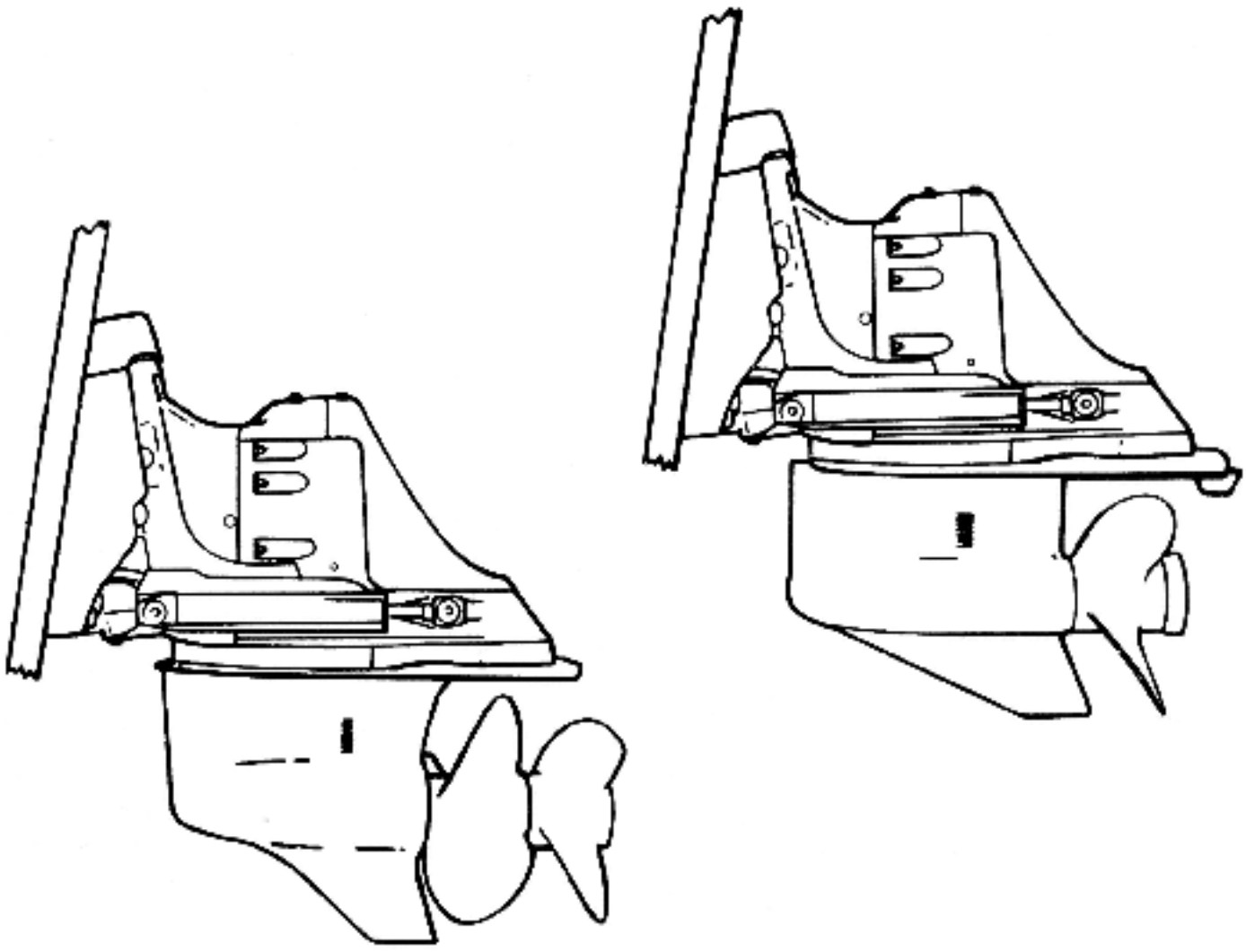
P/N 7797367-5
5-1997

Workshop Manual

"LK" Models

SX, DP-S Drive Unit & Transom Shield



VOLVO PENTA

⚠ Safety Warning

This Workshop Manual will alert you to certain procedures that must be done very carefully. If you ignore this information, you could...

- **Injure yourself or people around you**
- **Injure the boat operator, boat passengers, or people around the boat**
- **Damage the Volvo Penta product or its systems**

Understand the following symbols before proceeding:

⚠ **Safety Warning**	Alerts you to the possibility of danger and identifies information that will help prevent injuries.
Note	Identifies information that will help prevent damage to machinery.
Important	Appears next to information that controls correct assembly and operation of the product.

This Workshop Manual is written for qualified, factory trained service technicians familiar with the use of Volvo Penta special tools.

This Workshop Manual tells you how to correctly maintain and service Volvo Penta products and systems. When correctly serviced, the Volvo Penta product will be reliable and safe to operate.

When Volvo Penta special tools are called for, use them. Where mentioned, the tools are required to perform the service procedure.

If you use service procedures or service tools that are not recommended in this manual, YOU ALONE must decide if your actions might injure people or damage the Volvo Penta product.

Contents

This workshop manual is one of a set of eight that covers Volvo Penta sterndrive models. All eight books can be ordered as a set from Volvo Penta Parts. Order P/N 7797360-0.

Individual workshop manuals covering these models are also available. Order the following part numbers from *Volvo Penta Parts.*

• *P/N 7797361-8 Engine Components*

Includes information on Engine service and troubleshooting; Engine removal and installation; Steering systems; Throttle and Shift Control systems; and Cooling systems.

• *P/N 7797362-6 Electrical & Ignition System*

Includes service and troubleshooting information on Cranking systems; Charging systems; Trim/Tilt electrical systems; Ignition systems; and Engine and Instrument wiring diagrams.

• *P/N 7797363-4 Fuel System*

Includes service and troubleshooting information on all carburetor, MFI and TBI fuel systems and related components.

• *P/N 7797364-2 EFI Diagnostic Manual GM*

Contains troubleshooting procedures for all Electronic Fuel Injected GM models and related components.

• *P/N 7797365-9 PJX WaterJet*

Contains service information for repair and overhaul of the waterjet system.

• *P/N7797366-7 DPX - Workshop Manual*

Includes specific information for repair and overhaul of the DPX Sterndrive and Xact™ steering systems.

• *P/N 7797367-5 SX and DP-S Sterndrives and Transom Shield*

Includes information on Transom Shield, Upper Gear Unit and Lower Gear Unit service; Drive Unit removal and installation; Propellers; and Trim/Tilt hydraulic operation.

• *P/N 7797368-3 SP and DP Workshop Manual*

Includes Upper Gear Unit and Lower Gear Unit overhaul procedures, installation and removal.

This *Volvo Penta* Workshop Manual
Covers The Following Volvo Penta "LK" Models

Engine

3.0 LITER	
30GSMLKD	3868646
30GSPLKD	3868647

4.3 LITER	
43GLPLKD	3868618
43GSPLKD	3868619
43GiPLKDCE	3868620

5.7 LITER	
57GLPLKD	3868621
57GLPLKR	3868699
57GSPLKD	3868598
57GLiPLKDCE	3868732
57GiPLKDCE	3868623
57GSiPLKD	3868624
57GSiCPLKD	3868686

7.4 LITER	
74GLPLKD	3868626
74GiPLKDCE	3868627
74GSiPLKD	3868742

8.2 LITER	
82GSiPLKD	3868743

Transom Shield

SX-C1	3868404
SX-CLT1	3868432
SX-C1AC	3868515
SX-C2AC	3868820

Sterndrive

SX-C1	1.43:1	3868392
SX-C1	1.51:1	3868393
SX-C1	1.60:1	3868394
SX-C1	1.66:1	3868395
SX-CT1	1.97:1	3868397
SX-RT1	1.66:1	3868398
SX-RT2	1.66:1	3868587
SX-C2	1.41:1	3868581
SX-C2	1.51:1	3868582
SX-C2	1.60:1	3868583
SX-C2	1.66:1	3868584
SX-C1	1.85:1	3868465
SX-RT1	2.18:1	3868333
SX-RT2	2.18:1	3868588

DP-S	2.30:1	3868163
DP-S	1.95:1	3868164
DP-S	1.78:1	3868165
DP-S	1.68:1	3868166
DP-S1	2:30:1	3868601
DP-S1	1.95:1	3868602
DP-S1	1.78:1	3868603
DP-S1	1.68:1	3868604

DPX-S1	1.59:1	3868637
DPX-S1	1.68:1	3868638
DPX-S1	1.78:1	3868639

Jet Drive

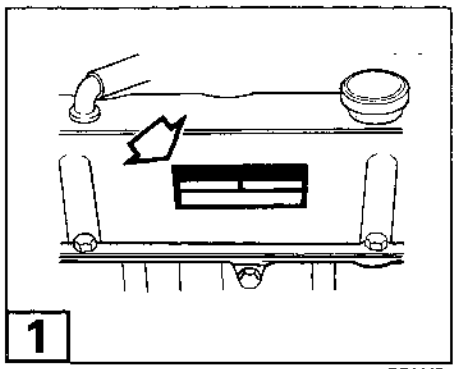
PJX-C	3868694
PJX-C1	3868694

Volvo Penta Model Identification

Note All sterndrive systems must be matched for either single or dual engine installations. Failure to properly match engine, transom bracket and sterndrive will result in poor boat performance, and risk or damage to the engine and or drive because of incorrect drive gear ratio.

The model identification is located on the engine valve cover, and **MUST** correspond with the transom bracket and sterndrive numbers as listed in this document.

- Engine Model Number 1 2 3
- Transom Bracket Model Number 4
- Sterndrive Model Number 5



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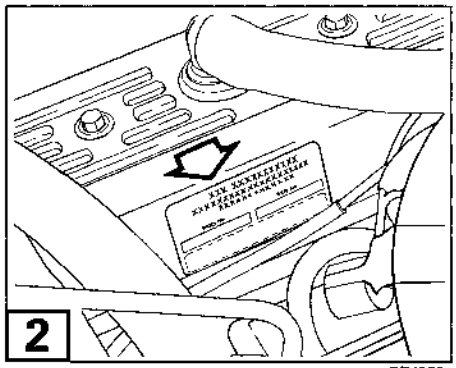

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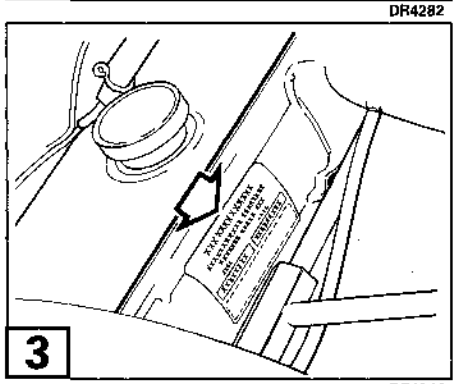

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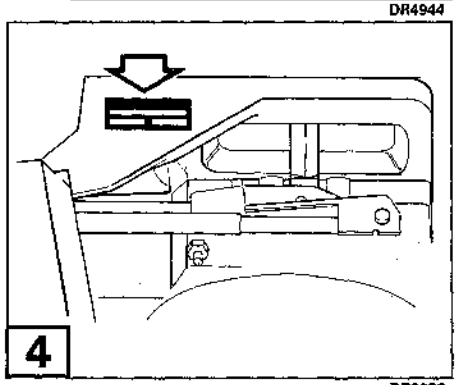

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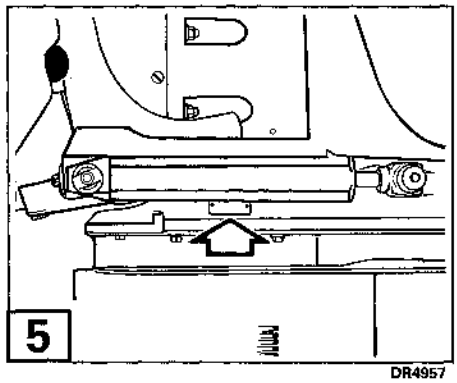

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Section 1

General Information

1

Table of Contents

⚠ Safety Warnings

Before beginning work in this section, read Safety chapter at end of this manual.

Proper installation is important for the safe, reliable operation of all mechanical products. The procedures we recommend and describe in these instructions are effective methods to be followed when installing *Volvo Penta* sterndrive products. Some of these methods require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

Introduction

This service manual covers *Volvo Penta* sterndrive models. It's divided into sections concerning various systems and assemblies. Refer to the Contents to locate the section covering the system or assembly requiring service. Each section title page has an additional listing that will describe the section's contents in more detail. Be sure to read the Safety Section at the end of this manual, and pay special attention to all safety warnings as they appear throughout the text. Since models are subject to change at any time, some photos may not depict actual product.

Good Service Practice

Service for *Volvo Penta* sterndrives are generally one of three kinds:

- Normal care and maintenance - which includes putting a new stern drive into operation, storing engines, lubrication, and care under special operating conditions such as salt water and cold weather.
- Operating malfunctions - due to improper engine or drive mounting, propeller condition or size, boat condition, or the malfunction of some part of the engine. This includes engine servicing procedures to keep the engine in prime operating condition.
- Complete disassembly and overhaul - such as major service or rebuilding a unit.

It's important to determine before disassembly just what the trouble is and how to correct it quickly, with minimum expense to the owner.

When repairing an assembly, the most reliable way to ensure a good job is to do a complete overhaul on that assembly, rather than just to replace the bad part. Wear not readily apparent on other parts could cause malfunction soon after the repair job. Repair kits and seal kits contain all the parts needed to ensure a complete repair, to eliminate guess work, and to save time.

Repair time can also be minimized by the use of special tools. *Volvo Penta* Special Tools are designed to perform service procedures unique to the product that cannot be completed using tools from other sources. They also speed repair work to help achieve service flat rate times. In some cases, the use of substitute tools can damage the part.

Note Do not operate engine out of water even momentarily. If operated in test tank, use proper test wheel. Failure to do so can damage water pump, overheat engine, or allow excessive engine RPM.

Preparation for Service

Proper preparation is extremely helpful for efficient service work. A clean work area at the start of each job will minimize tools and parts becoming misplaced. Clean an engine that is excessively dirty before work starts. Cleaning will occasionally uncover trouble sources. Obtain tools, instruments and parts needed for the job before work is started. Interrupting a job to locate special tools or repair kits is a needless delay.

⚠ Use proper lifting and handling equipment. Working on stern drives without proper equipment can cause damage and personal injury.

Always use clean fresh fuel when testing engines. Troubles can often be traced to the use of old or dirty fuel.

Service Policy

Whether within or following the warranty period, *Volvo Penta* has a constant interest in their products.

It is *Volvo Penta's* policy to provide dealers with service knowledge so they can give professional service demanded by today's consumer. *Volvo Penta* Training Centers, Service Bulletins, Letters and Promotions, Special Tools and this Service Manual represent *Volvo Penta's* efforts to assist dealers in giving consumers the best and most prompt service possible. If a service question does not appear to be answered in this manual, you are invited to call, fax, or write to the *Volvo Penta* Service Department for additional help. Always be sure to give complete information, including engine model number and serial number.

Be sure that you are familiar with *Volvo Penta's* Warranty. If you have any questions, call, fax or write the *Volvo Penta* Service Department. If other than genuine *Volvo Penta* replacement components or parts are used, *Volvo Penta* may refuse subsequent warranty claims involving that engine.

When a brand-name product or specific tool is called for, another item may be used. However, the substitute must have equivalent characteristics, including type, strength, and material. You must determine if incorrect substitution could result in product malfunction and personal injury to anyone. To avoid hazards, equivalent products which are used must meet all current U.S. Coast Guard Safety Regulations and ABYC standards.

Replacement Parts

⚠ When replacement parts are required, always use genuine *Volvo Penta* parts, or parts with equivalent characteristics, including type, strength, and material. Failure to do so may result in product malfunction and possible injury to the operator and/or passengers.

Parts Catalogs

Parts catalogs are a good source of information for ordering replacement parts. They are not a good source for disassembly and reassembly of sterndrives and accessories. The exploded views in the Parts Catalogs are for illustration of parts only, not a source of assembly instructions. The Workshop manual has detailed information and is the only source of information for disassembly and reassembly.

Volvo Penta Special Service Tools

Volvo Penta has specially designed tools to simplify some of the disassembly and assembly operations. These tools are illustrated in this Service Manual, in many cases in actual use. All *Volvo Penta* special tools can be ordered from *Volvo Penta Parts and Accessories*. Individual purchasers of Service Manuals must order Special Tools through an authorized *Volvo Penta* dealer.

Product References, Illustrations & Specifications

Volvo Penta reserves the right to make changes at anytime, without notice, in specifications and models and also to discontinue models. The right is also reserved to change any specifications or parts at any time without incurring any obligation to equip same on models manufactured prior to date of such change. All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of printing. The right is reserved to make changes at anytime without notice.

All photographs and illustrations used in this manual may not depict actual models or equipment, but are intended as representative views for reference only. The continuing accuracy of this manual cannot be guaranteed.

Sterndrive Lubrication - Volvo Penta *SX* Models

Adding Lubricant to Sterndrive *Volvo Penta SX Models*

[1] [2] Occasionally check oil level in the sterndrive. Screw dipstick Ⓐ fully into hole. Remove and read oil level in reference to mark on dipstick. If oil level is low, add oil through dipstick opening. Add only enough lubricant to bring the oil level to the proper level somewhere in the range Ⓑ on the dipstick.

Sterndrive Oil Capacity

Change Lubricant Every 100 Hours or Once Each Season Use *Volvo Penta DuraPlus™ Synthetic GL-5* Gear case Lubricant

- All *Volvo Penta SX* Models 71 oz. (2100 cc)

Draining and Filling Sterndrive

When a complete change of lubricant is required in the sterndrive, proceed as follows:

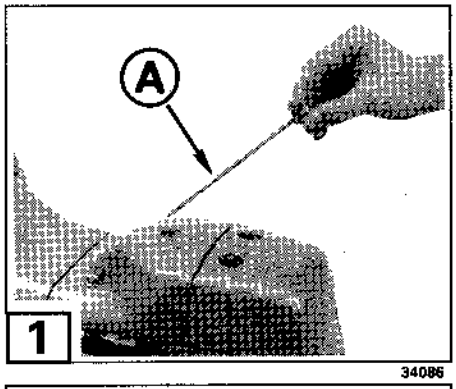
1. Place sterndrive in the full down position. Place a 4 liter drain pan under lower gear case to catch oil.

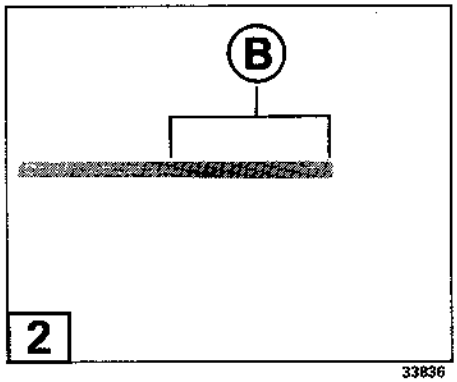
[3] 2. Remove oil drain plug Ⓓ (port side of lower gear case) and dipstick Ⓐ (top of sterndrive). Removing dipstick vents sterndrive to improve oil draining. Allow oil to drain completely.

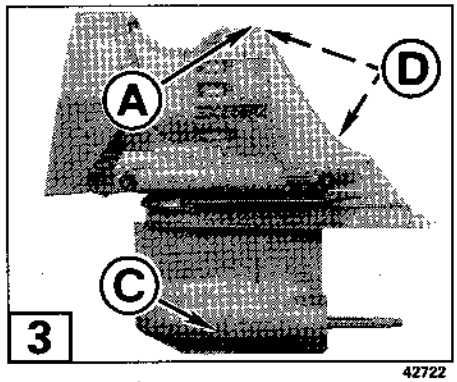
[3] [4] 3. Remove three screws securing the shift link access cover to access the oil level plug Ⓔ. Fill sterndrive with *DuraPlus™ GL-5 Synthetic Gear Lubricant* through oil drain plug hole Ⓒ. Fill slowly to purge air. Sterndrive is properly filled when the oil level appears at the oil level plug hole. When filled to the proper level, install oil level dipstick Ⓐ and the oil level plug Ⓔ first to prevent excessive oil loss, then the oil drain plug Ⓒ. Tighten oil level gauge, plug, and drain plug finger tight.

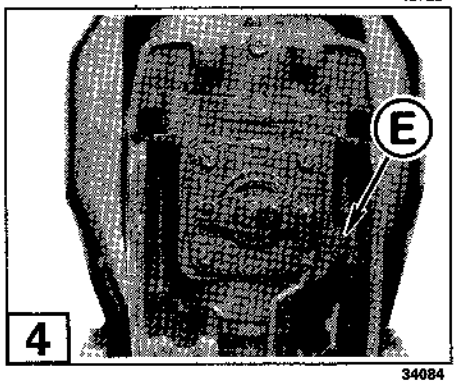
Note **Filling sterndrive too quickly may form air pockets that will cause an inaccurate oil level reading. Running the sterndrive with improper oil level will result in immediate internal damage. If lubricant has been completely changed, oil level must be rechecked after unit has been run and trapped air purged. Improper oil level will result in serious internal sterndrive damage. Add makeup oil through dipstick opening to bring oil up to proper level.**

[1] 4. Check oil level with dipstick. Oil level must appear on the blade of the dipstick. Add oil if required, through the dipstick hole following procedures under **Adding Lubricant to Sterndrive.**









5. Tighten drain plug to 60-84 in. lbs. (6,8-9,5 Nm). Tighten oil level dipstick to 48-72 in. lbs. (5,4-8,1 N•m)

6. Install access cover and tighten screws to 108-132 in. lbs. (12 - 14 N•m).

Note If lubricant has been completely changed, oil level must be rechecked after unit has been run and trapped air purged. Improper oil level will result in serious internal sterndrive damage. Add make-up oil through dipstick opening to brin oil up to proper level.

Sterndrive Lubrication -*Volvo Penta DP-S* Models

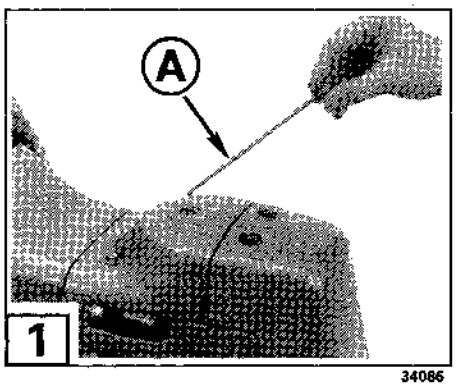
Adding Lubricant to Sterndrive *Volvo Penta SX Models*

1 2 Occasionally check oil level in the sterndrive. Screw dipstick Ⓐ fully into hole. Remove and read oil level in reference to mark on dipstick. If oil level is low, add oil through dipstick opening. Add only enough lubricant to bring the oil level to the proper level somewhere in the range Ⓑ on the dipstick.

Sterndrive Oil Capacity

Change Lubricant Every 100 Hours or Once Each Season Use *Volvo Penta DuraPlus™ Synthetic GL-5* Gear case Lubricant

- All *Volvo Penta DP-S* Models 81 oz. (2400 ml)



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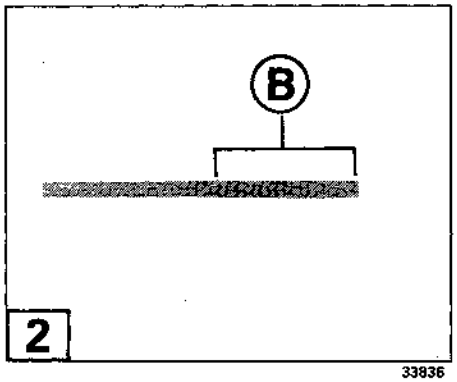

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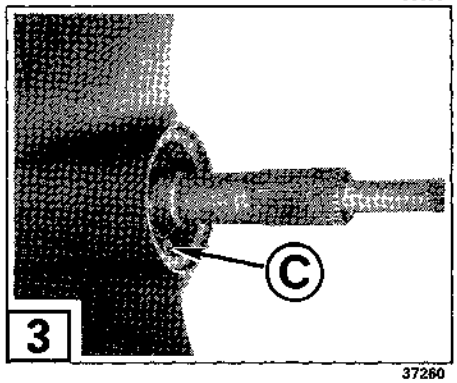

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Draining and Filling Sterndrive

1. Move shift control to reverse. Using a 30 mm socket, remove the rear propeller retaining nut and propeller. Move the shift control to forward. Using Prop Tool, P/N 3855876-3, remove the front propeller retaining nut and propeller.

⚠ Do not attempt to counterhold propellers by hand while removing or installing propeller nuts, serious injury may result.

2. With the sterndrive in the full down position, place a 4 liter oil drain pan under the gear case.

3 3. Remove oil fill/drain screw Ⓒ using an 8 mm Allen wrench. Discard the O-ring. Let the sterndrive drain completely.

1 4. Remove the oil level dipstick Ⓐ so the oil cavity can vent while draining.

Note Do not fill the sterndrive with oil unless it passes both pressure and vacuum tests. Sterndrives that fail either test will allow water entry when in use and cause subsequent damage to internal parts.

4 5 1. Remove the three screws Ⓓ securing the shift link access cover to access the oil level plug Ⓔ. Remove the oil level plug Ⓔ. Discard the plug and dipstick O-ring. Replace them with new ones. 2. Install Fill Adaptor, P/N 3855932-4. Fill the sterndrive with *DuraPlus™ GL-5 Synthetic Gear Lubricant* through oil drin plug hole Ⓒ. Fill slowly to purge trapped air. Stop filling when the oil level reaches the bottom of the oil level hole Ⓔ. Rotate propshaft several times to purge any trapped air.

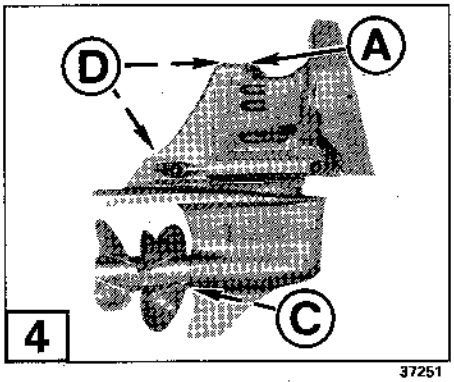
Note Do not overfill. This will cause the oil cavity to overpressurize during operation and damage oil seals. Filling drive too quickly may form air pockets that will cause an inaccurate oil level reading. Running drive with improper oil level may result in internal damage. Damage caused from running the drive oil too high or too low will not be covered under Volvo Penta's limited warranty.

1 12. Install propellers. Move the shift control to forward. Install the front propeller Ⓓ and propeller nut Ⓒ. Using Prop Tool, P/N 3855876-3 torque to 45 ft. lbs. (60 Nm). Move shift control to reverse. Install the rear propeller Ⓑ and propeller nut Ⓐ. Using a 30 mm socket, torque to 50 ft. lbs. (70 N•m).

Power Trim/Tilt-Fluid Level

6 The trim/tilt assembly contains the electric motor, hydraulic pump, and reservoir. At the beginning of each boating season, check the fluid level in the reservoir as follows:

⚠ The trim/tilt hydraulics are pressurized when the sterndrive is in the down position. The sterndrive must be tilted full up to relieve hydraulic pressure before removing level/fill plug Ⓖ. Failure to tilt the sterndrive to the full up position before removing level/fill plug would result in a hazardous spray of hydraulic oil. Caution should always be taken when removing level/fill plug by placing a rag over the level/fill plug to prevent residual pressure from spraying oil.



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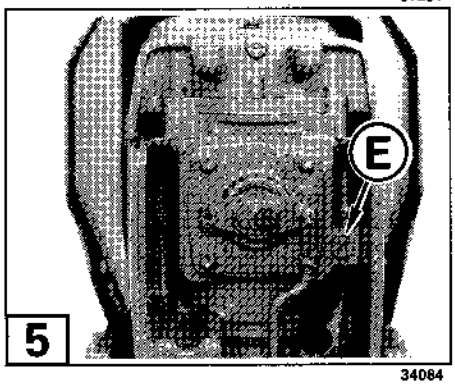

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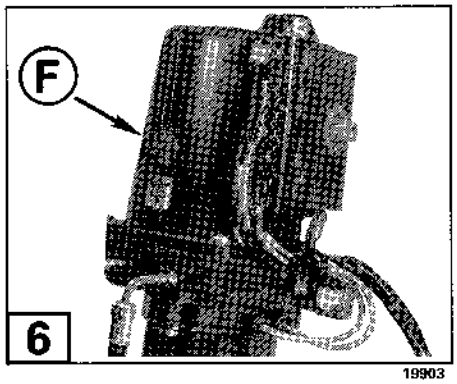

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1. With the sterndrive tilted full up, slowly and carefully remove the level/fill plug.

2. Check the fluid level. The fluid should be level with the bottom of the fill hole when the sterndrive is at full tilt.

3. If necessary, add *DuraPlus™ Power Trim/Tilt & Steering Fluid.* Replace the level/fill plug and tighten securely.

Note When checking fluid level, inspect the trim/tilt unit for leaks and proper operation. Repair or replace defective components.

Off-Season Storage - SX and DP-S Models

1. **Change Sterndrive Lubricant:**

Drain and refill with fresh *Volvo Penta DuraPlus™ Synthetic GL-5* gear oil. Refer to **Sterndrive Lubrication.**

2. **Lubricate Gimbal Bearing and Universal Joints:** Refer to information elsewhere in this manual.

3. **Inspect Sterndrive Water Pickup Screens for Obstructions.**

Note See ***Engine Components Workshop Manual*** for additional engine off-season storage procedures.

Painting

1. Remove all marine growth.

2. Remove all loose paint and corrosion by sanding or sandblasting. If sandblasting, use an aluminum oxide blasting media with a particulate size of 0.2 - 0.7mm.

3. Remove all trace of grease and wash with hot water and detergent. Roughen all painted surfaces with medium *3M Scotchbrite™* pad. Rinse thoroughly with water.

4. Treat any bare aluminum with chromate conversion coating. Clean the entire bare area with an acid cleaner that does not contain fluoride, such as *Du Pont® 5717.* Scrub surface with *3M Scotchbrite™* pad until it is completely "wetted" with no beads of water.

⚠ Fluoride in a cleaner causes a "smut" (dark discoloration on silicon-alloy aluminum castings, and paint will not stick to "smut." If this happens, sand the surface and start over using a different acid cleaner.

⚠ **Do not use steel wool.** Small pieces of steel will become imbedded in the aluminum and will cause severe corrosion.

5. Rinse thoroughly with water. The area must appear "wetted," or the surface is not clean and the paint will not adhere.

6. While the surface is still wet from rinsing, treat all bare aluminum with *Du Pont® 226S* chromate conversion solution. Brush the chromate solution on the surface. Adding additional solution as required for 2 to 5 minutes to prevent it from drying on the surface. Rinse the surface thoroughly with water and allow to air dry. Follow label instructions exactly.

- If the chromate is allowed to dry anywhere on the bare aluminum surface, chromic acid salts will form which will prevent paint adhesion and promote corrosion. Sand the surface to bare metal
- It is best to let the part air dry, but if you must wipe the surface to speed up drying, use lint free wipes not treated with anything that may contaminate the surface. Do not scrub the surface, wipe very lightly.
- Do not blow dry the part with shop air unless it is completely free of dirt, oil, and water.
- Do not heat the part above 150°F, before painting.
- Do not touch the treated surface with bare hands before painting.
- The part should be primed soon after it dries, or at least within 24 hours.

7. Where the prime coat is thin or where the surface is unpainted, prime with Volvo Penta P/N 1141562-7 or *PPG® Super Koropon* epoxy primer. Do not apply primer over hard finish coat. Primer solvents must be allowed time to evaporate and the primer must harden before applying the finish coat. Allow 8 to 12 hours drying time.

8. Apply finish coat. The parts catalogs and the *Volvo Penta Parts & Accessories* catalogs list part numbers for finishing products.

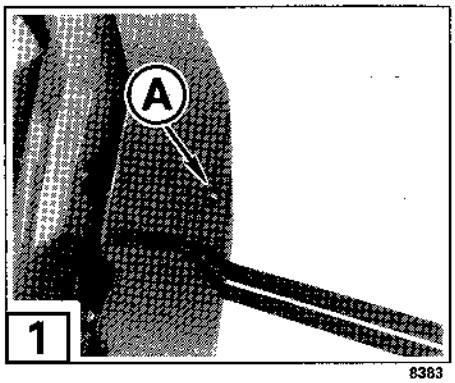
Gimbal Bearing and Universal Joint Lubrication

The gimbal bearing and universal joint must be lubricated each year. Lubricate the gimbal bearing and universal joint when preparing your boat for the off season storage. This requires the removal of the drive unit; therefore, Volvo Penta recommends that your Volvo Penta dealer perform this operation.

Note Failure to lubricate the gimbal bearing and universal joint each year will result in damage to the transom shield and drive unit.

1 **2** The gimbal bearing is lubricated by a grease fitting located on the starboard side Ⓐ, Volvo Penta SX and DP-S models, of the gimbal housing. *Volvo Penta* recommends that lubrication of the gimbal bearing be done with drive unit removed. This will allow observation of old grease as it is being replaced by new grease. If there is evidence of water, the bearing should be inspected for damage and/or replaced. Lubricate gimbal bearing with *EP wheel bearing* grease. Apply grease until all the old grease is removed and new grease appears.

2 The sterndrive must be removed to lubricate the universal joint. Lubricate U-joint with *EP Wheel Bearing* grease. Apply grease to the U-joint grease fittings Ⓑ until old grease is forced out. When the sterndrive is removed, wipe old grease and dirt off driveshaft splines, then thoroughly clean splines before applying new grease. The driveshaft splines Ⓒ must be lubricated with Molybdenum Grease, and light oil applied to the shaft O-rings Ⓓ. The bellows should be checked for damage and deterioration. Replace if necessary. Engine alignment must also be checked. Refer to **Sterndrive Installation** in **Sterndrive Removal and Installation** section of this manual.



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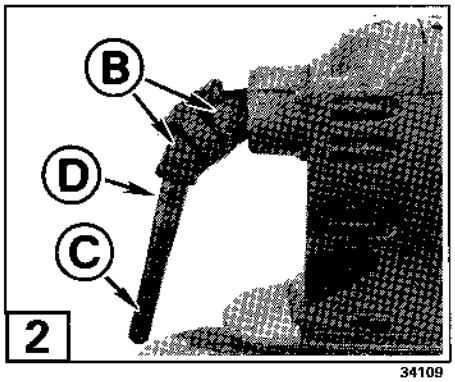

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Recommendations for antifouling paints on boats equipped with sterndrives.

All antifouling paints that prevent marine growth are poisonous and may harm our marine environment. The legislation concerning antifouling paints has changed in many countries and others have announced coming changes in their legislation.

In general the new legislation is or will be considerably more restrictive as far as the allowed leakage of the active ingredients in the paints to the water is concerned. Several countries have put into practice (or will put into practice) a more restrictive legislation for pleasure boats than for commercial boats and vessels. The reason is that leisure boat harbors often are situated in shallow waters, which are spawning grounds for fish. Contrary to commercial boats, leisure boats spend most of their time tied up in the harbor, which adds to the impact on the environment in these waters.

Since the protection of the environment is in the best interest of all concerned, it is important to minimize the use of antifouling paints. As far as smaller boats are concerned trailer boats, which can be taken out of the water, we recommend teflon type paint only, combined with cleaning a few times during the season. This procedure can prove somewhat impractical as far as larger boats are concerned and therefore antifouling paints might have to be used. However, always take care to find out the valid legislation in the area where you intend to use the boat prior to starting the treatment of the boat! The legislation can also provide rules as to the boat weight or overall length. Always follow these directions.

Note It may be completely forbidden to use antifouling paints on leisure boats in some instances (e.g. in fresh water).

Painting the sterndrive with antifouling paint

Clean the sterndrive carefully. De-grease and flush thoroughly with water. Sand the surface with a water-abrasive paper (grit size 200-240). Make sure not to sand through the original paint of the sterndrive. Damage to drive paint must be carefully repaired with primer and original *Volvo Penta* paint. Pure metal must be cleaned prior to the application of primer. Make sure to let the primer and the paint harden in accordance with the manufacturer's instructions. Mask the hull around the transom shield and spots on the sterndrive which are not to be painted.

Note Do not paint the zinc anodes!

⚠IMPORTANT Make sure that you have a good contact between the zinc anodes and the sterndrive. Prior to launching the boat the zinc anodes must be cleaned (activated) with emery cloth in order to remove the oxide layer. Never use a steel brush when cleaning. The steel brush reduces the galvanic protection. The engine and sterndrive must never be in metallic contact with the keel, rudder or other metallic components below the water line. Electrical equipment (such as charging equipment, navigational aids, VHF radio, etc.) must never be grounded to the engine or to the sterndrive .

PAINT FOR STERNDRIVES

PART No.	COLOR	DESCRIPTION
1141567-6	Blue-gray (270-290A) -1987	2-Part Paint 0.5 qts
1141578-3	Gray (290A-SPC1, DPD2)	2-Part Paint 0.5 qts
1141577-5	Gray (290A-SPC1, DPD2)	2-Part Paint 1.0 qts
1141575-9	Gray (290A-SPC1, DPD2)	Aerosol Spray can
3851219-0	Silver Metallic	Aerosol Spray can
3851220-8	Dark Silver (DPX)	Aerosol Spray can

Painting the hull with antifouling paint

Always follow the manufacturer's instructions. When making the purchase, make sure that you receive the correct product meeting the legislation prevailing in the area where you are going to use the boat. The product mu st contain the correct properties for the boat hull type. Aluminum hulls often require an initial treatment with an etching primer. Use a pure copper based antifouling paint, containing copper tiocyanate, not copper oxide. Tin-based (TBT-paints) are no longer allowed. Make sure to prepare the hull in accordance with the directions of the paint manufacturer.

⚠IMPORTANT Leave a 1" strip unpainted around the transom shield/sterndrive.

Preparing Boat After Storage

See **Engine Components Workshop Manual** for specific information concerning the engine preparation.

Volvo Penta Dealer Service - 20 Hour Check

20 - Hour check includes:

- Change engine oil and filter.
- Drain and refill sterndrive. Check the tilt/trim reservoir for proper fluid level.
- Lubricate steering cable ram with grease and check power steering pump reservoir for correct fluid level.
- Change fuel filter/water separator.
- Check tension on all drive belts.
- Check engine timing.
- Carbureted Models: Check and adjust carburetor for correct idle mixture and idle RPM.
- Check engine mounts.
- Lubricate gimbal bearing and U-joint.
- Check engine alignment.
- Check for any deficiencies, malfunctions, signs of neglect or abuse, etc. Correcting any problems discovered at this time will prevent worsening of a minor problem and help ensure a trouble-free boating season.
- Inspect exhaust system, check all hose clamps for security.
- Make sure engine can achieve maximum rated RPM.

For the U.S., Canada, and Mexico, the 20-Hour Check is paid for by the boat owner and performed by your *Volvo Penta dealer* at local shop rates. In other markets the Warranty Inspection is paid for according to the Warranty Policy for Importers.

METRIC CONVERSION CHART

LINEAR

inches	X 25.4	= millimetres (mm)
feet	X 0.3048	= metres (m)
yards	X 0.9144	= metres (m)
miles	X 1.6093	= kilometres (km)
inches	X 2.54	= centimetres (cm)

AREA

inches^2	X 645.16	= millimetres^2 (mm^2)
inches^2	X 6.452	= centimetres^2 (cm^2)
feet^2	X 0.0929	= metres^2 (m^2)
yards^2	X 0.8361	= metres^2 (m^2)
acres	X 0.4047	= hectares (10^4 m^2) (ha)
miles^2	X 2.590	= kilometres^2 (km^2)

VOLUME

inches^3	X 16387	= millimetres^3 (mm^3)
inches^3	X 16.387	= centimetres^3 (cm^3)
inches^3	X 0.01639	= litres (l)
quarts	X 0.94635	= litres (l)
gallons	X 3.7854	= litres (l)
feet^3	X 28.317	= litres (l)
feet^3	X 0.02832	= metres^3 (m^3)
fluid oz	X 29.57	= millilitres (ml)
yards^3	X 0.7646	= metres^3 (m^3)

MASS

ounces (av)	X 28.35	= grams (g)
pounds (av)	X 0.4536	= kilograms (kg)
tons (2000 lb)	X 907.18	= kilograms (kg)
tons (2000 lb)	X 0.90718	= metric tons (t)

FORCE

ounces - f (av)	X 0.278	= newtons (N)
pounds - f (av)	X 4.448	= newtons (N)
kilograms - f	X 9.807	= newtons (N)

ACCELERATION

feet/sec^2	X 0.3048	= metres/sec^2 (m/S^2)
inches/sec^2	X 0.0254	= metres/sec^2 (m/S^2)

ENERGY OR WORK

foot-pounds	X 1.3558	= joules (j)
calories	X 4.187	= joules (j)
Btu	X 1055	= joules (j)
watt-hours	X 3500	= joules (j)
kilowatt - hrs	X 3.600	= megajoules (MJ)

FUEL ECONOMY AND FUEL CONSUMPTION

miles/gal	X 0.42514	= kilometres/litre (km/l)

Note:
235.2/(mi/gal) = litres/100 km
235.2/(litres/100 km) = mi/gal

LIGHT

footcandles	X 10.76	= lumens/metre^2 (lm/m^2)

PRESSURE OR STRESS

inches HG (60°F)	X 3.377	= kilopascals (kPa)
pounds/sq in	X 6.895	= kilopascals (kPa)
inches H_2O (60°F)	X 0.2488	= kilopascals (kPa)
bars	X 100	= kilopascals (kPa)
pounds/sq ft	X 47.88	= pascals (Pa)

POWER

horsepower	X 0.746	= kilowatts (kW)
ft-lbf/min	X 0.0226	= watts (W)

TEMPERATURE

°Celsius = 0.556 X (°F -32)
°Fahrenheit = (1.8 X °C) +32

TORQUE

pound-inches	X 0.11299	= newton-metres (N·m)
pound-feet	X 1.3558	= newton-metres (N·m)

VELOCITY

miles/hour	X 1.6093	= kilometres/hour (km/h)
feet/sec	X 0.3048	= metres/sec (m/s)
kilometres/hr	X 0.27778	= metres/sec (m/s)
miles/hour	X 0.4470	= metres/sec (m/s)

Drill Size Conversion Chart

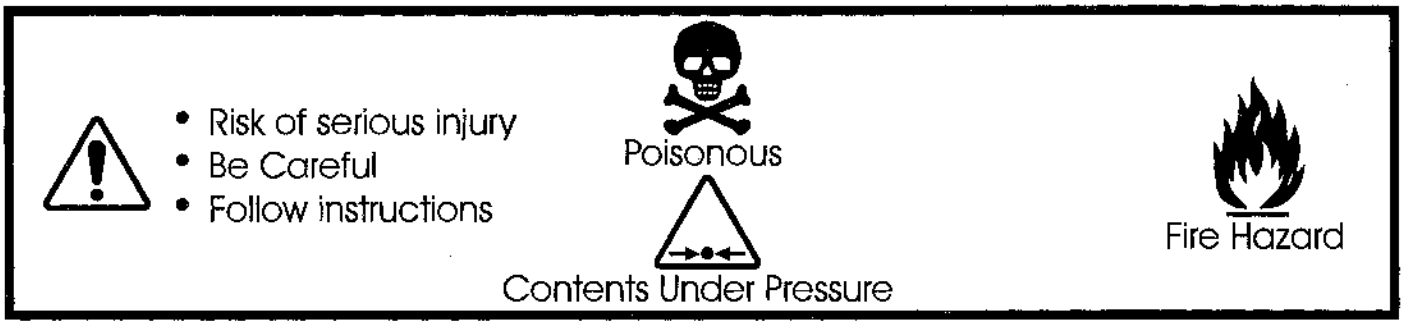
SHOWING MILLIMETER SIZES, FRACTIONAL AND DECIMAL INCH SIZES AND NUMBER DRILL SIZES

Milli-Meter	Dec. Equiv.	Frac-tional	Num-ber	Milli-Meter	Dec. Equiv.	Frac-tional	Num-ber	Milli-Meter	Dec. Equiv.	Frac-tional	Num-ber	Milli-Meter	Dec. Equiv.	Frac-tional	Num-ber	Milli-Meter	Dec. Equiv.	Frac-tional
.1	.0039			1.75	.0689			. . .	.1570		22	6.8	.2677			10.72	.4219	27/64
.15	.0059			. . .	.0700		50	4.0	.1575			6.9	.2716			11.0	.4330	
.2	.0079			1.8	.0709			. . .	.1590		21	. . .	.2720		I	11.11	.4375	7/16
.25	.0098			1.85	.0728			. . .	.1610		20	7.0	.2756			11.5	.4528	
.3	.0118			. . .	.0730		49	4.1	.1614			. . .	.2770		J	11.51	.4531	29/64
. . .	.0135		80	1.9	.0748			4.2	.1654			7.1	.2795			11.91	.4687	15/32
.35	.0138			. . .	.0760		48	. . .	.1660		19	. . .	.2811		K	12.0	.4724	
. . .	.0415		79	1.95	.0767			4.25	.1673			7.14	.2812	9/32	. . .	12.30	.4843	31/64
.39	.0156	1/64	. . .	1.98	.0781	5/64	. . .	4.3	.1693			7.2	.2835			12.5	.4921	
.4	.0157			. . .	.0785		47	. . .	.1695		18	7.25	.2854			12.7	.5000	1/2
. . .	.0160		78	2.0	.0787			4.37	.1719	11/64	. . .	7.3	.2874			13.0	.5118	
.45	.0177			2.05	.0807			. . .	.1730		17	. . .	.2900		L	13.10	.5156	33/64
. . .	.0180		77	. . .	.0810		46	4.4	.1732			7.4	.2913			13.49	.5312	17/32
.5	.0197			. . .	.0820		45	. . .	.1770		16	. . .	.2950		M	13.5	.5315	
. . .	.0200		76	2.1	.0827			4.5	.1771			7.5	.2953			13.89	.5469	35/64
. . .	.0210		75	2.15	.0846			. . .	.1800		15	7.54	.2968	19/64	. . .	14.0	.5512	
.55	.0217			. . .	.0860		44	4.6	.1811			7.6	.2992			14.29	.5624	9/16
. . .	.0225		74	2.2	.0866			. . .	.1820		14	. . .	.3020		N	14.5	.5709	
.6	.0236			2.25	.0855			4.7	.1850		13	7.7	.3031			14.68	.5781	37/64
. . .	.0240		73	. . .	.0890		43	4.75	.1870			7.75	.3051			15.0	.5906	
. . .	.0250		72	2.3	.0905			4.76	.1875	3/16	. . .	7.8	.3071			15.08	.5937	19/32
.65	.0256			2.35	.0925			4.8	.1890		12	7.9	.3110			15.48	.6094	39/64
. . .	.0260		71	. . .	.0935		42	. . .	.1910		11	7.94	.3125	5/16	. . .	15.5	.6102	
. . .	.0280		70	2.38	.0937	3/32	. . .	4.9	.1929			8.0	.3150			15.88	.6250	5/8
.7	.0276			2.4	.0945			. . .	.1935		10	. . .	.3160		O	16.0	.6299	
. . .	.0292		69	. . .	.0960		41	. . .	.1960		9	8.1	.3189			16.27	.6406	41/64
.75	.0295			2.45	.0964			5.0	.1968			8.2	.3228			16.5	.6496	
. . .	.0310		68	. . .	.0980		40	. . .	.1990		8	. . .	.3230		P	16.67	.6562	21/32
.79	.0312	1/32	. . .	2.5	.0984			5.1	.2008			8.25	.3248			17.0	.6693	
.8	.0315			. . .	.0995		39	. . .	.2010		7	8.3	.3268			17.06	.6719	43/64
. . .	.0320		67	. . .	.1015		38	5.16	.2031	13/64	. . .	8.33	.3281	21/64	. . .	17.46	.6875	11/16
. . .	.0330		66	2.6	.1024			. . .	.2040		6	8.4	.3307			17.5	.6890	
.85	.0335			. . .	.1040		37	5.2	.2047			. . .	.3320		Q	17.86	.7031	45/64
. . .	.0350		65	2.7	.1063			. . .	.2055		5	8.5	.3346			18.0	.7087	
.9	.0354			. . .	.1065		36	5.25	.2067			8.6	.3386			18.26	.7187	23/32
. . .	.0360		64	2.75	.1082			5.3	.2086			. . .	.3390		R	18.5	.7283	
. . .	.0370		63	2.78	.1094	7/64	. . .	. . .	.2090		4	8.7	.3425			18.65	.7344	47/64
.95	.0374			. . .	.1100		35	5.4	.2126			8.73	.3437	11/32	. . .	19.0	.7480	
. . .	.0380		62	2.8	.1102			. . .	.2130		3	8.75	.3445			19.05	.7500	3/4
. . .	.0390		61	. . .	.1110		34	5.5	.2165			8.8	.3465			19.45	.7656	49/64
1.0	.0394			. . .	.1130		33	5.56	.2187	7/32	. . .	. . .	.3480		S	19.5	.7677	
. . .	.0400		60	2.9	.1141			5.6	.2205			8.9	.3504			19.84	.7812	25/32
. . .	.0410		59	. . .	.1160		32	. . .	.2210		2	9.0	.3543			20.0	.7874	
1.05	.0413			3.0	.1181			5.7	.2244			. . .	.3580		T	20.24	.7969	51/64
. . .	.0420		58	. . .	.1200		31	5.75	.2263			9.1	.3583			20.5	.8071	
. . .	.0430		57	3.1	.1220			. . .	.2280		1	9.13	.3594	23/64	. . .	20.64	.8125	13/16
1.1	.0433			3.18	.1250	1/8	. . .	5.8	.2283			9.2	.3622			21.0	.8268	
1.15	.0452			3.2	.1260			5.9	.2323			9.25	.3641			21.04	.8218	53/64
. . .	.0465		56	3.25	.1279			. . .	.2340		A	9.3	.3661			21.43	.8437	27/32
1.19	.0469	3/64	. . .	. . .	.1285		30	5.95	.2344	15/64	. . .	. . .	.3680		U	21.5	.8465	
1.2	.0472			3.3	.1299			6.0	.2362			9.4	.3701			21.83	.8594	55/64
1.25	.0492			3.4	.1338			. . .	.2380		B	9.5	.3740			22.0	.8661	
1.3	.0512			. . .	.1360		29	6.1	.2401			9.53	.3750	3/8	. . .	22.23	.8750	7/8
. . .	.0520		55	3.5	.1378			. . .	.2420		C	. . .	.3770		V	22.5	.8858	
1.35	.0513			. . .	.1405		28	6.2	.2441			9.6	.3780			22.62	.8906	57/64
. . .	.0550		54	3.57	.1406	9/64	. . .	6.25	.2460		D	9.7	.3819			23.0	.9055	
1.4	.0551			3.6	.1417			6.3	.2480			9.75	.3838			23.02	.9062	29/32
1.45	.0570			. . .	.1440		27	6.35	.2500	1/4	E	9.8	.3858			23.42	.9219	59/64
1.5	.0591			3.7	.1457			6.4	.2520			. . .	.3860		W	23.5	.9252	
. . .	.0595		53	. . .	.1470		26	6.5	.2559			9.9	.3839			23.81	.9375	15/16
1.55	.0610			3.75	.1476			. . .	.2570		F	9.92	.3906	25/64	. . .	24.0	.9449	
1.59	.0625	1/16	. . .	. . .	.1495		25	6.6	.2598			10.0	.3937			24.21	.9531	61/64
1.6	.0629			3.8	.1496			. . .	.2610		G	. . .	.3970		X	24.5	.9646	
. . .	.0635		52	. . .	.1520		24	6.7	.2638			. . .	.4040		Y	24.61	.9687	31/32
1.65	.0649			3.9	.1535			6.75	.2657	16/64	. . .	10.32	.4062	13/32	. . .	25.0	.9843	
1.7	.0669			. . .	.1540		23	6.75	.2657			. . .	.4130		Z	25.03	.9844	63/64
. . .	.0670		51	3.97	.1562	5/32	. . .	. . .	.2660		H	10.5	.4134			25.4	1.0000	1

Symbols

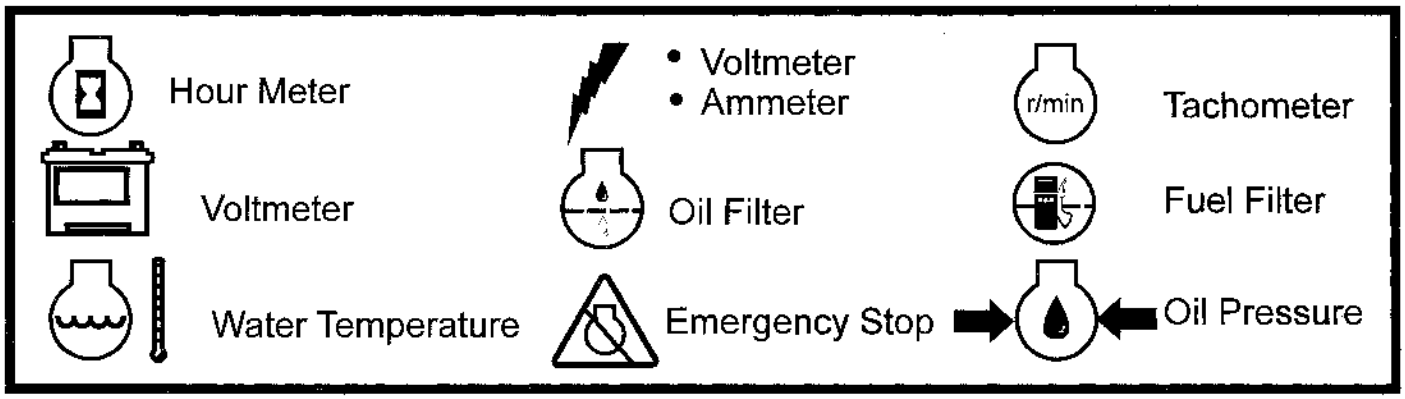
Certain symbols or combinations of symbols may appear on your Volvo Penta Sterndrive or accessory. It is very important that you understand their meeing r purpose. If any symbol is not clearly uynderstood, see you Volvo Penta Dealer.

"Safety Warning" Symbols



"Position Indicator" Symbols

"Condition" Symbols



"Instructional" Symbols