Workshop Manual

Electrical, Ignition, Fuel

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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 order.

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 order. 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. Refer to the **Engine Service Manual** for all tune-up specifications.

Test Procedures - Audible Warning Switches (if equipped)

Oil Pressure Switch: The oil pressure audible warning switch is calibrated to make or break contact at 4 ± 2 PSI (27,6 ± 13,8 kPa). Use an ohmmeter to make the following continuity checks. Replace the switch if it fails either of these tests.

1. With the engine off and the switch wire disconnected, there should be a full continuity (zero) reading between the switch terminal and engine block.

2. With the engine running and switch wire disconnected, there should be no continuity (infinity) reading between the switch terminal and engine block.

Water Ternperature Switch: The water temperature audible warning switch is calibrated to make or break contact at 200° ± 5° F (93° ± 5° C). Attach an ohmmeter to the switch and make the following check. Replace the switch if it fails this test.

1. Immerse switch in a container of oil. Heat oil over a flameless source and check temperature with a cooking thermometer.

2. Below the make/break temperature, the ohmmeter should show a no continuity (infinity) reading. Above the make/break temperature, the ohmmeter should show a full continuity (zero) reading.

Test Procedure - Audible Warning Horn (if equipped)

Note Under normal conditions, horn will sound when ignition is turned on. Horn will continue to sound until engine is started and oil pressure exceeds 4 ± 2 PSI (27,6 ± 13,8 kPa).

The dash mounted audible warning horn can be tested as follows. Replace the horn if it fails this test.

1. Turn ignition switch to the ON position. Do not start engine.

2. If horn does not sound, disconnect the lead at the water temperature audible warning switch, and momentarily touch lead terminal to engine block. If audible warning horn does not sound, horn is defective, or wiring of switch-horn-ignition switch circuit has lost continuity.

3. Disconnect the lead at the oil pressure audible warning switch, and momentarily touch lead terminal to engine block. If audible warning horn does not sound, horn is defective, or wiring of switch-horn-ignition switch circuit has lost continuity.

Hard Starting - Cold Engine

Ask these questions first:

Has Engine Always Done This? Check:

- Carburetor choke operation and adjustment
- Fuel lines for obstructions
- For debris inside fuel tank
- See **Fuel System** section

Was Engine Used For A Long Time? Check:

- For clean external canister and carburetor fuel filters
- Empty carburetor float bowl due to evaporation
- Water in fuel due to condensation
- Fuel quality deterioration
- See **Fuel System** section

Is This A New Condition? Check:

- Carburetor choke operation and adjustment
- Carburetor accelerator pump
- Fuel system for leaks, dirt, or obstructions
- Engine timing and ignition system
- See **General Information, Ignition System, Fuel System** sections
- See **Engine Service Manual**

Hard Starting - Hot Engine

Ask these questions first:

Has Engine Always Done This? Check:

- Carburetor choke operation and adjustment
- See **Fuel System** section

Is This A New Condition? Check:

- Brand, type or octane of fuel
- Spark plugs
- Water in fuel
- Condition of battery and cables
- Starter motor for overheat damage

Did Engine Refuse To Start After Being Run? Check:

- Ignition system primary circuit
- Ignition coil/ignition module
- Engine timing
- Carburetor choke operation and adjustment
- See **General Information, Ignition System, Fuel System** sections
- See **Engine Service Manual**

Section 2
Cranking System

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⚠ Safety Warnings

Before working on any part of the electrical system, read the Safety section at the end of this manual.

The original mounting, support and routing of electrical system parts conform with U.S. Coast Guard requirements. It is important to maintain the original mounting, support and routing after servicing the electrical system to prevent possible fire and explosion in boat's engine compartment.

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.

Sealants, Lubricants and Adhesives

Black neoprene dip

Section 3
Charging System

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Sealants, Lubricants and Adhesives

Black neoprene dip

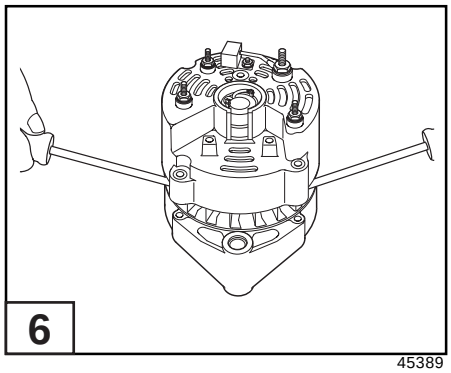
Rotor Removal

6 1. Set alternator with pulley side down. Insert a screwdriver on each side of the housing. Pry from **under** the stator using any two lower slots. **Do not pry on coil wires.**

7 2. Remove the stator and rear housing from the rotor assembly.

8 9 3. Use a soft jaw vise to hold the rotor armature. Remove the pulley nut Ⓔ, washer Ⓕ, pulley Ⓖ, tall spacer Ⓗ and fan Ⓘ from the rotor shaft.

10 4. Using a plastic hammer, tap the top of the rotor shaft while lifting up on the front housing. Remove short spacer Ⓙ and front bracket Ⓚ.



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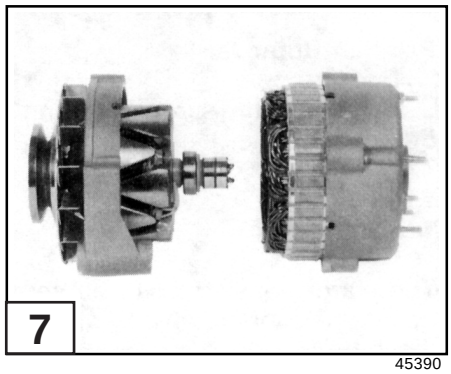

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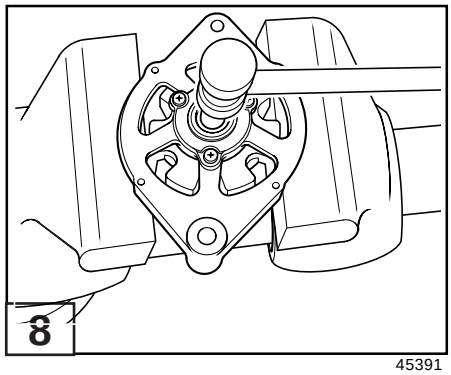

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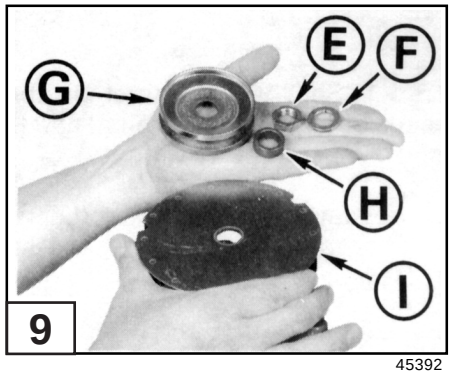

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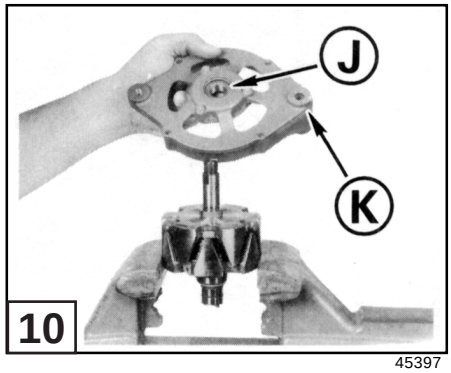

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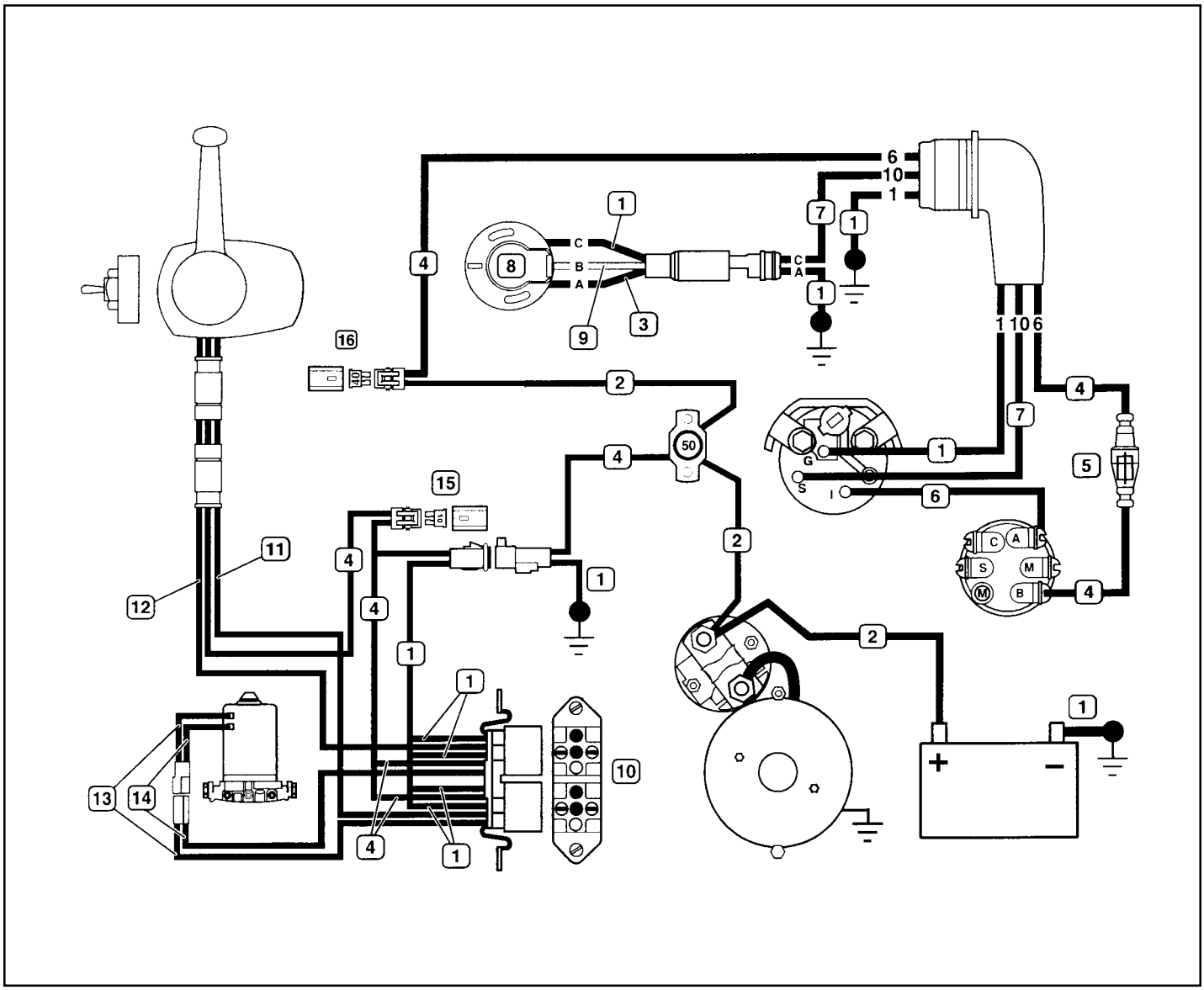
Alternator - 65 Amp

Minimum Engine RPM for Alternator Output	400 RPM
Regulated voltage range	14.0 - 14.7
Amperage output	65
Regulator	Internal, solid state
Belt tension	1/4-1/2 in. give with finger pressure
Output tests:	Load battery to obtain maximum alternator output
At 650 engine RPM	20 amps approximately
At 1500 engine RPM	53 amps min.
At 2000+ engine RPM	56 amps min.
“L2” terminal voltage (engine running)	13.0 - 14.0 volts
“P” terminal voltage (engine running)	6.5 - 7.5 volts
Capacitor capacity	0.5 ± 0.1 microfarads



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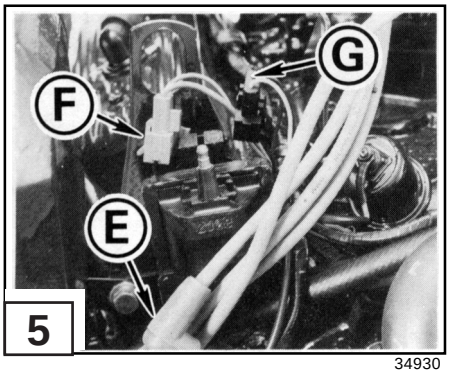
Trim/Tilt Circuit

① Black
② Red
③ Black (Ribbed Wire)
④ Red/Purple
⑤ 20 Amp Fuse
⑥ Purple
⑦ Brown/White
⑧ Trim Sending Unit
⑨ White
⑩ Relays
⑪ Green
⑫ Blue
⑬ Green/White
⑭ Blue/White
⑮ 10 Amp Fuse
⑯ 40 Amp Fuse



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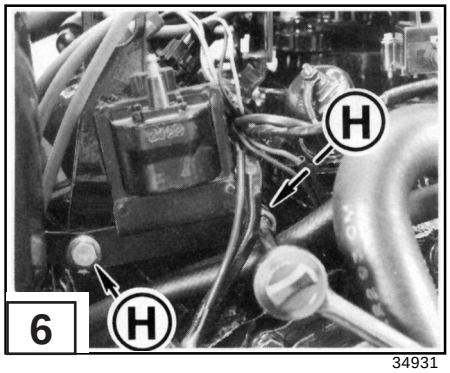

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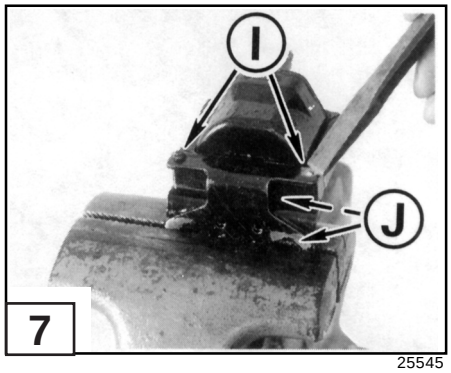

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2. Direct beam of timing light onto timing grid. Loosen distributor clamp, then turn distributor slowly by hand until timing mark is set at the appropriate timing figure. See **Tune-up Specifications** in the **General Information** section of the **Engine Service Manual**.

3. Recheck timing mark; reset if necessary. Tighten clamp bolt.

4. Stop engine. Remove adaptor plug.

Ignition Coil Replacement

5 1. Remove ignition coil to distributor cap high tension lead Ⓔ, two pin connector (purple and gray wires) Ⓕ, and two pin connector (pink and brown wires) Ⓖ from the ignition coil.

6 2. Remove two screws Ⓗ securing coil to engine block and remove ignition coil.

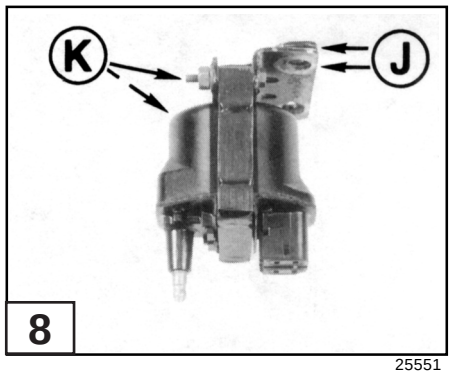
7 ⚠ 3. Place coil in a vise. **Wear eye protection**. Remove two rivet heads Ⓘ. Drive the rivets out of the coil. Save the bracket pieces Ⓙ.

8 4. Assemble the two bracket pieces Ⓙ and the coil using two screws and nuts Ⓚ provided in the replacement ignition coil kit. Tighten screws securely.

9 5. Mount the coil assembly to the engine block. Secure with two bolts Ⓗ. Tighten to 20-25 ft. lbs. (27-34 N·m).

10 6. Attach two pin connector (pink and brown wires) Ⓖ to the coil as shown. Attach two pin connector (purple and gray wires) Ⓕ to the coil as shown.

11 7. Apply marine EP/wheel bearing grease or equivalent to the high tension lead terminal Ⓔ and attach it to the ignition coil.



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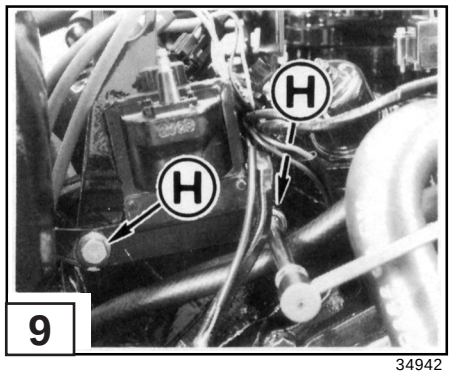

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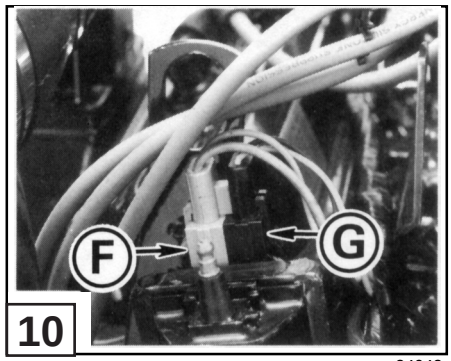

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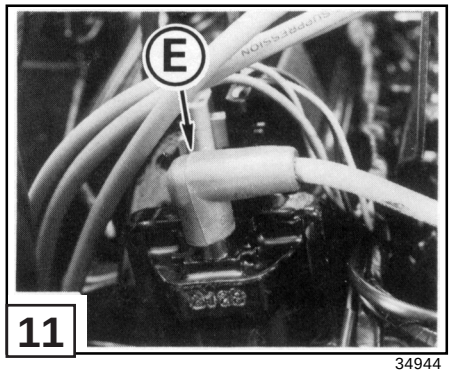

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⚠ 7. **Distributor housing: Spark suppression screens must be tightly in place.**

Reassembly

1. Apply silicone grease to the bottom edge of the sensor/ignition module.

2 2. Install sensor/ignition module assembly into the distributor housing and secure with two screws and lock washers Ⓑ.

2 3. Rotate the engine until one of the trigger wheel teeth lines up with the mark on the sensor.

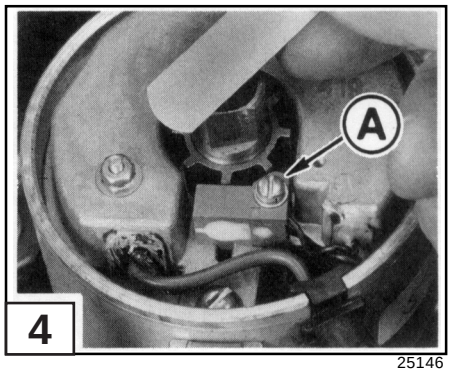
4 4. Adjust the sensor air gap by sliding the sensor in or out until an 0.008 in. (0,203 mm) measurement can be taken between the sensor and the trigger wheel tooth. Tighten the sensor mounting screw Ⓐ securely.

1 5. Install the rotor making sure to align the notch in the distributor shaft with the rotor. Push the rotor down until it seats.

6. Attach the purple distributor lead to the positive (+) terminal of the ignition coil. Attach the black distributor lead to the negative (-) terminal of the ignition coil. Coat the terminals with black neoprene dip.

⚠ 7. **Reinstall the distributor cap. Tighten screws securely to maintain external ignition proof characteristics.** Replace any high tension leads that were removed. Pay close attention to high tension lead routing and firing order.

8. Check ignition timing as required. See **Finish Timing** procedure.



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Distributor Installation

If the distributor has not been removed and the engine will run, continue on to the **Initial Timing** procedure.

Engine Not Disturbed

Note Use this procedure if the rotor/housing/block relationship was marked, and the crankshaft has not been rotated. If ignition/valve timing relationship has been disrupted or engine has been cranked with distributor out, install distributor following **Timing Out of Synch** procedure.

Section 7
Fuel Systems – Carbureted Models

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Carburetor Service and Adjustments: 2V Models

3.0 GS Models
4.3 GL Models
5.0 GL Models
5.7 GS Models

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⚠ Safety Warnings

When replacement parts are required, 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.

After any fuel system maintenance or repairs, always check for leaks.

Always ensure backfire flame arrestor fins are undamaged, and arrestor is in place and secured before starting engine.

When adjusting a carburetor while the engine is running or being cranked, use extreme care to avoid getting hands, fingers, or clothing caught in the alternator and water pump belts, pulleys, and other moving parts.

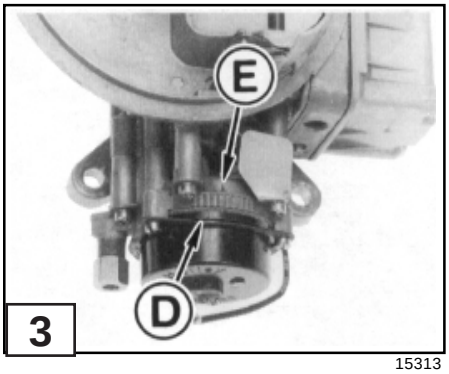
Electric Choke

The electric choke has an adjustment to control its opening rate. By loosening the clamp screws that retain the thermostatic spring housing, the housing can be turned to alter adjustment. Turning housing in a counterclockwise direction will richen mixture and make choke stay on longer. Turning spring housing in opposite direction (clockwise) will lean out mixture and make choke come off sooner.

Note The electric choke cap is grounded with an external ground wire. Make sure all ground components are clean and free of corrosion.

3 1. Set choke so that index mark on choke cover Ⓓ is aligned relative to index marks on choke housing Ⓔ as specified.

2. If a richer or leaner mixture during warmup period is desired, it can be obtained by rotating thermostat cover one mark at a time. Never set index mark on cover more than two graduations off specified setting.



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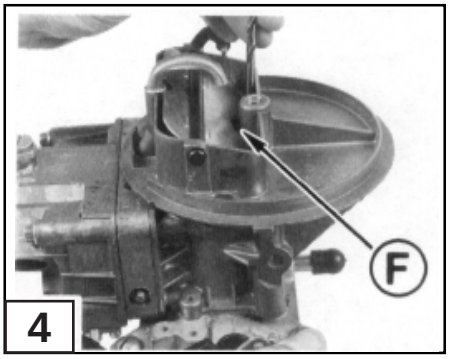
Choke Unloader

4 1. Hold throttle valves in a wide open position. Insert correct size drill between lower edge Ⓕ of choke valve and inner wall of air horn.

2. Press finger lightly against choke control lever. A slight drag should be felt as drill is pulled out.



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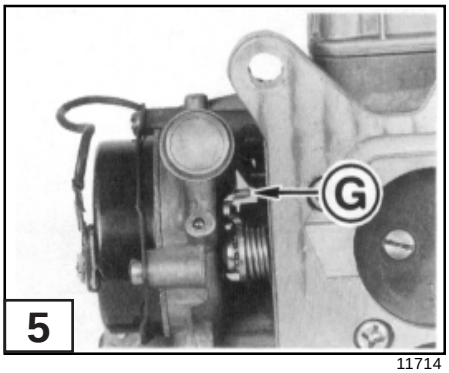
5 3. To adjust, bend tab Ⓖ on throttle shaft kick-down lever until correct opening has been obtained.



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Idle Mixture and Idle Speed

1. Initially set idle mixture by turning idle mixture screws inward until they are lightly seated, then turn screws outward the specified turns. **Do not turn screws tightly against seats.** Both the screw tips and casting seats may be damaged. Replace screws with damaged tips.

2. Final adjustments are made with engine running at operating temperature. Refer to **Specifications** for correct idle RPM.

3. Use a tachometer to make final adjustments. Turn idle mixture screws inward until engine RPM begins to drop due to lean mixture. Back screws out evenly and alternately until the best idle RPM is reached. If RPM begins to drop (due to an overly rich mixture) before reaching the specified RPM, turn screws inward until maximum engine RPM and smoothness is achieved.

4. Readjust idle speed as necessary. Always adjust idle speed last.

Two other items that would require checking are the screens in each end of the fuel pump body. This requires removal of the upper elbow and the lower fuel filter adaptor. If screens cannot be sufficiently cleaned, replace the fuel pump. The screens are not serviced separately.

Checking Boat Fuel System

The most common causes of failures in the boat fuel system are due to line restrictions or air entry. Typical restrictions are:

- kinked, bent, or internally swollen fuel lines
- fuel lines and/or tank selector valve I.D.'s too small
- restricted or wrong anti-siphon valve
- cracked or blocked fuel pick-up or screen inside tank
- blocked tank vent

Air entry can occur at any point on the suction side of the fuel system. Air in the fuel system is usually indicated by a pump humming or squealing noise.

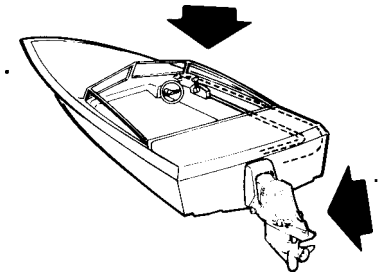
Note Pump noise is caused by air being drawn through the fuel pump gears, **but is not always an indicator that something is wrong**. Momentary noise has several causes that are not linked to fuel system failures:

- pump may squeal for a short time upon start-up as air is expelled
- if ambient temperatures are high, the engine compartment will be subjected to hot operating conditions that may create vapor in the fuel lines
- a hot engine after shutdown will go into a "hot soak" condition that may produce fuel vapors
- the use of ethanol fuel will also aggravate this condition as it's more susceptible to vapor formation

All of these situations are temporary, but may produce vapor that would cause pump noise. Pump noise that is continuous, and/or cannot be attributed to any of these conditions, could be an indicator of fuel system problems.

Sterndrive Shift System

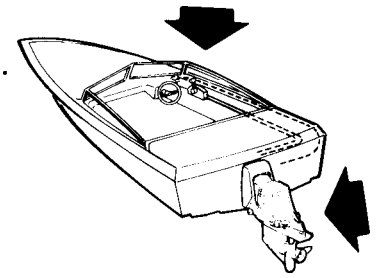
The Shift System starts
here at the remote control lever. . .



. . . and ends here at the propeller.

What's Most Important?

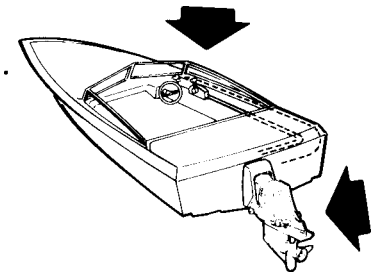
When the control lever is in Forward,
Neutral or Reverse position . .



. . . Shift mechanism must match
control lever position.

What Could Happen?

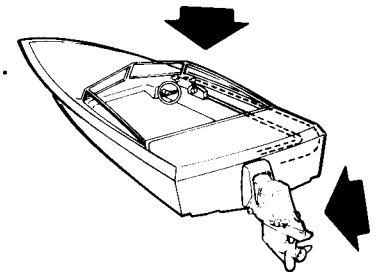
- **If . . . Neutral**



Forward or Reverse

. . . Propeller is still powered (turning) unknown to operator, or engine will start in gear, boat will move unexpectedly.

- **If . . . Forward**



Reverse

. . . boat will move opposite to direction intended by operator.

How Can Loss of Shift Control be Minimized? In pre-delivery inspection and when servicing . . .

- Read, understand and follow manufacturers instructions.
- Closely follow the warnings marked with ⚠ . . .
- Assemble parts and make adjustments carefully . . .
- Test your work. Don't guess. Make sure propeller does what the operator wants and nothing else.