# OWNER'S MANUAL

## 3.0, 4.3, 5.0, 5.7, 5.8

# *Owner's Manual*

## *Marine engines*

3.0GL/SX • 3.0GS/SX

4.3GL/SX, DP • 4.3GS/SX, DP • 4.3Gi/SX, DP

5.0FL/SX, DP • 5.0Fi/SX, DP

5.7GL/SX, DP • 5.7GS/SX, DP

5.7GLi/SX, DP • 5.7Gi/SX, DP • 5.7GSic/DP • 5.7GSi/SX, DP

5.8FL/SX, DP • 5.8Fi/SX, DP • 5.8FSi/SX, DP

This Owner´s Manual is intended for markets outside North America only.

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# Safety information

This Owner´s Manual contains the information you need to operate the engine correctly. Check that you have the correct Owner´s Manual for your engine.

⚠ **WARNING!** Read the manual carefully before operating or servicing the engine. Incorrectly undertaken operations could result in personal injury, or damage to property or the engine. If you do not understand or are uncertain about any operation or information in this manual, please contact your Volvo Penta dealer who will be able to help you with an explanation or will demonstrate the operation.

## Important

You will find the following special warning symbols in this manual and on the engine:

⚠ **WARNING!** If these instructions are not followed there is a danger of personal injury, extensive damage to the product or serious mechanical malfunction.

⚠ **IMPORTANT!** Used to draw your attention to something that can cause damage, product malfunction or damage to property.

**NOTE!** Used to draw your attention to important information that will facilitate work or operations.

 **Read instructions in the Owner´s Manual.**

Following is a summary of the risks and safety precautions you should always observe or carry out when operating or servicing the engine:

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

⚠ Always turn the engine off before starting service procedures. Avoid burns. Avoid hot surfaces and liquids in supply lines and hoses when the engine has just been turned off and is still hot.

Reinstall all protective parts removed during service operations before starting the engine. Make a point of familiarizing yourself with other risk factors, such as rotating parts and hot surfaces (exhaust manifold etc.).

Approaching a running engine is dangerous. Loose clothing or long hair can fasten in rotating parts and cause serious personal injury.

If the service operation requires that the engine is operating let your Penta authorized dealer carry out the work. If working in proximity of a running engine, careless movements or a dropped tool can result in personal injury.

⚠ Immobilize the engine by turning off the power supply to the engine at the main switch (switches) and lock it (them) in the OFF position before starting work. Set up a warning notice at the engine control position or helm.

⚠ Avoid opening the filler cap for engine coolant system (freshwater cooled engines) when the engine is still hot. Steam or hot coolant can spray out as system pressure will be lost. If opening the filler cap or drain cock/venting cock, or removing a plug or engine coolant line from a hot engine, open the filler cap slowly and release coolant system pressure gradually. Steam or hot coolant can spray out.

⚠ Stop the engine and close the sea cock before carrying out operations on the engine cooling system.

⚠ Only start the engine in a well-ventilated area. If operating the engine in an enclosed space, ensure that exhaust gases and crankcase ventilation emissions are ventilated out of the working area.

⚠ Anti-corrosion agents are hazardous to health. Read the instructions on the product packaging!

⚠ Anti-freeze agents are hazardous to health. Read the instructions on the product packaging!

⚠ Certain engine conservation oils are inflammable. Some of them are also dangerous if inhaled. Ensure that ventilation in the work place is good. Use a protective mask when spraying.

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

⚠ 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 - oxyhydrogen. This gas is easily ignited and highly volatile. Incorrect connection of the battery can cause a spark which would be sufficient to cause an explosion with resulting damage. Do not disturb battery connections when starting the engine (spark risk) and do not lean over batteries. Refer to instructions in the Instruction Book.

⚠ Always ensure that the positive and negative battery leads are correctly installed on the corresponding terminal posts. Incorrect installation can result in serious damage to electrical equipment. Refer to wiring diagrams.

⚠ Always use protective goggles when charging and handling batteries. Battery electrolyte contains sulfuric acid which is highly corrosive. If battery electrolyte comes into contact with unprotected skin wash off immediately using plenty of water and soap. If battery acid comes in contact with the eyes, immediately flush with copious amounts of water and obtain medical assistance.

⚠ Turn off the engine and turn off power at main switch(es) before carrying out work on the electrical system.

⚠ Clutch adjustments, where a clutch is fitted, must be carried out with the engine turned off.

⚠ Use the lifting eyes mounted on the engine/ reverse gear when lifting the drive unit. Always check that lifting equipment is in good condition and has sufficient load capacity to lift the engine (engine weight including reverse gear and any extra equipment installed).

To ensure safe handling and to avoid damaging engine components on top of the engine, use a lifting beam to raise the engine. All chains and cables should run parallel to each other and as perpendicular as possible in relation to the top of the engine.

If extra equipment is installed on the engine altering its center of gravity, a special lifting device is required to achieve the correct balance for safe handling.

Never carry out work on an engine suspended on a hoist.

⚠ Components in the electrical system, ignition system (gasoline engines) and fuel system on Volvo Penta products are designed and constructed to minimize the risk of fire and explosion.

Using non-original Volvo Penta parts that do not meet the above standards can result in fire or explosion on board. Damage caused by using non-original Volvo Penta replacement parts will not be covered under any warranty provided by AB Volvo Penta.

⚠ Fuel filter replacement should be carried out on a cold engine to avoid the risk of fire caused by fuel spilling onto the exhaust manifold. Always cover the generator if it is located under the fuel filter. The generator can be damaged by spilled fuel.

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

⚠ Always use fuels recommended by Volvo Penta. Refer to the Owner's manual. The use of lower quality fuels can damage the engine. Poor fuel quality can also lead to higher maintenance costs.

⚠ Observe the following rules when cleaning with high-pressure water jets. Never direct the water jet at seals, rubber hoses or electrical components. Never use a high pressure jet when washing the engine.

# General information

## Welcome aboard

Thank you for choosing a Volvo Penta marine engine. Volvo Penta have been building marine engines since 1907. Quality, operating reliability and innovation have made Volvo Penta a world leader in the marine engine industry.

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

We would like to wish you many pleasant voyages.

**AB VOLVO PENTA**

## Your new boat

Every new boat has it own special characteristics. Even experienced boat owners are advised to note carefully how the boat behaves at different speeds, weather conditions and loads. If your boat and engine combination permit high-speed use, we strongly recommend that a safety breaker is fitted, regardless of the type of boat. If your boat is not fitted with a safety breaker contact your Volvo Penta dealer who can assist you in selecting one.

## Running-in

A new marine engine needs to be run in for its first 20 operating hours. Run the engine at varying engine speeds but at a maximum of 3/4 throttle for the first two hours. In the next 8 hours of operation use the same operating method as earlier but with a maximum of 2 minutes at wide open throttle (WOT) included. During the last 10 hours the periods of running at WOT can be increased to 5-10 minutes at a time. Reduce throttle to idle engine speed between WOT running so that engine temperature drops. Never run an engine at a constant engine speed for long periods during the running-in period. The engine can be expected to use more engine oil during the running-in period than would otherwise be normal. Check the oil level regularly and more frequently during the running-in period. The First Service inspection should be carried out after 20 hours of operation.

## Fuel and lubricants

Only use lubricants and fuels recommended. See chapter ***Technical Data***. Use of other grades can cause malfunctions and reduced service life.

## Spare parts

⚠ **WARNING!** Components in the electrical system and in the fuel system on Volvo Penta products are designed and manufactured to minimize risks of fire and explosion. Using non-original Volvo Penta parts which do not meet the above standards, can result in fire or explosion on board.

Any type of damage which results from the use of non-original Volvo Penta replacement parts for the product will not be covered under any warranty provided by AB Volvo Penta.

## Safety

Everyone wants to have a problem-free and pleasant time when they take their boat out. To help you do this we have provided a pre-journey check-list, of course extra items can be added to this list if you want.

Important areas are the engine and its equipment and the general maintenance of the boat.

**Planning your trip**

- Get out up-to-date charts for the planned route
- Calculate distance and fuel consumption
- Note places where you can refuel on your planned course
- Tell friends or relatives about your route

**Safety equipment**

- Rescue and emergency items such as life vests and signal rockets. Does everyone know where they are?
- Replacement parts on board. On board kit with impeller
- Proper tools
- Fire extinguisher (checked and charged)

## Joint responsibility

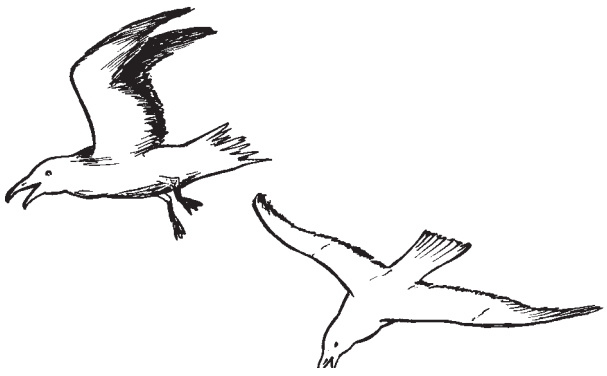
Volvo Penta continually commits a considerable part of its development resources towards minimizing the environmental impact of its products. Examples of areas where we are always looking for improvements are exhaust emissions, noise levels and fuel consumption.

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

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

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

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



## Warranty

A Service and Warranty book with conditions for Volvo Penta's International Limited Warranty is supplied with every engine. Contact your nearest Volvo Penta dealer or importer for your copy if you have not received one.

Some markets can have other warranty conditions depending on national legislation and regulations, information about these conditions can be obtained from Volvo Penta importers and dealers in those markets. Contact your local Volvo Penta representative for a copy.

## Warranty Registration Card

The Warranty Registration Form (North American market) or Warranty Card (other markets) should always be filled out and sent in by the dealer. Make sure that this has been done, since refusal of warranty can occur if no proof of the delivery date can be provided.

## Maintenance and care

Delivery undertaking Pre-Delivery Commissioning (PDC), for marine engines: "PDC" enables us to ensure that Volvo Penta products operate correctly after installation in a boat, and further that the end-user gets acquainted with the product, its functions and care (refer to checklist in the Warranty and Service book). Delivery undertaking "PDC" is carried out at the time of the delivery of the boat to the end-user. The cost of this work is covered by the Volvo Penta company's International Limited Warranty.

First Service inspection, for marine engines: A First Service inspection must be carried out after 20-50 running hours or within 180 days of delivery, or at the end of the first season, whichever comes first. Labor and material costs in connection with the First Service Inspection are not covered by the Volvo Penta International Limited Guarantee (for checklist see your Warranty and Service book).

Regular maintenance should be carried out after the First Service Inspection in accordance with the maintenance scheme in this book. Any work carried out in addition to maintenance services should be documented (refer to the Warranty and Service book)

It is an absolute condition for the Volvo Penta International Limited Warranty to apply that the Pre-Delivery Commissioning and First Service Inspection have been carried out by an authorized Volvo Penta service dealer.

## Volvo Penta Service

Volvo Penta has a comprehensive dealer network that offers both service and spare parts for Volvo Penta engines. These dealers have been carefully selected and trained to provide professional assistance for service and repairs. They also have the special tools and testing equipment required for maintaining a high standard of service. Volvo Penta dealers and vendors must maintain a stock of original spare parts and accessories to cover most requirements of Volvo Penta owners. When ordering a service or spare parts always quote the engine and drive type designation and serial number.

## Certificated engines

Important information for engines certificated for Lake Constance, Switzerland and other areas where exhaust emissions are limited by law.

All Volvo Penta engines and products are developed to minimize environmental impact.

National and regional legislation is not identical in all the markets where Volvo Penta sells its products. Occasionally legislation requires that we build special engine variants, or that an engine must be approved in advance, that is, certificated by the local authorities.

An engine with certification means that we, as the manufacturer, guarantee that all engines manufactured are of the same type as the certificated and approved example. Certification is not only a requirement covering engines from the factory, but also that engines in use must meet the environmental demands set for that engine. In order for Volvo Penta as the manufacturer to take responsibility for engines in use, certain requirements pertaining to service and spare parts must be met. We do not wish to discourage owners from carrying out service work themselves, rather the opposite since an owner can quickly notice if an engine is not operating normally.

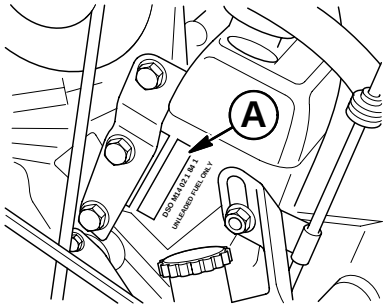
However, a number of service operations demand access to special expertise, workshop manuals, special tools and other equipment designed for the engines. These service operations may only be carried out by an authorized Volvo Penta Service workshop. Always contact your Volvo Penta dealer if you are not sure about anything concerning your engine's function or maintenance.

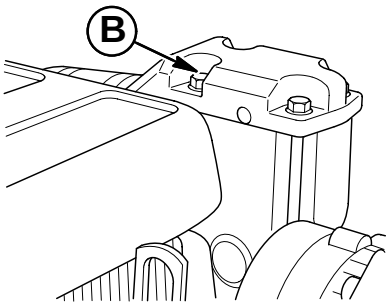
As the owner or operator of a certificated Volvo Penta engine it is important that you are aware of the following:

- The Service Intervals and maintenance operations recommended by Volvo Penta must be observed.
- Only Volvo Penta Original Spare parts intended for the certificated engine may be used.
- Service work on the ignition system, timing and fuel injection system must always be carried out by an authorized Volvo Penta workshop.
- The engine may not be altered or modified in any way, with the exception of accessories and service kits developed by Volvo Penta for that engine.
- No modifications to the exhaust pipes and air supply ducts for the engine room (ventilation ducts) may be undertaken as this may effect exhaust emissions.
- No seals on the engine may be broken except by authorized persons.

⚠ **IMPORTANT** Use only Volvo Penta Genuine Parts.

Use of non-original AB Volvo Penta spare parts will result in AB Volvo Penta being unable to assume liability for the engine meeting requirements under the engine certification. Any type of damage resulting from the use of non-original Volvo Penta replacement parts for the product will not be covered under any warranty provided by AB Volvo Penta.




## Type Approval Number

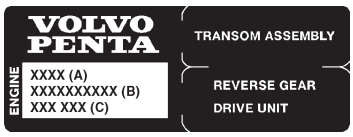
A type approval number is assigned to an engine model when it is certified for exhaust emissions. There are two certification decals placed on the engine to verify engine certification; one on the EFI computer cover, and the other at the front of the port cylinder head (**A**). These decals must be maintained so engine certification can be verified in the future.

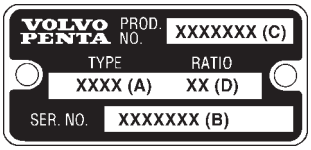
When an emissions check is required, the plug (**B**) located on the port high-rise elbow can be removed for installation of a test probe.

## Identification Numbers

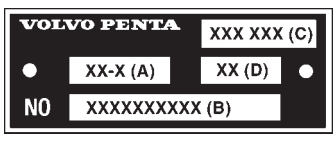
Immediately after you have taken delivery of your boat, make a note of the serial/product number and model designation of the engine, drive and shield. Include the serial number and model designation of the boat and any extra equipment.

This information is necessary when you contact your Volvo Penta or boat dealer for service and spare parts. Take a copy of the information and keep it in a safe place so it is available should the boat be stolen.




**SX/DP-S**




**DP-D**

**Engine**

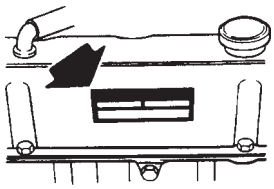
Product Designation (A) .....
Serial Number (B) .....
Product Number (C) .....

**Drive/Shield**

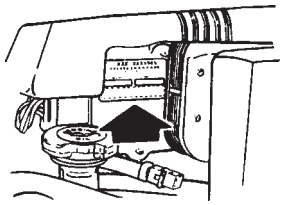
Product Designation (A) .....
Serial Number (B) .....
Product Number (C) .....
Gear Ratios (D) .....
Propeller designation .....

**Boat**

Model/Serial Number .....
Extra equipment .....
.....
.....
.....
.....

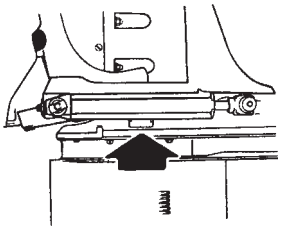


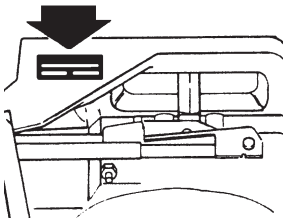
3.0/4.3/5.7



5.0/5.8

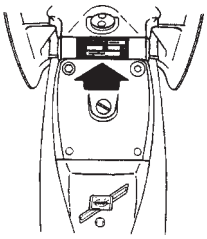
**Location of engine type plate**
The engine type plate is located on the engine valve cover for 3.0 models, on the inside of the port valve cover for 4.3/5.7 models, or on the Thick Film Ignition (TFI) module bracket for 5.0 and 5.8 models.

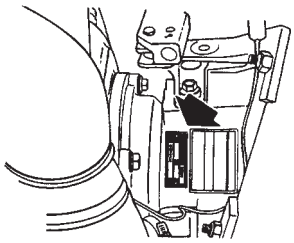




**Location of drive/shield type plate SX/DP-S**
The drive type plate is located on the drive unit behind the port trim/tilt cylinder.

The shield type plate is located on the top of the inner transom shield.





**Location of drive/shield type plate DP-D**
The drive type plate is located on the top of the upper gear unit.

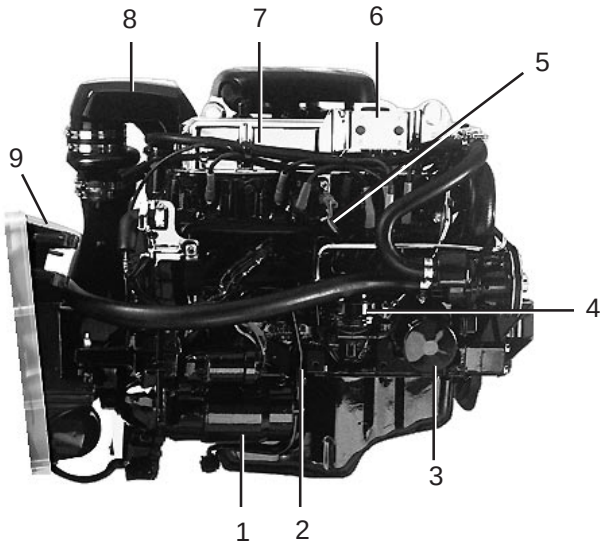
The shield type plate is located on the port side of the inner transom shield.

## Engine Component Guide

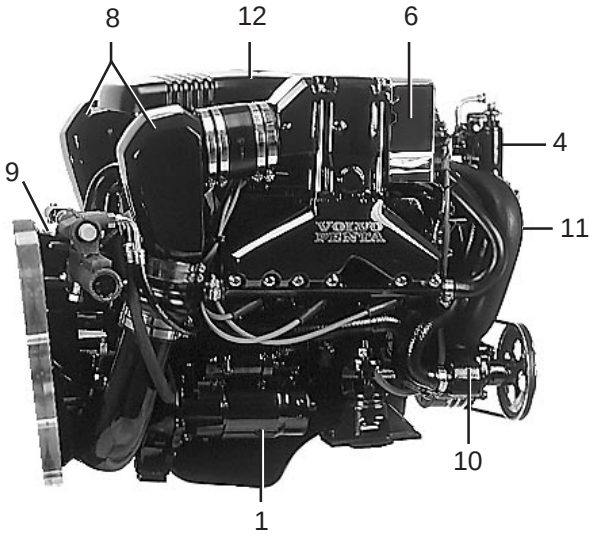
**Starboard**

1. Starter Motor
2. Oil Withdrawal Tube
3. Oil Filter
4. Fuel Pump
5. Oil Level Dipstick
6. Circuit Breakers
7. Type Plate (engine)
8. Water-Cooled Exhaust Pipe
9. Type Plate (shield)
10. Seawater Pump
11. Fuel Filter
12. Cover for flame arrestor and carburetor
13. Generator (GEN)
14. Electronic Control Assembly (ECA)
15. Cover for flame arrestor and throttle housing and electronic controls

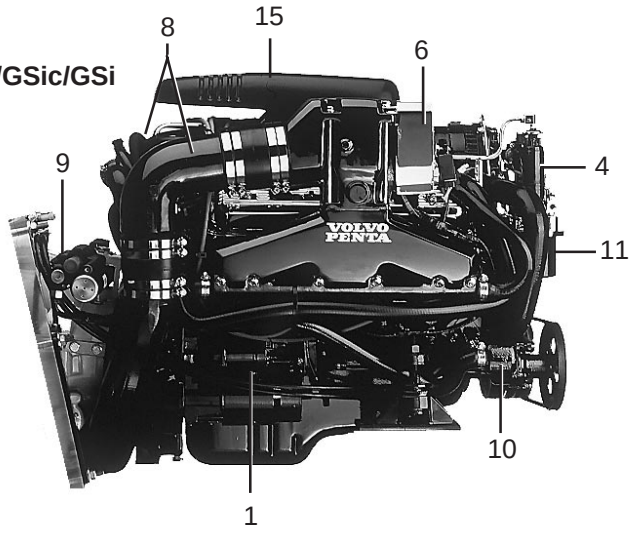
**3.0GL/GS**




**4.3GL/GS, 5.7GL/GS**




**4.3Gi, 5.7Gi/GLi/GSic/GSi**



## Engine Component Guide

**Starboard**

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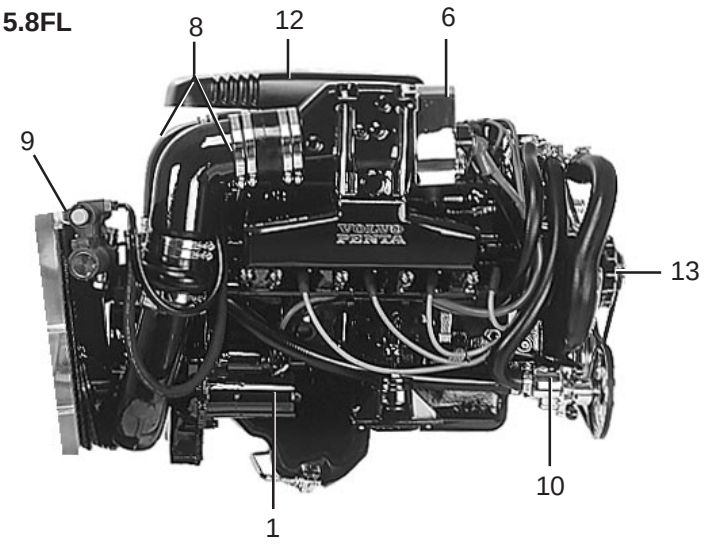
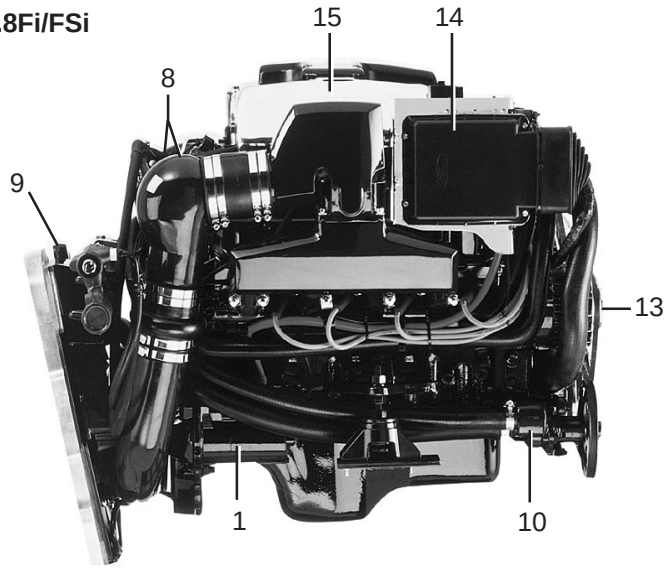
15. Cover for flame arrestor and throttle housing and electronic controls

**5.0FL, 5.8FL**




**5.0Fi, 5.8Fi/FSi**

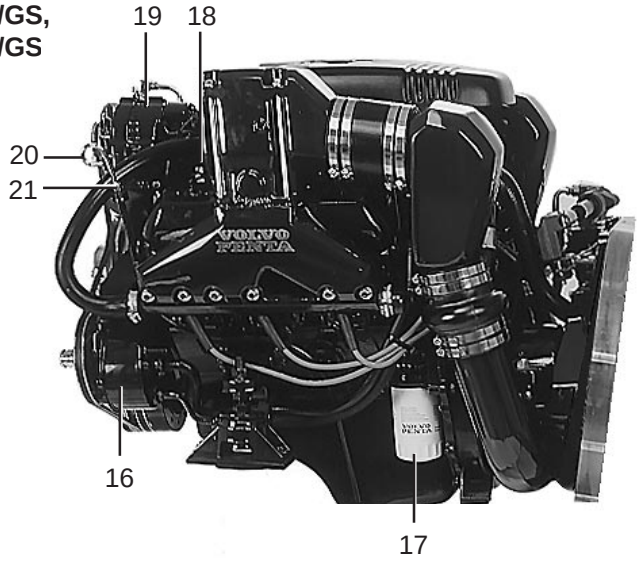



## Engine Component Guide

**Portside**

16. Power Steering Pump
17. Oil Filter
18. Oil Filler
19. Alternator
20. Oil Level Dipstick
21. Oil Withdrawal Tube

**4.3GL/GS, 5.7GL/GS**

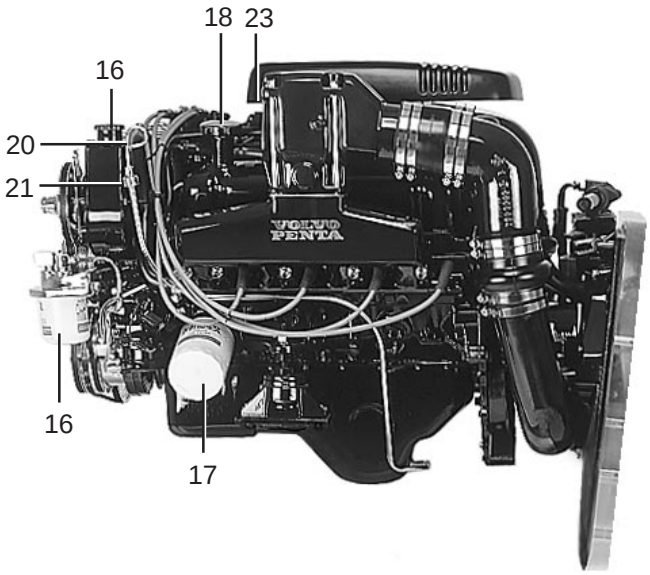


## Engine Component Guide

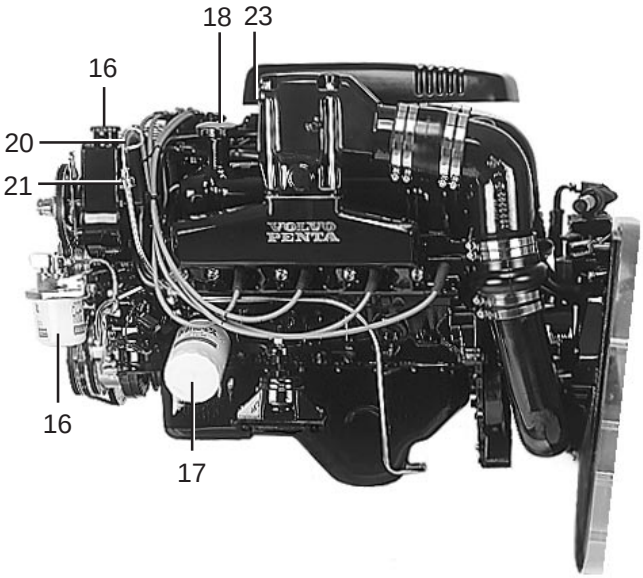
**Portside**

16. Power Steering Pump
17. Oil Filter
18. Oil Filler
19. Alternator
20. Oil Level Dipstick
21. Oil Withdrawal Tube
22. Fuel Filter
23. Type Plate
24. Circuit Breakers

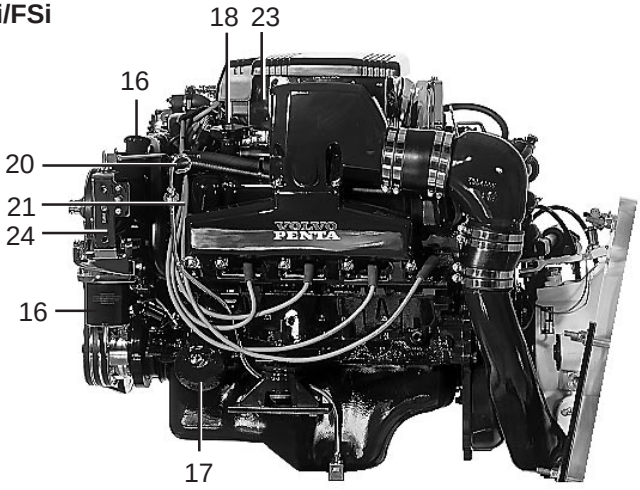
**5.0FL**




**5.8FL**



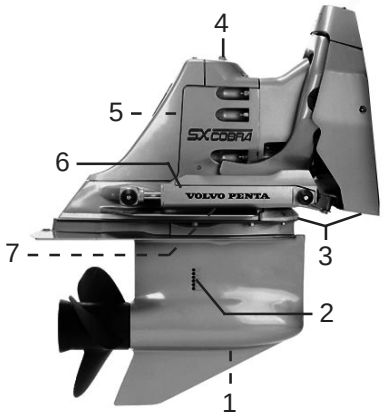

**5.0Fi, 5.8Fi/FSi**



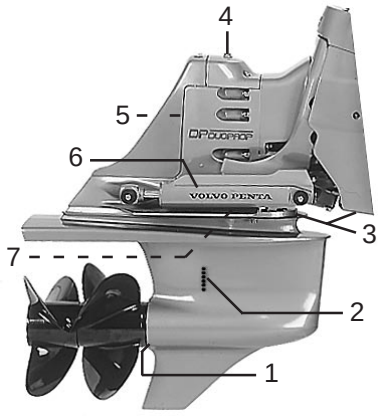
## Drive Component Guide

1. Draining Oil
2. Seawater Intake
3. Sacrificial Anode
4. Oil Level Dipstick
5. Topping Up Oil
6. Trim Cylinder
7. Type Plate
8. Sacrificial Anode

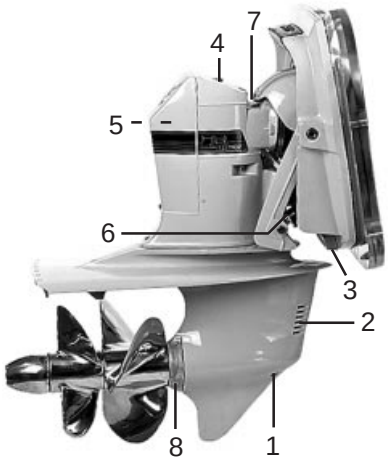
**SX Drive**




**DP-S Drive**

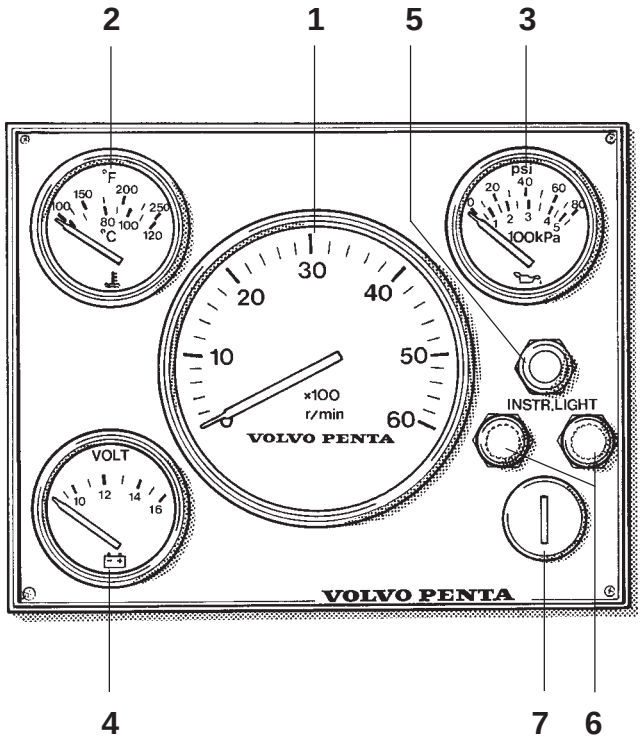



**DP-D Drive**



# Instrumentation

The instrument panel for Volvo Penta petrol engines is equipped with a tachometer, temperature gauge, oil pressure gauge, voltmeter, 2 fuses, instrument lighting switch and an ignition switch. Instruments, fuses and ignition switch can also be installed separately without an instrument panel. The boat builder's instrumentation can also be supplemented with extra Volvo Penta instruments, such as: synchronization tachometers, fuel gauge, fresh water gauge, clock, speed log or rudder indicator.




## 1. Tachometer

Shows the rpm of the engine. Multiply this value by 100 for revolutions per minute. Integral "Hours run" meter (only on separately installed instrument). Displays the engine's operating time in hours and tenths of an hour.

Engine speed range: See chapter "Operation".

## 2. Temperature gauge

Indicates the engine coolant temperature. Normal operating temperature is approx. 70-90°C (158 - 194°F).

## 3. Oil pressure gauge

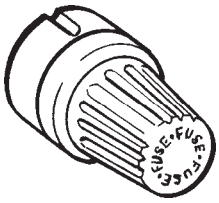
Indicates the oil pressure in the engine. Normal operating oil pressure is approx. 150-500 kPa (21-71 psi). At engine idle this is normally lower.

## 4. Voltmeter

Indicates the charge current from the generator which should normally be approx. 14 V. With the engine stopped the current indicated is that in the starter battery circuit, normally 12 V.

## 5. Instrument lighting

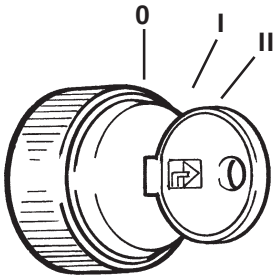
Switch for instrument lighting.




## 6. Fuses, 8 A

Fuses for the starter function and system voltage. To change fuses: Press the button and turn anti-clockwise.

⚠ **IMPORTANT** Always carry extra fuses on board.



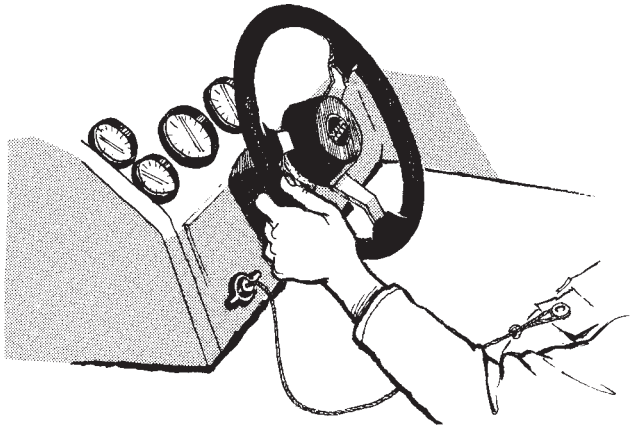

## 7. Ignition switch

The ignition switch has three positions (these positions are not marked):

**0** = The key can be inserted and taken out.
**I** = Operating and running position. System voltage connected
**II** = Starter position (spring-loaded). The starter motor is engaged.

⚠ **IMPORTANT** Read the starting instructions in the chapter **"Starting the engine"**.

The ignition keys are marked with a key code used when ordering extra keys. Make a note of this key code so that keys can be ordered if the old keys get lost. Keep the code in a safe place where unauthorized persons do not have access to it.



## Emergency stop switch

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

Using this switch is simple and should not interfere with normal operation of the boat. Care must be taken to avoid accidentally pulling the lanyard during normal operation. Unexpected loss of forward motion will occur. This could allow occupants to be thrown forward. In an emergency situation, any occupant of the boat can restart the engine. Just press in and hold the emergency stop switch button, then follow normal starting procedure. When the button is released, the engine will stop.

⚠ **IMPORTANT!** The emergency stop switch can only be effective when in good working condition. 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, pull lanyard. If engine does not stop, see your dealer.

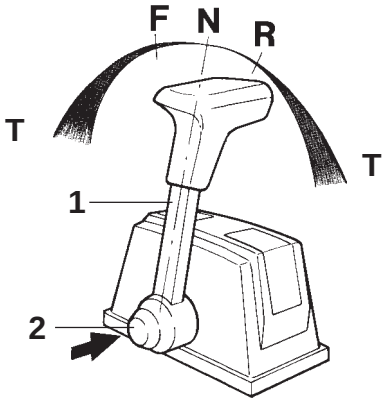
⚠ **IMPORTANT!** If your boat is not equipped with an emergency stop switch and it falls into one of the following categories, installation of an emergency stop switch is recommended.

- 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 30 cm.

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

The shift function and engine speed control are combined in one lever. The shift function can be simply disengaged so that only engine speed is affected. The control is available for top or side mounting. The control lever has an adjustable friction brake. A neutral position switch is available as an accessory, this will only permit the engine to be started with the drive disengaged.

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




## Maneuvering

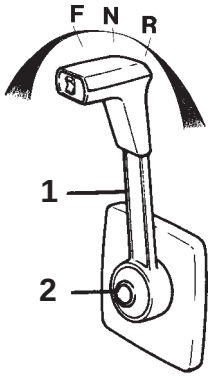
Shifting and engine speed are controlled with the same lever (**1**).

**N** = Neutral position. Drive/reverse gear disengaged

**F** = Drive/reverse gear engaged for forward movement (ahead).

**R** = Drive/reverse gear engaged for backward movement (astern).

**T** = Engine speed control.

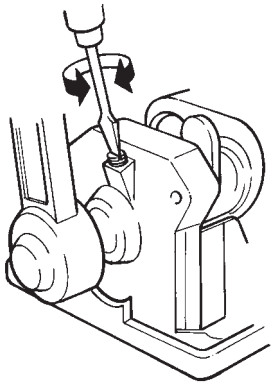



## Disengaging the shift function

Move lever (**1**) to the neutral position (**N**). Press in button (**2**), move the lever slightly forward and release button. The shift function is now disengaged and the lever affects only engine speed.

When the lever is moved back to the neutral position it will automatically re-engage.

⚠ **IMPORTANT!** Take care not to engage the drive by mistake.

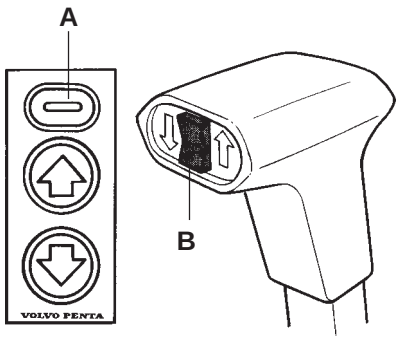


## Adjusting the friction brake

The friction brake only affects the engine speed control movements. Adjust with the lever in the **half-open throttle/reverse position.**

- Remove the cover over the control. **For side-mounted controls the lever must first be removed.**
- Adjust the friction brake by turning the screw at the arrow (see figure).
- Turn clockwise (**+**) for more friction and counterclockwise (**-**) for less friction.
- Reinstall the cover and lever.

Your Volvo Penta sterndrive is equipped with a power trim/tilt system as standard equipment. The purpose of power trim/tilt is to enable the operator to change the angle of the drive unit from the helm. Changing the angle of the drive unit in relation to the boat bottom is called "Trimming". Trimming provides the following benefits: Improves acceleration onto plane, maintains boat on plane at reduced throttle settings, increases fuel economy, provides smoother and/or drier ride in choppy water conditions, increases top speed.




## Trim control

Trimming and raising the drive can be done either using the separate control panel (**A**) installed on the dashboard, or using the control button (**B**) in the control lever (accessory). The trim position of the drive is shown on the separate trim instrument.

### Manoeuvring

The manoeuvring panel (**A**) has three buttons. The center button raises the bows of the boat. The lower button lowers the bows of the boat. The upper button bypasses the Beach range catch (DP-D, DP-S drives only). This button has no function on the SX drive unless it is fitted with the trim limiter (accessory).

Using the button (**B**) in the control lever it is possible to raise the bow of the boat by pressing the upper half of the button, and to lower it by pressing the lower half of the button. To trim within the BEACH range press a separate switch on the instrument panel (to bypass the catch) at the same time.

### Trim controls

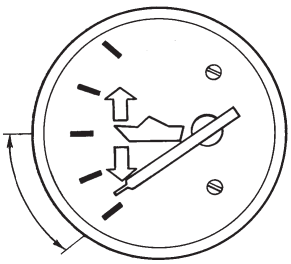
SX and DP-S drives only have analogue trim instruments.

DP-D drive can have either an analogue or digital trim instrument.

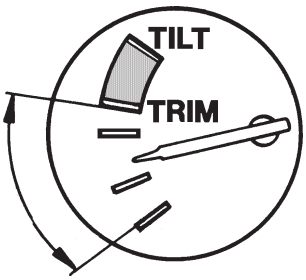
## Analogue trim instrument

The trim instrument indicates the current trim position. It has a scale with five segments and three main ranges:

DP-D

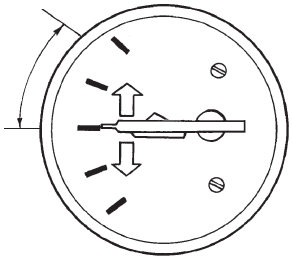


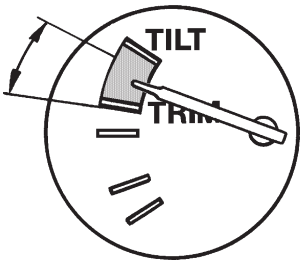
SX/DP-S




### 1. Trim range

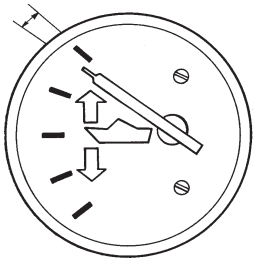
The trim range is used to achieve maximum comfort under normal operation from start to maximum speed.

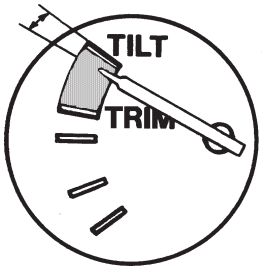





### 2. Beach range

The beach range is used for operation **at reduced speed** in shallow water where water depth is uncertain. This range is also used when launching and taking the boat out of the water onto a trailer ramp.






### 3. Lift range

The lift range is used for lifting the drive to its maximum angle, **however this cannot be used during operation**. This range is used for transporting the boat and to minimize fouling of the drive. The Power Trim has an automatic stop which cuts off the current when the stop position is reached. The stop is automatically reset when trimming down.


## Digital trim instrument (DP-D)

Displays a figure within the range. This figure is the angle of the drive to perpendicular (stationary boat). The instrument has a built in control program which starts each time the instrumentation is switched on with the ignition key. When this control program is run, all LCD segments light and A- BEACH is displayed. The instrument then returns to displaying the current drive angle.


**BEACH lock function**
Boats with separate BEACH catch bypass switches can be equipped with a lock function.

Trim to and within the BEACH range as follows:

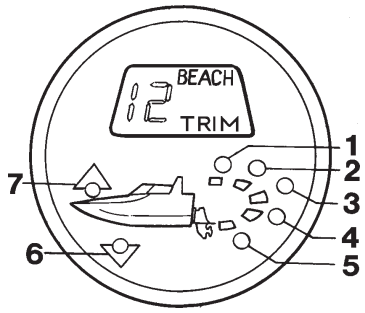
Press the button to bypass the BEACH catch. The signal lamp lights to confirm that the lock function is engaged. The drive can now be trimmed with one hand within the BEACH range. The lock function remains engaged as within the BEACH range. When the drive is lowered into the TRIM range the BEACH catch engages again and the signal lamp lights.

**TRIM =** Drive position at all speeds. Max trim up to 5.

**BEACH =** Used for operation at in shallow water where water depth is uncertain. Speed should always be low. 6 - 40.

**Lift =** Flashing red warning lamp. Drive up completely. See LEDs position 1.

⚠ **IMPORTANT!** The engine must not be run with the drive in this position.




**LEDs**

**1** Flashes red within the lift range above 40. Otherwise out.

**2** Constant red light: 6 - 40. Otherwise out.

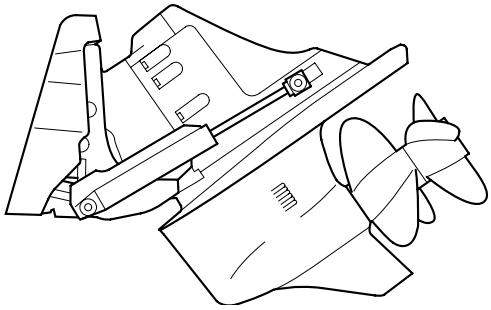
**3** Constant green light: 2 - 5. Otherwise out.

**4** Constant green light in the range 0 - 2. Otherwise out.

**5** Constant green light in trimmed range up to 0. Otherwise out.

**6** Constant yellow light in maximum trimmed position up to 0. Flashes when the drive moves and the bow is lowered. Otherwise out.

**7** Constant yellow light. 2 to 5. Flashes when the drive moves and the bow is raised.



## Trim/tilt motor protection

⚠ **IMPORTANT!** Always allow the trim/tilt switch to return to its center position when the drive unit reaches the maximum raised or lowered position. This will prevent your trim/tilt motor from overheating.

The trim/tilt motor is protected from overheating by an internal thermal overload switch (SX, DP-S). Should the electric motor stop while tilting, release the switch and allow the overload switch to cool and automatically reset itself. When the overload switch has reset, tilting may be resumed. Make sure the drive unit is not being restrained, causing the motor to overheat. If the electric motor still does not operate, check the 10 amp inline fuse (if equipped) or the external 10 circuit breaker and the 50 amp circuit breaker. Refer to Electrical Systems section.

## Impact protection

The trim/tilt system provides impact protection for the drive unit. Still, impact damage can occur in either forward or reverse directions. Care must be taken:

- When operating in forward or reverse
- When backing at low speed
- When trailering boat
- When launching boat

Impact damage is more likely to occur when in a turn where side loads are placed on the drive unit.

If the drive unit strikes a solid object, throttle back and shut off engine immediately. Closely inspect the boat and drive unit for damage, particularly the transom shield assembly that contains steering system components. Check engine compartment for water leakage.

If there is obvious or suspected damage, operate boat at low RPM and take your boat to a Volvo Penta dealer for inspection. Have necessary repairs made immediately. Operating a damaged drive unit could cause additional damage and could become very costly to repair.

⚠ **IMPORTANT!** Failure to inspect for damage may:

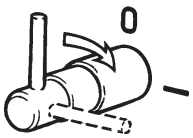
- Result in sudden loss of steering control.
- Adversely affect your boat and drive unit's ability to resist subsequent high speed impacts.

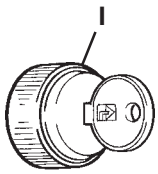
**NOTE!** When moving in reverse there is no impact protection. **Use caution when moving in reverse. Do not exceed 2500 RPM.**

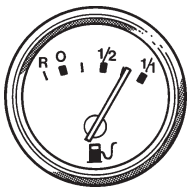
# Starting the engine

Familiarize yourself with the operation of the remote control supplied with your boat, then proceed as follows.

⚠ **IMPORTANT!** Pumping bilge: Frequently check bilge for leaking engine, power steering, or trim system oil. Find the cause and correct it immediately. Regulations prohibit the pumping of oil into any navigable waters. Always dispose of oil waste at proper disposal areas so they do not harm the environment.




## Preparations

Check the bilge for excessive water accumulation. Always keep the bilge clean and dry. Never allow the water depth in the bilge to exceed the bottom of the engine. Note! The water level in the boat's bilge will increase when the boat is operated at a high incline before planing speed is reached. Excessive water in the bilge can cause engine damage.

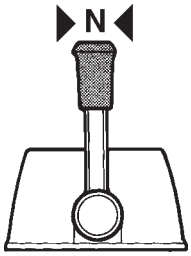
- Open the fuel cock.
- Check that there are no fuel, engine coolant or oil leaks.
- Check the engine oil level. See section on **Maintenance.**
- Switch on the main switches.

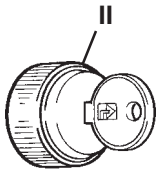
⚠ **IMPORTANT!** Never break the circuit with the main switches while the engine is running. The generator and engine electronics (injection engines) may be damaged.

- Insert the key in the ignition switch. Turn the key one step to the right (operating position **I**) this switches on the engine system voltage and instrumentation.
- Start the engine compartment fan if one is fitted and let it run for at least four minutes.

⚠ **WARNING!** To prevent a possible explosion, operate the blower as recommended by the boat manufacturer before starting engine. If the engine compartment is not equipped with a blower, open engine cover or hatch prior to starting to allow any fuel fumes that may be present to disperse. Leave hatch open until after engine is running.

- Check that there is sufficient fuel.
- Lower the drive if it was raised. Check there are no obstacles in the water near the propellers.




## Starting

**NOTE!** Do not start engine out of water unless using a flushing adapter.

⚠ **WARNING!** When using a flushing adaptor, remove the propellers befor starting engine to prevent accidental contact with moving propellers. If propellers are not removed, personal injury could result.

- Move the control lever to the neutral/idle position.
- Turn the ignition key one more step to the right (starter position **II**) to start the engine. Release the key as soon as the engine has started. Turn the starter motor for a maximum of 10 seconds, if the engine does not start release the key and try again after a few seconds.

⚠ **IMPORTANT** Never turn the key to the starter position with the engine running!

- Immediately after the engine has started check that the **oil pressure** and **battery charge** instruments are reading normal.

**NOTE!** Your boat may be equipped with a low oil pressure (and high engine coolant temperature) acoustic alarm and warning lamp. This alarm may sound while the engine is started until oil pressure has built up. Never rev a cold engine!

- If the engine is cold: idle it, while casting off for example.
- Shift to forward or reverse and start off.

## If engine floods

**Gi, GLi, GSic, GSi models:**
A flooded engine can be cleared by advancing the control handle to a position of 3/4 throttle. In this throttle position and the engine speed below 400 RPM (cranking speed) the ECM turns off the fuel injectors so no fuel is delivered. When the throttle position is moved to full throttle or less than 3/4 throttle, the ECM returns to the starting mode.

⚠ **IMPORTANT!** Be prepared to quickly move the control handle to the idle position once the engine starts. This will avoid overspeeding and possible damage to the engine.

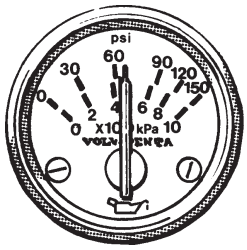
**GL, GS models:**
Disengage the shift control and move the handle to the full throttle position. Turn the key switch to the START position. Immediately move the control handle to the idle position when the engine starts.

⚠ **IMPORTANT** Be prepared to quickly move the control handle to the idle position once the engine starts. This will avoid overspeeding and possible damage to the engine.

All shifting between forward/reverse must be done at engine idle speed. Shifting at higher speeds may damage the drive/reverse gear and will also be uncomfortable for those on board. If the boat has two or three engines, it is important that they are all running during maneuvers astern (rearward movement), otherwise water might get into the exhaust of the engine which is not running when the backwash catches up with the boat. Water getting into the engine can cause serious damage.

## Checking instruments

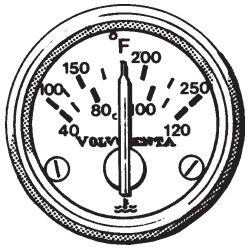
Check instruments regularly. Stop the engine if there is an abnormal reading or if an alarm (accessory) sounds. The following normal readings apply:




### Oil pressure

Normal operating oil pressure is approx. 150 - 500 kPa (21-71 psi). At engine idle this is normally lower. Your boat may be equipped with a low oil pressure acoustic alarm and warning lamp (accessory).

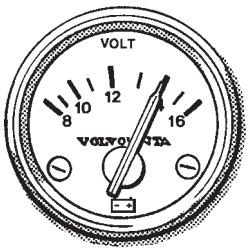
⚠ **IMPORTANT!** If oil pressure is too low: Stop the engine immediately and investigate.




### Engine coolant temperature

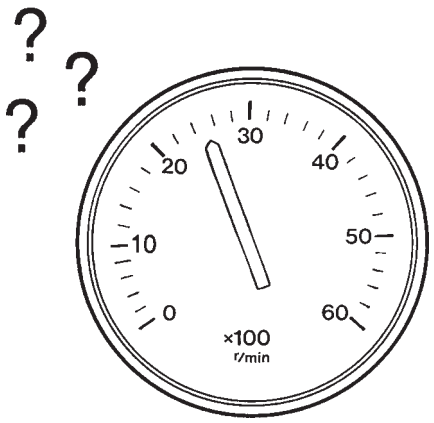
The temperature gauge should read between 70 - 90°C (158 - 194°F) normally. Your boat may be equipped with an engine coolant temperature acoustic alarm and warning lamp (accessory).

⚠ **IMPORTANT!** If engine coolant temperature is too high: Idle the engine, shift to reverse and then to forward. Idle the engine for 2 - 3 minutes and shut off the engine if the temperature does not sink. Investigate and correct the malfunction.




### Charge

The operating charge is approx. 14 V. When the engine is stopped battery voltage is approx. 12 V.




## Engine protection mode

**(Gi, GLi, GSic, GSi, Fi, FSi)**

In a low oil pressure or engine overheat situation, the EFI system enters an Engine Protection Mode. In these situations, normal engine operation is limited to 2500 to 2700 RPM or less. Above 2500 to 2700 RPM the engine will exhibit poor running characteristics. Use the oil pressure and water temperature gauges to verify a problem exists, then check the engine crankcase for proper oil level and the water inlets for obstructions. The low oil pressure/engine overheat problem must be corrected before the engine will return to normal operation.

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

**NOTE:** Should the problem continue, contact your nearest Volvo Penta dealer and have the engine checked.

## Abnormal running qualities driving forward

**(Fi, FSi)**

If your engine exhibits one of the following abnormal running characteristics, one of the Electronic Engine Control (ECC) system sensors has failed.

- Continuous 800 RPM idle
- Idle RPM oscillates then engine dies
- Remote control warm-up lever must be repeatedly used to aid starting a hot engine

See your Volvo Penta dealer for service assistance if these or other unusual operating conditions occur.

## High altitude operation

**(Engines with carburetors only)**

A performance loss at altitudes above 5000 ft. can be expected. If you are boating above 5000 ft. altitude 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 carburetter adjustment.

## How to shift and control speed

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

⚠ **IMPORTANT!** Carefully check function of all control and engine systems before leaving the dock.

- Move control handle to the neutral detent (idle) position. Check in front and behind boat for people or obstructions before shifting.
- To go **forward:** Briskly move the shift handle forward. Throttle movement will begin after forward gear engagement.
- To go in **reverse:** Briskly move the shift handle rearward. Throttle movement will begin after reverse gear engagement.

⚠ **IMPORTANT!** Do not shift 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.

- To go from **forward to reverse**, or **reverse to forward**, always pause at **neutral** and allow engine speed to return to idle.
- After shifting is completed, continue to move the control handle slowly in the desired direction to increase speed.

⚠ **IMPORTANT!** Any time the boat is operated, be aware of changes in shift system operation. A sudden increase in shift effort at the remote control handle, or other abnormal operation, indicates a possible problem in the shift system.

If you suspect there is a problem, see your Volvo Penta dealer as soon as possible for proper diagnosis and required service or adjustment. Continued operation could result in damage to the shift mechanism and loss of shift and throttle control that could result in personal injury.

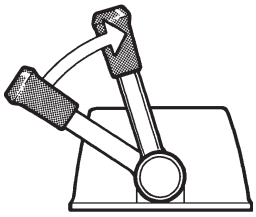
## Twin unit manoeuvring

When leaving or approaching the dock, or for any close manoeuvring at slow speed, place the starboard engine in neutral, on standby, and use the port engine with the control nearest the operator. The use of one control is very effective and more convenient.

In the event that the port engine being used for manoeuvring stops, you can immediately go to the starboard engine which has been on standby.

⚠ **WARNING!** If manoeuvring with the engine that has the power steering pump and it stops, the power steering assist is lost. Failure to follow the above manoeuvring procedure could result in a collision and personal injury.

**NOTE:** Both engines must be running during close manoeuvring or at slow speeds. Water may be forced back through the underwater exhaust outlet and cause serious engine damage if only one engine is running. Do not attempt to plane boat while operating on a single engine. The propellers are selected for the boat with the consideration that both engines operate together. Operating with a single engine at full throttle could cause engine or drive damage.

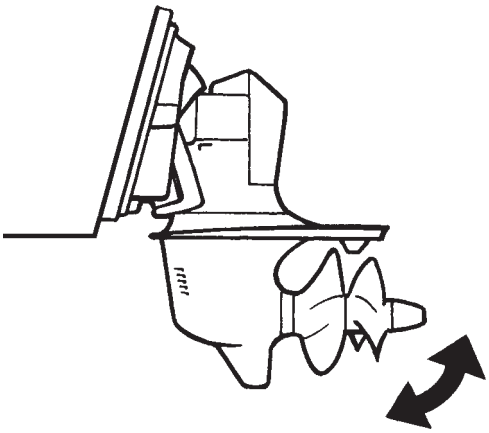


## Cruising speed

Operating the engine at wide open throttle (WOT) should be avoided since it is both uneconomical and uncomfortable. Volvo Penta recommends a cruising speed in the range 300 - 500 rpm lower than maximum rpm at WOT. Depending on hull type, choice of propeller, load and conditions etc. the maximum engine speed at top speed can vary, but it should be within the WOT range.

**Wide Open Throttle (WOT) range:**

| | |
|---|---|
| 3.0GL/GS | 4200–4600 rpm |
| 4.3GL | 4200–4600 rpm |
| 4.3GS/Gi | 4400–4800 rpm |
| 5.7GL/GS/GLi/Gi | 4200–4600 rpm |
| 5.7GSic | 4000–4400 rpm |
| 5.7GSi | 4600–5000 rpm |
| 5.0Fi, 5.8Fi | 4200–4600 rpm |
| 5.8FSi | 4600–5000 rpm |



## Power Trim

The hydraulic trim system (Power Trim) makes it possible to adjust the boat's trim for maximum comfort and fuel economy in different operating conditions.

Every boat has its own unique characteristics that are also affected by external factors. When you have got to know your boat thoroughly you can experiment with the best trim angles for different speed, load and sea conditions. It can generally be said that when the boat feels well-balanced, easy to steer and pleasant to operate, then that is the optimal trim angle for the boat. For information about the Power Trim controls and instruments: See chapter ***Power Trim***.

### *With the drive in the "Trim range".*

⚠ **WARNING!** The drive should not be trimmed violently when running at high speed. If the bow is lowered at high speed the boat's ability to hold a course may become unstable. To a great extent this is dependant on the shape of the hull and will vary from boat to boat. However, even if safety is not compromised the result may be an unpleasant experience for driver and passengers, who may lose confidence in the boat's handling.

### When starting

Trim the drive. The bow will be pressed down and the boat accelerates faster. This gives improved running and steering characteristics at speeds below the planing threshold.

### At planing speed

Trim the drive out to the running position which feels comfortable and the boat feels stable and smooth.

## For maximum fuel economy

Run boat at a constant throttle opening. Trim the drive out/in a little. The boat is most easily propelled and speed will increase in the position that gives the highest engine speed. The throttle opening can then be slightly reduced to retain the original speed.

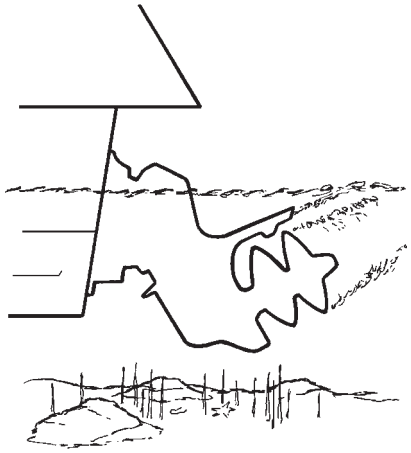
## In choppy seas or running against a heavy sea

Trim drive so the bows drop. This will provide more comfortable running.

⚠ **WARNING!** High speed running in a heavy sea is dangerous. High speed running in a heavy sea requires the driver's maximum attention and a boat of the right size and design for this type of running.

## Side winds

If the boat has a dual installation the drives can be trimmed at different trim angles. This compensates for side winds or uneven transverse load distribution (athwartships), which makes the boat list during running.

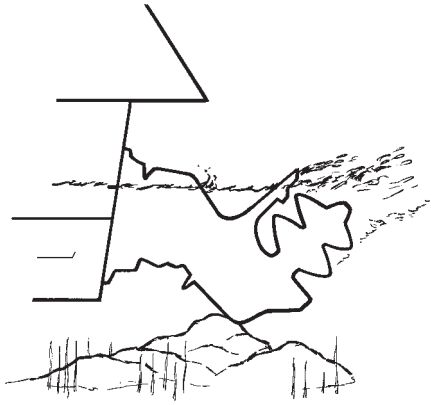


### *With the drive in the "Beach range":*

## Running in shallow water

If you do not know how much water is under the keel, slow down and trim the drive to the "Beach range".

⚠ **IMPORTANT** Maneuvering characteristics change with the drive in the "Beach range": Always lower your speed before trimming the drive in the "Beach range". Max. permitted engine speed (rpm) when running in the "Beach range" is 1000 RPM.



## *Running aground:*

### Kick-up function

The drive has a built-in Kick-up function which releases the drive if it grounds or strikes an obstruction in the water. If the function has been tripped and the drive released it must be trimmed back to the original position using the control buttons.

⚠ **IMPORTANT** The Kick-up function only protects the drive when running ahead (forwards). There is no protection for the drive while running astern (backward).

After running aground check for damage to the drive or propeller and for vibrations from the drive. If this is the case then the boat (if possible) should be run to harbor at reduced speed and taken out of the water.

Check the oil level in the drive. If it is colored gray then water has entered the drive. If this is the case or if other damage has occurred to the drive it must be inspected at an authorized Volvo Penta workshop.

If a propeller has been damaged it must be replaced. Launch the boat and test drive. If there are still vibrations it must be inspected by an authorized Volvo Penta workshop.

⚠ **IMPORTANT** To prevent galvanic corrosion any damage to the paintwork on the drive and propeller must be repaired before launching the boat: See chapter on ***Laying up/Launching.***

## *With the drive in the "Lift range":*

⚠ **IMPORTANT** The engine must never be run in the "Lift" range.

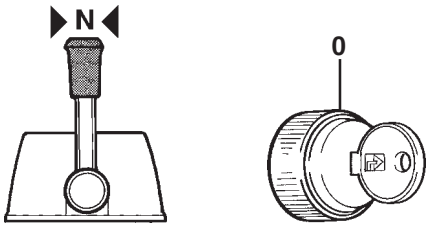
See also chapter: **After use**, "Transporting on a trailer".

# *After use*

To counteract boiling and heat stress the engine should be run for a few minutes at idle (in neutral) before turning it off. This is especially important if the engine has been operated at high engine speeds (rpm).

Before stopping the engine: The drive must be trimmed in to its maximum to protect the trim cylinders untreated surfaces from fouling.

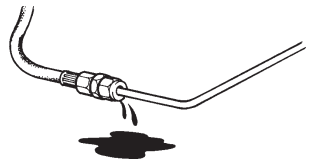
⚠ **IMPORTANT!** Do not trim the drive if it might hit the bottom, at low water for example. Trim it to its maximum raised position instead.

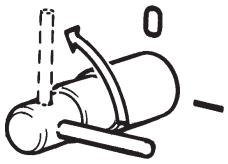



## Stopping the engine

- Move control handle to the NEUTRAL position.
- Turn ignition key to the OFF position.

**NOTE!** Do not stop engine at speeds above idle or "speed up" engine while turning off ignition. Engine damage could result.






## Safety measures

- Inspect the engine and engine compartment for any leaks.
- Close the fuel cock.

⚠ **IMPORTANT** Do not forget to open the cock before the engine is started again.

- Switch off the main switches if the boat is not to be used for some time.

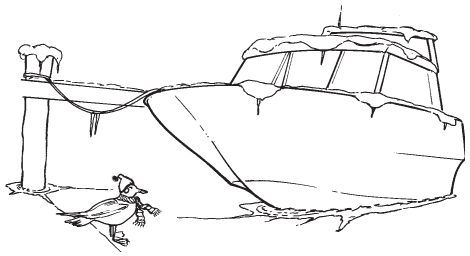
⚠ **IMPORTANT!** Never break the circuit with the main switches while the engine is running. The generator and engine electronics (injection engines) may be damaged.

## Salt water operation

Your Volvo Penta sterndrive is built for operation in either fresh or salt water.

If boat is moored for long periods, tilt drive unit out of the water (except during freezing temperatures). When removing the boat from the water, lower drive unit to the run (down) position until the cooling system has drained thoroughly

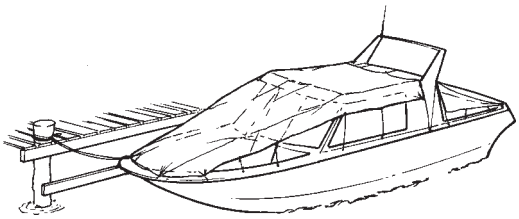
⚠ **IMPORTANT** After use in polluted or salt water and kept laid up on land the entire sterndrive's exterior should be rinsed with fresh water.



## Cold weather precautions

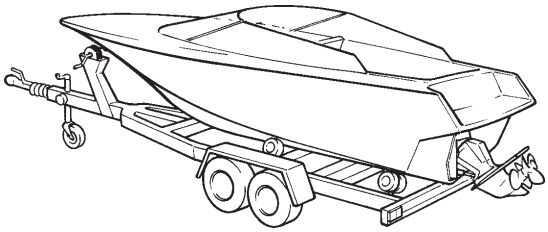
To prevent freezing damage the seawater system must be drained and the freshwater system (accessory) coolant must have sufficient anti-freeze protection. See chapter **Maintenance** "Cooling systems".

⚠ **IMPORTANT** A poorly charged battery may burst as a result of freezing.



## Laying up

If the boat is not going to be used for some time but be left in the water, the engine must be run hot at least once every 14 days. This prevents corrosion in the engine. If the boat is not going to be used for longer than two months then inhibiting procedures must be applied: See chapter: ***Laying up and inhibiting.***



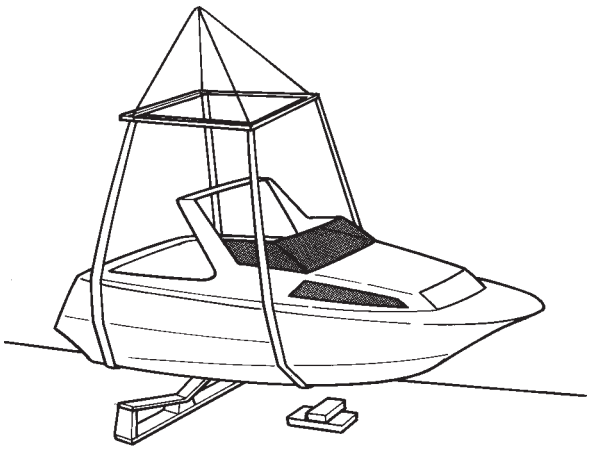
## Transporting on a trailer

Trim out to the "Lift" range (maximum lift point) before pulling the boat onto the trailer. An automatic stop will cut off the current to the hydraulic pump when the drive has reached its max. lift point. The stop is automatically reset when trimming down.

**NOTE!** Check local legislation for transporting boats on trailers, there are differences between different countries' trailer laws.

⚠ **IMPORTANT!** After use in polluted or salt water the entire sterndrive's exterior should be rinsed with fresh water.

The engine must not be run with the drive in the "Lift" range. Before transporting the boat by trailer always secure the drive in the lift position with a Trailer Kit (accessory) or similar, so that it cannot drop down.



## Laying up on land

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

**NOTE!** Do not use a wire brush or other steel tools when cleaning, as these may damage the galvanic protection.

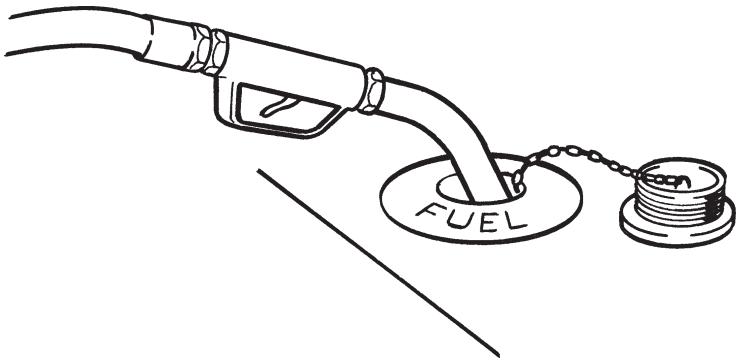
⚠ **IMPORTANT!** After use in polluted or salt water the entire Volvo Penta sterndrive's exterior should be rinsed with fresh water.

## Fuel requirements

⚠ **WARNING!** Fuel is extremely flammable and highly explosive under certain conditions. Always stop the engine and do not smoke or allow open flames or sparks near the boat when refuelling.

When filling the fuel tanks, ground the tanks to the source of fuel 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 build-up which could cause sparks and ignite fuel vapours.

Fuel leakage can contribute to a fire and/or explosion.




## Fuel

Use petrol with an octane number of at least 93 (RON).
Fuel injected engines can be run on petrol down to 90 octane (RON) if 93 octane fuel is not available but some power will be lost. Return to 93 octane as soon as possible. Carburetter models must always use 93 octane (RON). The engines are designed for unleaded petrol and for environmental reasons should always be run on this type of fuel. Leaded fuel can be used if unleaded fuel is not available.

**NOTE!** In certain areas, Lake Constance for example, the use of leaded fuel is not permitted.

⚠ **IMPORTANT!** Never use lead additives as these may leave deposits on injectors and carburetor jets.

Alcohol in the petrol (especially methanol), causes rubber and plastic components to age more quickly. This can result in fuel leakage. **Fuels containing methanol should therefore not be used** to avoid damage to fuel system components. **This type of damage is not covered by the factory warranty.**

The ethanol content of fuels used must not exceed 10% and the petrol **must** maintain the correct octane number.

When running the engine on fuels containing alcohol, a leaner fuel air mixture is required. This may cause idling problems, starting difficulties and vapor locks.

Petrol mixed with alcohol as opposed to pure petrol binds water. This can result in the increased corrosion of metal components in the fuel system. Check often and regularly.

For safety reasons all rubber or plastic components in the fuel system should be checked often and regularly. This includes components such as fuel lines, seals and fuel tanks. Always replace components you suspect are aged or damaged.

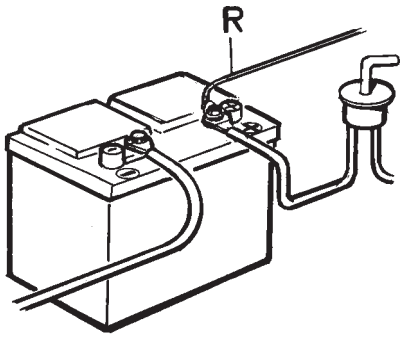
## Electronic engine control

**(Gi, GLi, GSic, GSi, Fi, FSi models)**

Your engine features an Electronic Engine Control (EEC) system. This is a computer controlled air, fuel and ignition system that requires very low maintenance. It has a memory that stores diagnostic information in the form of service codes to aid your Volvo Penta dealer when diagnosing performance problems. Contact your Volvo Penta dealer if service is required.

**NOTE!** The electronics in the EEC require protection from false signals and interference. Never mount radio transmitter antennas or sender cables near the EEC and never ground any wiring to the engine.

**If electrical connections are reversed, or wires are disconnected when the key switch is on or the engine is running, sensitive electrical components may be immediately damaged. Do not turn off the main battery switch until the engine has stopped.**




## EEC memory circuit

**(Fi, FSi models)**

Avoid disconnecting the battery negative cable or the small red wire at the battery B+ terminal. These wires power the memory circuit of the EEC system computer. If either are disconnected, any service codes that may have been stored will be lost. In addition, the engine may exhibit unsatisfactory operating characteristics on next start up, but will return to normal operating conditions after operating in neutral for 15 minutes, and in gear for 15 minutes.

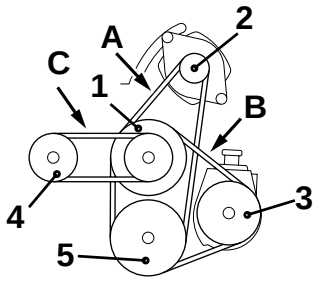
# Maintenance and care

Volvo Penta engines and transmissions are designed for maximum service life and reliability. They are built to survive in a tough marine environment, but also to cause as little environmental impact as possible. In order for your engine and transmission to operate reliably, **regular maintenance** is necessary. This chapter describes the engine/transmission and how to carry out the most essential maintenance operations. The following chapter has a maintenance schedule which shows when maintenance operations must be carried out.

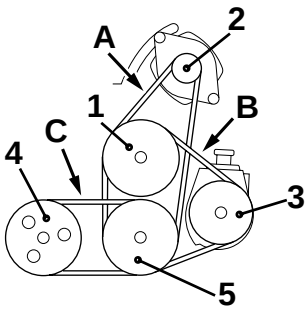
**NOTE!** Always use Volvo Penta Original Spare Parts, otherwise you run the risk of losing the original quality of the product, quite literally bit by bit.

⚠ **WARNING!** To prevent personal injury the engine must be turned off before starting maintenance work.

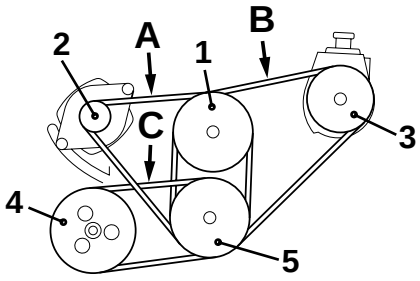
## Engine




**3.0 models**




**4.3, 5.7 models**



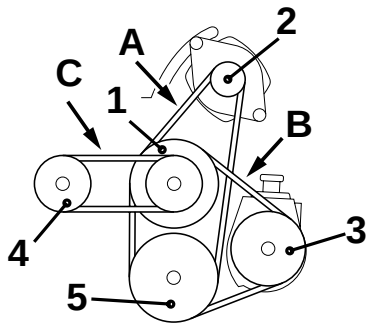

**5.0, 5.8 models**

### Belt adjustments. General

⚠ **WARNING!** To prevent possible injury caused by someone from inadvertently starting the engine, remove the ignition keys from each starting location (especially if the engine room/engine compartment cannot be seen from various remote starting positions such as a flybridge or enclosed cabin).

**NOTE!** The belts used for the alternator, water supply pump, and power steering pump are heavy duty. Do **not** replace with automotive belts.

Belt tension is determined by belt deflection. With engine stopped, the belt should be tight enough so that it will deflect 6 to 13 mm at positions **A**, **B** and **C** when pressed with the finger at the points shown. If the belt is too tight, excessive belt and bearing wear can occur. If it is too loose, slippage can occur, resulting in belt wear, poor circulating pump, alternator, and power steering operation.



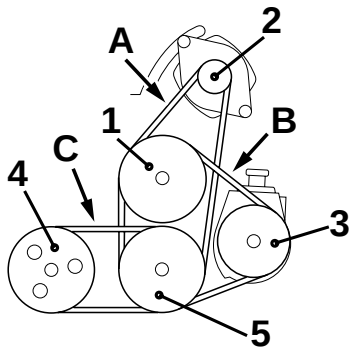

**3.0 models**

## Alternator belt

With engine off, check alternator belt deflection midway (**A**) between the circulating pump pulley (**1**) and the alternator pulley (**2**).

To increase belt tension:

- Loosen alternator mounting screws and nuts, and pivot alternator away from engine to increase belt tension.
- While maintaining pressure on alternator, retighten top screw and bottom screw and nut.
- Recheck belt tension.




**4.3, 5.7 models**

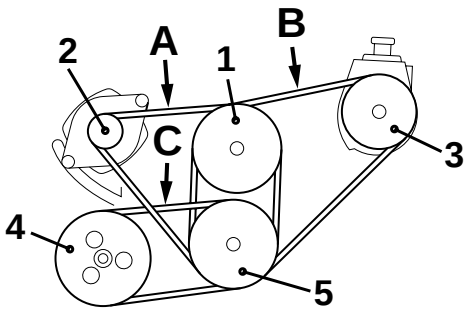
## Water pump belt

With engine off, check water pump belt deflection midway (**C**) between the water pump pulley (**4**) and the crankshaft pulley (**5**).

To increase belt tension:

- Loosen mounting bracket to water pump screws
- Pivot water pump away from engine to increase belt tension.
- While maintaining pressure on water pump, retighten top and bottom screws.
- Recheck belt tension.

Frequently check engine compartment for fuel fumes and excessive water accumulation; water depth in bilge should be kept well below flywheel housing.

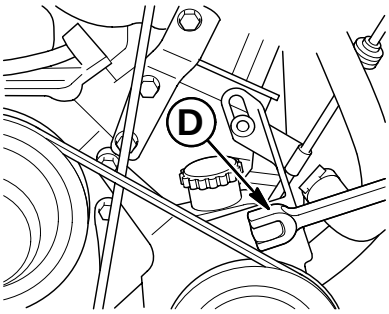



**5.0, 5.8 models**

## Power-steering pump belt

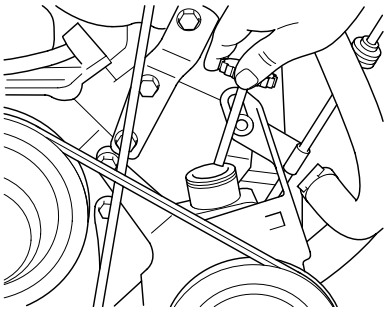
With engine off, check power steering belt deflection midway (**B**) between the circulating pump pulley (**1**) and the power steering pump pulley (**3**).

**NOTE!** Improper power steering belt adjustment will cause a loss of power steering assist, resulting in hard steering.




To increase belt tension:

- Loosen pump mounting screws.
- Insert a 1/2 in. breaker bar into the square hole (**D**) in the pump mounting bracket, and pivot pump away from engine as shown. Never pry against the pump reservoir or pull filler neck.
- While maintaining pressure on pump, retighten all mounting screws.
- Recheck belt tension.



## Power-steering fluid level

- Whenever you check the engine oil level, also remove the power steering oil fill cap and check the fluid level.
- Wipe dipstick and note the "HOT" and "COLD" fluid levels.
- Maintain the appropriate level using ATF oil.

## Exhaust system

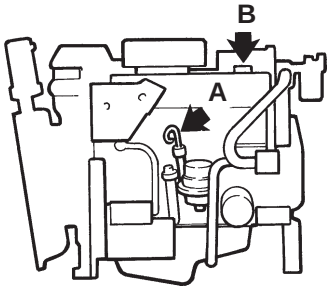
Periodically inspect engine exhaust system. Check for deteriorated or burned hoses, loose clamps, and evidence of water leaks.

⚠ **WARNING!** Replace damaged/defective components, and securely tighten all clamps. Any exhaust leak must be repaired before boat is operated. Exhaust leaks release fumes that can create hazardous conditions for operator and passengers.

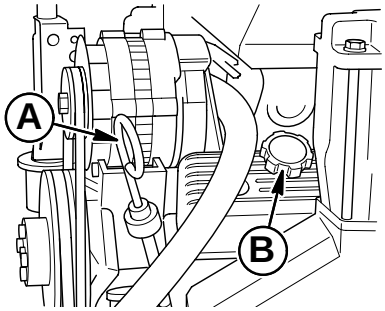
## Lubrication System

The engine has a pressurized lubrication system. The oil pump sucks oil from the oil pan and then pumps it to the moving parts in the engine. The oil is cooled in the oil cooler (not all models) and cleaned in the oil filter. Always use Volvo Penta original oil filters, they have an integral relief valve that allows the oil to by-pass the filter even if the filter is completely clogged.

⚠ **IMPORTANT** With a new or reconditioned engine, the oil and oil filters must be changed after 20-50 hours of operation. After that they should be changed every 100 operating hours or at least once a year. Use only oils of the recommended grade: See chapter ***Technical Data.***




**3.0 models**




**4.3, 5.0, 5.7, 5.8 models**

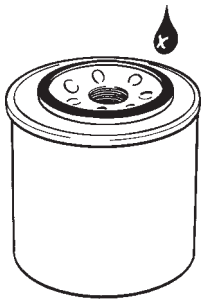
### Oil level. Checking and topping up

Every day before starting check that the level is between the Max and Min markings on the dipstick (**A**) and that the level is sufficient for the planned journey.

Top up if necessary through the oil filler (**B**). See chapter ***Technical Data*** for the grade of oil.

High performance engines usually have a higher oil consumption than lower powered engines. Apart from lubrication, the most important function of the oil is to cool and remove heat from the internal components of the engine. High performance engines produce much more heat at full load than lower powered engines. So it is important that the correct oil level is always maintained. **Check oil level daily.**

⚠ **IMPORTANT** Fill to the Max mark and no higher. The level must not drop below the Min mark.



## Oil and oil filters. Replacement

The oil should be changed when the engine is hot. Stop the engine. Suck out oil through the oil scavenging/bilge pipe.

⚠ **WARNING!** Hot oil can cause burns.

Unscrew the old filter. **NOTE!** Avoid oil spillage.

Check the mating surface of the engine is clean. Moisten the filter rubber gasket with a little oil. Screw on the new filter by hand until it is in contact with the mating surface. And then a further half turn but **no more!**

Top up oil to correct level. Start the engine and let it idle. Stop the engine. Check that there are no leaks round the oil filter and the oil level, top up if necessary. See chapter ***Technical Data*** for the grade of oil.

**NOTE!** Collect up the old oil and filter for deposit at a proper disposal site.

# Cooling System

The cooling system is a seawater system (a freshwater system is available as an accessory for certain types of engine). The engine seawater pump (mounted on front of the engine) sucks in water through the water inlets located on both sides of the lower gear unit. Water pumped to the engine by the seawater pump is circulated through the engine by the engine circulating pump. A thermostat determines the amount of water to be taken in, recirculated and discharged to control engine operating temperatures. Water is discharged through an idle exhaust relief and with exhaust through the propeller hub. A temperature gauge located on your boat instrument panel will indicate if the engine overheats. Do not operate engine without thermostat.

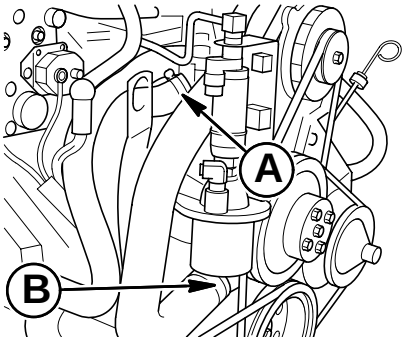
⚠ **IMPORTANT** If engine should overheat, turn off engine, tilt drive up and look for obstructions to water pick-up. Lower drive unit and run engine again at 1500 RPM in neutral and check temperature gauge to verify condition. If overheating still occurs, return to port at low RPM to prevent excessive overheating and engine damage. See your Volvo Penta dealer for service assistance.

If there is a risk of frost the cooling system must be drained.

When laying up the boat for the winter it is important that the cooling system be flushed with freshwater so that deposits do not dry and to prevent the build-up of salt crystals.

## Draining cooling system

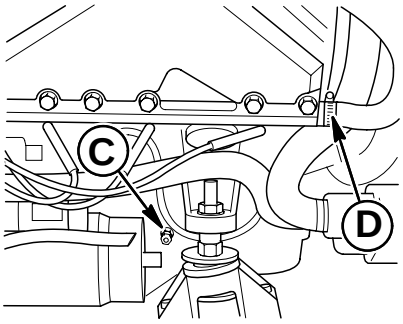
**Perform this procedure with boat out of water. It will prevent damage to cooling system components if temperature drop below freezing.** When draining the engine, raise or lower the bow of the boat to position the engine in a level altitude. This will provide for complete drainage of the block and manifold. If the bow of the boat is higher or lower than the stern, some water may be trapped in the block.




### 4.3, 5.0, 5.7 and 5.8 models

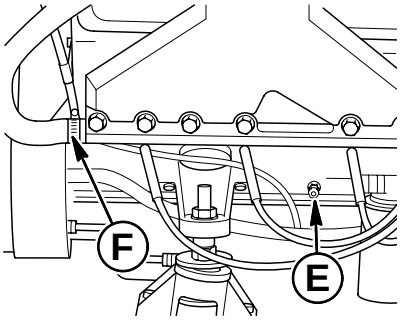
**Front**

- Disconnect long hose (**A**) at thermostat housing. Lower alongside block and drain completely.
- Disconnect and drain large hose (**B**) at water pump housing.
- Drain the small water by-pass hose between fuel reservoir and the top of thermostat housing. Disconnect at the reservoir side of the check valve. Blow out water in both directions. Inspect check valve for debris, then reassemble.



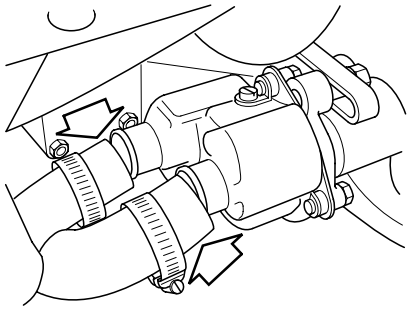

**Starboard**

- Remove one cylinder block drain (**C**) and clear hole with a wire.
- Loosen clamp (**D**) and remove manifold hose.



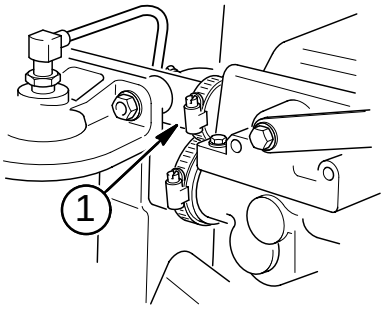

**Port**

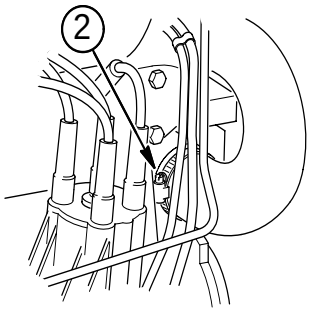
- Remove one cylinder block drain (**E**) and clear hole with a wire.
- Loosen clamp (**F**) and remove manifold hose.

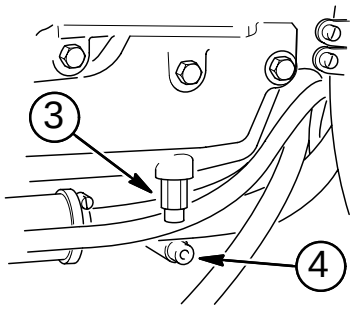


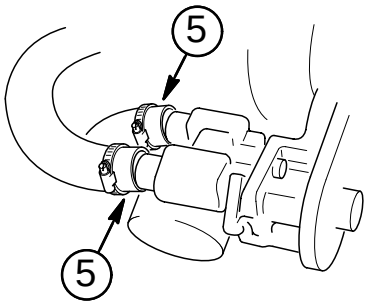
**Water pump**

Loosen and slide clamps back. Remove hoses from the rear of water pump and drain. Turn the engine over on the starter motor for a second (**do not allow the engine to start!**) so that the water remaining in the seawater pump comes out. Reattach water pump hoses.



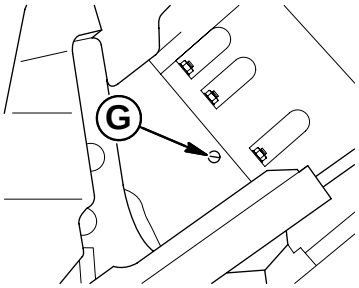




## 3.0 models

Remove the longer cooling hose (**1**) from the thermostat housing, then bend the hose down so that it empties completely. Remove and empty the thicker cooling hose (**2**) from the circulation pump. Remove the drain plug (**3**) at the exhaust pipe, then clear the hole of any impurities using steel wire so that the water can run out freely. Remove the drain plug (**4**) from the cylinder block, then clean the drainage hole. Remove both hoses (**5**) from the seawater pump and drain them. Turn the engine over on the starter motor for a second (**do not allow the engine to start!**) so that the water remaining in the seawater pump comes out. Refit all the hoses and drain plugs. Check the tightness of all the hose clips. Do not forget to open the seawater cock (if fitted) before starting the engine again.



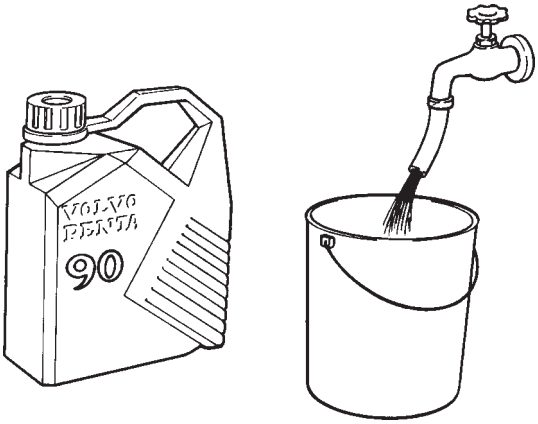

## Pivot housing (SX, DP-S)

To drain cavity in pivot housing, tilt drive unit to the full tilt (up) position and remove the water drain plug (**G**) from the port side of the pivot housing. Tilt the drive unit to the full tilt down position. Allow unit to drain. After unit has completely drained, replace pivot housing plug. Inspect drive unit water intake screen for obstructions.

## Oil coolers

Remove the lower water hose from the oil cooler. If cooler is mounted horizontally, remove either hose, loosen mounting bolt, and tip open end of cooler down to drain.

⚠ **IMPORTANT** Failure to completely drain the cooling system will result in serious damage to the engine, exhaust manifolds, pivot housing, and drive unit when temperatures go below freezing. To assure complete drainage, probe all drain openings with a piece of wire to remove any blockage.




## Cooling system. Inhibiting

When laying up the boat for the winter it is important that the cooling system be flushed with freshwater so that deposits do not dry and to prevent the build-up of salt crystals. Seawater in the system causes corrosion when air is introduced and can cause the build-up of salt crystals that could block the system. Flush with clean freshwater. This work should be carried out with the boat out of the water.

Flush the cooling system by removing the intake seawater suction hose (connected to the drive). Remove hose at engine. Connect another hose of a suitable length and put its other end into a bucket of freshwater. Keep the container filled. Remove the thermostat and reinstall the thermostat housing.

Start the engine and let it idle for a few minutes. Stop the engine.

⚠ **IMPORTANT** The pump must never run dry.

**NOTE!** Ensure that nobody is splashed with water spraying out of the exhaust outlet.

To avoid corrosion in the coolant water ducts these should be filled with either a 50/50 mixture of freshwater and glycol, or emulsifying oil. Fill a bucket with either the 50/50 mixture or the oil. If possible fix up an overflow return to the bucket (or another bucket). Start the engine and let it idle. Stop the engine if the bucket starts to empty and needs filling

⚠ **IMPORTANT** The pump must never run dry.

Start over. When the engine has been running for a few minutes the entire cooling system will have been flushed and filled with the mixture. A 50/50 mixture of glycol and water will not need to be drained. If emulsifying oil is used, it must be drained if the temperature is likely to drop below freezing while the boat is laid up.

⚠ **IMPORTANT** Emulsifying oil provides no antifreeze protection and must be drained if freezing temperatures are likely.

To drain see **Cooling System. Draining**

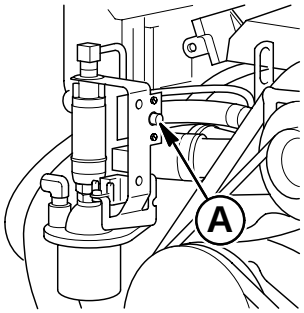
# Fuel system

A fuel pump sucks fuel from the fuel tank through the fuel filter to the fuel injection system or to the carburetor. The fuel pump and fuel injection system are fused, see **Electrical System**.

⚠ **IMPORTANT!** All work on the engine fuel injection system must be carried out at an authorized workshop.

⚠ **WARNING!** Be extremely careful when replacing fuel filters or other service work on the fuel system. Gasoline is highly inflammable and can be extremely explosive in certain circumstances. Before starting work: switch off the ignition and allow the engine to cool completely. There must be no smoking, naked flames or sparks in the immediate vicinity. Place a rag under fuel connectors and filters when removing. Remove the rag and any fuel spillage immediately and dispose of it in a safe place. When work has finished: check carefully that there are no leaks. Check both before and after starting the engine. Run the engine compartment fan for at least 4 minutes before starting the engine.

To prevent fire and explosion, Volvo Penta fuel system components meet requirements for fuel and fuel vapour containment. Do not substitute automotive or other non-approved parts.




## Fuel pumps

⚠ **WARNING!** Frequently check fuel pumps for signs of fuel leakage. Should this occur, have it serviced immediately by your Volvo Penta dealer.

All carburetor models except the 3.0GL, 5.0FL and 5.8FL have a single electric fuel pump mounted in at the front starboard side of the engine. The fuel pump electrical circuit is protected by a 6 amp circuit breaker (**A**). The 3.0GL, 5.0FL and 5.8FL have a mechanical fuel pump.

EFI engines have two electric fuel pumps; a low pressure pump to bring fuel from the boat tank to the engine, and a high pressure pump to supply the fuel injectors both pumps are protected by a single 20 amp circuit breaker (**A**).

All the fuel pumps operate only when the engine is running.

If a pump does not operate and/or the engine will not start, check and reset the circuit breaker. See your Volvo Penta dealer if further service is required.

⚠ **IMPORTANT!** 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.

## Throttle body fuel injection (TBI)

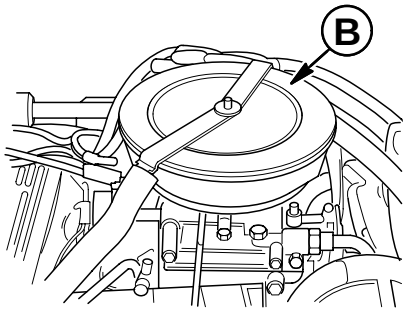
**(Gi, GLi, GSic, GSi models)**

The function of this fuel metering system is to deliver the correct amount of fuel to the engine under all operating conditions. Fuel is delivered by two electronic fuel injectors mounted in the throttle body that is attached to the intake manifold. The fuel injectors are controlled by the ECM. It requires no periodic maintenance or adjustment. If operational problems occur, see your Volvo Penta dealer.

## Electronic fuel injection (EFI)

**(Fi, FSi models)**

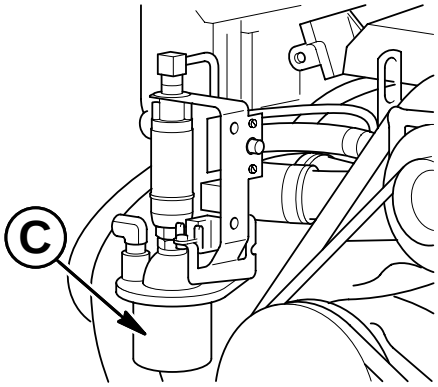
The Electronic Fuel Injection (EFI) system is a multipoint fuel injection system, microprocessor controlled, with injectors mounted directly above each of the engine's intake ports. It requires no periodic maintenance or adjustment. If operational problems occur, see your Volvo Penta dealer.




## Flame trap

The flame trap (**B**) should be cleaned annually. Remove flame trap and clean in kerosene or other solvent. Blow through with compressed air and check for damage. Reinstall flame trap, check that flame trap is securely mounted.

⚠ **WARNING!** To avoid the danger of an explosion or fire in the engine compartment, the engine must always have an undamaged flame trap securely installed.




## Fuel filter. Replacement

All models have a fuel filter (**C**) in the fuel line before the fuel pump.

⚠ **IMPORTANT!** Volvo Penta EFI engines require a special marine filter with a 5-10 micron filtering capability. Do not substitute any other type of filter.

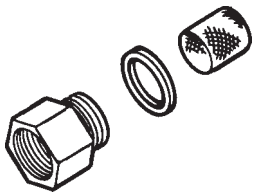
⚠ **WARNING!** Accumulation of water and other fuel contaminants may form corrosive compounds that can damage the fuel filter, and result in fuel leakage. For this reason, annual replacement of the fuel filter is required to avoid risk of explosion or fire.

- Unscrew fuel filter; remove and discard.

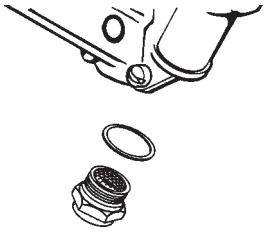
⚠ **WARNING!** Old filter contains flammable fuel. Dispose of safely.

- Lightly lubricate the gasket and inner seal on new fuel filter.
- Screw on fuel filter and hand tighten, following instructions on filter.
- Clean up any spilled fuel.
- Run bilge blower for at least five minutes to vent engine compartment, then start engine and check for leakage. Smell for fuel in the bilge's, if you can smell fuel, explosion and fire are an extreme danger. Clean up the bilge's until fuel cannot be detected by smell.

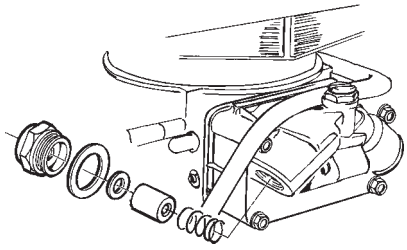
**NOTE!** A loud whining noise at idle may be due to a restricted fuel filter causing a noisy fuel pump. Operating engine with a restricted filter may damage pressure regulator or fuel pumps. See your Volvo Penta dealer if pumps make abnormal noise.



**Carburetor filter 4.3, 5.7 models**



**Carburetor filter 5.0, 5.8 models**



**Carburetor filter 3.0 models**

## Carburetor filter
**(GL, GS, FL models)**

A fuel filter is located at the point where the feed pipe connects with the carburetor. Check the filter at least once per season or as necessary.

**To check:**
Undo the fuel line and remove the nipple in the filter housing (avoid fuel spillage!). You can now take the filter out to check it.

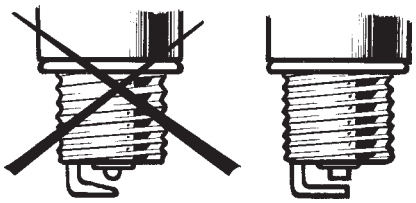
**NOTE!** Some models (3.0GL/GS) have a spring inside the filter.

Wash filter in kerosene or similar. Reinstall in reverse order. Check seal between nipple and filter housing and replace it if necessary. Start the engine and check that no connections are leaking.

## Carburetor adjustment
**(GL, GS, FL models)**

Changes in fuel, temperature or altitude (high level lakes) may make it necessary to adjust the carburetor idling setting and the fuel mixture. Before making adjustments, ignition timing (including spark plug gap) and the state of the flame trap must be checked.

**NOTE!** The engine should be hot when idling speed and fuel mixture are adjusted. An authorized Volvo Penta Service workshop should set the fuel mixture. A workshop tachometer should be used when setting idling speed.



### Spark plugs

Always clean the area around the spark plugs before removing them. Remove spark plug and clean. Check the electrode gap with a feeler gauge, adjust the gap if necessary. Replace the spark plug if the edges of the electrodes are rounded or if the ceramic spark plug body is damaged. See chapter ***Technical Data*** for spark plug type and electrode gap.

⚠ **WARNING!** The wrong type of spark plug can cause operating problems and engine damage. Do not run the engine if the ceramic spark plug body is damaged. Damaged spark plugs can cause sparks and ignite fuel vapor in the engine compartment.

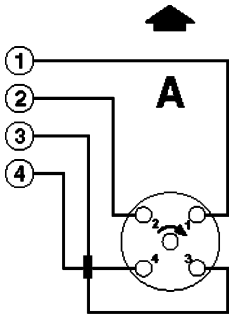
## Ignition cables and distributor cap

Clean ignition cables and distributor cap. Check that the cables are in good condition and that the distributor cap is not cracked. Replace if damaged. Other distributor components are maintenance free.

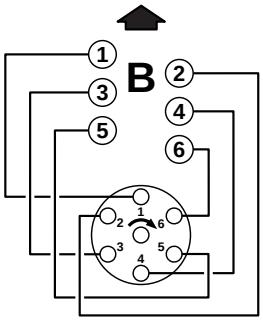
⚠ **WARNING!** To minimize the risk of fire and explosion Volvo Penta ignition components meet national and marine safety standards. The use of components that do not meet safety standards (automobile components for example) can cause a fire or explosion on board.

If ignition cables are removed, ensure that they are reinstalled in the correct order. The figures (on next page) show the typical layouts for the ignition cables. The arrow points to the front of the engine.

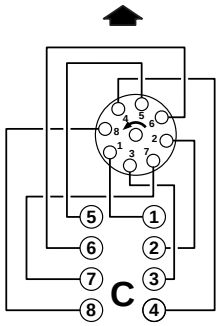
**Firing orders:**



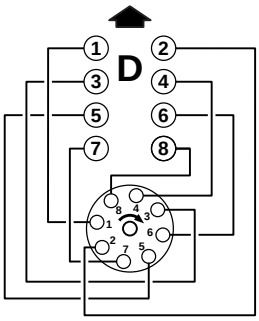

**3.0 engines**
1-3-4-2




**4.3 engines**
1-6-5-4-3-2




**5.0 and 5.8 engines**
1-3-7-2-6-5-4-8

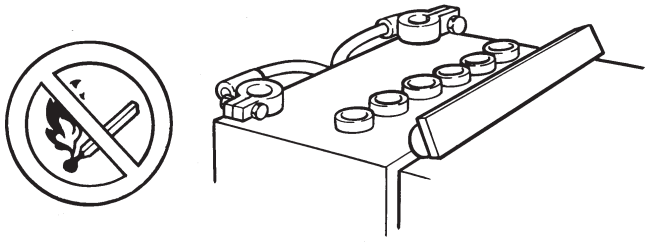



**5.7 engines**
1-8-4-3-6-5-7-2

# Electrical systems

The electrical system has a voltage of 12 V. The generator has a charging regulator to make it more effective. The engine also has semi-automatic and normal fuses which cut off the current if there is an overload. There are also fuses for the trim pump and the Power Trim controls.

⚠ **WARNING!** Danger of explosion! Never allow an open flame or sparks near the battery area. Always use eye protection when working with the batteries. The battery electrolyte contains extremely corrosive sulfuric acid. If electrolyte comes into contact with the skin: Wash it off with soap and plenty of water. If battery acid comes in contact with the eyes, immediately flush with copious amounts of water. Contact a doctor immediately.

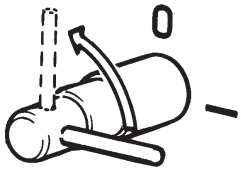


## Electrolytic corrosion

To protect the drive and propeller against galvanic corrosion your boat and its propulsion unit have galvanic corrosion protection. Leakage current from the electrical system will prevent this protection system from working and result in major damage. Leakage current from the electrical system can be caused by faulty equipment or incorrect installation of electrical equipment.

⚠ **IMPORTANT** Electrolytic corrosion as a consequence of leakage currents may cause serious damage to your boat's equipment within a short time. Work on the boat's low voltage circuit should only be carried out by qualified/experienced personnel. Installation or work on the shore power equipment must only be carried out by electricians authorized to work with high-voltage installations.

**The following should always be observed:** Route and clamp electric cables so that they will not be exposed to damp or bilge water in the keelson. The main engine switch must be connected to the positive (**+**) terminal on the battery, and cuts off all power consuming equipment as soon as the engine is stopped. If an extra battery has been installed then there must be separate switches for extra equipment. There should also be a main switch between the auxiliary battery positive terminal and the electrical equipment fuse strip. The main switch for the auxiliary battery must cut off all power consuming equipment connected to that battery and be turned off when power is no longer needed. The engine or drive must not be electrically connected to other equipment such as the trim plane, bathing steps etc. The engine and transmission must not be used as ground points for radio or navigation installations or other electrical equipment with separate ground cables. **All separate ground cables must have a common ground point, separated from the engine and transmission.** If shore power is connected a protective ground should not be connected to the engine or to any other ground terminal on the boat. Transformers connected to shore power must be installed so that the protective ground on the input side (120/220 V) and the negative connection on the output side (12 V) are not connected.




## Main ON/OFF power switch

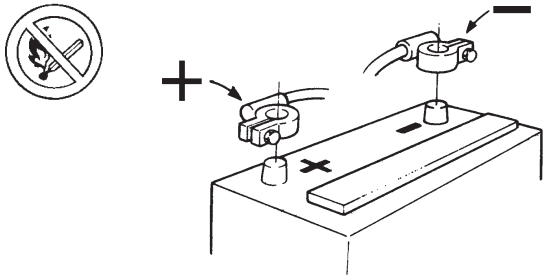
The main switch must never be turned off before the engine has stopped. If the circuit between the generator and the battery is cut off when the engine is running the generator can be seriously damaged. Engine electronics (fuel injection engines) may also be damaged.

For the same reason charging circuits must never be switched over while the engine is running. To simultaneously charge two independent battery circuits, fit a Volvo Penta charge distributor (accessory) to the regular generator.

⚠ **IMPORTANT** Turn the engine off and switch off power at the main switches before carrying out work on the electrical system.

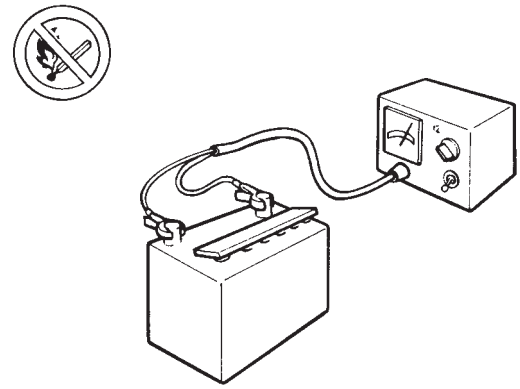
## Generator

Check belt tension regularly, replace belt if they appear worn. See under heading "Engine".



## Batteries

Never mix up the battery positive and negative terminals, this can cause serious damage to electrical equipment.

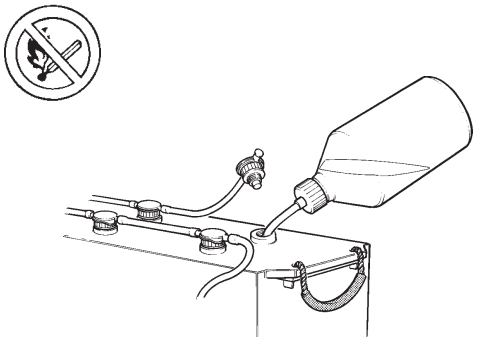


## Charging

Avoid boost charging the batteries. If boost charging is necessary then both battery leads must be removed from the battery. Never use a boost charger unit to jump start an engine.

When charging, unscrew filler plugs but leave them in their holes. Ventilation should be good, particularly if the batteries are being charged in an enclosed area. Always switch off the charging circuit **before** removing the battery charger connectors.

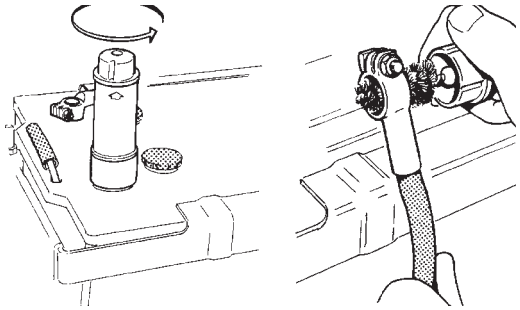
⚠ **WARNING!** Danger of explosion! Never allow an open flame or sparks near the battery area.



## Battery electrolyte levels

The electrolyte should be 5 – 10 mm (0.2 – 0.4 in) over the plates in the battery. Top up if necessary using **distilled water**. Charge the battery after topping up for at least 30 minutes by running the engine at fast idle. NOTE! Certain maintenance-free batteries have special instructions which must be followed.

⚠ **WARNING!** Danger of explosion! No naked flames or sparks. Battery electrolyte is highly corrosive. If it gets in the eyes, flush with water. Contact a doctor immediately.

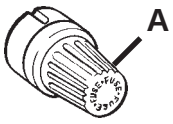


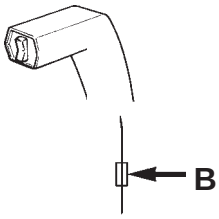
## Battery and electrical connections

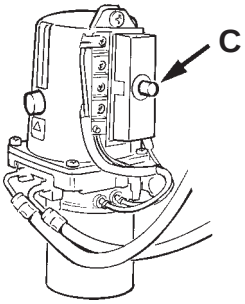
The service life of your batteries depends largely on how they are maintained. Keep batteries dry and clean. Oxidation or dirt on the battery and battery terminals can cause short-circuits, voltage drop and discharge especially in damp weather.

Clean the battery terminals and leads to remove oxidation using a steel brush. Tighten the cable terminals well and spray the battery terminals and connections with anti-corrosive agent or coat them with Vaseline. Also check that all other electrical connections are dry and free of oxidation and that there are no loose connections. If necessary, spray these connections with a water-repellent spray (Volvo Penta Universal oil).

⚠ **WARNING!** Never mix up battery positive and negative terminals.




## Fuses in the electrical system

If the engine cannot be started or if all instruments read zero, an engine fuse can have blown. Depending on its model the engine has one or more automatic fuses that cut off the electrical system if it overloads. The automatic fuse has a reset button. Always investigate the cause of an overload before resetting the fuse.

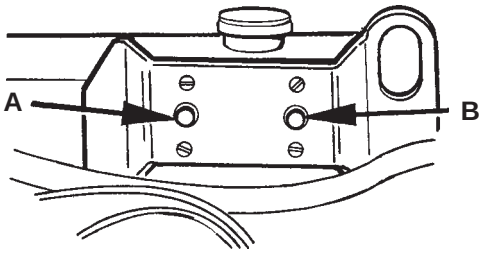
**NOTE!** Extra equipment requires its own fused circuits. Power should be taken from the battery (or from a contact unit intended for this purpose). Boats with Volvo Penta instrumentation also have two power take off terminals for accessories under the instrument panel. One fused for up to 5 A and one not fused for up to 20 A.

The engine has two 8 A fuses (**A**) in the instrument panel that protect the starter and system power. See chapter **Instrumentation.**

The control lever and integrated Power Trim button has a 5 A fuse (**B**) in its cabling.

⚠ **IMPORTANT!** Always carry extra fuses on board.

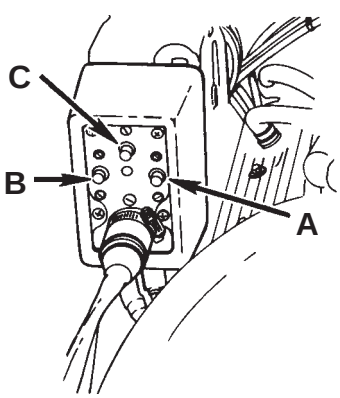
There is a 10 A automatic fuse on the hydraulic pump motor (SX and DP-S models). Reset the fuse by pressing in the button (**C**). Always investigate the reason for the fuse activating if it continues to do so.

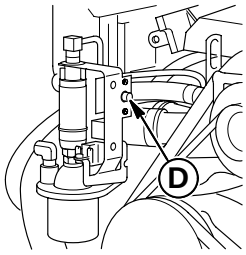



**3.0 models**

The Power Trim electrical circuit is protected by automatic fuse (**A**)*. Automatic fuse (**B**)* protects the main engine cabling. The fuses are located to starboard of the engine.

*50A

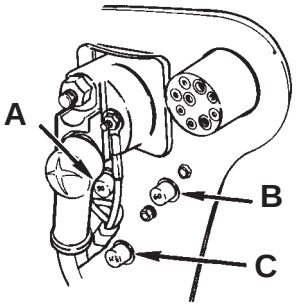


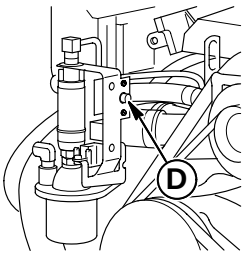




**4.3 and 5.7 models**

The Power Trim electrical circuit is protected by automatic fuse (**A**)*. Automatic fuse (**B**)* protects the main engine cabling. The automatic fuse (**C**)* protects the (EFI) power relay. Automatic fuse (**D**)* protects the fuel pump/s. The fuses are located to starboard of the engine.

* (**A**): 50A, (**B**): 60A (50A on GL and GS models), (**C**): 12,5A (Not fitted on GL/GS models), (**D**): 20A (6A on GL and GS models)

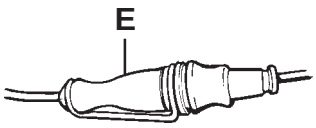


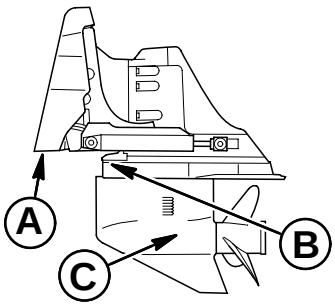




**5.0 and 5.8 models**

The Power Trim electrical circuit is protected by automatic fuse (**A**)*. Automatic fuse (**B**)* protects the main engine cabling. The automatic fuse (**C**)* protects the engine control unit (EEC) on Fi, FSi models. A melt fuse (**E**)* is located in the B+ line to the automatic fuse (**C**)*. Automatic fuse (**D**)* protects the fuel pump/s. The fuses are located to starboard of the engine.

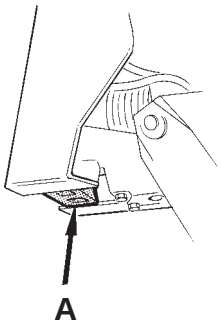
* (**A**): 50A , (**B**): 60A, (**C**): 12,5A, (**D**): 50A, (**E**): 20A

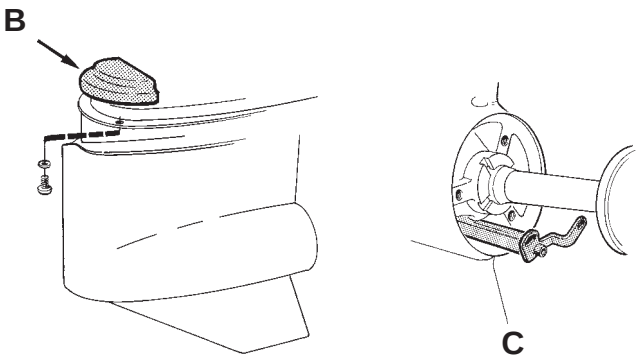





## Corrosion protection

Sacrificial anodes are attached to the bottom of the gimbal housing (**A**), at the front (**B**) of the gearcase above the anti-ventilation plate. SX models also have anodes in the exhaust passage (**C**). Anodes are slowly eroded away by galvanic action and require inspection. Anodes subjected to frequent wetting and drying require periodic scraping to remove scale and oxidation to maintain their effectiveness. Magnesium anodes are installed if the boat is to be used mainly in a fresh water enviroment.




## Checking corrosion protection

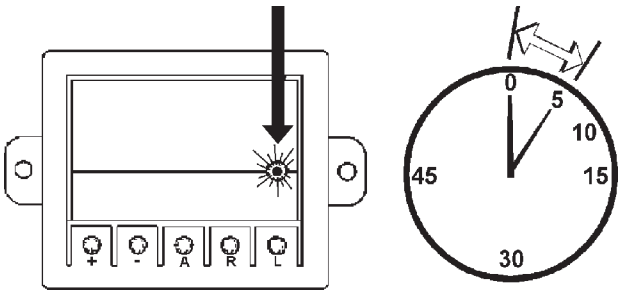
Inspect gimbal housing and front gearcase anodes (**A** and **B**) every 14 days, or more frequently if used in extremely salty water. If an anode is 2/3 its original size (1/3 eroded), it should be replaced. If a stainless steel propeller is used, additional sacrificial anodes may be required to handle the added corrosion potential. Inspect anode (**C**) in lower gearcase (SX drive) once a season or every 100 hours; replace if necessary.

Tighten the new anode so that there is a good electrical contact.

Where boats are kept laid up on land when not in use there is a lower level of galvanic corrosion protection due to the oxidation on the sacrificial anodes. Even a new anode can be oxidised on the surface. If less than 1/3 of the anode is corroded the oxidation layer on the corrosion protection should be rubbed down with emery cloth before launching the boat. Never use a wire brush or other steel tool.

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

Drives with stainless steel propellers (accessory) consume anodes faster. **Check that the ground braids are not broken and have good contact.**



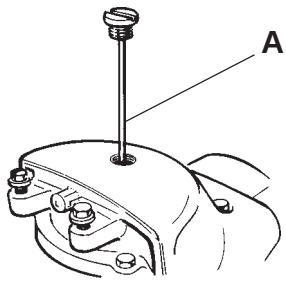

## Active Corrosion-Protection

Most boats are equipped with a Volvo Penta Active Corrosion Protection System as standard equipment. The system greatly improves the protection and life of the drive unit from corrosion. If your boat does not have this system as standard you can buy it as an accessory. It is available from your Volvo Penta dealer. This system operates with very little current drain from the boat's electrical system.

The Volvo Penta Active Corrosion-Protection System control box has a small LED indicator light that blinks to show the system is operating properly. The LED indicator light should blink once every one to five seconds to indicate proper operation. The light will blink at the once every five second rate if the demand for protection is very low. If the light is flashing once per second, the demand is high and the system is operating at maximum capacity. The Volvo Penta Active Corrosion-Protection System is designed to adequately protect one drive unit from galvanic corrosion.

The system works by keeping the voltage potential in the area around the drive unit in a range that is not corrosive to aluminum. This is accomplished by changing the charge of water molecules so that they do not remove electrons from the drive unit's metal parts that cause corrosion.

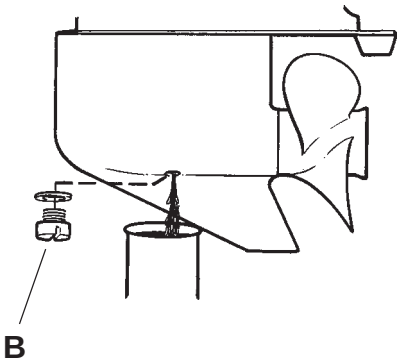
⚠ **IMPORTANT!** This system will not provide protection from stray currents emitted by a malfunctioning AC power source on either your boat, the pier, or other boats in close proximity to yours. Although the zinc sacrificial anodes will last much longer with this system, they must still be cleaned and checked for material condition periodically.




## Oil level. Check

Trim the drive to it's normal running position. Remove the dipstick (**A**) and check the oil level covers the entire marked area. Add oil if required through the dipstick hole. If oil level is low, add only enough lubricant to bring the oil level within the full range of dipstick.

⚠ **IMPORTANT!** Always screw the dipstick all the way home in dipstick tube before reading of the oil level.

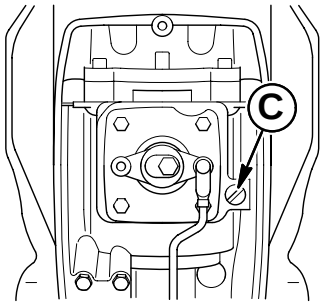


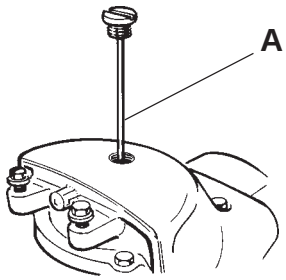

## Oil. Replacement SX drive

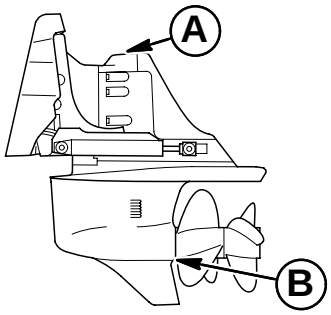
Trim the drive to it's normal running position. Remove the oil dipstick (**A**). Remove the plug (**B**) on the underneath of the propeller gear housing and let the oil run out in to a suitable container. Reinstall the plug and gasket. If oil is colored grey then water has entered the drive. Contact authorized service personnel.

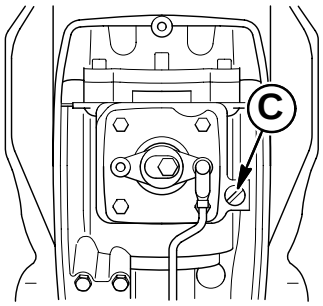
**NOTE!** Deposit the used oil at a properly designated disposal site.

Trim the drive up slightly. Remove the rear cover by removing the three retaining screws. Remove the oil level plug (**C**). Top up oil through the hole for the oil dipstick. Install oil level plug and lower drive to running position. Wait approx. 15 minutes to give the oil time to run down. (The dipstick should not be installed during the waiting time). Check the oil level. For oil quality and capacity: See chapter ***Technical Data***.






## Oil. Replacement DP-S drive

Place drive unit in the run (down) position. Remove propellers and mounting hardware. See **Propellers**

**NOTE!** Removing DuoProp propellers require the use of special tools.

Remove the oil drain plug (**B**) (below propeller shaft) and the oil level dipstick (**A**). Allow the drive unit to drain completely. Dispose of used oil in accordance with any applicable environmental regulations.

To fill the drive unit, remove the three screws securing the rear cover to access the oil level plug (**C**). Remove oil level plug.

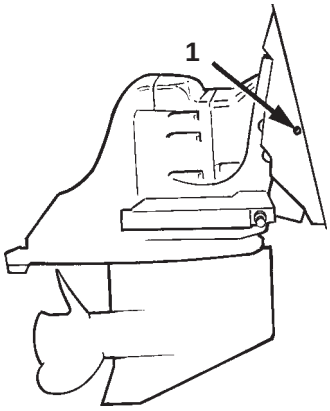
Fill drive unit with oil through the oil drain plug location (**B**). Fill slowly to purge air. The drive unit is properly filled when the oil appears at the oil level plug hole. For oil quality and capacity: See chapter ***Technical Data***.

**NOTE!** If unable to fill the drive unit through oil drain plug (**B**), the drive can be filled by trimming it up a few degrees and filling through the oil level plug (**C**).

When filled to the proper level, install oil level dipstick and oil level plug first to prevent excessive oil loss, then the oil drain plug. Tighten oil level and drain plugs securely. Reinstall oil level plug, and place drive in the run (down) position. Remove dipstick (**A**) and check oil level. Reinstall dipstick and tighten securely.

Install propellers. Install rear cover and tighten screws securely. Check oil level with the dipstick, oil must appear on the full range of dipstick. Add oil if required through the dipstick hole.

**NOTE!** If drive unit was filled through the oil level plug (**C**), wait 15 minutes before checking oil with dipstick. This will help ensure all air is purged from the oil cavity. Leave dipstick (**A**) loose during waiting period.

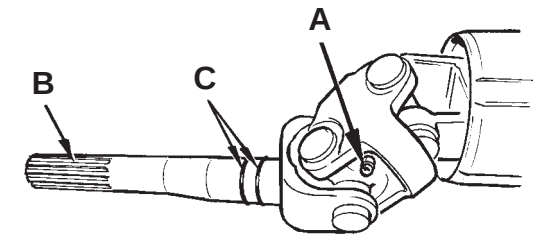



## Lubrication. Primary shaft bearings

Remove the drive from the mounting fork. Grease the primnary shaft bearing via the nipple (**1**) using a grease gun. Use an EP wheel bearing grease. Press in grease until it is forced out of the bearing. If the old grease indicates water contamination the bearing must be inspected and replaced if damaged.

⚠ **WARNING!** Removal of the drive requires special knowledge and tools. A falling drive can cause serious personalinjury. Please contact your nearest authorized Volvo Penta dealer for assistance.

⚠ **IMPORTANT!** Failure to lubricate the gimbal bearing and universal joints each year will result in damage to the pivot housing and drive unit.




## Lubrication. U- joint

Remove the drive from mounting fork. The U-joint is lubricated by the two lubricating nipples (**A**). Press in grease until it is forced out of the bearing. Use an EP wheel bearing grease.

**NOTE!** The splined joint on the shaft (**B**) must be greased using molybdenum grease. Lubricate the two O rings (**C**) with a little engine oil.

⚠ **WARNING!** Removal of the drive requires special knowledge and tools. A falling drive can cause serious personal injury. Please contact your nearest authorized Volvo Penta dealer for assistance.

## Bellows. Replacement

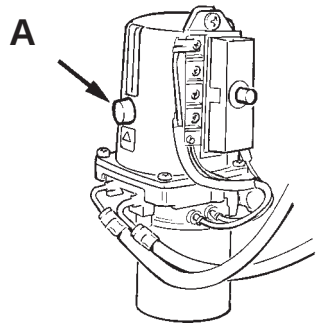
Remove the drive from the mounting fork. Check the condition on the universal joint and the exhaust bellows every year. If there are cracks or other defects they must be replaced. Otherwise replace every other year.

⚠ **WARNING!** Removal of the drive requires special knowledge and tools. A falling drive can cause serious personal injury. Please contact your nearest authorized Volvo Penta dealer for assistance.

## Engine alignment

Engine alignment requires special tools and that the drive unit be removed. This should be done when the drive unit is removed for lubrication during off-season storage preparations. Because of the special tools required, engine alignment must be performed by a Volvo Penta dealer.

⚠ **IMPORTANT** Failure to check engine alignment could result in premature failure of engine coupler, universal joints, and gimbal bearing.

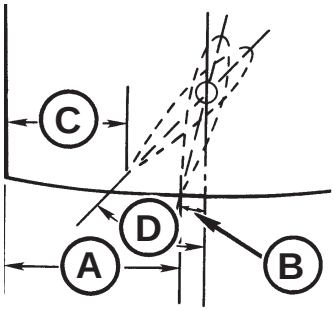



## Hydraulic pump. Oil level

Trim up the drive completelyand then remove the level/filling plug (**A**).

⚠ **WARNING!** The hydraulic system is under pressure. Before removing the filler plug the drive must be trimmed up completely so that the system is not under pressure. Always use a rag over the filler hole when the plug is being removed so that should the system be under pressure the oil does not spray out.

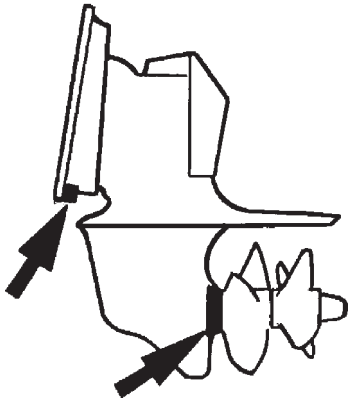
Check the oil level. The oil should reach the edge of the hole when the drive is completely trimmed up. Top up if necessary using ATF oil. Cleanliness is extremely important, no dirt may enter the drive when topping up with oil. Tighten the filler plug.

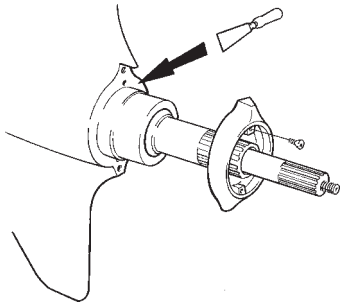


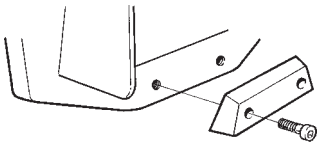

## Trim fin. Adjusting

**NOTE!** The DP-S drive has no trim fin.

No adjustment is required if the boat has power steering. If there is no power steering the trim fin must be adjusted depending on propeller rotation. With a left-rotating propeller the measurement (**A**) is 83 mm (3.3 in)(**B**= 5˚). With a right-rotating propeller the measurement (**C**) is 57 mm (2.2 in.)(**D** = 30˚). These settings apply to all installations, even twin drives. Tighten the trim fin using 38-44 Nm 28-32 ft.lbs.). Right or left-rotating propeller: See under heading ”Propellers”.







## Checking corrosion protection

If an anode is 2/3 its original size (1/3 eroded), it should be replaced. The oxidation layer on the corrosion protection should be rubbed down with emery cloth before launching the boat. Never use a wire brush or other steel tool.

The **DP-D drive** has a zinc ring* mounted on the gear housing in front of the propellers. To replace the zinc ring: Remove the propellers, undo the zinc ring screws and remove the ring. Scrape the mating surface on the gear housing clean to provide good contact with the new ring. Install the ring. There is a zinc anode** on the lower edge of the support shield. Undo the two screws holding the anode. Remove the anode and the support plate under the anode. Clean the mating surface and install the new zinc anode. Do not forget to reinstall the support plate.

**Replace with a magnesium ring (VP P/N 876138-9) if the boat is being used mainly in freshwater.*

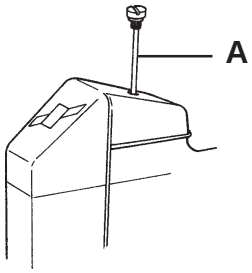
*** DP drives with stainless propellers (accessory) should have two zinc anodes on the shield (mounted with two screws VP P/N 963701-8 and two spacers 854486-8).*

Where boats are kept laid up on land when not in use there is a lower level of galvanic corrosion protection due to the oxidation on the sacrificial anodes. Even a new anode can be oxidised on the surface. Before launching clean the anodes.

## Active Corrosion-Protection

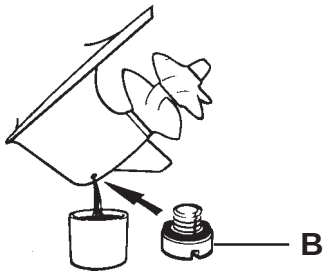
You can equip your boat with a Volvo Penta Active Corrosion Protection System. The system greatly improves the protection and life of the drive unit from corrosion. It is available from your Volvo Penta dealer.

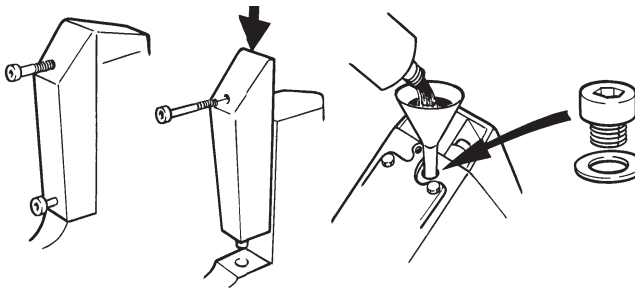
For more information about The Volvo Penta Active Corrosion Protection System: See section "Drive. SX and DP-S".




## Changing oil in drive

Remove the oil dipstick (**A**). Trim the drive up as far as possible. Remove the plug (**B**) on the gear housing and let the oil run out. If oil is discolored, contact an authorized Volvo Penta workshop. Reinstall plug and O ring. Always replace a damaged O ring. Remember the environment, dispose of the oil at a proper disposal site.

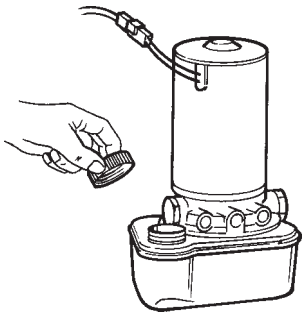


Remove cover and remove oil filter plug and O ring. Fill with oil. See chapter ***Technical Data*** for grades and quantity. Let down the drive.

After a while check the oil level with the dipstick. The dipstick should not be screwed down when checking the level. If the level is too high oil must be drained off. If the level is too low top up through the dipstick hole.

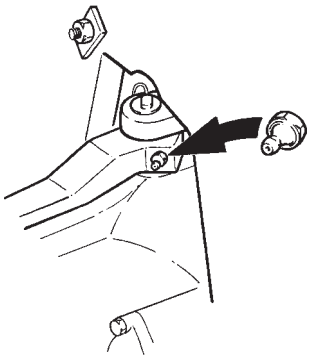
Check the tightening of the dipstick and bottom plug. Reinstall the cover



## Power-trim fluid level

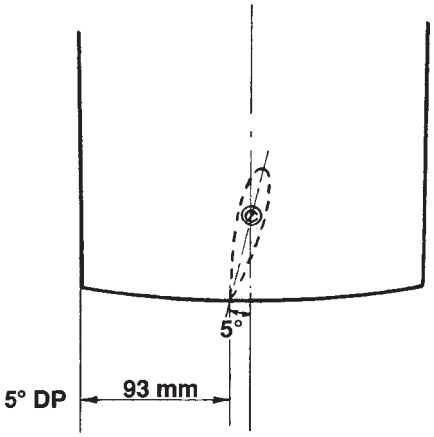
Trim the drive in as far as possible. Check the oil level is between the MAX and MIN markings on the oil container. Top up if necessary using ATF oil. Cleanliness is extremely important, no dirt must get into the drive when topping up with oil.

If the system has been drained, fill with new oil and trim the drive in and out 6 - 10 times to vent the system. Check the oil level and top up if necessary.



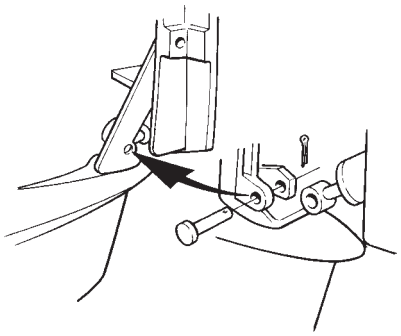
## Steering bearing lubrication

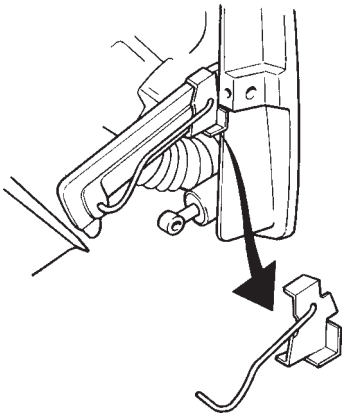
Lubricate steering bearing with a grease gun. Use water resistant grease. Press in grease until it is forced out of the bearing.

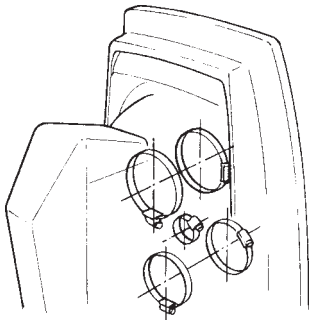



## Adjusting the trim fin

There are two versions of the DP drive. One without trim fin and one has a trim fin which is set at the factory. This setting applies to all installations, even twin drives. If the trim fin needs to be reset, undo it from the underside of the cavitation plate. Turn the fin in accordance with the measurements in the figure and tighten it.







## Bellows. Replacement

Check the condition on the universal joint and the exhaust bellows every year. If there are cracks or other defects they must be replaced. Otherwise replace every other year. The drive may need to be removed from the support fork to replace the bellows. Removal of the drive requires special knowledge and tools. If in doubt contact your Volvo Penta workshop for assistance.

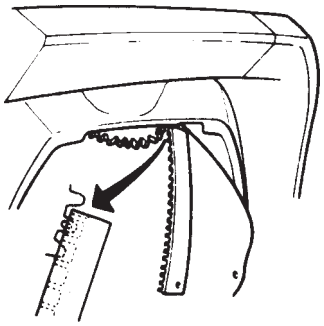
⚠ **WARNING!** Never work on the drive bellows or hydraulic system without locking the drive in its raised position so that it cannot fall down. A falling drive can cause serious personal injury.

Tool 885143-8, when properly installed, prevents the drive falling. Install the tool as follows: Trim the drive down to 0. Remove cotter pins and knock out trim cylinder bolts.

The drive can now be lifted by hand to its raised position. Hold the drive steady in this position and install the tool on the starboard side as illustrated. Carefully check the bellows for damage. The exhaust bellows can be replaced without removing the drive.

⚠ **WARNING!** Do not overload the tool by standing on the raised drive.

Hose clamp screws should be located as illustrated when tightened.



If the drive has been removed the steering rack and drive controlling the trim sensor may have come out of position. Turn the cog until the notched tooth is visible. Install the steering rack so that the first cog position meshes with the marked tooth.

# Steering

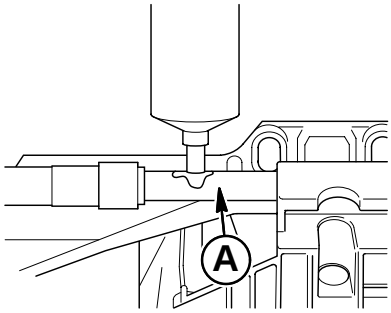
The Volvo Penta sterndrive may feature a power assisted steering system. This consists of an engine mounted pump, hoses, and steering cylinder. These work in conjunction with the helm and steering cable to move the tiller arm, thus moving the drive unit.

The steering system for your Volvo Penta sterndrive is operated by a steering cable connected to the helm. Restricting movement of the steering cable will limit or stop the steering system's hydraulic assist.

**NOTE!** Do not interfere with or restrict steering cable movement through the last 90° of bend at the engine. Do not use cable retainers, clamps or tie straps. Using one or all of these could restrict the cable movement near the engine. Do not tie wiring harnesses or other control cables to the steering cable. Make sure deck combing and bulkheads allow for steering cable movement.

If the power steering system becomes inoperative, an increase in steering effort will be felt. Should this condition occur, inspect for possible cause and correct condition if possible. If the power steering system cannot be corrected on board, proceed at a reduced speed. The boat will be steerable, but with increased effort. See your Volvo Penta dealer as soon as possible to correct your power steering system.

At slow speeds (no wake), your boat may tend to wander. 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 wander tendency. Changing weight distribution, aft to forward, can also affect slow speed steering.




## Twin unit steering

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

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

Some twin engine boats may have both engine power steering systems coupled together with a priority valve. This allows the use of either engine to provide power assist steering.

## Steering bearing lubrication

Lubricate the steering ram (**A**) with a grease gun. Use water resistant grease.

# Propellers

Your Volvo Penta sterndrive should be equipped with propeller(s) that are designed to give top performance and maximum economy under all operation conditions. To obtain peak performance, the engine RPM AT FULL THROTTLE must fall in the specified operating range at normal load conditions at favourable/best trim settings.

If full throttle RPM is below the recommended operating range, propeller(s) with less pitch should be used. Should full throttle RPM exceed the recommended range, install propeller(s) of higher pitch. Selecting the correct propeller(s) to allow the engine to run at full throttle in the recommended operating range will give the best engine life, fuel economy and performance. See your Volvo Penta dealer for help in determining the correct propeller(s) for your application.

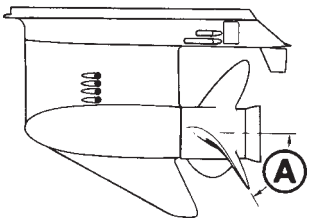
⚠ **IMPORTANT!** Engine damage can result from incorrect propeller selection. A damaged propeller must be changed without delay. Operate with extreme caution if a propeller is damaged. Do not operate DP models with only one propeller, this can cause damage to propeller shafts.

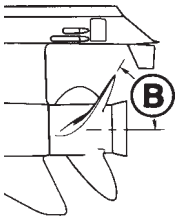
## Propeller selection. SX

The SX drive right-hand propellers rotate clockwise to propel a boat forward. Right-hand propellers are considered standard rotation propellers. To identify a right-hand propeller, note the angle of the blade as viewed from the port side.

Left-hand propellers rotate counterclockwise to propel a boat forward. Left-hand propellers are considered counter-rotation propellers. To identify a left-hand propeller, note the angle of the blade as viewed from the port side.

A drive unit set up for standard rotation must be equipped with a standard rotation (right-hand) propeller. A drive unit set up for counter-rotation must be equipped with a counter-rotation (left-hand) propeller.




**NOTE!** Never interchange a right-hand (**A**) propeller with a left-hand (**B**) propeller. This would result in the boat being propelled in reverse when the motors are operated in forward gear, and forward when motors are operated in reverse gear. To help you better understand and tell the difference between right (**A**) and left-hand (**B**) propellers, see illustrations.

After having the propellers serviced, shift into FORWARD or REVERSE at idle speed and determine if the boat moves in the direction indicated by the position of the control handle. If the boat moves opposite the direction indicated by control handle, the propellers are switched.

⚠ **WARNING!** Failure to perform the above test could result in loss of control.

## Propeller selection. DP-S

The propellers for the DP-S have application and diameter/pitch identification markings, D0 through D7 for aluminum propellers and F4 through F9 for stainless steel propellers. The single number represents the diameter/pitch. The DuoProp propellers (forward and rear) must operate in sets of the matched diameters/pitches. Propellers in a set will have the same identification marking with different part numbers. These sets must be maintained, and for twin installations both vertical drive units must always have propellers with the same identification markings.

## Propeller selection. DP-D

The propellers for the DP-D have application and diameter/pitch identification markings, B1 through B8 for aluminum propellers and C4 through C7 for stainless steel propellers. The single number represents the diameter/pitch. The DuoProp propellers (forward and rear) must operate in sets of the matched diameters/pitches. Propellers in a set will have the same identification marking with different part numbers. These sets must be maintained, and for twin installations both vertical drive units must always have propellers with the same identification markings.

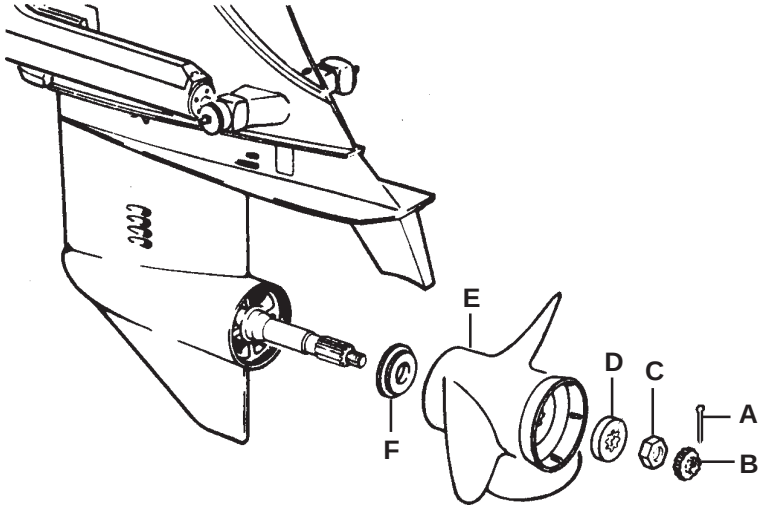
The identification symbol and the front and rear identification are stamped on the end of the propeller hubs. When replacement of a propeller is required, either a forward or rear propeller can be purchased to maintain the matched set. Always order replacement propellers by the part number.

## Propeller care

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 local Volvo Penta dealer. Always carry a spare propeller and replace the damaged propeller as soon as possible.

**NOTE!** Never continuously run with a damaged propeller. Running with a damaged propeller can result in drive unit and engine damage.

## SX propeller replacement




### Removal

⚠ **WARNING!** Make sure the ignition switch is off.

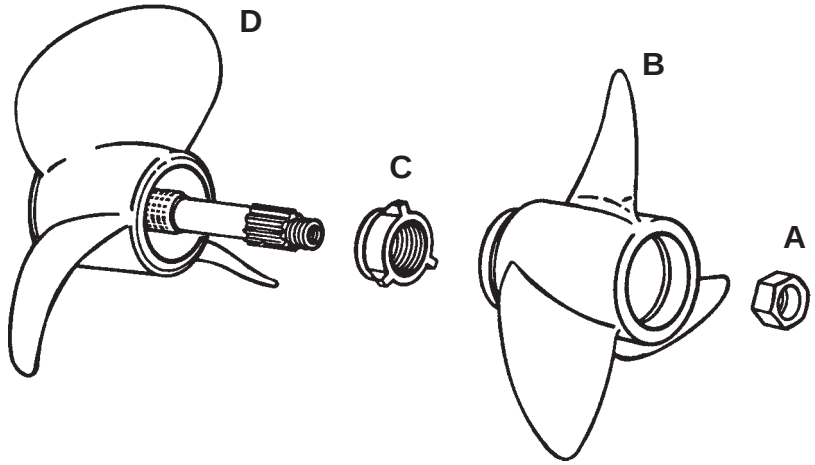
- Set the control lever in the neutral position. Remove the split pin (**A**) and the locking tab washer (**B**)
- Put a wooden block between the propeller blade and the cavitation plate.
- Remove the nut (**C**), spacer (**D**), propeller (**E**) and the bushing (**F**).
- Clean propeller shaft.

### Installation

- Set the control lever in the neutral position. Grease the propeller shaft using water repellant grease.
- Install the bushing (**F**) with the inner cone turned toward the propeller shaft cone.
- Install the propeller (**E**). Press the propeller against the bushing until the spline edges can be seen and install the spacer (**D**) on the splines.
- Put a wooden block between one propeller blade and the cavitation plate. Install the nut (**C**) and tighten using a torque of 96-108 Nm (9.6-10.8 kpm, 71-80 ft. lbs).
- Install the locking tab washer (**B**) so the split pin can be inserted in the hole on the shaft. Install split pin (**A**).

⚠ **IMPORTANT** Always use a new split pin, do not reuse the old one.

# DP-S propeller replacement




## Removal

⚠ **WARNING!** Ignition switch must be OFF.

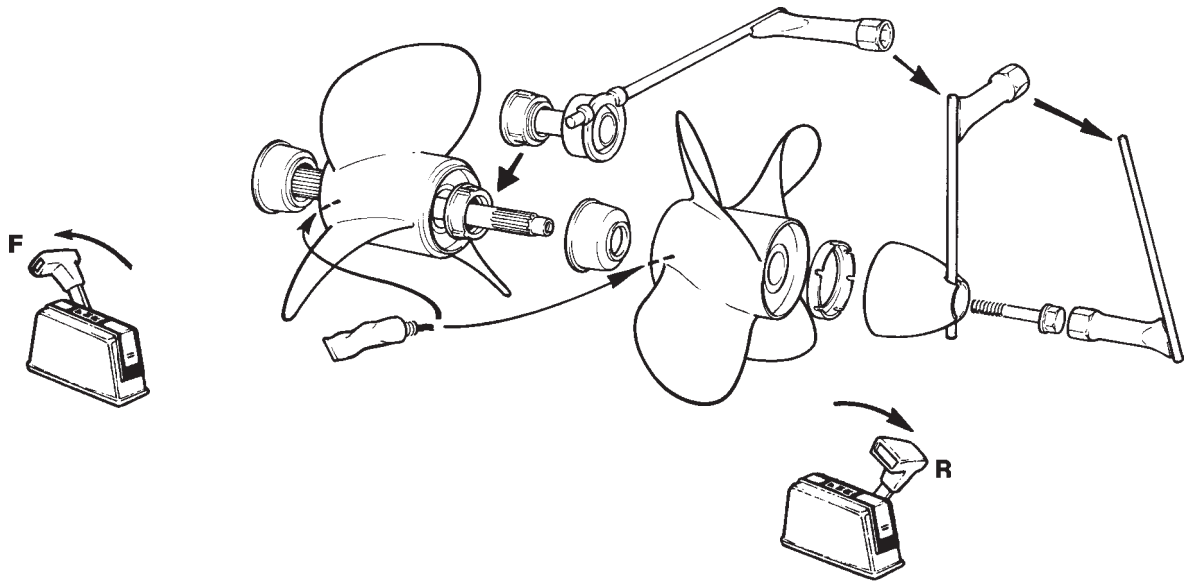
- Place remote control in the reverse position to lock propeller shafts.
- Remove rear propeller nut (**A**).
- Remove the rear propeller (**B**).
- Place remote control in the forward position to lock propeller shafts.
- Remove the front propeller nut (**C**).
- Remove front propeller (**D**).
- Wipe propeller shafts clean. Inspect for monofilament line; remove if present.

## Installation

- Coat the full length of both propeller shafts with Volvo Penta propeller shaft grease.
- Place remote control in the forward position to lock propeller shafts.
- Install front propeller (**D**).
- Install front propeller nut (**C**) and tighten to 60 Nm.
- Place remote control in the reverse position to lock propeller shafts.
- Install rear propeller (**B**).
- Install the rear propeller nut (**A**) and tighten to 70 Nm.

**NOTE!** Failure to install propellers as shown could result in the loss of the rear propeller and damage to the drive unit when boat is operated.

## DP-D propeller replacement




### Propeller removal

⚠ **WARNING!** Ignition switch must be OFF.

- Place remote control in the reverse position to lock propeller shafts.
- Remove rear propeller nut.
- Remove the rear propeller.
- Place remote control in the forward position to lock propeller shafts.
- Remove the front propeller nut.
- Remove front propeller.
- Wipe propeller shafts clean. Inspect for monofilament line; remove if present.

### Propeller installation

- Coat the full length of both propeller shafts with Volvo Penta propeller shaft grease.
- Place remote control in the forward position to lock propeller shafts.
- Install front propeller.
- Install front propeller nut and tighten to 60 Nm.
- Place remote control in the reverse position to lock propeller shafts.
- Install rear propeller.
- Install the rear propeller nut and tighten to 70 Nm.

**NOTE!** Failure to install propellers as shown could result in the loss of the rear propeller and damage to the drive unit when boat is operated.

# Maintenance schedule

Regular maintenance is necessary if the engine and transmission are to operate without problems. It is important that maintenance work is not forgotten and is done properly. Below is a maintenance schedule that deals with the recommended maintenance work.

Read the chapter ***Maintenance*** carefully before starting work. **If there is any item you are not sure of, please contact your Volvo Penta dealer for more information.**

⚠ **IMPORTANT!** These service operations ❑ must be carried out by an authorized Volvo Penta Service workshop.

## Daily before starting first time:

- Engine. Check oil level
- Fuel system. Check for leakage
- Exhaust/Cooling system hoses/clamps. Check for leakage

## Every two weeks:

- Battery. Check electrolyte level
- Drive belts. Check belt tension
- Servo pump. Check oil level
- Trim pump. Check oil level
- Drive. Check corrosion protection

## Checks every 50 hours or at least once a year:

- Steering shaft bearing. Lubricate
- Flame trap mounting. Tighten

## Every 100 operating hours or at least once a year:

- Engine oil and oil filter. Replace
- Drive (SX, DP-S). Oil replace
- Drive (SX). Replace aluminum anode.
- Drive (SX, DP-S). U-joint and exhaust bellows. Check

☐ Drive (SX, DP-S). Lubricate U-joint and gimbal bearing.

## Every 200 operating hours or at least once a year:

- Spark plugs. Replace
- Ignition cables and distributor cap. Check and clean
- Drive belts. Check
- Fuel filter. Replace
- Carburetor filter. Check
- Flame trap. Clean
- Seawater pump. Check
- Drive (DP-D). U-joint and exhaust bellows. Check
- Drive (DP-D). Oil replace
- Controls. Check, adjust
- Anti-fouling paint. Check

## Every other year:

- Seawater pump. Replace impeller

☐ Drive. Replace U-joint and exhaust bellows

# Laying up/Launching

Before taking the boat out of the water for winter/out-of-season storage have an authorized Volvo Penta workshop inspect the engine and other equipment. Have any necessary repairs or service work carried out so that your boat is in the top condition ready for the new season.

Inhibition should be carried out to ensure that the engine and transmission are not damaged while they are out of commission during the winter/off-season. It is important this is done properly and than nothing is forgotten. We have therefore provided a checklist covering the most important points. Before carrying out inhibition read the chapter ***Maintenance*** carefully. There you will find the instructions on how to carry out the points recommended in the checklist. If there is any item you are not sure of, please contact your Volvo Penta dealer for more information.

## Inhibiting

**The following are carried out best with the boat in the water:**

- Change the engine oil and oil filters.
- Replace the fuel filter. If there is a fuel pre-filter replace this as well.

**The following should be done with the boat out of the water:**

- Any fouling on the hull and drive is easiest removed directly after taking up the boat and before it has dried.

⚠ **IMPORTANT!** Be careful when cleaning with a high pressure water spray. Never point the spray at seals, rubber bellows and hoses, for example on the propeller shaft seal, exhaust or drive joint bellows and the trim cylinder seals.

- Clean and inhibit the seawater system.
- Drain any water and contaminants from the fuel tank. Fill the tank completely with fuel to avoid condensation in the tank.
- Clean and charge the batteries. Keep the batteries charged while the boat is in storage.

  **Note!** A poorly charged battery may burst as a result of freezing.
- Clean the outside of the engine. Do not use a high pressure spray to clean the engine. Touch up any damaged areas of paintwork with Volvo Penta original paint.
- Spray the electrical system components with moisture repellant spray.
- Check all control cables and treat with rust inhibitor.
- Steering shaft bearing. Lubricate
- Change oil in the drive.
- Repair any damaged areas of paintwork with Volvo Penta original paint. Note! Read the special instructions on painting the drive under the heading: "Painting the drive and keel".
- Remove the propeller(s) for storage. Grease the propeller shaft using water repellant grease.
- Check the U-joint and exhaust bellows. Replace every other year.
- Lubricate U-joint and gimbal bearing. (SX, DP-S)

## Bringing out of storage

- Check oil level in the engine and drive/reverse gear. Top up if required. For oil quality: See chapter ***Technical Data.***

  **Note!** If there is inhibiting oil in the system drain and fill with new oil, change the filters.

- Close/tighten drain cocks/plugs.
- Check belts.
- Check condition of rubber hoses and tighten hose clamps.
- Connect up the charged batteries.
- Paint drive and hull: See following section.
- Immediately before launching the drive's sacrificial anodes must be cleaned off with emery paper. If an anode is 2/3 its original size (1/3 eroded), it should be replaced.

  ⚠ **IMPORTANT** Do not use steel brushes or any steel tools for cleaning the anodes. This can result in reduced galvanic protection.

- Reinstall the propeller(s).
- Launch the boat. Check there is not fuel, water or exhaust leakage. Check that all control functions are operating normally.

## Painting the drive and keel

Before treating the drive with anti-fouling agent any damaged paintwork must be repaired. Sand down metal surfaces lightly using a 120 grade paper and a finer grade for painted surfaces. Wash off using thinners or similar. Any pores in the surface should be filled and sanded down. Paint using Volvo Penta original primer and topcoat. Let the paint dry. Then apply at least two coats of Volvo Penta anti-fouling **primer**. Let them dry. A further two coats of Volvo Penta anti-fouling should then be applied.

⚠ **IMPORTANT** The sacrificial anodes on the drive must not be painted over or treated with teflon. This also applies to stainless propellers.

Use of anti-fouling agents is not permitted in all countries. Please make sure that it is permitted where your boat is to be used. If anti-fouling agents are not permitted we recommend that the drive is treated with pure teflon®* directly on the original paintwork without sanding down first.

*teflon® Teflon is the registered trademark of the Du Pont Corp.

Paint the keel with a suitable paint or pure Teflon agent. All types of paints with anti-fouling properties are poisonous and more or less damaging to the marine environment. Avoid the use of such agents. Most countries have introduced legislation controlling the use of anti-fouling agents for paint boats. **Always abide by these regulations**. In some cases the agents are completely forbidden for use on leisure craft used in freshwater. If the boat is easy to take up on land then we recommend only teflon treatment combined with mechanical cleaning several times during the season. For larger craft this is not practical. If the boat is in an area where the water is favors fouling then anti-fouling probably must be used. If this is the case use a copper-based paint containing copper cyanate and **not coppper oxide**. Tin-based agents (TBT) must not be used. **Check the legislation that applies where the boat is to be used.** Do not paint nearer than 10 mm to the shield/drive. Wait for the paint to dry before launching the boat.

# Troubleshooting

⚠ **WARNING!** After following the "Action" described in chart, and before cranking the engine, make sure there are no loose electrical connections that could spark. Make sure engine compartment is free of fuel vapors. Failure to do so could result in fire and/or explosion.

| Symptom | Possible cause | Action |
|---|---|---|
| Engine won't start | No fuel in tank or petrol shutoff valve closed | Fill tank or open valve. |
| | Water in fuel supply or petrol is old | Check fuel supply for water contamination. If petrol is old or if water is present, drain fuel tank and flush with fresh petrol, and change fuel filters. |
| | Fuel system | See your Volvo Penta dealer. |
| | Emergency stop switch | Reinstall lanyard. |
| | Battery, or cable connections loose or corroded | Check and clean connections. Recharge battery. |
| | Ignition system | See your Volvo Penta dealer. |
| | Throttle position | Check to see that remote control is in NEUTRAL position. |
| Engine runs erratically | Fuel system problem | See your Volvo Penta dealer. |
| | Fuel filters | Replace filters. See your Volvo Penta dealer. |
| | Electrical system problem | See your Volvo Penta dealer. |
| Engine vibrates | Propeller condition | Check for damaged propeller. Check for weeds on propeller or gearcase. |
| Performance loss | Boat overloaded, not trimmed properly | Reduce or redistribute load. Adjust trim. |
| | Excessive water in bilge | Drain bilge. |
| | Boat hull condition | Clean boat hull. See your Volvo Penta dealer. |
| | Incorrect fuel octane | Fill tank with proper fuel. |
| High shift effort | Remote control box, or shift cable | See your Volvo Penta dealer. |

# Technical Data

## Engine

| | | |
|---|---|---|
| Engine designation | **3.0GL/GS** | **4.3GL/GS/Gi** |
| Type | 4-stroke | 4-stroke |
| No. of cylinders | 4 | 6 |
| Engine type | In-line | 90˚ V |
| Bore (mm) | 101.6 | 101.6 |
| Stroke (mm) | 91.4 | 88.4 |
| Swept volume (liter) | 2.96 | 4.29 |
| Compression ratio | 9.2:1 | 9.4:1 |
| Rotation (from the front) | Clockwise | Clockwise |
| Idle speed in gear (rpm) | 650-750 | 550-650 (GL, GS), 600 (Gi) |

## Fuel system

| | | |
|---|---|---|
| Carburetor, type | 2-port | 2-port (GL), 4-port (GS) |
| Fuel injection, type | - | TBI (Gi)<br>Throttle body injection |

## Lubrication system

| | | |
|---|---|---|
| Oil capacity (including oil filter) (liters) | 3.8 | 4.3 |
| Volume between Max and Min on the dipstick (liters) | 1.0 | 1.0 |
| Oil grade in accordance with the API system | Service SG | Service SG |
| Viscosity at -5° - +50° C* | SAE 20W/50**<br>(SAE 15W/50) | SAE 20W/50**<br>(SAE 15W/50) |

* Temperature based on constant ambient temperature
** Single grade oil can also be used, at temperatures above 0°C SAE 30 should be used.

## Ignition system

| | | | |
|---|---|---|---|
| Firing order | | 1-3-4-2 | 1-6-5-4-3-2 |
| Ignition timing | | 0˚ | 0˚ (GL, GS)<br>8˚ (Gi) |
| Spark plugs P/N: | Volvo Penta | 3851857 | 3856759 |
| | AC | MR43LTS | MR43LTS |
| | Champion | RS12YC | RS12YC |
| Spark plug gap, mm | | 1.1 | 1.1 |
| Tightening torques, spark plugs | | 27 Nm | 27 Nm |

## Electrical systems

| | | |
|---|---|---|
| System voltage | 12 V | 12 V |
| Battery capacity (starter battery) | 360 A | 360 A (GL, GS)<br>650 A (Gi) |
| Generator for alternating current: | | |
| Voltage/max. current | 14/65 A | 14/65 A |

# Engine

| | | |
|---|---|---|
| Engine designation | **5.0FL/Fi** | **5.7GL/GS/GLi/Gi** |
| Type | 4-stroke | 4-stroke |
| No. of cylinders | 8 | 8 |
| Engine type | 90° V | 90° V |
| Bore (mm) | 101.6 | 101.6 |
| Stroke (mm) | 76.2 | 88.4 |
| Swept volume (liter) | 4.85 | 5.73 |
| Compression ratio | 8.4:1(FL)<br>8.5:1 (Fi) | 9.1:1 |
| Rotation (from the front) | Clockwise | Clockwise |
| Idle speed in gear (rpm) | 650-750 | 650 (GL, GS), 600 (GLi, Gi) |

## Fuel system

| | | |
|---|---|---|
| Carburetor, type | 2-port (FL) | 2-port (GL, GS) |
| Fuel injection, type | MPFI (Fi)<br>Multi-port fuel injection | TBI (Gi, GLi)<br>Throttle body injection |

## Lubrication system

| | | |
|---|---|---|
| Oil capacity (including oil filter) (liters) | 5.6 (FL)<br>4.6 (Fi) | 5.7 |
| Volume between Max and Min on the dipstick (liters) | 1.0 | 1.0 |
| Oil grade in accordance with the API system | Service SG | Service SG |
| Viscosity at -5° - +50° C* | SAE 20W/50**<br>(SAE 15W/50) | SAE 20W/50**<br>(SAE 15W/50) |

* Temperature based on constant ambient temperature
** Single grade oil can also be used, at temperatures above 0°C SAE 30 should be used.

## Ignition system

| | | | |
|---|---|---|---|
| Firing order | | 1-3-7-2-6-5-4-8 | 1-8-4-3-6-5-7-2 |
| Ignition timing | | 10° BTDC (FL)<br>5° BTDC (Fi) | 8° BTDC |
| Spark plugs P/N: | Volvo Penta | 3851864 (FL)<br>3851866 (Fi) | 3851861 (GL, GS)<br>3851862 (GLi, Gi) |
| | AC | MR43T (FL), R44LTS (FI) | MR43T (GL, GS)<br>R43TS (GLI, Gi) |
| | Champion | | RV15YC4 |
| Spark plug gap, mm | | 0.9 (FL),1.1 (Fi) | 1.1 |
| Tightening torques, spark plugs | | 7-13 Nm | 27 Nm |

## Electrical systems

| | | |
|---|---|---|
| System voltage | 12 V | 12 V |
| Battery capacity (starter battery) | 360 A (FL)<br>650 A (Fi) | 360 A (GL, GS)<br>650 A (GLi, Gi) |
| Generator for alternating current: | | |
| Voltage/max. current | 14/51 A (FL)<br>14/65 A (Fi) | 14/65 A |

## Engine

| | | |
|---|---|---|
| Engine designation | **5.7GSic/GSi** | **5.8FL/Fi/FSi** |
| Type | 4-stroke | 4-stroke |
| No. of cylinders | 8 | 8 |
| Engine type | 90° V | 90° V |
| Bore (mm) | 101.6 | 101.6 |
| Stroke (mm) | 88.4 | 88.9 |
| Swept volume (liter) | 5.73 | 5.75 |
| Compression ratio | 9.4:1 | 8.4:1(FL), 8.5:1 (Fi), 8.8:1 (FSi) |
| Rotation (from the front) | Clockwise | Clockwise |
| Idle speed in gear (rpm) | 600 | 650-750 |

### Fuel system

| | | |
|---|---|---|
| Carburetor, type | | 4-port(FL) |
| Fuel injection, type | TBI<br>Throttle body injection | MPFI (Fi, FSi)<br>Multi-port fuel injection |

### Lubrication system

| | | |
|---|---|---|
| Oil capacity (including oil filter) (liters) | 5.7 | 5.6 (FL), 4.6 (Fi, FSi) |
| Volume between Max and Min on the dipstick (liters) | 1.0 | 1.0 |
| Oil grade in accordance with the API system | Service SG | Service SG |
| Viscosity at -5° - +50° C* | SAE 20W/50**<br>(SAE 15W/50) | SAE 20W/50**<br>(SAE 15W/50) |

* Temperature based on constant ambient temperature
** Single grade oil can also be used, at temperatures above 0°C SAE 30 should be used.

### Ignition system

| | | | |
|---|---|---|---|
| Firing order | | 1-8-4-3-6-5-7-2 | 1-3-7-2-6-5-4-8 |
| Ignition timing | | 8° BTDC | 10° BTDC (FL)<br>5° BTDC (Fi, FSi) |
| Spark plugs P/N: | Volvo Penta | 3851857 | 3851218 (FL, Fi)<br>3852224 (FSi) |
| | AC | MR43LTS | MR43T (FL)<br>R44LTS (FI, FSi) |
| | Champion | RS12YC | |
| Spark plug gap, mm | | 1.1 | 0.9 (FL), 1.1 (Fi, FSi) |
| Tightening torques, spark plugs | | 27 Nm | 7-13 Nm |

### Electrical systems

| | | |
|---|---|---|
| System voltage | 12 V | 12 V |
| Battery capacity (starter battery) | 650 A | 360 A (FL), 650 A (Fi, FSi) |
| Generator for alternating current: | | |
| Voltage/max. current | 14/65 A | 14/51 A (FL), 14/65 A (Fi, FSi) |

## Fuel specification.

See chapter ***Other product information*** for more information.

| | |
|---|---|
| **3.0GL, 3.0GS** | 93 Octane (RON) unleaded fuel** |
| **4.3GL, 4.3GS** | 93 Octane (RON) unleaded fuel** |
| **5.0FL, 5.7GL, 5.8FL** | 93 Octane (RON) unleaded fuel** |
| **4.3Gi** | 93* Octane (RON) unleaded fuel** |
| **5.7Gi, 5.7GLi** | 93* Octane (RON) unleaded fuel** |
| **5.0Fi, 5.8Fi, 5.8FSi** | 93* Octane (RON) unleaded fuel** |

* If 93 octane (RON) is not available, gasoline down to 90 octane (RON) can be used.

** Leaded gasoline can be used if unleaded is unavailable.

⚠ **WARNING!** Fuel is extremely flammable and highly explosive under certain conditions. Always stop the engine and do not smoke or allow open flames or sparks near the boat when refuelling.

When filling the fuel tanks, ground the tanks to the source of fuel 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 build-up which could cause sparks and ignite fuel vapours.

Fuel leakage can contribute to a fire and/or explosion.

## SX drive

| | |
|---|---|
| Designation | **SX** |
| Oil grade/viscosity | VP 1141572-6 (API GL5 SAE75/90) Synthetic |
| Oil capacity | 2.1 liters |
| **Power Trim hydraulic system** | |
| Oil grade | ATF (Dexron II) |
| Oil capacity | 1.6 liters |
| **Power Steering** | |
| Oil grade | ATF (Dexron II) |

## DP-S drive

| | |
|---|---|
| Designation | **DP-S** |
| Oil grade/viscosity | VP 1141572-6 (API GL5 SAE75/90) Synthetic |
| Oil capacity | 2.4 liters |
| **Power Trim hydraulic system** | |
| Oil grade | ATF (Dexron II) |
| Oil capacity | 1.6 liters |
| **Power Steering** | |
| Oil grade | ATF (Dexron II) |

## DP-D drive

| | |
|---|---|
| Designation | **DP-D** |
| Oil grade/viscosity | VP 1141572-6 (API GL5 SAE75/90) Synthetic |
| Oil capacity, liter | 2.7 liters |
| Volume between Max and Min | 0.15 liters |
| **Power Trim hydraulic system** | |
| Oil grade | ATF (Dexron II) |
| Oil capacity | 1.0 liters |
| **Power Steering** | |
| Oil grade | ATF (Dexron II) |

# Notes

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