

OPERATOR'S MANUAL

**V6-240, V6-280
V8-300, V8-350**

ENG

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

<http://manual.volvopenta.com/coupon/>

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

GER

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

<http://manual.volvopenta.com/coupon/>

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

FRE

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

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

SPA

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

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

ITA

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

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

SWE

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

<http://manual.volvopenta.com/coupon/>

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

DUT

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

<http://manual.volvopenta.com/coupon/>

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

DAN

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

<http://manual.volvopenta.com/coupon/>

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

FIN

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

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

POR

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

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

GRE

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

<http://manual.volvopenta.com/coupon/>

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

RUS

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

<http://manual.volvopenta.com/coupon/>

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

TUR

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

<http://manual.volvopenta.com/coupon/>

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

CHI

本操作手册可通过互联网以不同的言进行订购，交付后可免费使用达12个月。

<http://manual.volvopenta.com/coupon/>

如果无法访问互联网，请与沃尔沃遍达经销商联系。

BRA

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

<http://manual.volvopenta.com/coupon/>

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

JPN

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

<http://manual.volvopenta.com/coupon/>

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

CALIFORNIA PROPOSITION 65 WARNING

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

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

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Foreword



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.

Our Core Values: Quality, Safety, Environmental Care

Volvo Penta's core values of quality, safety, and care for the environment are central to our operations and activities. They express what we believe in as a company.

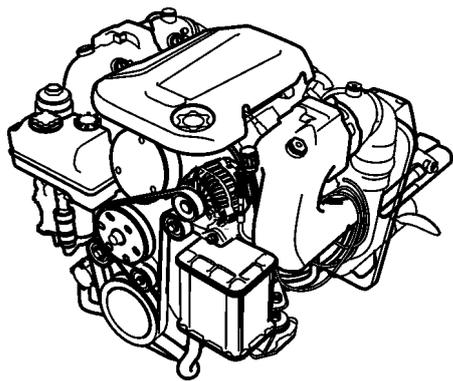
Quality is a value that historically referred just to product quality, but now encompasses all aspects of our products and services. Volvo Penta's quality commitment extends beyond industrial craftsmanship and engineering ingenuity to embrace care for the customer throughout the life of the product.

Safety will always be our most distinguishing core value. Volvo has a long history of safety innovations in all areas of our business. Concern for the safety of our customers is embedded in all Volvo products.

Environmental Care in all operations is an integral part of the Volvo commitment towards customers, employees, and the community. By embracing care of 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.



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Models

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

V6-240-CE

V6-280-CE

V8-300-CE

V8-350-CE

These engines have catalytic converter exhaust systems and are equipped with Electronic Vessel Control (EVC).

C = catalyst exhaust

E = Electronic Vessel Control (EVC)

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

Forward Drive

All drives mated to the engines listed above are covered by this manual, including the Forward Drive.

Illustrations throughout the manual show the traditional SX or DPS sterndrive. The information in each of these sections also applies to the Forward Drive (FWD), unless noted in the text.



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About this Manual

Our quality processes ensure that the correct operator's manual is 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 seeking assistance from your dealer regarding your power package, always provide the serial number for your engine.

This manual contains the information you need to operate and maintain your power package. Topics such as service, troubleshooting, and storage are also covered, however at a less detailed level. For more detailed information see your authorized Volvo Penta dealer, or the service manuals for your package.



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Safety Information

Safety Alert Symbol and Safety Messages

This section explains the way safety information is presented in this manual.

Safety Alert Symbol



This is a symbol that indicates a potential personal injury hazard. When you see this symbol carefully read and follow the instructions that follow. Personal injury is possible if the instructions are not followed.

Safety Messages

US and international standards exist and are followed in this manual to alert you of hazards as you are operating or working on your boat. As you read the procedures be aware of the following signal words and their definitions:

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.

Look for the safety alert symbol and Danger, Warning, and Caution messages in this manual. They alert you to possible safety issues or important safety information. They also provide instructions on how to avoid the safety issue.

IMPORTANT! NOTICE!

These messages are used to provide information that will prevent damage to the product (engine, drive) or other property. Failure to comply with a Notice or Important message may result in equipment failure or damage.

Safety Precautions While Operating the Boat



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Thoroughly read this 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 operating 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 navigation and safety laws. Make sure you know the laws that apply to you and the waters in which you are boating. Contact the relevant authorities for specifics.

We strongly recommend you take a course in safe boating. Contact your local boating organization to find available courses.

Always observe the following minimum precautions while boating:

Insist on the use of personal flotation devices (life preservers) by all passengers at all times.

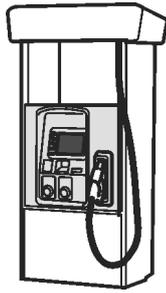


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Never operate a boat if you are under the influence of alcohol or drugs.



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Use extreme care when refueling the boat. Follow the safety messages below, and any found in the boat's manual or posted at the refueling station.

⚠ 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!

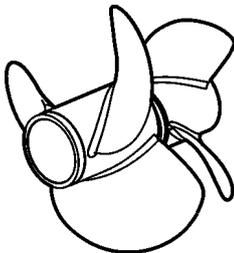
Fuel and vapors will be present during procedure, which can result in an explosion; provide ventilation and eliminate all sources of spark or flame.

Never overfill the tank. Completely close the fuel filler cap when finished.

⚠ DANGER!

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.

Safety messages covering gasoline and fuel vapors encountered while working on your boat or engine are provided in the appropriate locations throughout the manual. Look for the safety alert symbol (triangle).



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⚠ DANGER!

A rotating propeller can cause serious injury.

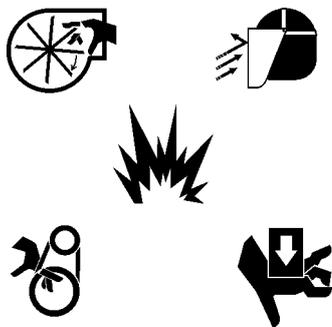
Never boat near people who are swimming or where there is a risk that there are people in the water. The engine must be off if there is anyone in the water near the boat.

Check that nobody is in the water before shifting the drive in to gear.

Never swim or board at the rear of the boat when the engine is running, even if the drive is in neutral.

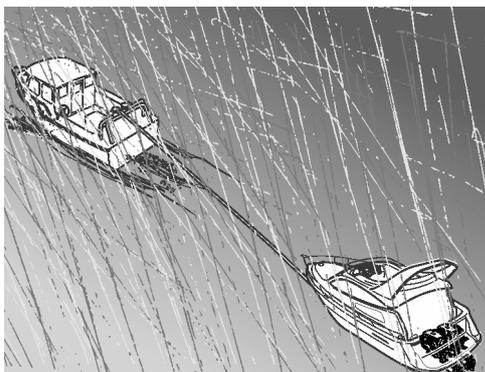
Never use the drive unit as a ladder or as a lift to board the boat.

No one should be in the water at the transom or swim platform if the engine is running. This is also a carbon monoxide poisoning hazard, see *Carbon Monoxide*.



Personal injury is possible when performing the maintenance or service work described in this manual. This work can involve rotating belts and parts, pinch points, hot surfaces, fuels that are explosive and chemicals that are fire hazards. These hazards are covered in the procedures, look for the safety alert symbol (triangle).

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A key component of safety on a boat is the condition of the boat and its systems, including the power package. A boat that has not been regularly maintained or that has neglected mechanical problems is more likely to break down, potentially leaving its passengers in dangerous situations.

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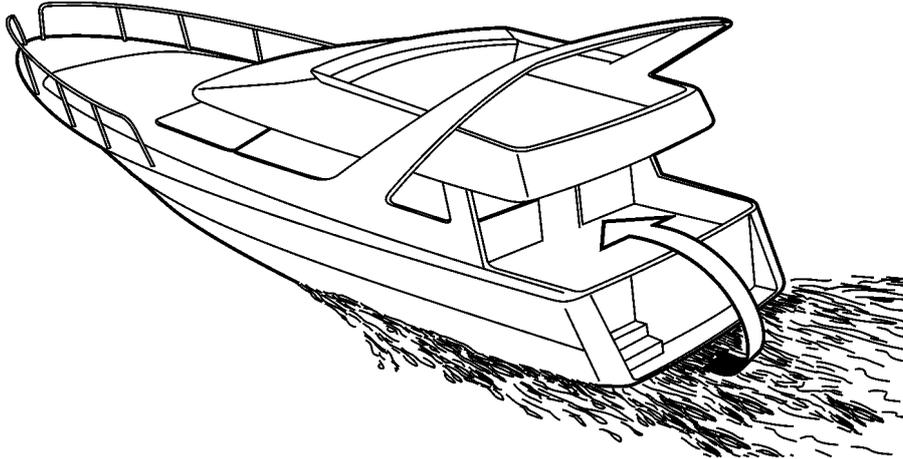
Carbon Monoxide

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. Watering 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.
- Evacuate the area and move affected person(s) to a fresh air environment.
- Observe the victim(s).
- Administer oxygen, if available.
- 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.
- Investigate the source of CO and take corrective action.

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.”

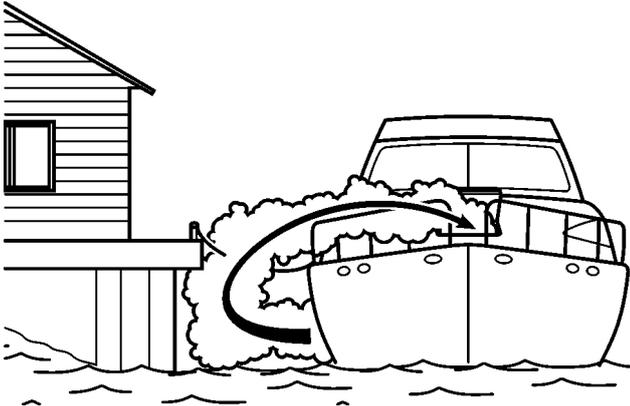
What to do When the Alarm Sounds

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:

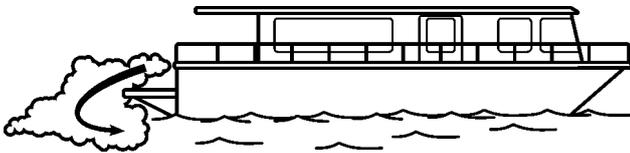
- Shut off sources of CO such as engines (if safe to do so), generators, and open flame stoves.
- Provide fresh air through actions such as opening port lights, hatches, and doors.
- Look for sources of CO that may be from other boats and take appropriate steps, which may include moving your boat to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

Boat Operation

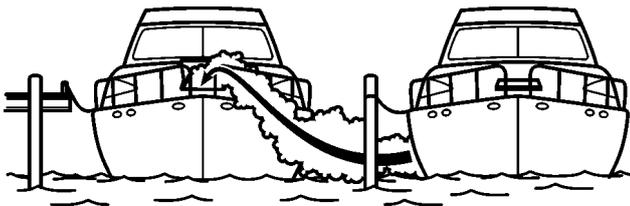
Don't run engine(s) or auxiliary generator(s) on boats with enclosed accommodation compartments unless the boat is equipped with a functioning marine carbon monoxide detector that complies with *2ABYC A-24, Carbon Monoxide Detection Systems on Boats*.



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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).

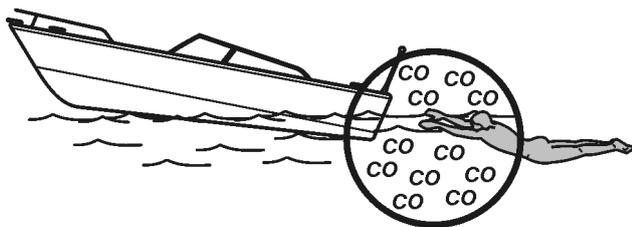
Pay attention to prevailing conditions and provide for ventilation to induce fresh air and minimize exhaust re-entry.

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.

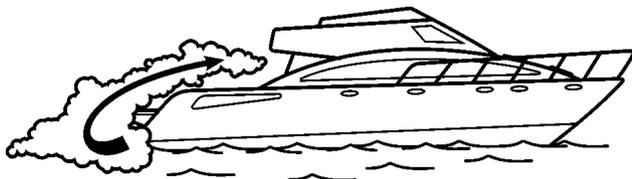
- Do not occupy aft lounging area(s) or swim platform,
- Do not swim under or around swim platform,
- Do not swim in the vicinity of exhaust outlet(s).

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.

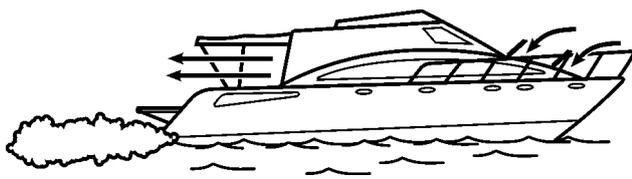
A boat operator should be aware that carbon monoxide is emitted from any boat's exhaust. Boats moored close together can affect each other. Operation, mooring, and anchoring in an area where other boats' engines or generators are running may put your boat in an atmosphere containing CO, even if your 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.



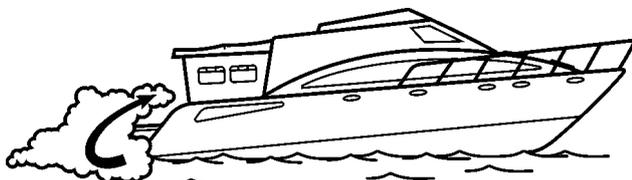
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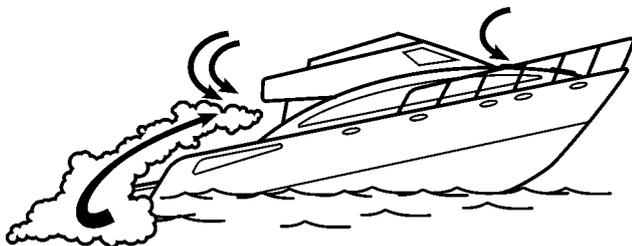
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Underway Operation

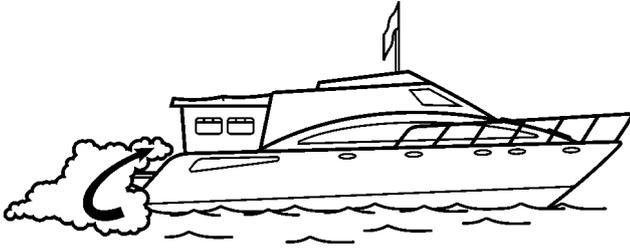
Do not sit on, occupy or hang on any stern appendages (e.g., swim platforms, boarding ladders, etc.) while underway. Do not body surf, commonly known as “teak surfing” or “platform dragging,” in the wake of the boat. Do not tow persons in close proximity to the stern of the boat.

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:

- 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.
- 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).



51621

- 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 in good condition.

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

Introduction



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P0016521

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.

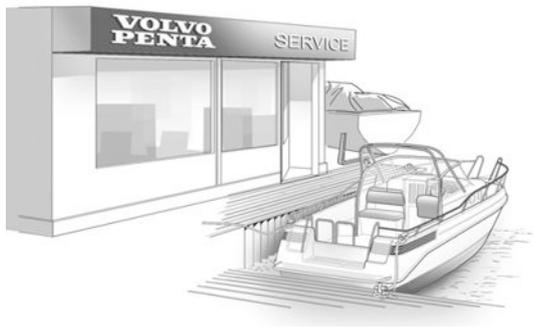
Volvo Action Service (VAS)

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.

In the US contact Volvo Action Service via phone at 1.877.33.PENTA (1.877.337.3682, toll-free).

Customers outside the US can find the phone number for Volvo Action Service on our website (see *Volvo Penta on the Internet page 14*), there is a link to VAS on the homepage for each market unit.



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.

Dealer Locator Services

If you are away from home and need service or maintenance on your engine and drive, take your product to the nearest Volvo Penta servicing dealer. For the name and location of the nearest Volvo Penta dealers, use the *Find a Dealer* feature on the Volvo Penta web site (see below).

Customers in the US can also call toll free; 1.800.522.1959.

Volvo Penta on the Internet

www.volvopenta.com

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.



P0019994

Customer Relations

For customers in the United States.

The Volvo Penta Customer Relations Department may be contacted at the following address;

Volvo Penta of the Americas
attn: Customer Relations
1300 Volvo Penta Drive
Chesapeake, Virginia 23320, USA

You may also call;
Phone: 866.273.2539

Instruments and Controls

This section describes Volvo Penta instrumentation (gauges), displays, panels and controls and their functions.

EVC (Electronic Vessel Control)

The engines covered by this manual are equipped with Volvo Penta's Electronic Vessel Control, known as **EVC**.

EVC is a complete vessel control system for the engine and drive. In some applications steering is part of the control system. Engine throttle, drive shifting, and other critical operations are controlled by the system. The system also monitors the performance of the driveline and provides operational data such as temperatures, oil pressure, fuel levels, and engine RPMs. Messages to advise when there are system problems (faults) are an important feature of the system.

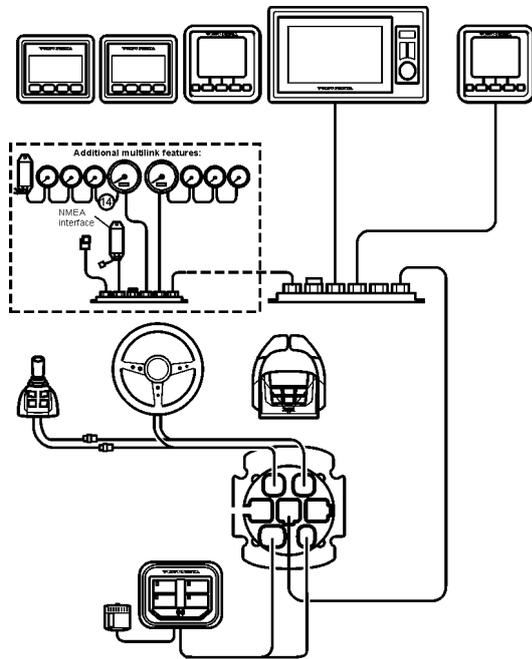
The complete EVC system is developed, tested and verified to comply with Volvo Penta's stringent requirements for safety and reliability based on approved standard configurations.

These configurations consist of control units (computers) and cabling connected to optional gauges, control panels, shift and throttle controls, displays and joysticks. As you read through this manual remember that an item that is covered in a section may not be installed on your boat.

The integrity of the system is critical to system performance. Never cut or modify connectors, wiring or splices to install components. Installing non Volvo Penta components may cause the system to malfunction.

NOTICE! Service must be done by authorized Volvo Penta dealers.

Aftermarket interfaces breach system integrity and may negatively affect vessel performance, safety and warranty coverage. Volvo Penta does not endorse any direct or indirect connection with other systems or components not being fully tested, verified and approved in writing by Volvo Penta. Volvo Penta accepts no responsibility for modification of the Volvo Penta EVC system and/or use of components or interfaces not sold or approved by Volvo Penta.



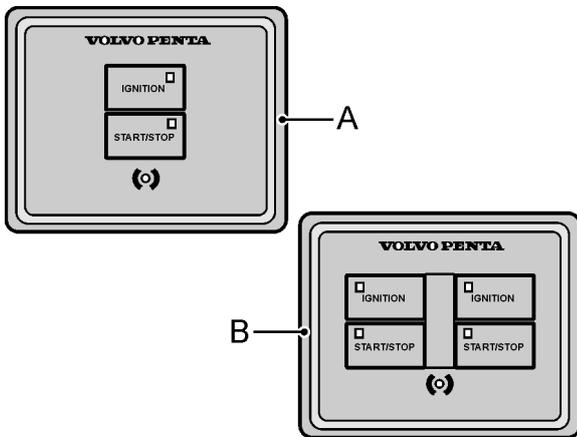
P0018470

Ignition Lock

e-Key

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

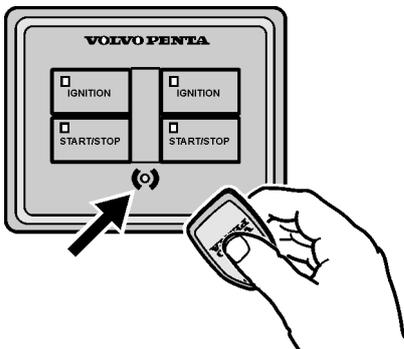
The panel options are a single driveline **A** or twin driveline **B**.



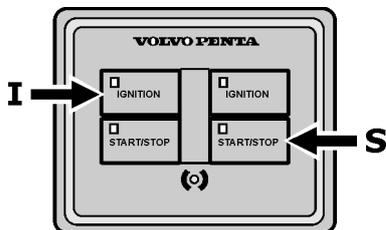
P0016534



P0016535



P0016536



P0016537

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 EVC 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 lock the EVC 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

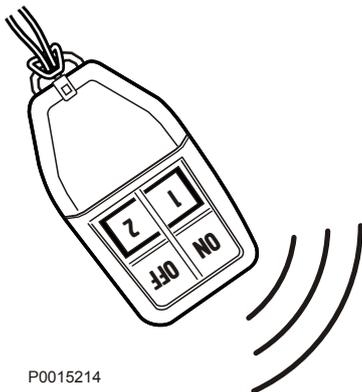
e-Key Remote uses the same panels as the standard e-Key system. However it uses wireless (Wi-Fi) key fobs that can remotely activate the panels.

ON — unlocks the system

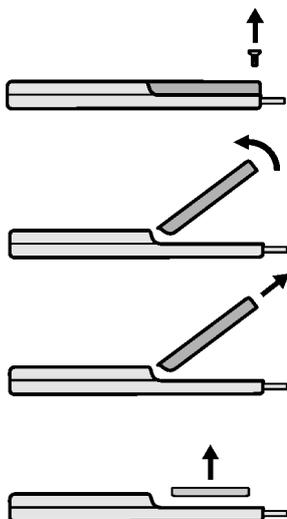
OFF — locks the system

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).



P0015214



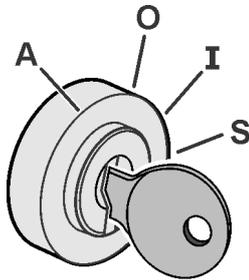
P0016616

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.



P0016523

Ignition switch

Usually located at the helm, near the gauges.

Key positions control power to accessories, power to the electrical system, and starting the engine;

A

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

O

Off position, the key can be inserted or removed.

I

Ignition is ON and engine is OFF. System energized.

S

START position (momentary). The starter motor is engaged and starting the engine. See *Starting page 64*.

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.

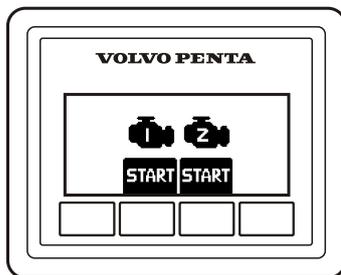
Start/Stop Panel

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.



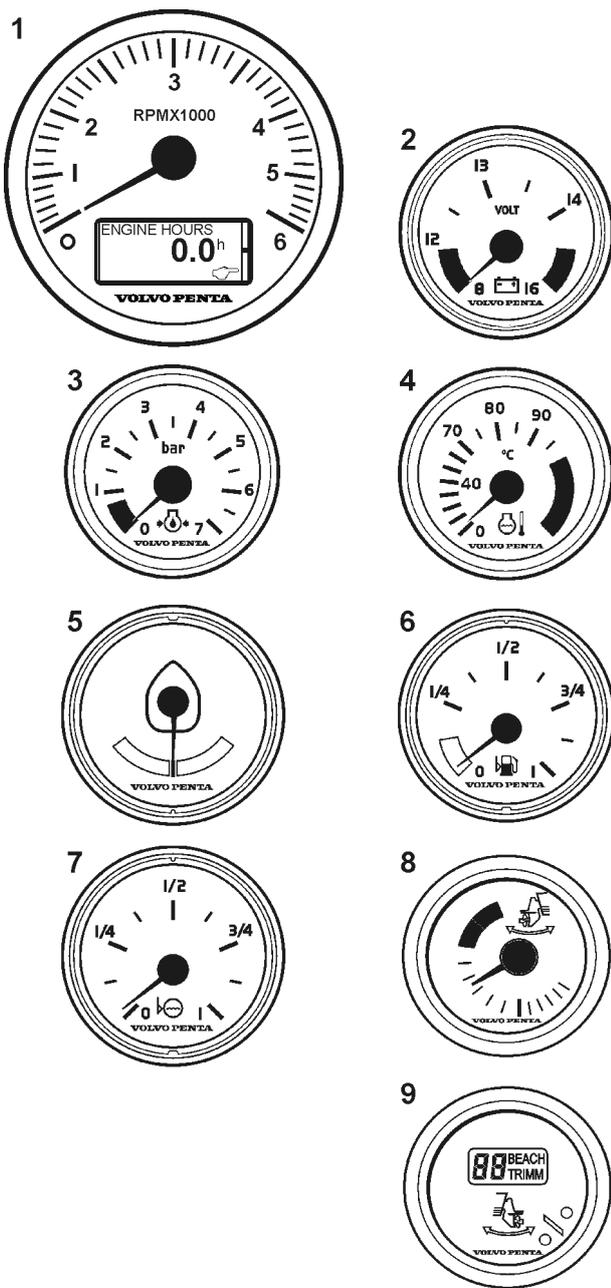
P0001087

Gauges

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)
- 2 Voltmeter
- 3 Oil Pressure
- 4 Coolant Temperature
- 5 Rudder Indicator
- 6 Fuel Level
- 7 Fresh Water Level
- 8 Analog Trim
- 9 Digital Trim

Gauges may not be Volvo Penta parts. The dash layout and which gauges are used are determined by the boatbuilder. If your boat is equipped with gauges not described here, or you are not sure about their functionality, please refer to the manual for your boat, or contact your dealer.



51279



50830

Alarm Display

The alarm display is optional. The gauge has warning lamps that alert you to problems with the engine. If installed, there is one alarm display for each engine.

At key on, the lamps self-test by turning on. When the engine is running the lamps are normally off.

A flashing lamp indicates that a fault has occurred. After the fault is acknowledged, the lamp stays on until the fault is corrected.

For more detailed information on which fault has occurred, how to acknowledge the fault, and what measures to take please refer to *Fault Handling*.

NOTICE! Serious engine damage is possible if an alarm is ignored.

Red Warning Indication: Serious Fault

The red warning lamp means a serious fault has occurred. Reduce speed to idle, investigate immediately.

Amber Warning Indication: Fault

An amber lamp means a lesser fault has occurred. Investigate as soon as possible.

Oil Pressure: Red Indicator

The oil pressure lamp means that the engine oil pressure is too low. Reduce speed to idle, investigate immediately. See *Fault Code Register page 101*.

Battery: Amber Indicator

The battery lamp means the alternator is not charging the battery. See *Fault Code Register page 99*.

Coolant Temperature: Red Indicator

The coolant temperature lamp means the temperature is too high. Reduce engine speed to idle, investigate immediately. See *Fault Code Register page 101*.

The functionality of these lamps is not available on gasoline engines:

Coolant Level

Oil Level

Water in Fuel



50831



50832



50834



50835



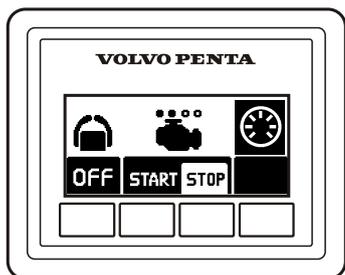
P0018469

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 *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.



P0012493

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.



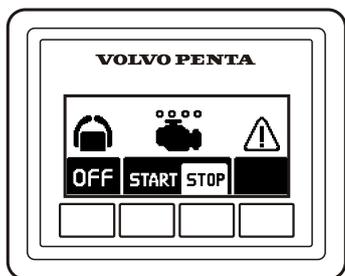
The helm station is locked.



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.

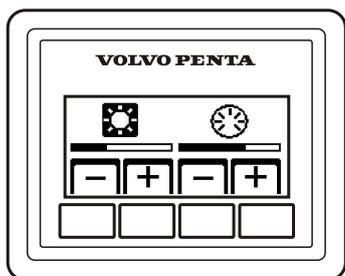


P0001308

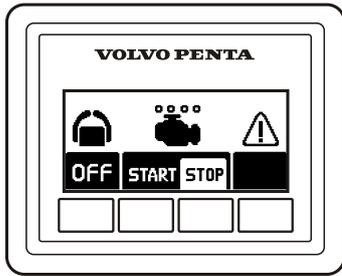
Contrast/Backlighting Buttons

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.



P0012494



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 five possible displays.

Glass Cockpit displays, 8 inches and larger, are covered by separate manuals that come with the displays. Refer to those manuals for complete details on the displays and their functionality.

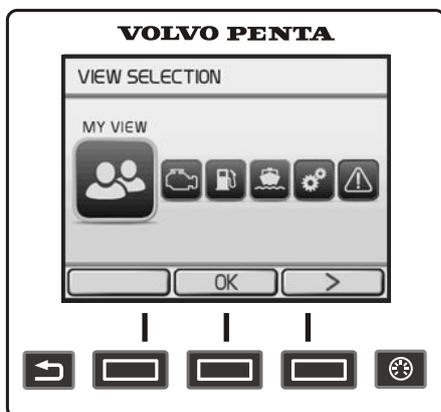


P0018471



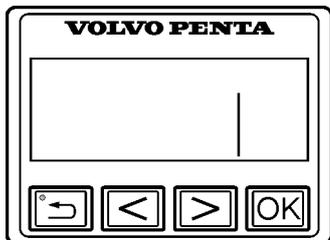
P0001165

7" Color Display – A larger, color LCD display. It provides a variety of information in a larger, easier to read format. Additional information about this display is found in the next section.

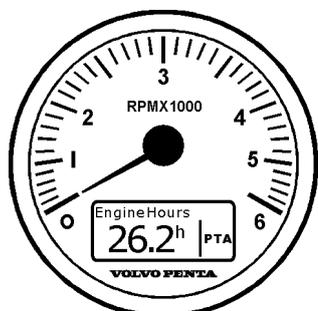


P0014727

4" Color Display – A color LCD display. It provides a variety of EVC-related information. Additional information about this display is found in the next section.



P0016524



P0009819

Information Panel – A smaller, 2.5” LCD display. It provides a variety of information. Additional information about this display is found in the next section.

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

Displays

7" Color Display



P0001165

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**).

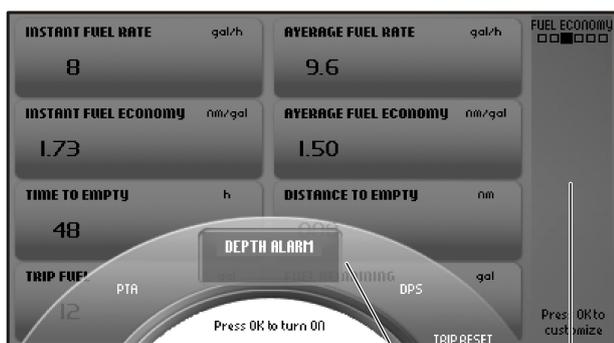
Pop-up

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

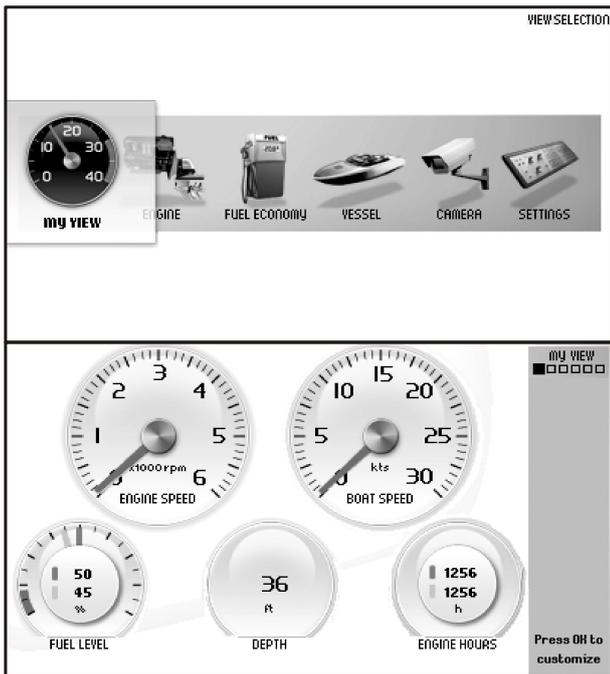
- 1 Pop-up menu
- 2 Status field



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

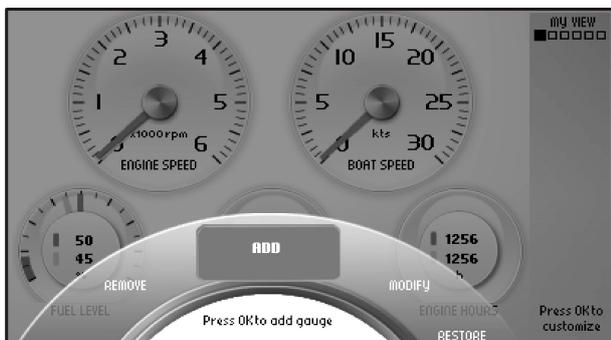
Boat, engine and transmission data are displayed in My View as analog or digital instruments. Selection of instruments to be displayed and their appearance is made under the Customize menu. Information for up to three engines can be displayed on the same screen in boats with multiple engine installations;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

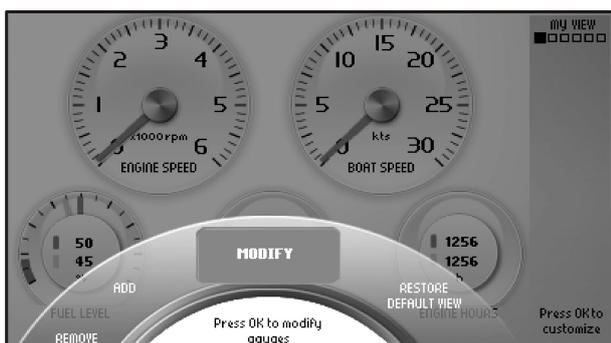
Turn the knob to **Add** and press **OK**.
Select the desired information is displayed and confirm with **OK**. The new instrument will position itself at the bottom right corner.



P0001184

Removing Instruments

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



P0001185

Changing Instruments

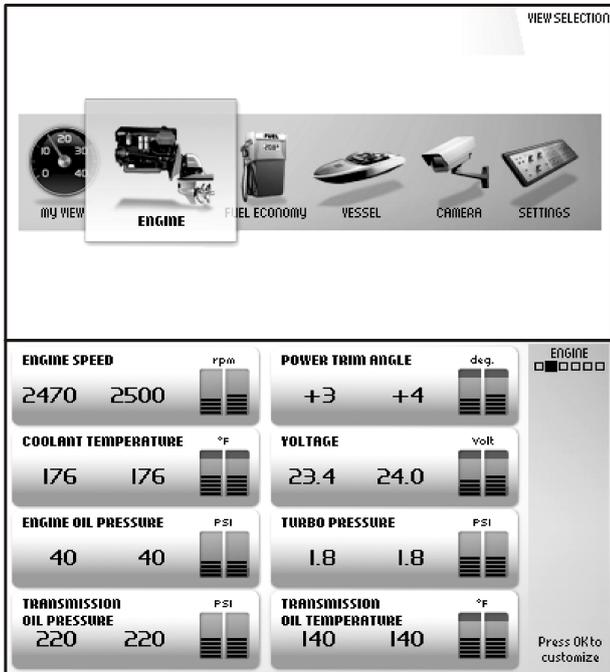
Turn to the **Modify** menu and press **OK**.
Select the instrument that is to be changed and press **OK**.

Choose between:

Remove, removes the instrument.

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

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



P0001046

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

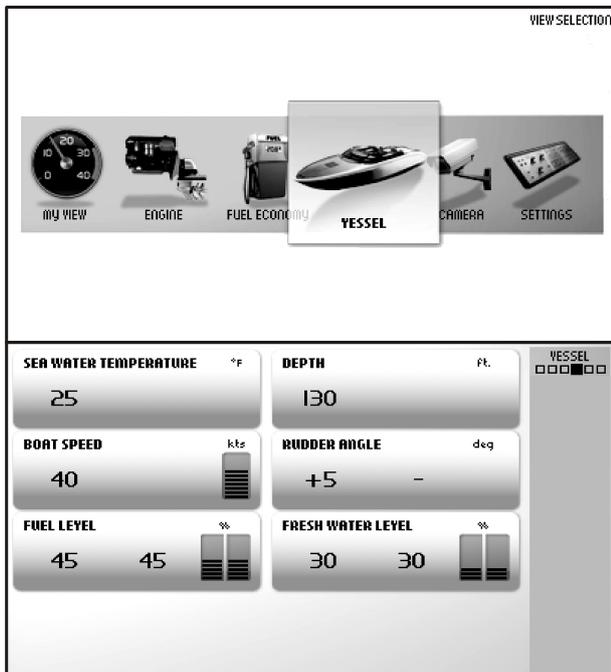
This view functions as the boat's trip computer.

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 rest; 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

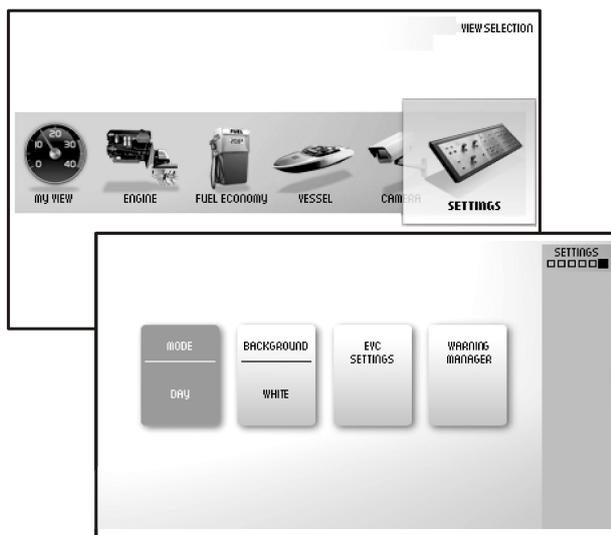
The information in this view cannot be changed.



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.

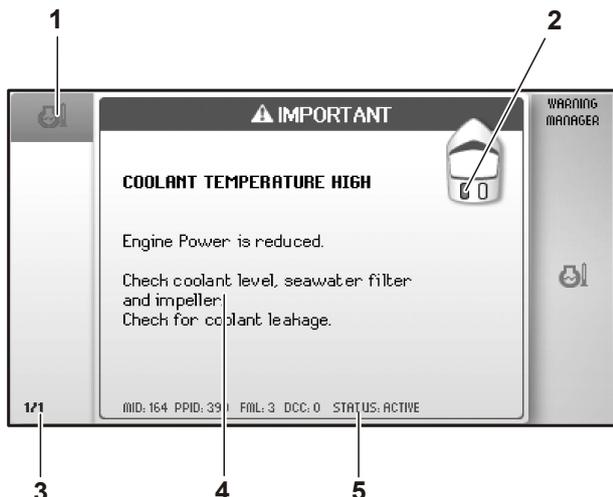
The following features are optional additions to the system, they are only displayed if the option is installed.

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.



P0001049

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

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

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.

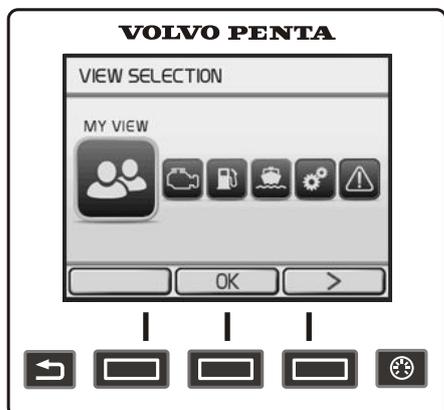
 Press the **CONTRAST** button to adjust the display contrast. The image reverts automatically a short while after the button is released.

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

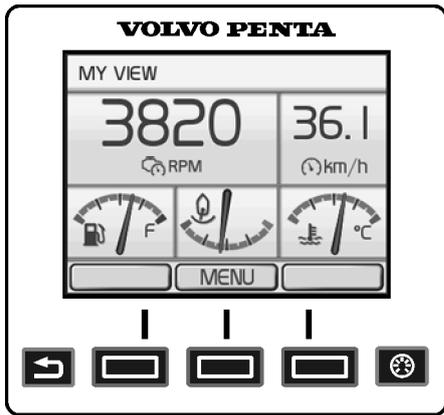
View Selection

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



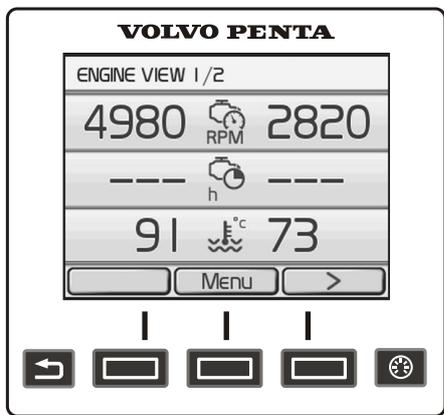
P0014748



P0020517



P0020518



P0014718

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.

With the ignition on and the engine not running, the “check engine” icon will appear at the top of the display. This is a test of the icon and does not indicate faults with the engine. The icon will disappear when the engine is started. If the icon stays on after the engine starts, engine faults are present, see *EVC Diagnostic Function page 96*

SLY is an indicator for the Safety Lanyard system. SLY indicates the safety lanyard is connected, (SLY) indicates it is disconnected. See *Safety Lanyard page 74*

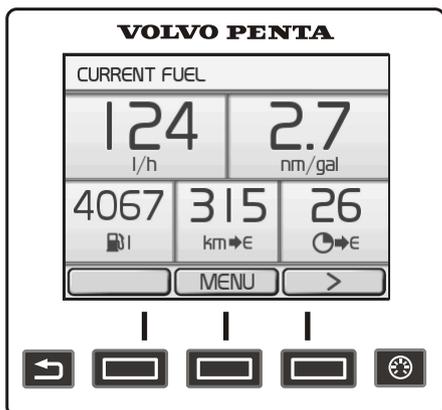
Engine View

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

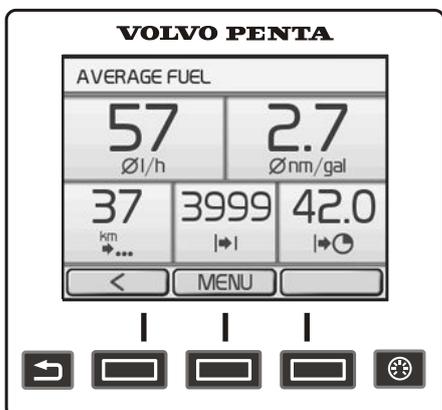
This is the boat's trip computer and information is shown in two windows, **Current Fuel** and **Average Fuel**. Switch between screens by pressing the arrow buttons.



P0014717

Current Fuel

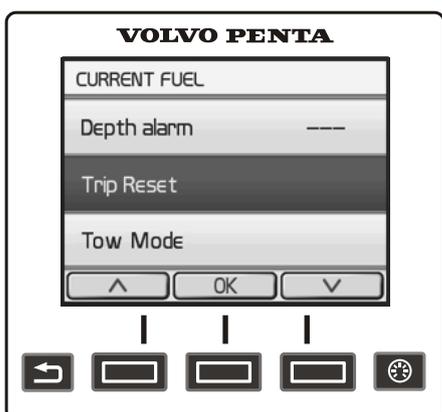
- **Instant Fuel Rate:** Current fuel consumption per hour.
- **Instant Fuel Economy:** Based on current fuel consumption.
- **Remaining in Tank:** Amount of fuel remaining in the tank.
- **Distance Remaining:** Trip distance with fuel remaining in the tank based on current fuel consumption.
- **Time to Empty:** Operating time with fuel remaining in the tank based on current fuel consumption.



P0014740

Average Fuel

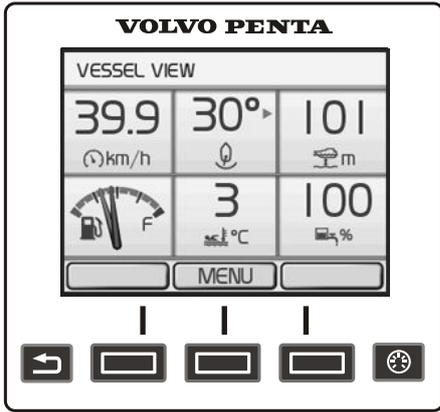
- **Average Fuel Rate:** Average fuel consumption since the last trip computer zero reset.
- **Average Fuel Economy:** Average since the last trip computer zero reset.
- **Trip Distance:** Average fuel consumption per unit of distance since the last trip computer zero reset.
- **Trip Fuel:** fuel consumption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



P0014741

Trip Reset

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

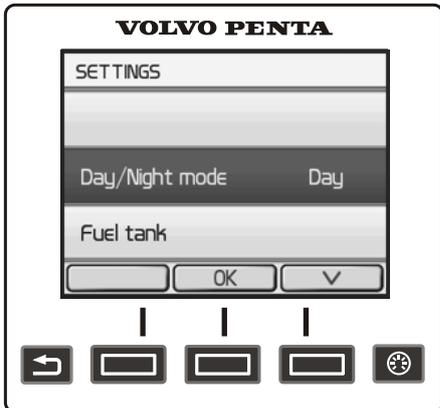


P0014719

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 *Depth Alarm* in this chapter.
- **Fuel Level**
- **Sea Water Temperature**
- **Freshwater Level**
- **ACP Info** for further ACP information, refer to *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 *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 *Depth Alarm* 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

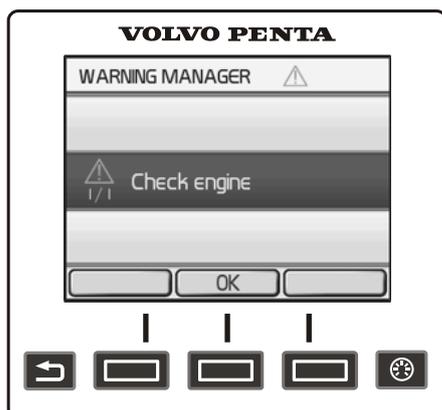
Setting the speed factor; refer to *Log Cal. Factor* in this chapter.

EVC Information

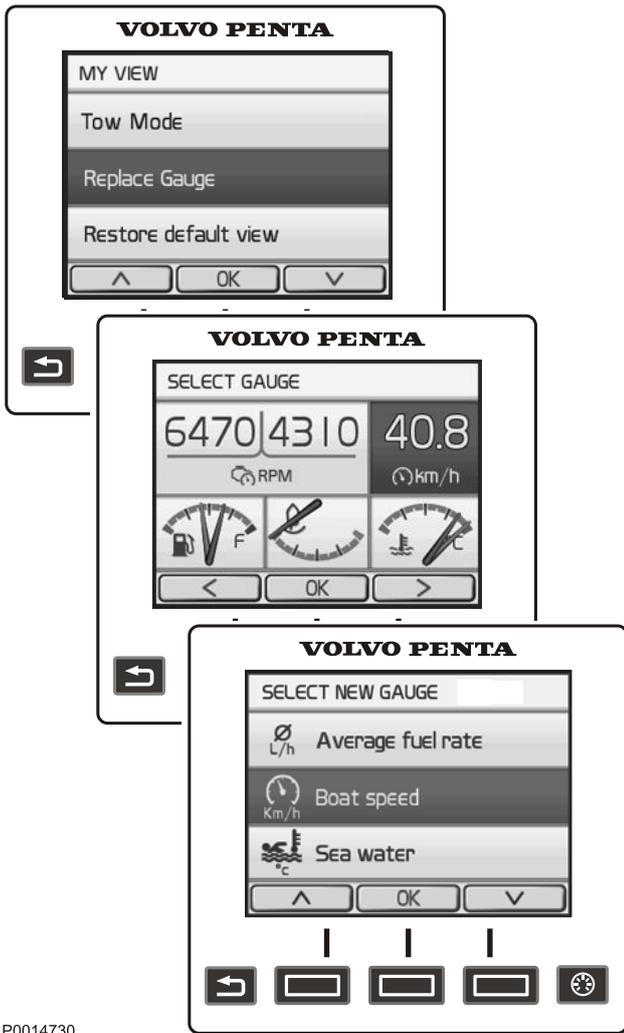
Information about components, software, and functions installed. Installed functions are checkmarked.

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 *Fault Code Register*.



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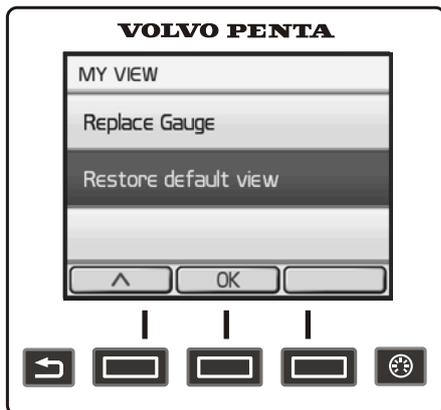


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Replace Gauge

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.

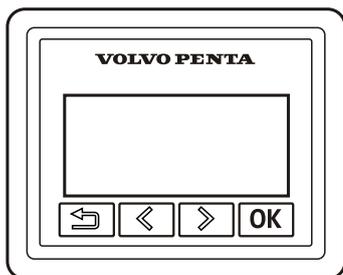


P0014731

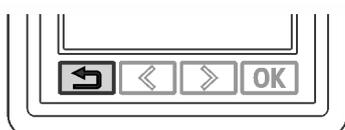
Restore Default View

The display has a basic setting that may be restored.

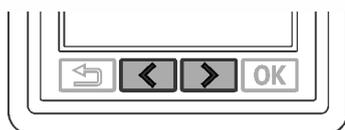
- 1 Press the MENU button and select **Restore Default View**.
- 2 Press OK.



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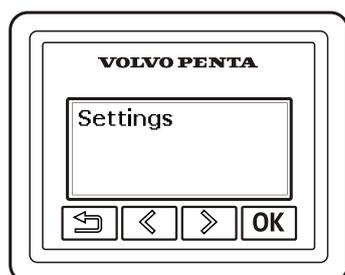
P0018472



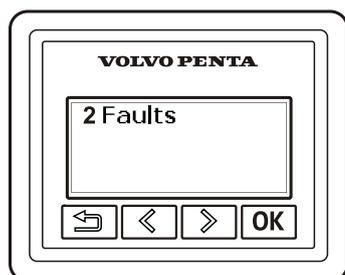
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P0012800

Information Panel

The information panel shows engine and operational information, messages and alarms. There is one panel per driveline.

The information shown can be set up according to personal preferences. Basic settings show:

- Engine RPMs
- Oil pressure
- Coolant temperature
- Battery voltage

Navigation

Return to the previous menu by pressing the back-arrow button.

Hold the button more than three seconds to reach the main menu. Pressing the button repeatedly will also access the main menu.

Browse backwards or forwards through the menus by pressing the < or > button. Hold either button to scroll through a menu.

Confirm a selection by pressing the **OK** button.

Settings

Browse to the settings menu and press **OK** to proceed to the submenu.

Full panel functionality and setup is covered in the next section, *EVC Menu*.

Fault Messages

If the system discovers a fault, the word **Fault** is displayed on the screen. To see the faults press **OK**.

For information on how to handle fault messages and corrective actions see *Fault Handling*.

Backlighting

Press the < and > buttons together to adjust panel backlighting.

EVC Menu

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 Information Panel. 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 page 41* 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).
- **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 drive is off center (°). Optional rudder angle sensor required.
- **Power Trim Angle** – Displays the amount of tilt, up or down, of the drive (°). 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.

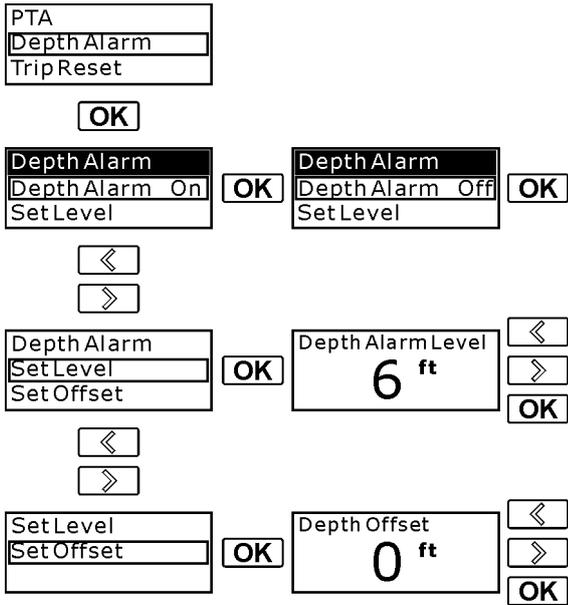
Available options include:

- 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

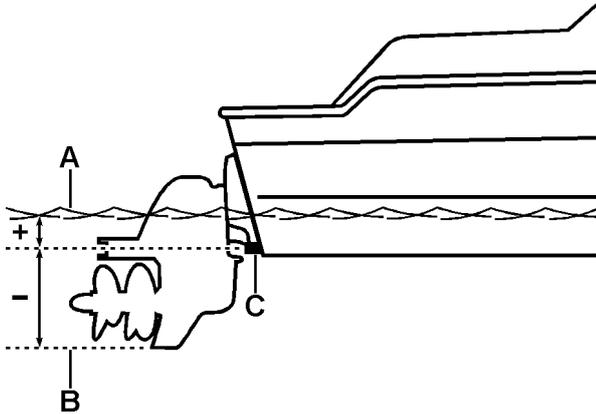
For twin engine installations always perform the settings on the port side system. Port side is the master side.

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.

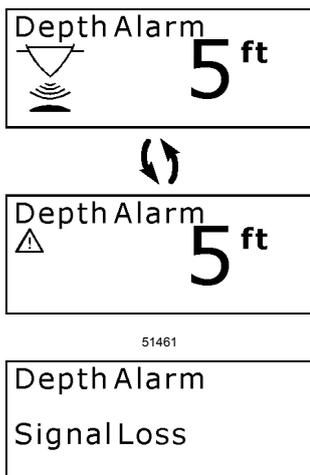
Push the **BACK** button to return to a previous menu level at any time.



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Depth Alarm

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

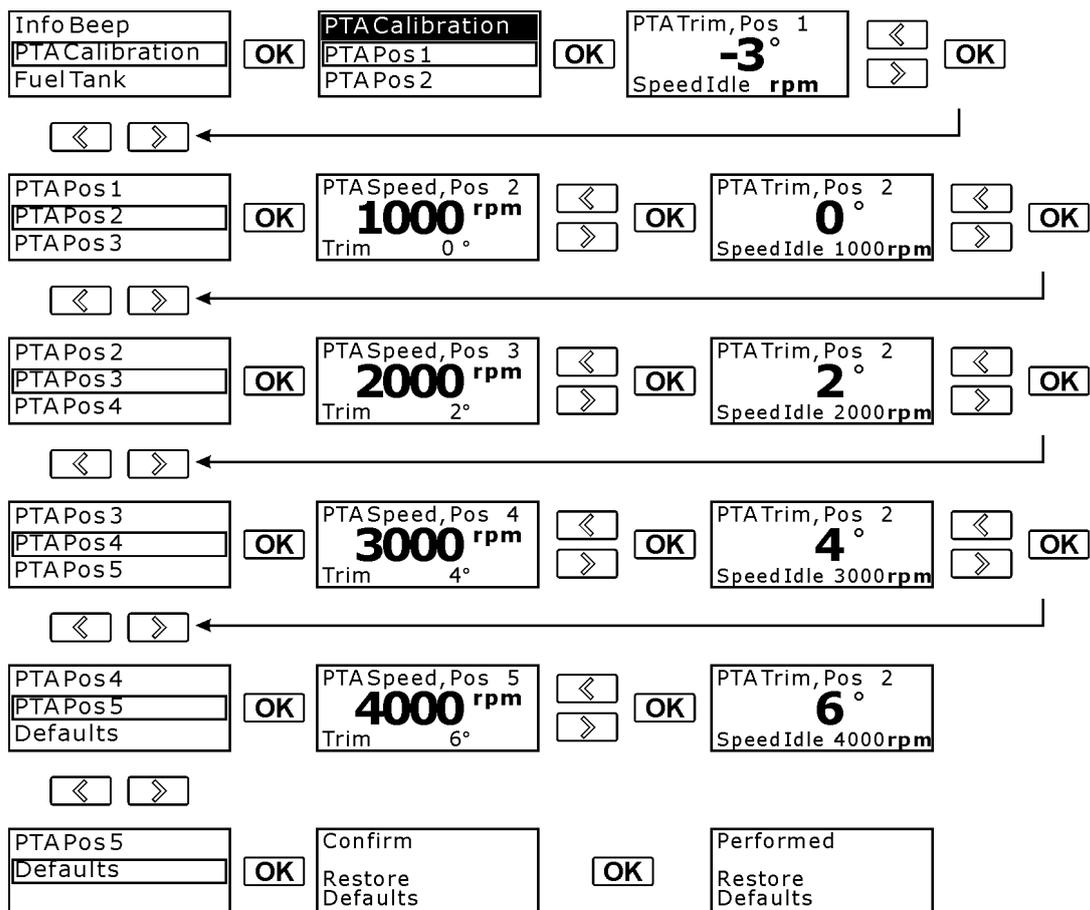
The PTA (power trim assistant) adjusts trim angle automatically according to engine speed (RPM). It is possible to set five trim angles at five different engine speeds (including idle speed).

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

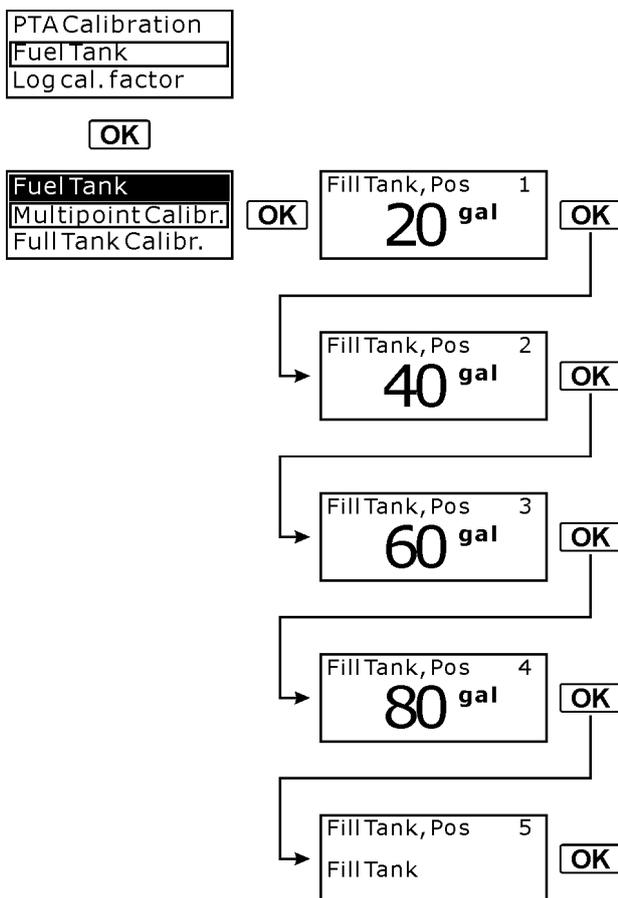
If your boat is equipped with a fuel level sensor, it will be possible to monitor fuel related data; however, you must first calibrate the fuel tank settings. There are two possible calibration methods: Multipoint Calibr. (more precise), Full Tank Calibr. (approximate).

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.



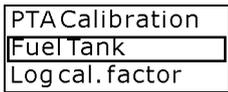
51821

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.



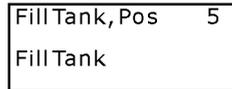
OK



OK

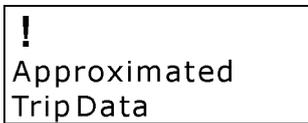


OK



OK

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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

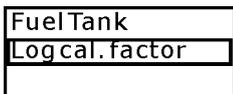
If your boat is equipped with a Volvo Penta speed sensor (multisensor), this setting needs to be performed.

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.

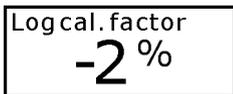
Set the speed factor while driving the boat. Compare the displayed speed with speed data from the GPS (or another boat) and adjust the speed factor until they correspond.

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.

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



OK



←



OK

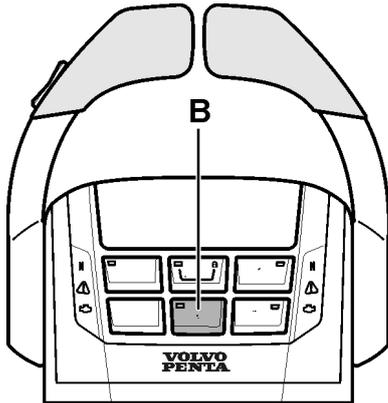
→

51823

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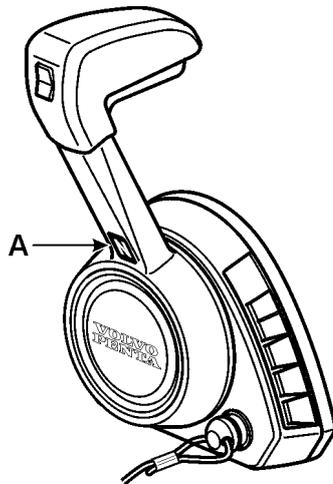
For a side mount control, press and release the Throttle Only button **A**.

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.

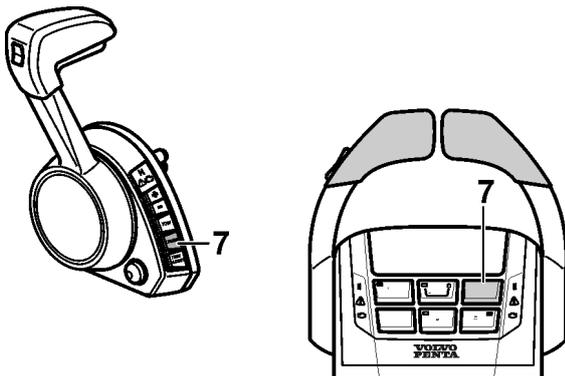
To return to normal control operation, press the Throttle Only button again. The system will sound two beeps to indicate Throttle Only has been turned off.



P0013572

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 time turns the system off (2 beeps, light off).



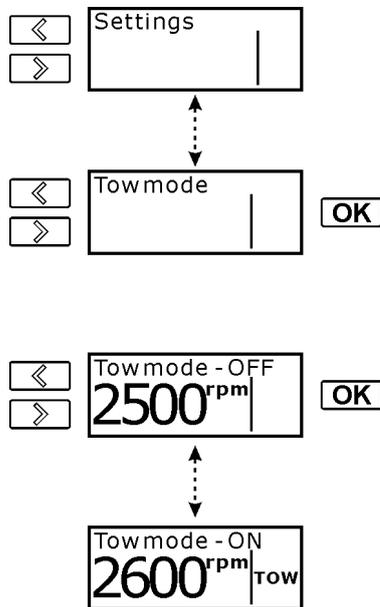
P0016617

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.



51824

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.

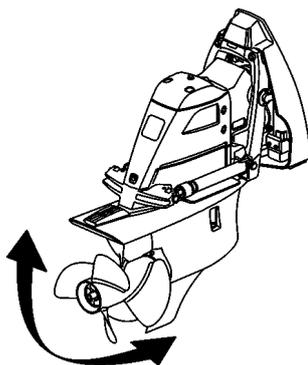
4. To deactivate tow mode, simply return the control lever to neutral, then press **OK**. The screen display will change from **On** to **Off**.

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

Your Volvo Penta drive is equipped with a power trim system as standard equipment. The power trim allows the operator to raise and lower the drive from the helm. This changes the angle of the drive (and its thrust) in relation to the boat bottom. This is called trimming, and provides the following benefits:

- Improves acceleration to planing.
- Keeps the boat on plane at reduced throttle settings.
- Improves fuel economy.
- Provides smoother and/or drier ride in choppy water conditions.
- Increases maximum speed.



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⚠ WARNING!

Risk of personal injury. Read the procedures and safety messages in *Operation* before operating these controls.

Trim system controls and gauges are shown in this section. Use of the trim system during boating and related safety messages are covered in *Power Trim/Tilt* page 75 in *Operation*. Do not operate the trim system until you have read that chapter.

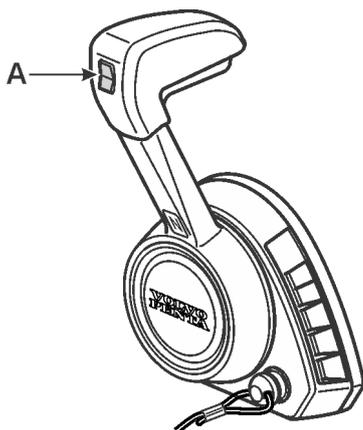
Power Trim Control

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

By trimming the drive up, the bow will be raised in relation to horizontal. Trimming the drive down lowers the bow of the boat.

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

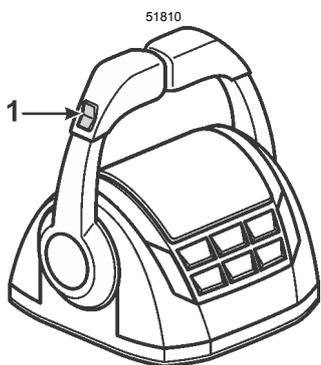
In twin engine installations, both drives can be trimmed together by pressing button **1**. Trim drives individually by pressing the starboard or port button **2**.



Trimming the Drive Up

Press the upper portion of button **1** or **A** to trim the drive up.

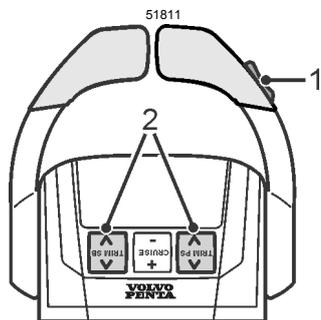
On a twin installation the drives are trimmed up by pressing the **lower** portion of starboard or port button **2**.



Trimming the Drive Down

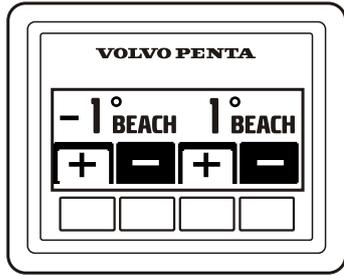
Press the lower portion of button **1** or **A** to trim the drive down.

On a twin installation the drives are trimmed down by pressing the **upper** portion of starboard or port button **2**.



P0016559

Power Trim Panel



P0001189

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 horizontal and trimming in the drive will lower the bow.

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

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

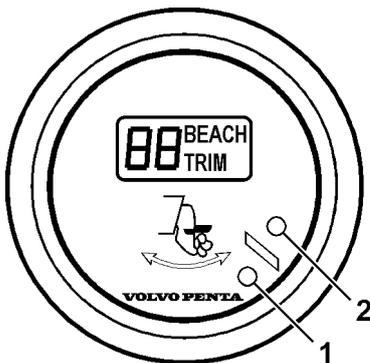
For further information on power trim, please refer to *Maneuvering*.

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.



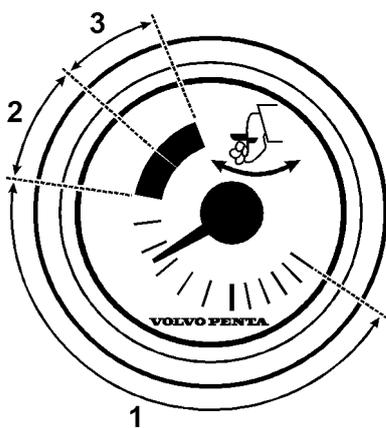
51279a

Analog Instrument

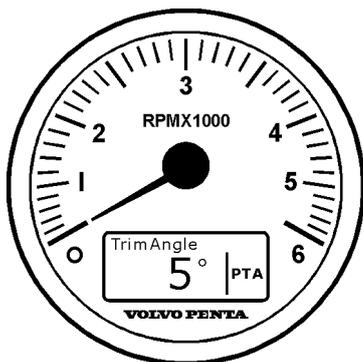
This instrument shows the current position of the drive.

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).



50897



51274j

Tachometer LCD Display

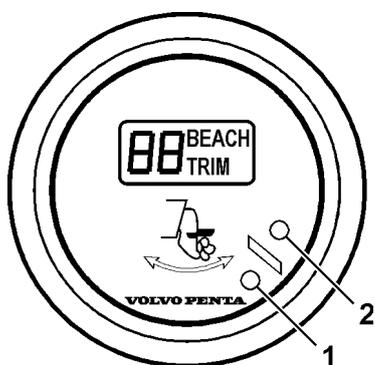
The trim angle may also be viewed in the LCD display of the tachometer (if installed). For additional information, please see *EVC System Display*.

Trim Gauges and Display

Digital Gauge

The digital gauge 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.

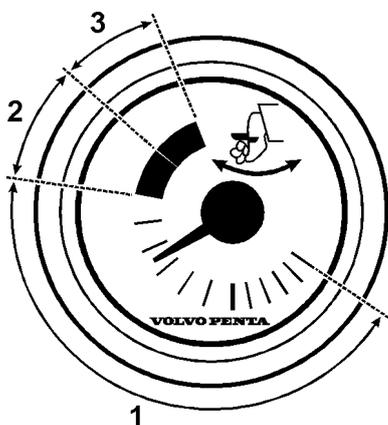


51279a

Analog Gauge

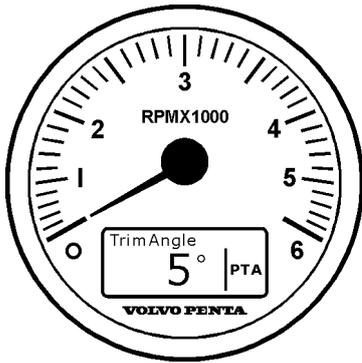
This gauge shows the current position of the drive.

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



50897

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).

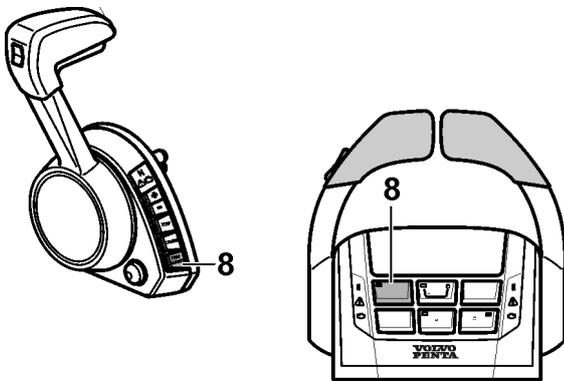
The PTA is turned on and off in the SETTINGS menu or in the main menu level if the option has been selected for viewing at that level.

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

Power Trim Override

Power Trim Override Mode

To raise the drive above trim range (see *Trim Ranges page 76*), for beaching or when in shallow water, hold the trim up button for over 5 seconds. A display message will advise that you may override trim limits. Continuing to hold the trim up button will raise the drive beyond the trim range, until the drive has reached the mechanical tilt limit.

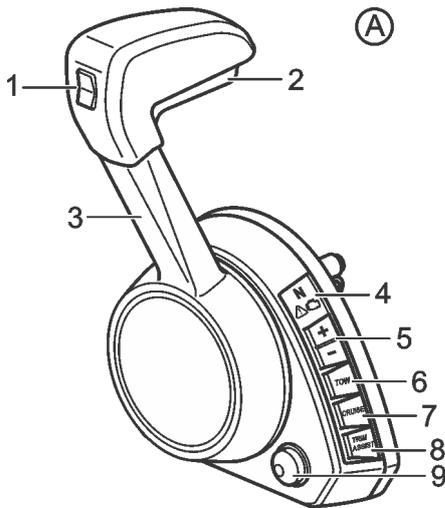
NOTICE! If your transom shield/drive package is not mechanically limited, when applying power trim override mode, use extreme caution while raising the drive as there is a possibility of pushing the drive into the swim platform.

NOTICE! Do not run engine above idle speed when overriding trim limits as it may cause damage to the U-Joint and engine.

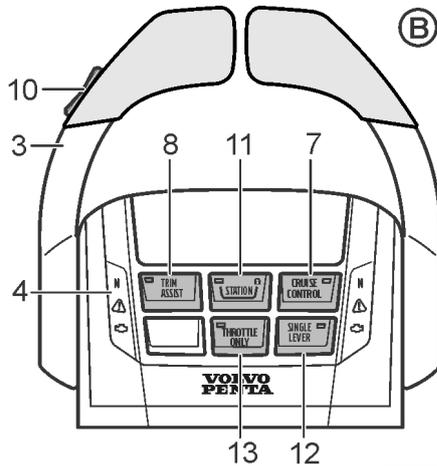
Controls

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.

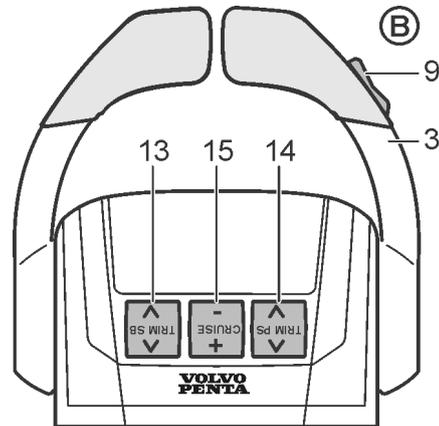
Your boat may be equipped with remote controls other than those described below. If Volvo Penta controls are not used, ask your dealer for operating instructions for the remote control used in your boat since operation and function may differ from Volvo Penta remote controls.



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

The remote control has a friction brake, which can be adjusted as necessary, to provide lighter or heavier lever action. To make adjustments to the friction brake, follow the instructions below to make the necessary changes.

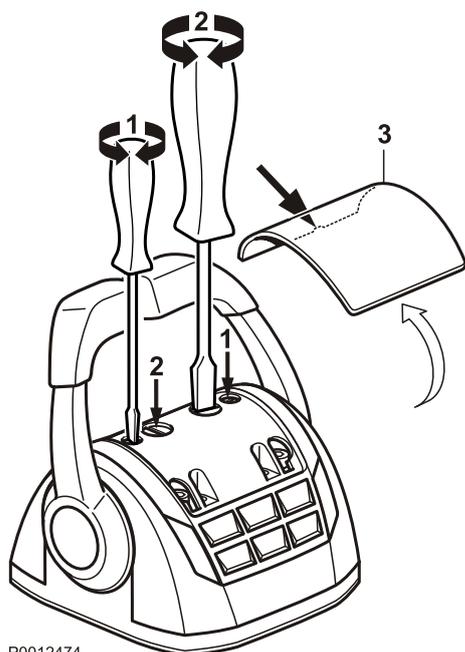
Side Mount Remote Controls

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

Joystick

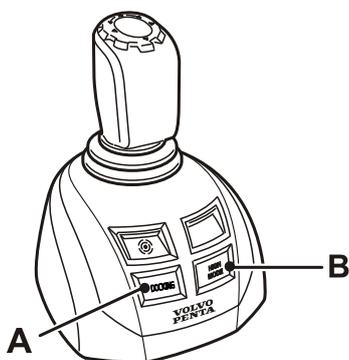
The Volvo Penta Joystick is a control used for docking and maneuvering at low speed.

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

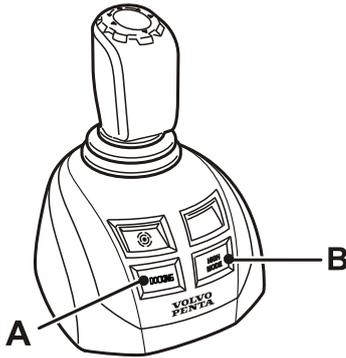
See *Maneuvering with the Joystick* page 85.

Only buttons A and B are used on sterndrive applications;

- A — Docking
- B — High Mode



P0012510



P0012510

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.

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.

Enabling the Docking Function

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

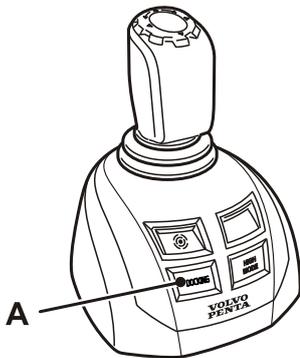
Activating the docking function

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.



P0012509

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

Optional

Autopilot

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

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

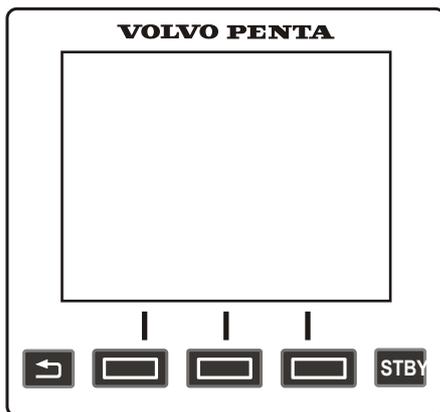
The helmsman is responsible for piloting the boat in a safe, reliable manner. Avoid navigational hazards and never leave the helm unattended. Always be prepared to quickly take over the helm.

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

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

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

Menus and settings are controlled by the control panel buttons.

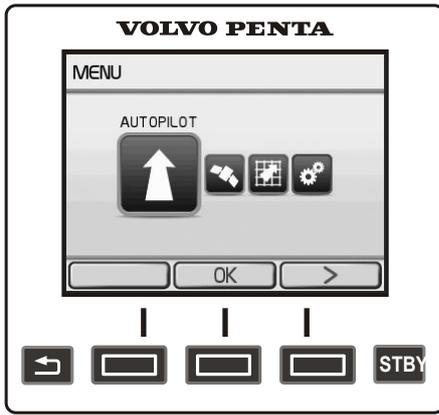


P0016636

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

 – Menu button functions are shown on the display.

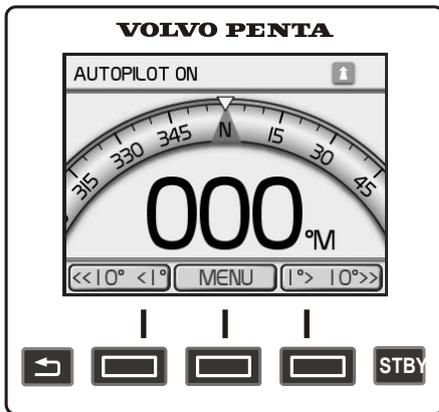
 – Sets the autopilot in standby mode.



P0015539

Main menu

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



P0015351

Autopilot

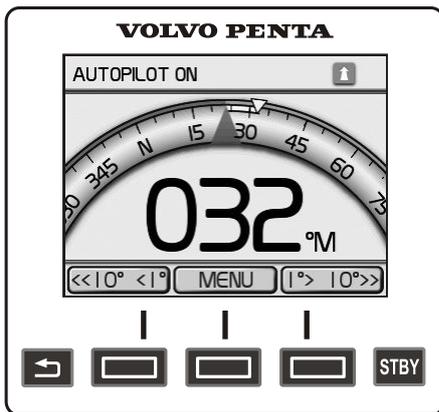
Active or stand-by autopilot status is shown in the top part of the screen. A green arrow in the top right corner of the screen confirms activation; if the autopilot is put in stand-by mode the arrow turns red and flashes for five seconds.

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

ENGAGE — Activates the autopilot.

MENU — Goes to the main menu.

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

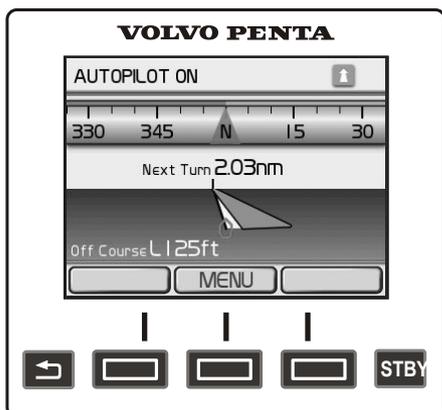


P0015791

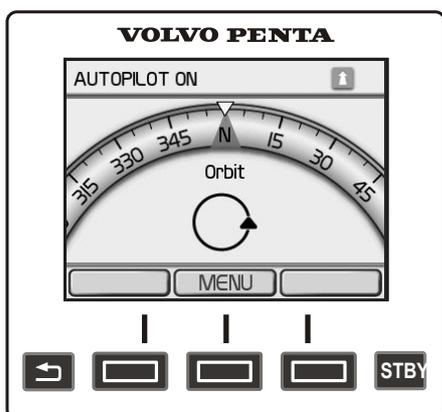
Setting a course

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

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



P0015810



P0015808



GPS Steering

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



Route to

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



CAUTION!

Maintain attention to boat operation when approaching final waypoints.

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

GPS Pattern

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

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



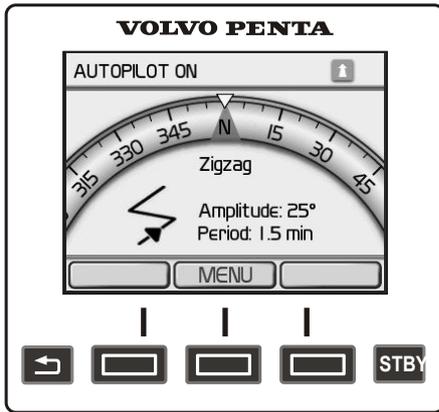
Orbit – The boat is steered on a circular course around the active waypoint. The radius of the circle is determined by the distance to the waypoint when the pattern is activated. Setting orbit helm, port or starboard.



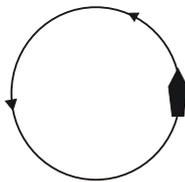
Cloverleaf – The boat is steered to the active waypoint and then follows a cloverleaf pattern with the waypoint as the central marker. Setting pattern helm, port or starboard. The size of the cloverleaf pattern (from waypoint to outer turn points) can be set under *Settings > Cloverleaf, length*; the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



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



P0015809



P0016494

Circular pattern



Pattern Steering

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

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



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



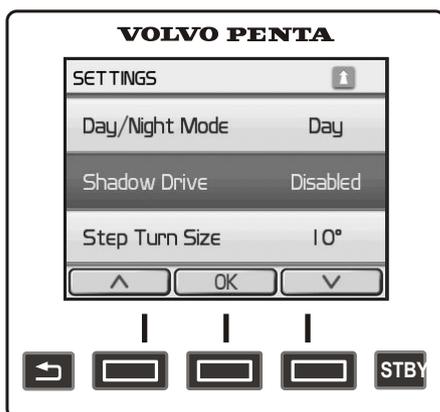
Circles – The boat is steered in a circular pattern based on its position when the pattern is activated. Setting the helm, port or starboard, and the time taken to complete a circle.



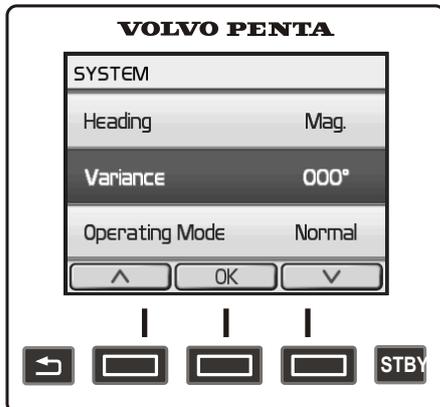
180° turn – The boat turns through 180° and then maintains the new course. Setting the helm, port or starboard, for the direction of the turn.



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



P0015793



P0015823



Settings

Day/night mode

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

Shadow Drive

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

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

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

Step size

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

Dealer autopilot settings

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

System

Course

Setting a reference for calculating course information.

Magnetic – calculating a course based on magnetic North

True – calculating a course based on true North

Declination

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

Auto – automatically sets declination.

User – Declination is entered manually.

Operating position

Setting the display for normal operations or demonstration mode.

Factory reset

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

NMEA 2000 devices

List of connected NMEA 2000 units.

Active Corrosion Protection System

Your boat may be equipped with a Volvo Penta active corrosion protection system (ACPS).

The ACPS acts as an active anode and is designed to reduce the galvanic corrosion of underwater parts of the drive. The system works in conjunction with the drive's sacrificial anodes. The sacrificial anodes may last much longer with ACPS, however they must still be checked periodically, see *Maintenance Schedule* page 128.

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.

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

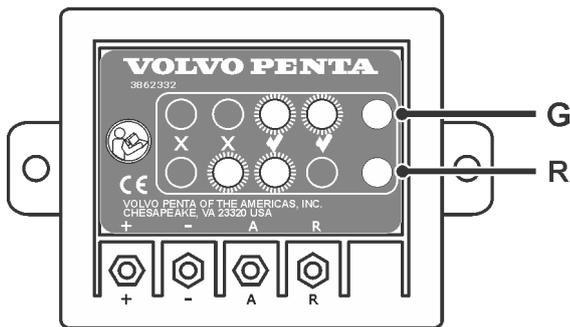
The ACPS control module will be mounted near the rear of the engine.

The module has green **G** and red **R** LED indicator lights. The lights indicate the status of the system:

- 1 Green LED only indicates the system is working.
- 2 Green and red LEDs on, the system is working, however the system is drawing power.
- 3 Red LED only, the system has power but is not working (no protection).
- 4 No LEDs, the system does not have power, and is not working (no protection).

If conditions 2, 3, or 4 exist, see *Active Corrosion Protection System* page 124 in *Troubleshooting*.

If your drive is not equipped with ACPS, the system can be purchased from your authorized Volvo Penta dealer.



P0018276

Water heater

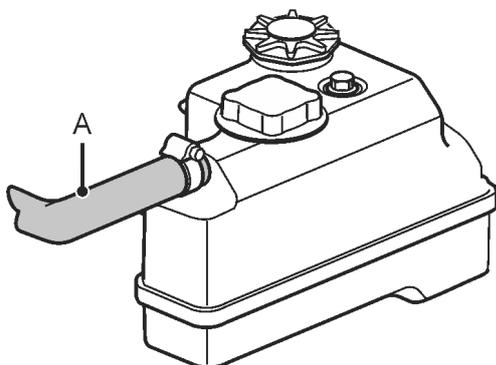
Hot Water Outlet

Heated water from the engine's cooling system can be used to heat hot water tanks, cabin heaters and other accessories on a boat.

The water is drawn from the engine and returned to the expansion tank with a system of fittings and hoses **A**.

If your engine is equipped with a hot water outlet system the impact on normal boat operation should be minimal. Keep the following in mind if your engine has this system:

- The extra hoses and the accessory add capacity to the cooling system. It may take longer to heat up the engine.
- The extra capacity must be accounted for when replacing the coolant.



P0019974

Starting

Before Starting

For your safety and to increase your enjoyment of your time boating, perform the following checks before starting your engine;

DANGER!

Explosion hazard! Never operate an engine/boat with a suspected or actual fuel leak.



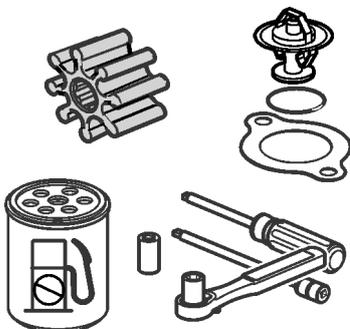
P0018283

- To prevent a possible explosion or fire, check the engine and engine compartment 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. See *Carbon Monoxide page 8*.
- Thoroughly familiarize yourself with operation of remote control supplied with your boat before proceeding.
- Never use start spray or similar agents to start an engine. This may cause an explosion in the inlet manifold.
- Before you to start your engine, be sure to perform the inspection items provided in the daily checklist located in *Maintenance Schedule*.
- 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 page 93* for instructions).
- Before using your boat, see *Static Water Line page 125* for important information about the load (weight) on the boat and how it relates to water ingestion in the engine.

Onboard Tools and Parts

Preparation is one of the keys to safety at sea. Volvo Penta recommends you have the following tools and parts on your boat;

- Spare propeller(s), hardware and prop tools
- Seawater pump impeller kit
- Fuel filters and filter wrench
- Basic set of hand tools
- Spare hose clamps, various sizes
- Electrical and duct tape

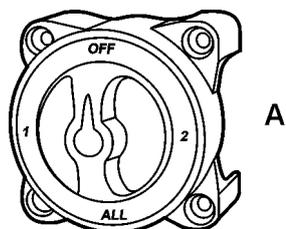


P0018284

Pre-start Procedure

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.



P0008711

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.

- 1 Turn main battery switch **A** to an ON position.

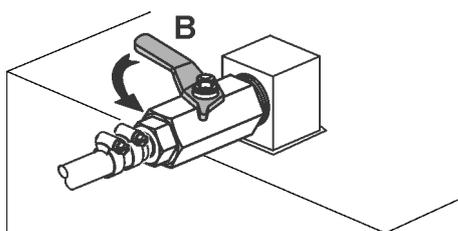
- 2 Start the boat's bilge blower and run as recommended by the boat manufacturer. Frequently check boat's bilge area for gasoline fumes.

- 3 Check the bilge for excessive water accumulation. Bilge water will run to the transom during acceleration and could damage the starter or other engine components.

- 4 Open the fuel valve **B**, if equipped.

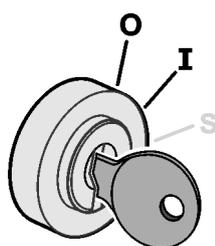
- 5 Check the engine oil level, top off if needed.

- 6 If your engine is equipped with a freshwater cooling system, check the coolant (antifreeze) level, top off if needed.



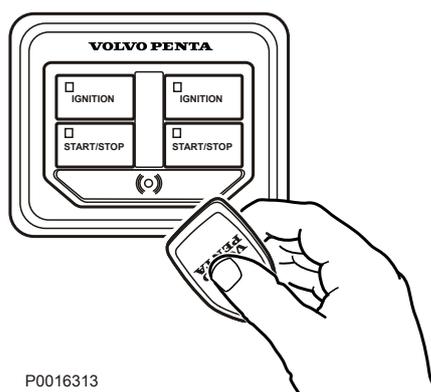
P0008712

- 7 Insert the key into the ignition switch **O**. Turn the key one step to the right **I** to energize the electrical system.

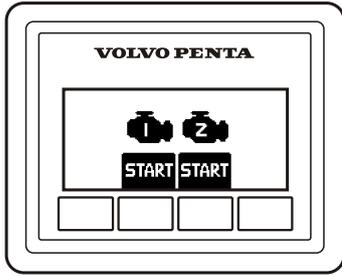


P0018309

- 8 For e-Key, unlock the system. The ignition should be on, if not press the ignition button.



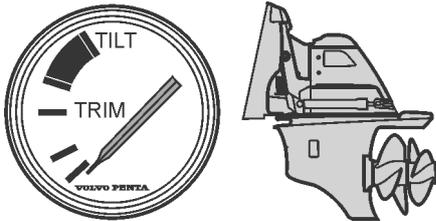
P0016313



P0001087

9 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.

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



P0018308

11 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

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 trim reading in the tilt range. See *Fault Code Register page 99* to override this condition.

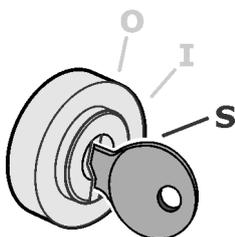


P0009959

Starting Using the Key



P0018475



P0016544

- 1 Move the control handle to the NEUTRAL position **N**.

- 2 Turn the ignition switch to START **S** and hold, for no longer than ten seconds or until engine starts. If the engine does not start, let go momentarily, then try again.

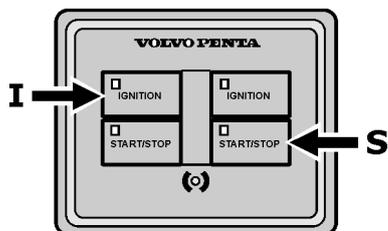
- 3 As soon as engine starts, release key to **I** (On/Run).

NOTICE! Never turn the key to **S** (Start) when the engine is running. Start damage is possible.

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 warm start, see *Starting* page 69.

Starting Using the e-Key



P0016537

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.

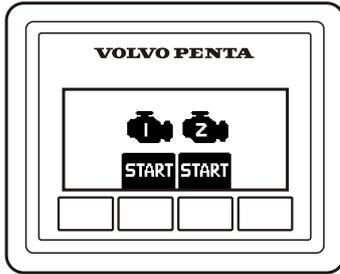
The Led on **Start/Stop** turns on when the engine is running.

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

Pass the key over the sensor to lock the EVC 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.



P0001087

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.

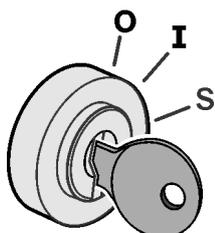
Flooded Engine

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.

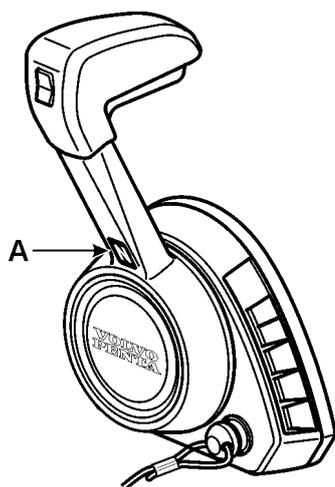
Analog Key

- 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.

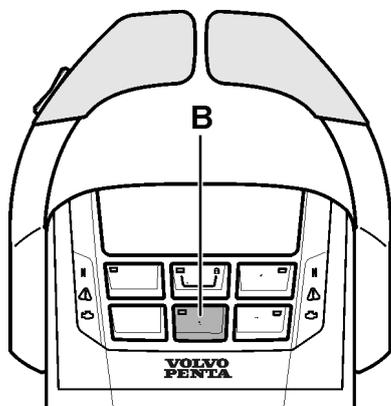


P0013572

- 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.

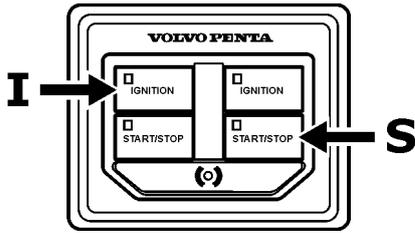
- 6 As soon as the engine starts;
 - return the shift lever to Neutral
 - release the key so that it will return to **I** (On/Run).



P0016542

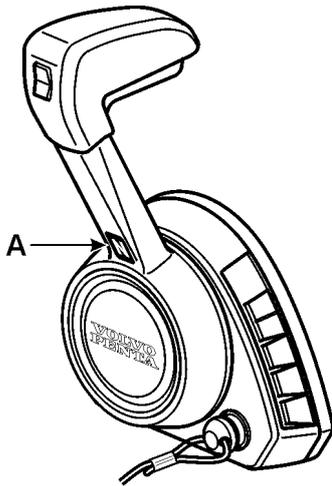
e-Key

1 Make sure the Ignition (I) is on.



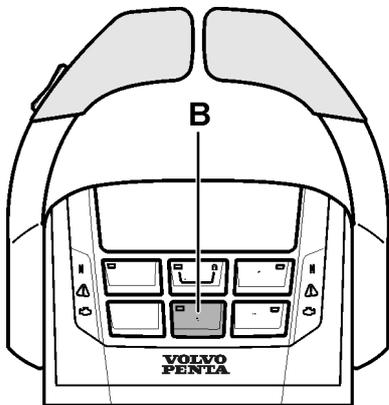
P0016539

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 Press the Start/Stop button **S**. If the engine does not start, press the button again.



P0016542

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

Be sure you have read and understand everything in *Starting page 64* prior to continuing with this section.

Break-in Procedures

Special operating procedures must be followed for the first 20 hours of engine use. See the *Engine Break-in* manual that came with the engine.

Reading the Instruments

WARNING!

Failure to track the gauge readings for problems could lead to engine breakdowns, which could put you, your crew and the boat at risk. Engine damage is also possible.

Monitor the gauges while operating the boat. Also listen for the engine alarm. Investigate the problem and correct before proceeding.

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

See *Troubleshooting page 116*.

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

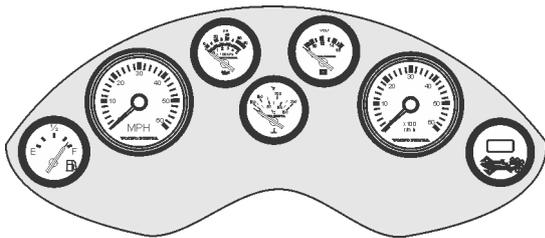
WARNING!

Risk of fire. Immediately investigate any engine overheat situation. The engine can catch fire if the overheat is prolonged or severe. Correct the overheat situation before using the boat/engine.

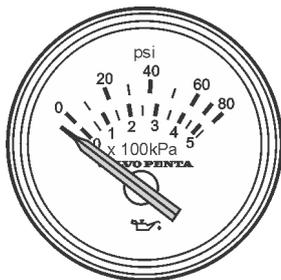
NOTICE! If engine temperature is too high: reduce speed to idle and investigate. Operating an engine with high temperatures will damage the engine.

See *Troubleshooting page 114*.

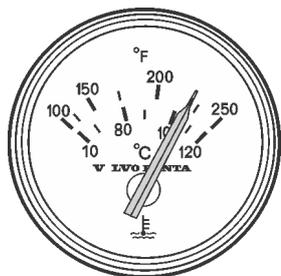
NOTICE! Do not run engine out of fuel or run the electric fuel pumps dry more than 20 seconds. Running the electric fuel pumps dry will damage the fuel pumps.



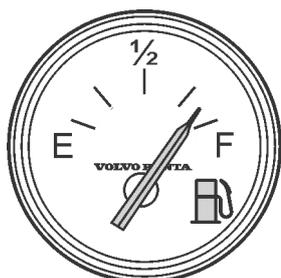
P0018285



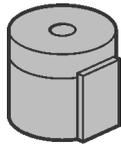
P0018286



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Alarms

The alarm is usually mounted out of sight under the dash, behind the gauges. It is a high decibel horn that is activated by the engine's control system.

The alarm will sound to warn you that there is a problem with your engine or drive. Alarms sound for the following engine malfunctions:

- Low engine oil pressure
- Engine overheating, coolant and exhaust
- Water in drive bellows (OceanX only)
- Water in drive oil or low drive oil level (OceanX only)

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

For a detailed explanation of the problems mentioned above and the corrective steps refer to *Troubleshooting*.

Maneuvering

Safety precautions for boat operation

DANGER!

A rotating propeller can cause serious injury.

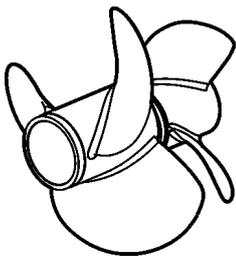
Never boat near people who are swimming or where there is a risk that there are people in the water. The engine must be off if there is anyone in the water near the boat.

Check that nobody is in the water before shifting the drive in to gear.

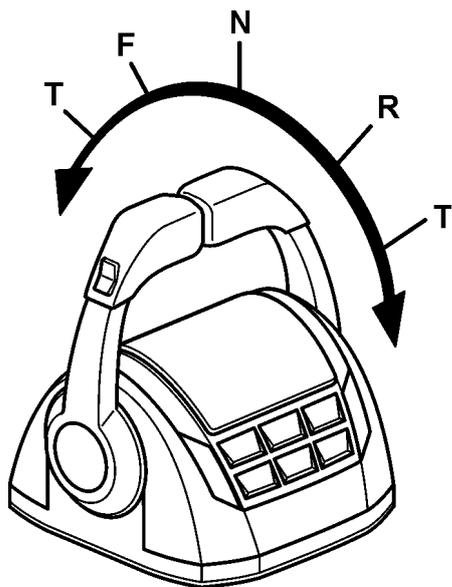
Never swim or board at the rear of the boat when the engine is running, even if the drive is in neutral.

Never use the drive unit as a ladder or as a lift to board the boat.

No one should be in the water at the transom or swim platform if the engine is running. This is also a carbon monoxide poisoning hazard, see *Carbon Monoxide* page 8.



P0016598



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Shifting and Speed Control

⚠ WARNING!

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

⚠ WARNING!

Possible loss of shift control. Be alert for slow or rough shifting of the drive. If present, check for obstructions, if none found see your dealer for service of the shift mechanism.

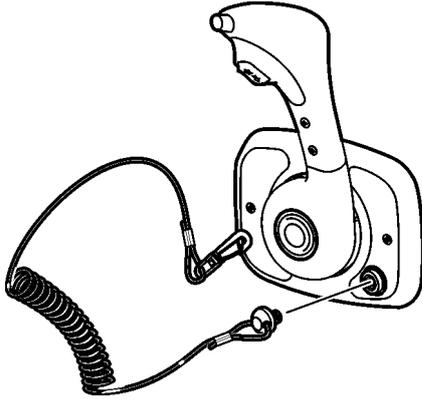
NOTICE! Do not shift gears if engine speed is above 800 RPM. Do not shift from forward to reverse when boat is planing. There is a danger that water will get into the engine and cause serious damage, while causing serious damage to the drive.

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

Control Operation

- To go from forward to reverse, or reverse to forward, always pause at neutral **N** and allow engine speed to return to idle.
- To go forward: Move the control handle forward from neutral detent to the forward detent position **F**. Throttle movement begins after the forward detent position. After the throttle is activated, continue moving the control handle to increase speed.
- To go in reverse: Move the control handle backward from the neutral detent to the reverse detent position **R**. Throttle movement begins after the reverse detent position. After the throttle is activated, slowly move the control handle to increase speed.

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



21182

Safety Lanyard

A safety lanyard (emergency stop switch) may be a feature on your boat. The switch stops the engine if the operator is thrown from the helm. Use of this safety feature is highly recommended.

Using the safety lanyard is simple and should not interfere with normal operation of the boat. Attach the lanyard clip to the operator's clothing. The attaching point must be strong enough so that it does not tear when the lanyard is pulled sharply. The other end of the lanyard must be installed at the fitting on the control.

The safety lanyard is indicated by **SLY** on the displays. **(SLY)** indicates the safety lanyard is disconnected.

The emergency stop switch 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.

NOTICE! Only test the safety lanyard at engine idle speed. Activating the safety lanyard at higher RPMs may cause engine water ingestion, which can cause serious engine damage.

If the lanyard is too long, do not cut and re-tie the lanyard. Shorten by looping or knotting the lanyard.

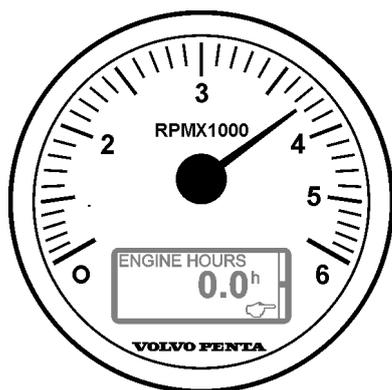
When the switch is pulled, the engine will ramp down and then turn off.

In an emergency situation, any occupant of the boat may attempt to restart the engine by pressing start/stop button or turning the key, followed by normal starting procedures.

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).

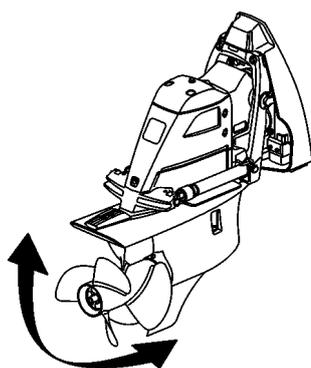
Contact your Volvo Penta dealer for installation of a Safety Lanyard.



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P0018265

Cruising Speed

Maximum recommended cruising speed for this engine 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.

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 *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.

Power Trim/Tilt

Trim

Controlling the trim system is an important part of maneuvering a boat. Power trim provides this control at the helm of the boat, allowing the operator full and easy control of the trim system.

Power trim is normally used as part of accelerating, to help get the boat on plane. Trim is also used to adjust the angle of the boat after cruising or planing speed is reached, and to adjust the boat for the sea conditions.

If you are new to boating or new to the type or size of your new boat, study how the boat reacts to various trim settings to determine the best setting for your boat in various sea and wind conditions. Small changes in trim angle are usually sufficient, avoid drastic changes in trim if possible.

Tilt

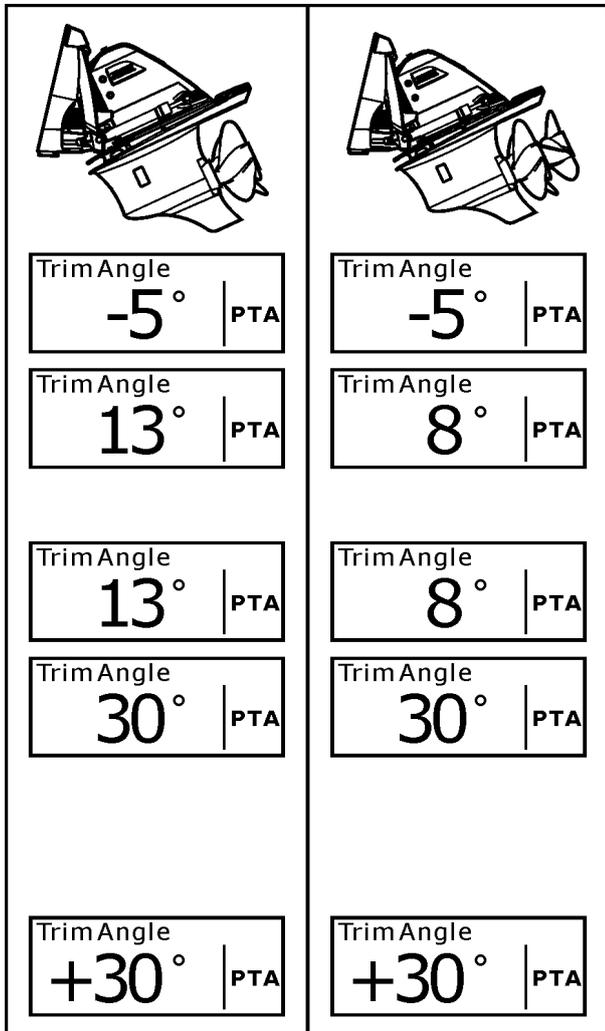
Tilt is used to raise the drive above normal operating angles. Examples are trailering, beaching, mooring, and shallow water operation (see *Shallow Water Operation* page 87).

Operating Trim Controls

For detailed information about using the power trim controls, refer to *Power Trim in 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.



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Trim Range

Trim range, for a drive with a single prop, is any angle between -5° and 13° . For a drive with twin props (including Forward Drive), it is any angle between -5° and 8° . This range is used to obtain the best comfort 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 drive with a single prop, is any angle between 13° and 30° . For a drive with twin props, it 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.

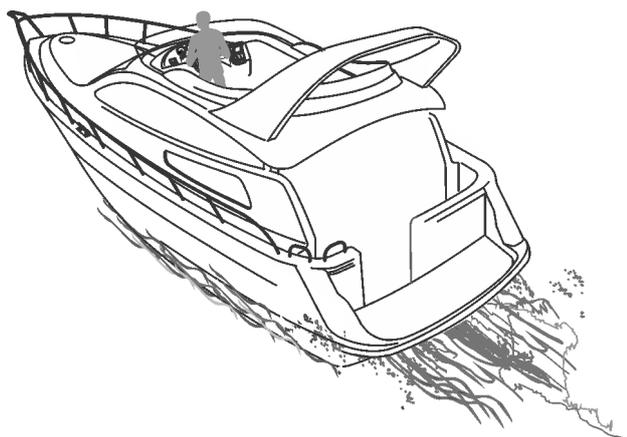
NOTICE! Maximum safe engine speed when running in beach range is 1000 rpm. Make sure the drive's coolant inlet is never trimmed out of the water.

Tilt Range

Tilt range, for either single- or dual-prop drive, 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".

See *Starting the Engine, Can Not Start, Trim Too High*.



P0018314

Determining the Proper Trim

The boat is properly trimmed when the trim angle provides the best boat performance and safety for the operating conditions. The boat ride should be comfortable for the passengers and the engine should be running at top fuel efficiency and performance.

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 of the boat.

WARNING!

Possible loss of boat control. Some boat/drive/propeller combinations may encounter boat instability and high steering torque when operated near the limits of the trim system (trim in or out). This is worsened with speed and changing sea conditions. Avoid excessive trim in or out. If you experience boat instability or high steering torque set the trim to neutral and return to port at reduced speed. See your Volvo Penta dealer to correct the situation.

Trim Operation during Takeoff

Trim is used to get the boat on plane when taking off from a stand-still or from low speed.

Start with the drive trimmed in to a neutral to fully trimmed-in position.

Locate passengers and equipment in the boat so that the load is balanced fore and aft, and side to side. Trimming will not overcome an unbalanced boat.



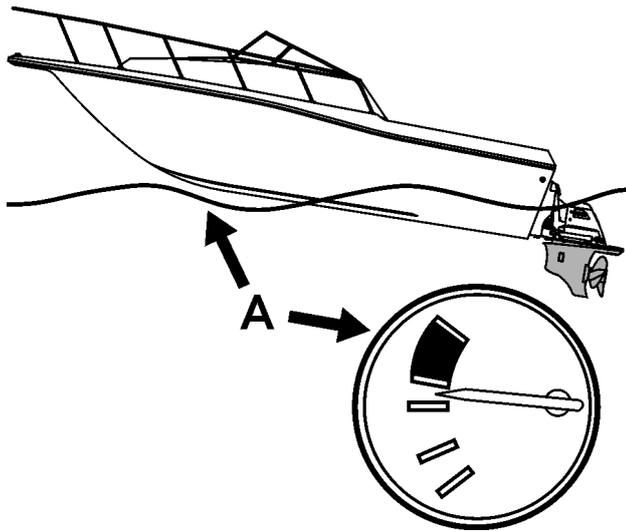
P0018270



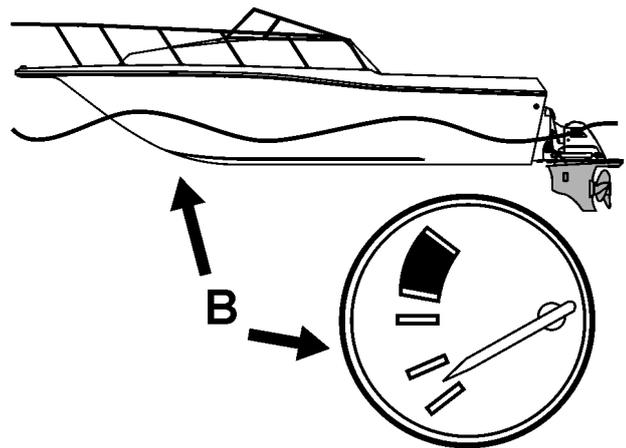
P0018271

As the boat accelerates, trim the drive up until the boat "pops" on to plane.

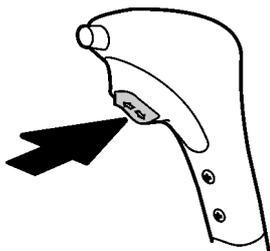
After the boat is on plane adjust the trim according to the information provided above and below in this section.



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22797



P0016272

Operating in Bow-up Position

The bow-up position **A** is normally used for cruising, running in a rough sea, or running at full speed.

⚠ WARNING!

Avoid excessive trim (bow-up) when crossing wakes or rough seas, the boat's bow may rise or fall sharply, possibly injuring the boat's passengers.

Be aware of these undesirable conditions that can occur when running 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 on a straight path.
- The boat's bow will tend to raise clear of the water. This reduces forward visibility from the helm.
- 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.

Operating in Bow-down Position

The bow-down position **B** is normally used for acceleration onto plane, operating at slow planing speeds, and running against a rough sea.

⚠ WARNING!

Avoid excessive trim-in (bow-down) when operating at speed and/or in rough seas. The boat's bow may dive in to oncoming waves, causing the boat to bow steer or spin rapidly, possibly injuring the boat's passengers.

Be aware of these undesirable conditions that can occur when running in a full bow-down position;

- The boat may tend to self-steer. You may have to compensate with the steering wheel to keep the boat on a straight path.
- The boat's bow will tend to go deeper into the water, reducing ride quality.

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.

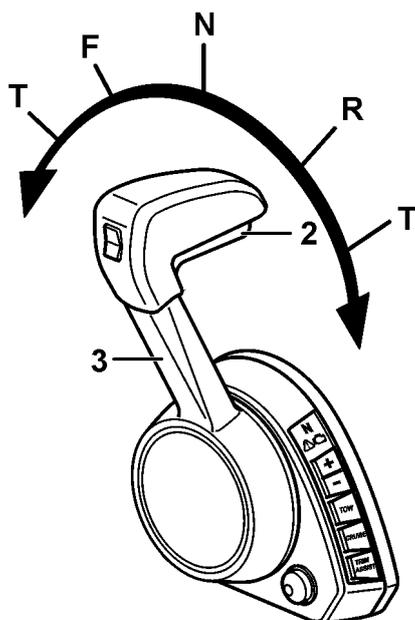
Lever, Throttle only

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 Mount 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.

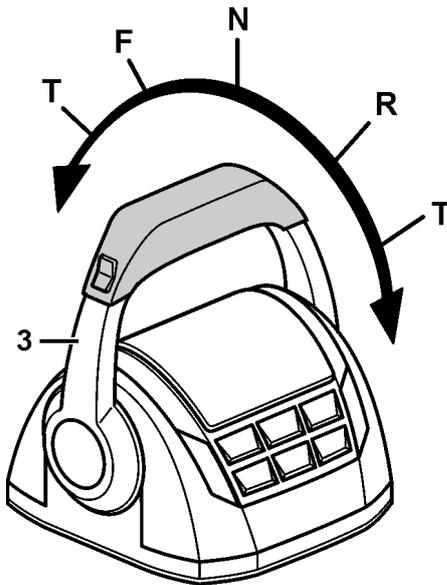
Top Mount Controls

Single Lever

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.



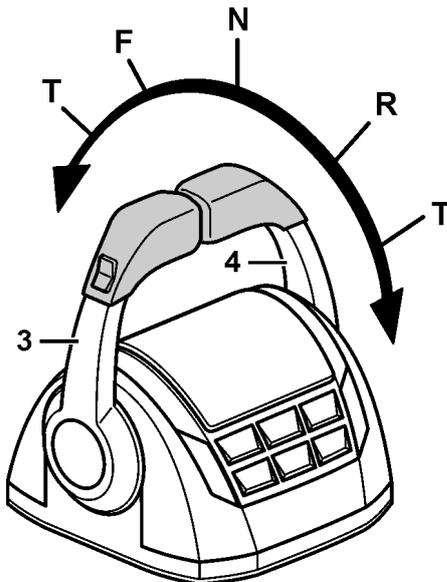
P0016563

Twin Lever

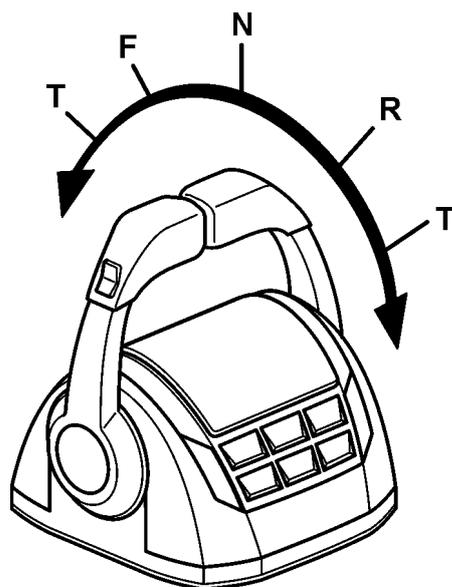
The port lever **3** controls both the drive shift mechanism and the engine speed control for the port engine. The starboard lever **4** controls both the drive shift mechanism and the engine speed control for the starboard engine.

- 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.



P0016562



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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.

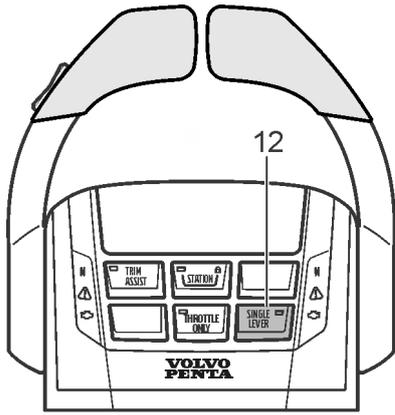
Engine Synchronization Function

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.



P0016576

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..

Station Handling

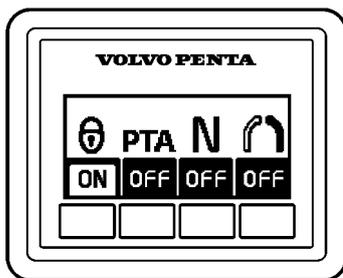
Active Station

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.



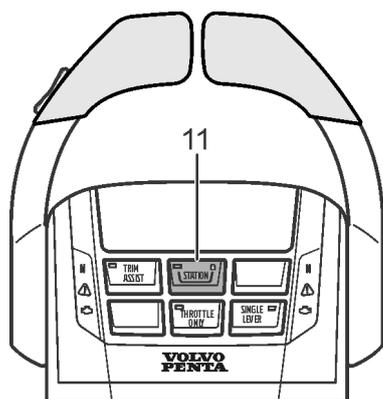
Inactive Helm Station



Active Helm Station



Locked Helm Station



P0016564

Using Remote Control Button

The gear must be in neutral when changing stations.

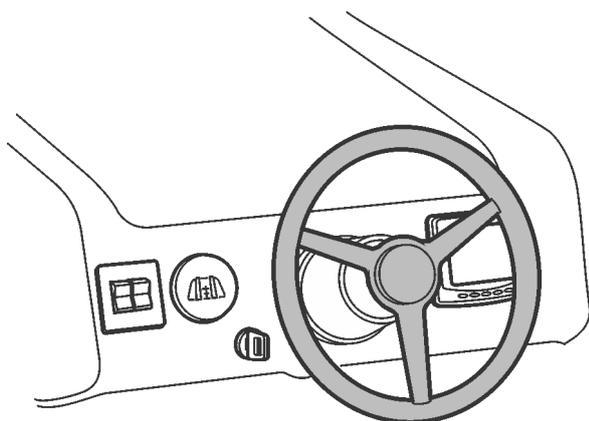
If the station is inactive, activate the helm station with a single press of button **11**. Pressing again locks the helm station. To render the helm station inactive, hold the button down for 3 seconds.

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.

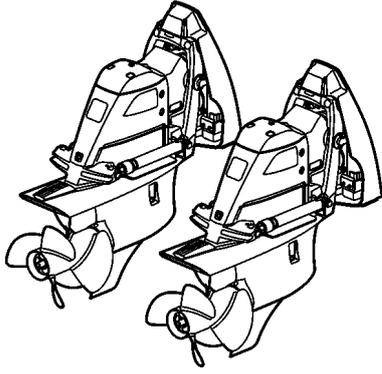
If the power steering system stops working, the steering wheel will still function but it will feel harder to steer. If this condition occurs, look for possible causes and fix them if possible. If the power steering system cannot be corrected on board, proceed at a reduced speed. You will be able to 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.



P0016581

Twin Unit Steering



50405

Twin engine boats have only one engine with a fully operational power steering system. That power steering system is on the starboard engine. If operating on only the port engine, there is no power steering, resulting in increased steering effort at the helm.

NOTICE!

Do not run the boat for extended periods with only one engine running. Both engines must be running when under way. If only one engine is running, water may be forced back through the exhaust of the engine that is not running, causing serious engine damage.

NOTICE!

Do not attempt to run the boat on plane if operating on a single engine; operating with a single engine at full throttle could cause engine or transmission damage. If running on one engine is necessary operate below planing speed.

Maneuvering with the Joystick

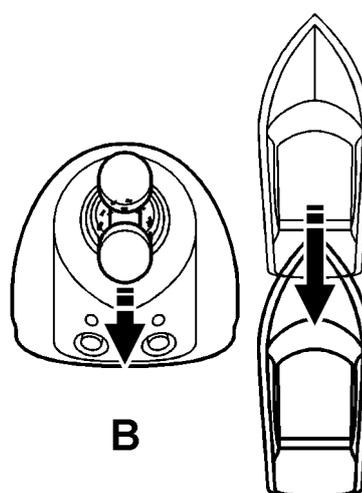
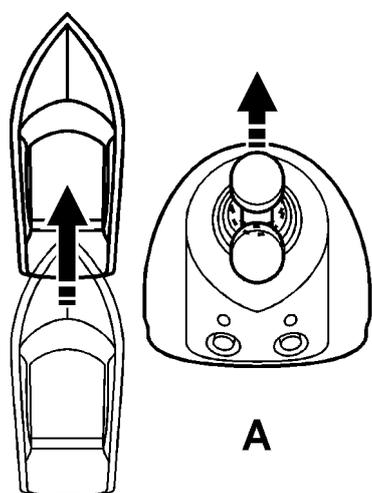
⚠ DANGER!

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.

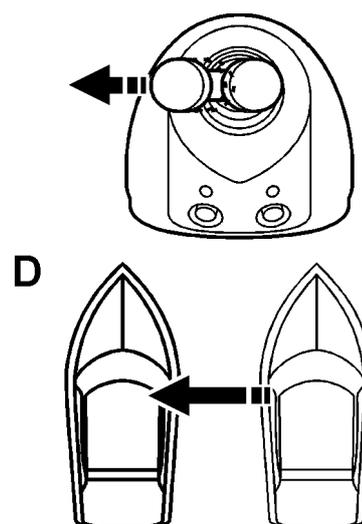
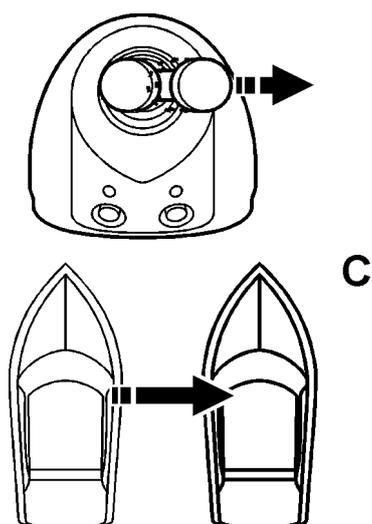
NOTICE! Remember that the side thrust is considerably greater than with a conventional bow thruster. The boat will continue to move in the selected direction even after the joystick has been released. Compensate for this movement by moving the joystick in the opposite direction.

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

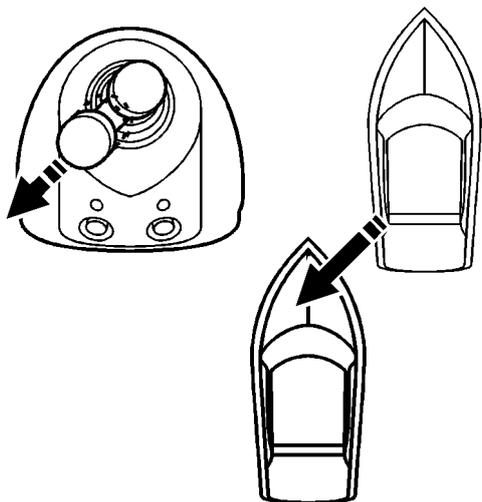
- A. Move straight forward
- B. Move straight backward
- C. Traverse to Starboard
- D. Traverse to Port
- E. Traverse diagonally
- F. Rotate to Starboard
- G. Rotate to Port
- H. Rotate while moving forward or backward



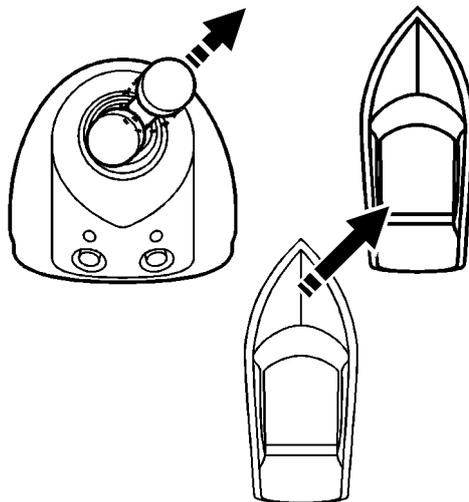
51316



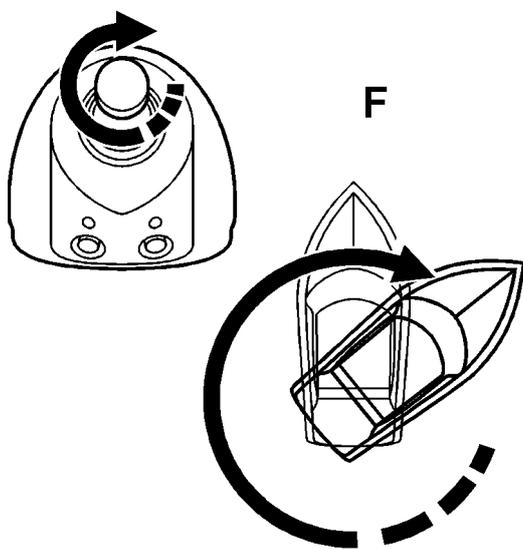
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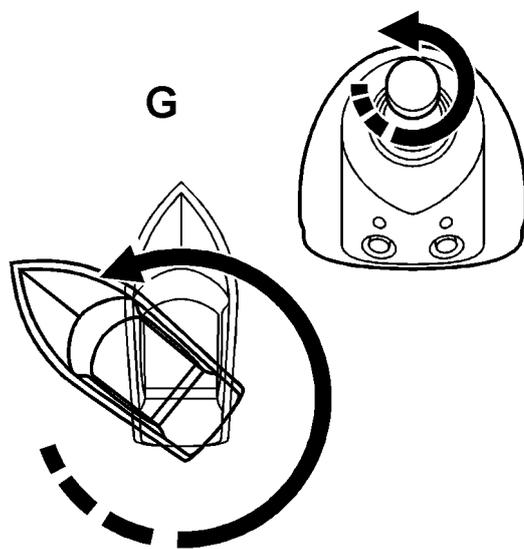
E



51318

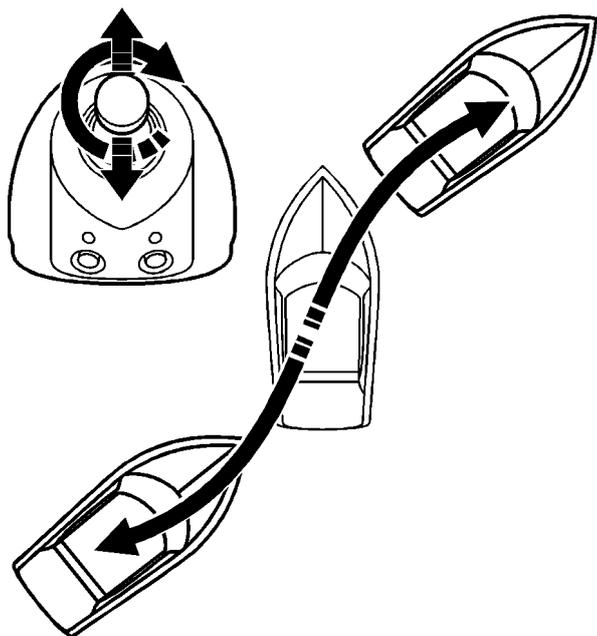


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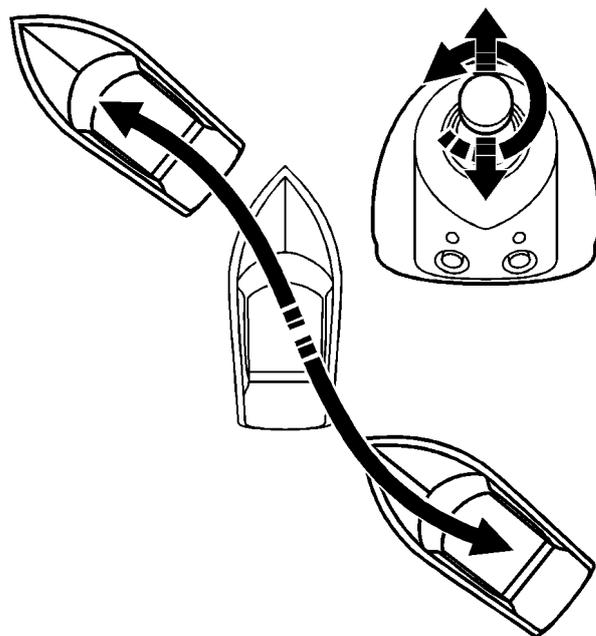


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H



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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.

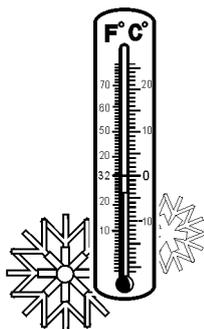
Operating in Freezing Temperatures

The engine is 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 will freeze. Freezing water and ice expand. This expansion could cause parts of the engine containing water to crack. Always be sure to drain any trapped water from your engine 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*.



P0018389

Shallow Water Operation

WARNING!

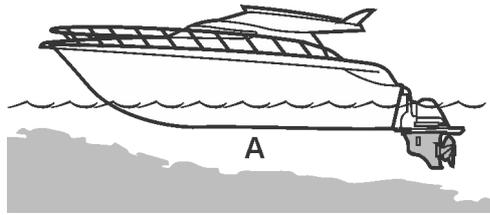
The sudden stop from striking an underwater object or running aground can cause injury to the boat's occupants, who could be thrown about the boat during the stop. Whenever the boat is underway the boat's operator should take precautions to avoid these situations and should encourage all occupants to be seated or otherwise prepared for a sudden stop.

See *In Case of Emergency* page 106.

When boating in unfamiliar waters, obtain appropriate navigation charts to avoid hard groundings. Proceed with caution in these areas.



P0018133



22798

Trim/Tilt Operation in Shallow Water

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.

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.

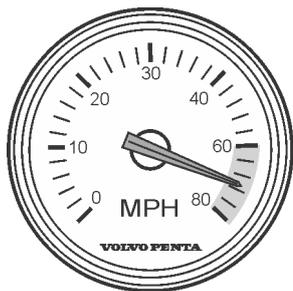


22799

Salt Water Operation

You can use your Volvo Penta drive 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 salt-water. This will prolong the service life of the engine and drive. For additional information, see *Engine Flush* page 93.



P0018315

High Performance Boat Operation

High performance is not only defined by engine size, but by a combination of engine power, hull design, and the size of the boat. Depending on the combination of these factors, top speed may be much higher than expected.

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 Safety Lanyard (see *Safety Lanyard page 74*). The safety lanyard 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 losing control is still possible.

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.

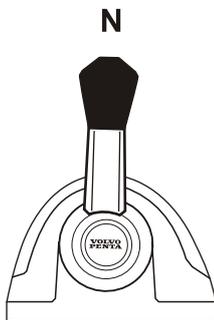
WARNING!

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.

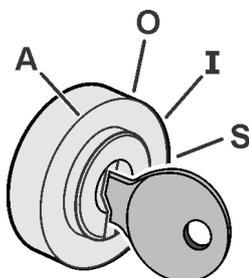
Stop the Engine

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.

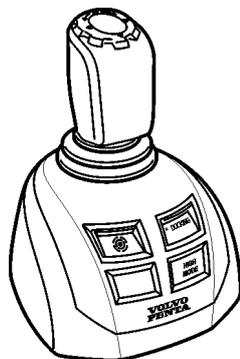


P0012457



P0016523

- 3 Turn ignition key to OFF **O**.



P0016577

⚠ 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!

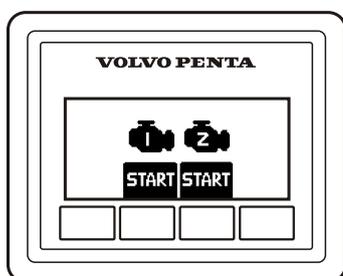
If your engines are equipped with electronic steering, never shut off the engines when approaching people in the water or when coming in to dock. When the engines are shut off, all steering control is lost.

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.

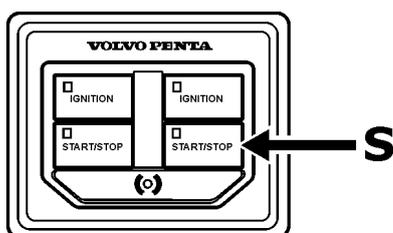


P0001087

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.



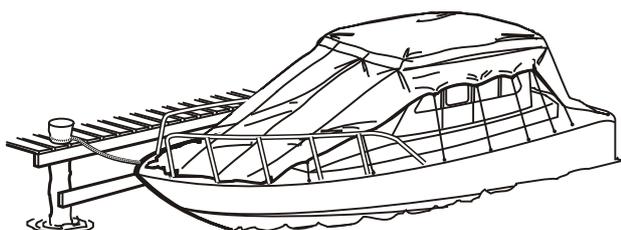
P0016582

After Engine Shutdown

Operation Break

If the boat is not used, the engine should be started and warmed up every two weeks. This prevents corrosion damage in the engine.

If the boat is left in saltwater it should be run on the engine flush fitting for the warm up, see *Engine Flush* page 93. Also see *Operating in Freezing Temperatures* page 87.



P0002451

If you expect the boat to be unused for two months or more, it must be prepared for this shut down period.
See *Storage page 157*

When the drive is stored out of the water, the sacrificial anodes oxidize on the surface. This prevents them from functioning correctly when placed back in the water. Before using the boat again the sacrificial anodes on the drive and shield must be cleaned with emery paper to remove any oxidation. Do not use a wire brush or other steel tools when cleaning, as these may damage the anodes.

Engine Flush

Volvo Penta engines have an engine flushing port that can be used to flush the engine with fresh water. Flushing the engine with fresh water after each use will increase the longevity of components, especially after operation in brackish or saltwater.

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.

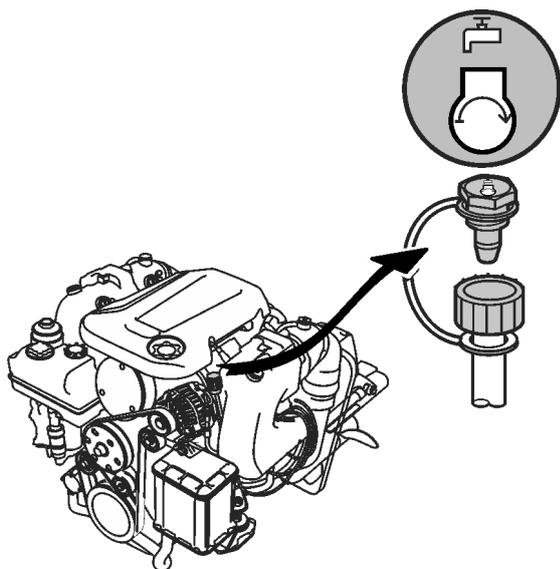
NOTICE! When flushing the engine, fresh water pressure must be 17 psi (117 kPa) or greater.

- 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.

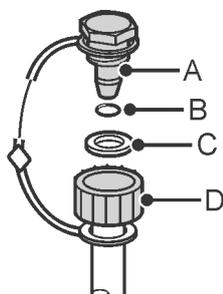
When reinstalling cap **A** make sure O-ring **B** is seated on cap and gasket **C** is in place in fitting **D**.

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.

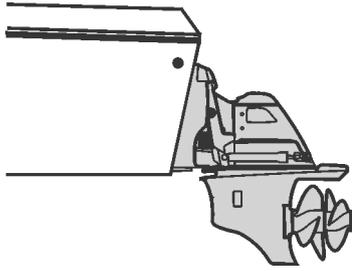
NOTICE! Drain the engine if freezing temperatures are expected, see *Draining the Engine*.



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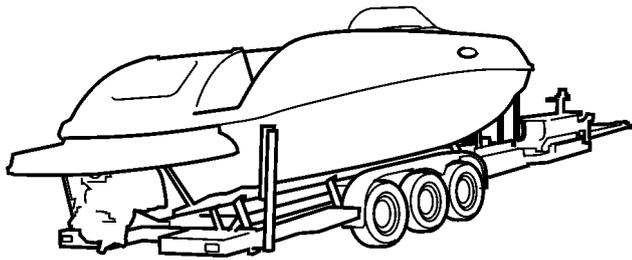
P0019992



P0016584

Drive Position, When Not in Use

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



P0002151

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 Engine*.

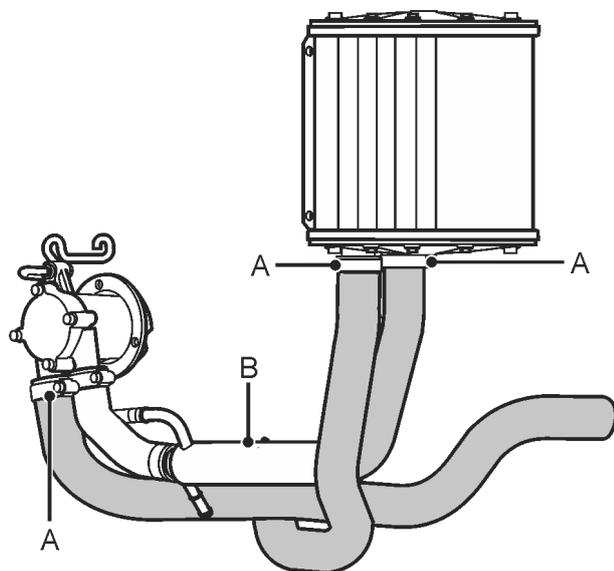
Draining the Engine

Draining the Cooling System

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

NOTICE! Risk of freeze damage to engine components. If the water is not drained, during freezing conditions expanding ice will crack and damage these components.

NOTICE! If the engine is run with these damaged components major engine damage is possible.



P0019976

- 1 Loosen the clamps on hoses marked with **A**.
- 2 Remove the hoses and lower the end of each hose below the level of the power steering cooler **B**. Allow water to completely drain.
- 3 Reinstall the hoses and clamps. 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.

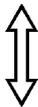
This chapter describes the purpose of the EVC's diagnostic function, the types of alarms and messages the operator can get from the EVC system, and how to address problems when they occur.

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.



50905a



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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.

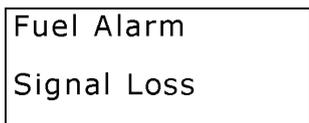
Caution Pop-up – If the Caution pop-up appears during operation, a fault has occurred which will not damage an engine or propulsion unit.



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51694



51461a



51283

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⁾ **Alarm** ⁽⁷⁾

EVC Tach Display ⁽⁸⁾

EVC Action: ⁽³⁾

Lamp ⁽⁶⁾

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 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;

Key

Return the key to the off position. Hold the ignition key in the start position for more than 5 seconds. Engine will start. Use procedure at main station.

eKey

Press *Stop*. Then press and hold *Start* 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

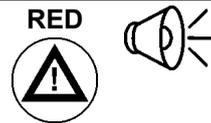
Check Engine

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.



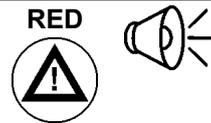
Check EVC System

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.



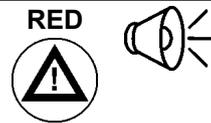
Check Joystick

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.



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.



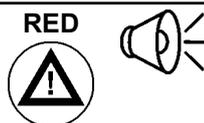
Check Shift Actuator

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.



! 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.



! CAUTION!
Check Steering Wheel

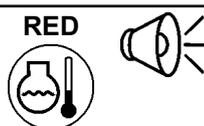
Coolant Temp.

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.



! WARNING!
Coolant Temp.
See Op Manual

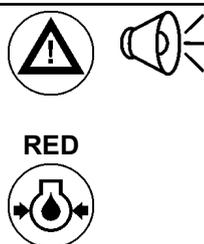
Engine Oil Press.

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.



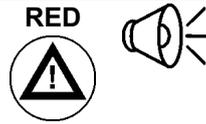
! WARNING!
Engine Oil Press.
See Op Manual

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.



 DANGER!
Engine Speed See Op Manual

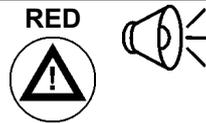
Exhaust Temp.

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.



 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.



 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.



 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.



 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

Power Relay

Symptom: Faulty ignition relay.

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.

AMBER



–

! WARNING!
Power Relay
See Op Manual

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.

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.

RED



! WARNING!
Powertrim
Faults



! WARNING!
See Op Manual

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.

RED



! WARNING!
Steering fault

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.

AMBER

–



↻

! WARNING!
See Op Manual

! 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.

AMBER

–



! WARNING!
Steering oil High Temp

EVC Action: None.

Operator Action:

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

↻

! 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



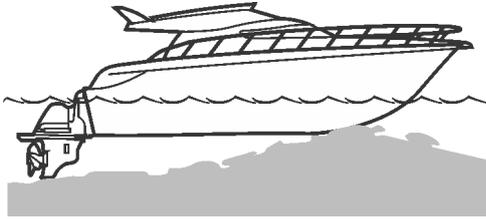
–

! WARNING!
SUS/SCU Battery
Voltage Low



! WARNING!
See Op Manual

In Case of Emergency



P0020829

Running Aground

Striking an Underwater Object

⚠ WARNING!

The sudden stop from striking an underwater object or running aground can cause injury to the boat's occupants, who could be thrown about the boat during the stop. Whenever the boat is underway the boat's operator should take precautions to avoid these situations and should encourage all occupants to be seated or otherwise prepared for a sudden stop.

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

⚠ WARNING!

Striking an underwater object or running aground could result in the loss of steering and shift control and 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.

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.

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.

- 1 Throttle back to idle, if possible maneuver to a safe place, out of high traffic areas.
- 2 Place the shift mechanism in neutral.
- 3 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.
- 4 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.

- 5 Turn the key on (do not start) and try to trim the drive back down. If the drive trims down check for alignment.
- 6 Restart the engine, check for vibrations or noise.
- 7 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 boat and drive should be thoroughly inspected before the boat is used again.

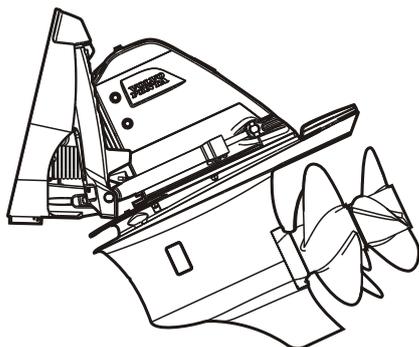
Drive Impact Protection

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.

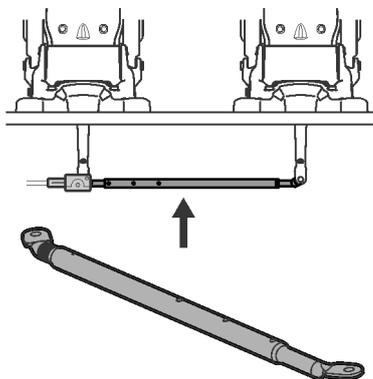
NOTICE!

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

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



P0015834



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.

⚠ WARNING!

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.

Engine Submersion

Engine Submersion

- 1 Remove the engine from the water as quickly as possible.
- 2 Contact your local Volvo Penta dealer for service.
 - Your dealer will need to drain all water from the engine and immediately lubricate all internal parts.
 - All electrical devices must also be dried and inspected for water damage.
- 3 After the engine has placed back in service, frequently check the engine compartment for gasoline fumes, fluid leaks, and corrosion.

NOTICE! Delay in completing the above actions will result in extensive engine damage.

Starting Using Auxiliary Batteries

Jump-starting a Drained Battery

DANGER!

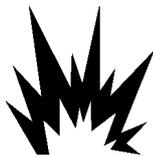
Never allow an open flame or electric sparks near the battery or batteries. Never smoke in proximity to the batteries. The batteries give off hydrogen gas during charging which, when mixed with air, can form an explosive gas. This gas is easily ignited and highly volatile.

WARNING!

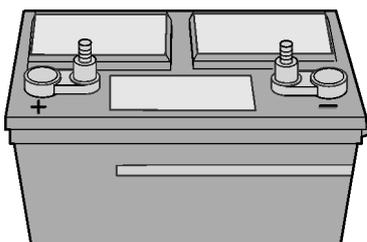
Risk of explosion.

Jumper cables connected to the wrong battery terminal (example; positive cable to negative terminal) will cause a spark which could ignite gases created by the battery or any fuel vapors in the engine compartment.

- 1 Check that the auxiliary or jumping battery has the same voltage as the engine electrical system.
- 2 Connect the positive (red) cable to the plus (+) terminal on the discharged battery and then to the positive (+) terminal on the auxiliary battery.
- 3 Connect the negative (black) cable to the negative (-) terminal on the discharged battery and then to a grounding point on the engine connected to the auxiliary battery.



P0018283



P0002255

- 4 Start the engine and let it run at fast idle for approximately 10 minutes to charge the battery. Run the engine compartment blower during this charging time. Turn off all other unnecessary electrical equipment until the battery has charged.

NOTICE! Do not run starter for extended periods, starter overheat and failure may occur.

- 5 Turn off the engine. Remove the jumper cables in the opposite order of connection.

If discharged batteries occur frequently the boats electrical systems should be checked for the cause. Also check the engine's charging system.

Troubleshooting

Engine Troubleshooting Guides

The following troubleshooting guides are provided to help you resolve minor problems with your engine. This low-level troubleshooting may help you resolve simple issues while using your boat, helping you continue your outing or enabling you to return the boat to shore.

The advanced technology incorporated in these next generation marine engines produces a more reliable engine. However if problems do occur, this technology requires a trained technician for full diagnostics of engine issues. Certified Volvo Penta dealers have the training and tools needed to properly and safely perform engine diagnostics and repairs.

During troubleshooting, keep in mind the fundamentals of engine operation, all of the following must be present for the engine to run:

- 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.
- COOLING - water is needed to cool the engine.

NOTE: If the troubleshooting steps that follow do not resolve the issue, call for assistance or see a Volvo Penta authorized dealer

At the dealer, the greatest aid to solving a service problem is information. Start gathering information and keep a detailed record of your observations about the issue. Keep a record of pertinent facts, such as:

- When did this trouble start?
- Did the trouble occur suddenly or develop gradually?
- Readings from the gauges and alarms.
- Reduction in engine RPMs or boat speed.
- Any recent work on the engine or boat?

NOTE: Some troubleshooting steps require that you have tools and spare parts on the boat.

Engine Will Not Crank

Starter Circuit – Check:

- Control lever must be in neutral detent position.
- Safety lanyard; properly installed on fitting on control.
- Battery switch in on position.
- Battery condition; weak, dead, sulfated, bad cells.
- Battery cables; loose or corroded connections, corroded cables.
- Starter relay and fuse, key switch fuse.
- Shorted or open ignition switch.
- Neutral Safety switch; terminals connected, switch bad.

Engine Cranks, But Will Not Start

Ignition Circuit – Check:

- Ignition fuse and relay
- Spark plug wires; condition, firmly mounted to coil and spark plug.
- Spark plugs; for proper gap, fouling, burned electrodes, or cracked/dirty insulator.
- Low battery voltage.

Fuel System – Check:

- Fuel level.
- Fuel shutoff and multiple tank valves are open and operating properly.
- Fuel filters; water or debris.
- Fuel pump relay and fuse.
- Fuel tank vent is unrestricted.

Hard Starting – Cold Engine

Ignition System — Check:

- Spark plug wires; condition, firmly mounted to coil and spark plug
- Spark plugs; for proper gap, fouling, burned electrodes, cracked insulator.

Fuel System — Check:

- Fuel filters; water or debris.
- Fuel tank vent is unrestricted.
- Fuel quality; octane too low, ethanol percentage too high, water in fuel, old fuel.

Hard Starting – Hot Engine

Is this a New Condition? Check:

- Fuel quality; octane too low, ethanol percentage too high, water in fuel, old fuel.
- Ignition system secondary circuit; spark plug wires, spark plugs.
- Condition of battery and cables.
- Starter motor—for overheat damage.

Starting Problems after engine was run? Check:

- Ignition system secondary circuit; spark plug wires, spark plugs.
- Flooded engine.
- Vapor lock; high heat in engine room.

Engine Noises and Vibrations

Valves (Hydraulic Lifters) – Check:

- Oil pressure; check gauge for low pressure.
- Oil quality; oil is old (overdue for change), dirt or water in oil.
- Oil quantity; proper level on dipstick.
- Oil type and weight.

Ping, Knock, or Detonation; Fuel and Ignition System – Check:

- Fuel quality; octane too low, ethanol percentage too high, water in fuel, old fuel.
- Ignition system secondary circuit; spark plug wires, spark plugs.

Cooling System – Check:

- Seawater pump, circulation pump.
- Loose belts and/or pulleys.

Engine Mounts – Check:

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

Alternator – Check:

- Loose pulley (see dealer).
- Noise from bearings (see dealer).
- Noise from belt tensioner or pulleys.

Drive – 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 *Propeller Replacement*.

Engine Runs Rough

If At Slow Speed – Check:

- Ignition system secondary circuit; spark plug wires, spark plugs.
- Fuel quality; octane too low, ethanol percentage too high, water in fuel, old fuel.
- Fuel filters; water or debris.

If At High Speed – Check:

- Air leak on suction side of fuel system.
- Ignition system secondary circuit; spark plug wires, spark plugs.
- Fuel quality; octane too low, ethanol percentage too high, water in fuel, old fuel.
- Fuel filters; water or debris.

Engine Temperature Too High

Check:

- Water intakes on drive 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. See *Engine Flush page 93*.
- Seawater pump impeller damaged or blocked. For additional information see *Maintenance: Impeller: Checking & Replacing*. Must have tools and parts on hand.
- Seawater pump, circulating pump, and belts.
- Coolant level in expansion tank. See *Freshwater Cooling System page 145*.
- Water supply hoses; loose clamps, holes in hoses, collapsed or restricted hoses.
- Air leaks on suction side of seawater pump; loose clamps, cap on flush fitting.
- Water leaks on pressure side of seawater pump.
- Heat exchanger; water passages blocked with grass, sand, mud, or other debris.

Engine Dies Out

Refer to *Engine Protection Mode*.

Loss of Fuel or Out of Fuel – Check:

- Fuel level in tank.
- Fuel filters; water or debris.
- Fuel quality; octane too low, ethanol percentage too high, water in fuel, old fuel.
- Air leak on suction side of fuel system.
- Fuel pump fuse and relay.

Loss Of Ignition – Check:

- Ignition system secondary circuit; spark plug wires, spark plugs.
- Ignition fuse and relay.

Engine Won't Reach Operating RPM

• Refer to *Engine Protection Mode*.

Check:

- Boat overloaded or load improperly placed.
- Marine growth on hull and drive (refer to *Boat Bottom*).
- Fuel quality; octane too low, ethanol percentage too high, water in fuel, old fuel.
- Wrong propeller (refer to *Propeller Replacement*).
- Oil quantity; proper level on dipstick.
- Engine overheating.
- Ignition system operation.
- Remote control cables and linkage for proper attachment and travel.
- Operating at high altitude.

Low Oil Pressure or Engine Knock

Engine Components – Check:

- Oil quality (dirt or water in oil).
- Oil quantity, level on dipstick.
- Oil type and weight.

See *Low Oil Pressure* page 119.

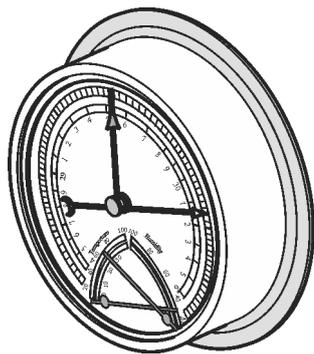
Low Battery Voltage After Short Storage

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 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.



P0020436

Less than Optimal Performance

To determine the engine's listed power rating, all Volvo Penta engines are tested and certified at the following conditions:

Condition	Value
Air temperature	25°C (77°F)
Barometric pressure	100 kPa (14.5 PSI)
Relative humidity	30%
Fuel	87 AKI (90 RON)

When troubleshooting a suspected reduction of power or speed consider the test conditions above. If actual conditions are significantly different than any of these variables, a reduction in speed is expected. High ambient temperatures, high humidity, low pressure or low octane fuel can all reduce power and speed.

In extreme cases these conditions can cause detonation or spark knock. The engine's computer constantly monitors for this condition. If detonation is detected, the computer reduces spark advance to reduce the detonation and the engine damage it can cause. Reducing the spark advance reduces power.

Performance of the boat as a complete package is also based on similar test conditions. Variances in boat performance can usually be traced to differences between actual conditions and the test conditions.

The condition of the hull also influences performance. See *Hull Weight* and *Boat Bottom* that follow.

Hull Weight

Total boat weight is an important factor in performance. This is a combination of the boat and the passengers and gear that are on the boat. Any increase in boat weight will reduce boat speed. To minimize this problem, do not store un-needed gear on your boat. Overloading with passengers also causes problems.

If adding a significant amount of weight to the boat, such as generators, appliances, coolers and other heavy items, consider the effect of the added weight on performance.

Fiberglass boat hulls can absorb a significant amount of water over time and can become progressively heavier.

As the boat becomes heavier, the original propeller (and in some cases the drive ratio) may no longer be correct for the boat. Hull weight was a major factor in the original selection of these components.

If boat performance has declined over time and added weight is suspected, consult an authorized Volvo Penta dealer to discuss the issue. Your dealer can

assist you with selecting the correct propeller size or gear ratio for your boat.

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.

Engine Protection Mode

In a low oil pressure or engine overheat situation, the engine's computer will initiate Engine Protection Mode (EPM). If an audible alarm has been installed with your engine, it will sound to notify you of a malfunction.

If engine conditions trigger EPM, engine RPMs may be reduced or the engine may shut down, depending on the severity of the problem.

Under most EPM conditions, engine operation is limited to 3000 RPMs or less. For mild engine overheating, engine speed reduction will be 4200 RPMs.

Bring the engine to idle to investigate the problem.

Use the oil pressure and temperature gauges to verify a problem exists. Check the engine dipstick for proper oil level. See *Troubleshooting page 114* for temperature issues. The low oil pressure/engine overheat problem must be corrected before the engine will return to normal operation.

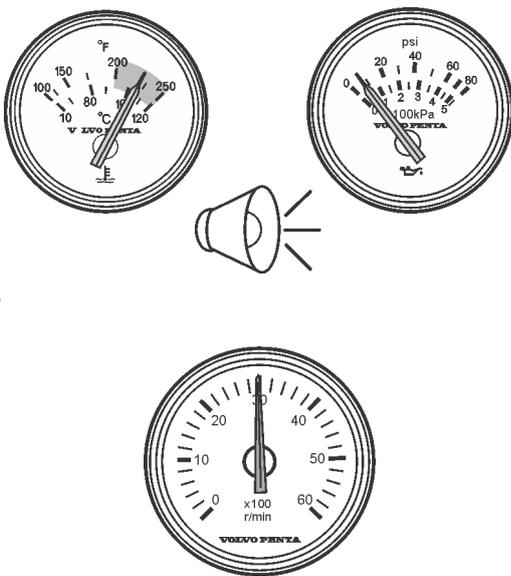
If a temperature problem caused the EPM to activate, the engine must cool down to an acceptable temperature before the EPM is turned off.

If the audible alarm stops sounding, the malfunction has been cleared and the engine may now be operated normally.

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 audible alarm will continue sounding and the engine speed will remain at a reduced level.

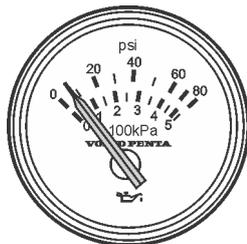
NOTICE! Continuing to run the engine, with EPM active and without correcting the cause of the problem, may result in engine damage or equipment failure which may not be covered by your warranty.

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



P0018320

P0018454



P0010868

Low Oil Pressure

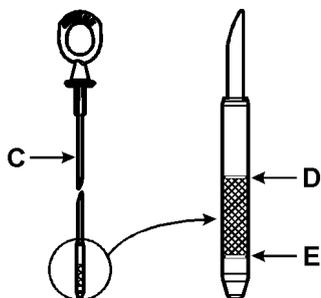
If your engine's oil pressure drops too low, the audible alarm will sound a constant tone, warning you that there is a problem. The engine will also enter EPM and engine RPMs will be reduced. There are three common reasons for oil pressure dropping too low:

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

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

NOTICE! Ignoring a low engine oil pressure situation can cause engine damage or failure. This 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 **C** to check engine oil level, which should be between Full **D** and Add **E**.



P0008470

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**. Correct the oil level as soon as possible.

If there is too much oil, remove the excess until it reaches recommended levels. If you are unable to remove oil from the engine, make way at **reduced speed**. Correct the oil level as soon as possible.

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.

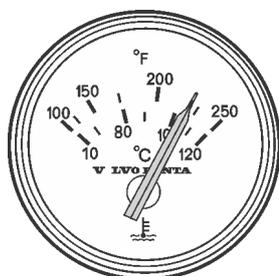
If the problem persists, contact your Volvo Penta dealer and have the engine inspected.

Engine Overheats

If the engine temperature is too high, the engine will enter EPM and the alarm will sound. See *Engine Protection Mode page 118*.

WARNING!

Risk of fire. Immediately investigate any engine overheat situation. The engine can catch fire if the overheat is prolonged or severe. Correct the overheat situation before using the boat/engine.



P0018287

Engine speed will be automatically reduced depending on the severity of overheating. For mild overheating, the RPMs are reduced to 4200 maximum and the alarm will sound for 1/2 second every 5 seconds. More severe overheating results in a speed reduction to 3000 RPMs and the alarm will sound once per second.

See *Troubleshooting page 114* for possible causes and solutions.

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

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

Water in Bellows

OceanX drives are equipped with a sensor that detects water in the u-joint bellows. If water is detected, an alarm will sound for one second every sixty seconds. If this alarm sounds, contact your dealer for repairs as soon as possible.

NOTICE! If the drive is not in use and there is water inside the bellows, the u-joint will corrode, possibly leading to expensive drive and engine repairs the next time the engine is started.



P0021190

Water in Oil and Oil Level

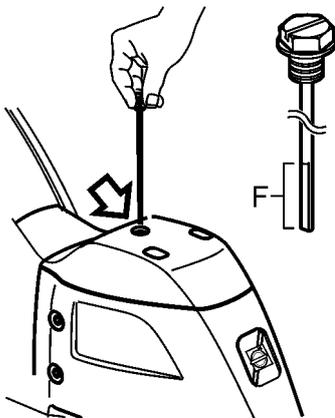
OceanX drives are equipped with a sensor that monitors oil level and quality. If the oil level in the drive is low or water is detected in the oil, an alarm will sound for one second every sixty seconds. If this alarm sounds, check the level and quality of the oil in the drive.

NOTICE! Operating the drive with low or poor quality oil could lead to major drive damage. If the alarm sounds, correct the problem before using the drive again.

For instructions on checking the level, refer to *Checking the Drive Unit Lubricant page 151*. If the oil level is low, add the necessary amount.

Check the oil to see if it has a milky or translucent white appearance, which indicates water in the oil.

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



P0002294

Electric Fuel Pumps

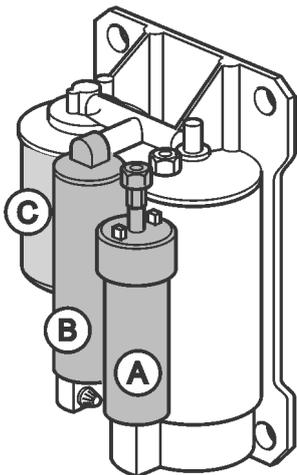
EFI engines have two electric fuel pumps, contained in a fuel cell on the front of the engine:

- 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 common 20-amp fuse and are controlled by a relay. See the next section. The pumps will operate only when the engine is cranking or running. If a pump is not working, check the fuse and replace if necessary. See your Volvo Penta dealer if further service is required.

The fuel filter **C** is also mounted to the fuel cell. To change the filter, see *Engine Fuel Filter Replacement*.

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.

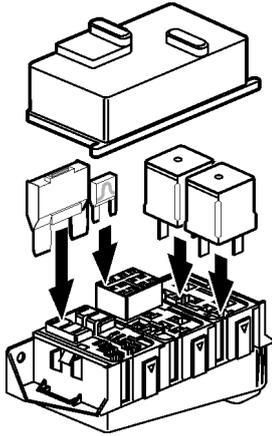


P0008585

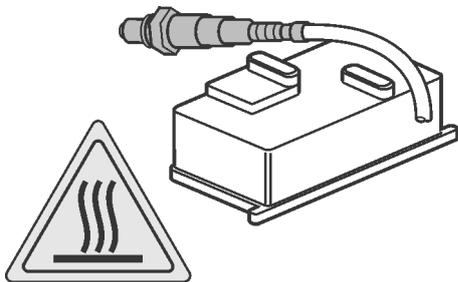
Fuse and Relay Box

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.



P0016590



P0019988

⚠ WARNING!

Burn hazard. Oxygen sensor located above Fuse and Relay Box cover may be very hot.

	R2		R3		R4		R5
3858809		3858809	3841366	3841366			
	R1	F1	F2	M1	40A	3841371	
3858809		F3	F4	CB	40A	3884849	
		F5	F6	M2	20A	3841370	
R1 Trim Down Relay		F1 Diagnostic					
R2 Trim Up Relay		F2 EVC					
R3 Starter Relay							
R4 Fuel Pump Relay							
R5 Ignition Relay		F1-15A	3861373				
		F2-10A	3841372				
		F2-20A	3861374				
		(EVC)					
		F3-20A	3861374				
		F4-15A	3861373				
VOLVO PENTA							

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.

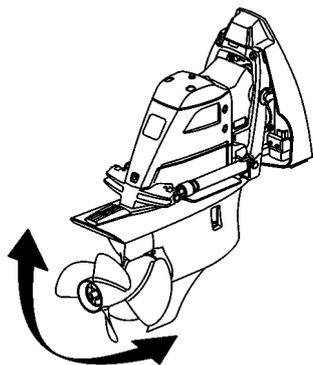
The image is an example of one of these labels and may not represent your engine. See the cover label on your engine.

Spare fuses are located on the inside of the fuse box cover. 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*.



P0018265

Power Trim

If the power trim system stops working check the following.

Fuses, Relays

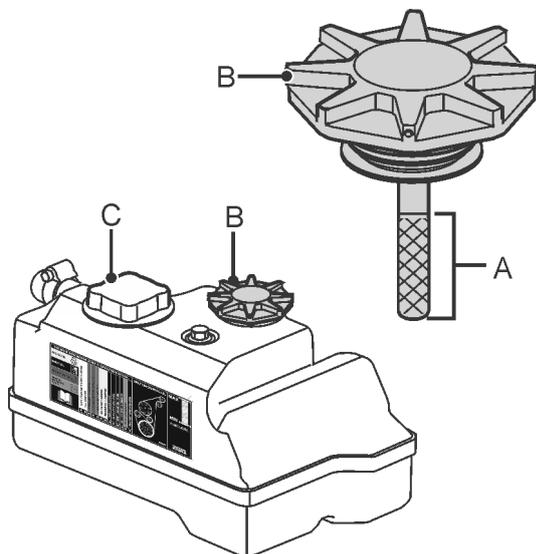
Check the fuses and relays in the fuse box.

Trim Motor Protection

If the trim switch is held too long in either full up or down the motor will stop. See *Trim/Tilt Motor Protection* page 78.

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.



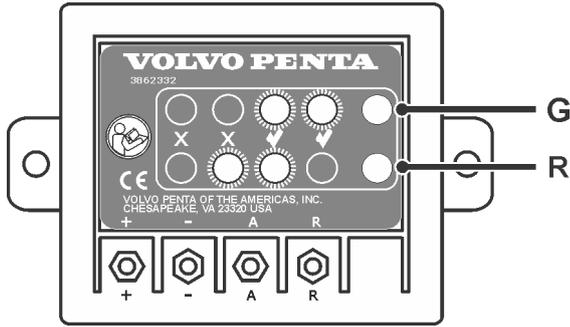
P0019978

Steering

If you experience difficulty steering the boat, check for the following:

- Check the fluid level in the power steering reservoir. Fluid level on the dipstick **B** should be in the range **A** shown in the image.
- 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 that all hose clamps on the power steering system are securely tightened.
- Check belt.

NOTICE! Filler cap C is for coolant/anti-freeze. Do not add power steering fluid to this section of the reservoir.



P0018276

Active Corrosion Protection System

The combination of on and off LEDs (Green and Red) show the current status of the system.

Green LED

On, system is protecting the drive.
Off, system is not protecting the drive.

Red LED on

(with or without green LED on)
Conditions are present that are hampering optimum system performance;

- 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. 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 is in contact with the transom shield. Remove paint and ensure there is a 25mm (1 in.) border between transom shield and bottom paint.

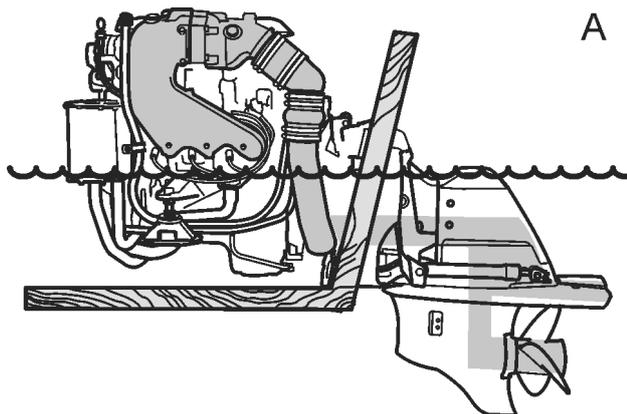
No LEDs on

No power to the system;

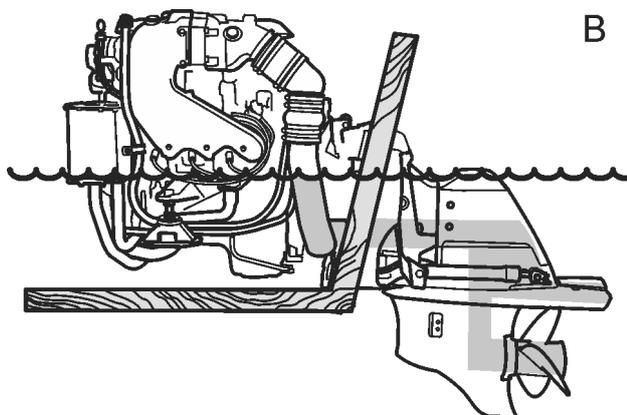
- Dead battery. Check battery condition and charge as necessary.
- Loose connection or corroded terminals on the electronic control unit or battery. Clean and tighten the connectors.
- Blown fuse. Replace defective fuse. Fuse is located on the power wire, near the battery.
- Broken anode or reference sensor unit. Replace damaged unit.

If problems continue after completing the steps above, see your Volvo Penta dealer for further help.

Static Water Line



P0019979



P0019980

Static water line is a measurement of the water level in the boat engine's exhaust system. The exhaust passages of a drive 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.

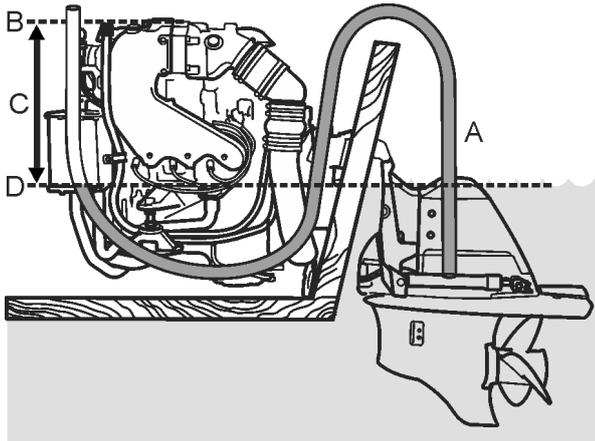
The static water line should be correct when you purchase a new boat. Your boat was designed and constructed so that, under normal load and use conditions, the water level would not be high enough for water to enter the engine. This is accomplished with exhaust riser height and the height of the engine 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.



P0019981

Static Water Line Test

Static Water Line (SWL) is the difference between sea water level **D** and top of the riser **B** on the engine.

To test for SWL height:

- 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. 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 and hold next to—and above—the manifold **B**.
- 4 Unplug the end of the hose and allow water to drain down until it has maintained a stable level.
- 5 Measure the vertical distance **C** from water line **D** in the hose to the top of manifold **B**. This is the SWL. Measurement **C** should be 13 in. (33 cm) or greater.
- 6 If the SWL is less than 13 in. (33 cm), contact your Volvo Penta dealer for information on raising the engine's exhaust system.

NOTICE! Engine damage from water ingestion is possible if the SWL is less than the specification. The damage may be severe, and is not covered by warranty.

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 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 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 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.

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, check system for leaks	•		•			<input type="checkbox"/>
Engine Oil	•	•				<input type="checkbox"/>
Fuel Pump and System – Check for leaks	•					<input type="checkbox"/>
Drive						
Anodes – Check, replace if eroded more than 30%	•					<input type="checkbox"/>
Power Trim/Tilt – Check for proper operation	•					<input type="checkbox"/>
Miscellaneous						
Safety Lanyard – 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"/>

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 ⁽²⁾	•	•				<input type="checkbox"/>
Exhaust System ⁽³⁾ – Check for damage, corrosion, leaks, and loose clamps	•		•			<input type="checkbox"/>

1) Check/correct these items every month, when the boat is in use (not winterized or in storage).

2) Not needed for OceanX, drive has sensors for oil fill and quality.

3) See *Exhaust Bellows and Clamps* page 147.

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 **100 hours or less per year** perform the items required in the Maintenance Schedule once per year. If you operate your engine more than 100 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 *Storage page 158*.

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 System ⁽³⁾ – Check for damage, corrosion, leaks, loose clamps	•		•			<input type="checkbox"/>
Sacrificial Anodes; Exhaust Manifolds – 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 ⁽⁴⁾	•		•			<input type="checkbox"/>
Sea Water Pump – Replace impeller every two years ⁽⁵⁾	•				•	<input type="checkbox"/>
Spark Plugs – Replace every fifth year ⁽⁶⁾					•	<input type="checkbox"/>
Engine Computer – Check and clear codes	•					<input type="checkbox"/>
Shift Cable — Dealer to replace every three years or 300 hours					•	<input type="checkbox"/>

1) See *Scheduled Oil Service page 138*.

2) Change oil/filter at least annually.

3) See *Exhaust Bellows and Clamps page 147*.

4) Replace coolant every four years.

5) **Must** use genuine Volvo Penta parts for two year change, change is every year for other parts.

6) **Must** use genuine Volvo Penta parts for five 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	✓
Drive						
Anodes – Visual inspection; replace if eroded more than 30%	•					<input type="checkbox"/>
U-joint Bellows – Check for wear, damage; replace every four years	•				•	<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 ⁽¹⁾ – 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

This chapter provides basic maintenance procedures. If you intend to carry out any maintenance on your equipment, be thoroughly familiar with the procedures described below. If any procedures are unclear, see your Volvo Penta dealer.

Always read and follow the safety warnings provided in this manual.

Repair procedures are covered in the *Workshop Manual*. To purchase a *Workshop Manual* visit Volvo Penta on the Internet. Certain tasks should only be performed by your Volvo Penta dealer. Dealers have the tools and expertise needed to properly and safely perform these tasks. Never carry out any work on the engine if you are unsure of the procedure. Instead, contact your Volvo Penta dealer for repairs.



P0018334

Replacement Parts

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.

Certain fuel and electrical system components must 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:

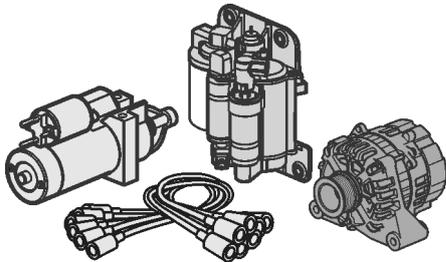
- **Alternator and related wiring**
- **Starter and related wiring**
- **Spark plug wires and related ignition parts**
- **Fuel pump assemblies, fuel rails, fuel filters, fuel lines, and related parts**
- **Relays and circuit breakers**

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 and durability requirements of a marine engine. Non-marine parts may fail prematurely, disabling the engine. Failures caused by the use of non-marine parts are not covered by warranty.

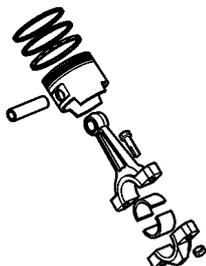
See your Volvo Penta dealer for replacement parts.



P0018283



P0019982



P0018331



P0018332

Volvo Penta engine oils, gear lubricants, and coolants are formulated with the correct lubrication qualities and corrosion inhibitors needed for marine applications. Use of these products ensures proper operation and protection of your engine and drive. See your Volvo Penta dealer for genuine oils, lubricants and coolant.



P0018333

Always insist that your dealer use genuine Volvo Penta parts, oils, and lubricants when servicing your engine and drive. 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.

Stop the Engine Before Service

WARNING!

Stop the engine before doing any maintenance work.

WARNING!

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

See *Serpentine Belt page 137* for important safety information about the belt system.

WARNING!

Place warning signs stating that service is in progress in every position from which the engine can be started.

Electrical power must be disconnected before working on the engine. This prevents an accidental engine start. It also prevents sparks, arcing, and shocks when working on electrical systems.

To disconnect electrical power;

- remove the ignition key
- turn off the power supply to the engine at the main switches
- lock the switches, or
- tag the switches to alert others
- tag all starting positions

Disconnect and remove any shore power connections to the boat.

Reverse the procedure when the maintenance work has been completed.

Pressure Washing

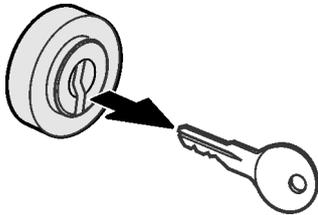
NOTICE! Do not use a pressure washer on the engine, drive, or transom shield.

High pressure spray could damage engine electrical, cooling, and fuel components.

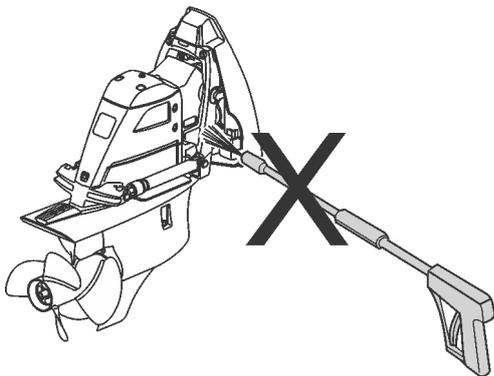
High pressure spray could damage the bellows, which could lead to major drive damage. Damage to cooling hoses, seals, and other parts is also possible.



P0018336



P0018337



P0018404

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:

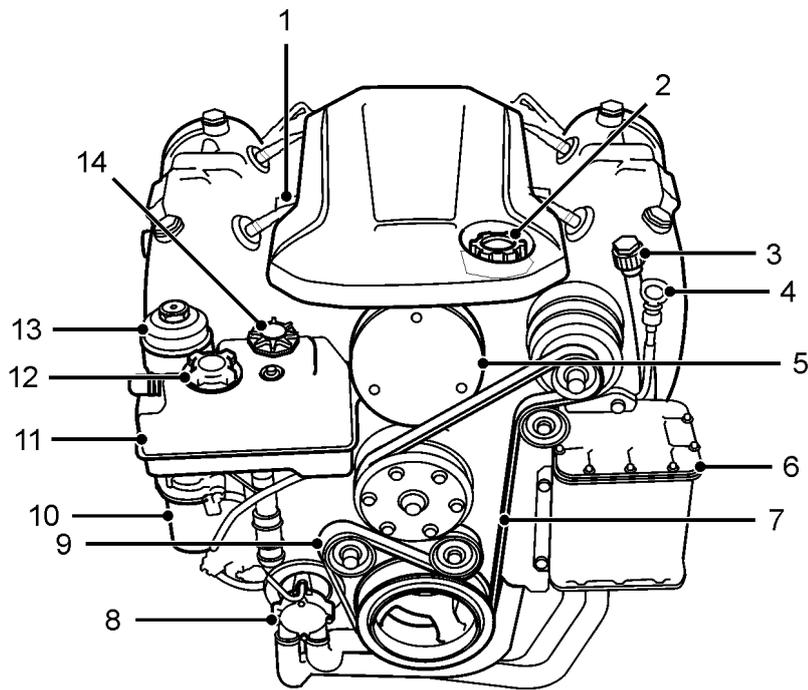
- The maintenance and service intervals recommended by Volvo Penta must be observed.
- Only genuine Volvo Penta replacement parts may be used.
- The servicing of ignition, timing, and fuel injection systems must always be carried out by an authorized Volvo Penta workshop.
- The engine must not be modified 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.

Service and Maintenance Points



P0019971

- | | | | |
|---|----------------------|----|-------------------------|
| 1 | Fuse and Relay Box | 8 | Seawater Pump |
| 2 | Oil Fill Cap | 9 | Belt Tensioner |
| 3 | Engine Flush Fitting | 10 | Fuel Filter |
| 4 | Engine Oil Dipstick | 11 | Coolant Expansion Tank |
| 5 | Flame Arrestor | 12 | Coolant Fill Cap |
| 6 | Heat Exchanger | 13 | Engine Oil Filter |
| 7 | Serpentine Belt | 14 | Power Steering Dipstick |

Engine, General

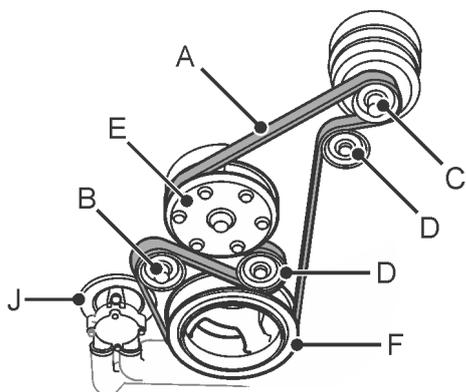
Serpentine Belt

WARNING!

Extreme crush and pinch hazard from belts, pulleys, and moving parts. Engine should be turned off before starting service or maintenance work.

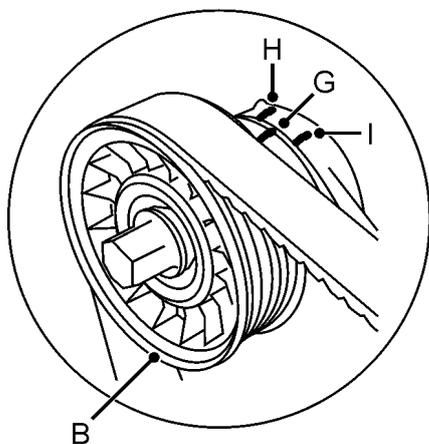
Stop the engine before inspecting or servicing a belt. Loose clothing, hair, fingers or a dropped tool can be caught in the rotating parts of the engine and cause serious personal injury.

The alternator and engine circulation pump are powered by a serpentine drive belt **A** that is driven by the crankshaft pulley **F** and is routed around the automatic belt tensioner **B**, alternator pulley **C**, idler pulleys **D** and circulation pump pulley **E**.



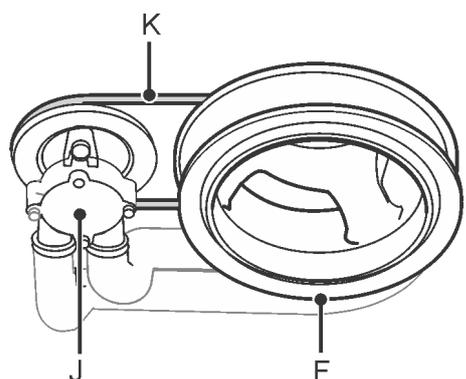
P0018336

P0019973



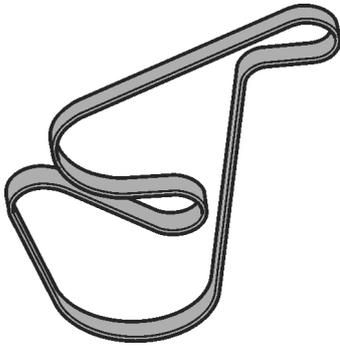
To determine if the belt is worn (stretched), check the indicators located on the automatic tensioner housing **B**. When marks **G** and **H** align, the belt is stretched and should be replaced. If **G** is between **H** and **I** the belt is good.

P0019989



A small, "stretch" belt **K** from the crankshaft pulley **F** drives the seawater pump and power steering pump **J**. The belt does not require maintenance or service during normal use conditions.

P0019990



P0019991

Check the belts for:

- Missing chunks
- Dry rot
- Exposed cords or excessive fraying
- Oil, grease, or coolant

Check the pulley surfaces for corrosion. A rough pulley surface will quickly wear the belt.

If you suspect a belt needs replacing, refer to the *Workshop Manual* for the procedure or see your 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

For a schedule of oil change intervals, refer to the *Maintenance Schedule page 130*.

Volvo Penta full Synthetic Gasoline Engine Oil Catalytic Converter Approved SAE 10W-40 is recommended and should be used for oil changes. If Volvo Penta oil is unavailable an alternative oil can be used as long as it meets the *Engine Oil Specifications page 162*.

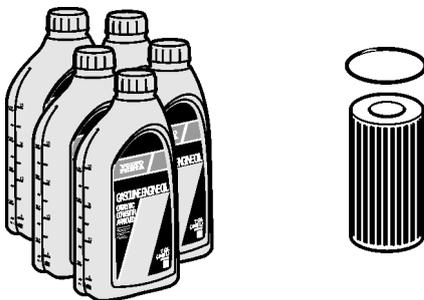
Always change the oil filter every time the oil is changed.

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 refilling the crankcase as part of changing the engine oil.

Checking Engine Oil Level

During the break-in period, slightly higher oil consumption is possible. Check the oil level before every trip. See *Engine Break-in: Gasoline Engines* (publication number 47700022) that came with your engine.



P0016601

After the break-in period, check the oil level according to the *Maintenance Schedule*.

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.

The oil level must be between the full **D** and add **E** 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.

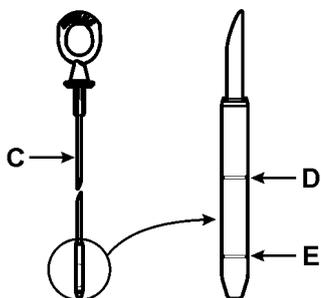
NOTICE! Gas engines require a precise oil fill level to operate correctly.

Overfilling results in high operating temperatures, foaming (air in oil), loss of power, and overall reduced engine life.

Adding Oil if Low

NOTICE! All oil used for oil changes or added between changes must meet the *Engine Oil Specifications* page 162.

If oil is added, use Volvo Penta full Synthetic Gasoline Engine Oil, Catalytic Converter Approved, SAE 10W-40. If Volvo Penta oil is unavailable an alternative oil can be used as long as it meets the *Engine Oil Specifications*.



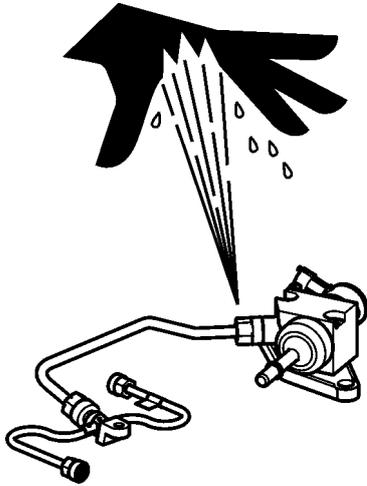
P0019984



P0018402

Fuel System

High Pressure Fuel System



P0020801

WARNING!

Risk of injury from the uncontrolled release of high pressure.

The engine's direct injection fuel system operates at a very high pressure. This pressure is also present when the engine is not running.

The high pressure system is located under the intake manifold. Service of this system must be performed by a trained technician, see your Volvo Penta dealer for assistance.



P0018283

Safety Information

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!

Turn off the main battery switch to prevent stray sparks. Eliminate all sources of spark.

DANGER!

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

WARNING!

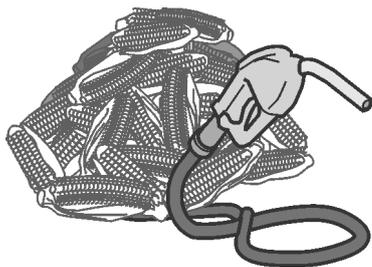
Risk of fire.

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.



P0020437

Ethanol-Blended Gasoline

Gasoline is distributed throughout the world that contains ethanol. Ethanol-blended gasoline should not cause engine problems if the fuel and fuel system are properly maintained according to the instructions given in this manual. The chapters covering *Maintenance* and *Storage* outline measures to prevent the ethanol from damaging the fuel system.

Ethanol has several characteristics that may lead to failures in marine fuel systems;

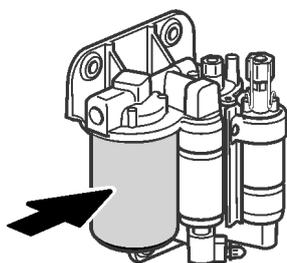
- Ethanol acts as a solvent and will loosen contaminants or debris in the fuel system, which can then clog filters, injectors and other parts.
- Ethanol in gasoline attracts and holds water, which can overload the fuel filter(s) and cause corrosion of injectors, pumps, and other fuel system components.

NOTICE! Fuel system or engine damage caused by water, foreign particles, sludge, or gum created by ethanol fuel is not covered by warranty.

Volvo Penta Ethanol Fuel Treatment⁽¹⁾, part number 22203959, should be used whenever fuel is added to the boat, to maintain constant protection from corrosion and oxidation. Add the treatment according to the instructions on the label. Also use the treatment for offseason storage (winterization), as part of the fuel treatment process. See *Fuel Treatment During Storage* page 143.



P0018600



P0018342

Volvo Penta gasoline engines are equipped with a water separating fuel filter (see *Engine Fuel Filter Replacement*). 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 *Maintenance Schedule* page 130. Check and/or replace the filter(s) as part of diagnosing engine performance issues (see *Engine Troubleshooting Guides* page 110). Carry spare filters and needed tools and supplies to change filters when boating.

1. Not available in all markets. Use a comparable marine fuel stabilizer if the Ethanol Fuel Treatment is not available.

Engine Fuel Filter Replacement

DANGER!

Turn off the main battery switch to prevent stray sparks. Eliminate all sources of spark.

Before you begin this procedure, be sure you have the following on hand:

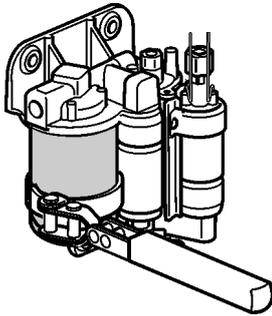
- new fuel filter
- fuel filter wrench
- clean engine oil
- container and absorbent materials

Remove all other personnel from the boat. If this is not possible, ensure that all personnel are above-decks and away from confined compartments.

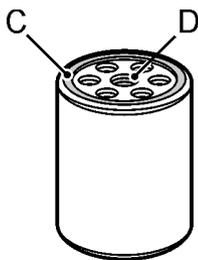
- 1 Turn off the engine and remove the key. Turn off all electrical power to the engine and boat.
- 2 Be prepared to catch any fuel that spills from the filter or pump.
- 3 Use a filter wrench to loosen the filter. Remove the filter.
- 4 Using clean engine oil, lightly lubricate the gasket **C** and inner seal **D** on the new fuel filter.
- 5 Screw the new filter on to the pump assembly. Hand tighten.
- 6 Clean up any spilled fuel. Safely discard the filter and any absorbent materials.
- 7 Turn on the main battery switch.
- 8 Run the bilge blower for at least five minutes to vent the engine compartment.
- 9 Start the engine and check for fuel leaks. Correct leaks before proceeding.

DANGER!

If you detect fuel leakage, turn the engine off immediately - EXPLOSION AND FIRE ARE AN EXTREME DANGER.



P0016857



P0016858

Fuel Treatment During 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 with a fuel treatment (stabilizer) that counters the negative effects of ethanol-blended fuels.

Use Volvo Penta Ethanol Fuel Treatment⁽¹⁾, part number 22203959 to treat the fuel in the tank(s). Add the treatment according to the instructions on the label.

During storage the engine's internal components must be protected from corrosion and any gasoline in the engine's fuel system must be treated. This is done by mixing fuel treatment and two-cycle motor oil in gasoline that is run through the engine. The oil in the mixture coats the inside of the engine and components with a light protective film.

See the *Fuel Storage Mixture* procedure below.



P0018600

Fuel Storage Mixture

This procedure requires a moderate level of mechanical skill and knowledge. If you do not feel comfortable performing this procedure, see your Volvo Penta dealer for assistance. Ask the dealer to perform this Fuel Storage Mixture procedure as part of preparing the engine for storage.

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)
- Volvo Penta Ethanol Fuel Treatment, per label instructions

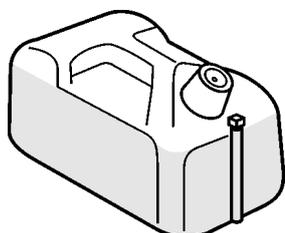
DANGER!

Fuel and vapors will be present during procedure, which can result in an explosion; provide ventilation and eliminate all sources of spark or flame.

WARNING!

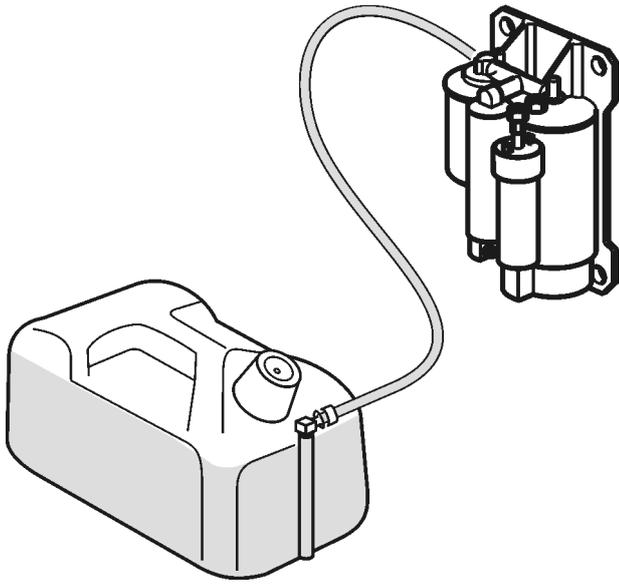
Engine must be run to complete process. Take precautions to ensure safety and prevent engine damage:

- Boat must be properly supported.
- Run the engine using the engine flush fitting. The engine must have adequate cooling water; always monitor engine temperature gauge and alarms when running engine with boat out of water.



P0016595

1. Not available in all markets. Use a comparable marine fuel stabilizer if the Ethanol Fuel Treatment is not available.



51773

- Run engine with drive out of gear and in full trim down position.
 - Do not run fuel pumps dry.
- 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!

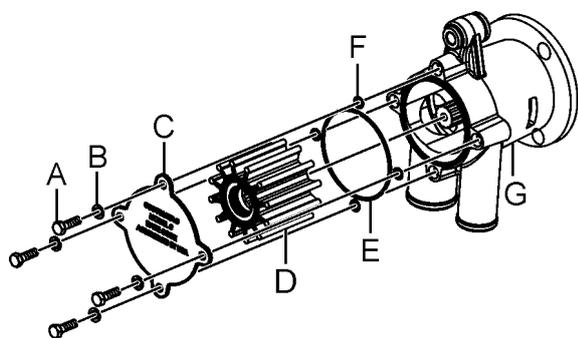
Failure to inspect your work may allow fuel leakage to go undetected. This could become a fire or explosion hazard.

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



P0019977

- 1 Loosen the four screws **A** and remove screws and washers **B**. Save for later use.
- 2 Remove the cover plate **C** from the housing **G**.
- 3 Remove and inspect the impeller **D**. 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-ring **E** for nicks, cuts, and wear. Replace as necessary. O-rings **F** are for retaining screws in the cover and are not critical.
- 4 Lubricate the pump housing with a light grease.
- 5 Install the impeller and O-ring. Reinstall the housing cover plate. Reinstall the washers and screws. Tighten screws to 19–24 in. lb. (2.2–2.8 Nm).

Freshwater Cooling System

Check the coolant level before each trip. If coolant is low, add by removing the coolant filler cap **B** and adding coolant via the fill spout. Do not fill above the maximum fill line **A**.

⚠ WARNING!

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

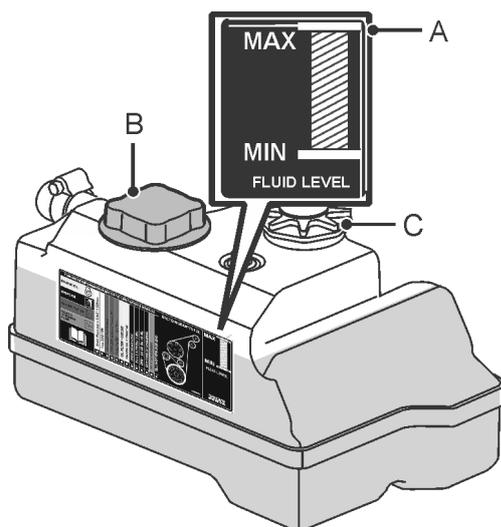
NOTICE! The filler cap at **C** is for power steering fluid. Do not add coolant to this section of the reservoir.

Engines covered by this manual are filled at our factory with the new, more advanced “VCS” yellow coolant. If coolant needs to be added or replaced, use the same coolant type that came in the engine. **DO NOT** mix coolant types.

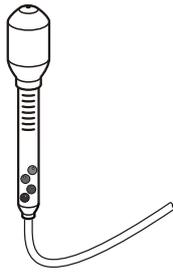
Do not use other coolant types such as traditional green ethylene glycol, propylene glycol (pink), OAT, or HOAT coolants.

Volvo Penta offers pre-mix, ready-to-use containers of the yellow coolant. If using full strength antifreeze, use a 50/50 mix of antifreeze and distilled water.

See *Checking Engine Coolant for Freeze Protection* page 146.



P0019983



P0012894

Checking Engine Coolant for 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 indicated 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.

Inlet and Exhaust System

Intake and exhaust system maintenance is limited to checking and inspecting the bellows and clamps on the exhaust system.

Other work on these systems should be done by your Volvo Penta dealer.

Exhaust Bellows and Clamps

Check the exhaust system according to the frequency defined in the *Maintenance Schedule*.

DANGER!

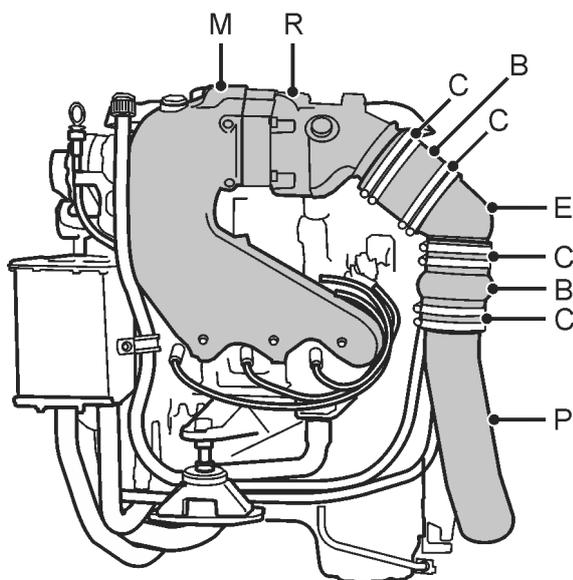
Risk of carbon monoxide poisoning from a leaking exhaust system. Do not operate the engine with defective exhaust system components.

Check the clamps **C**, make sure all are tight.

Inspect the rubber bellows **B** for signs of over-heating or deterioration of the rubber. Defective bellows must be replaced before the boat is used again.

Inspect the exhaust manifolds **M**, risers **R**, elbows **E**, and pipe **P** for signs of corrosion.

For replacement of exhaust parts see your Volvo Penta dealer.



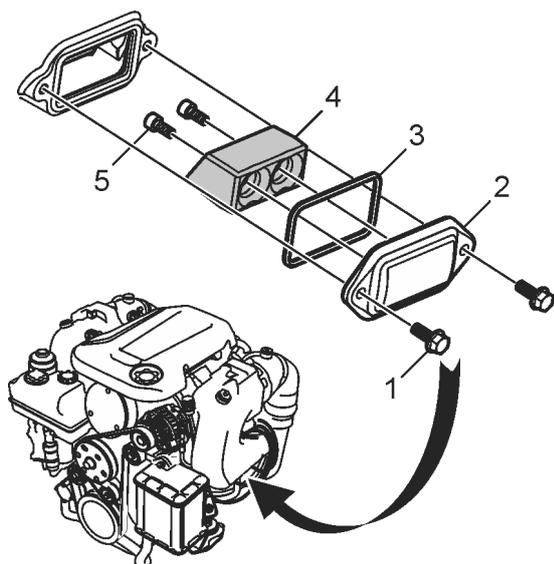
P0019986

Exhaust Anodes

There is an anode in each exhaust manifold, see illustration.

Exhaust 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 Screws – Anode housing cover; torque to 6–8 ft. lb. (8–11 Nm) when replacing assembly
- 2 Cover – Anode housing
- 3 Gasket – Anode housing
- 4 Anode
- 5 Screws – Anode; torque to 4–5 ft. lb. (5–7 Nm) when replacing



P0019985

Ignition System

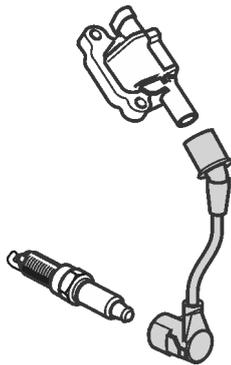
Maintenance for the ignition system is limited to plug wire inspections and replacing the spark plugs. For more complex repairs see the *Workshop Manual* or your Volvo Penta dealer.

NOTICE! When replacing or installing spark plugs, plug wires, or coils it is critical that the plug wires are reinstalled from the coil to the correct spark plug (cylinder). If the plug wires are connected to the wrong cylinder an engine miss-fire will occur. The miss-fire may cause engine damage. A miss-fire on a catalyst equipped engine will also destroy the catalyst element. This damage can be expensive and is not covered by warranty.

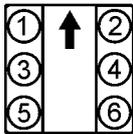
Firing order

V6: 1-6-5-4-3-2

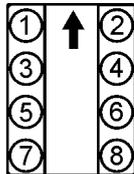
V8: 1-8-7-2-6-5-4-3



P0018461



V6



V8

P0020978

Spark Plugs

Very high quality spark plugs were installed in your engine at the factory. Replacement spark plugs must be of equal quality. See your dealer for the correct spark plugs.

The ignition and fuel management systems of these engines are finely tuned around many factors, including the exact specification of the spark plugs. After-market plugs and plugs from other manufacturers may differ slightly from the specifications of the factory plugs.

NOTICE! Using non-factory plugs in your engine could result in poor engine performance and even engine damage.

See *Maintenance Schedule* for replacement frequency.

See the tune-up decal on the engine for plug gap. Refer to the workshop manual for complete replacement procedures.



P0018387

Electrical System

Electrical system maintenance is limited to care and replacement of the battery (see below). Other electrical components do not require regular or preventative maintenance. Replacement or repair of these components is covered in the Workshop Manuals.

Fuses, relays and circuit breakers are covered at *Fuse and Relay Box* page 122.

Battery

DANGER!

Risk of explosion. Batteries generate a highly volatile gas. Keep all smoking, flames, and sparks away from the batteries.

Also observe the following;

All batteries must be enclosed in approved marine battery boxes, with covers. The battery and box must be secured.

Always ventilate the area where the batteries are stored before beginning any work.

Before working on the cables turn the battery switch to OFF and disconnect any accessories wired directly to the battery.

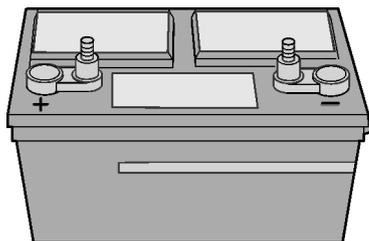
Incorrect battery cable connections can create a spark, make sure battery cables are mounted to the correct battery post; + to +, — to —.

A spark can also be created when connecting or disconnecting the cables. If there are electrical loads on the positive cable they will arc when the cable is installed. Remove the negative cable first and install it last to reduce arcing.

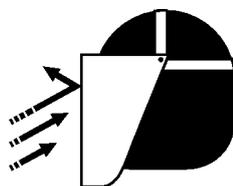
WARNING!

Risk of chemical burns. Battery electrolyte is very corrosive. Wear eye protection when working around batteries. Electrolyte spilled on the skin should be immediately flushed off with water.

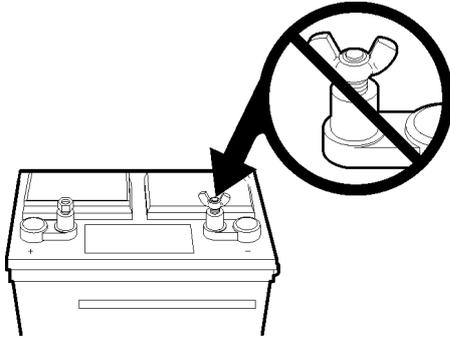
NOTICE! Do not disconnect the batteries if the engine is running, electrical components may be damaged.



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P0020439



P0016587

NOTICE! Do not use wing nuts to secure battery cables, even if they were supplied with the battery; use a nut and lock washer to secure the cables.

Proper maintenance and care will increase the reliability and service life of the batteries;

- Battery posts and cables should be free of corrosion. If corrosion is present disconnect the cables and clean the posts and cable ends. Corroded connections prevent full current flow, which can lead to numerous electrical issues with the engine or boat.
- Make sure battery connections are tight. Loose connections also prevent full current flow.
- Keep the batteries charged, especially during storage.

Drive

Checking the Drive Unit Lubricant

NOTICE! Improper oil level, under- or overfilled, may result in serious drive damage.

Check lubricant (oil) level in drive at each usage. Oil level and condition checks are the best ways to catch drive problems before serious damage occurs.

Remove the dipstick. Check for oil on the flat portion **F** of the dipstick.

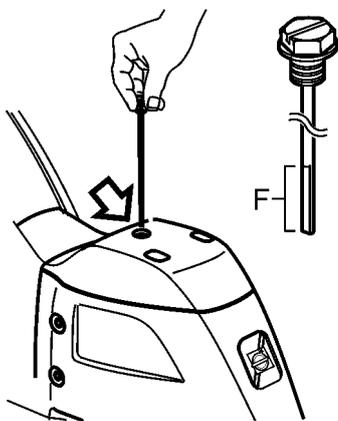
If oil level is low, add small amounts through dipstick opening until oil is at proper level.

If level is too high, remove until oil is at proper level. See drive *Workshop Manual*.

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.



50398

Painting the Drive

The drive and transom shield require a unique paint repair procedure. Refer to the *Workshop Manual* or see your Volvo Penta dealer for additional information regarding painting the drive.



P0016597

Anti-fouling Paint: Drive and Transom Shield

When using anti-fouling paint on the drive or transom shield, be sure to observe the following:

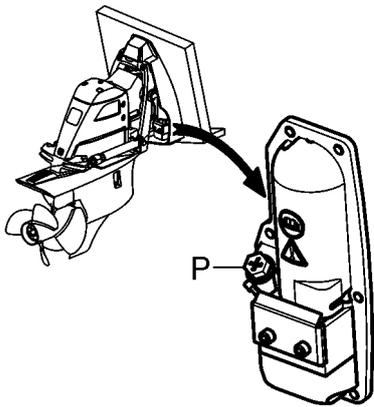
- Copper paints must not be used.
- Use paints specifically designed for aluminum drives.
- Due to environmental concerns, the painting procedure should be carried out by a qualified technician at an authorized Volvo Penta dealership.

NOTICE! If you 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.**

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

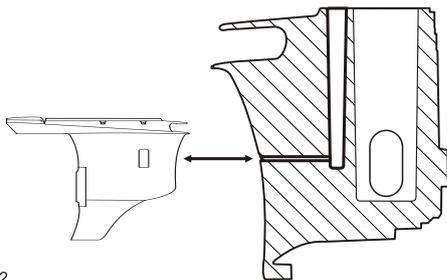
Pitot Tube (Speedometer Port)

The pitot tube, located at the leading edge of the drive unit, provides pressure input for the speedometer. If the pitot tube becomes clogged (e.g. silt, sand, vegetation), the speedometer may stop functioning.

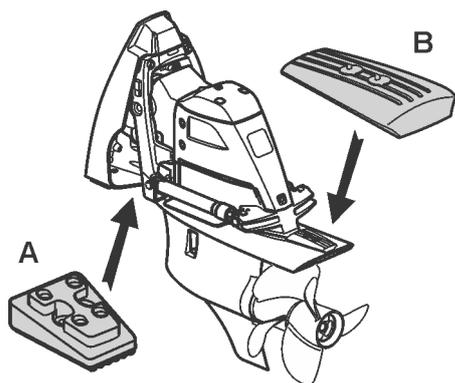
To clear debris from the pitot tube, use a six inch length of stiff wire (1/8" or 3 mm diameter) to push debris in the pitot tube into the drive cavity.

If this does not solve the issue, the pitot may be blocked further up in the system of tubes and passageways. Some drive or shield disassembly may be required. See your authorized dealer for assistance.

Note: the Forward Drive does not have a pitot tube.



P0009472



P0018354

Anodes

Sacrificial anodes are attached to the bottom of the transom shield **A** and on the rear of the drive **B**.

A correctly working anode will slowly erode away. They require frequent inspections to make sure there is enough anode material left to protect the shield and drive.

Anodes that are taken in and out of the water (e.g trailer boats) will develop surface scale or oxidation. This must be removed, with sandpaper, for the anode to function.

Do not paint anodes, the paint will block the galvanic action, preventing the anode from working correctly.

Anodes purchased from your Volvo Penta dealer meet the highest specifications for material composition and purity. Some aftermarket anodes may not meet these quality specifications.

Inspecting Drive Anodes

Inspect anodes (see *Maintenance Schedule* for frequency). If an anode is 2/3 its original size (1/3 eroded), replace it.

The amount of erosion on the drive anode is a good indication of the condition of the shield anode.

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

Aluminum works best in salt or brackish water and is also a good choice if the boat is used in different or unknown salinity conditions.

Magnesium anodes are available for freshwater use.

Zinc anodes are available if the boat will only be used in saltwater.

See your dealer for replacement anodes.

Oil Sensor Reset

OceanX (OX) drives only

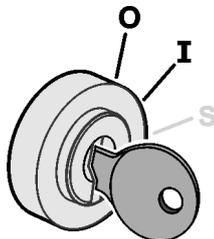
Whenever the drive oil is replaced, the drive oil sensor must be reset. If your dealer changed the oil in the drive, the sensor should already have been reset. However, if you changed the drive oil yourself, or if the dealer forgot to reset the sensor, the alarm may sound. If this occurs, you can reset the sensor yourself by using the following steps:

The boat/drive must be out of the water for this procedure.

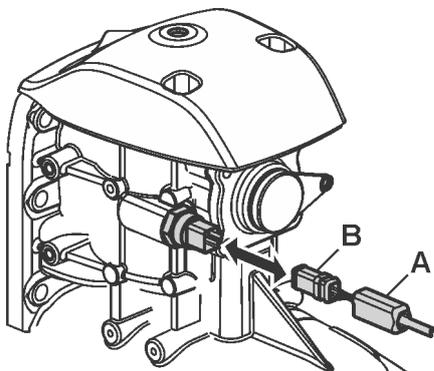


P0021190

- 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.**



P0018309

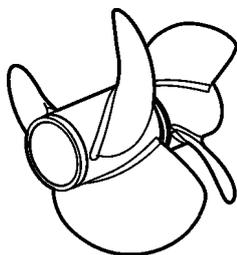


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- 5 Move the plastic protector **A** off of the oil sensor connector **B**.
- 6 Press the release on the connector and pull the plug out of the sensor. Wait at least three seconds.
- 7 Plug the connector back in. The engine alarm will sound three beeps 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!

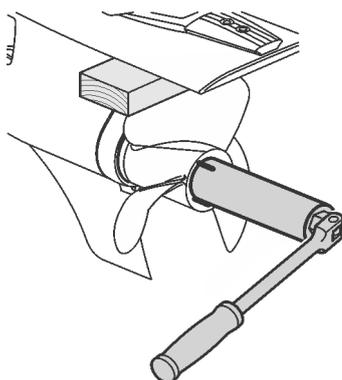
Protect your hands from the sharp edges of the propeller blades. Wear gloves whenever you remove or replace a propeller. Do not attempt to hold propellers by hand when you remove or install propellers and propeller nuts. Serious injury could result.

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.

Propeller Replacement

Removing and installing propellers requires special tools and procedures. If you would like to do this work yourself, visit the online publication store on our website to obtain the drive *Workshop Manual*. An authorized dealer can assist with obtaining the tools.



P0018363

Steering

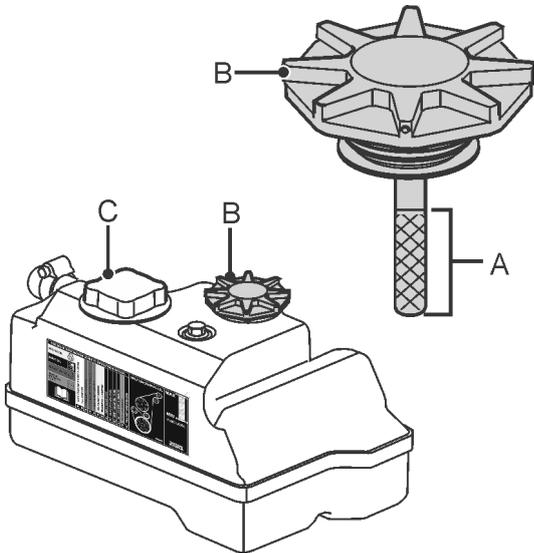
Power Steering Reservoir Fluid Level

Whenever you check the engine oil, also check the steering reservoir fluid level. Fluid level on the dipstick **B** should be in the range **A** shown in the image. If needed, add Volvo Penta Power Trim/Tilt and Steering Fluid. Do not overfill the 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.

NOTICE! Filler cap C is for coolant/anti-freeze. Do not add power steering fluid to this section of the reservoir.



P0019978

Storage

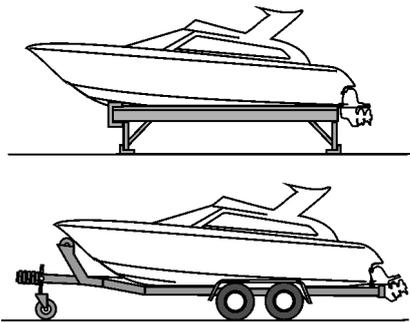
Laying Up (Winterization)

Be sure that your Volvo Penta equipment is properly prepared for long or short term storage. Engine or drive damage can result if some simple maintenance steps are overlooked prior to storage. Winterizing gives you the assurance that your engine will be protected during storage and will run more reliably when you put your boat back in the water.

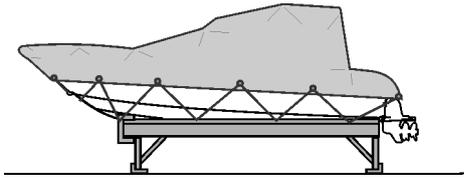
Short Term Storage

Up to two months:

- Flush engine with fresh water. See *Engine Flush page 93*.
- Drain water from raw water side of engine cooling system. **Do not drain the engine block!** See *Draining the Cooling System page 95*.
- Store battery as recommended by manufacturer.
- Add fuel stabilizer; refer to *Ethanol-Blended Gasoline page 141*.



P0016600



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 Treatment During Storage* page 143.
- Check coolant for proper fill level and freeze protection level.
- Drain water from raw water side of engine cooling system. See *Draining the Cooling System* page 95.
- 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:

- 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. If dirty, contact your dealer for cleaning.
- 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 and transom shield anodes. Clean or replace as necessary.
- If engine oil and filter were not changed for storage, do it now.
- If drive 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

Models	V6-240, V6-280	V8-300, V8-350
Displacement	262 Cu. In. (4.3 liters)	323 Cu. In. (5.3 liters)
Firing order	1 – 6 – 5 – 4 – 3 – 2	1 – 8 – 7 – 2 – 6 – 5 – 4 – 3
Idle RPM (Fixed)	650 RPM in forward gear	
Full throttle range	5400 – 5800 RPM	

FUEL SYSTEM	
Fuel injection	Direct injection
Fuel pumps	Two electric, one high-pressure mechanical
Fuel filter	Volvo Penta, water separating, spin-on filter
Fuel type	See <i>Octane Requirements page 163</i>

ELECTRICAL SYSTEM	
Charging system	12 volt 75 amp alternator, with internal transistorized voltage regulator
Battery size	Starting battery; 12 volt with minimum of 650 Cold Cranking Amp (CCA) rating and 135 minute reserve capacity. Do not use a deep cycle battery for starting.

IGNITION SYSTEM	
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	155°F (68°C) – closed cooling heat exchanger mounted on engine
Coolant type	See <i>Coolant page 165</i>

OIL FILTER	
Engine oil filter	Volvo Penta, replaceable paper element

OIL CAPACITY	
NOTICE! Overfilling the oil can cause engine and/or drive damage. Always use the dipstick to check the oil level whenever refilling or topping up the oil.	
Engine with filter	See <i>Engine Oil Capacity page 163</i>
Drive unit	See <i>Drive Unit Lubrication page 167</i>

OIL TYPE	
Engine	See <i>Engine Oil Specifications page 162</i>
Drive unit	See <i>Drive Unit Lubrication page 167</i>
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.

Lubrication System

Engine Oil Specifications

Special Oil Requirements for Catalyst Engines



P0018402

Engines covered by this manual are equipped with catalytic converters. These catalytic converters 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 catalytic converters. 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 catalytic converter. The ignition of these substances on the catalytic converter will damage the catalytic converter.

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 high-output engine 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 Catalytic Converter Approved 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! Catalytic converter 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 catalytic converters. Compounds in the oil may ignite at the catalytic converter, causing catalytic converter failure. This failure is not covered by warranty.

NOTICE! Do not use engine oil additives in engines with catalytic converters. Compounds in the additives may ignite at the catalytic converter, causing catalytic converter failure. This failure is not covered by warranty.

Engine Oil Capacity

NOTICE! Overfilling the oil can cause engine damage. Always use the dipstick to check the oil level whenever refilling or topping up the oil.

Capacity;
 V6 – 6.0 U.S. Quarts (5.7L)
 V8 – 9.0 U.S. Quarts (8.5L)

Capacity includes oil filter change.
 Always change the filter when the oil is changed.

Fuel System

Octane Requirements

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.

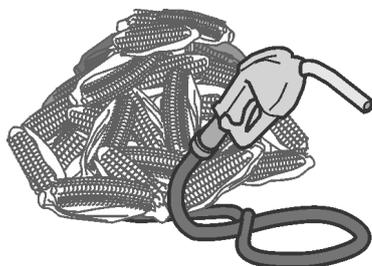
Ethanol-Blended Gasoline

Volvo Penta engines are designed to operate on the commercially available fuel approved by the legislation and governmental agencies of all countries where the engines are marketed and sold.

Volvo Penta gasoline engines are designed to operate on fuel blends which have a higher percentage of gasoline than ethanol. Examples are E10 (10% ethanol) and E25. The engines should not be operated on blends with more ethanol than gasoline.



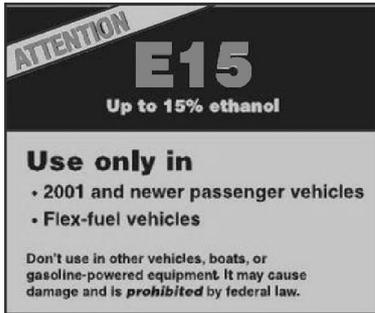
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P0020437



P0008534



P0015684

NOTICE! Do not use ethanol blends that contain a higher percentage of ethanol than gasoline, such as E85 (85% ethanol) or E98. 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 warranty.

Regardless of the ethanol content, the fuel must meet the octane requirements stated above.

US Only

Fuel with 15% ethanol (E15) is now available in the United States. Fuel pumps using E15 fuel will be marked with the label shown at left.

Federal law prohibits the use of E15 fuel in boats.

Fuel System Care

Ethanol has several characteristics that can create problems in marine fuel systems. It acts as a solvent and it attracts and holds water in a much higher percentage than non-ethanol fuels. Users of ethanol-blended fuels must take additional care in the maintenance of their fuel systems. Ethanol blended fuels should not cause engine problems if the fuel and fuel system are properly maintained according to the instructions given in this manual. See **Maintenance; Fuel System,** and **Storage.**

NOTICE! Fuel system or engine damage caused by water, foreign particles, sludge, or gums created by improperly handled ethanol fuel is not covered by warranty

Methanol

Do not use any gasoline containing methanol in Volvo Penta engines.

NOTICE! 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

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. Also see below *Checking Engine Coolant for Freeze Protection* page 146.



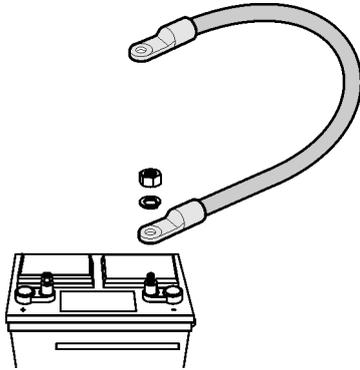
P0016256

Electrical System

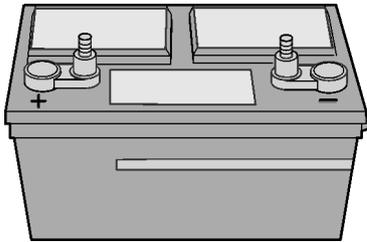
Battery Cables

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.



P0016602



P0002255

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.

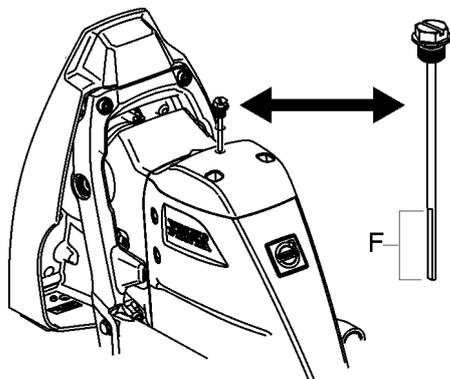
NOTICE! Do not use deep cycle batteries to start the engine. A deep cycle battery, while it may have enough cold cranking amps (CCA), does not have enough voltage to power the ECM and will cause problems with the engine.

Drive

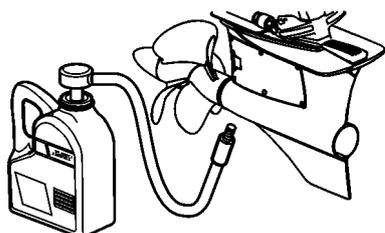
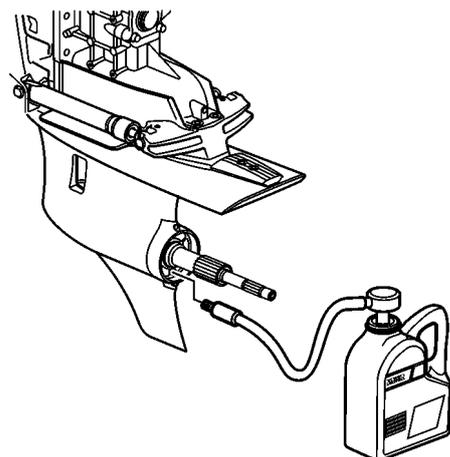
Drive Unit Lubrication

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.



P0016608



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Lubrication Capacity

All SX Models: 2.8 quarts (2.7 liters)

All DPS Models: 2.6 quarts (2.5 liters)

All FWD Models: 3.0 quarts (2.8 liters)

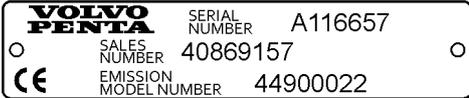
NOTICE! If your drive is equipped with a Drive Spacer, you will need to add more oil than the recommended amount.

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 next page. Record the information on the lines provided below. Make a copy of this page and store the information away from the boat.

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

 <p>VOLVO PENTA SERIAL NUMBER A116657 SALES NUMBER 40869157 EMISSION MODEL NUMBER 44900022</p> <p style="font-size: small;">51802</p>	
SERIAL NUMBER:	
SALES NUMBER:	

Transom Shield Plate

 <p>VOLVO PENTA SERIAL NUMBER A116701 PRODUCT NUMBER 3885522 TYPE SX-AACT32</p> <p style="font-size: small;">51804</p>	
SERIAL NUMBER:	
PRODUCT NUMBER:	
TYPE:	

Drive Unit Plate

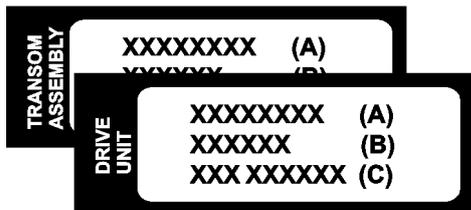
 <p>VOLVO PENTA SERIAL NUMBER A116713 PRODUCT NUMBER 3883623 TYPE SX-A RATIO 1.79</p> <p style="font-size: small;">51803</p>	
SERIAL NUMBER:	
PRODUCT NUMBER:	
TYPE:	
RATIO:	

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.

The engine decal is located on the engine cover.

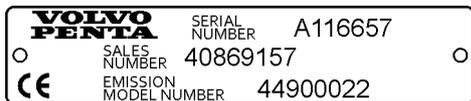


51805



22780-1

The transom assembly & drive unit stickers should be located on the engine decal. These stickers should have been placed on the engine decal at the time the transom assembly and drive unit were mounted on your boat.



51802

The engine plate is typically located on the port rear side of the engine block.



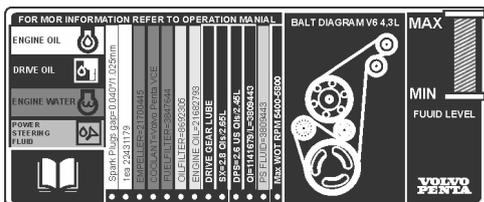
22773-a

The California emission sticker is located on the engine cover.



22776-a

The emission control Information sticker is located on the port side of the front accessory bracket (beside circulation pump).



P0019987

The tune-up and color code decal is located on the coolant expansion tank.

Declaration of Conformity

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.

Engine Manufacturer: Volvo Penta of the Americas, 1300 Volvo Penta Drive, Chesapeake, VA 23320, USA

Body for exhaust emission assessment
International Marine Certification Institute
Rue Abbé Cuypres 3, B-1040 Bruxells, Belgium
ID Number: 0609

Body for sound emission assessment
International Marine Certification Institute
Rue Abbé Cuypres 3, B-1040 Bruxells, Belgium
ID Number: 0609

Modules used for exhaust emission assessment
B
EC Type Examination according to Annex VII

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
V6-240	179 kW	EXVOL017	SDVOL021
V6-280	209 kW	EXVOL020	SDVOL022
V8-300	224 kW	EXVOL019	SDVOL024
V8-350	261 kW	EXVOL019	SDVOL024

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 complie(s) 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:

Joakim Falck
Director, Product Development Gasoline Products

Signature:



(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative)

Note:

This Declaration of Conformity does not apply to boats using through-hull exhaust systems.

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