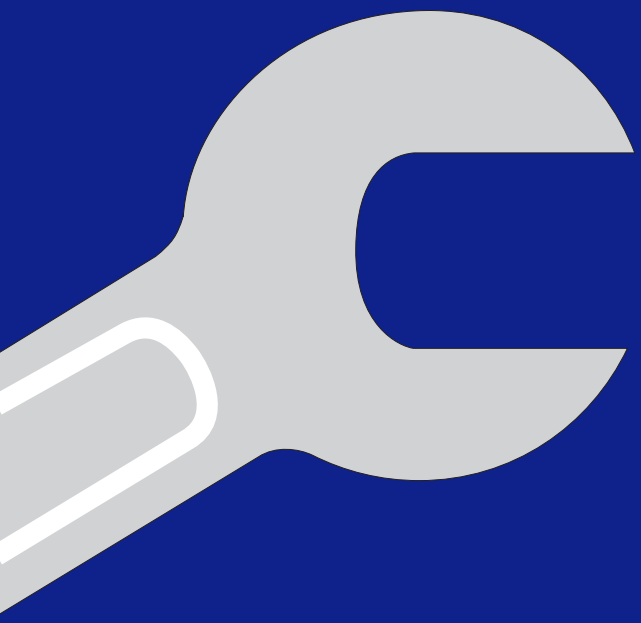
Workshop Manual

Engine Components

Models

30GSMEFS, 30GSPEFS
43GLPEFS, 43GiPEFS
50GLPEFS, 50GiPEFS
57GSPEFS, 57GSiPEFS
74GiPEFS, 74GSiPEFS
82GSiPEFS
DPX385XEFS, DPX415XEFS



VOLVO PENTA

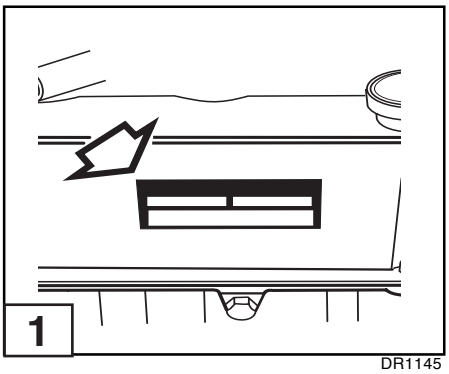
Contents

Model Identification

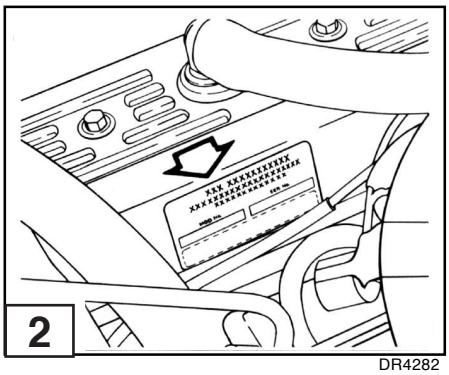
Ⓜ All stern drive system components must be matched for either single or dual engine installations. Failure to properly match engine, transom bracket and vertical drive will result in poor boat performance, and risk damage to engine and drive because of incorrect drive gear ratio.

Model identification is located on the engine valve cover, and **MUST** correspond with the transom bracket and vertical drive numbers as listed in this document.

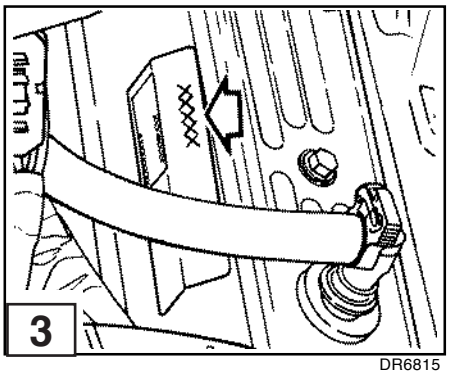
- Engine Model Number 1 2 3
- Transom Bracket Model Number 4
- Vertical Drive Model Number 5



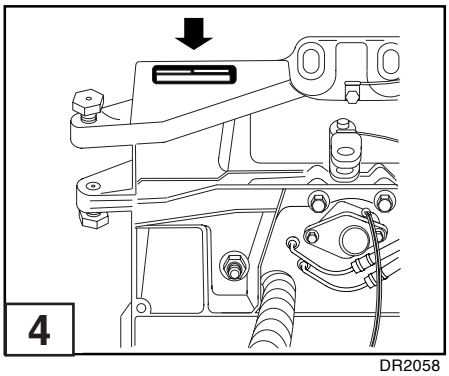
DR1145



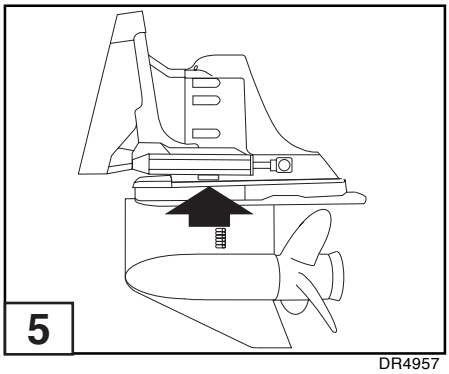
DR4282



DR6815



DR2058



DR4957

Section 1
General Information

Table of Contents

⚠ Safety Warnings

Before working on any part of a Volvo Penta stern drive, read the Safety section at the end of this manual.

Introduction

This service manual is 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 required for stern drives is 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 is 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 guesswork, 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 supply 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

It is a Volvo Penta policy to provide dealers with service knowledge so they can give professional service demanded by today's consumer. The Volvo Penta Training Centers, frequent mailing of Service Bulletins, Letters and Promotions, Special Tools and this Service Manual represent the latest effort 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 write to the Volvo Penta Service Department for additional help. Always be sure to give complete information, including engine model number and serial number.

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 contain exploded views showing the correct assembly of all parts, as well as a complete listing of the parts for replacement. These catalogs are helpful as a reference during disassembly and reassembly, and are available from Volvo Penta Parts.

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 special tools can be order from Volvo Penta Parts. Individual purchasers of Service Manuals must order Special Tools through an authorized 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.

Tuning The Engine

The purpose of an engine tune-up is to restore power and performance that has been lost through wear, corrosion or deterioration of one or more parts or components. In the normal operation of an engine, these changes can take place gradually at a number of points, so that it is seldom advisable to attempt an improvement in performance by correction of one or two items only. Time will be saved and more lasting results will be obtained by following a definite and thorough procedure of analysis and correction of all items affecting power and performance.

Economical, trouble-free operation can better be ensured if a complete tune-up is performed once every year, preferably in the spring. Components that affect power and performance can be divided into three groups:

- Components affecting compression
- Components affecting ignition
- Components affecting fuel system

Tune-up procedures should cover these groups in the order given. While the items affecting compression and ignition may be handled according to personal preference, correction of items in the fuel system group should not be attempted until all items affecting compression and ignition have been satisfactorily corrected. Most of the procedures for performing a complete engine tune-up will be covered in greater detail in this manual. This section will deal mainly with the order of procedures involved in tuning the engine.

Engine Compression Testing

⚠ **During all work done around the engine, while the engine is running or being cranked, use extreme care to avoid getting fingers or clothing caught in any belts, pulleys, or other moving parts.**

⚠ 1. Visually inspect stern drive unit for leaks, missing parts or other obvious defects. **Replace deteriorated parts.**

2. Compression check: Proper compression is essential for good engine performance. An engine with low or uneven compression cannot be properly tuned.

a. Operate engine to normal operating temperature.

Note Engine must **not** be started and run without water for cooling.

b. Remove any foreign matter from around spark plugs by blowing out with compressed air.

c. Remove and inspect all spark plugs. Install thread-type compression gauge in spark plug hole.

d. **To Prevent Sparking:**

- **All Models Except 5.0 GL and 5.7 GS:** Remove (grey) 2-wire connector, with purple and grey wires, at ignition coil.
- **5.0 GL and 5.7 GS Models Only:** Remove both distributor primary wires from the ignition coil. Tape wire terminals to prevent accidental grounding.

e. With choke and/or throttle plates wide open, crank engine through at least four compression strokes.

Test Conclusion

The indicated compression pressures are considered normal if the lowest reading cylinder is within 75% of the highest.

Example:

If the highest pressure reading was 140 PSI, 75% of 140 is 105. Therefore, any cylinder reading less than 105 PSI indicates an improperly seated valve, worn valve guides, piston, cylinder, or worn or broken piston rings. Any cylinder reading 105 PSI or greater is within specifications, and compression is considered normal.

If one or more cylinders read low, squirt approximately one tablespoon of engine oil on top of the pistons in the low reading cylinders. Repeat compression pressure check on the cylinders.

1. If compression improves considerably, the piston rings are at fault.

2. If compression does not improve, valves are sticking or seating poorly, or valve guides are worn.

3. If two adjacent cylinders indicate low compression pressures and squirting oil on the pistons does not increase the compression, the cause may be a cylinder head gasket leak between the cylinders. This problem could allow engine oil and/or coolant to enter the cylinders.

It is recommended the following quick reference chart be used when checking cylinder compression pressures. The chart has been calculated so that the lowest reading number is 75% of the highest reading.

Compression Pressure Limit Chart

Max. PSI	Min. PSI	Max. PSI	Min. PSI	Max. PSI	Min. PSI	Max. PSI	Min. PSI
134	101	154	115	174	131	194	145
136	102	156	117	176	132	196	147
138	104	158	118	178	133	198	148
140	105	160	120	180	135	200	150
142	107	162	121	182	136	202	151
144	108	164	123	184	138	204	153
146	110	166	124	186	140	206	154
148	111	168	126	188	141	208	156
150	113	170	127	190	142	210	157
152	114	172	129	192	144	212	158

After checking cylinder compression, repairs should be made as necessary. Subsequent adjustments to an engine that does not have proper compression will not measurably improve performance or correct operational problems. After verifying compression, check ignition and fuel system components.

Ignition System

- Spark Plugs
- Spark Plug Leads
- Distributor Cap
- Rotor
- Ignition Coil
- High Tension Lead
- Ignition Switch
- Circuit Wiring and Connectors
- IC Module

Fuel System

- Fuel Tank Pickup and Screen
- Fuel Tank Vent
- Anti-Siphon Valve (if equipped)
- Fuel Octane and Quality
- Boat Fuel Lines and Valves
- External Engine Fuel Filter
- Fuel Pump(s) and Line
- Carburetor Fuel Filter or Screen
- Carburetor Adjustments
- Engine PCV Valve
- Flame Arrestor
- Pressure Regulator and injectors

All of the above listed components are not necessarily part of an engine tune-up, but must be considered when attempting to correct engine/boat performance problems. Repair or replace components only as required.

⚠ Do not substitute automotive parts. Volvo Penta marine components meet U.S. Coast Guard regulations for external ignition proof operation and marine use. Volvo Penta marine components are specially designed not to cause ignition of fuel vapors in the bilge or engine compartment. The use of automotive parts can result in fire and explosion.

Intake Manifold Vacuum Testing

Test Procedures

1. Install a vacuum gauge to a good intake manifold source, following the gauge manufacturer's instructions. Start and warm up the engine.

2. Observe the vacuum gauge while operating the engine over a range of engine speeds.

Test Results

1. A steady vacuum reading between 18 and 22 in. Hg. (60,7-74,3 kPa) at idle indicates an engine in good mechanical condition.

2. A vacuum reading below 18 in. Hg. (60,7 kPa) at idle, indicates an engine that is not developing enough vacuum. Further testing for base mechanical problems is needed.

3. Possible causes of low intake manifold vacuum are late ignition timing, low compression, poor engine sealing, leaks at vacuum lines and connections or bad MAP sensor.

4. If the gauge fluctuates at idle, possible causes are sticking or leaking valves, or an ignition miss.

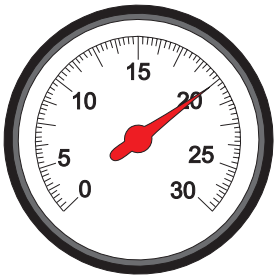
5. If the gauge fluctuates at idle but smooths out as engine RPM increases, check for bad valves or camshaft.

6. If the gauge fluctuates more with increases engine RPM, check for weak or broken valve springs, bad valves, ignition miss, or a leaking head gasket.

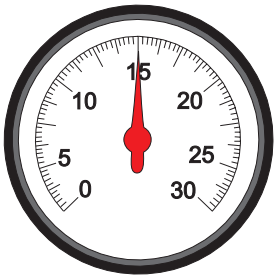
7. If the vacuum gauge fluctuates regularly with each engine cycle, check for a bad valve.

8. If the vacuum reading drops steadily as engine RPM increases, check the exhaust system between the engine and vertical drive for restrictions.

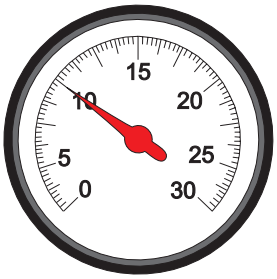
9. See chart on the following page for more information.



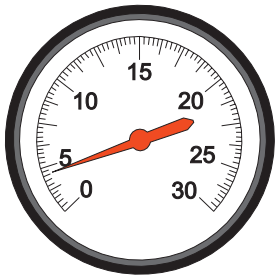
1. NORMAL
17-21 in. Hg. idle



2. LATE IGNITION TIMING
14-17 in. Hg. idle



3. LATE VALVE TIMING
8-15 in. Hg. idle

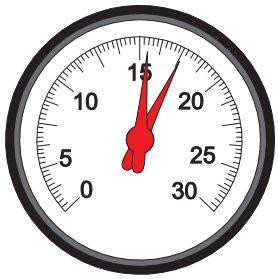


4. INTAKE LEAK
Low steady reading

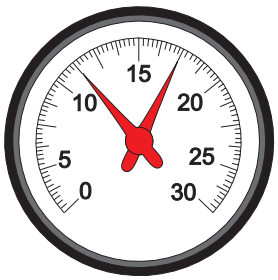
5. NORMAL READING
Drops to 2, then rises to 25 when throttle is rapidly increased and decreased.

6. WORN RINGS
Drops to 0, then rises to 22 when throttle is rapidly increased and decreased.

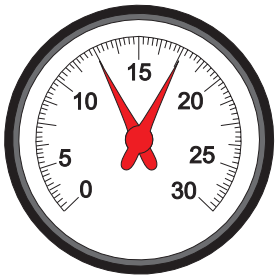
7. STICKING VALVE(S)
Normally steady. Intermittently flicks downward about 4 in. Hg. from highest level.



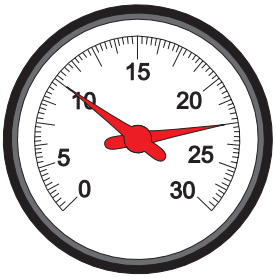
8. LEAKING VALVE
Drop 2 in. Hg. from highest reading.



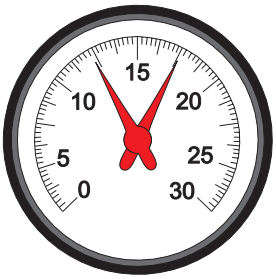
9. BURNED OR WARPED VALVE
Evenly spaced down-scale flicker Approx. 5 in. Hg.



10.WORN VAVLE GUIDES
Oscillates approx. 4 in. Hg.

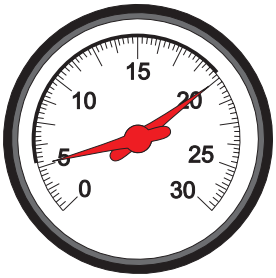


11. WEAK VALVE SPRINGS
Violent oscillations as RPM increases.

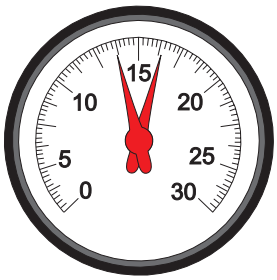


12. IMPROPER IDLE MIXTURE
Floats slowly between 13-17 in. Hg.

13 RESTRICTED EXHAUST SYSTEM
Normal when first started. Drops to 0 as RPM increases. May eventually rise to about 16 in. Hg.



14. HEAD GASKET LEAK
Floats between 5-20 in. Hg.



15. SMALL SPARK GAP OR DEFECTIVE POINTS
Slight float between 14-16 in. Hg.

DRC6688

Gasoline Requirements

The models covered in this manual are designed for maximum performance with the use of lead-free gasoline with the following minimum or higher octane specification:

Inside the U.S., (R+M)/2 (AKI) - 89

Outside the U.S., (RON) - 93

4.3 GL, GS, 5.0 GL, and 5.7 GS Models Only - The ignition timing will have to be retarded if lower octane fuels, with minimum 86 AKI (90 RON) octane, are used. Refer to “Timing” in **Tune-up Specifications**. When ignition timing is retarded, a slight decrease in power can be expected.

Note Use of gasoline with lower than 89 AKI (93 RON) octane in 4.3 GL, GS, 5.0 GL, and 5.7 GS models, without retarding ignition timing as specified, will result in serious damage to your engine and will void the engine warranty.

All Other Models - Lower octane fuels, with minimum 86 AKI (90 RON) octane, can be used. With the use of lower octane fuel, a slight decrease in power can be expected.

Note **Engine damage resulting from the use of gasoline with octane lower than 86 AKI (90 RON) is considered misuse of the engine and will void the engine warranty.**

Some marinas sell fuel with lead additives. **Do not use such fuel as it may plug the fuel injectors.** Premium fuel contains injector cleaners and other additives that protect the fuel system and provide optimum performance. **The use of premium grade fuels in all models is strongly recommended.** To prevent gum formation and corrosion in the fuel system, use *DuraPlus™ Marine Fuel Cleaner* in the gasoline. *DuraPlus™ Marine Fuel Cleaner* is available from your authorized dealer.

Gasoline is extremely flammable and highly explosive under certain conditions. Always stop engine and do not smoke or allow open flames or sparks near the boat when refueling gas tanks.

When filling the gas tank, ground the tank to the source of gasoline by holding the hose nozzle firmly against the side of the deck filler plate, or ground it in some other manner. This action prevents static electricity build-up which could cause sparks and ignite fuel vapors.

Gasolines Containing Alcohol

Many gasolines being sold today contain alcohol. Two commonly used alcohol additives are Ethanol (ethyl alcohol) and Methanol (methyl alcohol).

See the boat's Operators Manual to determine if the boat's fuel system is compatible with alcohol blended fuels. If it is, your engine may use gasolines blended with no more than 10% Ethanol (ethyl alcohol) meeting the minimum octane specification. **Do not use any gasoline which contains METHANOL (methyl alcohol).**

Note Continued use of **METHANOL** (methyl alcohol) fuel will cause serious damage to the fuel system.

If you use gasoline containing alcohol, be aware of the following:

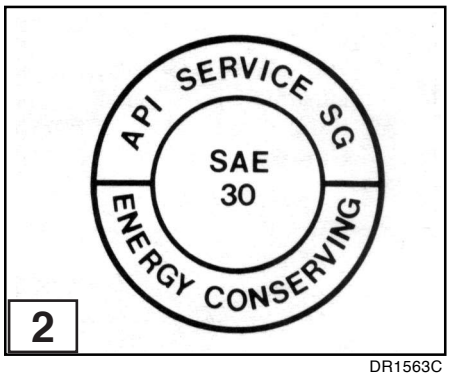
- The engine will operate leaner. This may cause engine problems such as vapor lock, low speed stalling, or hard starting.
- Alcohol blended fuels attract and hold moisture. Moisture can cause fuel tank corrosion. Inspect fuel tanks at least annually. Replace corroded or leaking fuel tanks.
- Frequently inspect non-metallic parts of fuel system and replace if excessively stiff, deteriorated or leaking.

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

Crankcase Oil

1 2 Initial factory fill is a high quality motor oil for API Service SG/CD. During the break-in period (20 hours), frequently check the oil level. Somewhat higher oil consumption is normal until piston rings are seated. The oil level should be maintained in the safe range between the Add and Full marks on the dipstick. This range represents approximately 1 liter (1 quart). If it is necessary to add or change the motor oil, use a quality oil with API service category SG/CD that meets *General Motors* Standard GM-6094-M.

DRC6834



DR1563C

At the end of the break-in period (20 hours), change the crankcase oil and replace the oil filter. Refer to **Lubrication and Inspection Chart** for recommended oil change intervals.

Note **The use of multi-viscosity oils, such as 10W-30 or 10W-40, is not recommended.**

Draining and Filling the Engine Crankcase

Drain and refill crankcase every 100 hours of operation or once a year, whichever occurs first.

⚠ **To prevent fire and explosion, always make sure engine compartment is free of gasoline fumes before using any spark-producing tools such as the electric drill motor used with oil withdrawal pump kit.**

1 → 3 Check the motor oil level frequently with the dipstick. When oil is to be changed, remove dipstick and withdraw oil from crankcase through withdrawal/dipstick tube. The oil withdrawal tube is provided so oil does not have to be drained into the bilge. Withdraw oil with a suction pump.

Fill the crankcase to the specified capacity with a quality motor oil labeled for service category SG/CD which meets *General Motors* Standard GM-6094-M. Oils conforming to this standard contain detergent and anti-wear additives that will prolong engine life.

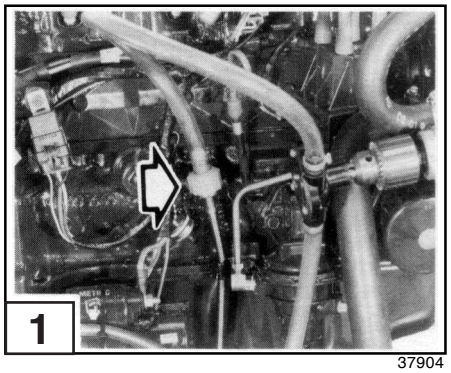
When changing motor oil, select from the following chart the SAE viscosity that matches the temperature range in which the boat will be operated. If it is necessary to add motor oil, use motor oil of the same viscosity.

IF THE LOWEST ANTICIPATED TEMPERATURE IS:	THE FOLLOWING SAE VISCOSITY OILS ARE RECOMMENDED:
32° F (0° C) and above	SAE 30
0° F (-18° C) to 32° F (0° C)	SAE 20W-20
Below 0° F (-18° C)	SAE 10W

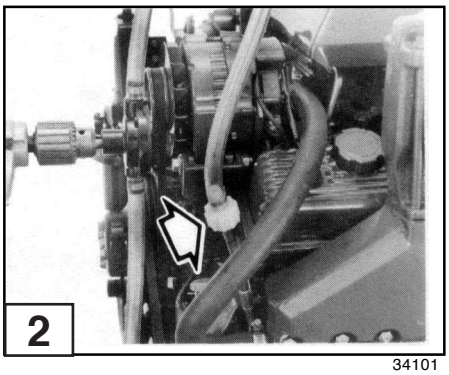
Note **Disregard any reference to multi-viscosity oil printed on engine. Such reference is intended for automotive use only and not marine application.** Do not fill above full mark. Overfilling results in high operating temperatures, foaming (air in oil), loss of power, and overall reduced engine life.

Crankcase Capacities

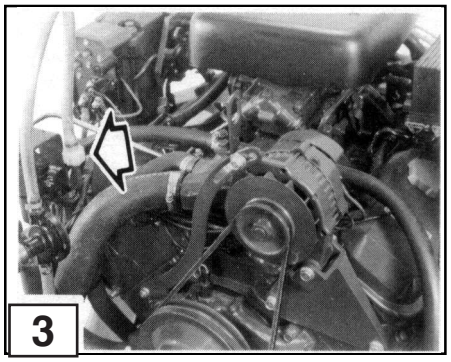
Model	Less Filter	With Filter
3.0 GS	3.5 qts. (3,3 litres)	4.0 qts. (3,8 litres)
4.3 GL and Gi	4.0 qts. (3,8 litres)	4.5 qts. (4,3 litres)
5.0 GL and Gi	5.0 qts. (4,7 litres)	6.0 qts. (5,7 litres)
5.7 GS and GSi	5.0 qts. (4,7 litres)	6.0 qts. (5,7 litres)
7.4 Gi and GSi	8.0 qts. (7,5 litres)	9.0 qts. (8,5 litres)
8.2 GSi	8.0 qts. (7,5 litres)	9.0 qts. (8,5 litres)



37904



34101



37210

Oil Filter

Replace the oil filter whenever the motor oil is changed. This filter is a self-contained, screw-on type. To remove, unscrew filter canister counterclockwise and discard. When attaching a new filter, be sure the gasket is lightly lubricated with motor oil. Hand tighten only, run engine and check for leaks. Do not run engine without supplying cooling water. See **parts catalog** for model and filter requirements.

Power Steering Fluid Level

4 5 Maintain the level with DuraPlus™ Power Trim/Tilt & Steering Fluid. Approved power steering fluids such as GM power steering fluid or Dexron II automatic transmission fluid can also be used. Do not overfill the pump reservoir.

Steering System Lubrication

6 7 Every 60 days, grease the steering ram Ⓐ with Volvo Penta grease.

Power Trim/Tilt-Fluid Level

8 At the beginning of each boating season, check the fluid level in the reservoir as follows:

- Level should be between the “MIN” and “MAX” marks on the reservoir.
- If necessary, add DuraPlus™ Power Trim/Tilt & Steering Fluid. Replace the cap Ⓑ and tighten securely.

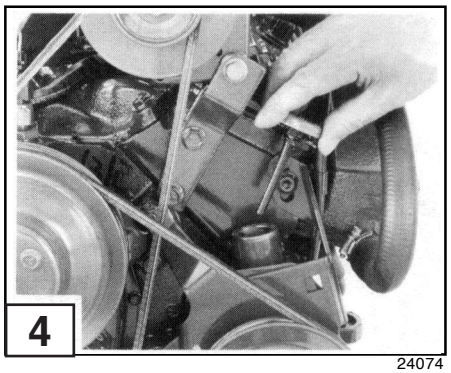
Off-Season Storage Preparations

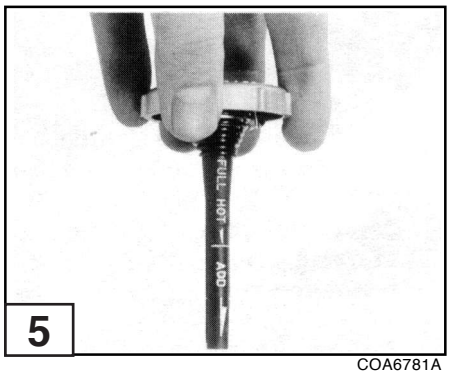
Note There are nine steps that must be completed for off-season storage preparation.

Step 1. Condition Fuel System:

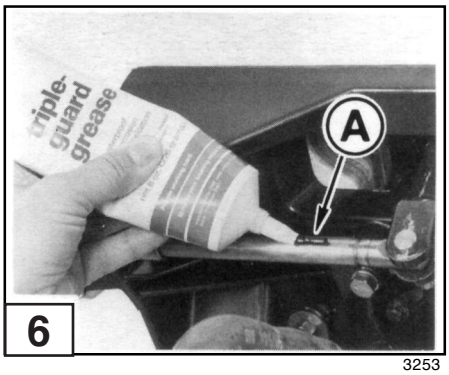
Add DuraPlus™ Marine Fuel Stabilizer to fuel system. Follow instructions for adding conditioner and running engine as stated on the container. This will stabilize the fuel and prevent formation of varnish and gum in entire fuel system. Do this before continuing with the following procedures.

Note Models equipped with 4 BBL carburetors should be run under a load at a high enough throttle setting to circulate conditioner through the secondary fuel system.

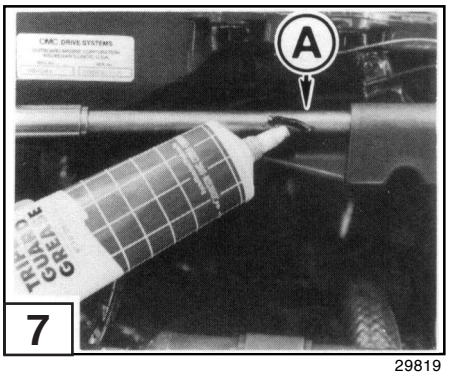

4
24074



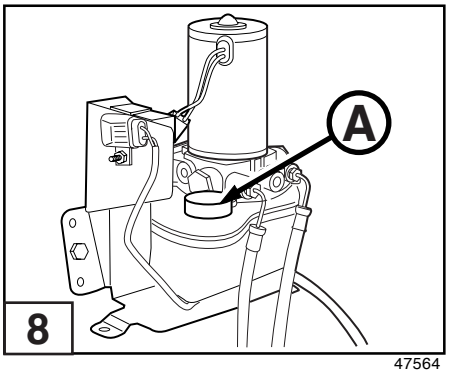
5
COA6781A



6
3253



7
29819



8
47564

Step 2. Change Motor Oil and Oil Filter:

- Engine should first be operated under load until oil is thoroughly warmed up. If oil is allowed to warm up before draining, a more complete draining will be accomplished. In addition, accumulated impurities will be held in suspension by the oil and be removed during draining operation.
- Remove motor oil by siphoning it out of oil withdrawal tube. Follow the procedure under **Draining and Filling the Engine Crankcase.**
- Install a new oil filter and fill crankcase with recommended oil.

Note Vertical drive must be submerged in water or an accessory flushing adaptor must be used while operating engine.

⚠ **When using a flushing adaptor, remove propeller before starting engine to prevent accidental contact with rotating propeller.**

- With vertical drive in full down position, run engine at a fast idle for a few minutes to distribute clean oil through engine.
- Shut off engine and check oil level. Check oil filter gasket for leaks. Add oil if necessary to bring oil level up to, but not over, the full mark.

Step 3. Change Vertical Drive Lubricant:

Drain and refill with fresh DuraPlus™ GL-5 Synthetic Gear Lubricant or Mobilube 1 SHC Fully Synthetic SAE 75W-90 (meeting or exceeding MIL-L-2105C or D, API GL-4 or 5) gear lubricant. Refer to Vertical Drive Service Manual.

Step 4. Fog Engine:

Carbureted Models Only:

- Warm up engine to ensure fuel conditioner is throughout fuel system. Use 1/2 pint (0.24 liter) of Volvo Penta Fogging Oil 12 oz. (355 ml) spray can to fog engine.
- Remove flame arrestor from carburetor. Following instructions on container, bring engine up to a fast idle and slowly pour or spray 2/3 of fogging oil into carburetor. Keep engine running while pouring fogging oil into carburetor throat.
- Rapidly add remaining 1/3 of fogging oil to carburetor, then reduce throttle to idle and let engine die. Turn off ignition and replace flame arrestor. Close fuel shutoff valve (if so equipped).