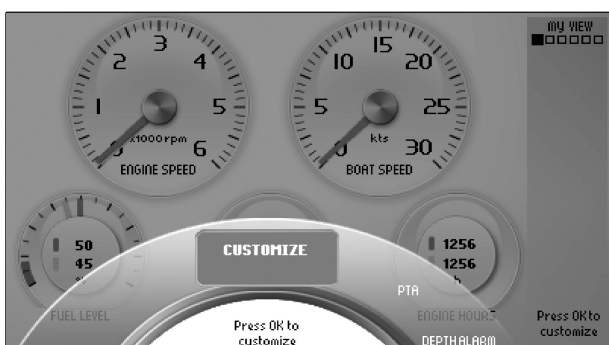
The screen has a basic setting that can always be returned to by pressing **Restore Default View** in the **Customize** menu.



P0001045

MY VIEW

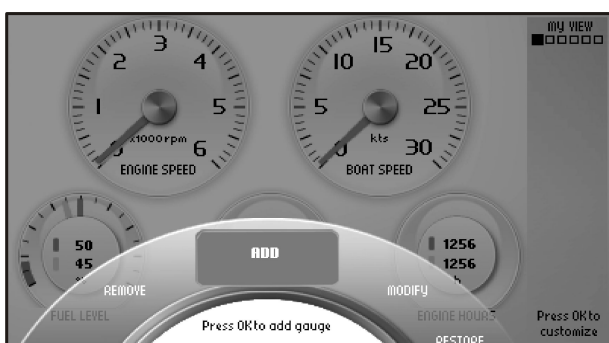
Boat, engine and transmission data are displayed in My View as analog or digital instruments. Selection of instruments to be displayed and their appearance is made under the Customize menu. Information for up to three engines can be displayed on the same screen in boats with multiple engine installations;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

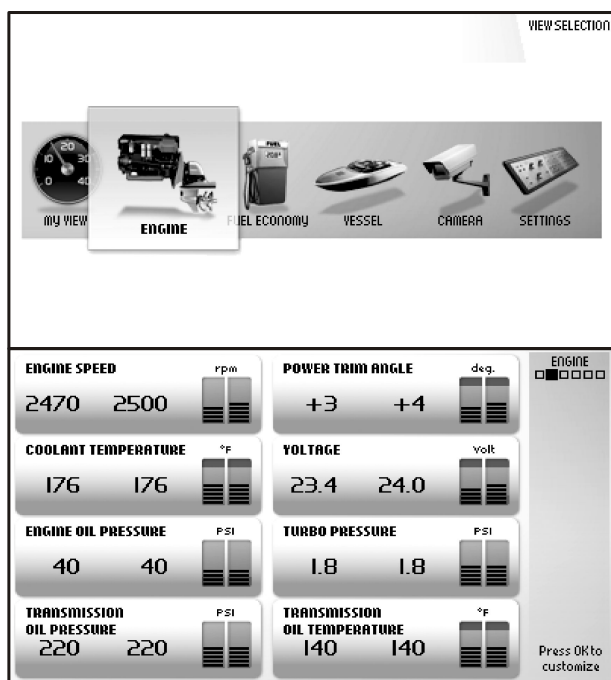
Turn the knob to **Add** and press **OK**. Select the desired information is displayed and confirm with **OK**. The new instrument will position itself at the bottom right corner.



P0001184



P0001185



P0001046

Removing Instruments

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

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

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.

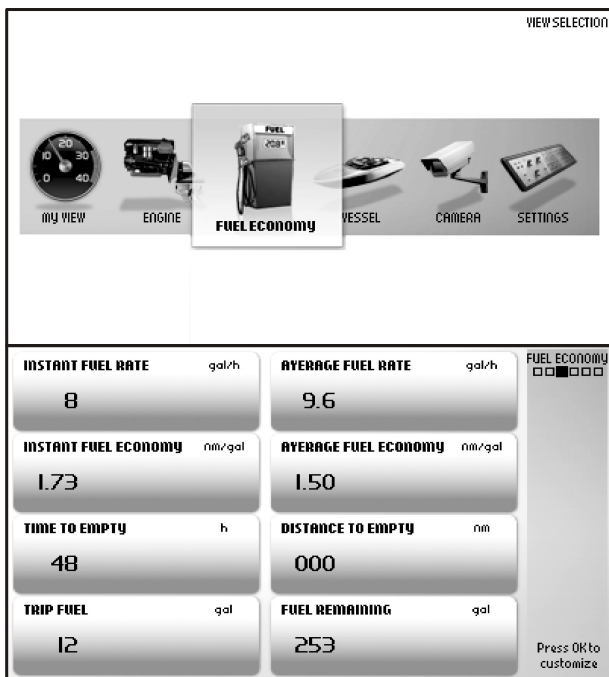
ENGINE

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 control information throughout the book and PTA Calibration in this chapter.
- Rudder Angle
- Coolant Temperature
- Voltage, battery voltage
- Engine Oil Pressure
- Engine Hours, total operating hours.

The information in this view cannot be changed.



P0001100

FUEL ECONOMY

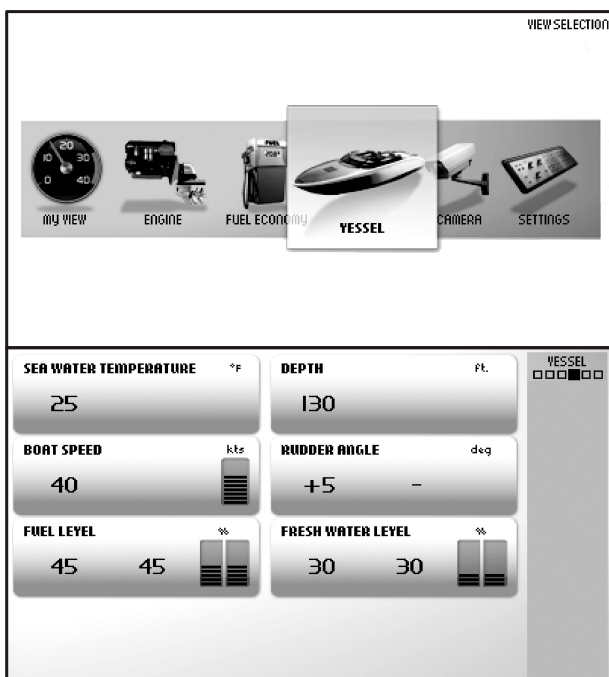
This view functions as the boat's trip computer.

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

- Instant Fuel Rate, current fuel consumption per hour.
- Average Fuel Rate, average fuel consumption since the last trip computer zero reset.
- Instant Fuel Economy, based on current fuel consumption.
- Average Fuel Economy, average since the last trip computer zero reset.
- Time to Empty, operating time with fuel remaining in the tank based on current fuel consumption.
- Distance Remaining, trip distance with fuel remaining in the tank based on current fuel consumption.
- Trip Fuel, fuel consumption since the last trip computer zero reset; refer to Pop-up earlier in this section.
- Fuel Remaining, remaining fuel in the tank.

To zero all values in the trip computer, refer to *Settings* further in this section.

The information in this view cannot be changed.



P0001099

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 (Optional) in the EVC Menu section of this chapter.
- Boat Speed
- Rudder Angle
- Fuel Level
- Fresh Water Level

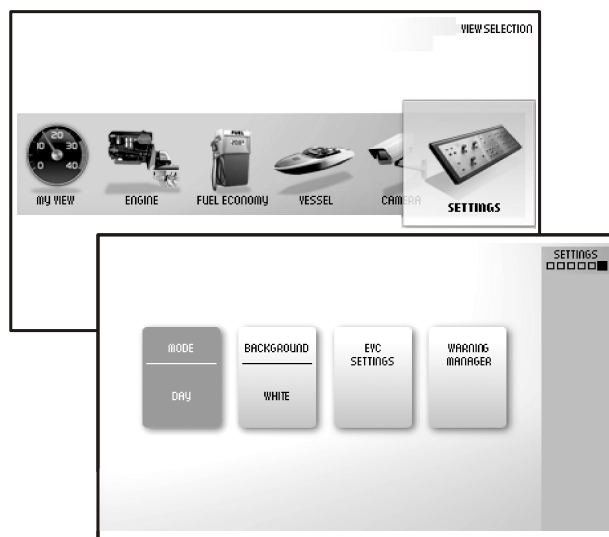
The information in this view cannot be changed.



P0001175

CAMERA

It is possible to connect a camera to the screen (e.g. for monitoring the engine compartment or swim platform). If a camera is installed, images will be displayed in this view.



P0001098

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.



P0001043

EVC Settings

Press **OK** to access the settings menu. Settings for screen, switching functions on and off, audible alarm settings, alarm limits, language and units. Information regarding boat installations is also found here.

Toe Angle, dealer and/or original equipment manufacturer setting only.

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

PTA, Power Trim Assist, allows you to turn PTA mode on or off. For additional information, please see PTA (On/Off) later in this chapter.

PTA Calibration, allows you to change PTA settings. For additional information, please see PTA Calibration later in this chapter.

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, allows you to switch between cameras if more than one is installed.

Display Type, select the engines for which operating data will be displayed and the type of installation the engines is part of.

Units, setting of units (metric/U.S.) and distance (km. Nm. or miles).

Language, selecting the screen language.

Gauge Range, setting instrument maximum display range.

Boat Speed, 10 – 100 knots, in steps of 10 knots.

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.

Calibrations, displays the options, installed for this system, that may be calibrated. Options include, but are not limited to: Power Trim, Docking, Lever, Trolling, Idle Speed, and Fuel Level Sensor.

The following features are optional additions to the system, they are only displayed if the option is installed.

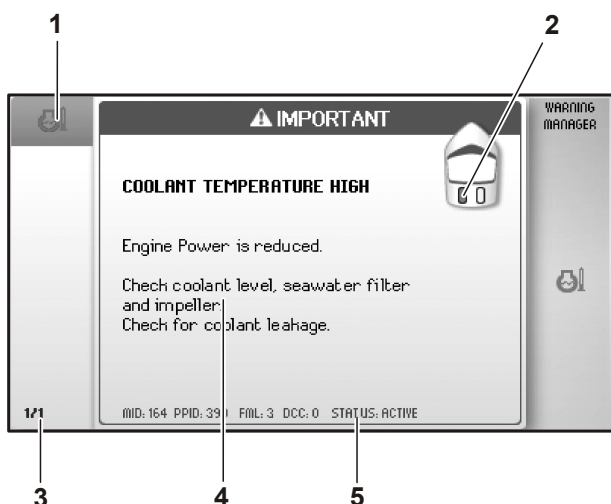
Speed Correction, setting the speed factor.

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

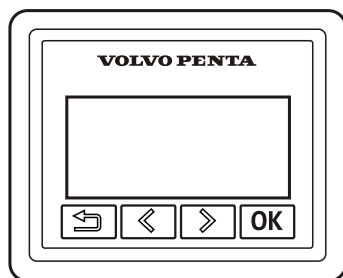
Warning Manager

If the system discovers a fault, the operator is informed by a message on the screen. The fault message must be confirmed by pressing **OK**.

All faults are stored in the Warning Manager. The fault message indicates the drivetrain affected, describes the fault and suggests suitable actions.

For further information on fault messages, refer to the chapter entitled *Fault Code Register*.

- 1 Symbol
- 2 Shows which driveline has the fault
- 3 List of registered faults, rotate the knob to browse
- 4 fault message with description and recommended action
- 5 Service information



P0001306

EVC Menu


Navigation



The Info Display Panel provides 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 information provided includes, but is not limited to:

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

Navigation of the menu system in the Info Display Panel is accomplished using the following buttons:

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.

Optional Functions

Some optional functions (items in the EVC menus described below) may appear in the display but may not be installed or they may appear grayed-out or they may not appear at all. Optional functions that are compatible with your engine and drive package may be purchased and activated at any authorized Volvo Penta dealer.

Main Menu

The main menu is the top level of information available in the Info Display window. The Settings selection is always located in the main menu. You may or may not see the Settings selection when the system is first started. The last screen displayed before engine shutdown will be the first screen displayed when the system is restarted.

If there are any faults logged with the EVC system, the faults menu will be the first to appear after the Settings menu selection. If there are no faults logged, this menu will not appear. To view any existing faults, press the **OK** button and then use the scroll buttons to navigate. Use the back button to return to the previous menu level.

Main menu screens, listed below the faults menu, may be viewed based on what has been selected in the My View menu. For additional information on how to select these items for viewing, please refer to *My View Menu* in this chapter.

Some information requires optional accessories. If the boat does not have this equipment installed, the information will not be available for viewing. The Vessel Fuel Rate screen will only be available for twin engine installations.

- | | |
|-----------------------|--|
| 1. Settings | 19. Fuel Level |
| 2. Faults | 20. Battery Voltage |
| 3. Tow (RPM) | 21. Exhaust Temp |
| 4. Depth Alarm | 22. Transmission Oil Pressure ⁽¹⁾ |
| 5. Trip Reset | 23. Transmission Oil Temp ⁽¹⁾ |
| 6. ACP Status | 24. Engine Oil Pressure |
| 7. Trip Fuel Rate | 25. Turbo Pressure ⁽¹⁾ |
| 8. Trip Fuel Economy | 26. Coolant Temp |
| 9. Trip Fuel | 27. Propeller RPM ⁽¹⁾ |
| 10. Trip Hours | 28. Engine RPM |
| 11. Trip Distance | 29. Slip Factor ⁽¹⁾ |
| 12. Time To Empty | 30. Engine Hours |
| 13. Distance To Empty | 31. Rudder Angle |
| 14. Fuel Economy | 32. Power Trim Angle |
| 15. Fuel Remaining | 33. Speed |
| 16. Vessel Fuel Rate | 34. Depth |
| 17. Fuel Rate | 35. Water Temp |
| 18. Fresh Water Level | |

1) Not used on gas engines

Viewable Options in the Main Menu

Following is a list of all informational and functional screens that may be viewed at the main menu level. Some of the functionality described below will require additional (optional) components to be installed on your boat.

- **Tow RPM** – Displays the current setting for engine speed in revolutions per minute (rpm) when using Tow Mode.
- **Depth Alarm** – Allows the depth alarm to be turned on and off. Optional Volvo Penta depth sounder (multisensor) required.
- **Trip Reset** – Allows all trip data (Trip Fuel Rate, Trip Fuel Econ, Trip Fuel, Trip Time, and Trip Distance) to be reset (zeroed out).
- **ACP Status** – Displays the status of the Active Corrosion Protection System (optional). For additional information, see *ACP* in this chapter and in the chapter entitled *Optional*.
- **Trip Fuel Rate** – Displays average fuel rate per hour since last reset (l/h, gal/h).
- **Trip Fuel Economy** – Displays fuel consumption over distance (nm/l, km/l, mile/l, nm/gal, km/gal, mile/gal). Optional multisensor or NMEA 0183/NMEA 2000 compatible component (plotter, GPS, paddle wheel, etc.) required.
- **Trip Fuel** – Displays fuel consumption, since last reset (l, gal).
- **Trip Hours** – Displays trip engine hours since last reset (h).
- **Trip Distance** – Displays trip distance since last reset (nm, km, miles). Optional multisensor or NMEA 0183/NMEA 2000 compatible component (plotter, GPS, paddle wheel, etc.) required.
- **Time To Empty** – Displays time to empty fuel tank based on instantaneous fuel rate and remaining fuel (h). Optional fuel level sender connected to EVC required.
- **Distance To Empty** – Displays distance to empty fuel tank based on instantaneous fuel rate, remaining fuel, and speed (nm, km, miles). Optional multisensor or NMEA 0183/NMEA 2000 compatible component (plotter, GPS, paddle wheel, etc.) required. Optional fuel level sender connected to EVC required.
- **Fuel Economy** – Displays instantaneous fuel rate per distance (nm/l, km/l, mile/l, nm/gal, km/gal, mile/gal). Optional multisensor or NMEA 0183/NMEA 2000 compatible component (plotter, GPS, paddle wheel, etc.) required.
- **Fuel Remaining** – Displays fuel remaining in fuel tank (l, gal). Optional fuel level sender connected to EVC required.
- **Vessel Fuel Rate** – Displays the sum of the instantaneous fuel rate per hour for twin engine installations (l/h, gal/h).
- **Fuel Rate** – Displays instantaneous fuel rate per hour (l/h, gal/h).
- **Fresh Water Level** – Displays amount of water remaining in fresh water tank (%). Optional water level sender connected to EVC required.
- **Fuel Level** – Displays amount of fuel remaining in fuel tank(s) (%). Optional fuel level sender connected to EVC required.
- **Battery Voltage** – Displays current charge in the battery or batteries (V).
- **Exhaust Temp** – Displays engine exhaust temperature (°C, °F).
- **Transmission Oil Pressure**
Not used on gas engines

- Transmission Oil Temp
Not used on gas engines
- **Engine Oil Pressure** – Displays engine oil pressure (psi, kPa).
- Turbo Pressure
Not used on gas engines
- **Coolant Temp** – Displays engine coolant temperature (°C, °F).
- Propeller RPM
Not used on gas engines
- **Engine RPM** – Displays engine speed in revolutions per minute (rpm).
- Slip Factor
Not used on gas engines
- **Engine Hours** – Displays the total number of hours the engine has been operated (h).
- **Rudder Angle** – Displays the amount the stern-drive is off center (°). Optional rudder angle sensor required.
- **Power Trim Angle** – Displays the amount of tilt, up or down, of the sterndrive (°). Also shown as a popup for two seconds while trimming.
- **Speed** – Displays boat speed over the water (knots, mph, km). Optional multisensor or NMEA 0183/NMEA 2000 compatible component (plotter, GPS, paddle wheel, etc.) required.
- **Depth** – Displays current depth of the water under the boat (ft, m). Optional Volvo Penta depth sounder (multisensor) required.
- **Water Temp** – Displays the temperature of the water surrounding the boat (°C, °F). Optional Volvo Penta water temperature sensor (multisensor) required.

Settings Menu

In the Settings menu, you may set various options and calibrate various parameters for the EVC system.

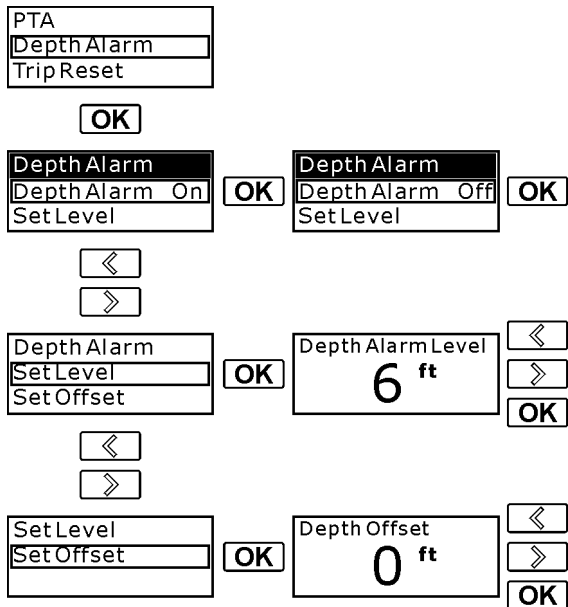
Available option include:

- My View
- Drive Type – OEM/Dealer Only
- Toe Angle – OEM/Dealer Only
- Neutral Beep
- Info Beep Level
- PTA Calibration
- Trip Reset
- Display Contr.
- Side Selection
- Units
- Language
- Log Cal. Factor
- EVC Info

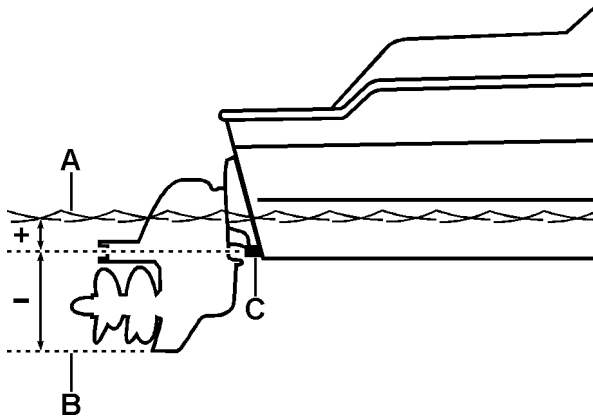
For twin engine installations always perform the settings on the port side system. Port side is the master side.

When you are in the Settings menu, navigate to a specific selection. Highlighted selections appear within a rectangular box. When you have highlighted the option you wish to modify, press the **OK** button to enter the submenu for that selection.

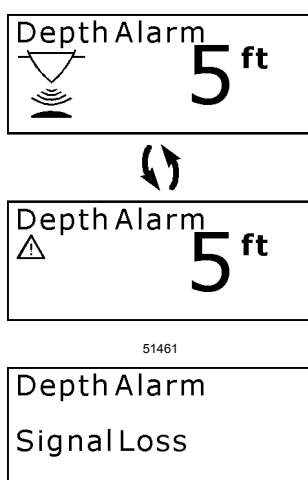
Push the BACK button to return to a previous menu level at any time.



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Depth Alarm (Optional)

If your boat is equipped with a Volvo Penta depth sounder (multisensor), you may perform the following settings. These settings need to be performed only on one display (twin installation) at one station for the settings to apply to all displays in the boat.

In the *Settings* menu, navigate to the *Depth Alarm* selection and enter by pushing the **OK** button.

Depth Alarm (On/Off) – The depth alarm function may be turned on and off.

Set Level – Adjust the depth at which you want the depth alarm to sound. Adjust the depth (in increments of ± 0.1 m or ± 1 ft) by using the arrow buttons and press **OK** when done.

Set Offset – Adjust the depth offset so it corresponds to the lowest point or the water line of the boat (depending on what depth you want to monitor). The depth sounder may be placed anywhere between these points. The depth alarm is dependent on the depth offset.

- A. Water line
- B. Lowest point
- C. Depth sounder

Adjust the depth offset (in increments of ± 0.1 m or ± 1 ft) by using the arrow buttons and press **OK** when done.

Depth Alarm Pop-up – The depth alarm pop-up will appear when the depth is less than the depth alarm set point. The pop-up shows the actual depth. The depth alarm pop-up is also accompanied by a buzzer.

Acknowledge the depth alarm by pushing the **OK** button (repeatedly if necessary).

The depth alarm pop-up will remain on screen until the depth increases and exceeds the depth alarm set point.

Depth Alarm Signal Loss – If the depth alarm is on and the depth signal is lost, for instance in the case of a sensor malfunction, the “depth alarm signal loss” pop-up will appear.

Trip Reset

The Trip Reset function (located within Settings) allows you to reset (zero out) all trip data that has been compiled and calculated. Trip data that will be reset includes trip fuel rate, trip fuel economy, trip fuel, trip time, and trip distance.

In twin engine installations, the trip reset will apply to only one engine at a time. If the Port side is selected, then the trip reset will apply to the port side engine. Similarly, if the Starboard side is selected, then the reset will apply to Starboard engine.

Once Trip Reset has been performed, the system starts compiling and calculating data all over again. Any trip information provided reflects data gathered since the last reset was performed.

My View Menu

The My View menu (located within Settings) is used to select the information that will be displayed in the main menu level of the EVC Basic Window.

Following is a list of the informational screens that may be selected in the My View menu. Use the scroll buttons to view the list of items. When an option you wish to have displayed in the main menu level is highlighted (located within the rectangular box), ensure the box next to the item is blackened.

- | | |
|---------------------|--------------------|
| • Rudder Angle | • Trip Fuel Rate |
| • Engine Hours | • Trip Distance |
| • Engine RPM | • Trip Fuel Econ |
| • Coolant Temp | • Trip Reset |
| • Battery Voltage | • Fuel Economy |
| • Fuel Rate | • Fuel Level |
| • Total Fuel Rate | • Fresh Water Lvl |
| • Fuel Remaining | • Depth |
| • Distance To Empty | • Depth Alarm |
| • Time To Empty | • Power Trim Angle |
| • Trip Time | • Speed |
| • Trip Fuel | • Water Temp |

Neutral Beep

The neutral beep, a beep that indicates that the control levers are in neutral positions, can be turned on and off.

This setting needs to be performed on each station in the boat. For twin installations: The setting only needs to be performed on either display on each station.

In the Settings menu, scroll to select Neutral Beep. Turn on and off by pressing the **OK** button.

Display Contrast

The display contrast can be adjusted in increments of 10% between 0–100%.

This setting only applies to the display in the EVC Info Display. Each display in the boat is set separately.

In the Settings menu, scroll to select Display Contrast. Press the **OK** button to enter the display contrast settings. Adjust the level of contrast by using the scroll buttons and press **OK** to set the level.

EVC Info

The EVC Info function is designed to provide information specific to the EVC system installation on your boat. This information will help your boat dealer identify the features of your EVC system and will facilitate any troubleshooting that may be necessary.

The submenus located in the EVC Info function are informational only and cannot be modified.

Units

The Units option allows you to select which units to display. **These settings need to be performed only on one display (twin installation) at one station for the settings to apply to all displays in the boat.**

In the Settings menu, scroll to select Units. Press the **OK** button to enter Units settings.

US or Metric

Press the **OK** button to enter the US or Metric menu selection. Highlight the units of your choice and confirm by pushing the **OK** button. Your choice should have a blackened box next to it for it to be activated.

Distance

Press the **OK** button to enter the Distance menu selection. Highlight the distance units of your choice and confirm by pushing the **OK** button. Your choice should have a blackened box next to it for it to be activated.

Language

The displays can show information in 10 different languages. **This setting needs to be performed only on one display (twin installation) at one station for the settings to apply to all displays in the boat.**

In the Settings menu, scroll to select Language. Press the **OK** button to enter Language settings.

Scroll to highlight the language of your choice. Press the **OK** button to activate the highlighted language. Your choice should have a blackened box next to it for it to be activated. All EVC menus will now appear in the language selected.

Info Beep

The info beep sound level for the built-in buzzer in the EVC system can be adjusted in increments of 5% between 0–100%. **This setting needs to be performed on each station. For twin installations: The setting only needs to be performed on either display on each station.**

In the Settings menu, scroll to select Info Beep Level. Press the **OK** button to enter Info Beep settings. Adjust the level of sound by using the scroll buttons, then press the **OK** button set the level.

PTA Calibration

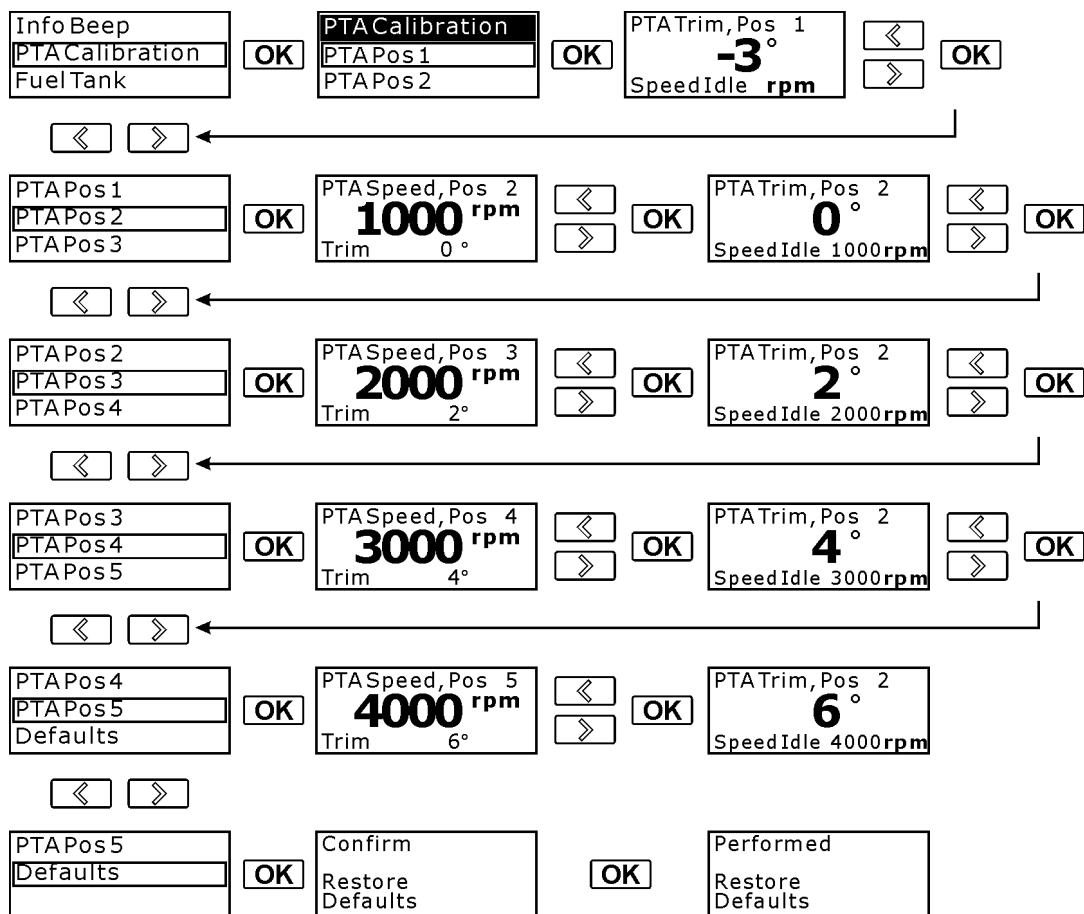
The PTA (power trim assistant) adjusts trim angle automatically according to engine speed (RPM). It is possible to set five trim angles at five different engine speeds (including idle speed).

For twin installations, the PTA CALIBRATION can be performed on either display (engine side).

1. In the Settings menu, scroll to select PTA Calibration.
2. Press the **OK** button to enter PTA Calibration settings.
3. Press the **OK** button to enter PTA Pos 1. The first position is the trim angle of the drive at idle.
4. Adjust the setting to the desired angle by using the scroll buttons, then press **OK** to confirm. Once confirmed, you will be returned to the PTA Calibration menu.
5. Scroll to highlight PTA Pos 2, then press **OK**.
6. Set the desired engine speed (RPM) for the second trim position by using the scroll buttons, then press **OK** to confirm.
7. Now adjust the drive angle for the second position. Press **OK** to confirm.
8. Repeat **Steps 5–7** for the remaining PTA positions.

You may revert to the default EVC settings for PTA Calibration by using the Restore Defaults option within the PTA Calibration menu. For additional information about trimming the drive(s), please see *Power Trim*.

These settings are for illustrative purposes only; they are not recommended settings for an actual system! Proper settings are boat specific. Check with your dealer for correct settings.



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Fuel Tank

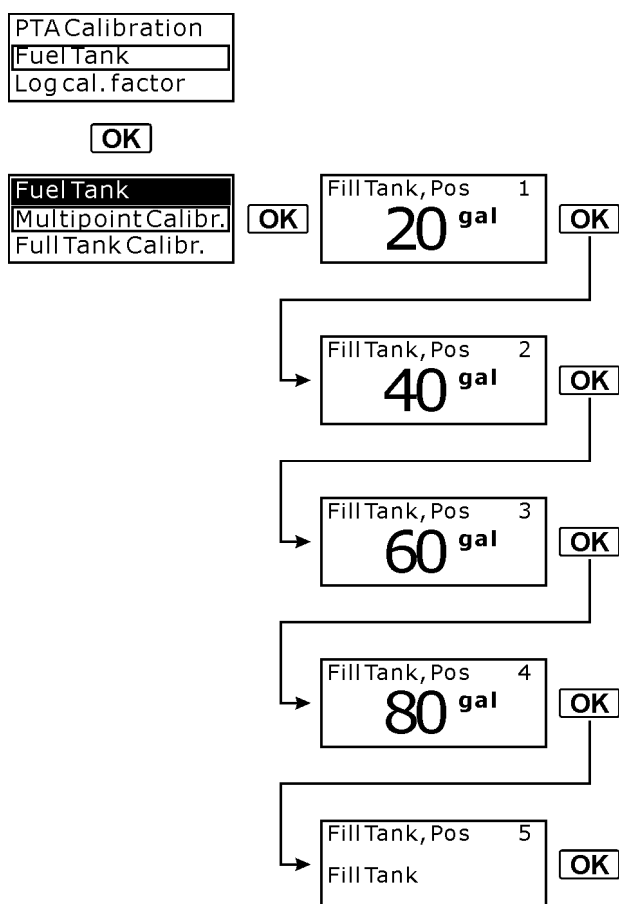
If your boat is equipped with a fuel level sensor, it will be possible to monitor fuel related data; however, you must first calibrate the fuel tank settings. There are two possible calibration methods: Multipoint Calibr. (more precise), Full Tank Calibr. (approximate).

For twin installations: There is one sender connected to port engine or one sender connected to each engine. Fuel tank calibrations need to be performed for each fuel level sender. Check both displays for fuel tank calibrations.

If the Fuel Tank menu selection does not appear in the Settings menu, you will need to take your boat to an authorized Volvo Penta dealer. The dealer must perform fuel tank capacity and fuel tank empty calibrations.

In the Settings menu, scroll to select Fuel Tank. Press the **OK** button to enter Fuel Tank settings.

These settings are for illustrative purposes only; they are not recommended settings for an actual system! Proper settings are boat specific. Check with your dealer for correct settings.



51821

Fuel Multipoint Calibration

When the more precise Multipoint Calibr. is selected, the fuel level sender is calibrated in five equally divided steps; 20% full (pos 1), 40% full (pos 2), 60% full (pos 3), 80% full (pos 4) and 100% full (pos 5).

To perform a successful multipoint calibration, we recommend that the fuel tank be empty. If it is not possible to calibrate on an empty tank, it must be LESS than 20% full. If the calibration skips POS 1 and goes directly to another position, the fuel tank contains too much fuel and the calibration will not be possible.

1. Scroll to highlight Multipoint Calibr. and press **OK** to enter.
2. Fill fuel tank with displayed volume (POS 1) and confirm by pushing the **OK** button.
3. Add fuel (do not reset the pump) up to displayed volume for each POS (and confirm in between) until the tank is filled.

PTACalibration
Fuel Tank
Log cal. factor

OK

Fuel Tank
Multipoint Calibr.
Full Tank Calibr.

OK

Multipoint Calibr.
Full Tank Calibr.

OK

Fill Tank, Pos	5
Fill Tank	

OK

51822

!
Approximated Trip Data

51692

Fuel Full Tank Calibration

When the approximate Full Tank Calibr. is selected, the fuel level sender is calibrated in one step. This only gives an approximate value of the fuel level. Therefore all trip data concerning and based on remaining fuel volume should be recognized as approximate values only.

1. Scroll to select Full Tank Calibr. and press **OK** to enter.
2. Fill the fuel tank and confirm by pushing **OK**.

Approximated Trip Data

If the fuel Full Tank Calibr. is performed instead of the fuel Multipoint Calibr., this pop-up will appear once every drive cycle when viewing trip data.

Log Cal. Factor

If your boat is equipped with a Volvo Penta speed sensor (multisensor), this setting needs to be performed.

The log calibration (speed) factor for the boat's paddle wheel speed sensor can be adjusted with a resolution of $\pm 1\%$ (from -100% to $+100\%$) to apply a correction to the output from the speed sensor.

Set the speed factor while driving the boat. Compare the displayed speed with speed data from the GPS (or another boat) and adjust the speed factor until they correspond.

This setting needs to be performed only on one display (twin installation) at one station for the settings to apply to all displays in the boat.

Fuel Tank
Log cal. factor

OK

Log cal. factor
-2 %



Log cal. factor
11 %

OK

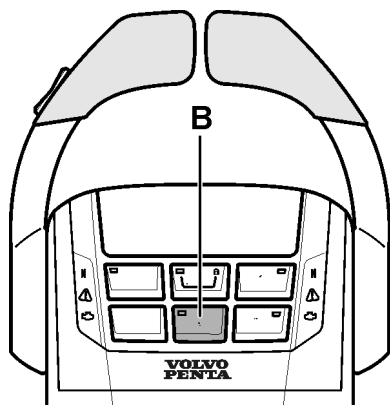
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1. Scroll to select Log cal. factor and press to enter.
2. Adjust the level (in steps of $\pm 1\%$) by pressing the scroll burrons and press **OK** to confirm setting.

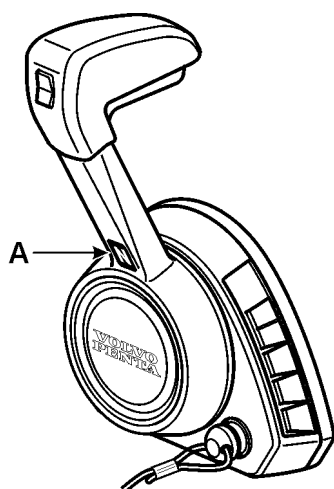
Throttle Only

The gear shift can be disengaged so that the control lever affects only the engine speed. To activate this feature, move the control lever to the neutral position.

For top mount controls, press and release the Throttle Only button **B**.



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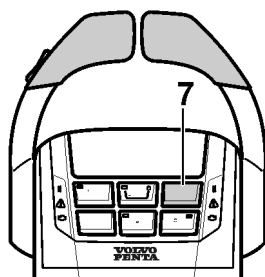
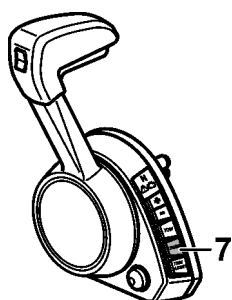
For a side mount control, press and release the Throttle Only button **A**.

The EVC system will indicate that throttle only mode is engaged with one beep.

The 7" color display will show a message confirming that throttle only mode has been turned on.

Move the lever past the Shift (Forward) position to access the throttle function.

To return to normal control operation, press the Throttle Only button again. The system will sound two beeps to indicate Throttle Only has been turned off.



P0016617

Cruise Control

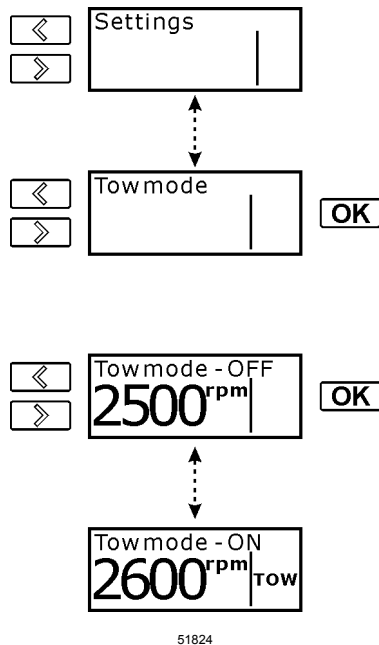
Pressing the Cruise Control button **7** allows you to turn cruise control on or off. Pressing the button the first time turns cruise control on (1 beep, light on). Pressing the button a second a time turns the system off (2 beeps, light off).

Tow Mode

Tow mode is a simple speed (engine RPM) control function that helps maintain a steady acceleration and a constant velocity when wake boarding or water skiing.

NOTICE! Tow Mode is only applicable for single engine installations with a single helm.

NOTICE! Tow Mode cannot be used via the 7" Color Display.



1. Move the control lever to the neutral position.
2. Navigate to the upper level EVC menu. At this level, navigate until you locate the **Tow mode** screen.
3. To enter the tow mode function, press the **OK** button.
4. To activate tow mode, press **OK**. The screen display will change from **Off** to **On**. Tow mode is now engaged.

You may set the speed to your desired maximum engine RPMs. When you move the control lever to full throttle, the boat will steadily accelerate to your desired maximum speed and maintain a constant velocity. You may make minor adjustments (in 50 RPM increments) by pressing the left < and right > arrows.

4. To deactivate tow mode, simply return the control lever to neutral, then press **OK**. The screen display will change from **On** to **Off**.

NOTICE! If at any time Tow Mode appears to be functioning irregularly, it may be reset by shutting off the engine. Upon engine restart, Tow Mode will have been reset. If any problems persist, please contact an authorized Volvo Penta dealer.

Power Trim

Power Trim

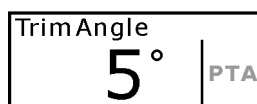
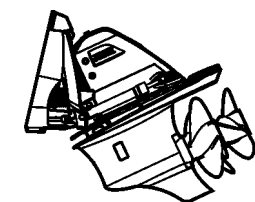
Power trim in an EVC installation is operated from the main or secondary station using the power trim buttons on the power trim panel or on the control lever(s). The position of the drive is shown on the trim instrument (digital or analog) or in the display(s).

NOTICE! Avoid running the boat with the drive in a high trim/tilt position. Steering will be negatively affected.

NOTICE! Do not run the engine above idle speed while the drive is in tilt range.

Power Trim Override Mode

If the drive is tilted to maximum trim range (+30°) and you wish to raise it further (i.e. for beaching purposes or in extremely shallow water), you may do so by holding the trim up/out button for over 5 seconds. The system will display a message informing you that you may override power trim limits. Continuing to hold the trim up/out button will raise the drive beyond the limits set by the boat manufacturer. The system will display a

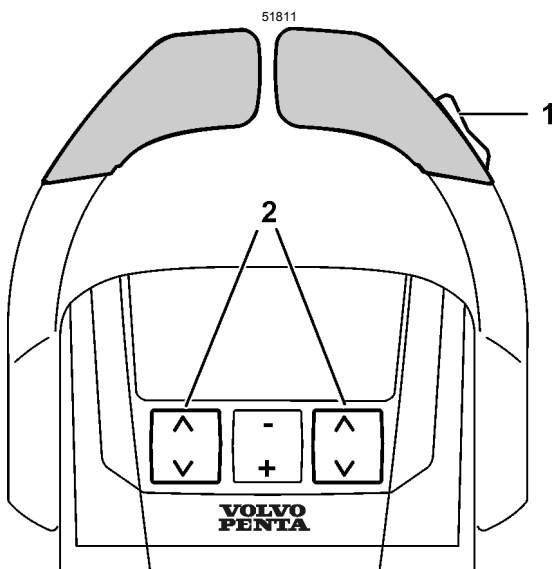
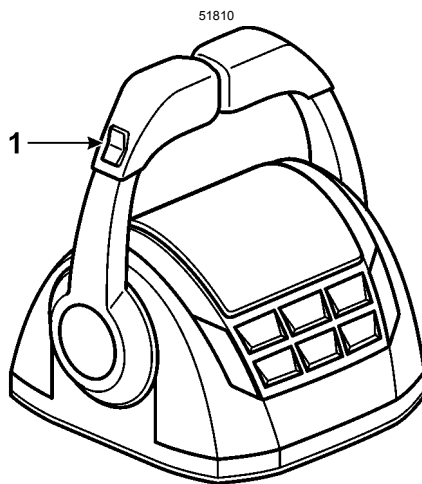
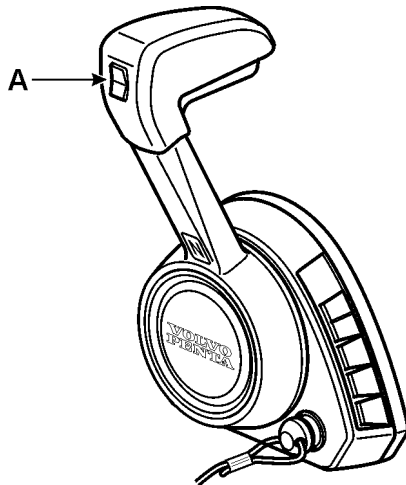


P0016532

message informing you that trim override has been activated. You may continue raising the drive until you have reached the mechanical limit.

NOTICE! If your transom shield/drive package is not mechanically limited, when applying power trim override mode, use extreme caution while raising the drive as there is a possibility of pushing the drive into the swim platform.

NOTICE! Do not run engine above idle speed when overriding trim limits set by your boat manufacturer as it will cause damage to the U-Joint and engine.



P0016559

Power Trim Buttons

The buttons on the power trim control panel are used for both single and twin engine installations.

By trimming out the drive away from the transom, the height of the bow will be “raised” in relation to the horizontal axis, while trimming in the drive will “lower” the bow of the boat.

In single engine installations, the drive can be trimmed by pressing button **A**.

For twin engine installations, the power trim buttons can be used to trim the drives individually or simultaneously.

In twin engine installations, both drives can be trimmed simultaneously by pressing button **1**. Alternatively, you may trim drives individually by pressing starboard or port button **2**.

Trimming out the Drive

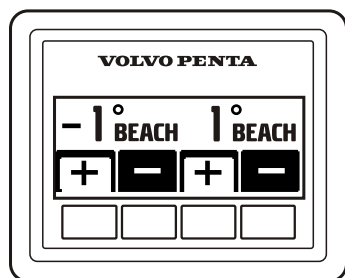
Press the upper portion of button **1** or **A** on the control lever to raise the bow of the boat (drive trimmed up or out).

The drives on a twin installation can be individually trimmed up or out by pressing the lower portion of starboard or port button **2** on the front of the control.

Trimming in the Drive

Press the lower portion of button **1** or **A** on the control lever to lower the bow of the boat (drive trimmed down or in).

The drives on a twin installation can be individually trimmed down or in by pressing the upper portion of starboard or port button **2** on the front of the control.



P0001189

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 power trim panel may 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.

The + button will trim the drive away from the transom (i.e., the bow will be "raised" in relation to the horizontal axis).

The - button will trim the drive in towards the transom (i.e., "lower" the bow of the boat).

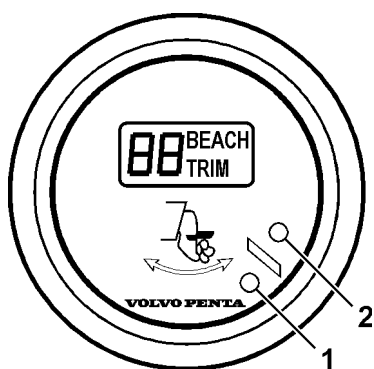
For further information on power trim, please refer to *Power Trim, Trim Ranges, Power Trim Instruments and Displays, Power Trim Assistant, and Emergency Trimming* in this chapter.

Power Trim Instrument and Displays

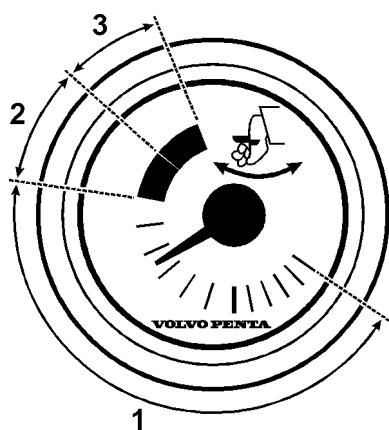
Digital Instrument

The digital instrument shows the trim angle in digits and the trim range (TRIM) and beach range (BEACH) in letters. When in beach range the LED 1 lights orange. When in tilt range, the LED 2 lights red (no letters are displayed).

When the system is first started, the digits read "88" and both words "TRIM" and "BEACH" are displayed.



51279a



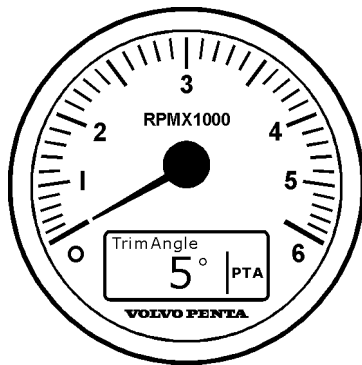
50897

Analog Instrument

This instrument shows the current position of the drive.

Beach range is marked with an orange zone and Tilt range with a red zone.

1. Trim range
2. Beach range (orange).
3. Tilt range (red).



51274j

Tachometer LCD Display

The trim angle may also be viewed in the LCD display of the tachometer (if installed). For additional information, please see *EVC System Display*.

Power Trim Assistant

The power trim assistant (PTA) automatically adjusts the trim angle according to engine speed (RPM).

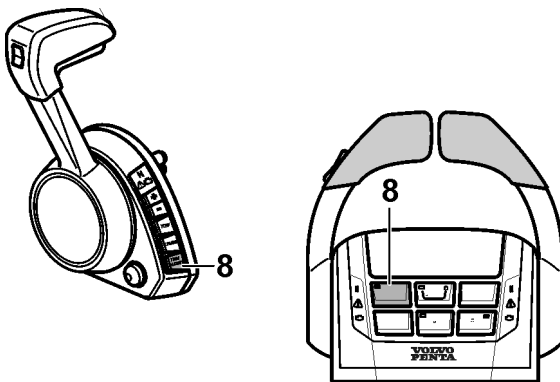
The PTA is turned on and off in the SETTINGS menu or in the main menu level if the option has been selected for viewing at that level.

PTA is activated by pressing the **Trim Assist** button **8** on the control. Press the button again to deactivate PTA.

It is possible to change the power trim assistant default settings by performing a power trim calibration. For additional information, please see *PTA Calibration* in the section *EVC Menu*.

PTA will not move the drive if it is manually trimmed above 7°.

NOTICE! If the boat is 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(s) if any test runs are performed while the boat is on land.

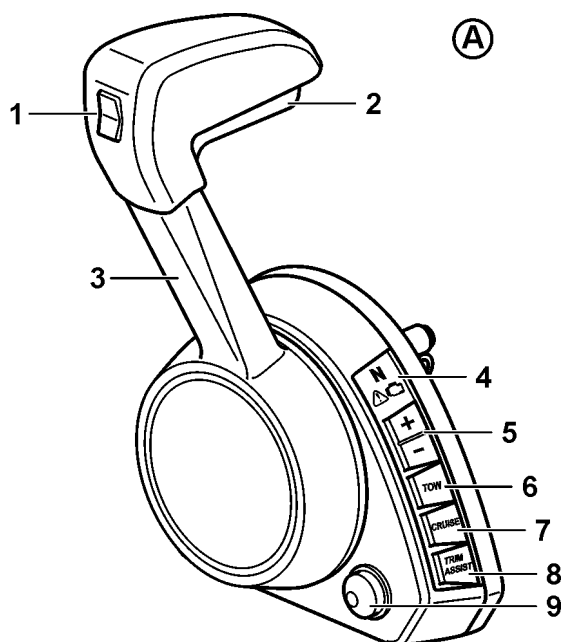


P0016533

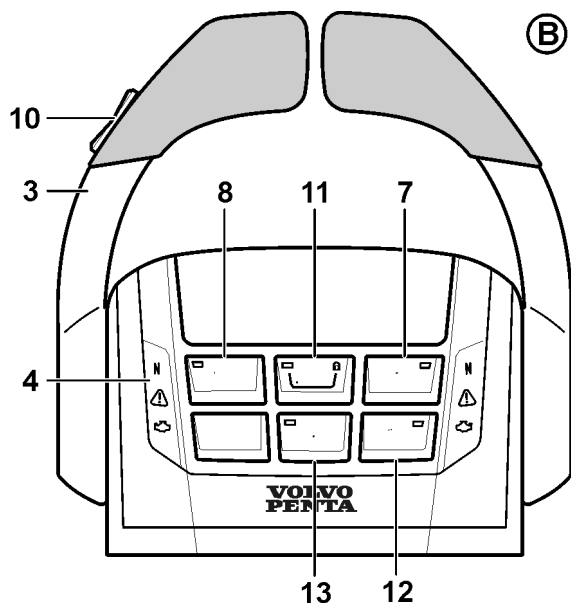
Controls

Volvo Penta controls are available in single side-mount **A**, single top-mount (not shown), or twin top-mount **B** configurations. The control levers have an adjustable friction brake and a neutral position switch to ensure that the engine cannot be started when the drive is in gear.

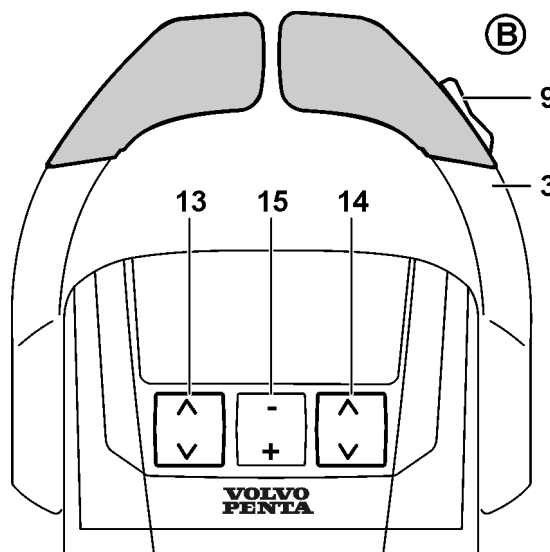
Your boat may be equipped with remote controls other than those described below. If Volvo Penta controls are not used, ask your dealer for operating instructions for the remote control used in your boat since operation and function may differ from Volvo Penta remote controls.



51812



51813



51814

1. Power Trim Adjust
2. Neutral Interlock
3. Engine Throttle Control Lever
4. Status Indication Lights
5. Tow/Cruise Control Adjust
6. Tow Mode (On/Off)
7. Cruise Control (On/Off)
8. Power Trim Assist (On/Off)

9. Safety Lanyard/Emergency Stop Switch
10. Power Trim Adjust
11. Station Activation (On/Off/Lock)
12. Single Lever Mode (On/Off)
13. Throttle Only Mode (On/Off)
14. Power Trim Adjust – Starboard
15. Power Trim Adjust – Port
16. Cruise Control – Speed Adjustment

Friction Brake

Generally, the remote control has a friction brake, which can be adjusted as necessary, to provide lighter or heavier lever action. If you are using a Volvo Penta remote control and you wish to make adjustments to the friction brake, follow the instructions below to make the necessary changes.

NOTICE! Each manufacturer has a particular method for making adjustments to the friction brake. For specific directions on how to adjust a non-Volvo Penta friction brake, please refer to your manufacturer's manual.

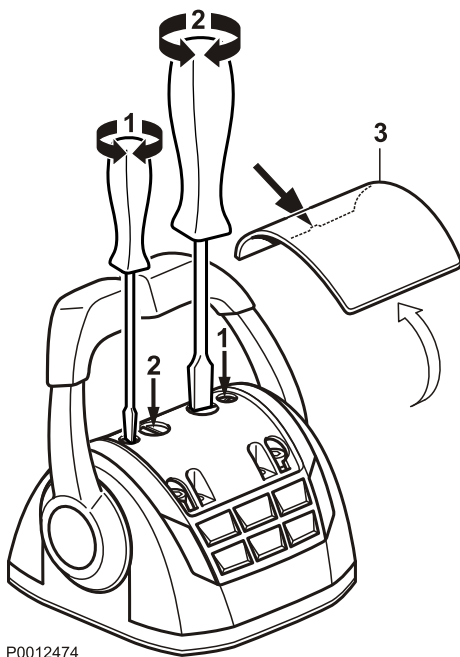
Side Mount Remote Controls

The procedure for adjusting the friction brake on side mount remote controls is complex and time-consuming. If you need to have the friction adjusted on your side mount remote control, please visit a Volvo Penta authorized dealer.

Top Mount Remote Controls

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

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. Reinstall the cover.



P0012474

Steering System

Electronic Steering Control Unit

Each engine uses a hydraulic valve body and a steering control unit to control the movement of the drive during steering. Both devices are contained in a black housing **A** mounted somewhere in the engine compartment.

When you first turn the ignition key to START (key on, engine off), you may hear clicking noises coming from the engine compartment. This is a sound that is emitted by the hydraulic system when it is functioning normally.



51663

Joystick

The Volvo Penta Joystick is a control used for docking and maneuvering at low speed.

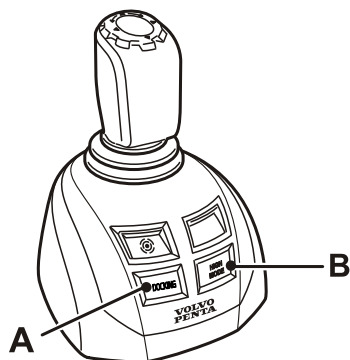
Learn to use the joystick and its functions in open areas before beginning to use the function in crowded marinas.

See *Maneuvering with the Joystick* in the chapter *Operation*.

Only buttons A and B are used on sterndrive applications;

A — Docking

B — High Mode



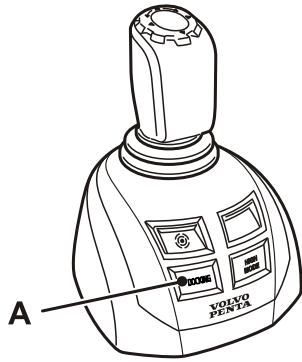
P0012510

Docking

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

In order to activate the docking function, all of the following conditions must be met;

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



P0012509

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.

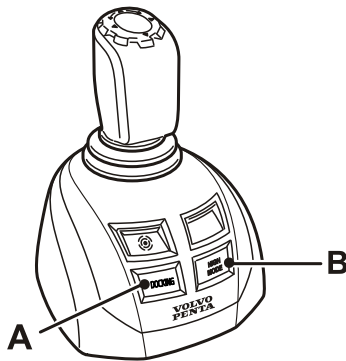
High Mode

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

Activate High Mode

Make sure Docking is engaged, button A should be lit. Activate the High Mode function by depressing button (B) on the joy stick.

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.

Optional

Autopilot

Volvo Penta Autopilot consists of a compass unit and a 4" control panel. The autopilot continuously adjusts the boat's steering so that it maintains a steady heading. Several different steering patterns can be entered and the autopilot also permits manual steering.

Read the instructions carefully and learn to operate the autopilot on calm and hazard-free open water.

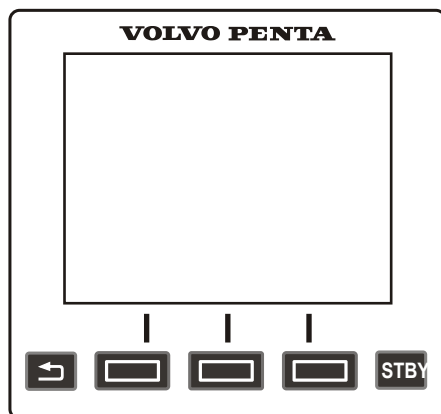
The operator is responsible for the safe and prudent operation of the boat. Avoid navigational hazards and never leave the helm unattended. Always be prepared to promptly regain manual control of the boat.


When the ignition is switched on, the autopilot will start and assume standby mode. The screen will show the main menu or the last selected option from the main menu.


When the autopilot is active, it steers the boat to maintain heading. However, the steering wheel may always be used to change the heading of the boat or to avoid obstacles. The autopilot will then assume standby mode by default and must be manually reactivated.


If the **Shadow Drive** function is activated in the *Settings* menu the autopilot will automatically be reengage when the boat has held a steady heading for a few seconds. When Shadow Drive is activated, an icon will be shown in the upper right corner of the screen.

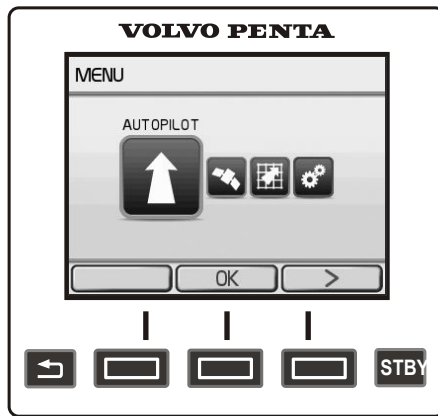
Menus and settings are controlled by the panel buttons.



 – Back to previous menu. Hold down the button to go to the Autopilot menu.

 – Button functions are shown on the display.

 – Sets the autopilot in standby mode. A red arrow in the top right corner of the display will flash for five seconds.



P0015539

Main Menu

- Autopilot
- GPS Steering
- Pattern Steering
- Settings



Autopilot

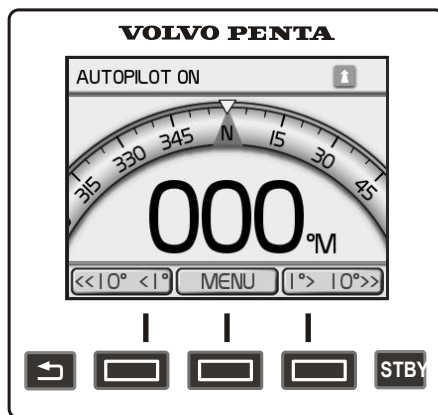
The upper part of the display shows the status of the autopilot; active or in standby mode. A green arrow in the upper right corner confirms activation. If the autopilot is set to standby mode, the arrow turns red and flashes for five seconds.

The display shows the heading with a digital value and an indicator in the shape of a blue triangle.

ENGAGE – Activate the autopilot.

MENU – Goes back to the main menu.

ROUTE – Activates the autopilot to follow the route from the chart plotter. This option is only shown if a GPS unit is connected and a chart plotter is transmitting an active route or waypoint. The display shows the distance to next waypoint in the set route. Refer to *GPS Steering* for more information and settings.

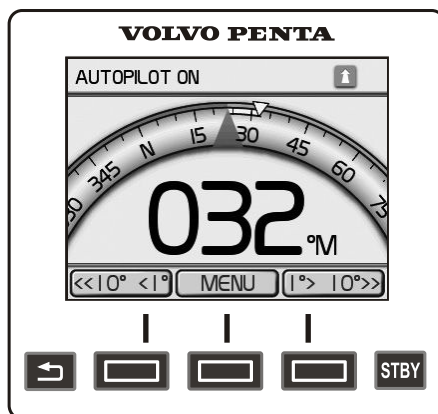


P0015351

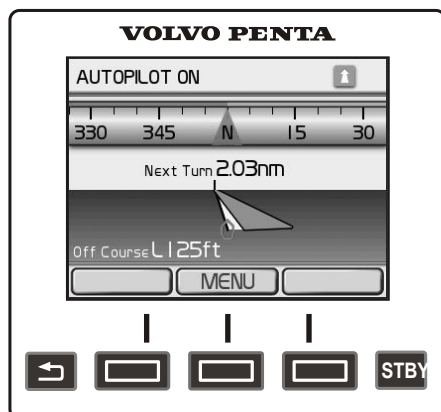
Setting a heading

The boat's heading is changed with the arrow buttons **<<10° <1° 1° >10°>>**. One click on the button changes the heading 1° at a time; if the button is held down the heading is changed in larger steps. A yellow arrow shows the new heading that the boat will be set to. Step turn size can be adjusted in the *Settings* menu.

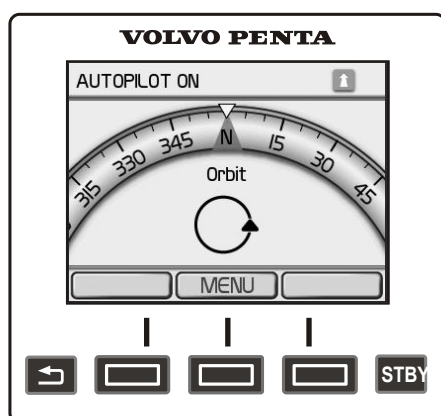
NOTICE! The heading shown by the autopilot may deviate slightly from the heading displayed in a GPS/plotter. The autopilot displays the line the boat head, i.e. it does not account for influence by wind or stream. The plotter shows the course over ground, which is why the heading shown may differ.



P0015791



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P0015808



GPS Steering

For the GPS Steering menu to be enabled a chart plotter must be connected. A route with one or several waypoints can be set in the chart plotter and used by the autopilot.

Different steering patterns can also be set from an active waypoint.



Route to

- 1 Create a route with one or several waypoints in the boat's chart plotter; refer to the manual of the chart plotter for settings.
- 2 Press **Route to** to make the autopilot begin steering the boat along the marked route. The distance to next waypoint is shown on the display. If the autopilot has been set in standby mode, pressing **ROUTE** will enable the autopilot to resume the route.

NOTICE! 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 activating a pattern in the autopilot a waypoint has to be set in the chart plotter; the pattern will center around this waypoint. The display will show the selected pattern, direction and other settings.

The pattern steering is deactivated if the heading is changed by the steering wheel or the buttons on the autopilot. It must then be manually reactivated.



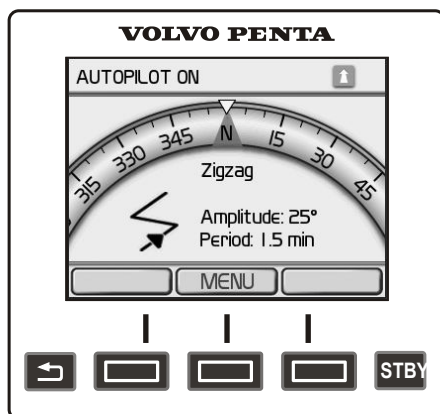
Orbit – The boat is steered on a circular course with the active waypoint in center. The radius of the circle depends on the distance to the waypoint when the pattern is activated. Set the direction of the orbit; port or starboard.



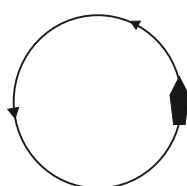
Cloverleaf – The boat is steered to the active waypoint and then follows a cloverleaf pattern with the waypoint as the central marker. Set the direction of the pattern; port or starboard. The size of the cloverleaf (from the waypoint to the outer turning points) can be adjusted in *Settings > Cloverleaf,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



Search – The boat is steered to the active waypoint and then follows a spiral pattern outward from the waypoint. Set direction of pattern; port or starboard. Spacing of the spiral can be adjusted in the *Settings menu > Search spacing*; default is 20 m (50 ft).



P0015809



P0016494

Circle pattern



Pattern Steering

The autopilot can be set to follow a certain pattern even without a GPS unit connected. The display shows the selected pattern and its settings.

The pattern steering is deactivated if the course is changed by the steering wheel or the buttons on the autopilot. It must then be manually reactivated.



Zigzag – The boat is steered in a zigzag pattern along its heading. Set the angle of the pattern and the period of the pattern.



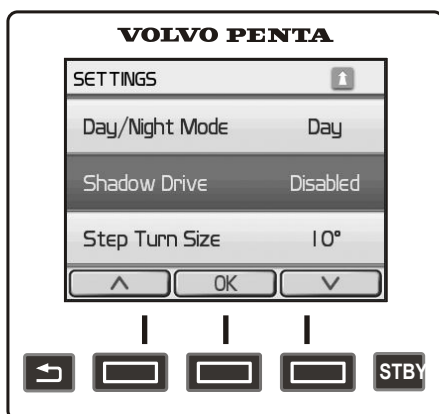
Circles – The boat is steered in a circular pattern based on its position when the pattern is activated. Set direction of the pattern; port or starboard, and the desired time it takes to complete a circle.



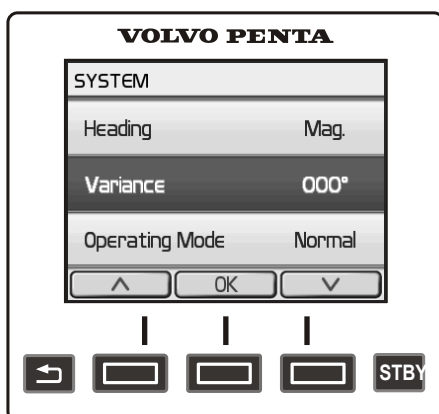
U-Turn – The boat turns 180° and maintains the new course. Set the direction of the turn; port or starboard.



Man Overboard (MOB) – Turns the boat around with the intent of running alongside the location where the man overboard pattern was initiated. The boat must be under planning speed to be able to activate the pattern. Set direction of the turn; port or starboard.



P0015793



P0015823



Settings

Day/Night Mode

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

Shadow Drive

Enable/disable the *Shadow Drive* function. When *Shadow Drive* is activated, an icon is shown in the upper right corner of the display.

If this function is enabled, the autopilot will temporarily enter standby mode when the steering wheel is used. Once the boat has a steady heading for a few seconds, the autopilot is automatically reengaged.

NOTICE! When Shadow Drive is disabled, the autopilot will not automatically be reengage after the heading of the boat has been adjusted. The autopilot will need to be manually reactivated.

Step turn Size

Set the specified degrees the heading is changed when the arrow button is held down.

Dealer autopilot setup

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

System

Heading

Set the reference used in calculating heading information.

Magnetic – calculates the heading based on magnetic north.

True – calculates the heading based on true north.

Variance

Set the variance from true north. Variance is available only when the heading is set to True.

Auto – automatically determines the ideal variance setting

User – variance setting is entered manually

Operating Mode

Set the display for normal operations or demonstration mode.

Factory Reset

Revert to the factory settings and reset the autopilot calibration.

NMEA 2000 Devices

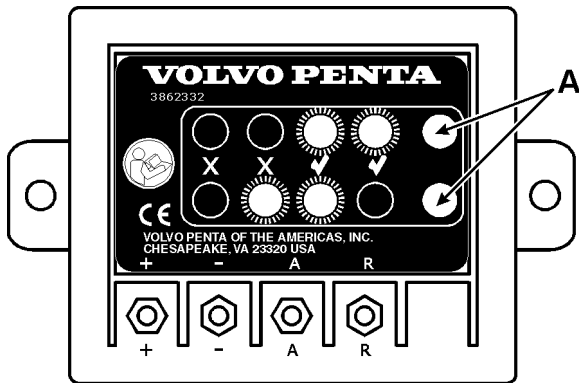
List of connected NMEA 2000 units.

ACP

Active Corrosion Protection System

Your boat may be equipped with a Volvo Penta active corrosion protection system (APCS). This system operates with very little current drain from the boat's electrical system. It keeps the voltage potential in the area around the drive unit in a range that is not corrosive to aluminum. If you do not have an active corrosion protection system already installed, you may purchase one from your authorized Volvo Penta dealer.

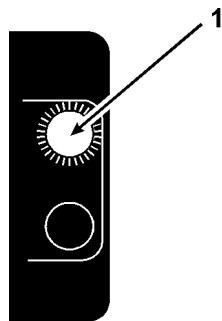
NOTICE! ACPS is designed for salt water applications only; using the system in fresh water—while harmless—will not protect your sterndrive from corrosion.



22251

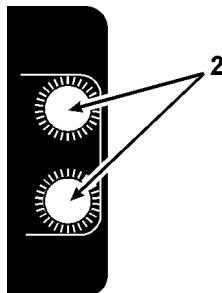
The protection system's control box has both red and green LED indicator lights **A**. The lights will indicate the amount of protection that the unit is providing to protect the sterndrive and transom shield.

NOTICE! The active corrosion protection system is designed to adequately protect one drive unit from galvanic corrosion under normal operating conditions. This system will not provide protection from stray currents emitted by a malfunctioning AC power source on your boat, the pier, or other boats in close proximity to yours. Although the sacrificial anodes will last much longer with this system, they must still be cleaned and checked for material condition periodically.



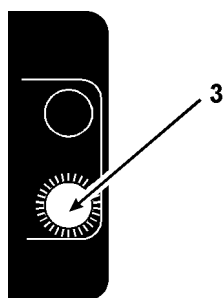
22863-1

1. The green LED **1** indicates the unit is adequately protected.



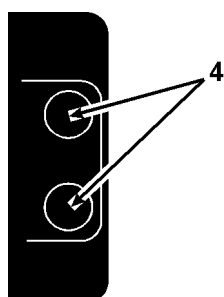
22863-2

2. If the green and red LEDs **2** are illuminated, the drive is protected but the system is drawing power (between 3 to 150 mA) to protect the drive unit. Check the conditions and solutions listed below.



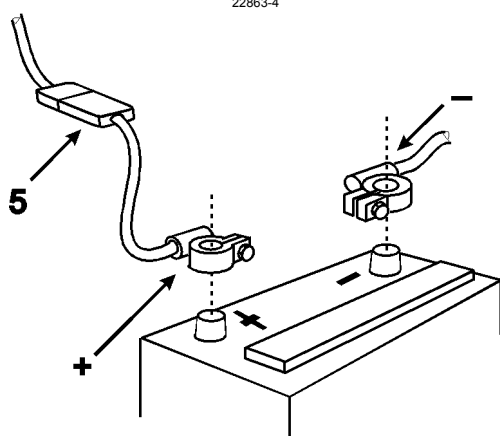
22863-3

3. If only the red LED **3** is illuminated, the drive is not adequately protected and may have one of the following conditions:
- Water too severely contaminated or polluted. Install additional anode on the transom and bond to the grounding system.
 - Too much unpainted metal on the drive or transom shield. Clean and paint exposed metal on drive and transom shield. Please see the section entitled *Painting the Drive* and/or refer to the drive *Workshop Manual* for paint repair procedures.
 - Corroded, missing, or painted anodes. Service or replace anode as required.
 - Stray current from shore power or surrounding boats. Disconnect shore power, wait 8 hours and recheck. If still present, temporarily relocate boat to another area away from the marina and check again.
 - Loose or corroded terminals on the electronic unit or battery. Clean and tighten connectors.
 - Copper bottom paint used and is in contact with the transom shield. Remove paint and ensure there is a 25mm (1 in.) border between transom shield and bottom paint.



22863-4

4. If no LEDs are illuminated **4**, the unit is not receiving power. Check the following conditions:
- Dead battery. Check battery condition and charge as necessary.
 - Loose connection or corroded terminals on the electronic control unit or battery. Clean and tighten the connectors.
 - Blown fuse. Replace defective fuse. The fuse **5** is located near the battery connectors.
 - Broken anode or reference sensor unit. Replace damaged unit. Follow the installation instructions included with the replacement unit, or see your authorized Volvo Penta dealer for service.



22826

If any of the malfunction conditions continue to exist after completing the steps above, see your authorized Volvo Penta dealer for further service.

Starting

The information in *Static Water Line* that follows should be considered before starting your engine(s). This is especially important if weight has been added to the boat, see the details below.

Static Water Line

Static water line is a measurement of the water level in the boat engine's exhaust system. The exhaust passages of a sterndrive propulsion system are open to the water surrounding the boat **A**. When the engine is not running, the water level in the exhaust system will settle at the same level as the surrounding water **B**. If this water level is too high, water will enter the engine through the exhaust manifolds; this is called water ingestion.

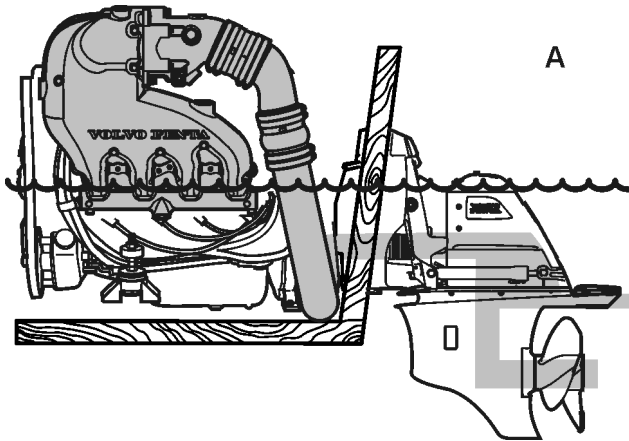
The static water line should be correct when you purchase a new boat. Your boat was designed and constructed so that, under normal load and use conditions, the water level would not be high enough for water to enter the engine. This is accomplished with exhaust riser height and the height of the engine in the hull. If you add weight to your boat, the boat and engine exhaust will sit lower in the water. This raises the water level in the exhaust. If you add too much weight, the water level will be high enough to allow water ingestion.

NOTICE! Water ingestion damage from over-loading is not covered by warranty.

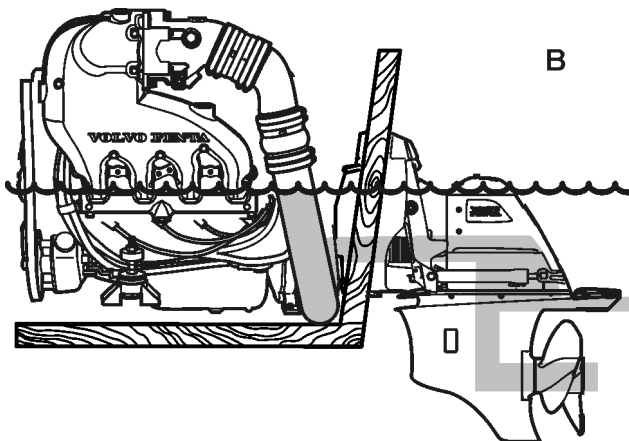
Consider the static water line of your boat before adding equipment such as generators, appliances, coolers and other heavy items. Do not store un-needed gear on your boat. Overloading with passengers also causes problems with the static water line. Load distribution, especially when concentrated in the stern of the boat, can raise the static water line.

NOTICE! Never exceed the weight limit posted by the boat manufacturer. Never overload the stern of the boat as this may cause the engine to be lowered below the minimum safe static water line height.

If you have added weight to your boat and suspect there may be problems with the static water line, perform the following test before operating the boat.



51844a

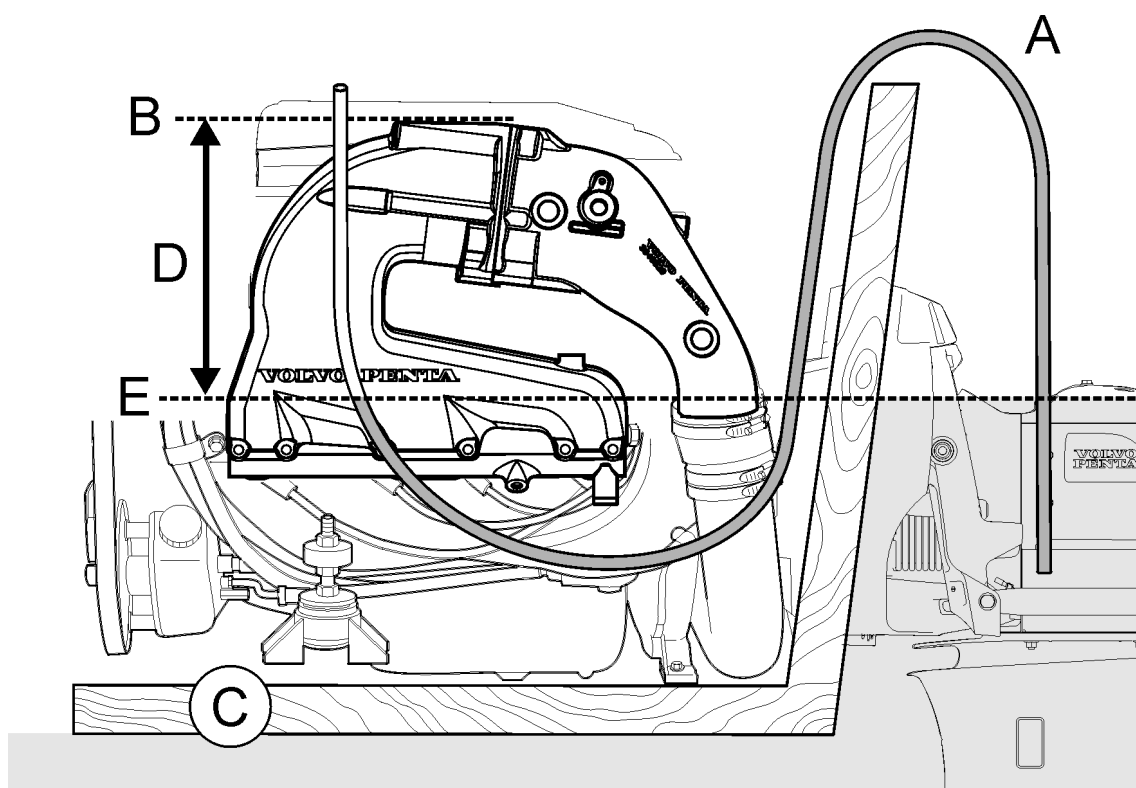


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Static Water Line Test

Static water line is the difference between sea water level **E** and top of the riser **B** on the engine.

1. Load the boat to maximum capacity and distribute weight as you would for normal boating conditions.
2. Lower a clear plastic hose **A** into the water and, once it is full of water, plug the top of the hose using your thumb or a plug.
3. Bring plugged end of hose inside the hull **C** and hold next to—and above—the manifold **B**.
4. Unplug the end of the hose and slowly allow water to drain down until it has maintained a stable level.
5. Measure the vertical distance **D** from water line **E** in hose to the top of manifold **B**. Measurement **D** should be 13 in. (33 cm) or greater.
6. If the static water line does not meet these specifications, contact your Volvo Penta dealer for information on high rise extension kits. Make sure one is installed before the engine is started for the first time.



P0016274

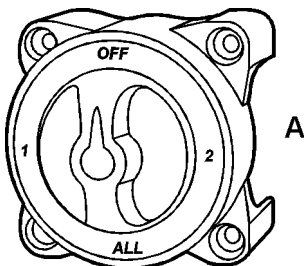
Before Starting

Before you attempt to start your engine, be sure to perform the inspection items provided in the daily checklist located in the chapter entitled *Maintenance Schedule*.

WARNING!

To prevent a possible explosion hazard, operate the engine compartment bilge blower as recommended by the boat manufacturer before starting the engine. Do not operate the engine without a fully functioning bilge blower.

- To prevent a possible explosion or fire, check the engine and engine compartment before starting the boat and after operating the boat. Also, smell for the presence of gasoline fumes.
- 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 from the area. Please see *Carbon Monoxide* in the section entitled *Safety Information* for additional details.
- Do not start the engine out of the water unless you have connected a hose with running water to the engine flushing port (see *Engine Flush* in the section entitled *After Engine Shutdown* for instructions).
- Never use start spray or similar agents to start an engine. This may cause an explosion in the inlet manifold.
- Thoroughly familiarize yourself with operation of remote control supplied with your boat before proceeding.



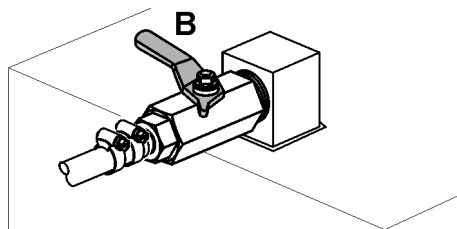
51421

1. Turn main battery switch **A** to start battery.

If your boat is equipped with multiple batteries and a selector switch, after starting, the engine should be operated with the selector switch set to the ALL position. This will provide charging system output to all batteries.

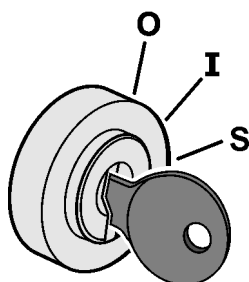
2. Start the boat's bilge blower and run as recommended by the boat manufacturer. Frequently check boat's bilge area for gasoline fumes.
3. Check the bilge for excessive water accumulation. Always keep the bilge clean and dry.

NOTICE! While the boat is at an angle before coming on plane, any water in the bilge will move to the stern, possibly damaging the starter or other engine components.



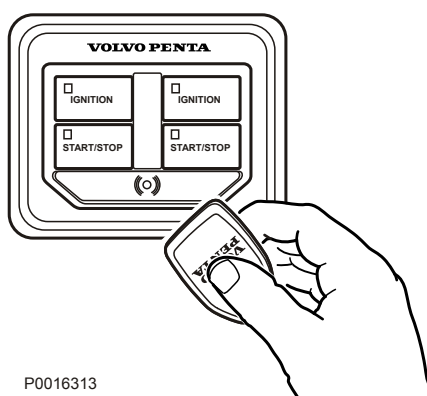
P0008712

4. Open the fuel cock **B**.
Also, ensure that the sea cock is open—if so equipped.



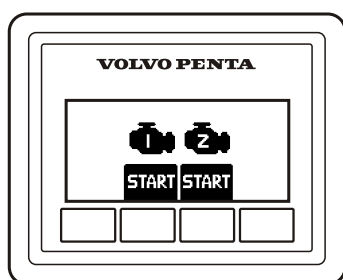
P0016543

5. Check the engine oil level.
6. If your engine is equipped with a freshwater system, check the freshwater coolant (anti-freeze) level.
- 7a. Insert the key into the ignition switch **O**. Turn the key one step to the right **I** to switch on engine system voltage and instrumentation.



P0016313

- 7b. For e-Key, unlock the system.
The Ignition should be on. If not press the Ignition button.

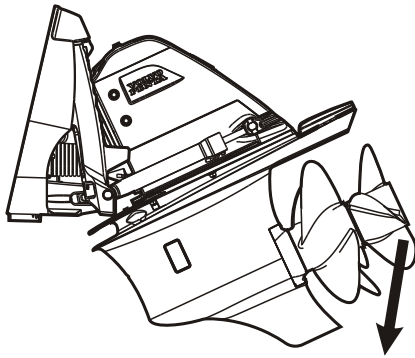


P0001087

- 7c. For systems with Start/Stop panels, make sure the key is on at the main station and the station where you are starting the engines is active.

8. Make sure that the fuel gauge is operating and that you have enough gasoline.

NOTICE! Do not run engine out of fuel or run the electric fuel pumps dry more than 20 seconds. Running the electric fuel pumps dry will damage the fuel pumps.



P0002141

9. Lower the drive unit to normal run position; make sure the water intakes are submerged. There should be no obstructions in the water near the propellers.

Starting the Engine

Audible Alarm

If an audible alarm has been installed on your boat, it will perform a brief self-test when the ignition key is turned to the RUN position. Following is a description of how the alarm performs the self test.

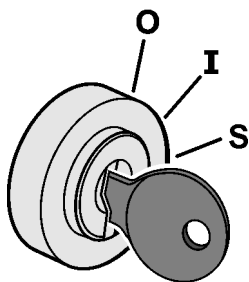
When the ignition switch is turned to RUN (key on, engine off), the alarm emits three short beeps to indicate that the ECM is performing a check of the sensors. If there are any problems detected by the ECM, the alarm will sound; otherwise, it will remain off.

Volvo Penta provides an audible alarm with every engine, however it's installation is determined by the manufacturer of your boat. If your boat does not have an audible alarm available, we strongly recommend that you contact your dealer to have one installed.

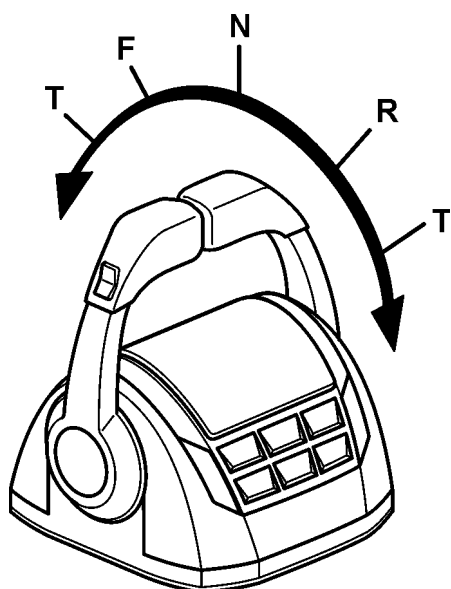
Starting Using the Key

EVC engines are equipped with an auto-crank feature. Momentarily turning the key to the **S** (Start) position, then releasing it back to the **I** (On/Run) position will cause the engine to continue to crank for up to 5 seconds or until the engine starts.

If you attempt to execute a "fast crank" (turning the key from **O** (Off) immediately all the way to **S** (Start), there will be a 3–5 second delay while EVC "warms up."



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- 1 Move the control handle to the **N** (Neutral) position.
- 2 Turn the ignition switch to **S** (Start) . If the engine does not start, try again.

If engine cranking needs to be stopped, turn the key to the **O** (Off) position.

NOTICE! Risk of starter damage, do not run the starter for extended periods (>20 sec.). Allow time to cool between start attempts.

If the engine floods during a start, follow the directions provided in the section entitled *Flooded Engine: EVC Engines* to restart the engine.

Can Not Start, Trim Too High

This fault (error message) can occur at engine start if the drive is tilted too high.

It may also occur if the trim sender has failed and is providing a false high reading.

The engine will **not start** with the drive in the tilt range (high position). Use the **Crank Override Mode** (see below) to override this condition.

Crank Override Mode

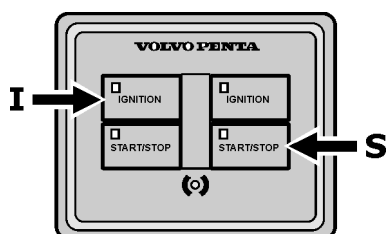
If the trim reading is in the tilt range and the engine must be started, use this override procedure. When you first try to start the engine, you will receive a message; **Can Not Start, Trim Too High**.

Hold the ignition key in the start position for over 5 seconds, the system will override the condition and the engine will start.

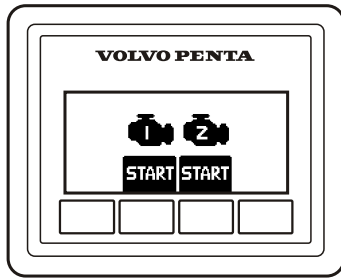
Starting Using the e-Key

With the Ignition **I** on (LED lit), press the START/STOP button **S**.

Do not hold the button.



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Starting Using the Start/Stop Panel

Press the starter button for each engine. Release the button as soon as the engine has started. If you start from a secondary station, the starter key at the main control station must be in the ignition ON engine OFF position. Stop cranking if the engine does not start within 20 seconds.

If a station is active and locked, the engine(s) can only be started from that station.

EVC engines are equipped with an auto-crank feature. Pressing the start button will cause the engine to continue to crank for up to 5 seconds or until the engine starts. Should you need to stop cranking, simply press the stop button.

NOTICE! Risk of starter damage, do not run the starter for extended periods (>20 sec.). Allow time to cool between start attempts.

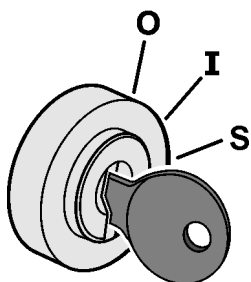
Flooded Engine

Procedures follow for clearing a flooded condition on an engine with an analog key and on an engine with the e-Key.

NOTICE! Risk of starter damage, do not run the starter for extended periods (>20 sec.). Allow time to cool between start attempts.

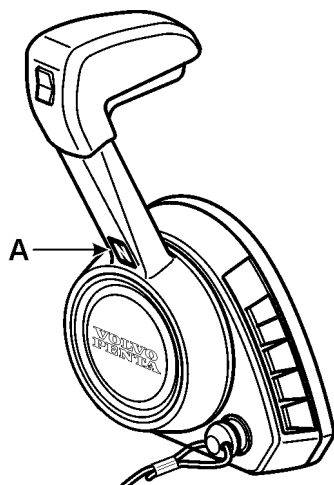
Analog Key

- 1 Turn the key to **I** (On/Run).



P0016543

- 2 For a side mount control, press and release the Throttle Only button **A**, then move the lever to the Shift (Forward) position. Skip to step 4.

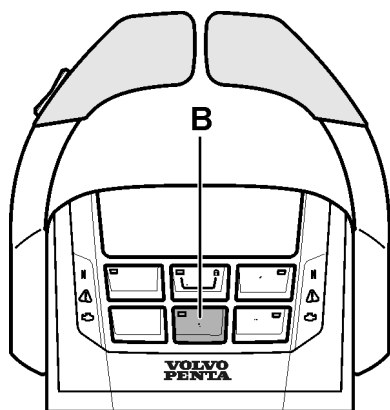


P0013572

- 3 For top mount controls, press and release the Throttle Only button **B**, then move the lever to the Shift (Forward) position.
- 4 Move the lever to Full Throttle, all the way forward.
- 5 Turn the key to **S** (Start). If the engine does not start, release the key and try again.

NOTICE! After a second attempt, if the engine still does not start, return the control lever to the neutral position and try a normal engine start.

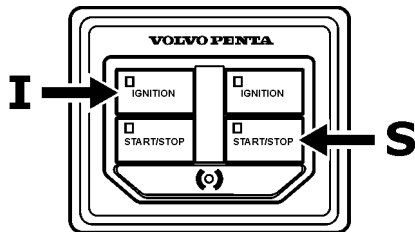
- 6 As soon as the engine starts;
 - return the shift lever to Neutral
 - release the key so that it will return to **I** (On/Run).



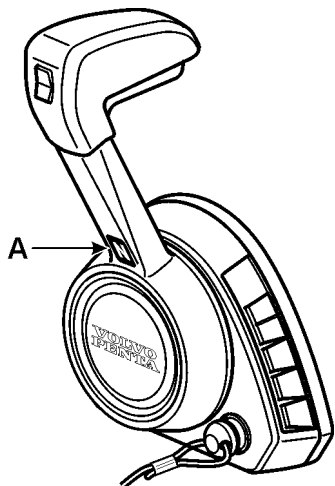
P0016542

e-Key

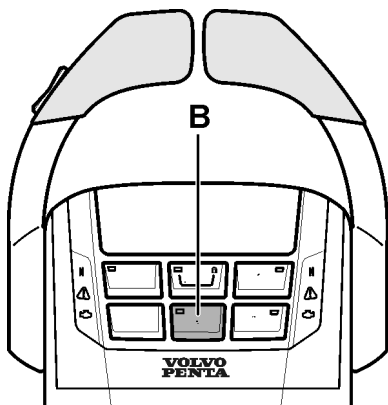
- 1 Make sure the Ignition (I) is on.



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P0016542

- 2 For a side mount control, press and release the Throttle Only button **A**, then move the lever to the Shift (Forward) position.
Skip to step 4.
- 3 For top mount controls, press and release the Throttle Only button **B**, then move the lever to the Shift (Forward) position.
- 4 Move the lever to Full Throttle, all the way forward.
- 5 Press the Start/Stop button **S**. If the engine does not start, press the button again.

NOTICE! After a second attempt, if the engine still does not start, return the control lever to the neutral position and try a normal engine start.

- 6 As soon as the engine starts;
 - return the shift lever to Neutral

Operation

DANGER!

Never allow an open flame or electric sparks near the battery or batteries. Never smoke in proximity to the batteries. The batteries give off hydrogen gas during charging which, when mixed with air, can form an explosive gas. This gas is easily ignited and highly volatile.

DANGER!

Do not run the engine while there are people located on or near the swim platform and transom.

- Check that nobody is in the water before engaging ahead or astern.
- Never drive in or near areas where people could be in the water.

DANGER!

Avoid the area immediately around the back of the boat while engines are operating or while propellers are under power. Contact with moving propellers will cause severe injury.

- Never use the drive unit as a ladder or as a lift to board the boat.
- Never swim or board at the rear of the boat when the engine is running, even if the drive is in neutral.

WARNING!

Avoid violent and unexpected changes in course and gear engagement. This could cause someone on the boat to lose their balance and fall over or overboard.

CAUTION!

Be sure you have read and understand everything in the section entitled “Before Starting” prior to continuing with this section.

Replacement Parts and Tools Checklist

For your safety and to ensure minimal interruption of your boating, we strongly recommend that you carry the following spare parts and tools aboard your boat.

- | | |
|---|--|
| <input type="checkbox"/> Extra propeller & prop hardware | <input type="checkbox"/> Ignition, starter, and fuel pump relays |
| <input type="checkbox"/> Impeller & glycerine | <input type="checkbox"/> Fuses |
| <input type="checkbox"/> Fuel filters | <input type="checkbox"/> Electrical & duct tape |
| <input type="checkbox"/> Tools, for any possible repairs while underway | <input type="checkbox"/> Hose clamps |

Reading the Instruments

NOTICE! Check instruments regularly. Stop the engine if there is an abnormal reading or if the engine alarm sounds.

NOTICE! If oil pressure is too low: Stop the engine immediately and investigate. Operating the engine with oil pressure too low will damage the engine.

NOTICE! If engine coolant or exhaust temperature is too high: Idle the engine, shift to reverse and then to forward. Idle the engine for 2 to 3 minutes and shut off the engine if the temperature does not decrease. Investigate and correct the malfunction. Operating an engine with temperatures too high will damage the engine.

Alarms

Under a variety of conditions, an alarm will sound to warn you that there is a problem with your engine(s) or sterndrive(s). Common engine and sterndrive malfunctions include, but are not limited to, the following situations:

- Low engine oil pressure
- Engine overheating
- Water in drive oil or low drive oil level (OceanX only)
- Water in drive oil or low drive oil level (OceanX only)

Alarms sound in order to provide you with an audible warning that your engine or drive has a problem.

NOTICE! Continuing to run the engine without correcting the cause of the problem may result in engine damage or equipment failure.

Any engine or drive damage that occurs or is worsened due to ignoring an alarm may not be covered by your warranty.

For a detailed explanation of the problems mentioned above and the steps to take to deal with them, please refer to the chapter entitled *Troubleshooting*.

Volvo Penta provides an audible alarm with every engine, however whether it is installed is determined by the manufacturer of your boat. If your boat does not have an audible alarm available, we strongly recommend that you contact your dealer to have one installed.

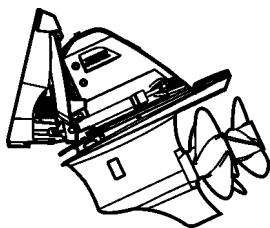
Maneuvering

Operating Trim Controls

For detailed information about using the power trim controls, please refer to *Power Trim* in the chapter entitled *Instruments and Controls*.

Trim Ranges

In order to utilize the information gained from the trim instrument, it is essential to know about the different trim ranges and their uses. There are three trim ranges as described below.



Trim Angle	-5°	PTA
------------	-----	-----

Trim Angle	8°	PTA
------------	----	-----

Trim Angle	8°	PTA
------------	----	-----

Trim Angle	30°	PTA
------------	-----	-----

Trim Angle	+30°	PTA
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Trim Range

Trim range for the DuoProp drive is any angle between -5° and 8°. This range is used to obtain the best comfort and fuel economy at all running speeds (from start to maximum speed).

The trim number corresponds to the drive angle in relation to the horizontal (stationary boat). The lowest value shows that the drive is at maximum trim in and the highest value that the drive is raised to maximum. Note that the lowest value can vary from boat to boat depending on the angle of the transom.

Beach Range

Beach range for a DuoProp drive is any angle between 8° and 30°. This range is used for running at reduced speed in shallow water or where water depth is uncertain.

NOTICE! Maximum safe engine speed when running in beach range is 1000 rpm. Make sure the drive's coolant inlet is never trimmed out of the water.

Tilt Range

Tilt range is any angle over 30°. It is used to lift the drive to maximum height, **but not when the engine is running**. This range is used for trailering or putting the boat on the trailer. Power trim has an automatic stop that cuts the power when its end limit has been reached. The stop is reset automatically when activating down trimming.

NOTICE! The engine will not start with the drive in the tilt range (high trim position). The system will show the fault "Can Not Start, Trim Too High" Use the Crank Override Mode, see *Starting the Engine, Can Not Start, Trim Too High*.



CAUTION!

Operating in beach range or tilt range will cause significant loss of maneuverability.

Determining the Proper Trim

CAUTION!

Avoid trimming the sterndrive too much as steering will be severely reduced.

The effect of the maximum “bow-up” and “bow-down” positions will be similar for most boats. The bow position best for your operating conditions could be at any trim setting between the maximum “bow-up” and “bow-down” positions.

The boat will be properly trimmed when the trim angle provides the best boat performance for your operating conditions. On models without power steering, the trim position that provides a balanced steering load is desirable.

To familiarize yourself with the power trim, make test runs at slower speeds and at various trim positions to see the effect of trimming. Note the time it takes for the boat to plane. Watch the tachometer and speedometer readings and the ride action of the boat.

Operating in “Bow-up” Position

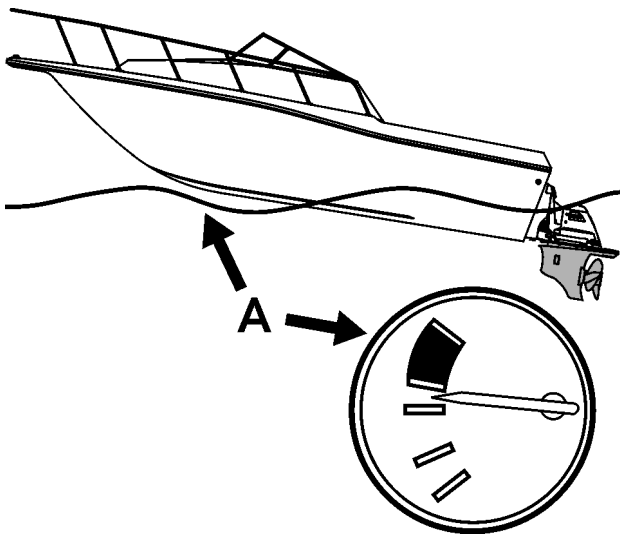
The “bow-up” **A** position is normally used for cruising, running with a choppy wave condition, or running at full speed. In a full “bow-up” position the boat may tend to self-steer. You may have to compensate with the steering wheel to keep the boat in a straight-ahead path. In this position the boat’s bow will tend to raise clear of the water. Excessive “bow-up” trim will cause propeller ventilation resulting in propeller slippage. Engine RPM will also increase, but boat speed will not increase and may even drop.

CAUTION!

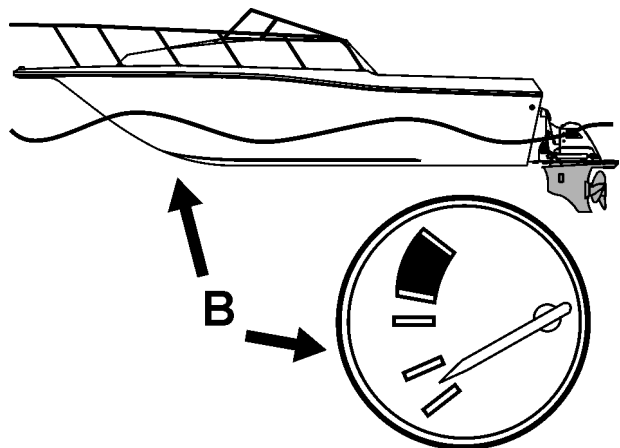
Use caution when operating in rough water or crossing another boat’s wake. Excessive “bow-up” trim may result in the boat’s bow rising rapidly and possibly throwing the boat’s occupants into the water.

Operating in “Bow-down” Position

The “bow-down” **B** position is normally used for acceleration onto plane, operating at slow planing speeds, and running against a choppy wave condition. In the fully “bow-down” position the boat may tend to self-steer. You may have to compensate with the steering wheel to keep the boat in a straight-ahead path. In this position the boat’s bow will tend to go deeper into the water. If the boat is operated at high speed and/or against high waves, the bow of the boat will plow into the water.



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CAUTION!

The boat may tend to bow steer or spin about rapidly and possibly eject occupants.

The boat trim should be adjusted to provide balanced steering as soon as possible each time you get underway. Some boat, engine, and propeller combinations may encounter boat instability and/or high steering torque when operated at or near the limits of the “bow-up” or “bow-down” positions. Boat stability and steering torque can also vary due to changing water conditions. If you experience boat instability and/or high steering torque, see your Volvo Penta dealer to correct these conditions.

Emergency Trimming

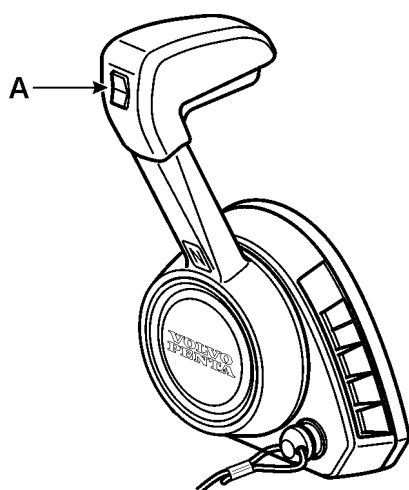
If a fault occurs which prevents the drive from being trimmed with the power trim control panel, it is possible to perform an emergency trimming.

You may do so by holding the trim up/out button on the remote control (**A**) for over 5 seconds. The system will display a message informing you that you may override power trim limits. Continuing to hold the trim up/out button may raise the drive beyond the limits set by the boat manufacturer. The system will display a message informing you that trim override has been activated. You may continue raising the drive until you have reached the mechanical limit.

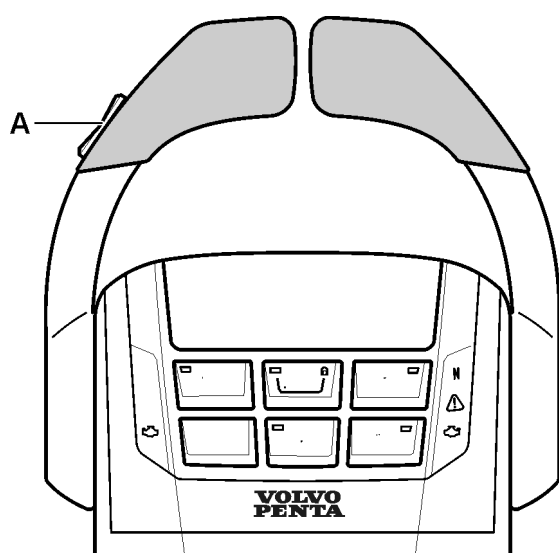
NOTICE! If your transom shield/drive package is not mechanically limited, when applying power trim override mode, use extreme caution while raising the drive as there is a possibility of pushing the drive into the swim platform.

NOTICE! Do not run engine above idle speed when overriding trim limits set by your boat manufacturer as it will cause damage to the U-Joint and engine.

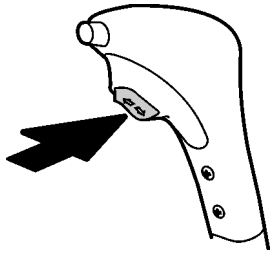
NOTICE! If the power trim function does not work, the trim gauges may not work either. Before starting an emergency trimming, check the trim angle of the drive (s) visually.



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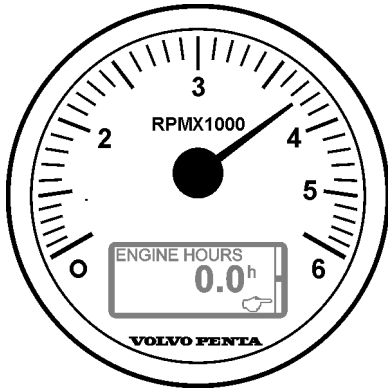
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P0016272

Trim/Tilt Motor Protection

The trim/tilt motor is protected from overheating by an internal thermal overload switch. If the trim switch is held too long at either full up or full down, the electric motor may stop. If the motor stops, release the trim switch and wait for 20 seconds. Then try the switch again. Also refer to the section entitled *Troubleshooting: Trim/Tilt Motor Protection*.



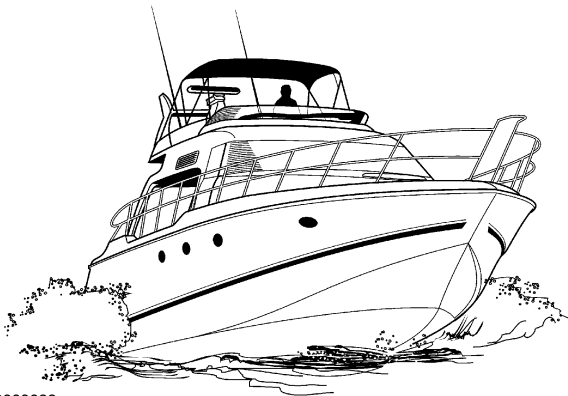
P0016568

Cruising Speed

Maximum recommended cruising speed for the V8–380 is 4600 RPM.

Operating the engine between 4600 and WOT (wide open throttle) for extended periods should be avoided since it increases fuel consumption and increases the stresses and wear on both the engine and drive.

Better fuel economy can be achieved by cruising at 3600–3800 RPM.



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NOTICE! The engine should reach maximum RPM at WOT. If the engine exceeds maximum RPM or can not reach maximum RPM, especially for extended periods, engine damage may occur. This type of damage is not covered by warranty. See the section entitled *Technical Data* for full throttle operating ranges.

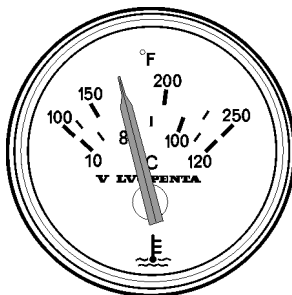
The engine should not be operated at RPMs above the WOT range (see *Technical Data*). If the engine is routinely exceeding the WOT maximum RPM or is frequently at limited RPM range (controlled by engine computer) the boat should be taken to the dealer to check for proper propeller size. If the engine will not reach the WOT range, the boat may be overloaded or over-propped and should be taken to the dealer for correction.

Operating Temperatures

Normal operating temperature range for these engines is 155° — 180°F (68° — 82°C).

NOTICE! Gauge readings consistently above the upper limit (180°) are signs of engine problems and should be addressed as soon as possible to prevent engine damage.

Also monitor the alarm (see *Operation, Alarm*), this is usually the first indication of over-heating.



P0016567

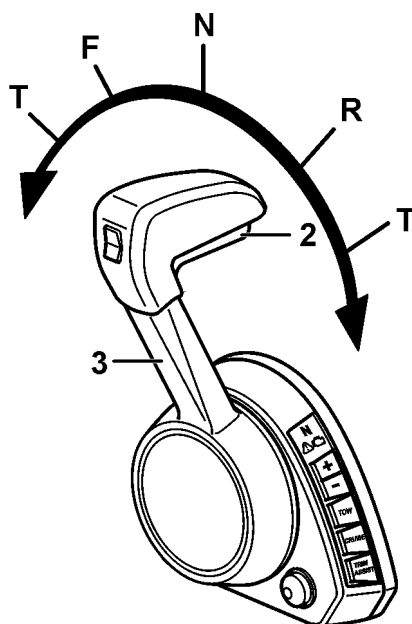
Lever, Throttle only

The gear shift can be disengaged so that the control lever affects only the engine speed.

See *Instruments and Controls, EVC Menu, Throttle Only*.

Side-mounted control

Both the drive shift mechanism and the engine speed control are operated using the lever **3**.



P0016560

- N** Neutral position (drive is disengaged and the engine runs at idle speed).
- F** Drive forward gear engaged for forward movement.
- R** Drive reverse gear engaged for backward movement.
- T** Throttle/engine speed control.

NOTICE! Shift mechanism must be in Neutral to start engine.

Neutral Interlock Button

The neutral interlock button **2**, available on the side-mount control only, prevents accidentally moving the throttle out of neutral. This button must be depressed to shift the throttle out of neutral.

To move the control lever away from neutral, depress the neutral interlock button **2**.

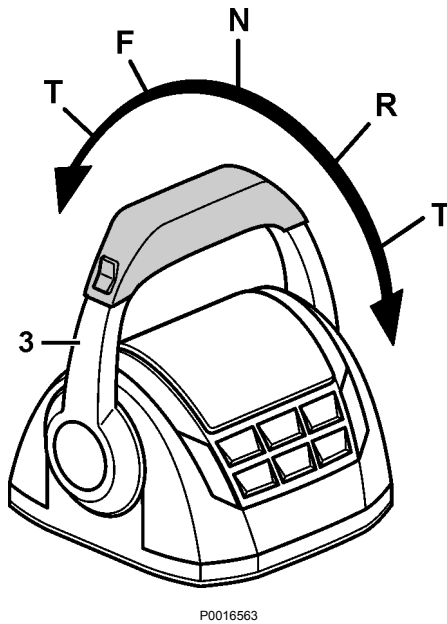
While keeping the button pressed, move control handle out of neutral in the desired direction.

Once the throttle is out of the neutral position, you may release the button.

The neutral interlock will automatically re-engage when the control handle is returned to the NEUTRAL position.

Top Mount, Single

Both the drive shift mechanism and the engine speed control for the engine are operated using the lever **3**.

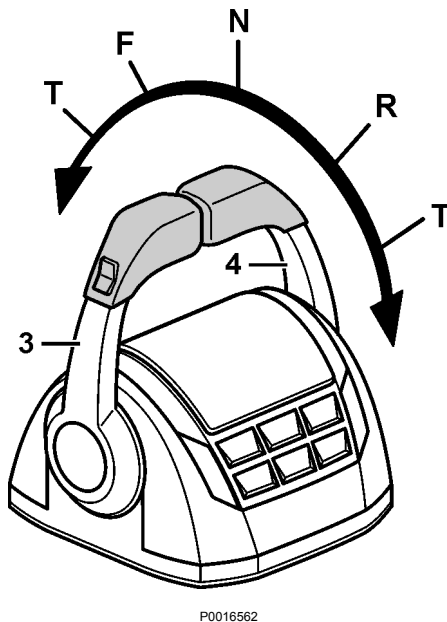


- N** Neutral position (drive is disengaged and the engine runs at idle speed).
- F** Drive forward gear engaged for forward movement.
- R** Drive reverse gear engaged for backward movement.
- T** Throttle/engine speed control.

NOTICE! Shift mechanism must be in Neutral to start engine.

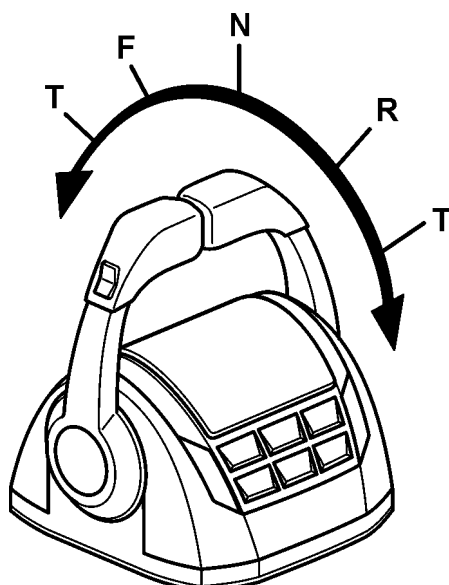
Top Mount, Twin

The **port lever 3** controls both the drive shift mechanism and the engine speed control for the port engine. The **starboard lever 4** controls both the drive shift mechanism and the engine speed control for the starboard engine.



- N** Neutral position (drive is disengaged and the engine runs at idle speed).
- F** Drive forward gear engaged for forward movement.
- R** Drive reverse gear engaged for backward movement.
- T** Throttle/engine speed control.

NOTICE! Shift mechanism must be in Neutral to start engine.



P0013557

Shifting and Speed Control

WARNING!

Never abruptly change speed. Sudden changes in speed may cause passengers to be thrown about in the boat.

CAUTION!

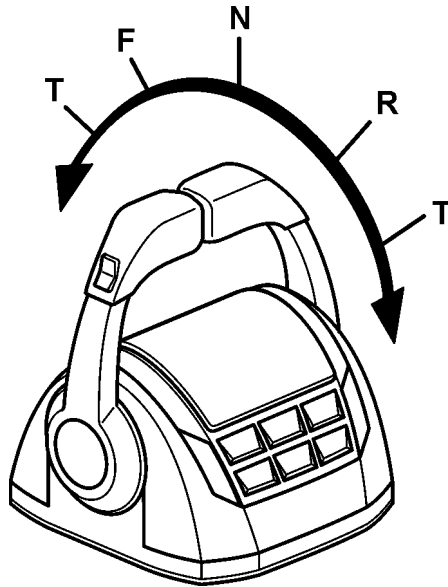
Any time the boat is operated, be aware of changes in shift system operation. A sudden increase in shift effort at the remote control handle, or other abnormal operation, indicates a possible problem in the shift system. If you suspect there is a problem, see your Volvo Penta dealer as soon as possible for proper diagnosis and required service or adjustment. Continued operation could result in damage to the shift mechanism and loss of shift and throttle control that could result in personal injury.

NOTICE! Do not shift gears if engine speed is above 800 RPM. Do not shift from forward to reverse when boat is planing. There is a danger that water will get into the engine and cause serious damage, while causing serious damage to the drive.

NOTICE! Verify proper functionality of all control and engine systems before leaving the dock.

- Move control handle(s) to the neutral detent position **N**. Check in front and behind boat for people or obstructions before shifting.
- To go from forward to reverse, or reverse to forward, always pause at neutral **N** and allow engine speed to return to idle.
- After shifting is completed, continue to move the control handle slowly in the desired direction to increase speed.
- To go forward: Move the control handle forward from neutral detent to forward gear engagement detent position **F**. Throttle movement will begin after the detent position for forward gear engagement. After the throttle is activated, continue to move the control handle slowly in the desired direction to increase speed.
- To go in reverse: Move the control handle backward until you reach the detent position for reverse gear engagement **R**. Throttle movement will begin after reverse gear engagement. After the throttle is activated, continue to move the control handle slowly in the desired direction to increase speed.

If your boat is equipped with a non-Volvo Penta remote control system, ask your dealer how to properly operate it.



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Twin Unit Maneuvering

Operation of the control for a twin engine boat is very similar to single engine operation. See *Shifting and Speed Control* above.

During planing and when cruising both levers are usually in the same position. Most exceptions to this occur during low speed maneuvers such as docking.

Twin engine maneuvering can be effected by many factors; boat design, sea conditions, driveline set up, type of controls.

If you are new to piloting a twin engine boat consider the following before attempting these maneuvers in congested areas:

- seek training from an experienced captain.
- practice maneuvering the boat in secluded places, away from traffic and congestion.

NOTICE! Both engines must be running during close maneuvering or at slow speeds. If only one engine is running, water may be forced back through the underwater exhaust outlet and cause serious engine damage.

NOTICE! Do not attempt to plane boat while operating on a single engine; operating with a single engine at full throttle could cause engine or transmission damage.

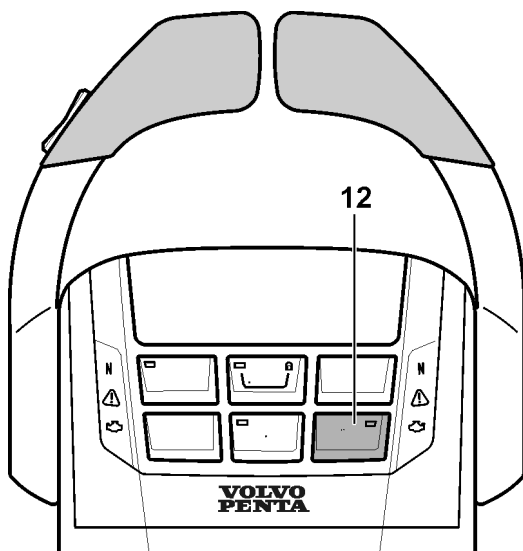
Engine Synchronization Function

The engine synchronization function adjusts the engines in a twin installation to operate at the same RPM. This improves fuel economy and operational comfort.

The function is automatically activated if the following conditions are met:

- Both the control levers must be in approximately the same position.
- The engine speed must exceed 800 RPM.

The function is disengaged as soon as the conditions are no longer met or when operating at wide open throttle.



Single Lever Mode

This feature is optional. If not active on your boat, see your Volvo Penta dealer to purchase this option.

To activate this feature, press the Single Lever button **12** on the control.

The first lever that is moved will then control both engines. The other lever can be moved to full reverse or forward, to position it out of the way.

To deactivate the feature the levers must be returned to neutral, then press the button **12** again..

P0016576

Safety lanyard

An emergency stop switch, also called a safety lanyard, may be a feature of your boat. Use of this switch is highly recommended. To properly use this feature, attach the lanyard to clothing that will **NOT** tear away before the lanyard is pulled from the switch to stop the engine. If the lanyard is too long, shorten it by knotting or looping it. **DO NOT** cut and re-tie the lanyard.

The safety lanyard can only be effective when in good working order. Observe the following:

- Lanyard must always be free of entanglements that could hinder its operation.
- Once a month, check the switch for proper operation. **With engine running at idle speed**, pull lanyard. If engine does not stop, see your dealer for repairs.



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NOTICE! When testing the emergency stop switch, do so at engine idle speed only. Activating the emergency stop switch at any speed above idle **may** allow water to be ingested into the engine, causing serious engine damage.

Using this switch is simple and should not interfere with normal operation of the boat.

WARNING!

Care must be taken to avoid accidentally pulling the lanyard during boat operation. Unexpected loss of forward motion will occur which could cause occupants to be thrown forward.

In an emergency situation, any occupant of the boat may attempt to restart the engine by turning the ignition key to stop or off, then starting the engines normally. If the engine will not crank on the first attempt, do not keep trying to start it as you may cause additional engine damage.

If your boat is not equipped with an emergency stop switch and it falls into one of the following categories, installation of an emergency stop switch is recommended.

- High performance sport boats
- Small runabouts
- Boats with sensitive steering
- Boats where the distance from the top of the gunwale down to the driver's seat is less than one foot (30 cm).

Contact your Volvo Penta dealer for installation of an emergency stop switch.

Station Handling

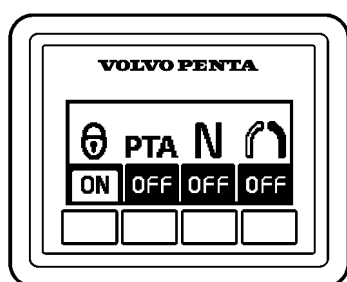
Active Station

Shifting, adjusting speed, trimming, and performing EVC settings and calibrations is only possible on an active station.

On a boat with one station, the station is always active. On a boat with two or more stations, the main station automatically becomes active when the EVC system is started up with the ignition key(s). If the engine is started from a secondary station that station automatically becomes active instead.

During engine start the EVC system sometimes restarts automatically. If this happens, the main station becomes active even though the start was performed from a secondary station.

The following instructions apply to both single engine and twin engine installations. On a single engine installation, only one LED will light up. On twin engine installations, both LEDs will light up.



51820

Using Station Panel

The gear must be in neutral when changing stations.

If the station is inactive, activate the helm station with a single press of the button. Pressing again locks the helm station. To render the helm station inactive, hold the button down for 3 seconds.



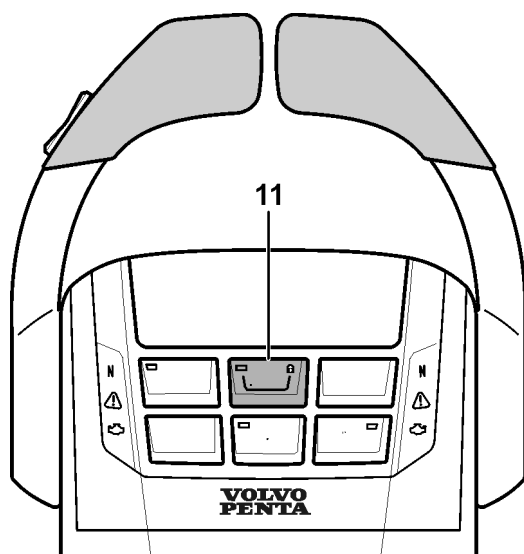
Inactive Helm Station



Active Helm Station



Locked Helm Station

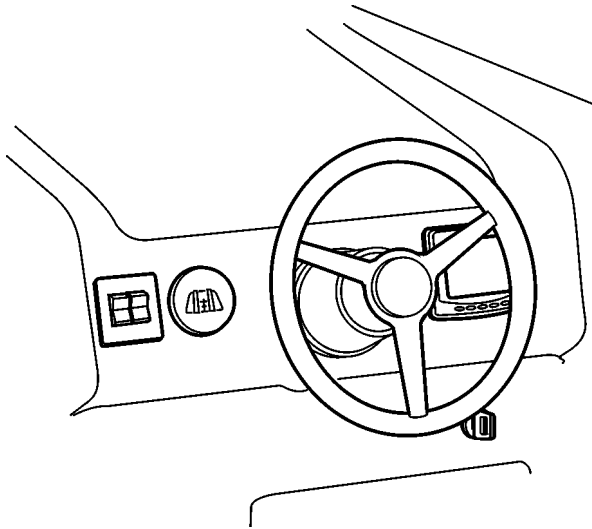


P0016564

Using Remote Control Button

The gear must be in neutral when changing stations.

If the station is inactive, activate the helm station with a single press of button 11. Pressing again locks the helm station. To render the helm station inactive, hold the button down for 3 seconds.



P0016581

Steering System Operation

While directional control of a boat's steering system operates much like that of an automobile, a boat's responsiveness and maneuverability is very different from that of a car. Avoid high-speed maneuvers until you become accustomed to driving your boat. Keep in mind that a boat is never as maneuverable when moving in reverse as it is when travelling forward.

If the power steering system stops working, the steering wheel will still function but it will feel harder to steer. If this condition occurs, look for possible causes and fix them if possible. If the power steering system cannot be corrected on board, proceed at a reduced speed. You will be able to steer the boat, but with increased effort. See your authorized Volvo Penta dealer as soon as possible to correct your power steering system.

At slow speeds (no wake), your boat may tend to wander due to wind and current. This is normal and may be overcome by anticipating bow direction and correcting with steering wheel. A slightly higher throttle and trim setting may also lessen the tendency to "wander." Changing weight distribution, aft to forward, can also affect slow speed steering.

Twin Unit Steering

Twin engine boats may have only one engine with a fully operational power steering system. That power steering system is on the starboard engine; therefore, when operating on a single engine use the starboard engine.

Using a port engine that does not have a functional power steering system will cause an increased effort in steering control, due to absence of power assist.

NOTICE! Both engines must be running during close maneuvering or at slow speeds. If only one engine is running, water may be forced back through the underwater exhaust outlet and cause serious engine damage. Do not attempt to plane boat while operating on a single engine; operating with a single engine at full throttle could cause engine or transmission damage.

Loss of Steering

NOTE! The following procedures only apply if the boat is equipped with electronic or joystick steering.

WARNING!

When steering wheel control is lost, engine speed is automatically limited.

WARNING!

When one engine stops running, oil pressure needed to control steering for that drive side will be lost. While the functioning side will still provide steerage, control characteristics for the boat will be substantially different from that of two running engines.

WARNING!

Do not shut off engines when docking or when you need to maneuver the boat. When you shut off the engines, the drives will center and stay centered as long as the engine is off. If you are still in motion when this occurs, you will not have steering control and the boat will move straight forward until coming to a standstill.

Both Engines Stop Running

There are several reasons that both engines would stop running. If the emergency stop switch (ignition lanyard) is pulled, both engines will stop operating. Running out of fuel will also cause the engines to stop functioning. Another possibility is that the propellers become fouled (e.g. anchor line, tow rope, etc.) and cause the engine to stop.

In all situations where the engines stop running, you will lose all steering control. If you are driving straight forward, the boat will eventually coast to a standstill. If you are turning, the boat may straighten out and eventually will come to a standstill.

One Engine Stops Running

In some instances, only one engine may stop functioning. A reason for this could be that the propeller(s) on one drive become fouled (e.g. anchor line, tow rope, etc.) and cause the engine to stop running. Other possibilities include engine failure, ignition key turned off, and so on.

Whatever the cause for one engine shutting down, you will lose steering control on that drive side. You will still be able to steer with the remaining working engine.

When using only one engine, the drive on the non-working side should be tilted up. To tilt up the nonworking drive:

1. Turn ignition key on the non-working side to the START position (key on, engine off).
2. Using the trim/tilt button, tilt the drive up as far as it will go.
3. Turn ignition key off.

NOTICE! Failure to lift the drive with steering faults may cause the drives to hit one another, potentially causing extensive damage to drives and engines.



51657

Steering System Fault Messages

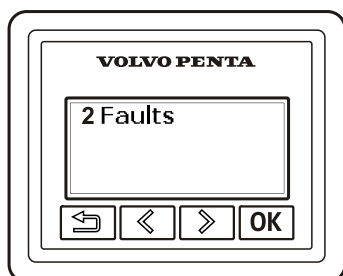
If a malfunction in the steering system is discovered, a steering specific pop-up will appear in the tachometer or system display. The audible warning may also sound. If installed, a relevant warning lamp will start to flash on the alarm panel.

The pop-up displayed at left is a sample of what you may see. The screen may cycle between several messages. The up and down arrows in the image at left indicate that the screen is cycling between two distinct messages.

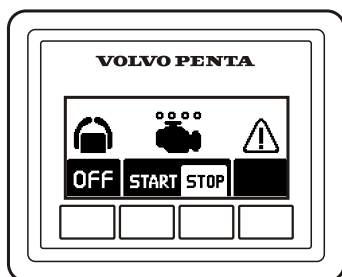
For a list of steering system fault messages, please refer to the chapter entitled *Fault Code Register*.

Acknowledging Steering Related Alarms


If the system discovers a fault, the word Fault(s) is displayed on the screen. To see what faults have been detected, press **OK** on the Info Display Panel. Use the scroll buttons to move through the list if more than one fault exists.



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Alarms may also be acknowledged, but not viewed, on the docking station panel. To acknowledge a fault, press the  button.

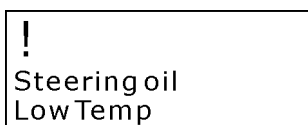
For further information on how to handle fault messages and recommended actions, refer to the chapter entitled *Fault Code Register*.

Steering System General Messages

Low Steering Oil Temperature

For the electronic steering to operate normally, the oil must reach a certain temperature. When the oil is cold, steering is slower than normal. This condition is especially true in colder climates. The system displays a message to let you know when the temperature is too low. The message repeats every thirty seconds until the oil reaches normal operating temperature.

Once the engines have been running for a short while, the oil temperature will rise to a high enough level that the steering system will begin to function normally. The message will disappear of its own accord once operating temperatures have been reached.



51650

Maneuvering with the Joystick

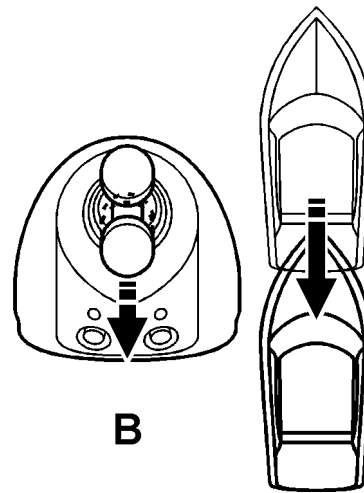
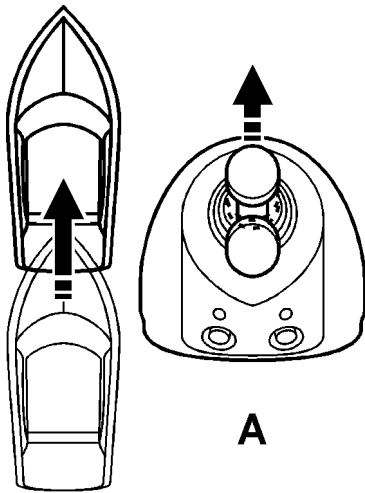
DANGER!

A rotating propeller can cause serious injury. Ensure that there is no one in the water before you enable docking mode. Never go near people who are swimming or where there is a risk that there are people in the water.

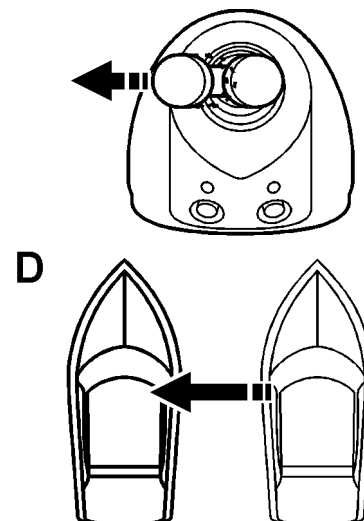
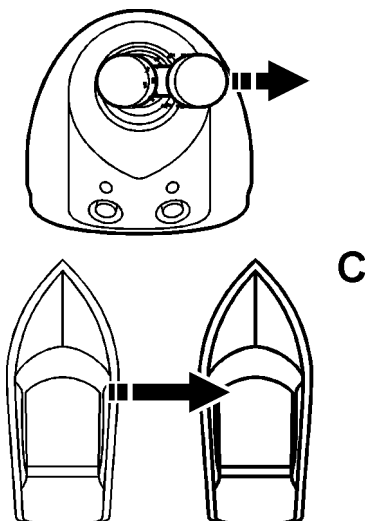
NOTICE! Remember that the side thrust is considerably greater than with a conventional bow thruster. The boat will continue to move in the selected direction even after the joystick has been released. Compensate for this movement by moving the joystick in the opposite direction.

NOTICE! The joystick and its functions are only to be used when docking. In all other cases, the wheel and control levers should be used.

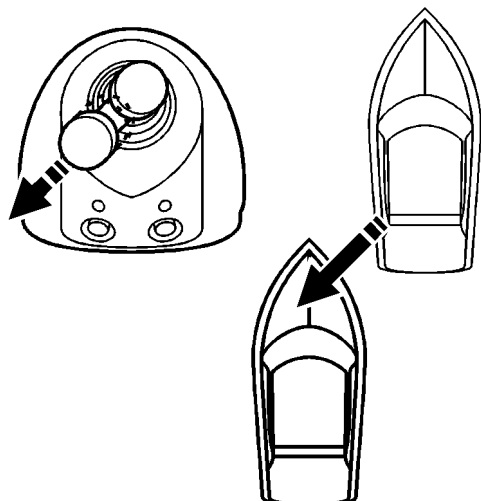
- | | |
|----------------------------------|---|
| A. Move straight forward | E. Traverse diagonally |
| B. Move straight backward | F. Rotate to Starboard |
| C. Traverse to Starboard | G. Rotate to Port |
| D. Traverse to Port | H. Rotate while moving forward or backward |



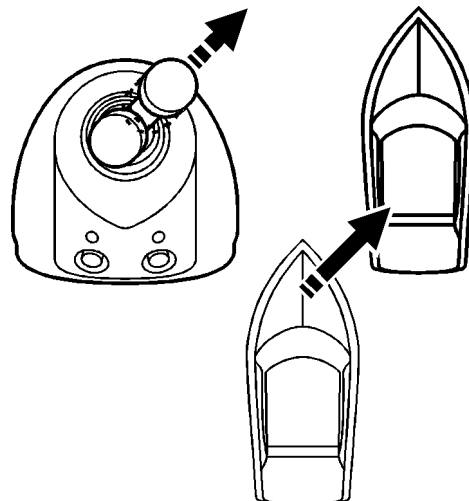
51316



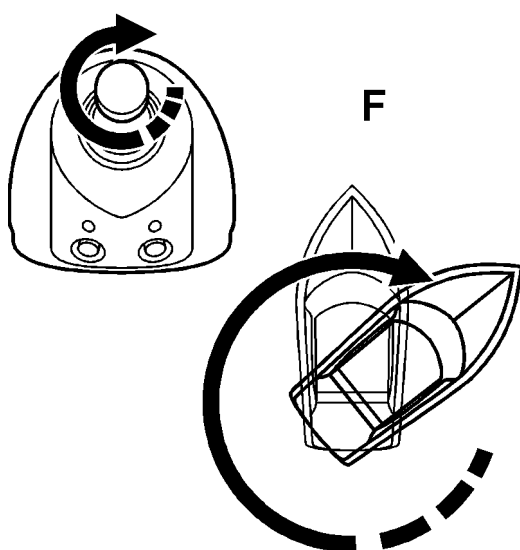
51317



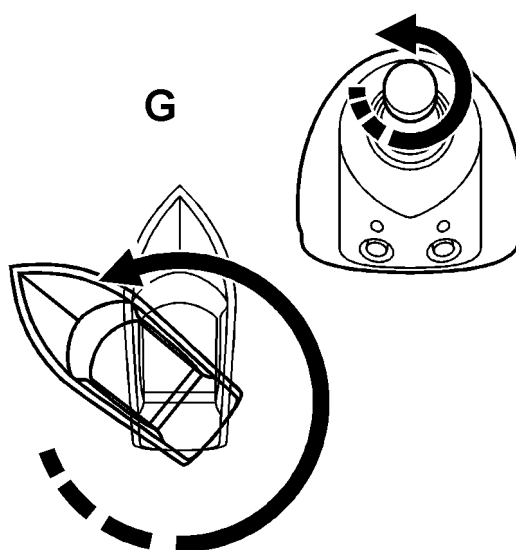
E



51318

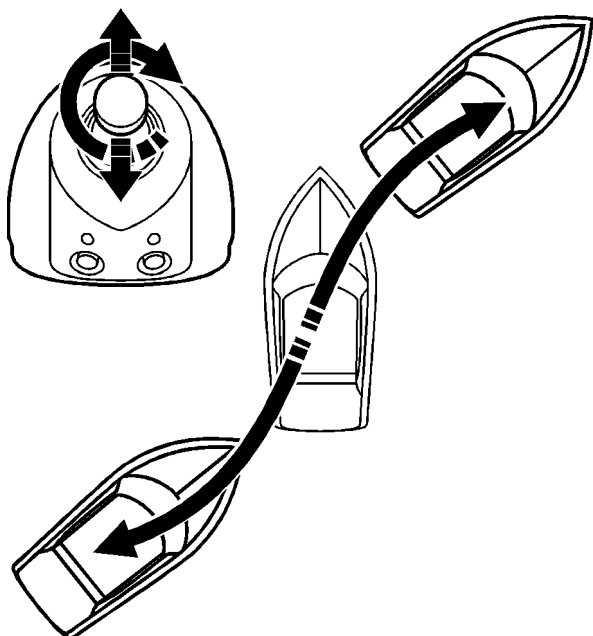


F

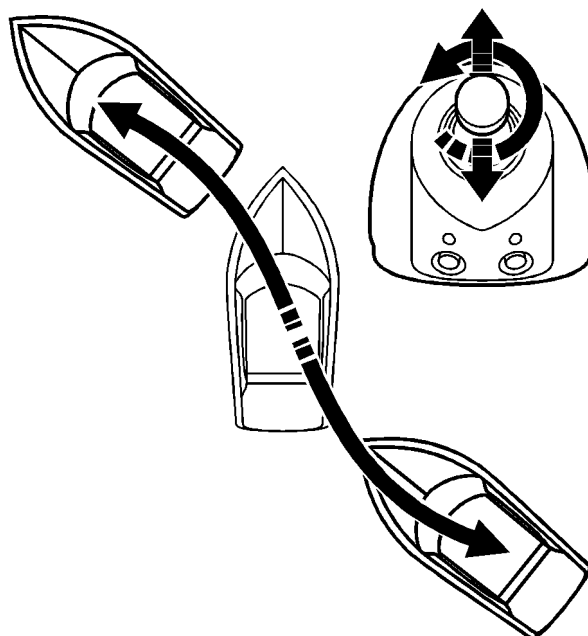


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Special Boating Conditions

The following section covers scenarios that are considered special boating situations. When using the boat in the following situations, there are some special procedures to take into consideration in order to keep the engine, transmission, drive, and propeller in top working condition.

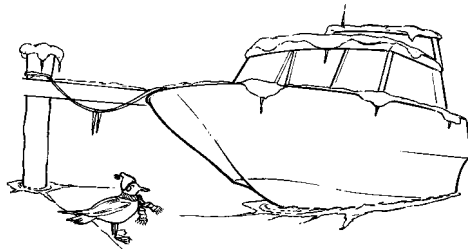
Operating in Freezing Temperatures

The engine and drive are cooled using raw (sea) water. Even freshwater (closed cooling) engines use raw water for cooling purposes. When the air and water temperatures drop low enough, any water trapped in your engine or drive will freeze. Freezing water and ice expand. This expansion could cause parts of the engine and drive containing water to crack. Always be sure to drain any trapped water from your engine and drive if temperatures are expected to drop low enough to cause freezing.

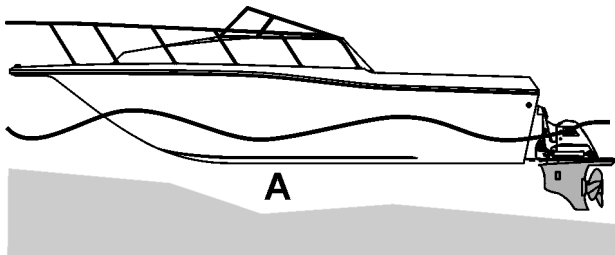
NOTICE! When temperatures drop below freezing, failure to completely drain the cooling system will result in serious damage to the engine and exhaust manifolds.

NOTICE! Freeze damage to the engine package is not covered by your Volvo Penta limited warranty.

Upon completion of engine operation, drain the engine as described in *Draining the Engine* in the chapter entitled *Engine Shutdown*.



21199



22798

Shallow Water Operation

You may tilt the drive unit to reduce the draft for shallow water running **A** as long as you do not exceed 1000 RPM. Exceeding 1000 RPM at high trim/tilt is not necessary. It will only increase the boat wake and will not increase boat speed appreciably.

NOTICE! Exceeding 1000 RPM with the drive unit tilted could damage drive train components. This type of damage is not covered by warranty. Never attempt to plane the boat or exceed 1000 rpm with the drive unit in a partially tilted position. Always return to the trim range as soon as possible to avoid damage to drive train.

NOTICE! Be very careful when operating in shallow water; the intakes may pick up mud, sand, underwater vegetation, or other submerged debris. This may lead to overheating and engine damage.



22799

High Altitude Operation

Volvo Penta EFI engines have programmed altitude compensation; however, there may be a slight performance loss at altitudes above 5000 feet due to lower air density. If you are boating above 5000 feet for a short time, a lower pitch propeller will restore some of the lost performance. Long term use above altitudes of 5000 ft. may require a change in gear ratio which is not covered under the Volvo Penta Limited Warranty.

Salt Water Operation

You can use your Volvo Penta sterndrive in either fresh or salt water.

We recommend that you use fresh water to flush out the engine and drive after you use your boat in polluted or salt water. This will prolong the service life of the engine and sterndrive. For additional information, see the section entitled *After Engine Shutdown: Engine Flush*.

High Performance Boat Operation

High performance is not only defined by engine size, but by a combination of engine power (horsepower), hull design, and the size of the boat. Your new engine(s) produce a high power output. Depending on the boat type, the top speed may be much higher than what you are accustomed to.

High speed operation requires an experienced operator who has mastered handling of high performance boats. It is advisable that you learn the boat's behavior before you take passengers on board. Inform your passengers about your boat's characteristics and the maneuvers you intend to do. Use the boat's performance with due consideration and care!

When operating at high speeds, remember that other boaters may not realize the speed at which you are travelling, especially when you close in on another boat from astern or from ahead. Always keep a good distance to allow for the unexpected! Always be prepared for what other boaters may do unexpectedly. High speed driving requires the driver to give a high degree of attention to boat operation and surrounding conditions.

A boat travelling at a speed of approximately 70 M.P.H. (60 knots) covers about 101 feet (30 meters) in 1 second. The faster you go the quicker things will happen. High speed driving requires a lot of water and a good distance from possible hazards! Always allow for adequate reaction time. Always reduce speed when visibility is reduced for whatever reason.

When driving, make sure that all passengers are safely seated. Emphasize this especially if you have a larger, high performance cabin cruiser where one normally moves about during operation. Reduce speed considerably, or stop completely if someone needs to move about the boat.

The driver should always use the emergency stop switch! The emergency stop switch lanyard which is securely connected to the driver, immediately shuts off the engine(s) should the driver be thrown from the driving position. Even if the risk of being thrown overboard is practically nonexistent in your type of boat, the risk of the driver falling and being dazed in rough seas can be even greater.

Remember, even when the engine(s) is stopped in a high performance boat that is planing, it will travel approximately 325 feet (100 meters) before dropping through the planing threshold and stopping!

Engine Shutdown

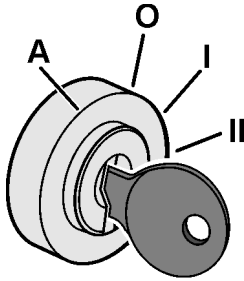
Before Engine Shutdown

Plan where the boat will be stopped, reduce speed to approach the area (dock, anchorage, etc.). Maneuver the boat to the dock or other safe place, position the boat so that it can be secured or anchored. When in position, move the shift mechanism to neutral. Secure the boat, if possible the captain should remain at the helm while the passengers secure the boat.

WARNING!

Avoid abrupt changes in speed or direction when maneuvering towards a dock or slip.

Passengers could be injured if thrown about in the boat due to sudden changes in boat movement.



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Allow the engine to run at low idle, in neutral, for a few minutes after operations are completed.

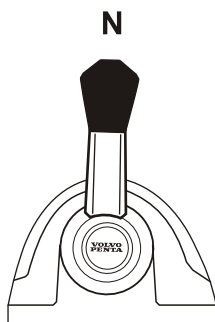
This allows engine temperatures to equalize. This is especially important when the engine has been run at high rpm or under heavy load just prior to shutdown.

Turn the key switch to the off position **O**.

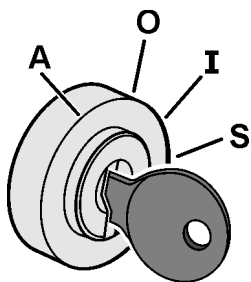
Stop the Engine

Allow the engine to run at low idle, in neutral, for a few minutes after operations are completed. This allows engine temperatures to equalize. This is especially important when the engine has been run at high rpm or under heavy load just prior to shutdown.

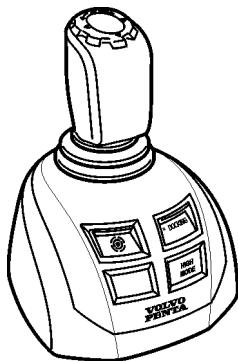
- 1 Move the remote control lever to NEUTRAL **N**.
- 2 Let engine return to idle.



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- 3 Turn ignition key to OFF 0.

WARNING!

If your engines are equipped with electronic steering, when you shut them down, the drives will automatically center to straight ahead positions. Anyone or anything in the water between the drives could be crushed when the drives center.

WARNING!

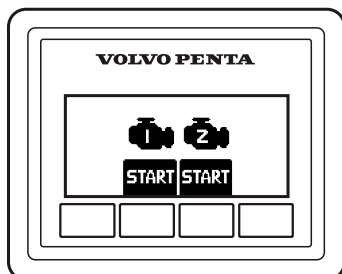
If your engines are equipped with electronic steering, never shut off the engines when approaching people in the water or when coming in to dock. When the engines are shut off, all steering control is lost.

NOTICE! Do not stop the engine at speeds above idle or "speed up" the engine while turning off the ignition. Do not stop the engine while in gear or while the boat is moving. Engine damage could result from water being sucked back up through the exhaust ports.

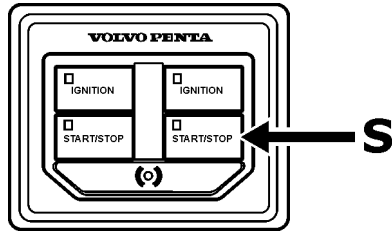
Stopping Using the Start/Stop Panel

Push the stop button for each engine. Release the button when the engine has stopped.

If a station is active and locked, the engine(s) can only be stopped from that station.



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Stopping Using the e-Key

Press the Start/Stop **S** button for each engine to stop the engines.

Remember to lock the system with the e-Key if the boat will be unattended. If the system is not locked, anyone can start the engines by pressing the buttons.

After Engine Shutdown

Engine Flush

Volvo Penta engines incorporate an engine flushing port designed to flush the engine with fresh water while the engine is running. Flushing the engine with fresh water after each use will increase the longevity of components.

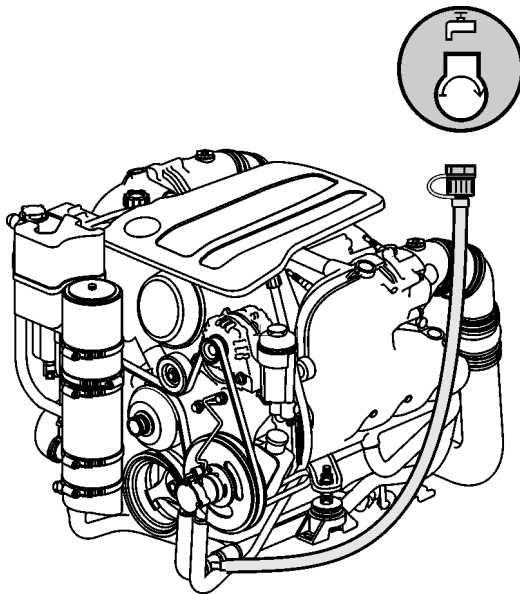
NOTICE! If flushing the engine with the boat in the water, do not run higher than idle speed or sea water may be drawn in with the fresh water.

NOTICE! When flushing the engine with the boat in the water, fresh water pressure must be 17 psi (117 kPa) or greater.

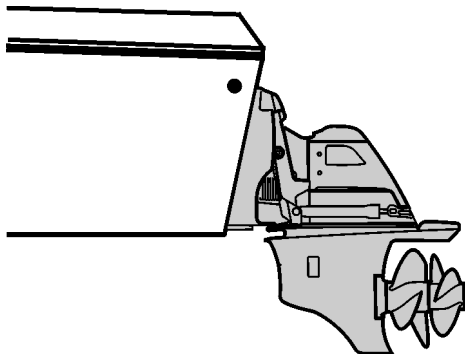
- 1 If the engine is running, shut it down.
- 2 Remove the blue plastic cap from the hose that is clamped to the port side of the engine. It is marked with the running engine flush symbol .
- 3 Connect a water hose from a fresh water source to the female flush connector.
- 4 Turn water on full and start the engine.
- 5 Let engine idle until engine temperature stabilizes at its normal operating range. This will allow the thermostat to open and ensure the fresh water circulates throughout the engine.
- 6 After engine is flushed, shut down the engine.
- 7 Disconnect water hose and reinstall the cap.

NOTICE! When re-installing the blue cap on the fresh water flush hose, tighten it by hand, then tighten 1/4 turn using a wrench. If the cap is too loose, air may be sucked in, causing the engine to overheat, resulting in damage.

NOTICE! Drain the engine if freezing temperatures are expected. For details on draining the engine, see *Draining the Cooling System*.



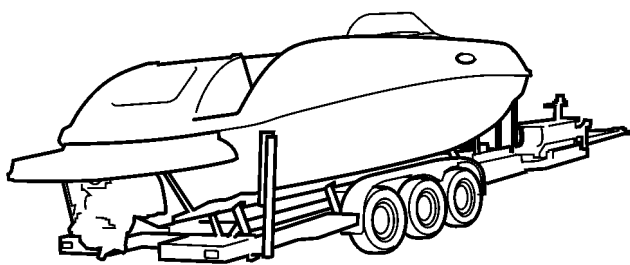
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Drive Position, Not in Use

When the boat is not being used the drive should be trimmed to the vertical position. Do not leave the drive in the tilt position for long periods of time.



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Trailing Your Boat

- Tilt the drive completely up before loading the boat on to the trailer.
- After the boat is on the trailer and the trailer has been moved away from the ramp (on more level ground), lower the drive to drain any water from the drive.
- Rinse the drive if possible.
- Tilt the drive completely up before transporting the trailer. The drive should be all the way up and secured whenever the trailer and boat are being moved.
- During transport, be aware of high spots or dips in the roadway, such as railroad crossings, low street gutters, large potholes or other uneven road surfaces. Be careful when backing. The drives could strike the road or ground, causing damage.
- When you have reached your destination, if the boat will be stored on the trailer, the drive should be trimmed down to a level position.
- Flush the engine if that hasn't already been done. See *Engine Flush*.

NOTICE!

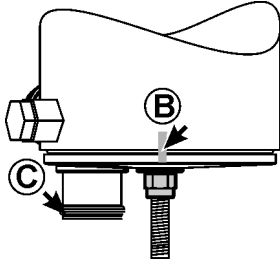
Drain the engine if freezing temperatures are expected, see *Draining the Cooling System*.

Draining the Cooling System

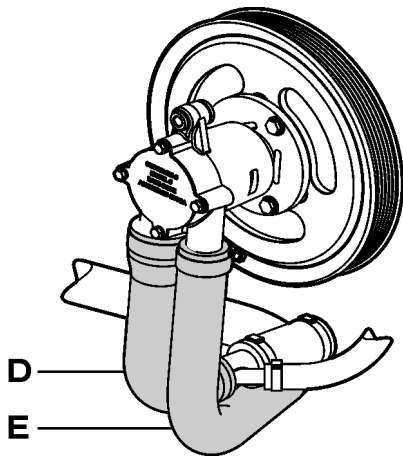
This procedure covers draining the raw (sea) water from the heat exchanger and seawater pump. This is usually done to prevent damage to these parts during freezing temperatures.

Before starting this process, ensure that there is an indexing mark on the heat exchanger and a corresponding mark on the end cap at B. If there are no marks, use a white paint marker to create the indexing marks.

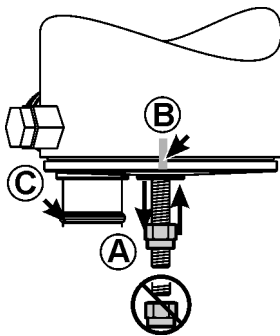
NOTICE! This indexing mark is required to ensure that the raw water inlet C is in the correct position when the end cap is reinstalled.



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- 1 Loosen clamps on raw water pump hoses D and E. Lower ends of the hoses below the level of the oil cooler and the bottom of the heat exchanger. Allow water to completely drain.

- 2 Loosen 9/16" nut A on the stud holding the end cap on the bottom of the heat exchanger. Do not remove the nut from the stud.
- 3 Make sure the cap completely separates from the heat exchanger.

NOTICE! Risk of freeze damage to heat exchanger. The raw water portion of the heat exchanger has multiple compartments, to insure that all compartments drain, the cap must completely separate from the gasket and housing.

- 4 Once the end cap has come loose, water will begin to drain from the heat exchanger. Allow all water to drain.
- 5 Reinstall the end cap, using the indexing marks to properly align the cap. Tighten nut until cap and gasket are sealed to the bottom of the heat exchanger. Do not over tighten nut, maximum torque is 10–11 ft. lb. (14–15 Nm).
- 6 Reinstall the hoses D and E and tighten clamps.

Fault Handling

EVC Diagnostic Function

Despite regular maintenance (in accordance with the maintenance schedule) and perfect operation, faults may occur which must be addressed before the boat can be operated any further.

This chapter describes the purpose of the EVC's diagnostic function, the types of alarms and messages the operator can get from the EVC system, and how to address problems when they occur.

The diagnostic function has the following tasks:

- Detect and localize faults.
- Warn the boat's operator of faults that have been detected.
- Protect the engine and drive to ensure continued operation when serious faults are discovered. The engine RPM is reduced or the engine stops automatically if needed.

Alarms and Messages

There are several types of alarms and messages that may appear as pop-ups in the displays. They must be acknowledged to stop appearing in the display. Please refer to *Acknowledging Alarms and Messages*.



Alarm for Faults

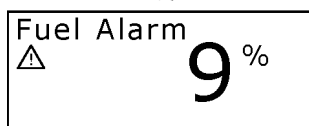
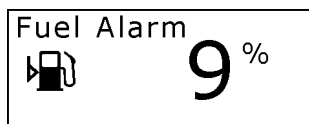
This type of alarm appears as a Caution, Warning or Danger pop-up that alternates between “source of fault/cause of fault” and “action to take.” It appears in the display representing the engine with the fault. If the fault is more serious the fault pop-up is also accompanied by a buzzer.

These alarm pop-ups have the following priority, from highest to lowest:

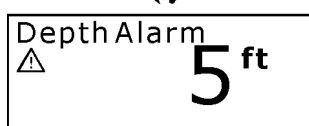
Danger Pop-up – If the Danger pop-up appears during operation, a serious engine fault, requiring immediate attention, has occurred.

Warning Pop-up – If the Warning pop-up appears during operation, a fault has occurred which will not immediately damage an engine or drive. Acknowledge the alarm as soon as safely possible.

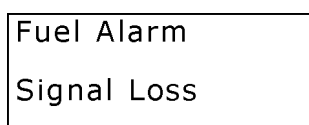
Caution Pop-up – If the Caution pop-up appears during operation, a fault has occurred which will not damage an engine or propulsion unit.



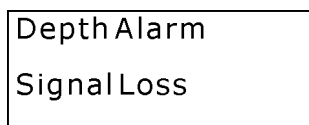
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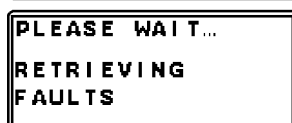
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Alarm for Fuel or Depth (Optional)

These alarms appear as a “fuel left in %” or “depth in m/ft” pop-ups that alternate between “data symbol” and “warning triangle.” The depth alarm pop-up is also accompanied by a buzzer.

The fuel level alarm pop-up will appear when the fuel level is lower than fuel alarm setpoint. The pop-up shows the percentage of fuel remaining. Fuel level alarm pop-up will reappear every 10 minutes until the fuel level in tank is higher than fuel alarm set-point.

Fuel/Depth Alarm Signal Lost Message

This message appears as a pop-up when the Fuel or Depth alarm is out of order.

If the fuel level or depth alarm has been set and the signal is lost, for instance in the case of sensor malfunction, the alarm signal loss pop-up will appear.

Messages

There are a variety of message pop-ups that appear to attract the operator’s attention to different matters regarding the handling of the boat or the status of communications in the EVC system. **These messages disappear automatically if they are not acknowledged.**

Fault Code Register

CAUTION!

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

The following are descriptions of potential faults, the warning lamp (and its color) that may be activated, an indication of whether the audible alarm will sound, and the associated pop-up that will appear on the EVC tachometer display. The arrows in the EVC Tach Display column signify that the display cycles between two screen messages. The second message in the cycle informs the operator to read this section of the manual.

If you are unsure how to proceed any time an action is required, please refer to the appropriate section in this manual for additional information.

Carry out all operations involving equipment checks and troubleshooting by first moving the boat to a safe location (preferably anchoring, mooring, or docking) and then shutting down the engine(s).

When following the steps outlined in the Operator Actions, if the fault ceases, there may be no need to go to the dealer. However, after following the steps, if the fault persists, see your dealer as soon as possible.

Fault Code ⁽¹⁾

Symptom: ⁽²⁾	Color ⁽⁵⁾ Lamp ⁽⁶⁾	Alarm ⁽⁷⁾	EVC Tach Display ⁽⁸⁾
EVC Action: ⁽³⁾			
Operator Action: ⁽⁴⁾			

1) Warning text that appears on the display.

2) Brief symptomatic description of the fault that is occurring.

3) Brief description of the steps EVC is taking to counter the fault.

4) Brief description of additional steps operator must take to counter the fault.

5) Icon representing color of alarm indicator lamp (only if installed).

6) Icon representing alarm indicator lamp (only if installed).

7) Icon representing that alarm is sounding.

8) Screen illustration of fault code.

Fault codes provided on the following pages are listed in alphabetical order.

Battery Voltage

Symptom: Battery voltage too low.

EVC Action: None.

Operator Action:

- Check battery fluid level.
- Check belt tension.
- Contact a Volvo Penta dealer if the fault persists.



-

! WARNING!

Battery Voltage
See Op Manual

AMBER



Can Not Start, Trim Too High

Symptom: Engine will not start. Error message in display.
Trim reading too high.

EVC Action: None.

Operator Action:

- see *Crank Override Mode*

!
Can Not Start
Trim Too High

Crank Override Mode

To start the engine when this fault is present;
Hold the ignition key in the start position for more than 5 seconds. Engine will start.

Check Control Lever

Symptom: Fault in throttle control lever.

EVC Action: Depends on severity of fault—red or amber lamp. Red warning lamp: Cannot throttle up or down.

Operator Action:

- Check the electrical connectors for the control lever.
- Contact a Volvo Penta dealer.



! WARNING!

Check
Control Lever



! WARNING!

See Op Manual

AMBER



-

! CAUTION!

Check
Control Lever



! CAUTION!

See Op Manual

Check Engine

Symptom: Miscellaneous engine faults.

EVC Action: Some faults will cause the engine to reduce RPMs.

Operator Action:

- When safe to do so, shut off and restart engine(s). If engine(s) operate normally, leave engine(s) running.
- Contact a Volvo Penta dealer.

RED



! WARNING!

Check Engine
See Op Manual

AMBER



–

! CAUTION!

Check Engine
See Op Manual

Check EVC System

Symptom: Internal fault in the EVC system.

EVC Action: Depends on severity of fault—red or amber lamp. Red warning lamp will result in engine RPM reduction.

Operator Action:

- If restarting EVC, it's important to wait until EVC completely shuts down (the display, gauges, and button panels turn off) before turning the key back on again.
- Restart engine(s).
- If the engine cannot be operated from the chosen control panel, use an alternative control panel.
- Contact a Volvo Penta dealer.

RED



! WARNING!

Check EVC System
See Op Manual

AMBER



–

! CAUTION!

Check EVC System
See Op Manual

Check Joystick

Symptom: Fault in joystick.

EVC Action: Engine power is reduced.

Operator Action:

- When safe to do so, shut off and restart engines.
- If engine cannot be operated from the chosen control panel, use an alternate control panel.
- Contact a Volvo Penta dealer.

RED



! WARNING!

Check Joystick

AMBER



–

! CAUTION!

Check Joystick

Check Multilink

Symptom: Multilink communication error. Possible engine synchronization loss or loss of one or more display(s).

EVC Action: None.

Operator Action:

- When safe to do so, shut off and restart engine(s). If performance is not affected, leave engine(s) running.
- Contact a Volvo Penta dealer.

AMBER



–

! CAUTION!

Check Multilink
See Op Manual

Check Shift Actuator

Symptom: Fault in shift motor or shift position sensor.

EVC Action: Shifting is disabled. Engines are shut off.

Operator Action:

- Shift to neutral, acknowledge the fault message, then attempt to shift into forward or reverse.
- Check shift cable attachment points for loose connections.
- Check shift actuator's electrical connector.
- Contact a Volvo Penta dealer.

RED



! WARNING!

Check
Shift Actuator



! WARNING!

See Op Manual

Check Steering Wheel

Symptom: Fault in steering wheel.

EVC Action: Engine power is reduced.

Operator Action:

- When safe to do so, shut off and restart engines.
- Contact a Volvo Penta dealer.

AMBER

—



! CAUTION!

Check
Steering Wheel

Coolant Temp.

Symptom: Engine coolant temperature too high.

EVC Action: Engine power is reduced.

Operator Action:

- Check coolant level.
- Check that the seawater intake is clear.
- Check the impeller in the seawater pump.
- Check that no leakage occurs.
- If the cooling water flow ceases, the exhaust hose should be inspected internally and replaced if the hose shows signs of damage.
- Contact a Volvo Penta dealer if the fault persists.

RED



! WARNING!

Coolant Temp.
See Op Manual

Engine Oil Press.

Symptom: Engine oil pressure too low.

EVC Action: Engine power is reduced.

Operator Action:

- Check the oil level in the engine.
- Check that the oil filters are not blocked.
- Check that no leakage occurs.
- Contact a Volvo Penta dealer if the fault persists.



! WARNING!

Engine Oil Press.
See Op Manual

RED



Engine Speed

Symptom: Over-speed condition caused by extreme operating conditions or fault in engine speed sensor.

EVC Action: Engine RPM is reduced.

Operator Action: Contact a Volvo Penta dealer.

RED



! DANGER!
Engine Speed
See Op Manual

Exhaust Temp.

Symptom: Exhaust temperature too high.

EVC Action: Engine power is reduced.

Operator Action:

- Check that the seawater intake is clear.
- Check the impeller in the seawater pump.
- Check exhaust hoses.
- Contact a Volvo Penta dealer if the fault persists.

RED



! WARNING!
Exhaust Temp.
See Op Manual

Fuel Pump Relay

Symptom: Faulty relay.

EVC Action: Engine will stop. If engine is off, engine will not start.

Operator Action:

- Check fuel pump relay in fuse box and replace if necessary.
- Contact a Volvo Penta dealer if the fault persists.

AMBER



–

! WARNING!
Fuel Pump Relay
See Op Manual

Key Failure

Symptom: Key or start panel inoperative. Possible short in electrical cables.

EVC Action: None.

Operator Action:

- If the engine cannot be started from the chosen control panel, use an alternative control panel.
- Contact a Volvo Penta dealer.

AMBER



–

! CAUTION!
Key Failure
See Op Manual

Lever Calib. Incorrect

Symptom: Incorrect lever calibration.

EVC Action: Not possible to choose active helm station.

Operator Action:

- When safe to do so, shut off and restart engines.
- Please contact a Volvo Penta workshop if the fault persists.

AMBER



–

! CAUTION!
Lever Calib.
Incorrect

Limited Steering, Limited Engine RPM

Symptom: Fault in one driveline.

EVC Action: Engine RPM is reduced to idle on on faulty driveline. Steering is deactivated on faulty driveline.

Operator Action:

- Throttle back to neutral on engine with faulty driveline. Tilt the drive out of the water.
- Check steering oil level.
- Check for leaks in steering system.
- Check circuit breakers/relays.
- Check for loose electrical connections.
- Check battery condition.
- Check for kinked hoses.
- Contact a Volvo Penta dealer.

RED



! WARNING!
Limited Steering
Limited Eng RPM



! WARNING!
See Op Manual

No Gear/Throttle, No Steering

Symptom: Helm computers lose communications with both drivelines.

EVC Action: Engine RPM reduced to idle. Gears are shifted to neutral. Steering is deactivated and left in current position.

Operator Action:

- When safe to do so, shut off and restart engines.
- Check circuit breakers/relays.
- Check for loose electrical connections.
- Contact a Volvo Penta dealer.

RED



! DANGER!
No Gear/Throttle
No Steering



! DANGER!
Restart Engines
See Op Manual

No Steering, Limited Engine RPM

Symptom: Fault(s) in both drivelines.

EVC Action: Steering is deactivated in both drivelines. Engine RPM is reduced to idle on both drivelines.

Operator Action:

- When safe to do so, throttle back to neutral on both engines.
- Check circuit breakers/relays.
- Check for loose electrical connections.
- Check battery condition.
- Contact a Volvo Penta dealer.

RED



! DANGER!
No Steering
Limited Eng RPM



! DANGER!
See Op Manual

Power Relay

Symptom: Faulty ignition relay.

AMBER

–



! WARNING!

Power Relay
See Op Manual

EVC Action: Engine will stop. If engine is off, engine will not start.

Operator Action:

- Check ignition relay in fuse box and replace if necessary.
- Contact a Volvo Penta dealer if the fault persists.

Power Trim Faults

Symptom: Fault in power trim system. Possibility that the system does not detect relays or trim sensor drifts without operator action. Also may be a trim sensor fault resulting in no readings.

RED



! WARNING!

Powertrim
Faults



! WARNING!

See Op Manual

EVC Action: Power trim assist function is turned off. Normal trimming may be disabled in some situations.

Operator Action:

- If normal trimming does not function, use emergency trimming procedure. For additional information, please see *Emergency Trimming*.
- Contact a Volvo Penta dealer.

AMBER

–



! CAUTION!

Powertrim
Faults



! CAUTION!

See Op Manual

Start Relay

Symptom: Faulty relay.

AMBER

–



! WARNING!

Start Relay
See Op Manual

EVC Action: None while engine is operating. If engine is off, engine will not start.

Operator Action:

- Check start relay in fuse box and replace if necessary.
- Contact a Volvo Penta dealer if the fault persists.

Steering Fault

Symptom: Possible sensor failure or low oil pressure. Result of steering oil overheat situation getting worse.

EVC Action: Depends on severity of fault—red or amber lamp. If the lamp is red the steering is disabled. Amber warning lamp may result in limited steering and/or limited RPM. No action taken on amber caution lamp.

Operator Action:

- Throttle back to neutral.
- Tilt the failed drive into the tilt position.
- Check steering oil level.
- Check for leaks in steering system.
- Check for kinked hoses.
- Contact a Volvo Penta dealer.

RED



! WARNING!
Steering fault



! WARNING!
See Op Manual

AMBER



—

! CAUTION!
Steering fault



! CAUTION!
See Op Manual

Steering Oil High Temp

Symptom: Steering oil overheat situation. Functionality remains unaffected. If the situation persists or gets worse, it will result in a different code.

EVC Action: None.

Operator Action:

- Check steering oil level.
- Check for leaks in steering system.
- Check for kinked hoses.
- Contact a Volvo Penta dealer.

AMBER



—

! WARNING!
Steering oil
High Temp



! WARNING!
See Op Manual

SUS/SCU Battery Voltage Low

Symptom: Electrical power level provided to steering control unit (SCU) is low or there is a charging problem in circuit controlling SCU. This fault could result in other faults occurring.

EVC Action: None.

Operator Action:

- Check battery condition.
- Check for loose battery cables.
- If possible and if necessary, switch battery selector to "ALL" and use house batteries.
- Contact a Volvo Penta dealer if the fault persists.

AMBER



—

! WARNING!
SUS/SCU Battery
Voltage Low



! WARNING!
See Op Manual

In Case of Emergency

Running Aground

Striking an Underwater Object

WARNING!

Striking an object can cause severe damage to the boat or drive.

This damage could result in loss of steering, loss of shift control, or possibly water entering the boat.

All of these situations could place the boat's occupants at risk. Consider all of these factors when formulating plans to address the impact damage.

Trim/tilt system impact protection is built in to the trim cylinders. If an impact occurs while in **forward** motion, the cylinders will allow the drive to "kick up," thereby helping to minimize boat and drive damage.

NOTICE!

There is no impact protection in **reverse**. When in reverse, operate at low RPMs to reduce the potential for damage.

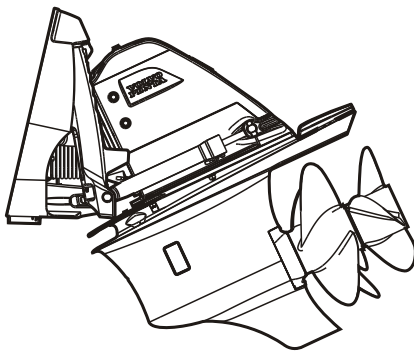
Operate at reduced speeds when in or near shallow water, or in areas where underwater objects are known to exist.

If you strike an object or run aground;

NOTICE!

If there are problems at any of the following steps, call for assistance to move the boat to a location where it can be removed from the water for inspection. Operating with damaged equipment, especially at speed, could worsen the damage. Steering and control could also be affected.

- Throttle back to idle, if possible maneuver to a safe place, out of high traffic areas.
- Place the shift mechanism in neutral.
- Check the engine compartment for water leaking around the transom shield. If water is seen, assess the amount of water entering the boat, determine whether emergency actions are needed, proceed accordingly.
- If no emergency action is needed, check for damage to the boat, drive or propellers. Visually inspect the exterior of the shield and drive for broken or damaged components. Check for damaged propellers.
- Turn the key on (do not start) and try to trim the drive back down. If the drive trims down check for alignment.



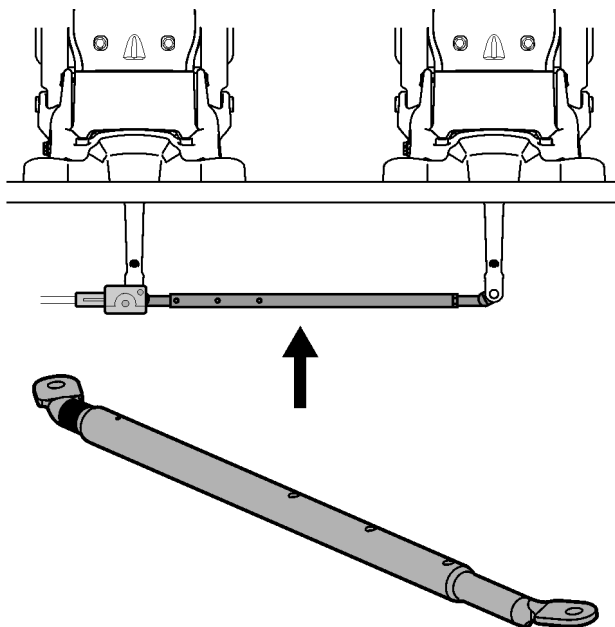
P0015834

- Restart the engine, check for vibrations or noise.
- Place the drive in gear, at idle. Determine if the drive can safely power the boat. If possible proceed to a facility where the boat can be removed from the water for inspection.

The captain of the boat is responsible for determining which actions should be taken after an impact or grounding. The safety of the boat's occupants should be a high priority. The circumstances of the impact including the speed, any injuries or any damage done, should be factored into the course of action taken to protect the occupants and then minimize any further damage to the boat.

The boat and drive should be thoroughly inspected before the boat is used again.

To prevent galvanic corrosion, any paint damage on the drive and propeller should be repaired before launching the boat again.



P0016588

Tie Rod

Applies to twin engine boats with mechanical (not electric) steering.

The tie rod connects the tiller arms of the two drives. It is mounted inside the boat at the rear of the engines. Check the tie rod if you have hit an obstacle. If the tie rod is bent, loose, or damaged, have it serviced immediately by your Volvo Penta dealer. In the meantime, operate your boat at slow speeds only.

CAUTION!

The tie rod is an integral part of the steering system and is a vital safety part. A damaged tie rod may hinder steering operation or render it completely ineffective. Always replace a damaged tie bar. Never try to straighten or weld a damaged tie rod.

Starting Using Auxiliary Batteries

DANGER!

Never allow an open flame or electric sparks near the battery or batteries. Never smoke in proximity to the batteries. The batteries give off hydrogen gas during charging which, when mixed with air, can form an explosive gas. This gas is easily ignited and highly volatile.

DANGER!

Never interchange 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 negative (–) terminal on the auxiliary battery and to a place a little distance away from the discharged battery (e.g. the starter motor's negative terminal).
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.

Troubleshooting

Engine Troubleshooting Guides

The following troubleshooting guide is provided to help you isolate a malfunction of one or more of your boat's systems. After determining which systems are affected by the malfunction, refer to the individual system troubleshooting charts to isolate the specific cause.

This guide was written to help you trace the symptoms of the trouble to the source, without having to read through and prove every possibility. Much of the information here will be familiar to well informed mechanics.

Also, many factors will seem insignificant but when you think of it, usually the toughest problem to troubleshoot is caused by the smallest error. The greatest aid to solving a service problem is information. Start gathering information and keep a detailed record of the symptoms of the malfunction. Keep a record of pertinent facts, such as:

- When did this trouble start?
- How was the boat loaded?
- Did the trouble occur suddenly or did it become apparent gradually?

Whether servicing the boat's systems yourself or having your product serviced by a certified Volvo Penta dealer, you will need this record of information to identify potential causes of the malfunction.

Analyze this information and try to match it to similar situations you have experienced in the past. Keep in mind the fundamental rules:

- COMPRESSION - Mixture inducted into cylinder and compressed.
- SPARK - Proper intensity at the proper time.
- FUEL - Proper mixture of air and fuel.
- EXHAUST - Clear of any obstructions.

Also see *Fault Code Register* for additional troubleshooting help.

Detonation (Spark Knock)

Detonation, or spark knock, is continually monitored by the electronic fuel injection (EFI) system. The EFI's computer (ECM) will automatically alter spark advance to help prevent engine damage if knock is detected, and there will be a slight loss of power.

Engine Will Not Crank

Starter Circuit – Check:

- The control lever must be in neutral.
- Emergency stop switch.
- Battery switch turned off.
- Battery condition: weak, dead, sulfated, bad cells.
- Battery cables—for loose or corroded connections.
- Circuit breakers and/or fuses.
- Ignition relay.
- Shorted or open ignition switch.
- Wiring, from battery to ignition switch.
- Starter relay.
- Starter motor and solenoid—for shorts, grounds, or open circuits.
- Starter assist solenoid.
- Call for assistance or see Volvo Penta authorized dealer.

Engine Cranks, But Will Not Start

Ignition Circuit – Check:

- Primary circuit wiring, from ignition switch to ignition coil/ignition module.
- Secondary circuit wiring, from coil to spark plug.
- Spark plugs—for proper gap, fouling, burned electrodes, or cracked/dirty insulator.
- Low battery voltage.
- Call for assistance or see Volvo Penta authorized dealer.

Fuel System – Check:

- Fuel level.
- Fuel shutoff and multiple tank valves are open and operating properly.
- External fuel filter canister clogged.
- Quantity and condition of fuel in boat tank.
- Operation and flow capacity of boat anti-siphon valve.
- Fuel tank vent is unrestricted.
- Fuel tank pick-up screen is clean.
- Correct diameter/unrestricted boat fuel lines.
- Fuel pump relay and circuit breaker operation.
- Call for assistance or see Volvo Penta authorized dealer.

Hard Starting – Cold Engine

Check:

- Fuel lines for obstructions.
- For debris inside fuel tank.
- For clean fuel filter.
- Water in fuel.
- Fuel quality deterioration.
- Fuel system—for leaks, dirt, or obstructions.
- Ignition system.
- Call for assistance or see Volvo Penta authorized dealer.

Hard Starting – Hot Engine

Is this a New Condition? Check:

- Quality of fuel – octane (E10 max).
- Spark plugs.
- Water in fuel.
- Condition of battery and cables.
- Starter motor—for overheat damage.
- Call for assistance or see Volvo Penta authorized dealer.

Did Engine Refuse to Start after Being Run? Check:

- Ignition system primary circuit.
- Ignition coil(s) and/or ignition module.
- Flooded engine.
- Call for assistance or see Volvo Penta authorized dealer.

Engine Runs Rough

If At Slow Speed – Check:

- Idle speed.
- Spark plugs.
- Fuel pump pressure.
- Water or contaminants in fuel.
- Manifold vacuum leak.
- Call for assistance or see Volvo Penta authorized dealer.

If At High Speed – Check:

- Air leak on suction side of fuel system.
- Too low octane fuel.
- E20 or E85 fuel.
- Ignition system secondary circuit.
- External fuel filters.
- Water or contaminants in fuel, or water in cylinders.
- Call for assistance or see Volvo Penta authorized dealer.

Engine Noises and Vibrations

Valves (Hydraulic Lifters) – Check:

- Oil quality (dirt or water in oil).
- Oil quantity.
- Oil type and weight.
- Call for assistance or see Volvo Penta authorized dealer.

Ignition System (Ping or Knock) – Check:

- Improper tuning (see dealer).
- Proper octane fuel is used.
- Call for assistance or see Volvo Penta authorized dealer.

Cooling System – Check:

- Supply pump.
- Loose belts and/or pulleys.
- See section entitled *Cooling System*.
- Call for assistance or see Volvo Penta authorized dealer.

Mountings – Check:

- Loose, broken, or worn engine mounts.
- Loose lag screws holding mounts to stringer.

- Call for assistance or see Volvo Penta authorized dealer.

Alternator – Check:

- Loose pulley (see dealer).
- Noise from bearings (see dealer).
- Call for assistance or see Volvo Penta authorized dealer.

Sterndrive – Check:

- Failed U-joints or gimbal bearing (see dealer).
- Damaged internal drive components (see dealer).
- Worn, bent, or broken propeller hub or blades (refer to the section entitled *Propeller Replacement*).
- Call for assistance or see Volvo Penta authorized dealer.

Engine Overheats

Check:

- Drive water intakes blocked. Tilt the drive up and look for obstructions to the water intakes (e.g., seaweed, plastic bags, etc.).
- Check cap on running engine flush port to ensure it is securely in place.
- Raw water pump impeller damaged or blocked. For additional information, see *Maintenance: Impeller: Checking & Replacing*. Do not do this unless you have tools and parts on hand.
- Supply pump, circulating pump, and belt(s).
- Thermostat.
- Sending unit operation and wiring circuit.
- Water supply hoses (loose clamps or holes in hoses).
- Air leaks on suction side of supply pump.
- Water leaks on pressure side of supply pump.
- Heat exchanger to be sure that it is free of debris.
- Call for assistance or see Volvo Penta authorized dealer.

Engine Dies Out

- Refer to the section entitled *Engine Protection Mode*.

Loss of Fuel or Out of Fuel – Check:

- Fuel level in tank.
- Water or debris in fuel.
- Plugged fuel filter.
- Fuel pickup tube and screen blockage.
- Fuel tank vent blockage.
- Air leak on suction side of fuel system.
- Fuel leak on pressure side of fuel system.

DANGER!

Be extremely careful around fuel leaks. Never expose fuel or fuel vapors to sources which could cause ignition, resulting in a fire or explosion.

- Fuel pump operational.
- Call for assistance or see Volvo Penta authorized dealer.

Loss Of Ignition – Check:

- Spark plug wires.
- Ignition switch wires.
- Circuit breakers and relays.
- Wiring between engine and dash.
- Call for assistance or see Volvo Penta authorized dealer.

Engine Stops Or Dies Out Due To Seizure – Check:

- Call for assistance or see Volvo Penta authorized dealer.

Engine Won't Reach Operating RPM

- Refer to the section entitled *Engine Protection Mode*.

Check:

- Boat overloaded or load improperly placed.
- Marine growth on hull and drive (refer to the section entitled *Boat Bottom*).
- Fuel type or octane.
- Propeller: Damaged blades or slipping hub (refer to the section entitled *Propeller Replacement*).
- Wrong propeller (refer to the section entitled *Propeller Replacement*).
- Crankcase oil volume.
- Operating at high altitude.
- Restricted exhaust outlets in engine, transom bracket, or drive.
- Fuel pump.
- Engine overheating.
- Ignition system operation.
- Remote control cables and linkage for proper attachment and travel.
- Call for assistance or see Volvo Penta authorized dealer.

Low Oil Pressure or Engine Knock

Engine Components – Check:

- Oil quality (dirt or water in oil).
- Oil quantity.
- Oil type and weight.
- Call for assistance or see Volvo Penta authorized dealer.

Low Battery Voltage After Short Storage

To Charge:

- Check all battery and starter cable connections to ensure they are clean and tight.
- Use a fully charged battery to jump start the engine. Refer to *Starting Using Auxilliary Batteries* in section entitled *In Case of Emergency*.
- Recharge starter battery.
- Check battery condition; replace if necessary.

To Prevent:

- All electrical accessories including ignition circuit are turned off.
- Turn battery switch off and disconnect main battery negative cable from battery.
- If problem persists, call for assistance or see Volvo Penta authorized dealer.

Less than Optimal Performance

A great number of environmental factors, such as barometric pressure, ambient temperature, humidity, the quality of fuel, and exhaust back pressure can affect engine performance. All Volvo Penta engines are tested and certified using the following fixed values or common conditions for determining the rating of the engine.

Condition	Value
Air temperature	25°C (77°F)
Barometric pressure	100 kPa (14.504 PSI)
Relative humidity	30%

A gasoline engine operates with very little surplus air. When conditions deviate from the standard values, the result can be a loss of power at full load. It can also cause a rise in exhaust emissions due to incomplete fuel combustion.

Hull Weight

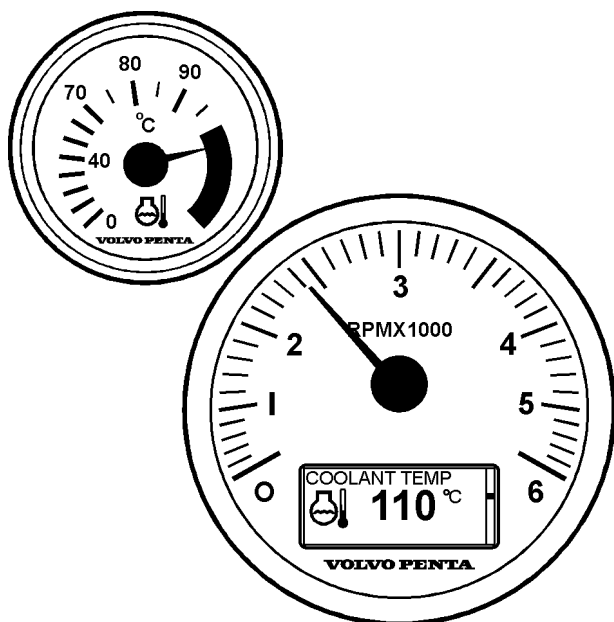
The overall weight of the boat is an important factor in performance. Any increase in boat weight will slow down the boat speed, particularly on boats with planing and semi-planing hulls. To minimize this problem, eliminate all excess weight from the boat.

In considering the influence of weight, it is worth remembering that fiberglass boats absorb a significant amount of water into their hulls while left afloat for any length of time and so become progressively heavier.

Another negative influence on boat performance is marine growth beneath the water line—a problem that is often overlooked.

The propeller originally installed is frequently one that is designed to give maximum speed when the boat is new. For this reason, it is often advisable to reduce the propeller pitch by as much as an inch or more in order to counter the effects of the increase in overall weight encountered in normal cruising, particularly in hotter climates. Although this will reduce top speed somewhat, overall ride conditions will improve and you should achieve greatly enhanced acceleration.

If you feel that your boat performance has declined over time, we recommend that you visit an authorized Volvo Penta dealer to discuss the issue. Your dealer can assist you with selecting the correct propeller size, gear ratio, and horsepower for your boat, based on your current operating conditions.



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Engine Protection Mode

In a low oil pressure or engine overheat situation, the engine will trigger the Engine Protection Mode (EPM). In such cases, if an acoustic alarm has been installed with your engine, it will sound to notify you of a malfunction.

Volvo Penta provides an audible alarm with every engine, however its installation is determined by the manufacturer of your boat. If your boat does not have an audible alarm, we strongly recommend that you contact your dealer to have one installed.

If the engine triggers protection mode, its speed (RPMs) may be reduced or it may shut down, depending on the engine equipment and circumstances.

Under most conditions, engine operation is limited to 3000 RPMs or less. For mild engine overheating, engine speed reduction will be 4200 RPMs. When the engine enters EPM, there will be a temporary reduction in power until the problem is resolved. **We strongly urge you to bring the engine to idle to investigate the problem.** If the acoustic alarm stops sounding, the malfunction has been cleared and the engine may now be operated normally.

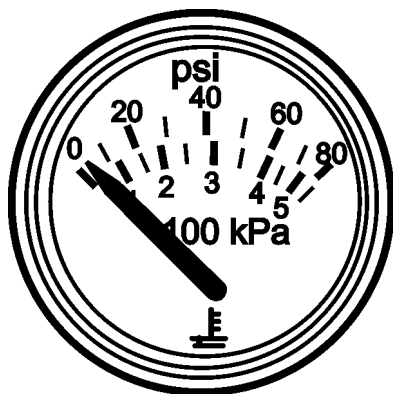
Use the oil pressure and water temperature gauges to verify a problem exists, then inspect the engine crankcase for proper oil level and check the water inlets for obstructions. The low oil pressure/engine overheat problem must be corrected before the engine will return to normal operation.

To reset the Engine Protection Mode after the problem is corrected, reduce engine speed to idle, allow the engine to cool, and then continue with normal operation.

If you are unable to locate and resolve the problem, you may be able to continue operating the engine at above idle speed, keeping in mind that the acoustic alarm will continue sounding and the engine speed will remain at a reduced level.

NOTICE! Continuing to run the engine, with EPM active and without correcting the cause of the problem, may result in engine damage or equipment failure which may not be covered by your warranty.

If the problem continues, contact your Volvo Penta dealer and have the engine inspected.



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Low Oil Pressure

If your engine's oil pressure drops too low, the acoustic alarm will sound a constant tone, warning you that there is a problem. The engine will also enter protection mode and engine RPMs will be reduced. There are three common reasons for oil pressure dropping too low:

- High oil level
- Low oil level
- Increased engine temperature

If the alarm sounds and the oil pressure gauge indicates low pressure, reduce engine speed (RPMs) to idle and investigate the problem.

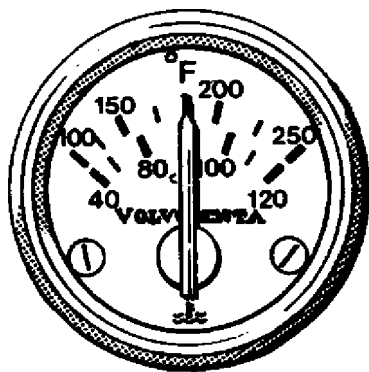
NOTICE! Ignoring a low engine oil pressure situation can cause engine damage and/or equipment failure which may not be covered by your warranty.

If safe to do so, shut off the engine and allow oil to settle for five minutes. Use the dipstick to check engine crankcase oil level. If there is too much oil, siphon out the excess until it reaches recommended levels. **If you are unable to remove oil from the engine, make way at reduced speed only.**

If there is not enough oil, add more until it reaches recommended levels. **If you are unable to add oil to the engine, make way at reduced speed only.**

If the oil level is not the problem or the alarm continues to sound after adjusting the oil level, check to see if there are any additional problems such as engine overheating. See the next section for additional information.

If the problem persists, contact your Volvo Penta dealer and have the engine inspected.



21195-1

Engine Overheats

If the engine overheats at high speeds, the engine protection mode will activate and:

- Engine speed will be automatically reduced to approximately 3000 or 4200 RPM, depending on the severity of overheating. Mild overheating results in a speed reduction to 4200 RPM. If an engine alarm has been installed, an audible warning horn will sound for 1/2 second every 5 seconds. More severe overheating results in a speed reduction to 3000 RPM. If an engine alarm has been installed, an audible warning horn will sound once per second.
- The engine protection mode will remain active until the engine has been reduced to idle and the overheating problem has been corrected. For additional information, see *Engine Protection Mode*.

To determine possible causes for overheating:

- Look for obstructions to the water intakes (e.g., seaweed, plastic bags, etc.)
- Check impeller
- Check coolant level
- Check all water supply hoses for leaks

NOTICE! Ignoring an overheating situation can cause engine damage and/or equipment failure which may not be covered by your warranty.

If the situation persists, contact your Volvo Penta dealer for assistance.

Water in Bellows

OceanX (OXi) drives are equipped with a sensor that detects water intrusion in the bellows. If water is detected inside the bellows, an alarm horn will sound for one second every sixty seconds. If this alarm sounds, please contact your dealer for repairs as soon as possible.

Water in Oil and Oil Level

OceanX (OXi) drives are equipped with an oil level sensor that also detects water intrusion in the drive. If the oil level in the drive is low or water is detected in the oil, an alarm horn will sound for one second every sixty seconds. If this alarm sounds, check the level and quality of the oil in the drive.

For instructions on checking the level, please refer to *Lubrication System: Checking Engine Oil Level* in the chapter entitled *Technical Data*. If the oil level is low, add the necessary amount.

To check the quality of the oil, siphon off a small amount of oil from the drive. Check to see if the oil has a milky or translucent white appearance. If the oil has water in it, it will appear milky.

If the alarm persists after checking the oil level and quality, please contact your dealer for repairs as soon as possible.

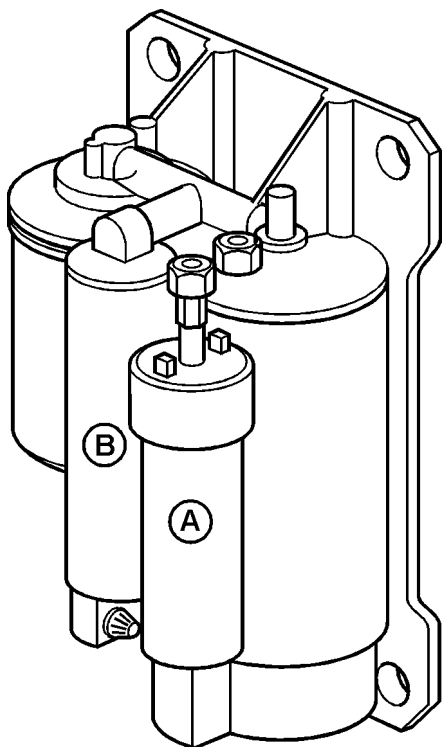
Electric Fuel Pumps

EFI engines have two electric fuel pumps:

- A high-pressure pump **A** to supply the fuel injectors.
- A low-pressure pump **B** to bring fuel from the boat tank to the engine.

Both pumps are protected by a single 20-amp fuse and relays. The pumps will operate only when the engine is cranking or running. If a pump does not function, check the fuses and replace them if necessary. See your Volvo Penta dealer if further service is required.

NOTICE! A loud whining noise at idle may be due to a restricted fuel filter causing a noisy fuel pump. Operating the engine with a restricted filter may damage the pressure regulator or fuel pumps. See your Volvo Penta dealer if the pump makes an unusual noise.



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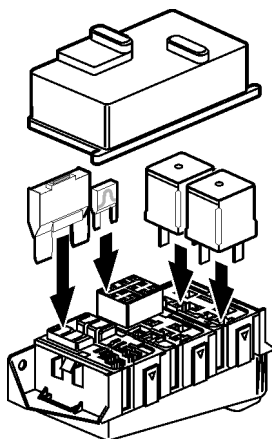
Circuit Breakers and Fuses

The engine's electrical system is protected against circuit overload by fuses and circuit breakers.

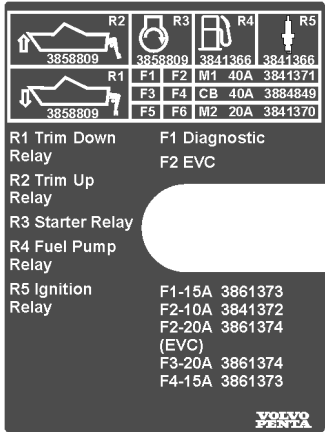
Engine electrical circuits may also be routed through relays.

All relays, breakers, and fuses for the driveline are contained in a single fuse box. The box is covered and is mounted on the top of the engine.

If electrical systems such as power trim or ignition are not working, check this box as a first step in troubleshooting the problem.



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P0016589

A label on the cover shows the location, type, size, and other information for the relays, fuses, and breakers. Part numbers are also provided. The image is an example of one of these labels and may not represent your engine. See the cover label on your engine.

Several spare fuses and relays are located on the inside of the fuse box cover. In case of malfunctioning or faulty fuses and relays, use the spares provided.

Remember to replace any spares that are used.

NOTICE! Circuit breakers or fuses that repeatedly fail indicate a problem that requires immediate attention. See your Volvo Penta dealer.




EVC Diagnostic Function

See *Fault Handling*.

Engine Status Panel Function

The engine icon (below), when lit, is an indication of a possible emission system fault. The second icon indicates an engine-monitored malfunction has been detected. Depending on the severity of the fault, it may be accompanied by a continual beep from the audible alarm (third icon).

The following is a list of possible fault indications that may appear on the engine status panel or be heard through the audible alarm. The list also provides actions that may be required on the part of the boat operator.

Warning Signals			Reduced Throttle	Forced Idle	Engine Shuts Down	Required Operator Response
						
	ON ^A					Engine and/or emission system should be inspected by authorized service technician at your earliest convenience ^B .
ON	ON ^A					Engine and/or emission system should be inspected by authorized service technician at your earliest convenience ^B .
	ON ^A		YES			Even at full throttle, boat may not reach planing speed; operate boat accordingly. Engine and/or emission system should be inspected by authorized service technician soon ^B .
ON	ON ^A	ON	YES			Even at full throttle, boat may not reach planing speed; operate boat accordingly ^C . Engine and/or emission system should be inspected by authorized service technician soon ^B .
	ON ^A	ON	YES			Engine operates at reduced throttle, providing maneuvering speed only; operate boat accordingly ^D . Engine and/or emission system should be inspected by authorized service technician as soon as possible ^E .
	ON ^A	ON	YES	YES		Engine RPMs limited to idle speed only. Return to port as soon as possible. Engine and/or emission system should be inspected by authorized service technician as soon as possible ^E .
ON	ON ^A	ON	YES	YES		Engine RPMs limited to idle speed only. Return to port as soon as possible. Engine and/or emission system should be inspected by authorized service technician as soon as possible ^E .
	ON ^A	ON	YES		YES	Attempt to re-start the engine. If engine cannot be restarted, call for a tow. Engine and emission system should be inspected by authorized service technician before next use, even if engine can be restarted.

A. Check: clogged sea water intake(s), damaged impeller, engine oil level, engine coolant level, relays, fuses, and circuit breakers.

B. Ignoring this fault indicator could lead to deteriorating engine and/or emission system condition.

C. This fault may be an indication that the engine is running out of fuel.

D. This fault may be an indication of engine overheat and/or low oil pressure.

E. Ignoring this fault indicator may lead to serious engine and/or emission system damage.

Boat Bottom

The condition of the boat's bottom can affect your engine's performance. Marine growth, present in fresh water as well as salt water, will reduce boat speed. A boat bottom with evidence of marine growth can cause a reduction in top speed of 20 percent or more. Periodically clean the bottom of your boat following the manufacturer's recommendations. Bottom painting may also be desirable.

Power Trim

If the power trim system stops working check the following.

Fuses, Relays

Check the fuses and relays in the fuse box.

Trim Motor Protection

The electric trim motor has internal protection from thermal overload. If the trim switch is held too long in either full up or down the motor will stop. Release the switch and wait for the motor to cool and then reset. Resume trimming.

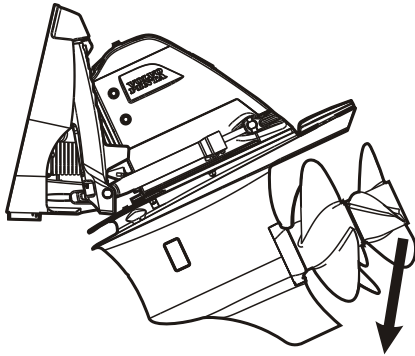
Drive Physically Blocked from Moving

Check to see if anything has become entangled in the drive or the trim cylinders. Clear the obstruction before proceeding with trimming.

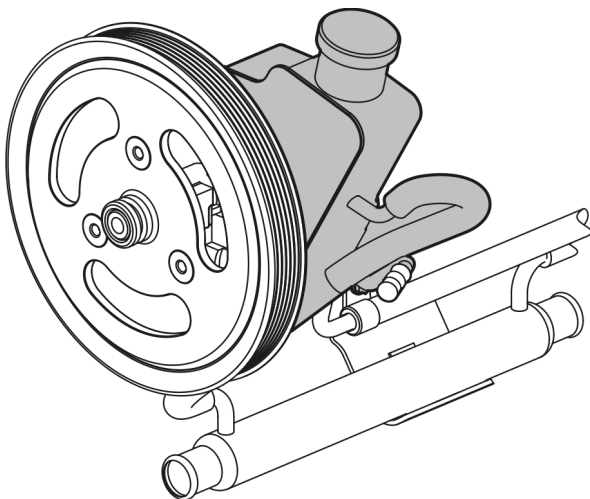
Steering

If you experience difficulty steering the boat, check for the following:

- Check the fluid level in the power steering pump reservoir. The fluid level must be above the "ADD" line and below the "FULL HOT" line or "FULL COLD" line, depending on its temperature when checked.
- Make sure the drive is not blocked from moving.
- Check all steering line fittings to ensure they are tight. Check for leaks.
- Check all hoses and fittings for leaks/pinches.
- Check drive belt.
- Check that all hose clamps on the power steering system are securely tightened.



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Maintenance Schedule

Owner's Responsibility

Marine engines and power packages are used in a harsh environment and operate at much higher loads than automotive engines. These circumstances necessitate a higher level of diligence when operating and maintaining marine engines. Volvo Penta products are designed to operate efficiently and to provide reliable and durable power in the marine environment. However, to ensure continued operating efficiency, a boat owner or operator must check, monitor, and maintain the power components as specified in this manual. An owner or operator has the responsibility to ensure that all daily and monthly checks are performed and that all scheduled maintenance is done. Please see the checklists and maintenance schedules in this chapter.

The operation, maintenance, and care of the Volvo Penta engine and power package, as outlined in this manual, are an owner's responsibility. The owner must keep records of all maintenance and service performed. This record of proper maintenance may be required to determine warranty coverage. If the boat is sold, these records should be transferred to the new owner.

Emissions Control Components

The sterndrive emission control system is governed by a separate warranty statement set forth in your warranty booklet. Volvo Penta recommends that you retain all receipts covering maintenance on the emissions control system, but Volvo Penta cannot deny warranty coverage on the emissions control system solely for the lack of receipts or your failure to ensure the performance of all scheduled maintenance. However, Volvo Penta may deny you warranty coverage for your emission control system if failure results from abuse, neglect, improper maintenance, or unapproved modifications.

If emission control system repair is required during the warranty period, you are responsible for presenting your sterndrive engine to a Volvo Penta authorized dealer as soon as the problem exists. The warranty repairs will be completed using genuine Volvo Penta parts in a reasonable period of time without charge. After expiration of the emission control system warranty, you may present your sterndrive engine to a repair shop or person of your choosing to maintain, replace, or repair emission control devices and systems.

Safety and Preventative Maintenance Checklists

The following checklists provide the preventative maintenance program for the engine and power package; successful preventative maintenance is a key element of safe boat operation. Preventative maintenance, combined with regular completion of the service work in the maintenance schedule, can reduce boat down-time and significantly reduce the chance of expensive engine repairs in the future. Checklists should be completed, by the boat owner or operator, at the intervals indicated. If an owner is unsure about how to check these items, (s)he should contact a Volvo Penta dealer for assistance with the checklists. Small corrections such as filling fluids, tightening hardware, and similar procedures can be done by the owner. If more complex problems or component failures are discovered, the owner should contact a Volvo Penta dealer to correct the problem.

DANGER!

Explosion hazard! Never operate an engine/boat with a suspected or actual fuel leak.

CAUTION!

If any items fail the checks (inspections), correct the failed items before using the boat/engine.

Owner's Checklist						
Check Before Each Use	Check/ Correct	Fill/ Lube	Adjust/ Tighten	Clean	Change/ Replace	✓
Engine						
Cooling System – Check coolant level ⁽¹⁾ ; check system for leaks	•		•			<input type="checkbox"/>
Engine Oil	•	•				<input type="checkbox"/>
Fuel Pump and System – Check for leaks	•					<input type="checkbox"/>
Sterndrive						
Anodes – Check, replace if eroded more than 30%	•					<input type="checkbox"/>
Power Trim/Tilt – Check for proper operation	•					<input type="checkbox"/>
Miscellaneous						
Emergency Stop Switch – Check clip and lanyard	•					<input type="checkbox"/>
Power Steering – Check for proper operation; check hoses and components for leaks	•					<input type="checkbox"/>
Power Steering Fluid – Check level	•	•				<input type="checkbox"/>
Remote Control and Shift System – Check for proper operation	•		•			<input type="checkbox"/>

1) Fresh water cooled versions

Owner's Checklist						
Check Each Month ⁽¹⁾	Check/ Correct	Fill/ Lube	Adjust/ Tighten	Clean	Change/ Replace	✓
Batteries and Connections – Batteries hold charge; connections clean and tight	•		•			<input type="checkbox"/>
Drive Unit Oil	•	•				<input type="checkbox"/>
Exhaust Hoses and Bellows – Check for damage, leaks, and loose clamps	•		•			<input type="checkbox"/>
Bellows, U-joint, and Exhaust – Check for wear, leaks, and loose clamps	•		•			<input type="checkbox"/>
Propshaft, Propeller, and Hub – Check for damage, corrosion; lubricate shaft, splines	•	•		•		<input type="checkbox"/>

1) Check/correct these items every month, when the boat is in use (not winterized or in storage)

Scheduled Maintenance

We recommend you contact an authorized Volvo Penta service dealer when your power package is due for scheduled maintenance. Procedures in the maintenance schedules may require lifting devices, special tools, electronic diagnostic instruments, or specialized training that are not typically available to the owner. Dealers have the training, tools, and service expertise needed to safely, correctly, and efficiently service your power package. Also, dealers are familiar with current environmental regulations and will recycle or dispose of used fluids and materials in a manner that is least harmful to the environment.

During the service visits, discuss with your dealer any questions or issues that you may have regarding your engine or power package. Advise the dealer of anything unusual that you have noticed about your boat or engine. This check can identify small problems before they become more serious. The dealer will use the following checklists to perform the scheduled maintenance. Many items on the list are also included in the daily and monthly checks to be done by the owner (see above). The dealer will conduct a more thorough check of these items to deter future problems.

If any items fail the checks, the dealer should correct them as needed. Scheduled maintenance and any corrective work performed are part of normal maintenance and, as such, are not part of warranty. Exceptions may occur, based on what the dealer finds during the service work.

Always insist that your dealer use genuine Volvo Penta parts, oils, and lubricants when servicing your engine. See *Technical Data*.

In markets outside the United States: All service specified by the maintenance schedules for the first year **must** be performed and documented by an authorized Volvo Penta dealer to be eligible for the Extended Protection Service Plan.

Hour Meter

Accurate knowledge of engine operating hours is critical for tracking engine/drive maintenance and service needs. Many boats have an hour meter mounted at the helm or near the engine; use this meter to determine when maintenance or service is due. If you do not have an hour meter, we strongly recommend that you contact a dealer to have one installed on your boat. If you do not have an hour meter, keep a manual log of the time the engine is operated.

Whenever "hours" or "engine hours" are listed in the following maintenance schedules, the reference is to engine operating hours, as recorded by the hour meter, EVC system (if applicable), or manual log.

Maintenance Schedule

If you operate your engine **50 hours or less per year** perform the items required in the Maintenance Schedule once per year. If you operate your engine more than 50 hours per year, the required items should be performed every 100 hours.

NOTICE! For engines operated over 50 hours during the first year, the engine oil and filter must be changed at 50 hours. The oil and filter are changed again at 100 hours and then afterwards according to the Maintenance Schedule.

If the boat is placed in storage during the off-season (winterized), the service should be coordinated with the service activities needed to prepare the boat for storage or for use after the storage period. See the chapter entitled *Storage*. Change the engine oil, filter, and drive oil as part of preparation for storage (winterization). The impeller should be replaced after storage.

Annual Service or Every 100 Hours	Check/ Correct	Fill/ Lube	Adjust/ Tighten	Clean	Change/ Replace	✓
Engine						
Check for Campaigns or Recalls – Dealer to check serial number on Partner Network	•					<input type="checkbox"/>
Serpentine Belt – Wear, tension	•					<input type="checkbox"/>
Oil and Filter ⁽¹⁾⁽²⁾ – Change					•	<input type="checkbox"/>
Fuel Pump and System – Check for leaks	•					<input type="checkbox"/>
Flame Arrestor – Properly secured	•			•		<input type="checkbox"/>
Fuel Filter – Replace					•	<input type="checkbox"/>
Exhaust Hoses and Bellows – Check for damage, leaks, loose clamps	•		•			<input type="checkbox"/>
Exhaust Manifolds, Risers, Pipes – Check for corrosion, damage, leaks	•					<input type="checkbox"/>
Sacrificial Anodes; Heat Exchanger, Risers – Visual inspection; replace if eroded more than 30%	•				•	<input type="checkbox"/>
Cooling System – Check coolant level; check system for leaks; check coolant for freeze protection ⁽³⁾	•		•			<input type="checkbox"/>
Sea Water Pump – Replace impeller, check housing	•				•	<input type="checkbox"/>
Spark Plugs – Replace every third year ⁽⁴⁾					•	<input type="checkbox"/>
Engine Computer – Check and clear codes	•					<input type="checkbox"/>
Shift Cable – Dealer to replace every 3 years or 300 hours					•	<input type="checkbox"/>

1) See *Scheduled Oil Service* in chapter entitled *Technical Data*.

2) Change oil/filter at least annually.

3) Replace coolant every 4 years.

4) **Must** use genuine Volvo Penta parts for 3 year change; change is every year for other plugs.

Annual Service or Every 100 Hours (Continued)	Check/ Correct	Fill/ Lube	Adjust/ Tighten	Clean	Change/ Replace	✓
Sterndrive						
Anodes – Visual inspection; replace if eroded more than 30%	•					<input type="checkbox"/>
Bellows, U-joint, and Exhaust – Check for wear, damage; replace every second year	•				•	<input type="checkbox"/>
Propshaft, Propeller, and Hub – Check for damage, corrosion; lubricate shaft, splines	•	•		•		<input type="checkbox"/>
Power Trim/Tilt – Check for proper operation	•					<input type="checkbox"/>
U-joint Shaft Splines ⁽¹⁾ – Lubricate	•	•				<input type="checkbox"/>
U-joint, Gimbal Bearing – Check for wear, corrosion	•					<input type="checkbox"/>
Gear Oil – Change					•	<input type="checkbox"/>
Miscellaneous						
Batteries and Connections – Batteries hold charge, connections clean and tight	•		•			<input type="checkbox"/>
Engine Alignment – Check	•					<input type="checkbox"/>
General Inspection – All engine and drive hardware; clamps, screws, nuts, etc.	•		•			<input type="checkbox"/>
Power Steering – Check for proper operation, check hoses and components for leaks	•					<input type="checkbox"/>
Power Steering Fluid – Check level	•	•				<input type="checkbox"/>
Steering System Cable(s) – Check for proper operation, lubricate		•				<input type="checkbox"/>
Steering Control Unit (Sterndrive Joystick Only) – Dealer to replace fluid and filter every 5 years or 300 hours		•			•	<input type="checkbox"/>
Remote Control and Shift System – Check for proper operation	•		•			<input type="checkbox"/>

1) Drive must be removed for this step. This is a good time to check and/or replace both bellows.

Maintenance

Doing Your Own Maintenance and Repairs

The following sections provide basic periodic maintenance procedures. Repair and advanced maintenance procedures are covered in the *Workshop Manual*. If you intend to carry out any maintenance on your equipment, we urge you to be thoroughly familiar with the procedures described in this manual. **Always read and follow the safety warnings provided in this manual.**

If you are uncertain about any procedures described in the manual or you would like to purchase a workshop or *Workshop Manual*, please contact your Volvo Penta dealer or visit Volvo Penta on the Internet. Keep in mind, however, that there are certain tasks which should only be performed by your Volvo Penta dealer. The dealer has the tools, expertise, and most current information needed to properly perform these tasks. **Never carry out any work on the engine if you are unsure of how it should be done. Instead, contact your Volvo Penta dealer for help.**

Replacement Parts

Always insist that your dealer use genuine Volvo Penta parts, oils, and lubricants when servicing your engine and power package. Genuine Volvo Penta parts have been designed and approved to meet the safety requirements and heavy demands of marine engines. Volvo Penta replacement parts are designed to meet all applicable legal requirements and industry standards for marine applications.

WARNING!

Do not use automotive or other non-marine parts on your Volvo Penta engine. Non-marine electrical and fuel parts do not meet USCG and other requirements for explosion prevention in gasoline fueled boats. Use of non-marine parts may result in onboard explosions.

In your Volvo Penta product, certain fuel and electrical system components have been designed to comply with U.S. Coast Guard and other regulations for explosion prevention. Parts or components that comply with these regulations are designed so they will not emit fuel vapors or cause ignition of fuel vapors in the engine compartment. To prevent explosion or fire, do not substitute automotive or general hardware parts for the following:

- **Circuit breakers, alternator, and related wiring.**
- **Starter and related wiring.**
- **Spark plugs, high tension leads (spark plug wires), and related ignition parts.**
- **Fuel pumps, relays, filter, and related parts.**
- **Fuel injector O-rings, injector fuel line pressure relief valve and caps, fuel reservoir vent hose and cover gasket, high pressure fuel pump mounting O-rings, fuel pressure regulator, and fuel rails.**

NOTICE! Do not use automotive or other non-marine parts on your Volvo Penta engine. Non-marine parts may not be designed for the high loads, harsh environment, and durability requirements of a marine engine. Non-marine parts may fail prematurely, disabling the engine. Engine or power package failure caused by the use of non-marine parts is not covered by warranty.

Substituting automotive or generally supplied parts and hardware may result in product malfunction. Never use parts of unknown quality. See your Volvo Penta dealer for replacement parts. You can depend on your dealer to furnish expert service and genuine Volvo Penta parts.

Volvo Penta engine oils and transmission lubricants are formulated with the correct lubrication qualities and corrosion inhibitors needed for marine applications. Use of these oils and lubricants ensures proper operation and protection of your engine and sterndrive. See your Volvo Penta dealer for genuine oils and lubricants.

Stop the Engine Before Service

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

Always stop the engine and turn off the main battery switch(es) before working on the electrical system. Disconnect and remove any shore power connections to the boat.

To prevent accidentally starting the engine, remove the ignition key, turn off the power supply to the engine at the main switches, and lock them in the OFF position, or disconnect the battery cables from the battery 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 that is running is dangerous. Loose clothing, hair, fingers or a dropped tool can be caught in the rotating parts of the engine and cause serious personal injury. We recommend that all servicing with the engine running be undertaken by an authorized Volvo Penta workshop.

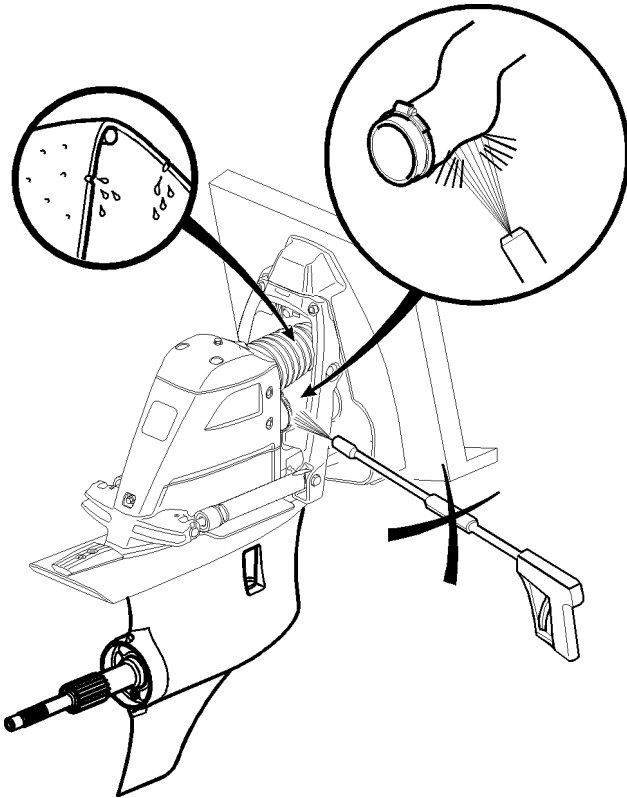
Starting the Engine After Service

Reinstall all protective parts removed during service operations before starting the engine. Make a point of familiarizing yourself with other risk factors, such as rotating parts and hot surfaces (exhaust manifold, starter, etc.). Check that no tools or other items have been left on the engine.

Washing the Engine

Never use a high-pressure washer when washing the engine.

NOTICE! When washing the drive unit, do not use a pressure washer. Using a pressure washer will damage the water intake hose and the drive bellows.



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Certified Engines

If you own an engine certified for any area where exhaust emissions are regulated by law, the following is important:

Certification means that an engine type is inspected and approved by the authorities. The engine manufacturer guarantees that all engines manufactured of that type correspond to the certified engine.

This places special requirements for maintenance and service as follows:

- The maintenance and service intervals recommended by Volvo Penta must be observed.
- Only genuine Volvo Penta replacement parts may be used.
- The servicing of ignition, timing, and fuel injection systems must always be carried out by an authorized Volvo Penta workshop.
- The engine must not be modified in any way except with accessories and service kits approved by Volvo Penta.
- No modifications to the exhaust pipes and air supply ducts for the engine may be undertaken.
- Seals may only be broken by authorized personnel.

Otherwise the general instructions contained in this *Operator's Manual* concerning operation, service, and maintenance must be followed.

NOTICE! Late or inadequate maintenance/service or the use of spare parts other than Volvo Penta original spare parts will invalidate Volvo Penta's responsibility for the engine specification being in accordance with the certified variant.

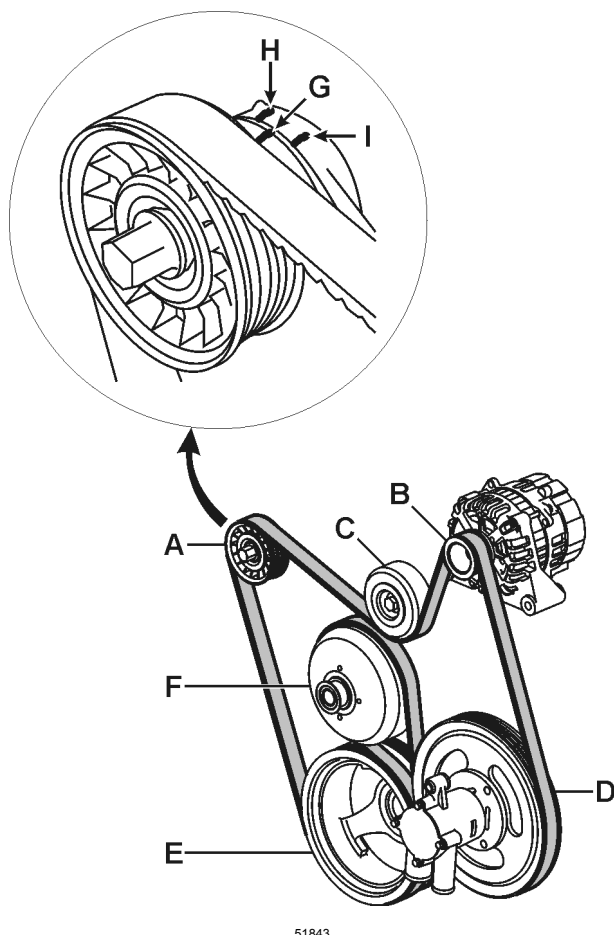
Volvo Penta accepts no responsibility or liability for any damage or costs arising due to the above.

Engine, General

Serpentine Belt

CAUTION!

The serpentine belt and pulley system have pinch points that can cause injury. If the engine is running, keep fingers away from the belt and all pulleys. Also be aware of loose clothing and keep away from the belt and all pulleys.



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All engines use a serpentine belt, which is a continuous-loop belt threaded through automatic belt tensioner **A**, alternator pulley **B**, idler pulley **C**, power steering pump and raw water pump pulley **D**, crankshaft pulley **E**, and circulating pump pulley **F**.

Check the indicators, located on the automatic tensioner housing, to determine the amount of tension loss. When tick marks **G** and **H** coincide, it's time to replace the serpentine belt. As long as mark **G** is between marks **H** and **I**, the belt has adequate tension on it.

Also check the serpentine belt for:

- Regularly spaced cracks
- Regularly spaced missing chunks
- Dry rot
- Exposed cords or excessive fraying
- Oil or grease

If the belt needs to be replaced, refer to the *Workshop Manual* for the procedure or take your boat to a Volvo Penta dealer.

Engine Alignment

Because of the special tools required, a Volvo Penta dealer must do the engine alignment. This should be done during off-season storage preparations.

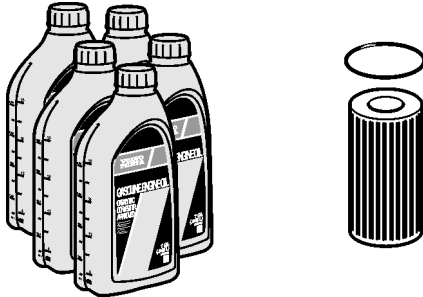
NOTICE! Failure to periodically check engine alignment may result in premature failure of the engine coupler.

Lubrication System

Scheduled Oil Service

WARNING!

Hot oil and hot surfaces can cause burns.



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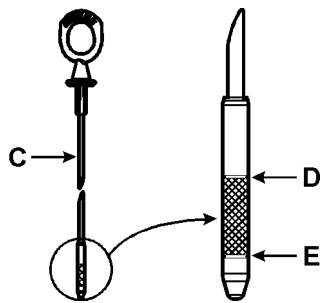
NOTICE! All oil used for oil changes or added between changes must meet the *Engine Oil Specifications*.

For a schedule of oil change intervals, please refer to the chapter entitled *Maintenance Schedule*.

Volvo Penta full Synthetic Gasoline Engine Oil Catalytic Converter Approved SAE 10W-40 is recommended and should be used for topping off during the first 50 hours of operation. If Volvo Penta oil is unavailable an alternative oil can be used as long as it meets the Engine Oil Specifications.

Always change the oil filter every time the oil is changed.

Checking Engine Oil Level



51216

The oil level must be between the two level marks on the dipstick **C**. If the engine is not in a horizontal position, the oil level on the dipstick will not be accurate. If the oil level is checked with a cold engine, the oil level on the dipstick could be above the actual level. If the oil level is checked directly after shutting the engine off the oil level on the dipstick will be low. To get an accurate oil level reading on the dipstick:

1. Run the engine to normal operating temperature, then shut it off and wait at least 5 minutes.
2. Remove the dipstick and check the oil level.

NOTICE! Gas engines require a precise oil fill level to operate correctly.

- Overfilling results in high operating temperatures, foaming (air in oil), loss of power, and overall reduced engine life.
- Information has been provided in Operators Manuals, Workshop Manuals and other publications that provide crankcase capacities for these engines. This information is provided as a guideline for ordering parts and planning service work.
- To ensure the engine oil is filled to the correct level, the level must always be checked on the dipstick. This includes re-filling the crankcase as part of changing the engine oil.

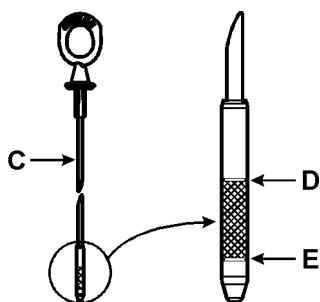
Adding Oil if Low

Adding Oil During Break-in Period

NOTICE! All oil used for oil changes or added between changes must meet the *Engine Oil Specifications*.

During the engine break-in period, until the piston rings have seated, somewhat higher oil consumption is normal. Check the oil level before each trip during the break-in period. Please see *Engine Break-in: Gasoline Engines*, PN 47700022.

Maintain oil level between **E** (add) and **D** (full) on the dipstick. If oil is added during break-in, use Volvo Penta full Synthetic Gasoline Engine Oil, Catalytic Converter Approved SAE 10W-40 for make up oil see *Engine Oil Specifications*.



51216

Adding Oil After Break-in Period

Check the oil level frequently (see *Maintenance Schedule* for minimum intervals). Frequent oil level checks are a good strategy to ensure long engine life. Oil level checks help identify engine service issues such as leaks and excessive oil consumption before they become serious.

Maintain oil level between **E** (add) and **D** (full) on the dipstick. If oil is added, use Volvo Penta full Synthetic Gasoline Engine Oil, Catalytic Converter Approved SAE 10W-40 for make up oil; if unavailable, use a high quality oil that meets the *Engine Oil Specifications*.

Fuel System

DANGER!

Gasoline is extremely flammable and highly explosive. Always turn off the engine before refueling. Do not smoke or allow open flames or sparks near the boat when adding fuel. When filling the gas tank, ground the tank to the source of gasoline by holding the hose nozzle firmly against the side of the deck filler plate, or ground it in some other manner. This action prevents static electricity buildup that could cause sparks and ignite fuel vapors.

DANGER!

Fuel leakage can contribute to a fire and/or explosion. Frequently inspect fuel system parts and replace if fuel leakage or parts deterioration are found.

DANGER!

To prevent fire and explosion, perform all service procedures with the engine turned OFF.

DANGER!

Failure to inspect your work may allow fuel leakage to go undetected. This could become a fire or explosion hazard.

WARNING!

Risk of fire.

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.

WARNING!

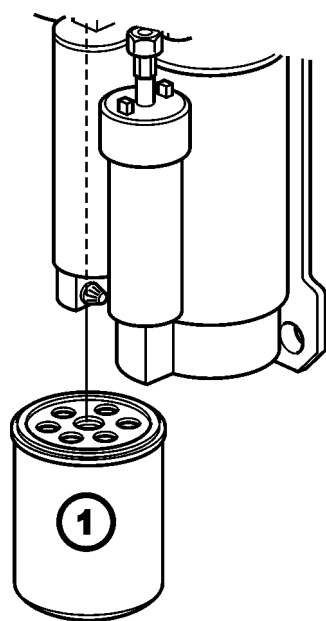
Risk of fire.

Store fuel soaked rags and other flammable material so that there is no danger of them catching fire.

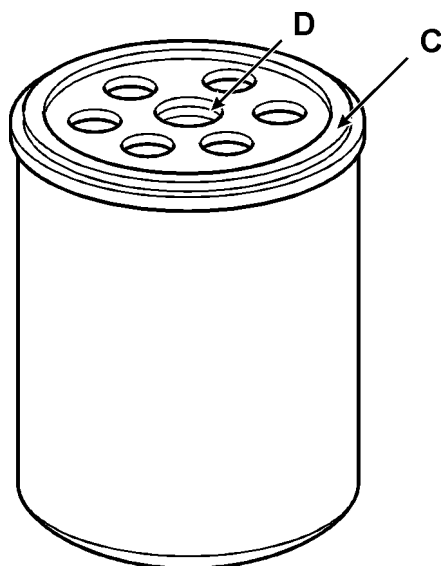
Engine Fuel Filter Replacement

Before you begin this procedure, be sure you have the following on hand:

- Fuel Filter
- Wrench
- Oil
- Container and absorbant rags for catching fuel spills



22825-1



22839

1. If possible, remove all passengers from the boat. If this is not feasible, ensure that all passengers are above-decks and away from confined compartments.
2. Start the engine and check for leakage.
3. Turn off the engine and remove the key.

DANGER!

Turn off the main battery switch to prevent stray sparks. Eliminate all sources of spark.

4. Unscrew fuel filter and remove.
NOTICE! Be prepared to catch any excess fuel that may spill from fuel pump or filter.

5. Using clean engine oil, lightly lubricate the gasket **C** and inner seal **D** on the new fuel filter.
6. Screw on fuel filter and hand-tighten.
7. Clean up any spilled fuel.

If possible, remove the old fuel filter, containers, and absorbant rags from the boat. Dispose of safely and according to local environmental regulations.

8. Turn on the main battery switch.
9. Run the bilge blower for at least five minutes to vent the engine compartment.
10. Start the engine and check for leakage.

DANGER!

If you detect fuel leakage, turn the engine off immediately - EXPLOSION AND FIRE ARE AN EXTREME DANGER.

11. If leakage occurs, repeat **Steps 3–10** until leakage stops.
12. If necessary, re-clean the bilge area.

Fuel Storage

If the boat will not be used for two months or longer, the boat and engine must be prepared for this storage period.

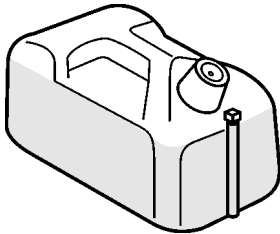
Both the fuel in the tank(s) and the engine must be treated.

The fuel must be treated with fuel stabilizer. Add stabilizer according to the manufacturer's instructions.

Engine and fuel system internal components should be coated with a light film of oil to prevent corrosion. The *Fuel Storage Mixture* procedure introduces the oil through the fuel system, protecting both the fuel system and engine during storage.



P0016596



P0016595

Fuel Storage Mixture

Using a portable, outboard engine fuel tank, add:

- Fresh fuel (enough to run engine 15 minutes)
- Two-cycle motor oil (50:1 ratio, gas to oil)
- Fuel stabilizer, per manufacturer's instructions

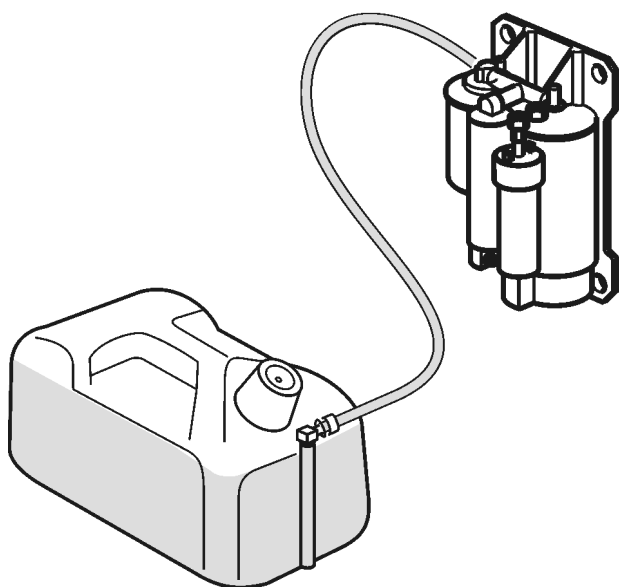
DANGER!

Fuel and vapors will be present during procedure, which can result in an explosion; provide ventilation and eliminate all sources of spark or flame.

CAUTION!

Engine must be run to complete process. Take precautions to ensure safety and prevent engine damage:

- Run engine with drive out of gear and in full trim down position.
- Boat must be properly supported.
- Flush engine with fresh water while engine is running. The engine must have adequate cooling water; always monitor engine temperature gauge when running engine with boat out of water.
- Do not run fuel pumps dry.



51773

- 1 Disconnect the fuel line at the inlet fitting of the engine's fuel pump. Connect a line from the portable tank (with storage mixture) to the fuel pump inlet.
- 2 Run the engine on the storage mixture for five minutes at 1500 RPM. This will ensure that all fuel system and internal engine components are protected.
- 3 Reduce the engine speed to idle and stop the engine.
- 4 Reconnect the boat fuel line to the fuel inlet fitting and check for fuel leaks. Do not start engine.

**DANGER!**

Failure to inspect your work may allow fuel leakage to go undetected. This could become a fire or explosion hazard.

Electronic Fuel Injection

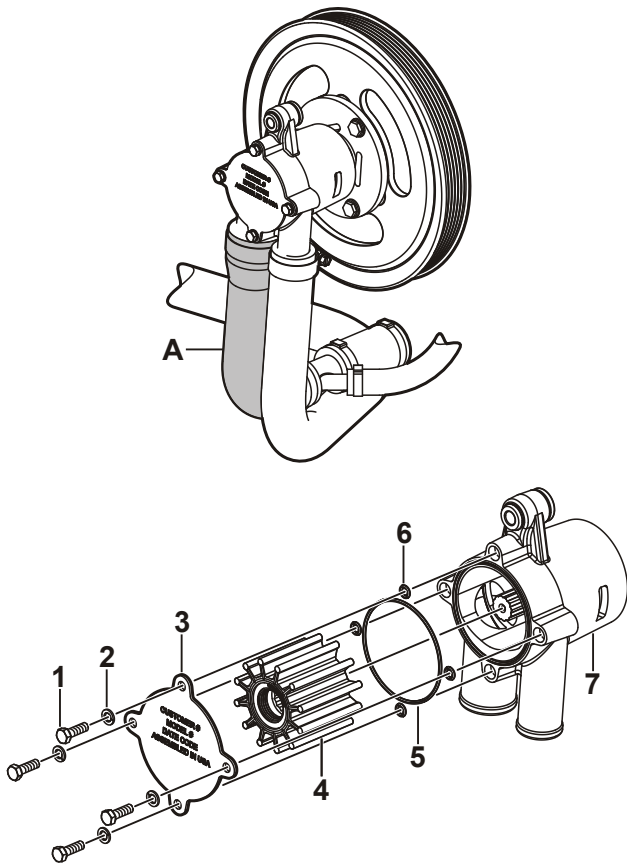
The electronic fuel injection (EFI) fuel metering system delivers the correct amount of fuel to the engine under all operating conditions. The EFI system is controlled by a microprocessor, and requires no periodic maintenance or adjustment. If operational problems occur, see your Volvo Penta dealer.

Cooling System

Impeller: Checking & Replacing

NOTICE! If you have a seacock installed, close it now to prevent any possible water intrusion; otherwise, plug the intake hose **A** with a suitable stopper to prevent water entry.

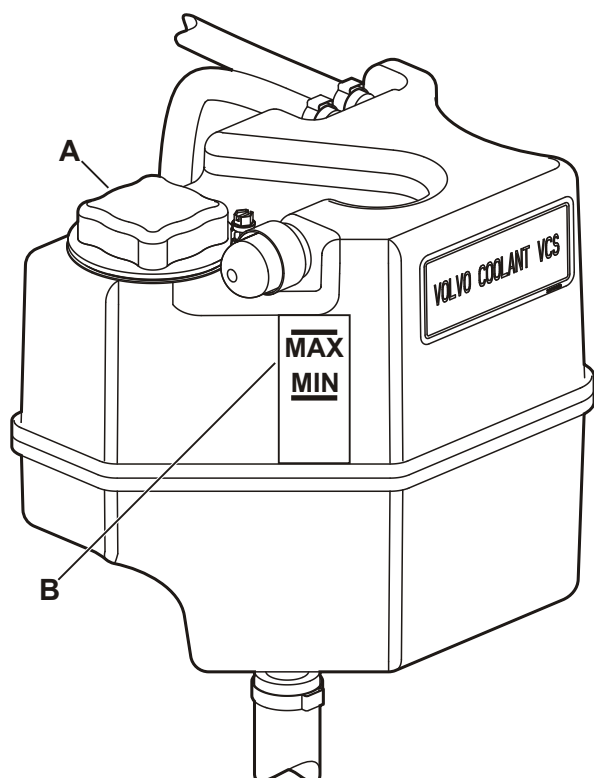
NOTICE! Always carry a spare impeller on board.



P0015651

1. Loosen the four screws **1** and remove screws and washers **2**. Save for later use.
2. Remove the impeller housing **7** cover plate **3**.
3. Remove and inspect the impeller **4**. If there are cracks, signs of burning or melting on the edges, or any other visible defects, the impeller must be replaced. Inspect the O-rings **5** for nicks, cuts, and wear. Replace as necessary. O-rings **6** are for retaining cover screws in the cover and are not critical.
4. Lubricate the pump housing with non-petroleum based lubricant, suitable for rubber, such as glycerine. If you have purchased the Volvo Penta impeller kit, a packet of glycerine is included.
5. Reinstall the impeller and O-rings. Reinstall the housing cover plate. Reinstall the washers and screws. Tighten screws to 19–24 in. lb. (2.2–2.8 Nm).
6. If the intake hose was removed, reinstall hose and hose clamp.

If you closed the seacock, be sure to reopen it before restarting the engine.



P0015653

Freshwater System

Be sure to check the freshwater coolant (antifreeze) level before beginning each trip. If coolant is not between the MIN and MAX lines **B** in the reservoir, top up the level by removing the coolant filler cap **A** and adding coolant via the fill spout. Do not fill above the MAX fill line when topping up.

⚠ WARNING!

Do not open the coolant filler cap when the engine is warm. Steam or hot fluid could spray out, causing severe burns.

If it becomes necessary to top up the coolant regularly, inspect the cooling system for leaks. If leaks are detected, please contact an authorized Volvo Penta dealer at your earliest convenience.

⚠ WARNING!

If opening the filler cap or drain/venting cock, or removing a plug or engine coolant line from a hot engine, open the filler cap slowly and release coolant system pressure gradually; otherwise, steam or hot coolant can spray out. Note that the coolant may still be hot and can cause burns.

This engine uses **Volvo Penta “VCS” coolant only** (yellow color).

Do not use other coolant types, mixing other coolants may damage the cooling system.

Sacrificial Anode

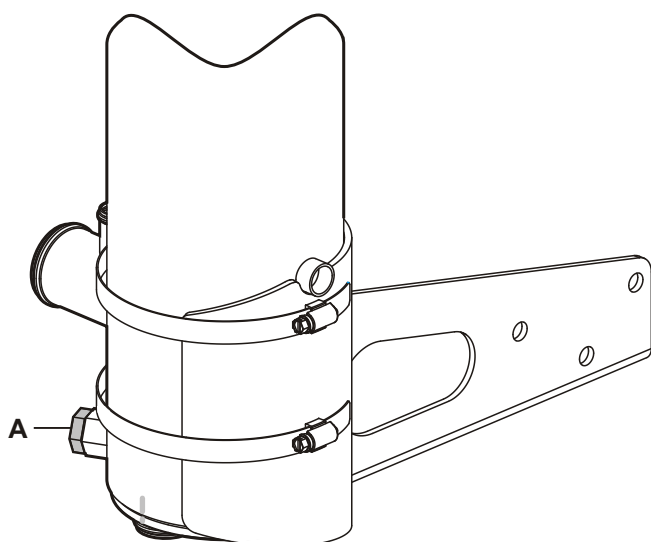
These engines have a sacrificial anode **A** located in the heat exchanger, as shown in the illustration.

Anodes are slowly eroded away by galvanic action and require inspection. Additionally, anodes that are subjected to frequent wetting and drying require periodic scraping with sandpaper to remove scale and oxidation to maintain their effectiveness.

When you need to purchase new anodes, see your Volvo Penta dealer. The material composition of Volvo Penta anodes meets U.S. Military Specification 18001-H. Some aftermarket anodes may not meet mil-specs.

Inspecting Heat Exchanger Anodes

The anode **A** resembles a bolt and may be removed and replaced using a 3/4 inch (19mm) wrench. If the anode is more than 30% eroded, it should be replaced. When installing, tighten the anode all the way by hand, then turn an additional quarter turn using a wrench.



P0015645

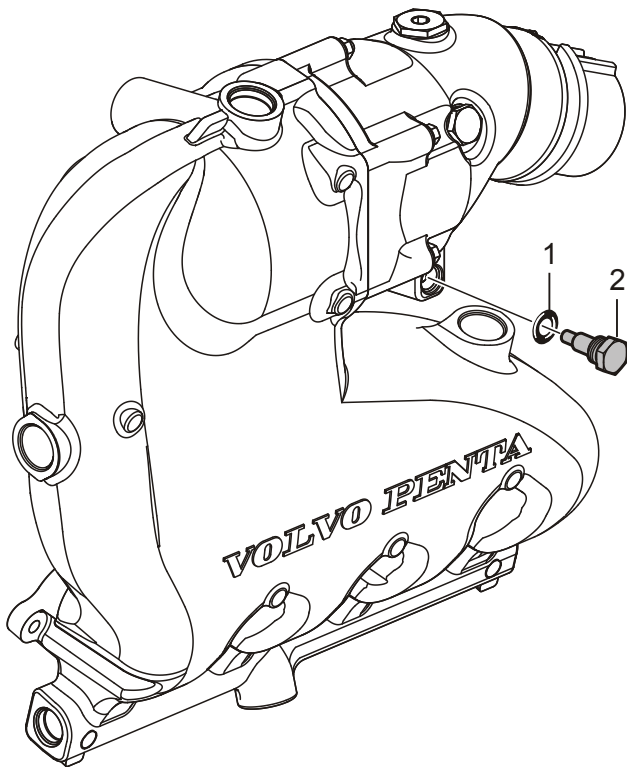
Inlet and Exhaust System

Sacrificial Anode

There is an anode in each exhaust riser, see illustration.

Riser anodes must be checked yearly or once every 100 hours to determine the amount of erosion that has occurred. If the anode is more than 1/3 eroded, replace.

- 1 O-ring
- 2 Anode – Exhaust elbow; torque to 15–21 ft. lb. (20–28 Nm) when replacing



P0015646

Electrical System

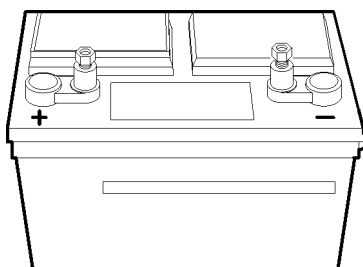
Battery Maintenance and Replacement

⚠ DANGER!

Never allow an open flame or electric sparks near the battery or batteries. Never smoke in proximity to the batteries. The batteries give off hydrogen gas during charging which, when mixed with air, can form an explosive gas. This gas is easily ignited and highly volatile.

⚠ WARNING!

Battery electrolyte is a corrosive acid and should be handled with care. If you spill or splash electrolyte on any part of the body, immediately flush the exposed area with liberal amounts of water and seek medical attention as soon as possible.



22827

⚠ WARNING!

Risk of explosion.

Always insure the negative (-) and positive (+) battery cables are installed on the corresponding battery post. Incorrect connections may spark,

Do not disturb battery connections during engine start.

Ventilate the engine compartment before working on batteries or battery connections.

⚠ WARNING!

Risk of explosion.

To prevent accidental sparks and control acid and gases emitted by the batteries, the batteries should always be mounted in approved marine battery boxes with covers. Always make sure the battery is secured and the cover is firmly attached.

NOTICE! Do not disconnect the batteries with the engine running as sensitive electrical components may be immediately damaged.

NOTICE! Do not use wing nuts to secure battery cables, even if they were supplied with the battery; use a lock nut instead.

NOTICE! Some maintenance-free batteries have special care instructions. Make sure to follow the battery manufacturers instructions carefully.

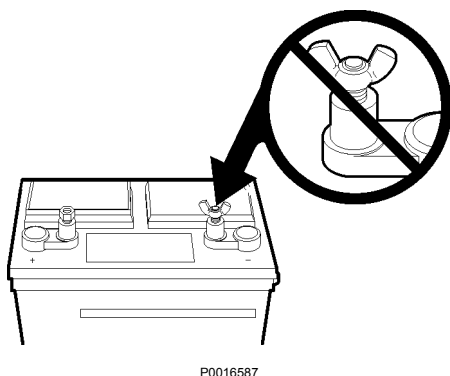
NOTICE! When replacing your battery, read and understand the information supplied with it before you begin installation.

The service life of your battery depends largely on how it is maintained.

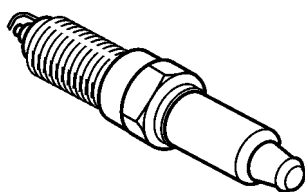
- Keep batteries and battery terminals dry and clean. Oxidation or dirt on the battery and battery terminals may cause short circuits, voltage drops, and discharges (especially in damp weather).
- Tighten all battery connections. Loose battery connections may cause damage to the engine's electrical system.

Spark Plugs

Your engine comes equipped with high quality spark plugs that require infrequent maintenance. Please see *Maintenance Schedule* for replacement frequency.



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P0016273

WARNING!

Ensure that plug wires are in good condition to avoid sparking. Sparking could potentially cause a fire or explosion.

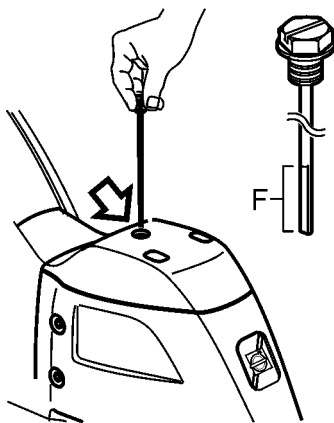
Please refer to the workshop manual for replacement procedures.

Drive

Checking the Drive Unit Lubricant

NOTICE! Improper oil level, under- or overfilled, will result in serious internal sterndrive damage.

Check lubricant (oil) level in sterndrive at each usage. Oil level and condition checks are the best ways to catch sterndrive problems before serious damage occurs.



50398

1. Screw dipstick fully into hole, then remove.
2. Check oil level on dipstick. Oil should show on flat portion **F** of dipstick.

If oil level is low, add small amounts through dipstick opening until oil is at proper level.

If level is too high, remove until oil is at proper level. See drive *Workshop Manual*.

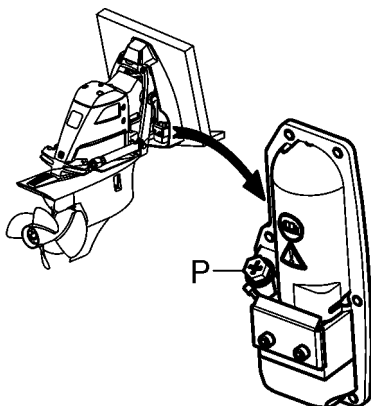
3. Check O-ring on dipstick for wear or nicks. Replace if needed. Tighten dipstick to 48–72 in. lb. (5.4–8.1 Nm).

During oil level check, inspect oil for signs of water intrusion. The oil should be amber in color. Milky looking oil indicates water mixed with the oil. Also check for metal or other debris in oil. If moisture or metal flakes appear in the drive unit oil, take the boat to your Volvo Penta dealer.

Power Trim/Tilt-Fluid

The trim/tilt assembly is a closed hydraulic system that includes the trim pump assembly, trim cylinders and hydraulic lines. No regular oil level check is required unless trim system performance is poor.

If system performance is poor, contact a Volvo Penta dealer or refer to the *Workshop Manual*.



50408

Pitot Tube (Speedometer Port)

The pitot tube, located at the leading edge of the lower unit, provides pressure input for the speedometer. If the pitot tube becomes clogged (e.g. silt, sand, vegetation), the speedometer may stop functioning. There are two methods for clearing debris from the pitot tube:

Method 1

Use a six inch length of stiff wire of 1/8 in. (3 mm) thickness or a wire coat hanger to push any debris in the pitot tube into the drive cavity.

Method 2

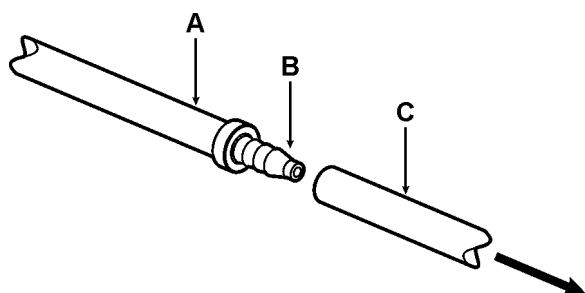
Use compressed air to clear the pitot tube.

CAUTION!

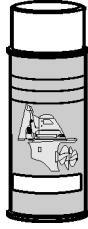
Do not place bare hand(s) in front of the pitot tube to check for air flow as debris may be ejected forcefully enough to cause an injury.

NOTICE! Do not exceed 116 PSI (800 kPa) as this may damage the drive.

- 1 The pitot tube hose **A** is attached to the shift cable hose located inside the transom shield, just behind the engine. Once you have located the pitot tube hose, remove the speedometer hose **C** from the plastic barb fitting **B**.
- 2 Attach the hose from an air compressor to the barb fitting.
- 3 Have someone assist you by placing a rag in front of the pitot tube at the leading edge of the lower unit.
- 4 Blow air, pressurized to **no more than 116 PSI** (800 kPa), into the pitot tube hose until your assistant can feel the air exiting the pitot tube.
- 5 Reattach the speedometer hose to the barb fitting on the pitot tube hose.



P0002300



P0016597

Painting the Drive

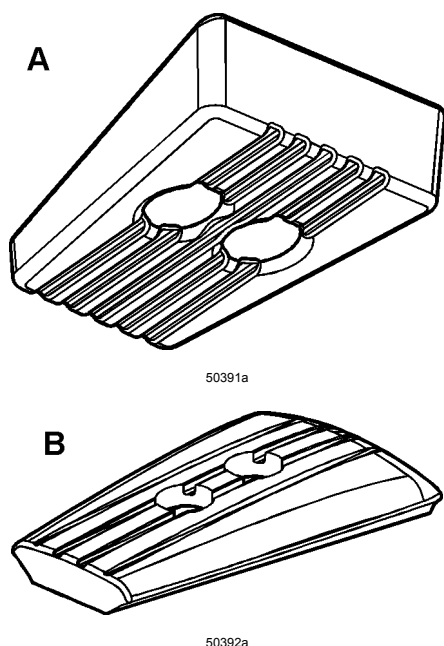
The sterndrive and transom shield require a unique paint repair procedure. Please refer to the *Workshop Manual* or see your Volvo Penta dealer for additional information regarding painting the drive.

Anti-fouling Paint: Drive and Transom Shield

When using anti-fouling paint on the drive or transom shield, be sure to observe the following:

- Copper paints must not be used.
- Use paints specifically designed for aluminum sterndrives.
- Procedure should be carried out by a qualified technician at an authorized Volvo Penta dealership due to environmental concerns.

NOTICE! If you do use copper-based paint on your boat bottom, leave a 1-inch border between the paint and the transom shield. **Failure to follow this instruction will result in severe corrosion of the transom shield and drive system.**



Sacrificial Anode

Sacrificial anodes are attached to the bottom of the gimbal housing **A** and at the rear of the sterndrive, above the anti-ventilation plate **B**.

Anodes are slowly eroded away by galvanic action and require inspection. Additionally, anodes that are subjected to frequent wetting and drying require periodic scraping with sandpaper to remove scale and oxidation to maintain their effectiveness. Do not paint anodes, as this will destroy their effectiveness.

When you need to purchase new anodes, see your Volvo Penta dealer. The material composition of Volvo Penta anodes meets U.S. Military Specification 18001-H. Some after-market anodes may not meet mil-specs.

Inspecting Drive Anodes

The amount of erosion from the drive anode is a good indication of the condition of the transom shield anode.

Inspect anodes (see *Maintenance Schedule* for frequency). If an anode is 2/3 its original size (1/3 eroded), replace it.

If additional electronic or electrical equipment is installed, each item should have an individual anode or grounding device and all grounding devices must be interconnected. Follow equipment manufacturers recommendations.

Anode Replacement Information

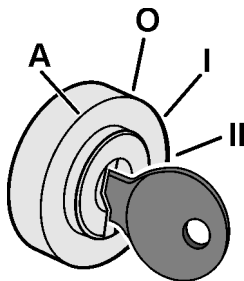
NOTICE! Your Volvo Penta product has been shipped with Aluminum anodes. The table below provides replacement information and also specifies which anodes should be used, depending on water conditions.

Anode	Material	Part No.	Water Condition
Transom Shield	Zinc	3888817	Salty
Sterndrive	Zinc	3888814	Salty
Transom Shield	Aluminum	3888816	Brackish
Sterndrive	Aluminum	3888813	Brackish
Transom Shield	Magnesium	3888818	Fresh
Sterndrive	Magnesium	3888815	Fresh

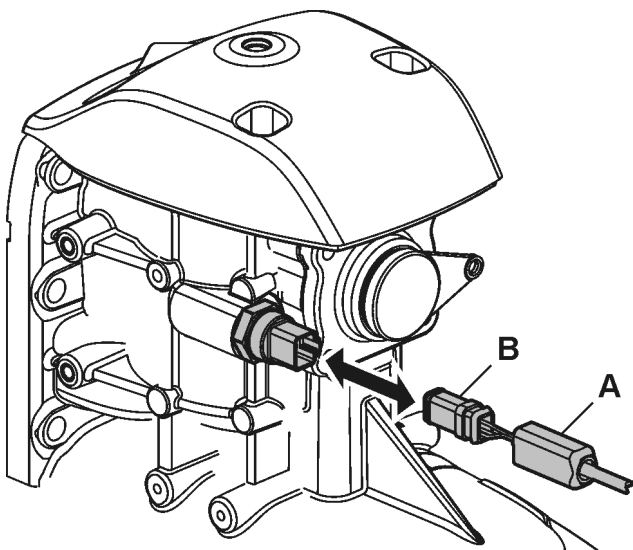
Oil Sensor Reset

Whenever the drive oil is replaced, the drive oil sensor must be reset. If your dealer changed the oil in the drive, the sensor should already have been reset. However, if you changed the drive oil yourself, or if the dealer forgot to reset the sensor, the alarm may sound. If this occurs, you can reset the sensor yourself by using the following steps:

NOTICE! This procedure must be carried out with the boat out of the water. If you plan to run the boat while it is out of the water, ensure that the engine has sufficient cooling water by using the flush port. For additional information, please see *After Engine Shutdown: Engine Flush* in the chapter entitled *Engine Shutdown*.



21181

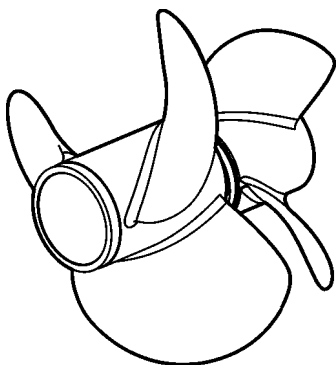


51735

1. Ensure that the drive is trimmed to six degrees or below and that the cavitation plate is as close to level as possible.
2. Turn the engine off and allow the oil to settle for at least 30 minutes.
3. Remove the gear shift cover using a 12mm socket to loosen and remove the five screws holding it in place.
4. Insert the key into the ignition switch **O**. Turn the key one step to the right **I** to switch on engine system voltage and instrumentation. **Do not start the engine.**
5. Move the plastic protector **A** on the oil sensor connector **B**.
6. Press the release on the connector and pull the plug out of the sensor. Wait at least three seconds.
7. Plug the connector back in. The engine alarm will sound three beeps to acknowledge that the sensor has been reset.
8. Replace the cover and torque all screws to 13–17 ft. lb. (17–23 Nm).

Propeller

Propeller Care



P0016598

A damaged or unbalanced propeller will cause excessive vibration and a loss of boat speed. Under these conditions, stop the engine and check the propeller for damage. If the propeller appears damaged, have it checked by your Volvo Penta dealer. Always carry a spare propeller and replace the damaged propeller as soon as possible.

A rubber hub in the propeller is the shock absorber that minimizes damage to drive units and engines. If the rubber hub should begin to slip, it can be easily replaced at an authorized Volvo Penta dealer or propeller shop.



WARNING!

Protect your hands from the sharp edges of the propeller blades. Wear gloves whenever you remove or replace a propeller. Do not attempt to hold propellers by hand when you remove or install propellers and propeller nuts. Serious injury could result.

NOTICE! Never continuously run with a damaged propeller. Running with a damaged propeller can result in drive unit and engine damage.

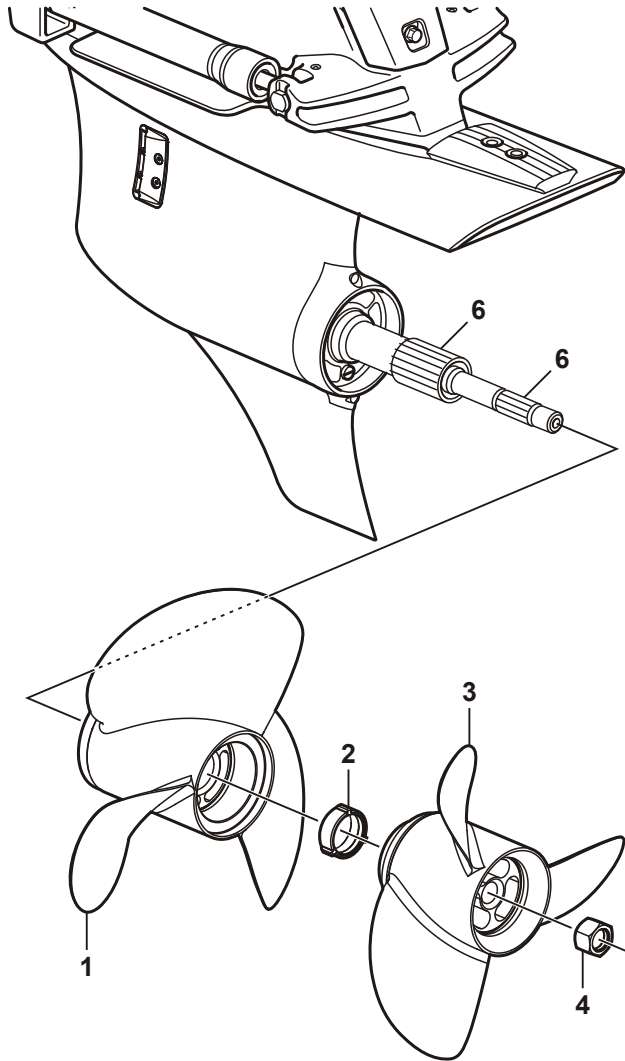
NOTICE! Propellers must be removed and the shaft re-greased according to the frequency provided in the maintenance schedule or removal (in emergency situations while in the water) will be very difficult or impossible. Please refer to the section entitled *Troubleshooting: Propeller Replacement* for additional information.

Propeller Replacement

Removing DPS Propellers

NOTICE! This “get home” (emergency) procedure will require you to have tools, spare propellers and propeller nuts on hand.

Special tool P/N 3862797 is needed to remove the front propeller nut on DPS drives.



1. Turn ignition switch ON (key on, engine off).
2. Tilt drive up.
3. Turn ignition switch OFF and remove key.
4. Use propeller tool (P/N 3862808) or 30 mm socket and ratchet to remove rear propeller nut 4.

Use a block of soft wood 5 between the cavitation plate and the front propeller, to stop the propeller shafts from turning, so the nut can be loosened.

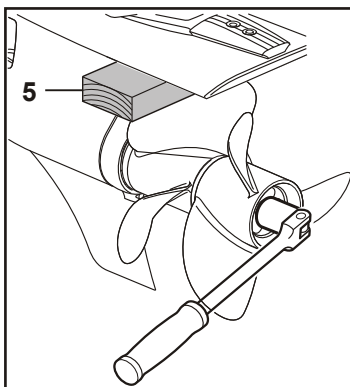
NOTICE! Blades of aluminum propellers may bend when using the wood to stop the shafts from turning. Proceed slowly and check for bending blades. If propellers appear to bend, refer to the *Do It Yourself* manual for an alternate procedure or contact your dealer.

5. Remove rear propeller 3.
6. Use propeller tool (P/N 3862797) and ratchet to remove front propeller nut 2.
7. Remove front propeller 1.

NOTICE! Propeller may be stuck to shaft. Tap the forward edge of the propeller blades **LIGHTLY** with a **NON-METALLIC** hammer. If the propeller still can not be removed, contact your dealer.

Regular removal of the propellers and re-greasing the splines of the shafts 6 and hubs helps reduce the chances of the propeller sticking.

8. Clean the propeller shafts. Inspect for fishing line or other debris; remove if present.
9. Inspect shaft seals; correct if leaking (see dealer). If reinstalling the propellers, clean the splines in the hubs (inside).



P0011941

Installing DPS Propellers

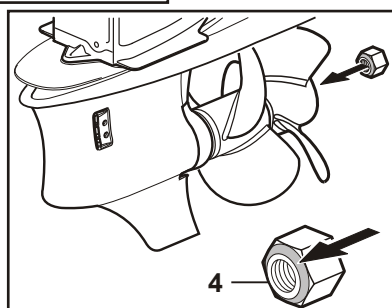
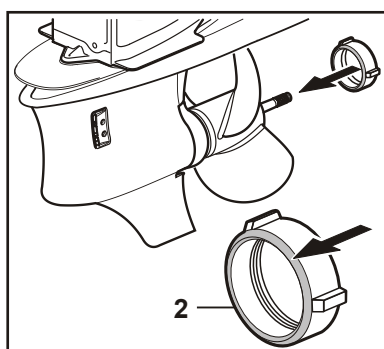
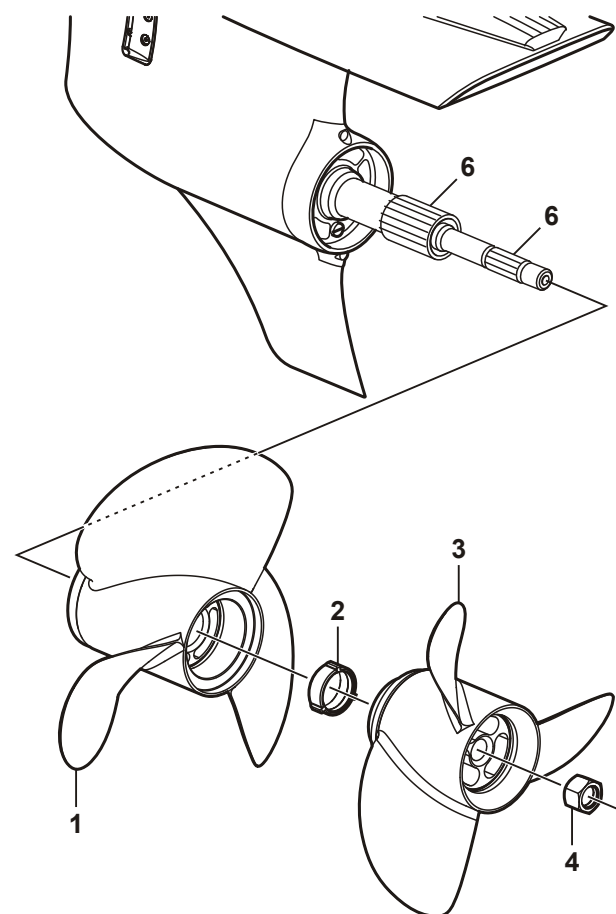
NOTICE! Failure to install all components could result in loss of the propeller and damage to the drive unit.

1. Turn ignition switch off and remove key.
2. Coat the full length of both shafts with grease (P/N 828250). Future removal of the propellers will be difficult if this is not done.
3. Install the front propeller 1.
4. Install the front propeller nut 2, chamfered edge forward. Use propeller nut tool (P/N 3862797) and torque wrench to torque the nut to 45 ft. lb. (60 Nm).

NOTICE! Be sure the chamfered edges of the propeller nuts are facing forward. Failure to install the propeller nuts correctly could result in propellers coming loose and damage to the lower unit and/or propellers.

5. Install the rear propeller 3.
6. Install the rear propeller nut 4, chamfered edge forward. Use a 30 mm socket and torque wrench to torque the nut to 75 ft. lb. (100 Nm).
7. With the remote control in neutral position, both propellers should turn freely.

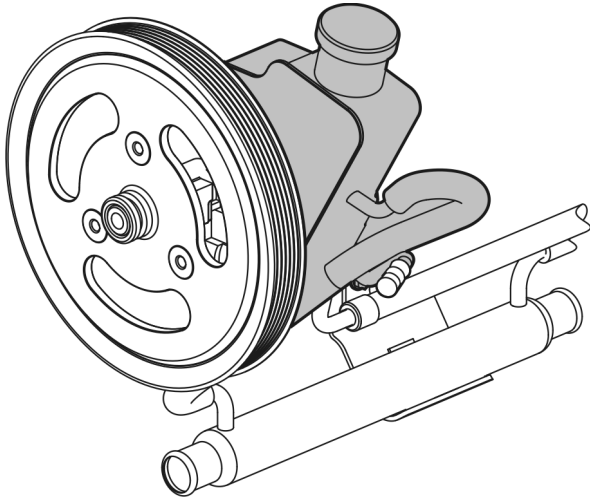
NOTICE! Failure to install the propellers as indicated could result in a propeller coming loose and damage to the sterndrive and/or propeller.



P0011942

Steering

Power Steering Reservoir Fluid Level



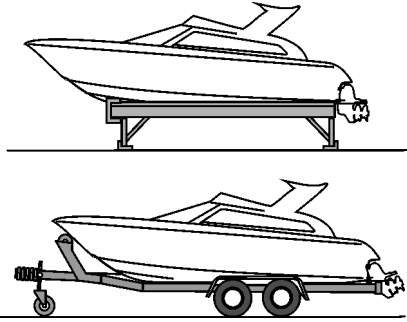
51836

Whenever you check the engine oil, also check the steering reservoir fluid level. The fluid level must be above the “ADD” line and below the “FULL HOT” line or “FULL COLD” line, depending on its temperature when checked. If needed, add Volvo Penta Power Trim/Tilt and Steering Fluid. Do not overfill the pump reservoir.

NOTICE! Never fill the steering system with oil of unknown quality. Non-recommended oil may cause steering operation impairment or component damage.

Do not allow contaminants to enter the reservoir when checking or filling the oil level.

Storage

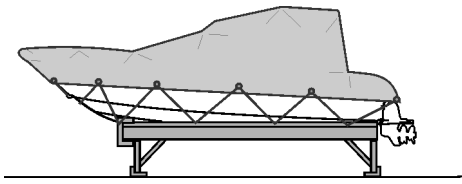


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Short Term Storage

Up to two months:

- ☐ Flush engine with fresh water.
- ☐ Drain water from raw water side of engine. **Do not drain the engine block!** See information on draining the engine in the section entitled *Engine Shutdown: Draining the Engine*.
- ☐ Store battery as recommended by manufacturer.
- ☐ Add fuel stabilizer; please refer to *Ethanol-Blended Fuels (E10)* in the chapter entitled *Technical Data*.



P0016599

Long Term Storage

For long term storage (more than two months), we recommend that you have your Volvo Penta dealer “winterize” your engine and drive. Your dealer will provide the proper servicing and maintenance to ensure that your equipment is treated and stored properly.

Should you decide to winterize the engine and drive yourself, carry out the following procedures, **in the order in which they are listed below**:

- ☐ Remove drive to inspect bellows for water intrusion.
- ☐ Lubricate shift cables, use WD40® or similar on ends.
- ☐ Replace engine oil and oil filter.
- ☐ Replace drive oil.
- ☐ Fuel system treatment as described in *Fuel System* in the chapter entitled *Maintenance*. **Please be sure to read the entire procedure in *Fuel System* and *Fuel Storage Mixture* before continuing.**
- ☐ Check coolant for proper fill level and freeze protection level.
- ☐ Drain water from raw water side of engine. See information on draining the engine in the section entitled *Engine Shutdown: Draining the Engine*.
- ☐ Close the valve in the fuel line between the tank and the engine’s fuel pump or fuel filter (if mounted off the engine).
- ☐ Spray engine with anti-corrosion spray.
- ☐ Pump the bilge dry and air out engine compartment.
- ☐ Remove propellers, clean splines, store in boat.
- ☐ Remove seawater pump impeller, store in boat.
- ☐ Store battery as recommended by manufacturer.

Bringing Out of Storage

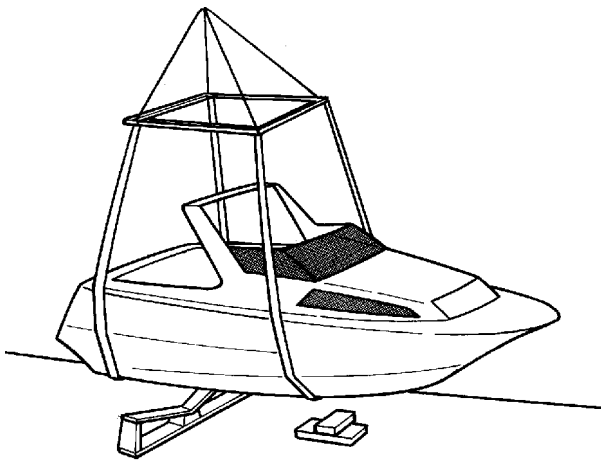
After Short-Term Storage

When launching your boat after short-term storage, always carry out the steps provided in the following checklist:

- ☐ Reinstall all engine drain plugs.
- ☐ Reconnect any hoses removed for storage.
- ☐ Check battery for correct charge. Reinstall if removed.
- ☐ Open the fuel shut-off valve and check fuel system for leaks.
- ☐ Check all oil and fluid levels and fill as necessary.
- ☐ Check drive, transom shield, and heat exchanger anodes. Clean or replace as necessary.

After Long-Term Storage

When launching your boat for the first time or when starting out a new season, always carry out the steps provided in the following checklist:



21201

- ☐ Reinstall all engine drain plugs.
- ☐ Reconnect any hoses removed for storage.
- ☐ Check condition of hoses; tighten clamps and connections.
- ☐ Install boat drain plug, if removed.
- ☐ Clean battery terminals and connections.
- ☐ Check battery for correct charge.
- ☐ With ignition switch and/or battery switch in OFF position, install battery and attach battery cables.
- ☐ Open the fuel shut-off valve and check fuel system for leaks.
- ☐ Check the flame arrestor and clean if necessary (please see the *Do it Yourself* manual for additional information).
- ☐ Pump the bilge dry and air out engine compartment. Federal, state, and/or local regulations prohibit the pumping of oil into any navigable waters.
- ☐ Check all oil and fluid levels and fill as necessary.
- ☐ Check drive, transom shield, and heat exchanger anodes. Clean or replace as necessary.
- ☐ If oil and filter were not changed for storage, do it now.
- ☐ If sterndrive oil was not changed for storage, do it now.
- ☐ If the impeller was removed for storage, reinstall it now. If the impeller is due for replacement, install a new one now.

Technical Data

V8-380

ENGINE	
Displacement	364 Cu. In. (6.0 liters)
Firing order	1 – 8 – 7 – 2 – 6 – 5 – 4 – 3
Idle RPM (Fixed)	650 RPM in forward gear
Full throttle range	5600 – 6000 RPM

FUEL SYSTEM	
Fuel injection	Port injection
Fuel pumps	Electric
Fuel filter	Volvo Penta, water separating, spin-on filter
Fuel type	See <i>Gasoline Requirements</i> in this section

ELECTRICAL SYSTEM	
Charging system	12 volt 75 amp alternator, with internal transistorized voltage regulator
Battery size	12 volt with 650 Cold Cranking Amp (CCA) rating (135 minute reserve capacity) Do not use a deep cycle battery as the start battery

IGNITION SYSTEM	
Distributorless	Crankshaft and camshaft triggered ignition sensors
Spark plugs	See Tune-up and Color Code Decal on engine cover or Parts Catalog
Spark plug gap	0.040 inches (1.025 mm)
Spark plug installation torque	11 ft. lb. (15 Nm)

COOLING SYSTEM	
Thermostat	160°F (71°C) – closed cooling heat exchanger mounted on engine
Coolant type	See <i>Maintenance: Freshwater System</i> .

OIL FILTER	
Engine oil filter	Volvo Penta, replaceable paper element

OIL CAPACITY	
NOTICE! Overfilling the oil can cause engine and/or sterndrive damage. We urge you to use the dipstick to check the oil level whenever you are changing or topping up the oil.	
Engine with filter	5.0 quarts (4.7 liters)
Drive unit	See <i>Sterndrive: Drive Components</i> in this section

OIL TYPE	
Engine	See <i>Engine Oil Specifications</i> in this section
Drive unit	See <i>Sterndrive: Drive Components</i> in this section
Power steering fluid U.S.	Volvo Penta power steering fluid
Power steering fluid non-U.S.	ATF oil Dexron 2 or higher classification

Volvo Penta reserves the right to make changes in weight, construction, materials, or specifications without notice or obligation.	
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Lubrication System

Engine Oil Specifications

Special Oil Requirements for Catalyst Engines

Engines covered by this manual are equipped with catalytic converters. These catalysts combined with a system of sensors and computer controls of the engine are designed to meet stringent exhaust emissions standards. Proper engine oil quality is critical to the service life of the catalysts. Oils that do not meet these specifications may contain excessive amounts of additives, impurities, and other substances which are passed through the exhaust and will ignite when they contact the hot catalyst. The ignition of these substances on the catalyst will damage the catalyst.



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Engine Oil Specifications

Whenever oil is added to the engine, we strongly recommend the use of Volvo Penta full Synthetic Gasoline Engine Oil Catalytic Converter Approved SAE 10W-40. These oils are engineered to meet all of the requirements of your V8-380 and are formulated specifically for marine engines. These oils are available at Volvo Penta dealers.

If the Volvo Penta oil is not available, use an oil that meets NMMA FC-W Catalyst Compatible® specifications. Viscosity should be SAE 10W-40 **or higher** (example: 15W-40, 20W-40, 25W-40, 15W-50). Do not use 0W40 or any XW-30 oils (example: 10W-30).

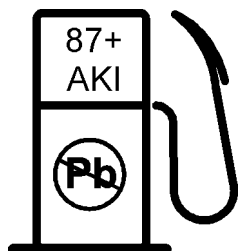
NOTICE! Catalyst failure will occur if the wrong oil is used in these engines. This failure is not covered by warranty.

NOTICE! Do not use oil rated for diesel engines in gasoline engines with catalysts. Compounds in the oil may ignite at the catalyst, causing catalyst failure. This failure is not covered by warranty.

NOTICE! Do not use engine oil additives in engines with catalysts. Compounds in the additives may ignite at the catalyst, causing catalyst failure. This failure is not covered by warranty.

Fuel System

Gasoline Requirements



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Octane

Use unleaded gasoline with the following minimum octane rating:

- In the U.S.: $(R+M)/2$ (AKI) - 87
- Outside the U.S.: (RON) - 90

NOTICE! Engine damage resulting from the use of lower octane gasoline (below 87 AKI or 90 RON) is considered misuse of the engine and is not covered by the warranty.

All Volvo Penta gasoline engines are engineered to operate on AKI 87 (RON 90) octane fuel. Mid-grade and premium fuels contain injector cleaners and other additives that protect the fuel system and provide improved performance. EFI engines may obtain an increase in power from higher octane fuels.

NOTICE! Leaded gasoline may be available in some markets. Leaded gasoline will damage the catalysts and can not be used in engines with catalytic converters. Catalyst failure due to improper fuel is not covered by the warranty.

Ethanol-Blended Fuels (E10)

Gasoline is distributed, in the United States and other markets, containing ethanol. Volvo Penta gasoline engines may be operated using gasoline blended with no more than 10% ethanol and that meets the minimum octane specification. 10% ethanol-blended fuel is also commonly referred to as "E10."

Because of the high content of alcohol in the blend, users of ethanol-blended fuels must take additional care in the maintenance of their fuel systems. The effects vary depending on the fuel tank material. Most boats have fuel tanks constructed of aluminum, stainless steel, or composites. Since ethanol-blended fuels attract and hold moisture, ethanol content can contribute to corrosion of the tank material in aluminum fuel tanks. Corrosion material can clog fuel filters and damage injectors, carburetors, and other fuel system components. Stainless steel and composite fuel tank materials are not affected by ethanol-blended fuels. However, ethanol-blended fuel can act as a solvent, loosening and washing old deposits or contaminants into the fuel system.

NOTICE! Fuel system or engine damage caused by contamination from water, foreign particles, sludge, or gums entering or forming in the fuel system is not covered by the warranty.

Volvo Penta gasoline engines are equipped with a water separating fuel filter (see *Engine Fuel Filter*

Replacement in the section entitled *Maintenance*). The use of an additional water separating fuel filter between the fuel tank and the engine is recommended. The filter must be approved for gasoline inboard installations and be installed in accordance with US Coast Guard regulations and ABYC standards. The filter must be rated for use with gasoline and have a minimum rating of 50 gallons (189 liters) per hour.

Water separating fuel filters should be checked frequently for water and contaminants in accordance with the filter manufacturer's recommended service intervals. Check and/or replace the filters when engine performance is poor (see the section entitled *Engine Troubleshooting Guides*). Carry spare filters and needed tools and supplies to change filters when boating.

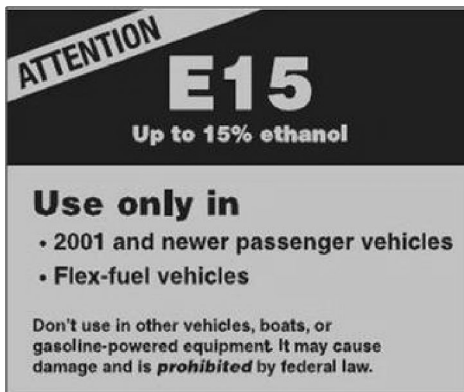
The use of a commercially available fuel stabilizer such as STA-BIL® is recommended when storing ethanol-blended fuels for more than 2 weeks. Avoid extended storage of ethanol-blended fuels whenever possible.

Other Ethanol-Blended Fuels

NOTICE! Do not use ethanol blends greater than 10%, especially E85 (85% ethanol). Volvo Penta engines are not designed to run on high percentages of ethanol. Loss of performance will occur. Engine damage may also occur; damage caused by fuel with too high a percentage of ethanol is not covered by the warranty.



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Fuel with a 15% blend of ethanol (E15) is now available in the United States. Fuel pumps using an E15 blend of fuel will be marked with the label shown at left. **Fuels marked E15 should not be used with your equipment; engine damage is likely to occur.**

Methanol

Do not use any gasoline containing methanol in Volvo Penta engines.

Serious engine damage may result from the continued use of fuel containing methanol. Any resulting engine damage is not covered by the warranty.

Cooling System

Coolant

WARNING!

Ethylene Glycol coolant is poisonous to humans and animals if ingested.

Carefully control all coolant removed from the engine, quickly clean up all spilled coolant, and dispose of coolant and absorbent materials according to local environmental regulations.

WARNING!

Risk of eye injury. Eye protection required.

Coolant is an eye irritant. Always wear eye protection when working with coolant.

Engines covered by this manual are filled at our factory with the new, more advanced Volvo **VCS** yellow coolant. If coolant needs to be added or replaced, only use the **VCS** coolant.

Do not mix coolant types. Do not use other coolant types such as traditional green ethylene glycol, propylene glycol (pink), OAT or HOAT coolants.

Volvo Penta offers ready-to-use, pre-mixed containers of the "VCS" coolant. If using full strength antifreeze, use a 50/50 mix of antifreeze and distilled water. See *Freeze Protection* below.

Freeze protection

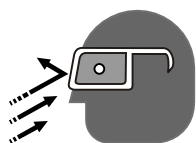
NOTICE! Engine damage is possible during freezing temperatures if coolant mix is not correct .

If the boat/engine will be stored or used in an area with freezing temperatures, the coolant mixture must be checked to insure it has adequate temperature protection properties. As part of winterization, Volvo Penta highly recommends that the coolant be checked for correct freeze protection. Use a coolant test kit (hydrometer) to check a sample of the coolant. The temperature indicated by the hydrometer should be at least 10° F (6°C) lower than the lowest expected temperature for the area where the engine will be stored. Check the coolant at ambient temperature, do not check hot coolant (safety and inaccurate reading concerns).

The coolant solution can be strengthened to protect at lower temperatures by draining half a gallon of coolant from the engine and replacing with a half gallon of full strength antifreeze solution. Run engine for 10 minutes to ensure proper mixing of solution and recheck for level of protection. Repeat, if necessary, until the indi-



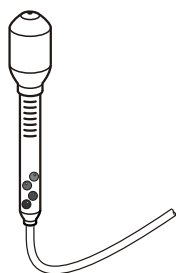
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cated level of protection is at least 10° F (6°C) lower than the projected lowest temperature for the local area.

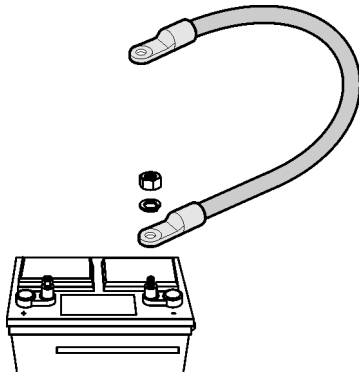
See your Volvo Penta dealer for assistance with this test.

Electrical System

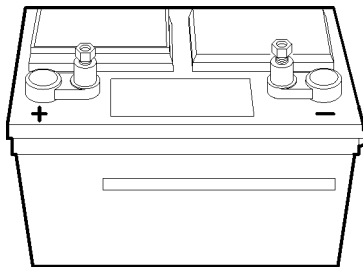
Battery Cables

When replacing battery cables, always use multi-strand copper cables of the same gauge (or better) as those already installed in your boat by the boat builder. If you are unsure of the gauge to be used, consult your dealer. The maximum length is 20 feet per cable, regardless of diameter.

NOTICE! Do not use aluminum core battery cables. Failure to use battery cables of recommended gauge and material could result in poor starting and electrical component damage.



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Battery

Battery Requirements: Replace the battery with one that has the same (or more) cold cranking amps and reserve capacity as the battery installed in your boat by the boat builder. See *Technical Data* for your engine for minimum battery requirements. If you are unsure of the battery to be used, consult your dealer.

NOTICE! Failure to use a battery of recommended specifications could result in poor starting and electrical component damage.

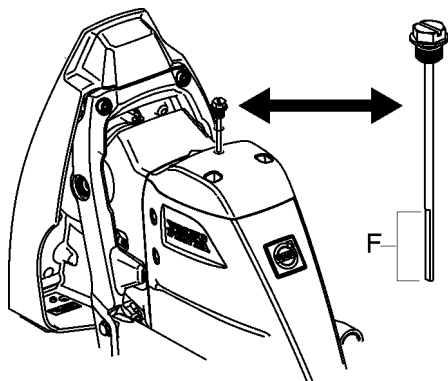
NOTICE! Do not use deep cycle batteries to start the engine. A deep cycle battery, while it may have enough cold cranking amps (CCA), does not have enough voltage to power the ECM and will cause problems with the engine.

Sterndrive

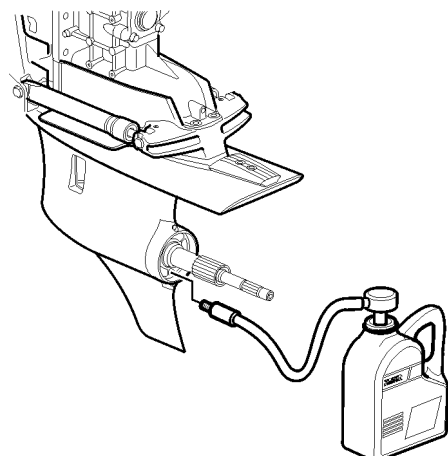
Drive Components

The drive unit is filled at the factory with Volvo Penta Synthetic Gear Oil. Change lubricant as specified in *Maintenance Schedule*. Use Volvo Penta SAE 75W/90 API service GL 5 synthetic gearcase lubricant.

NOTICE! Whenever you are changing or topping up the oil, **always** check the oil level using the dipstick.



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P0016609

Sterndrive Oil Capacity

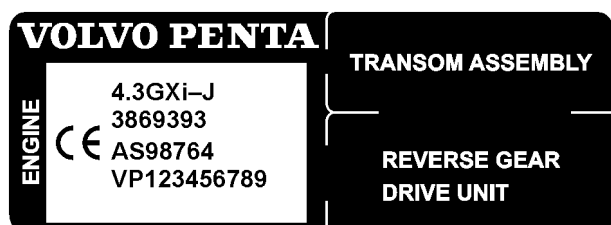
DPS Models: 2.6 quarts (2.5 liters)

NOTICE! If your drive is equipped with a Drive Spacer, you will need to add more oil than the recommended amount.

Identification Numbers

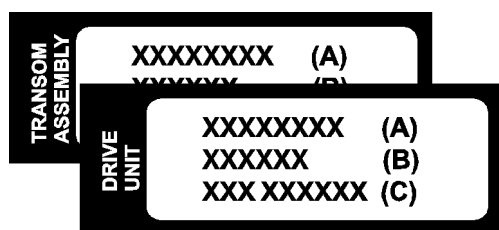
Informational Decals and Identification Plates

The following images provide graphical representations of various engine decals. The areas described are general locations and are intended to be guides only. Engine models and configurations do vary and, depending on the amount of space available, the exact locations of engine decals tend to vary also.



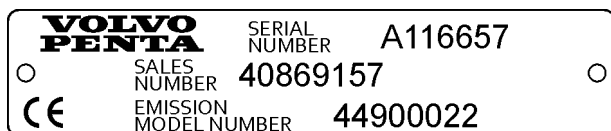
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The engine decal is located on the engine cover.



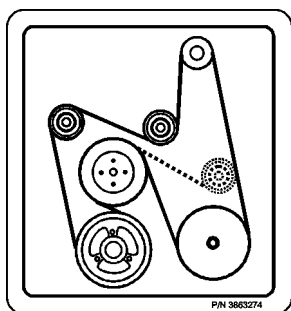
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The transom assembly & drive unit stickers should be located on the engine decal. Your Volvo Penta dealer will have attached these stickers at the time that the transom assembly and drive unit were mounted on your boat and attached to the engine.



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The engine plate is typically located on the port rear side of the engine block.



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The label depicting the serpentine belt configuration is typically mounted on the front of the heat exchanger or on the remote oil filter housing.



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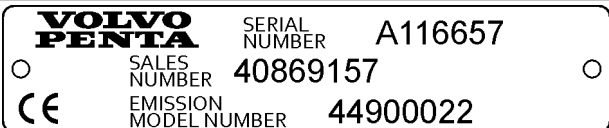
The California emission sticker is located on the engine cover.

Identification Numbers

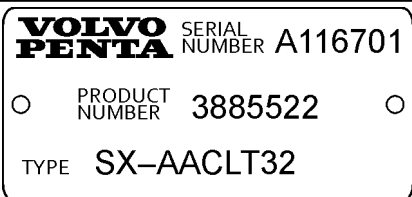
Always provide the engine, transom shield, and drive identification numbers when ordering service or replacement components. The engine identification numbers are on informational decals located in the spots described on the previous page(s). Make a note of the information on the lines provided below. Make a copy of this page and store the information so that it is available in the event of the boat being stolen.

NOTICE! The identification plates depicted in the illustrations below are samples only. The numbers on your identification plates will be different than those shown below.

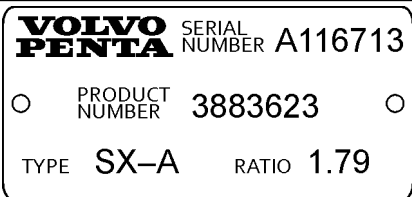
Engine Plate

	
51802	
SERIAL NUMBER:	
SALES NUMBER:	
EMISSION MODEL NUMBER:	

Transom Shield Plate

	
51804	
SERIAL NUMBER:	
PRODUCT NUMBER:	
TYPE:	

Drive Unit Plate

	
51803	
SERIAL NUMBER:	
PRODUCT NUMBER:	
TYPE:	
RATIO:	

Declaration of Conformity

NOTICE! This Declaration of Conformity does not apply to boats using through-hull exhaust systems.

Engine Manufacturer: Volvo Penta of the America, 1300 Volvo Penta Drive, Chesapeake, VA 23320, USA

Body for exhaust emission assessment

International Marine Certification Institute
Rue Abbé Cuypres 3, B-1040 Brussels, Belgium
ID Number: 0609

Modules used for exhaust emission assessment

B
EC Type Examination according to Annex VII

Body for sound emission assessment

International Marine Certification Institute
Rue Abbé Cuypres 3, B-1040 Brussels, Belgium
ID Number: 0609

Module used for sound emission assessment

Aa
International production control
Test according to Annex VI

Other Community Directives applied: EMC 89/336/EEC

Description of engines and essential requirements: 4-stroke gasoline with stern drive & integral exhaust.

Engine model(s) covered by this declaration

Engine Model(s)	Nominal Power	Exhaust: EC Type Certificate Number	Sound: EC Type Certificate Number
V8-380	283 kW	EXVOL012	SDVOLF018

Essential Requirements	Standards Used	Other Normative Documents 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	89/336/EEC	

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: Martin Jufors, Director of Engineering
(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): 2011/07/15 – Chesapeake, VA, USA

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.

Operator's Manual Order

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

Please refer to the link below. On the web page, type in the publication number found in the bottom of this page (7–8 digits).

<http://vppneuapps.volvo.com/manual/coupon/>

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

All order information is stored internally at AB Volvo Penta and will not be shared with third parties.

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