INSTRUCTION BOOK

AQD40A/280, AQAD40A/280
MD40A, TMD40A, TAMD40A

FOREWORD

This instruction book is dealing with AQD40A, AQAD40A with Outboard Drive Model 280B and TMD40A, TAMD40A, MD40A with reverse- and reduction gears Models MS3, MS3B and BW. The inboard engine, as far as the engine unit is concerned, common with AQD40A. This is the reason why all instructions for the engine units are identical. Specific instructions for the reverse- and reduction gears for TMD40A, TAMD40A, MD40A are to be found on pages 42–44.

Before you start your new Volvo Penta marine engine, you are advised to read through this instruction book carefully. It contains the information you need to run and service your engine in the best possible way.

Volvo Penta has built up an extensive service organization of service workshops with specially trained personnel at your service.

Always contact your local Volvo Penta representative for advice and when in need of service and parts.

We are convinced that the demands on good running economy and top performance, which you have every right to expect of a quality product, will be met and that your engine will serve you faithfully on many pleasant cruises.

Warranty Certificate

A warranty certificate is supplied with each new engine. It contains the warranty conditions for the engine and should be studied carefully.

Included in the warranty certificate is a report card which is to be completed by the dealer or boat seller and forwarded to Volvo Penta.

However, if our warranty is to apply, it is an absolute condition that the measures given in the "Checks and Service Scheme" are carried out and that your engine and equipment are looked after according to the instructions in this book. When in doubt, always get in touch with an authorized Volvo Penta dealer.

In all correspondence with the dealer and when ordering spare parts, state the type designation and serial number of the engine and outboard drive.

Make certain that the engine's specification coincides with what is described in this instruction book.

AB VOLVO PENTA
Technical Publications Dept.

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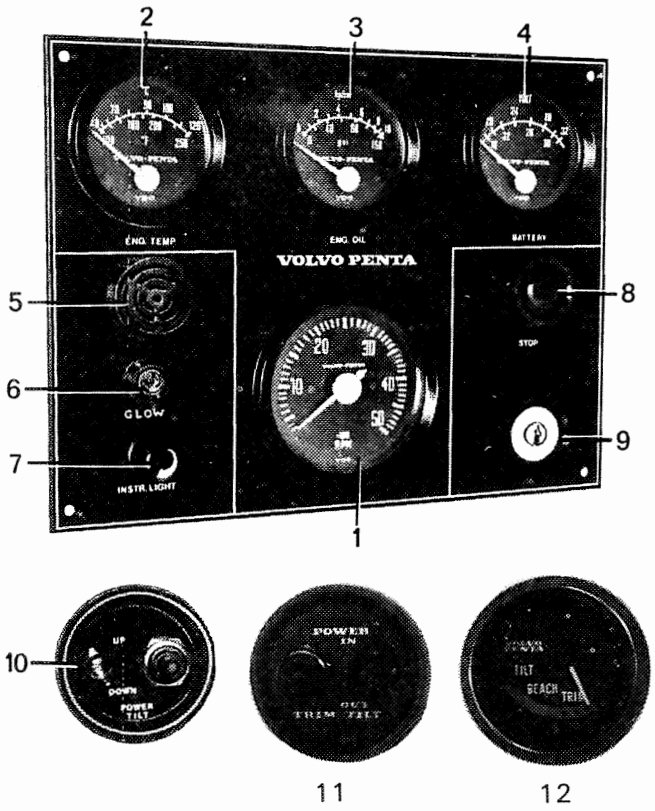
INSTRUMENTS AND CONTROLS

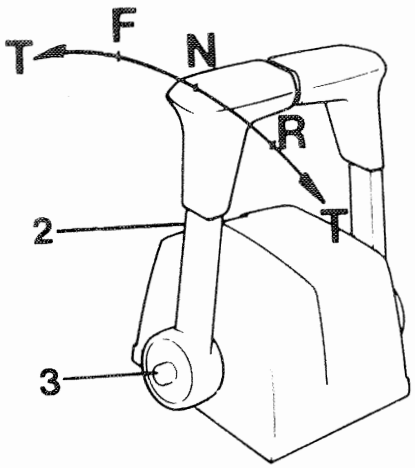
INSTRUMENT PANEL



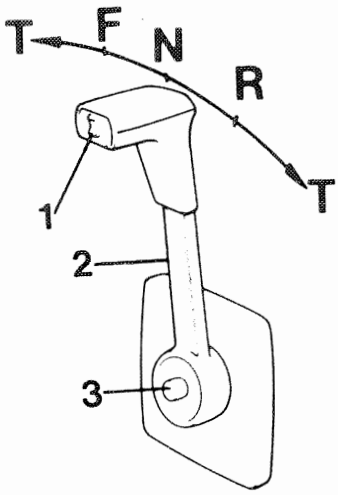
11 12

1. **Rev counter** – scale 0–5000 r/m
2. **Temperature gauge for cooling water** (fresh water)
   Normal cooling water temperature 75–90°C (167–194°F)
3. **Oil pressure gauge**
4. **Voltmeter**
5. **Alarm,** "Low oil pressure", "Temperature too high".
6. **Control lamp for glow plugs**
7. **Rheostat switch for instrument lighting**
8. **Stop**
9. **Key switch**
10. **Operating switch.** Electro-mechanical lift
11. **Operating switch for power trim**
12. **Trim gauge**

OPERATING CONTROLS



Volvo Penta Twin Control System



Volvo Penta Single Control System

1. Operating switch for power trim
2. Control lever
3. Disengaging device

Push in the button when the control lever is in neutral and move the lever forwards slightly. Release the button. The lever now operates the throttle only. Pull back the lever when you wish to use it for operating the speed and for manœuvring.

N = Neutral
F = Control lever in position for running "Forward"
R = Control lever in position for "reversing"
T = Engine speed

Important information concerning the function of your engine:

FUEL Use diesel fuel oil of "Autodiesel" quality. Lower fuel quality can cause operational breakdowns.

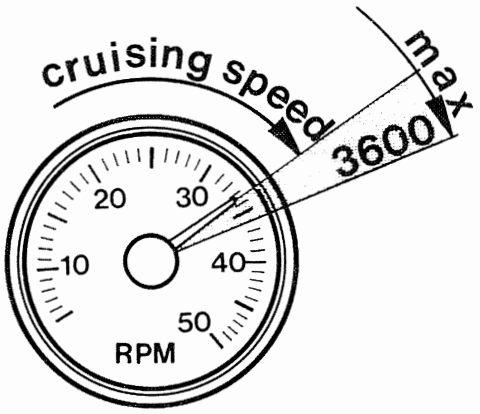
LUBRICATING OIL Use only oil with quality CD (DS) according to the API-system. Volvo Penta oil for diesel engines fulfills these quality requirements and can be used to advantage. See "Technical data" for viscosity.

RUNNING IN A new engine must be run in with due care during the first 20 hours of operation. Therefore, avoid to run the engine under full load during this period. A higher oil consumtion during this running-in period is normal. Therefore, check the oil-level in the engine more frequently than normally during this period.

FREE SERVICE INSPECTION The warranty inspection is to be carried out between 20 to 50 hours of operation or before 180 days from the date of delivery or before the end of the first season, whichever occurs first. This service inspection has to be carried out by an authorized Volvo Penta service workshop in order for the warranty to be valid.

OIL CHANGE The oil in the engine and the oil filter must be replaced in connection with the service inspection after 20 hours of operation. See under "Checks and Service".

ENGINE SPEED



MAX. SPEED:

AQD40A/280, AQAD40A/280 pleasure boats 60 r/s (3600 r/m)
TMD40A, TAMD40A MD40A pleasure boats 60 r/s (3600 r/m)
AQAD40A, TAMD40A light commersial use 50 r/s (3000 r/m)

The maximum allowed engine speed for longer periods of operation, so called cruising speed, is 200 r/m below the maximum speed obtained.

With a correctly selected propeller and the boat normally loaded a maximum engine speed of 3500–3600 r/m (respectively 2900–3000 r/m) should be possible to obtain. NOTE: If the boat has been in the water for some time the speed and the maximum engine rev. can drop as a result of weed growth on the boat hull and the outboard drive. Prevent growth by painting boat hull and the outboard drive with anti-fouling paint. See "Measures before launching".

SAFETY EQUIPMENT

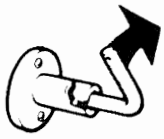
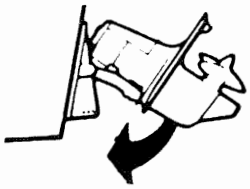
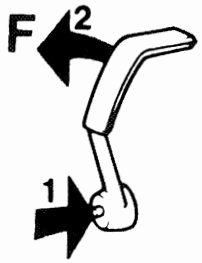
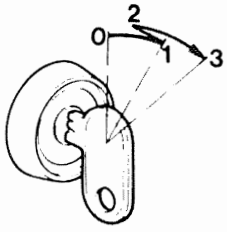
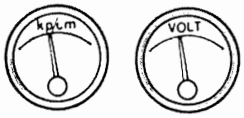
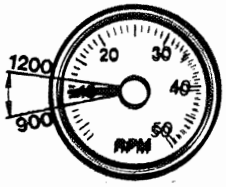
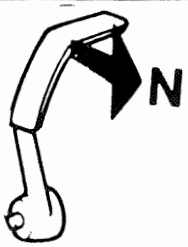
Irrespective of whether the boat is being used for long cruises or short bathing trips, it should be equipped with the safety equipment listed below. It can, of course, be supplemented further according to personal taste. Investigate at regular intervals to ensure that there is safety equipment on board and that it is in working order.

LIFE-JACKETS for all on board.
FIRE EXTINGUISHER, approved, at least one and installed easy to get at.
DISTRESS ROCKETS and matches. Packed watertight.
FIRST-AID BOX
TOOLS suitable for the equipment on board.
ON BOARD KIT containing, e.g. an impeller, etc.
ANCHOR with line.
RADAR REFLECTOR
RADIO for listening to, e.g. weather reports.
COMPASS which is deviated.
BOAT HOOK and **PADDLE.**
MOORING ROPES
FOG-HORN and **WHISTLE.**
FLOATING ANCHOR
TORCH
PROPELLER

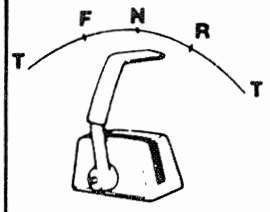
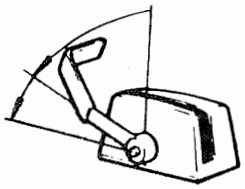
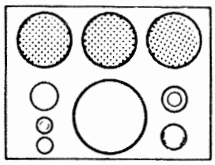
PREPARATIONS BEFORE STARTING

Before starting make sure that:
There is no **FUEL LEAKAGE**
There is no **WATER LEAKAGE** from engine or hull
There is no **OIL LEAKAGE**
There is no **SMELL OF LP-GAS** in the deep cavities of the boat or elsewhere
The **OIL LEVEL** is correct
COOLING WATER LEVEL in the expansion tank for the fresh water is correct. NB. If the expansion tank has been empty, venting must be done when filling up. See instruction on the engine.
The proper **NAUTICAL CHARTS** are on board for the planned voyage.
There is enough FUEL on board for the planned voyage.
Make sure when filling with fuel that there is no naked flame on board, e.g. in the galley. Ventilate the boat and run the engine room fan (if fitted) before starting the engine. Do not fill with too much fuel.
If some people are on board for the first time, tell them how to manœuvre the boat and where to find the life-jackets and the fire-extinguisher. Also tell them everything else you think necessary from the point of view of safety. Should something unexpected happen during the voyage, very often it is too late to tell those on board how the safety equipment works.

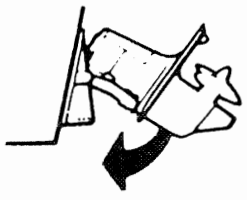
STARTING THE ENGINE

	Switch on the **main switch.** Start the **engine room fan** (if fitted) and allow it to run for several minutes before starting the engine.
	**Lower the drive,** if it has been tilted. Make sure there is no obstacle near the propeller. The warning lamp should be out. (Not Power trim).
	**Release the engine speed control** from the shift control as follows: Push in the button (1) when the lever (2) is in the neutral position and then move the lever slightly forwards. Release the button. The control level now operates the engine speed only. **An automatic cold starting device is built into the fuel injection pump.**
	**Turn the key switch** one step to the right (1) and keep it there for 30 seconds. (The control lamp for the glow-plugs shall be on and the alarm shall be sounding.) Push in the key (2) and turn it further to the right (3) to start the engine. Release the key when the engine has started. When starting a warm engine prewarming is not necessary. The key is then turned directly to position (3).
	Check immediately after starting that the **oil pressure gauge** and the **voltmeter** show normal values and that **the alarm** is quiet. If abnormal values are shown and the alarm sounds, the engine must be stopped immediately and the cause investigated.
	Run the engine warm at high idling speed which means 15–20 r/s (900–1200 r/m).
	Set the speed at idling and check that he engine runs smoothly. Pull the lever to neutral. The control lever now operates the power transmission as well as the throttle simultaneously.

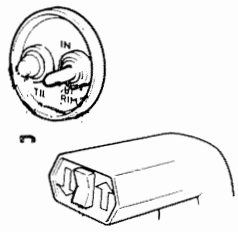
RUNNING INSTRUCTIONS

	The single control lever operates both the speed and the drive shift. F = Forwards R = Reverse N = Neutral T = Engine speed
	To obtain good operating economy the engine should not be run at maximum speed for longer periods. Note that the maximum operational speed for longer periods, the so called "cruising speed" is 200 r/m less than the maximum of speed obtained.
	Check that the engine temperature is normal when running (75–90°C) (167–194°F) and that the instruments for charging and oil pressure show normal values. If abnormal values are shown the engine must be stopped immediately and the cause investigated.

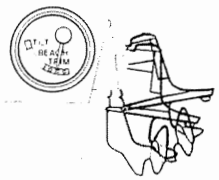
RUNNING INSTRUCTIONS DRIVE 280 B

	**Running in shallow waters** If you are uncertain about the depth of the water, we recommend you to reduce the speed and to tilt up the outdrive slightly by operating the tilt-switch in the UP-position for some seconds. The red tilt-warning lamp is now on and the retaining-pawl is disengaged. **CAUTION! It is now no longer possible to reverse.**
	**Reversing** The drive must be fully down and the warning lamp out before reversing can be carried out. **IMPORTANT! Never shift to reverse when the boat is planing.**

RUNNING INSTRUCTIONS DRIVE 280B POWER TRIM

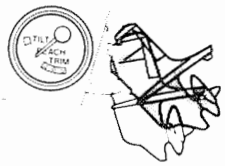


Outboard drives fitted with Power Trim can be hydraulically trimmed out and in whilst the boat is underway.



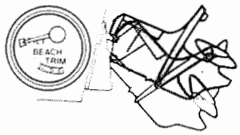
Trim range

The drive can be adjusted whilst underway to maintain the best running position.



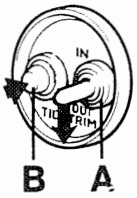
Beach range

The drive is adjustable within the beach-range, whilst underway at low speed and at idling, in order to make it possible to run in shallow water. Once the drive has been set, "forward" or "reverse" running can be carried out and speed can be increased.



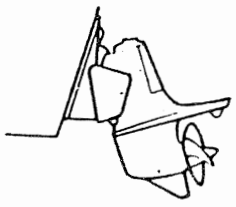
Tilt range

Engine must not be started or run with the drive in the tilt range. The tilt range is intended for use only when the boat is moored in shallow water or when the boat is transported by trailer.



Running in shallow waters

If you are uncertain about the depth of the water, we recommend you to reduce the speed and to tilt up the outdrive.
If you want the drive to pass the trim position: Press in the button (B) at the same time as the operating switch (A) is kept in "out"-position. Do not operate the two switches for Power Trim (in the control lever and at the instrument panel) simultaneously.

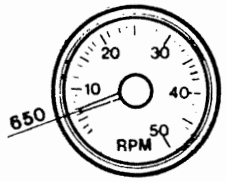
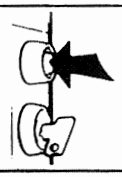
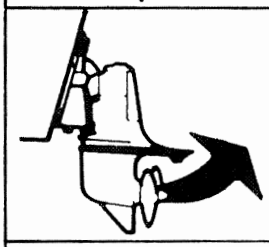


Reversing

Reverse can be engaged with the drive in Trim and Beach positions.

IMPORTANT! Never shift to reverse when the boat is planing.

SHUTDOWN PROCEDURE

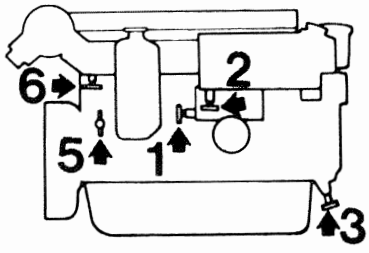
	Before stopping the engine it should be allowed to idle for a minute or two with the control lever in neutral.
	Stop the engine by pressing the stop button and hold it there until the engine has stopped. Then turn the key switch to the switched off position.
	If there is shallow water at the mooring place and if there is risk that the drive can strike the bottom, it should be fully tilted. Otherwise it is not necessary to tilt the drive.
	Switch off the main switch. IMPORTANT! **The main-switch must never be switched off until the engine has stopped.**

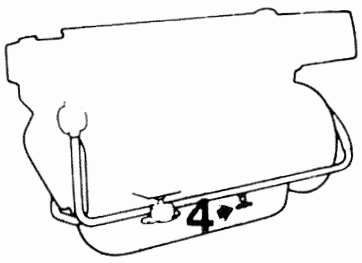
AQD40A/280, TAMD40A, MD40A

Before leaving the boat check that there is no water leakage. If cold weather and risk of icing, drain the cooling water from the engine.

The seawater system is drained through the cock on the oil cooler (1) and the cock on the pressure-side of the seawater pump (3). The AQ-version of the engine has a further cock positioned on the water-tube on the suction-side of the seawater pump (4). (Loosen the hose to the drive's intake pipe to prevent water flooding the boat.) Draining the reverse- and reduction gear, see page 46 pos. 49 and 50. Also loosen the cover of the seawater pump. NB! Close the cocks and fit the cover before leaving the boat.

The fresh-water system, if filled with water only, should be drained through the cock/plug on the heat exchanger (2) and the side of the block (5) and through the cock on the exhaust manifold (6). In order to facilitate draining loosen the cover on the expansion tank. If the system is filled with anti-freezing liquid draining is no longer necessary.





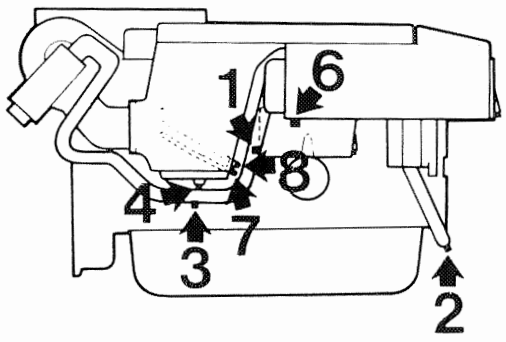
Protect your boat and make theft difficult. Never leave your boat ready for use.

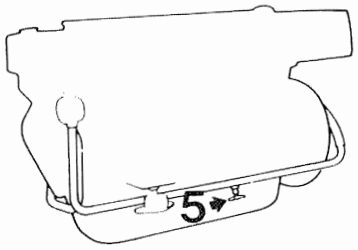
AQAD40A/280, TAMD40A

Before leaving the boat check that there is no water leakage. If cold weather and risk of icing, drain the cooling water from the engine.

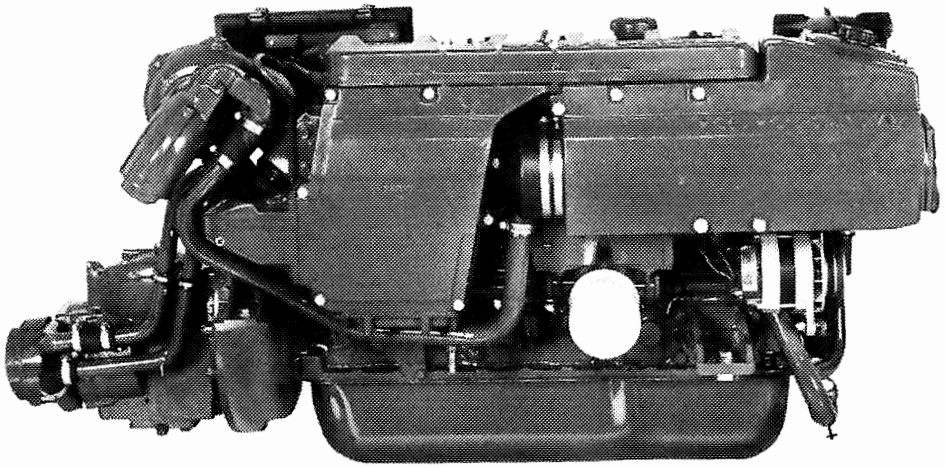
The **seawater system** is drained through the cock on the oil cooler (1) and the cock on the pressure-side of the seawater pump (2). The cock on the water-tube (3) and through the cock (4) on the after cooler. The AQ-version of the engine has a further cock positioned on the water-tube on the suction-side of the seawater pump (5). (Loosen the hose to the drive's intake pipe to prevent water flooding the boat.) Draining the reverse- and reduction gear, see page 46 pos. 49 and 50. Also loosen the cover of the seawater pump. NB! Close the cocks and fit the cover before leaving the boat.

The fresh-water system, if filled with water only, should be drained through the cock/plug on the heat exchanger (6). The block and the exhaust manifold are drained through the cocks (7) and (8). In ordet to facilitate draining loosen the cover on the exspansion tank. If the system is filled with anti-freezing liquid draining is no longer necessary.





TECHNICAL DESCRIPTION



ENGINE ASSEMBLY

All the engines described in this book have the same engine-body and are in-line, freshwater cooled, 6-cyl., 4-cycle marine diesel engines of swirlchamber-type, with overhead valves. AQD40, AQAD40, TAMD40 and TMD40 are turbo-charged. AQAD40 and TAMD40 are also equipped with an after cooler. Block and cylinderhead are made of cast-iron. Exchangeable wet cylinder liners. The crankshaft and the camshaft are journalled in seven main bearings. Oil-cooled, light-alloy pistons with two compression rings and one oil-scrape-ring. The cylinder head has exchangeable valve seats. Valves are made of high-grade material.

LUBRICATING SYSTEM

The lubricating system is provided with an cooler and a full flow oil filter. All oil is cooled and filtered before it reaches its lubricating points. A pressure reduction valve in the oil pump prevents the oil pressure from reaching too high values. Crankcase ventilation with exhangeable filter.

ELECTRICAL SYSTEM

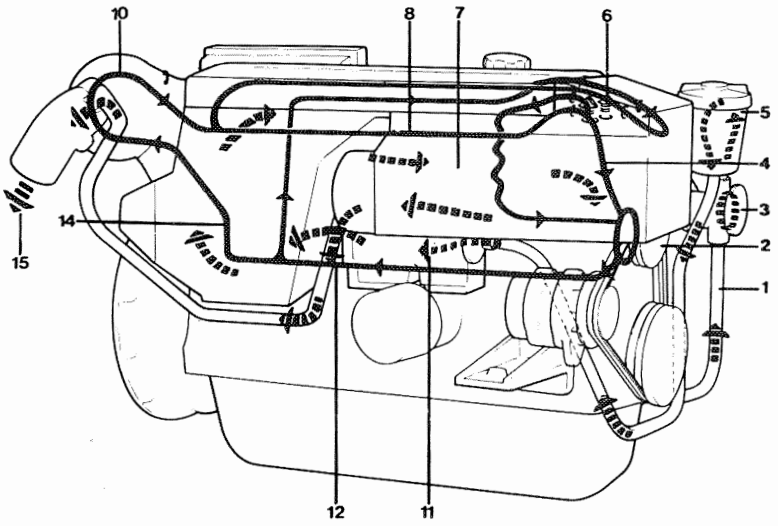
The engine has an alternator with built-in rectifier. The voltage control is carried out by a transistorized regulator. The alternator allows charging of two independent battery circuits if a charging-distributor (double-diod) – accessory – is fitted on the alternator. A main fuse, re-settable by hand, is fitted on the engine.

The engine has glow-plugs, wired in parallell. Electrical wiring diagram for engine and instrument panel to be found on page 39.

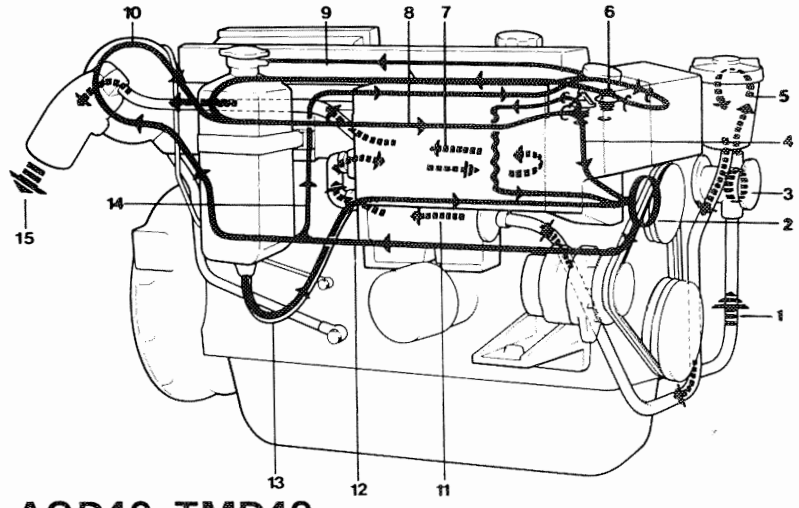
FUEL SYSTEM

The fuel system consists of a feed pump, fuel filter, an injection pump and injectors. The feed pump, which is of diaphragm type, also has a hand primer. The injection pump has a cold start device built in.

COOLING SYSTEM



AQAD40, TAMD40



AQD40, TMD40

Seawater system

Freshwater system

1. Suction pipe – seawater pump
2. Circulation pump – freshwater
3. Seawater pump
4. Direction of circulation – closed thermostat
5. Seawater filter
6. Thermostats, 2 pcs
7. Heat-exchanger
8. Freshwater cooled exhaust manifold
9. Entrance, expansion tank (MD40 has separat mounted expansion tank)
10. Freshwater cooled turbo (not on MD40A)
11. Oil cooler, seawater cooled
12. Distribution channel in cylinder block
13. From expansion tank
14. Cooling of liners and cylinder head
15. Exhaust gases mixed with cooling water

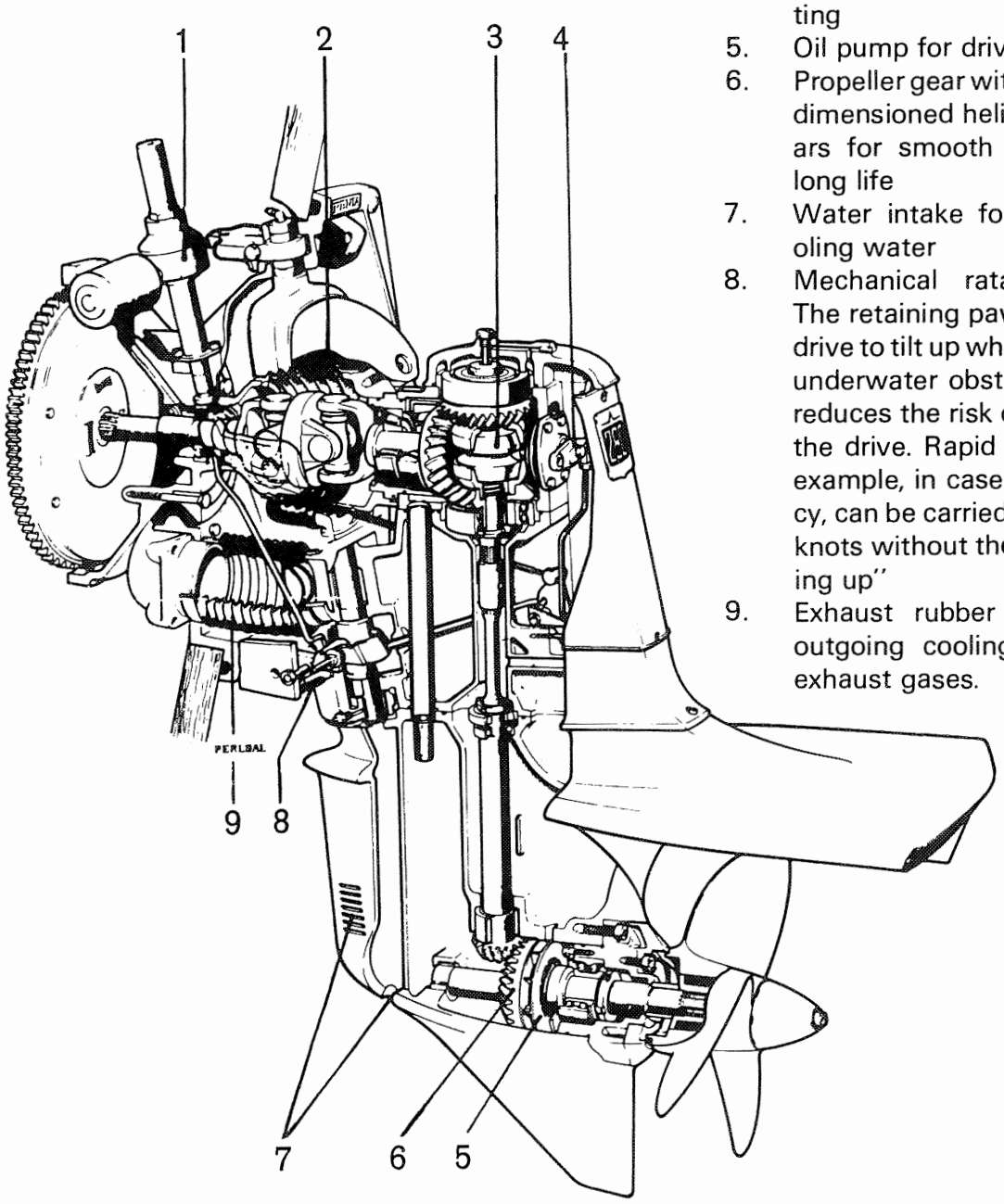
The engine is equipped with a heat exchanger and has two cooling systems, one for seawater and one for freshwater. The seawater system contains a seawater pump, water filter and an oil cooler. AQAD40 and TAMD40 has also an after cooler for cooling the compressor air. In the freshwater system there is an expansion tank, circulation pump and thermostat.

The seawater pump, which has an impeller of neoprene rubber, is driven via a rubber carrier from the same gear as the injection pump. The circulation pump is driven by the same V-belt as the alternator.

In order to prevent seaweed from entering the seawater system and blocking the circulation there is a water filter fitted on the system's pressure side. The thermostat regulates the freshwater circulation so that the engine temperature is always correct. The exhaust manifold and the turbocharger are cooled via the freshwater system. The exhaust elbow is cooled via the seawater system.

DRIVE 280

The Aquamatic Outboard drive model 280 is designed in such a way that it provides very low resistance to flow at high speeds. The drive is steerable mounted in a transom-shield in the boat-transom and can be tilted up with the help of an electro-mechanical tilting device.



1. Electro-mechanical tilting device for tilting the drive
2. Rubber bellows for the drive U-joint
3. Silent Shift type cone clutch (patented) ensures reliable and smooth engagement
4. Shift mechanism with servo-diesengagement for easy shifting
5. Oil pump for drive lubricating
6. Propeller gear with generously dimensioned helical bevel gears for smooth running and long life
7. Water intake for engine cooling water
8. Mechanical rataining pawl. The retaining pawl allows the drive to tilt up when striking an underwater obstacle and this reduces the risk of damage to the drive. Rapid reversing for example, in case of emergency, can be carried out up to 15 knots without the drive "floating up"
9. Exhaust rubber bellows for outgoing cooling water and exhaust gases.

Checks and servicing should be carried out regularly according to the intervals given below. Let an authorized Volvo Penta Service Workshop maintain your engine.

CHECK DAILY BEFORE STARTING that

CHECK every 14 days that

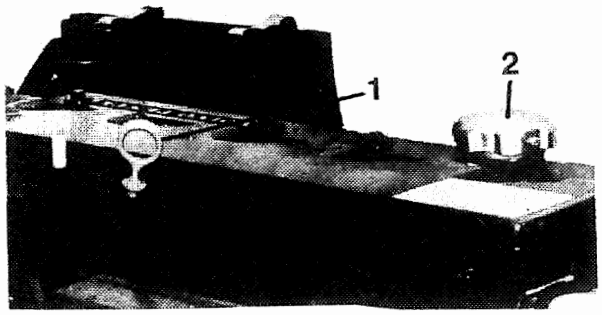
SERVICE EVERY 50 HOURS OF OPERATION

SERVICE EVERY 200 HOURS OF OPERATION OR AT LEAST ONCE PER SEASON:

MEASURES IN CONNECTION WITH LAYING UP AND LAUNCHING THE BOAT

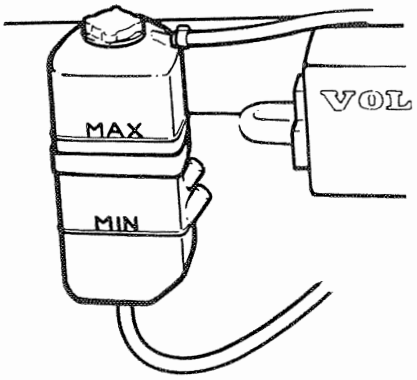
CHECK DAILY BEFORE STARTING

OIL LEVEL IN ENGINE



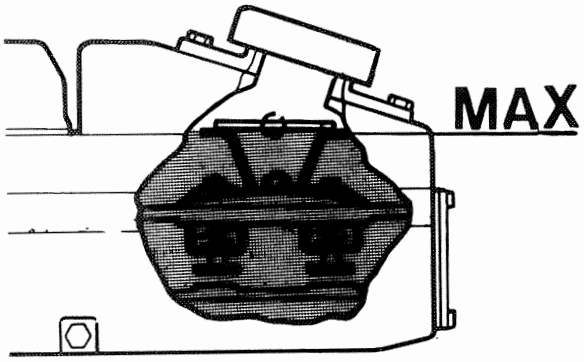
Check the oil level daily before starting and make sure that the oil level is within the marked field on the dipstick (1). Fill with oil when necessary through the oil filler (2). NOTE! Do not exceed the maximum mark. See "Technical Data" for choice of oil.

Coolant level in expansion tank AQD40, TMD40, MD40)



Before starting each day, check that the expansion tank is completely full (past the max level). If necessary fill to the correct level with fresh water or corrosion inhibiting anti-freeze mixture. Start the engine and check that the level stays between MAX and MIN. Top-up if necessary whilst the engine is running. For airventing the cooling system, see page 15.

Coolant level in thermostat housing (AQAD40, TAMD40)



Before starting each day, check that the thermostat housing is filled up to the splash plate. If necessary fill to the correct level with fresh water or corrosion inhibiting anti-freeze mixture. Start the engine and top-up if necessary whilst the engine is running. For air venting the system, see page 15.

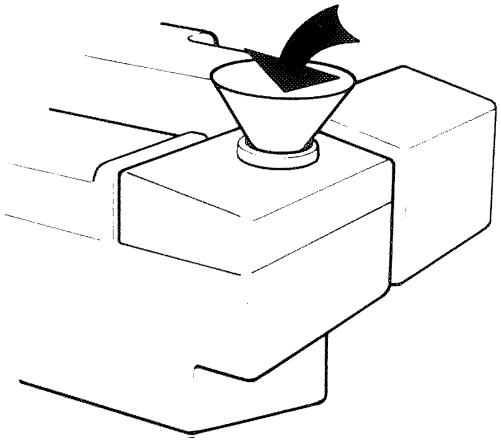
When there is a danger of frost it is important that the fresh water system is filled with an anti-freeze mixture. Alternatively the system can be drained. See "Shut-down procedure" when draining the sea water system.

The anti-freeze mixture shall be made up in accordance with the table below. Use Volvo Original Ethylene glycol.

Freezing points of mixtures of ethylene glycol and water:

Percent by volume of ethylene glycol	Freezing point °C	°F
35	-20	- 4
45	-30	-22
50	-35	-31

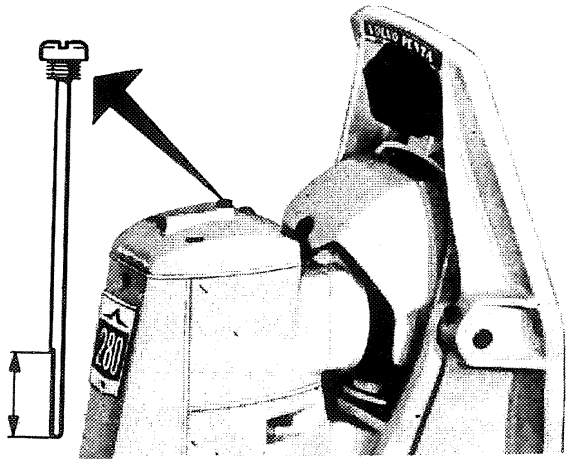
VENTING THE FRESHWATER SYSTEM (AQD40A, TMD40A)



If the expansion tank has been emptied, venting must be done when filling up. See instruction on the inlet manifold of the engine. If the expansion tank is mounted separately and higher than the engine, venting of the turbocharger is sufficient. If the freshwater system has been emptied filling-up is done through the thermostat housing.

CHECK every 14 days

OIL LEVEL IN DRIVE



Check the oil level with the drive fully down. The oil level should be between the marks on the dipstick, which must not be screwed down when measuring the oil level. Make sure that water cannot enter the drive while carrying out the oil-level check. If necessary, top-up with oil through the hole for the dipstick. Concerning the type of oil, see under "Technical Data".

NOTE! The O-ring which lies in the groove under the dipstick tightening screw.

ELECTROLYTE LEVEL IN BATTERY

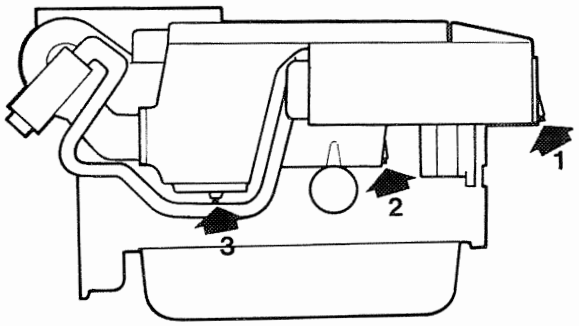
The level should be 5–10 mm (3/16"–3/8") above the cell plates in the battery. If necessary, top-up with distilled water. CAUTION! Observe great care since the gas formed in the battery is explosive and the acid frets.

BELT TENSION

The V-belt must be properly tensioned in order to get full alternator output and correct cooling water temperature. The V-belts are properly tensioned when it is possible to depress them 10 mm (3/8") midway between the pulleys.

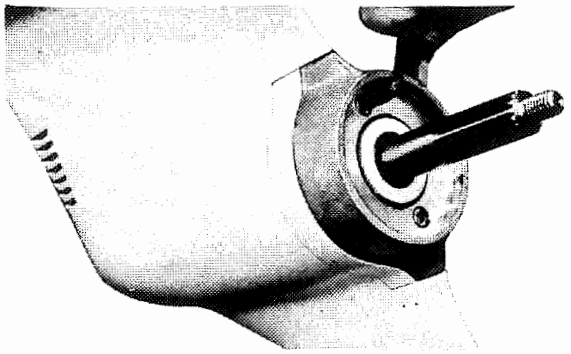
For correct V-belt tension see page 20 "Check the V-belts".

CORROSION PROTECTION



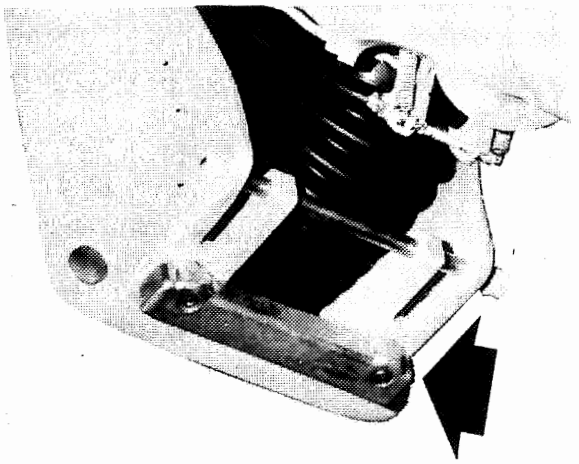
Replace the zinc plugs when they have been worn down by 50 %.

1. AQAD40, TAMD40.
2. AQD40, AQAD40, TAMD40, TMD40, MD40
3. AQAD40, TAMD40.



Replace the zinc ring on the inside of the propeller when it has been corroded off by 50 %. See "Removing and installing the propeller".

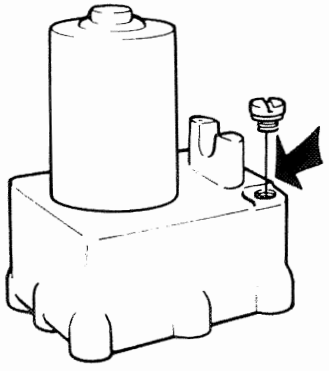
Make sure that the contact surface on the drive is clean before fitting the new zinc ring.



Replace the zinc plate under the transom shield when it has been corroded off by 50 %.

Make sure that the contact surface is clean before fitting the new zinc plate.

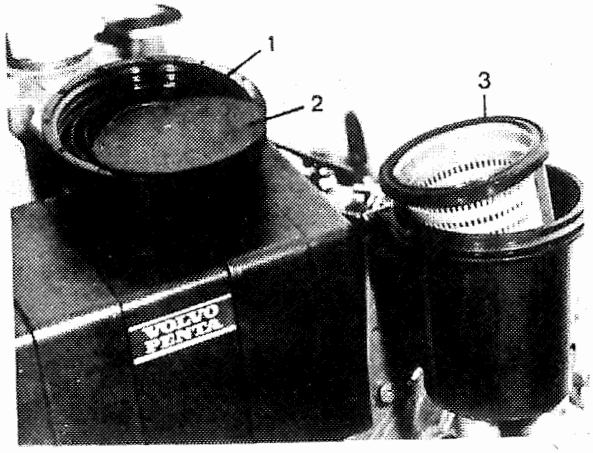
OIL LEVEL IN THE HYDRAULIC PUMP (POWER TRIM)



Remove the screw and check that the pump is filled with oil. Fill with oil if necessary. For choice of oil see "Technical Data". Take great care when checking the oil level that no foreign particles enter the system.

SERVICE EVERY 50 HOURS OF OPERATION

SEA-WATER FILTER

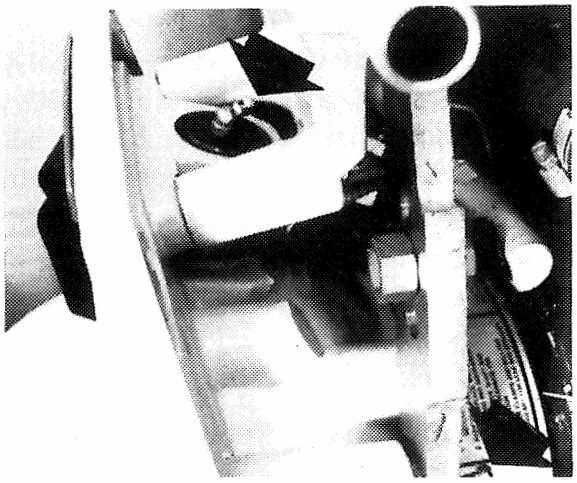


When there is risk for clogging the filter, check after about 25 hours.

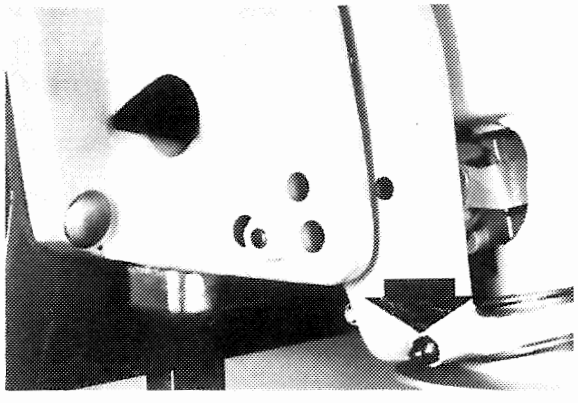
When checking and cleaning the water-filter unscrew the cover (1) and remove the sealing-plate (2). Then lift out the insert (3). Shake the insert and rinse it. The insert can be fitted in one way only. Check that the seal on the insert is undamaged. Put on the sealing-plate and tighten the cover well. Check for water leakage after the engine has been started up.

NOTE! Watch out for water getting into the boat when working with the sea-water filter.

LUBRICATING THE PRIMARY SHAFT AND STEERING SHAFT JOURNALS



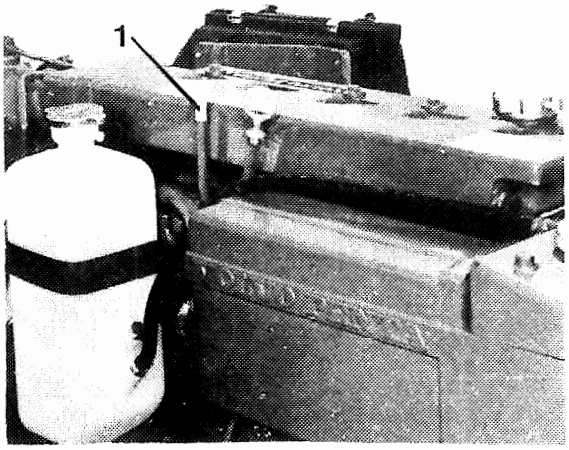
Grease the steering shaft journals with a grease-gun until grease is forced out at the journals. Use water-resistant grease.



Grease the lower steering shaft bearing with a grease-gun until grease is forced out at the bearing. Use water-resistance grease.

SERVICE EVERY 200 HOURS OF OPERATION OR AT LEAST ONCE PER SEASON

CHANGE OIL IN ENGINE (EVERY 100 HOURS)



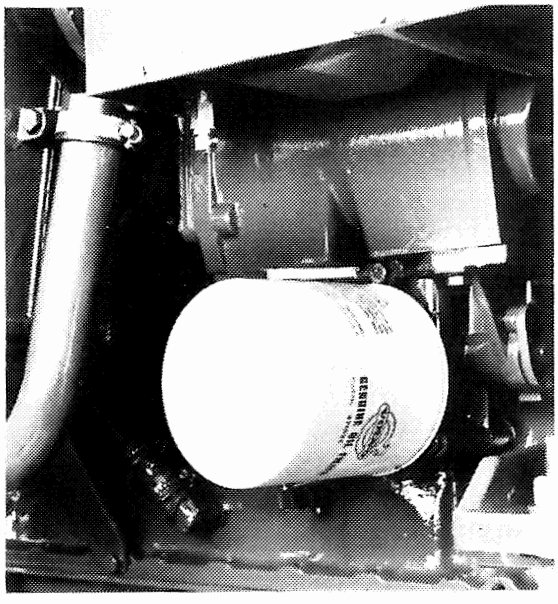
The oil is to be changed in new or reconditioned engines after the first 20 hours of operation and then after every 100 hours of operation.

Run the engine until it is hot. Suck up the oil through the tube for the oil drain pump (1).

Fill up with oil to the correct level. See "Technical Data" for choice of oil.

NOTE! The oil filter must also be changed at every other oil change.

OIL FILTER



The oil filter is to be changed the first time after 20 hours of operation and then after every 200 hours of operation. Screw off the old oil filter. If the oil filter is difficult to unscrew, there is a special tool which can be used. Alternatively a screwdriver can be driven through the outer section of the filter and then used as a lever. **Be careful not to spill oil.**

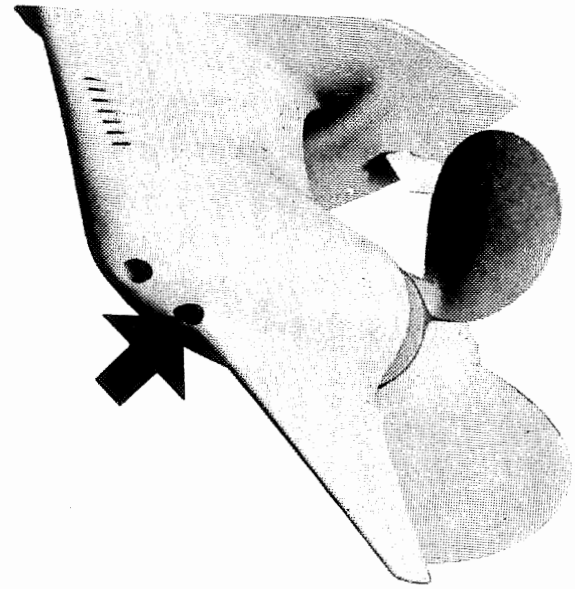
Coat the rubber seal of the new filter with oil. Check the contact surface on the engine and screw on the filter **by hand** until it touches the contact surface. Turn the filter a further **half turn, not more.**

NOTE! **Use only genuine oil filters.**

Start the engine, run at idling speed and check immediately that the oil pressure-gauge shows normal values.

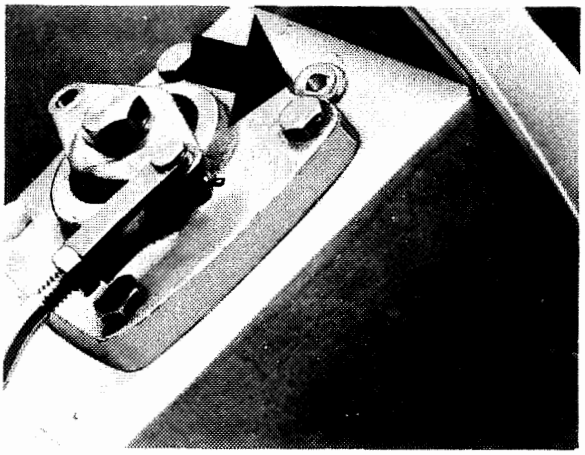
Check the oil-level and check also for leakage around the filter.

OIL CHANGE IN DRIVE



Draining

Remove the oil dipstick. Tilt the drive. Remove the plug under the propeller gear housing and let the oil run out. Refit the plug with its O-ring.



Filling

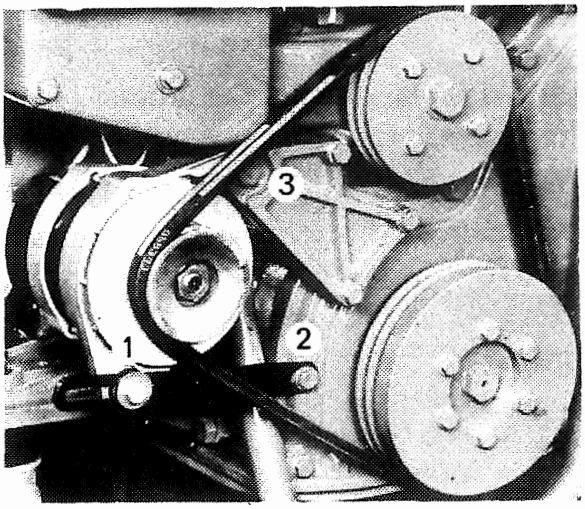
Remove the oil filler plug. Fill up with oil. Concerning quality and capacity see under "Technical Data". Refit the plug together with its O-ring. Lower the drive. Check the oil with the dipstick, which must not be screwed down when measuring the level. Fill up to the correct level through the dipstick hole. If the level is too high, the oil must be drained to the correct level. Re-insert the dipstick together with its O-ring.

Check that the drain-plug is not leaking.

CHECKING THE VALVE CLEARANCE

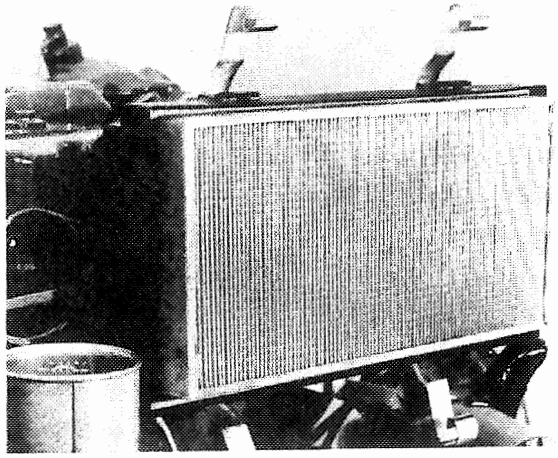
Checking and adjusting the valve clearance should be carried out by an authorized Volvo Penta service workshop. See "Valves" under "Technical Data".

CHECKING AND REPLACEMENT OF V-BELTS



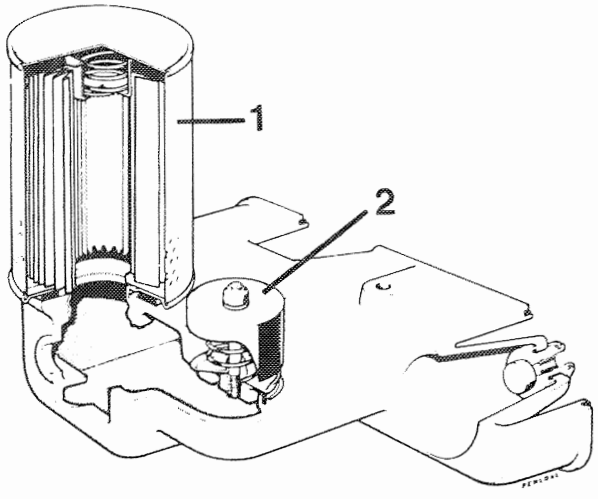
Check the belts thoroughly for wear and cracks. Any indication of such and the belts must be replaced. Loosen the alternator mounting bolts 1, 2 and 3 and slip off the belts. Clean the belt grooves on the pulleys before fitting the new belts. Tension the belts in such a way that they can be depressed 10 mm (3/8") between the pulleys. After a few hours of running recheck the belt tension and adjust if necessary.

CHANGING THE AIRFILTER



The airfilter must be replaced every 200 hours of operation or once each season. Loosen the four clamps and remove the cover. Change the filter and refit in reversed order. Be careful so that no dirt enters the housing.

CHANGING OF FILTER FOR CRANKCASE-VENTILATION



The airfilter for the crankcase-ventilation (1) must be changed every 200 hours of operation or when the vent-air, mixed with oil starts to flow out by the oil-valve (2).

TURBOCHARGER, (AQD40, AQAD40, TMD40, TAMD40)

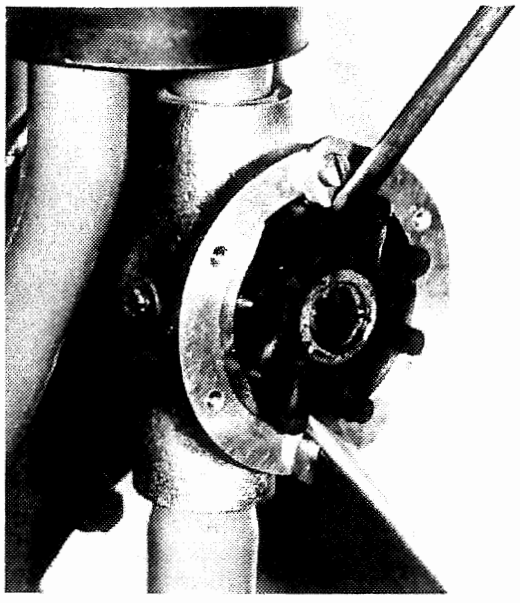
Check airtube and connections for leakage

Check the air-tube when the engine is running. Whistling or hissing sounds are signs of leakage. Leakage can also be detected by brushing soap-water on suspected spots on the pressure-side between the turbo-charger and the engine. Tighten hoseclamps or replace the air-tube if necessary. If faults on the turbo-charger contact an authorized service-workshop.

CHECKING THE COOLING SYSTEM

The cooling system functions normally when the needle of the temperature gauge is between 75–90°C (165–194°F). If the temperature is too high this can depend on the following: blocked seawater filter, defective pump impeller or carrier in the seawater pump, air in the freshwater system, leakage, blocked oil cooler, too low freshwater level, slipping or broken drive belt for the circulation pump, blocked heat exchanger, faulty thermostat or instrument and temperature sender. **Watch out for water penetration** during all work with the cooling system. See page 17 for blocked seawater filter.

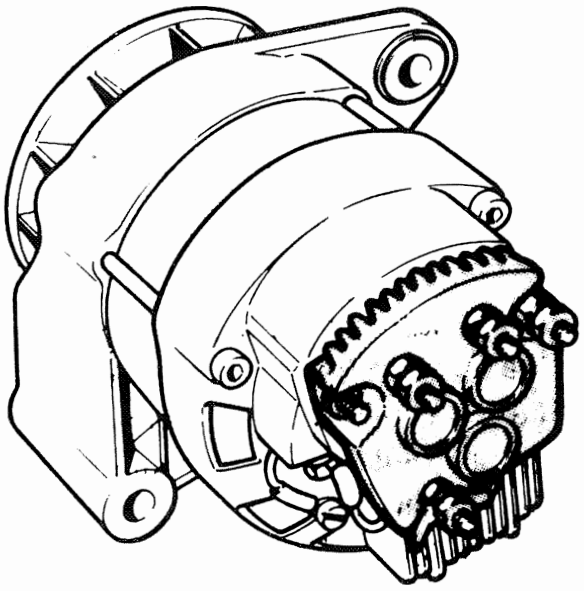
CHECKING AND REPLACING THE IMPELLER

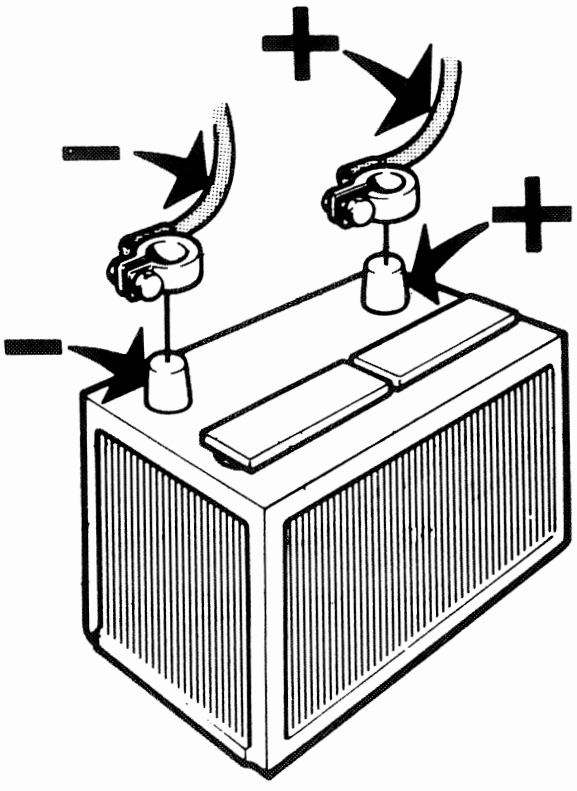


The impeller can be damaged, mostly because of lack of water in the pump due to blocked intake. Remove the cover. **Watch out for water penetration.**

Inspect the impeller. If the impeller is damaged, it must be replaced. Pull off the impeller using two screwdrivers. Do not damage the housing. The carrier is defective if it is possible to turn the impeller and the shaft. A new carrier can be fitted after the pump has been removed.

ELECTRICAL SYSTEM





Alternator

The engine is equipped with an alternator. If the alternator and the regulator are to function without interference, it is important that the following instructions are observed:

1. **The main switch must not be switched off until the engine has stopped.**

   Otherwise the charging regulator can be ruined.

2. **Battery terminals polarity must never be mixed up.** The battery terminals have a plus and a minus sign respectively. The cable from the minus terminal is connected to the engine block. The cable shoes must be greased and well tightened.

3. **Do not switch the charging circuits while the engine is running.**

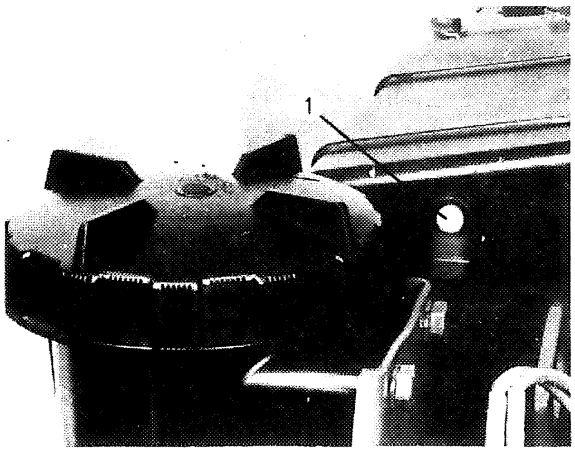
   Fit the Volvo Penta charging distributor (accessory) to the alternator when more than one battery is connected.

4. In the event the engine has to be started with the help of a spare battery, proceed as follows:

   Let the ordinary battery remain connected. Connect the spare battery to the ordinary battery with plus to plus and minus to minus. When the engine has started, remove the spare battery but under no circumstances may the circuit to the ordinary battery be broken.

5. Do not use a rapid charger when the alternator is connected to the battery.
6. Disconnect both battery cables before doing any work on the alternator equipment.
7. Before carrying out any electrical welding on the engine or installation components, disconnect the charging regulator cables at the alternator and insulate the cable ends.
8. Check the belt tension and the cable connections regularly.

Re-set button on fuse



The engine is equipped with an automatic fuse which breaks the electrical system when overloaded. The automatic fuse has a re-set button (1). Always investigate the reason for the overload.

Checking of starter motor and alternator

Let an authorized service-workshop do all checking and repairs of the starter-motor and the alternator. Inspection and control should be carried out in connection with a general inspection of the engine.

BATTERY

Checking the charging status

The charging status of the battery should be checked at least once each season. The check is carried out using a hydrometer which indicates the specific gravity of the electrolyte, this varying with the status of the charging, (see "Technical Data").

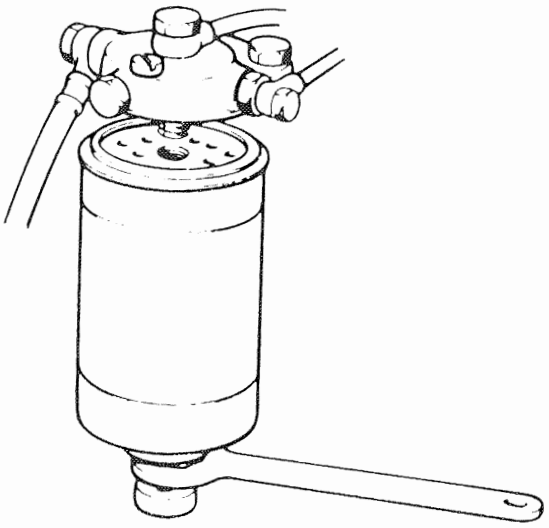
GLOWPLUGS

If faults on the glowplugs can be suspected the glowplugs can be checked as follows. Loosen the current-carrying flat wire between the plus-poles of the glow-plugs. Connect a bulb between the plus-pole of the battery and the plus-pole of the glowplug. If the bulb lits up the glowplug is functioning. Check all glowplugs and replace faulty ones. Always carry spare glow-plugs on board.

FUEL SYSTEM

Observe the greatest cleanliness when handling the fuel system. IMPORTANT: Try to avoid fuel splash.

Changing fuel filter

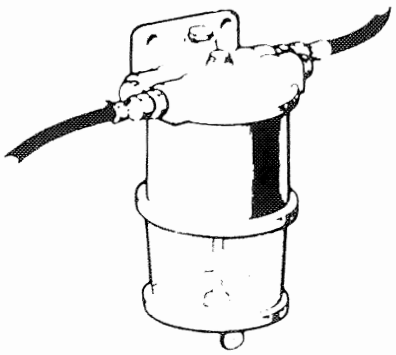


The fuel filter should be changed at least once each season.

To do this remove the fuel filter by turning the nut at the bottom of the container. Try to avoid fuel splash. The fine filter and container are of throw-a-way type and therefore a new filter has to be fitted.

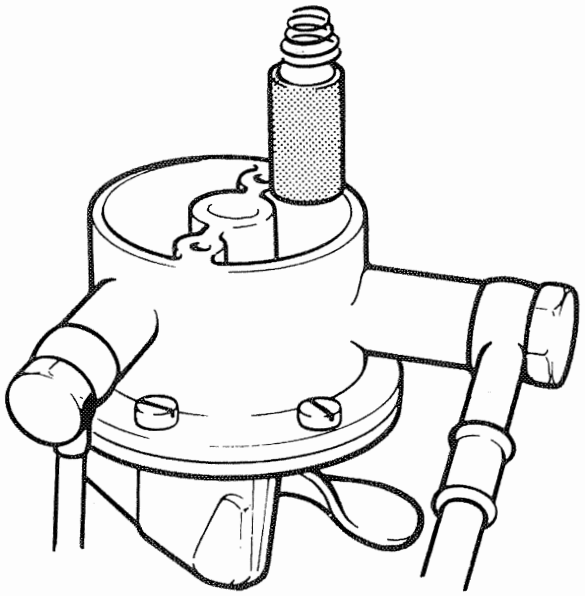
Check that the contact surface in the cover is clean and that the filter-gasket is faultless. Screw on the new filter by hand until the gasket touches the cover. Then tighten a further half turn. Vent the fuel system (see page 26) and check for leakage.

Extra fuel filter



If an extra fuel filter with water separator is fitted, check the transparent bowl to see if there is any water in the fuel. If necessary, drain the filter via the cock in the bottom of the bowl. Try to avoid fuel splash. Pump up the fuel and vent the system. The fuel filter element should be changed at least once each season.

Fuel strainer



The fuel pump on the engines has a built-in strainer, which can be removed after removing the pump's cover. The strainer must be cleaned at least once per season. Always vent the fuel system. Refer to "Venting of Fuel System" (page 26). **Check immediately after starting that there is no fuel leakage.**

Injectors

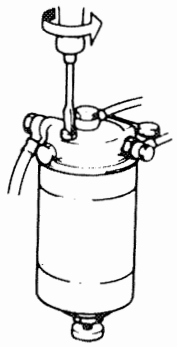
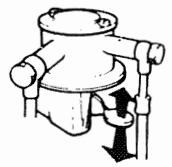
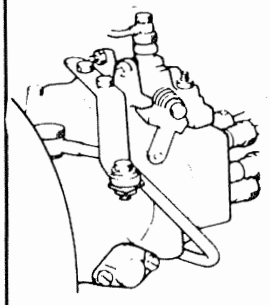
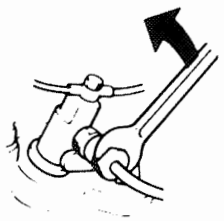
All work on the injectors of the engine must be carried out by an authorized service workshop. Check the opening pressure, spray pattern and also check for leakage each 600 hours of operation.

Venting of the fuel system

To enable the engine to start, the fuel system must be vented after carrying out the following:

Change of fine filter
After cleaning the fuel pump strainer
If the fuel tank has been run empty
When fitting the injection pump
If leakage or if work has been carried out on fuel pipes
After long periods of no running

Venting is carried out as follows. Regarding location: see Engine Component Guide.

	Open venting screw on the fuel filter about 4 turns. Watch out for fuel splash. Use rags around the vent opening.
	Pump up the fuel by using the hand primer until fuel, free from air bubbles flows out. Close venting screw. If the pump action is poor, turn the engine so that the cam driving the pump changes position.
	If the fuel injection pump has been removed or when starting up a new engine for the first time the fuel injection pump must always be vented. Use the hand primer and pump for about half a minute. During this procedure the injection pump is automatically vented.
	Loosen the injectors' delivery pipe nuts, and put the throttle control lever in the full speed position. Turn the engine using the starter motor until fuel flows out of the delivery pipes. Watch out for fuel splash. Use rags around the venting location. Tighten delivery pipe nuts and start the engine.

SERVICE IN CONNECTION WITH LAYING-UP AND LAUNCHING THE BOAT

INHIBITING

IDLE ENGINE FOR BRIEF PERIODS WITH BOAT IN WATER

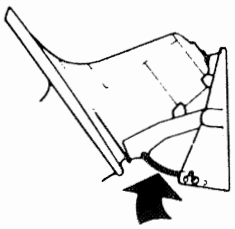
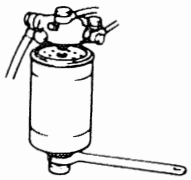
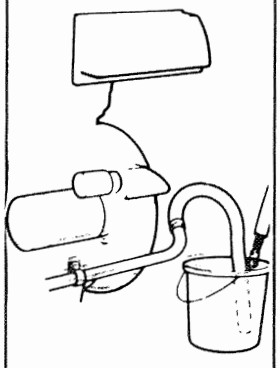
In order to prevent damage to the engine caused by corrosion, the engine should be run warm at least every 14 days as long as the boat is in the water. If the boat is not to be used for over a month, a long-term inhibiting should be carried out.

INHIBITING WHEN LAYING UP FOR THE WINTER

An authorized service shop should test the engine and equipment before inhibiting the engine for a long period. It is advisable to test the compression to find out the condition of the engine. If anything is not in good condition let the shop repair it already now.

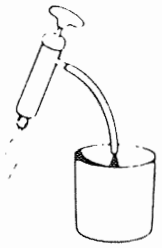
Inhibiting scheme

Carried out with the boat on land

	When transporting the boat on a trailer for example, the outdrive must be fully tilted and locked in this position. A locking device is included. Fit this device as shown on the picture. On boats fitted with Power trim the drive should be raised up to maximum.
	Change the fuel filter. Pump fuel forward and vent the system. See "Venting the fuel system" (page 26). Check the fuel hoses as well as the complete fuel system for leakages. If an extra fuel filter is fitted, this filter cartridge must also be changed.
	Loosen the hose on the seawater system suction line, between the transom shield and the cooling water tube. (If reverse- and reduction gear is fitted loosen the hose between the seawater intake and the seawater pump.) Connect a hose to the suction line on the engine and put down the free end into a container with freshwater. Arrange for refilling of the container.

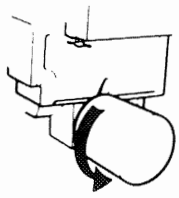
Let the engine run on fast idling for a few minutes. Then stop the engine. Drain the system. Check that the vicinity of the exhaust outlet is not being splashed.

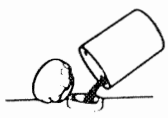
NOTE! Let not the propeller rotate.



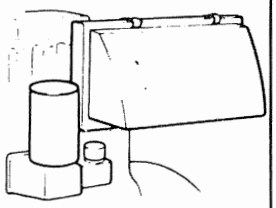
Pump out all oil from the engine. (On drive reverse- and reduction gear, the oil in this must be changed each 200 hours of operation.)

Use the oil drainage pump.

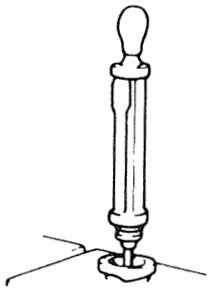




Change the oil filter. Fill up the engine (and reverse- and reduction gear if fitted) to the correct level with Volvo Penta diesel engine oil, which also has corrosion protective properties. After this the engine is ready to run on this oil next season. By long-time inhibiting, exeeding a normal winter laying-up, preservative oil must be used. This should be of the type Esso Rustban 623, Shell Ensis Oil or corresponding oil. In this case the oil filter shall not be replaced until launching.



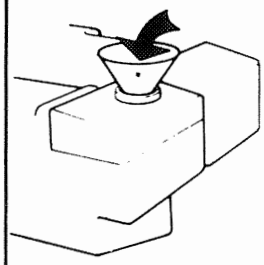
Change the air-filter and the crankcase ventilation filter, (see page 20).



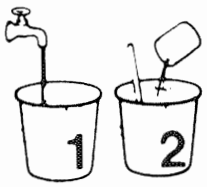
Fresh-water system

Inhibiting can be carried out according to 3 alternatives.

Alt. I. In case the fresh-water system is already filled with ethylene glycol, the freezing-point should be checked.



Alt. II. If the system is filled with freshwater only, drain the water and fill up with a mixture of water and Volvo Genuine Ethylene Glycol (with rust-protective properties) through the filler-lock on top of the thermostat housing. See table on page 14 for correct mixture.
Alt. III. If the freshwater system shall remain empty, inhibiting must be done using a rust-proofing mixture. For correct mixture, see below.
Fill the freshwater system with the mixture.

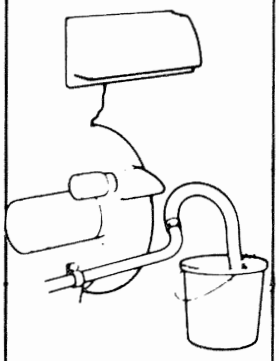


Seawater system

Mix a 20 % rust-proofing mixture containing fresh-water and emulsifying, rust-proofing oil.

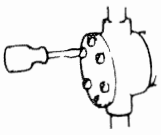
NOTE! Water first, than oil.

Use e.g. Esso Cutwell 40, Shell Donax C or similar.



Insert the hose into the rust-proofing mixture. Start the engine and let it run idle until the mixture is finished.

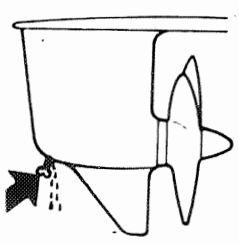
NOTE! The pump must not be allowed to run dry.



The rust-proofing mixture does not have anti-freezing properties, therefore it has to be drained off the engine. Draining points see page 8 and 9. Check that the water drains off, since dirt can block the cocks. Then close all cocks. Remove the cover from the seawater pump. Check that the impeller is undamaged. Refit the cover.

NOTE! Do not remove the impeller if undamaged.

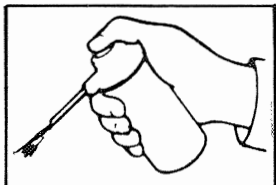
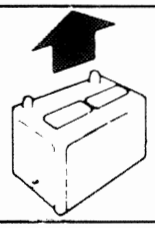
Reconnect hoses which have been removed.



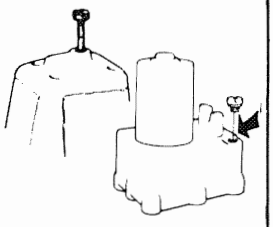
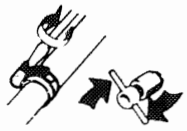
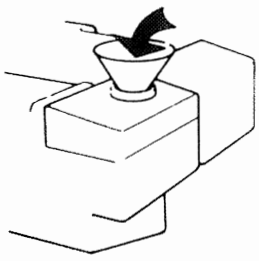
Untighten the oil drain-plug of the bottom of the outdrive to let out a few drops of oil. Check that the oil is clean and not discoloured.

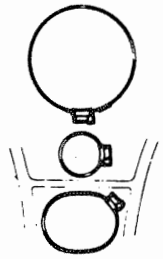
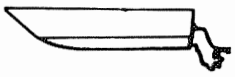
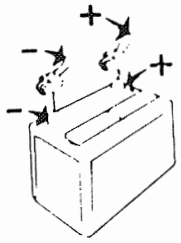
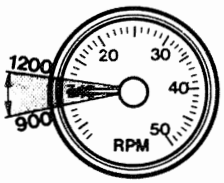
Further inhibiting of the outdrive is not necessary. Remove the propeller and coat the shaft with rust-proofing oil.

LAYING-UP AND LAUNCHING

	Clean the outside of engine, drive or reverse gear. Touch-in any bare patches in the paintwork with the original type of paint. Spray the components of the electrical system, and all the control components with anti-moisture spray.
	Remove the battery. For proper maintenance it needs to be charged to prevent it from being damaged.

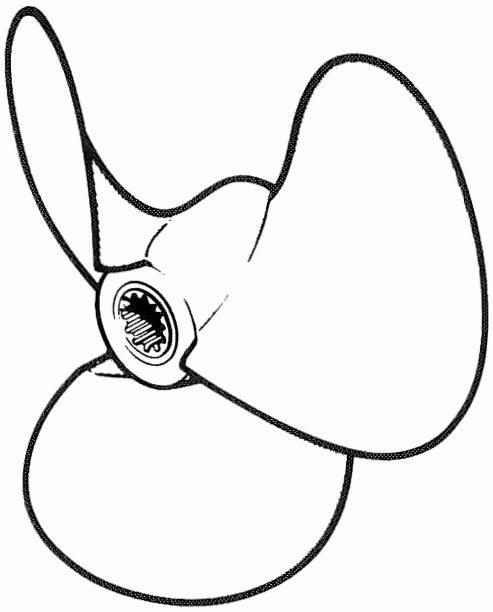
MEASURES IN CONNECTION WITH LAUNCHING

	If Volvo-Penta oil has been used in the engine only the level needs to be checked. If another type of inhibiting oil has been used, both the oil and the filter must be changed. See under "Service every 200 hours of operation".
	Check the drive oil level. If it is too high, it must be lowered by draining. If it is too low, top-up through the hole for the oil dipstick. NOTE! The dipstick must not be screwed down when checking the oil level. Check also the oil level in the hydraulic pump if the drive is fitted with Power trim. Fill if necessary.
	Check the tightening of all hose-clamps. Check that all drain-cocks are closed. Clean the engine and drive on the outside. Check the exhaust-hose.
	Fill-up the freshwater system to the correct level. Fill-up through the filler-hole on top of the thermostat housing with freshwater or with a mixture of freshwater and rust-proofing ethylene glycol. See table on page 14 for correct mixture. Vent the system. See instruction on the inlet manifold on the engine and on page 15.

	Check carefully the rubber bellows for damage and check the tightening of the hose-clamps. NOTE! The bellows over the U-joint and the clamps should be replaced each 3rd year. If the drive has been removed be careful to refit bellows and hose clamps in the right position. Check the retaining pawl, see page 33. Fit the propeller. Check the tightening of the Allen-bolt which attatches the steering-helmet to the drive. Tightening torque – see "Technical Data".
	Examine the paintwork on the outboard drive. Touch up any blemishes with genuine Volvo-Penta paint. Then paint the drive with Volvo-Penta anti-fouling paint. **Important!** Anti-fouling paint containing copper must not be used, since this can corrode the drive. Launch the boat once the paint has dried.
	Install the battery or batteries, which should have been fully charged. Grease the cable shoes. Fit the battery cables. **Important! Do not mix the polarity.** Tighten the cable shoes well.
	Start the engine. See instructions on page 5. Run the engine warm with gear engaged, if this is possible. Check and make sure there is no fuel leakage, no water leakage or exhaust gas leakage. Check further that the manœuvering functions are in order.
VOLVO PENTA Service	When necessary, contact an authorized Volvo-Penta service workshop. Let them service your engine and drive or reverse gear according to the instructions given in the servicing scheme, and if possible, do it very long time before launching because the shop can be occupied if you want to have the service carried out just before launching.

PROPELLER

SELECTING THE RIGHT PROPELLER



The right propeller has been selected when the engine maximum speed is reached with a normal load in the boat.

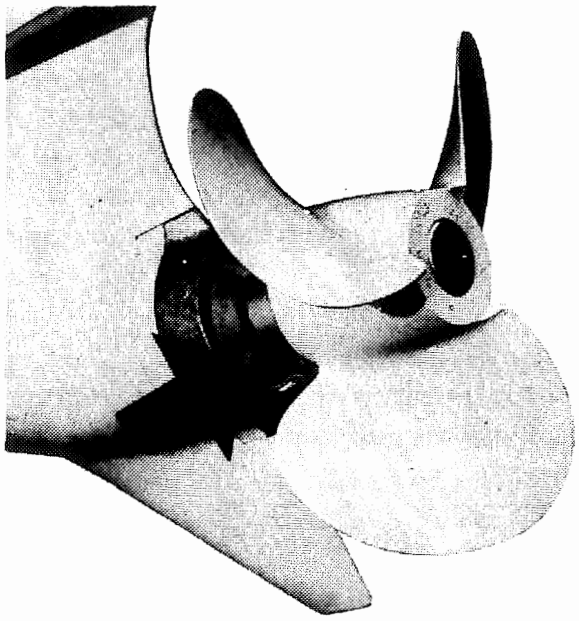
A left-hand rotating propeller should be selected for single installation, since with this direction of rotation there is less tendency for the boat to deviate from course.

With a twin installation, the port drive should be adjusted for a left-hand rotating propeller and the starboard drive for a right-hand rotating propeller.

When replacing a propeller, make sure that you get a genuine Volvo Penta propeller of the same size as the old propeller. The size is punched on the propeller hub. Sizes are given in inches, e.g., 15 x 17, where 15 stands for the diameter and 17 for the pitch.

Never use a bronze propeller because of the increased corrosion risk.

REMOVING AND INSTALLING A PROPELLER



The propeller is locked with a screw and a propeller cone. Undo the screw and the cone. Pull off propeller. NOTE! There is a spacer sleeve with a deflector ring on the inside of the propeller.

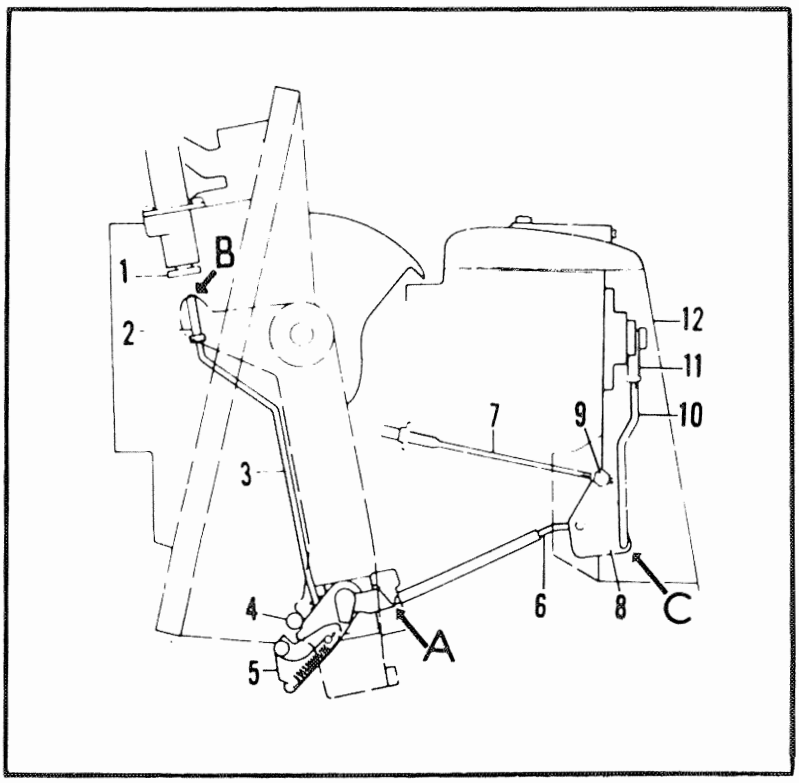
A damaged propeller must be changed.

Before fitting the propeller the propeller shaft must be coated with graphite grease or corresponding lubricant to prevent the propeller from sticking on the shaft.

When fitting the propeller the spacer sleeve must be fitted first. Then refit the propeller and screw on the cone and the locking screw.

ADJUSTING THE RETAINING PAWL

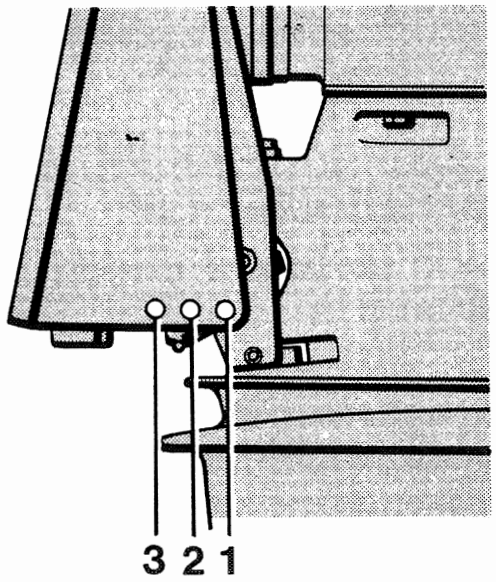
Check once per season and when necessary adjust the position of the locking rod against the retaining pawl (A) and also the position of the push rod (see B) for lift disengagement of the retaining pawl. Adjustment is done as follows:



1. Remove the protective cover (12). Move the control lever to neutral.
2. Disconnect the shift control cable swiwel (9) and yoke (11).
3. Slacken the lock nut for yoke (11). Adjust the yoke so that after having connected to the lever it gives push rod (6) a position where it reaches the clamp of the retaining pawl at "A" without pressing against it. Secure yoke (11) with the lock nut.
4. Adjust swiwel (9) so that is can easily be moved into the hole on the shift yoke. Move the control lever to the "forward" position and check that the corner "C" does not touch the housing. Fit the cover (12).
5. **Press the drive forward against the adjuting pin.** Check the position of rod (3). Its upper part (2) should be flush with the yoke at "B" to enable lift (1) to flushed disengage the retaining pawl when tilting the drive. Adjust the upper part (2) of the rod after the lock nuts have been slackened.

TRIMMING THE DRIVE

THE TRIM OF THE BOAT



The transom shield adjusting pin determines the position of the drive trimming angle. Place the adjusting pin in either of the three holes as follows:

Hole 1: When the boat has a tendency to over-planing (the nose dips)

Hole 2: Normal position

Hole 3: When the boat has a tendency of heavy planing (heavy stern)

ADJUSTING COURSE DEVIATION

Check for deviation in course by releasing the wheel when the boat is planing and observe its course. If, e.g., the boat veers to port, the trim tab under the cavitation plate on the drive must be released. Then turn the rear edge of the trim tab slightly to port and lock the trim tab in this position. Test-run the boat. Adjust the trim tab further if the boat still tends to veer.

TRACING FAULTS WHEN HAVING INTERRUPTIONS IN OPERATION

The fault tracing scheme given below lists only the most usual of faults that give rise to interruptions in operation. With the help of the instructions given in this handbook, the owner can generally remedy most of the faults listed below. When in doubt, always contact the nearest Volvo Penta service workshop.

Follow the maintenance scheme's recommendations – it helps provide trouble-free running.

Engine will not start	Engine stops	Engine does not attain top speed at full throttle	Engine runs unevenly or vibrates abnormally	Engine overheats	Probable cause	See
●					Main switch not switched on, flat battery, brake in electric circles or main fuse. Defective glow plugs.	pages 5, 22, 23
●	●				Empty fuel tank, closed fuel cock, blocked fuel filter	pages 24, 25, 26
●	●		●		Water, air or impurities in fuel	pages 24, 25, 26
		●	●		Defective injector(-s).	page 25
		●			Boat abnormally loaded. Marine growth on boat bottom.	page 3
		●			Blocked air-filter. Turbocharger faulty (AQD40, TMD40, TAMD40).	page 26
			●		Damaged propeller	page 32
				●	Blockage in cooling water intake, water filter, defective impeller to thermostat, wrong level in fresh-water system, air in the fresh-water system.	pages 15, 17 21

TECHNICAL DATA

General

Engine designation	**AQD40A**	**TMD40A**	**MD40A**
Flywheel output[1] HP (kW) at 60 r/s (3600 r/m)	130 (96)	–	–
Propeller shaft output[1] pleasure-boats HP (kW) at 60 r/s (3600 r/m) (Borg Warner)	–	117 (86)	79 (58)
Propeller shaft output[1] pleasure-boats HP (kW) at 60 r/s (3600 r/m) (MS3)	–	124 (91)	85 (62)
Engine weight incl. outdrive kg (lbs)	465 (1025)	–	–
Engine weight incl. BW-reverse gear, kg (lbs)	–	470 (1035)	465 (1025)
Engine weight incl. MS3-reverse gear, kg (lbs)	–	440 (970)	435 (960)
Engine designation	**AQAD40A**	**TAMD40A**	
Flywheel output[1] pleasure-boats HP (kW) at 60 r/s (3600 r/m)	155 (115)	–	
Flywheel output[1] light commersial duty HP (kW) at 50 r/s (3000 r/m)	120 (89)	–	
Propeller shaft output[1] pleasure-boats HP (kW) at 60 r/s (3600 r/m) (MS3B)	–	148 (109)	
Propeller shaft output[1] light commersial duty HP (kW) at 50 r/s (3000 r/m) (Borg Warner)	–	110 (81)	
Engine weight incl. outdrive kg (lbs)	505 (1110)	–	
Engine weight incl. BW-reverse gear, kg (lbs)	–	505 (1110)	
Engine weight incl. MS3B-reverse gear, kg (lbs)	–	485 (1065)	
Number of cylinders		6	
Valve system		Overhead valves	
Max. operating speed, r/s (r/m)		60 (3600)	
Idling speed, r/s (r/m)		11 (650)	
Bore/stroke mm (inch)		92 (3.62)/90 (3.54)	
Displacement dm^3 (in^3)		3.59 (220)	
Compression ratio		21:1	
Firing order, No 6 cylinder closest to flywheel		1-5-3-6-2-4	

Valves

Valve clearance, cold engine	
inlet, mm (inch)	0.40 (.0157)
outlet, mm (inch)	0.40 (.0157)

Lubricating system

Engine	
Oil capacity, dm^3 (UK pints – US pints)	
excl. filter	10.0 (17.6–20.7)
incl. filter	11.0 (19.4–22.8)
Oil quality (Acc. to API)	Diesel lubricating oil CD
Viscosity, above +10°C (+50°F)	SAE 20W/30[2]
below +10°C (+50°F)	SAE 10W[3]
Oil pressure, warm engine,	
idling speed, kp/cm^2 (lbs/in^2)	2.2–2.5 (31.3–35.6)
at full speed, kp/cm^2 (lbs/in^2)	3.5–4.5 (49.8–64.0)

[1] According to "DIN 6270 Leistung B"
[2] Volvo Penta CD Oil Double Grade
[3] Volvo Penta CD Oil Single Grade

Outboard drive	
Oil capacity, dm^3 (UK pints – US pints)	2.6 (4.6–5.4)
Oil quality and viscosity	Same as engine
Oil volume between max. and min. marks on dipstick, dm^3 (UK pints – US pints)	0.15 (0.25–0.31)
Oil capacity, hydraulic system drive 280 with Power trim, litres (UK pints – US pints)	1.5 (2.7–3.1)
Oil grade	Service SE, SAE 10W/40
Reverse gear MS3	
Oil quality and viscosity	Same as engine
Oil capacity, dm^3 (UK pints – US pints)	1.2 (2.1–2.5)
Reverse gear MS3B	
Oil quality and viscosity	Same as engine
Oil capacity, dm^3 (UK pints – US pints)	1.6 (2.8–3.3)
Reverse gear BW	
Oil quality	Automatic Transmission Fluid Type A[1)]
Oil capacity, dm^3 (UK pints – US pints)	3.1 (5.3–6.2)

Cooling System

Thermostat 1 begins opening at, °C (°F)	70 (158)
2 begins opening at, °C (°F)	76 (169)
Freshwater system capacity incl. heat-exchanger, (AQD40A, TMD40A, MD40A), dm^3 (UK pints – US pints)	21 (37–43.5)
Freshwater system capacity incl. heat-exchanger, (AQAD40A, TAMD40A), dm^3 (UK pints – US pints)	23 (40–47)

Fuel system, Bosch

Electrical system

Voltage	12
Battery capacity, Ah	114
Battery, spec. gravity of electrolyte:	
Fully charged battery	1.275–1.285
To be recharged at	1.230
Glow plugs, Bosch	
Alternator	
Type	AC
Max. output	450 W (38 A)
Starter motor output, kW (HP)	2.5 (4)

Outdrive

Outdrive model	280 B
Ratio	1.61:1

TECHNICAL DATA

Reverse gear

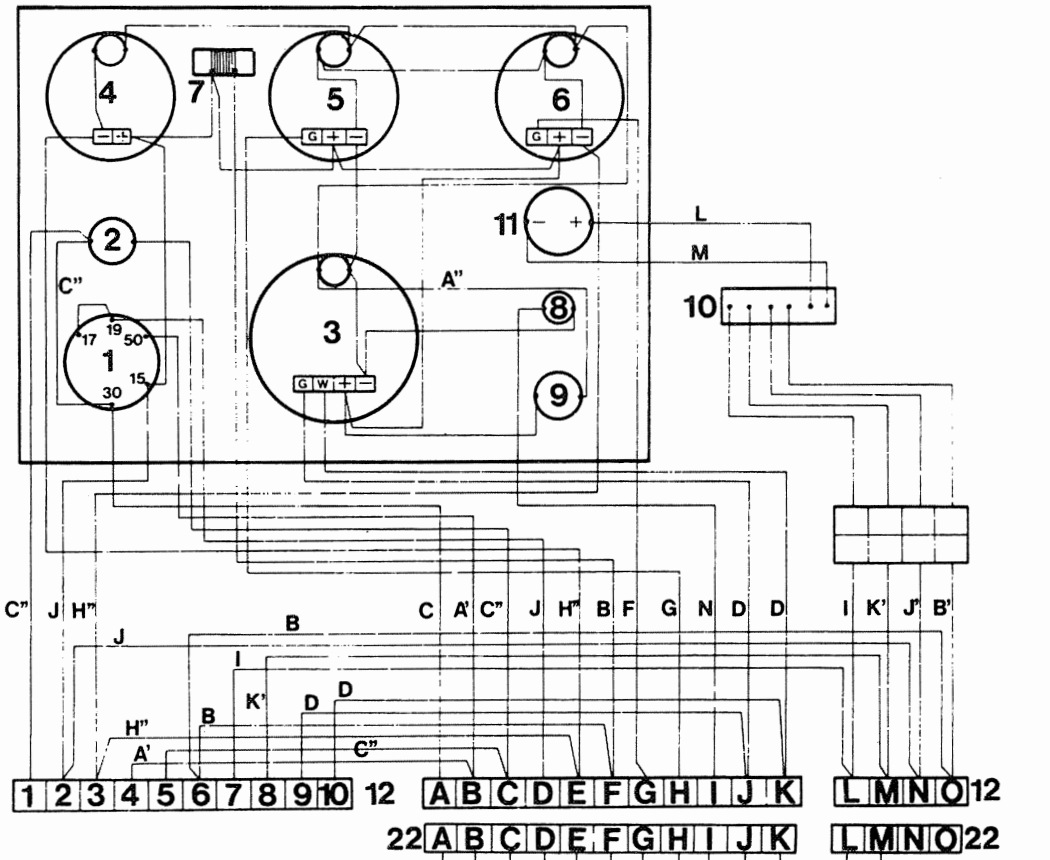
Type	Volvo Penta MS3
Ratio	1.91:1
Rotation	LH or RH
Type	Volvo Penta MS3B
Ratio	1,93:1 or 1,54:1
Rotation	LH or RH
Type	Borg Warner 71
Ratio	1.91:1 RH
Ratio	2.1:1 LH
Ratio	2.9:1 LH

Tightening torques

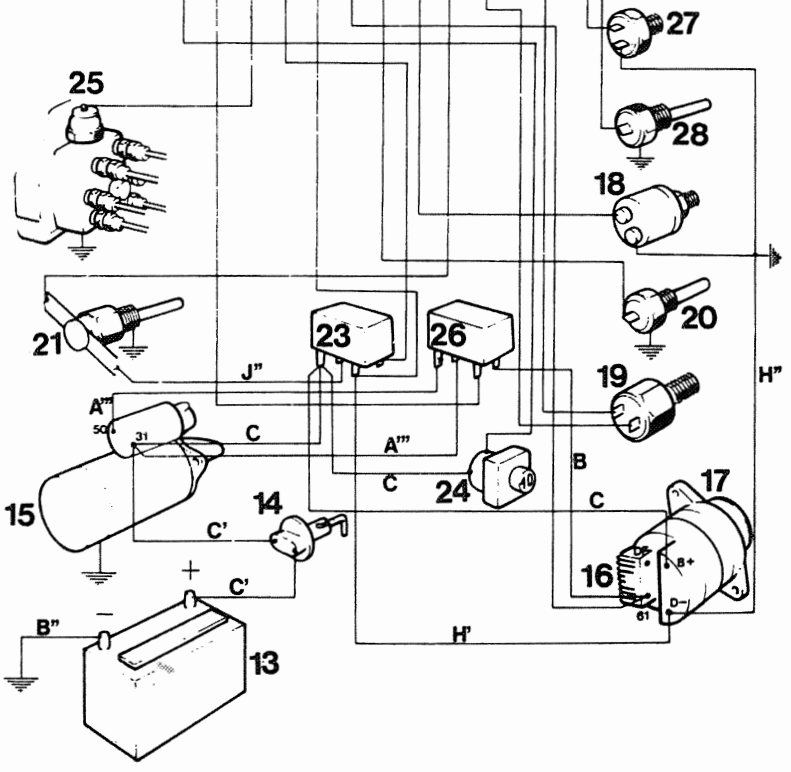
Steering helmet Allen-bolt (AQD40A, AQAD40) kpm (Nm)/ftlbs	5–6 (50–60)/36–43
Cylinder-head bolts:	
1 st tightening, kpm (Nm)/ftlbs	3 (30)/22
2nd tightening, kpm (Nm)/ftlbs	9 (90)/65
3rd tightening, kpm (Nm)/ftlbs	13 (130)/94

[1] Esso Automatic Transmission Fluid 55, Shell Donax T6 or equivalent.

INSTRUMENT PANEL



ENGINE



WIRING DIAGRAM

Instrument panel

1. Key switch
2. Stop button
3. Rev. counter
4. Voltmeter
5. Oil pressure gauge
6. Temperature gauge
7. Resistor
8. Warning lamp, glowing
9. Instrument light
10. Alarm separator
11. Alarm
12. Connector

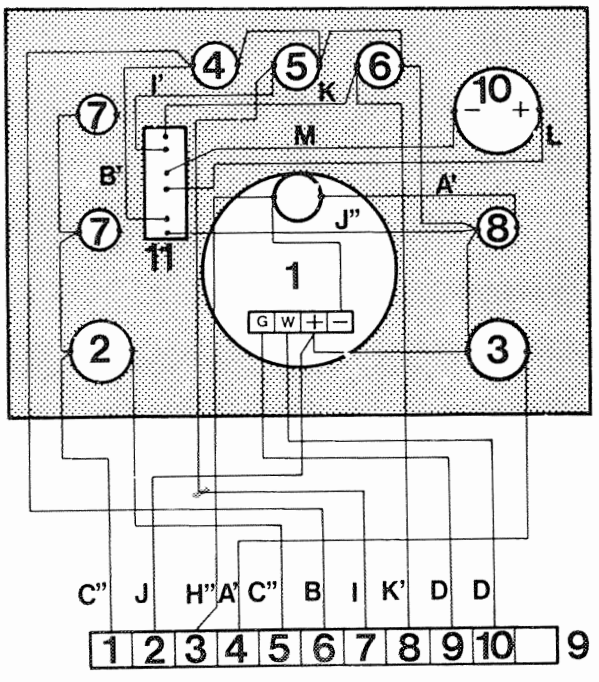
Engine

13. Battery
14. Main switch
15. Starter motor
16. Charging regulator
17. Alternator
18. Oil pressure sender
19. Sender, rev. counter
20. Temp. sender
21. Glow-plugs
22. Connector
23. Relay, glow-current
24. Fuse
25. Solenoid, stopping
26. Start-relay
27. Temp guard (alarm)
28. Oil pressure-guard (alarm)

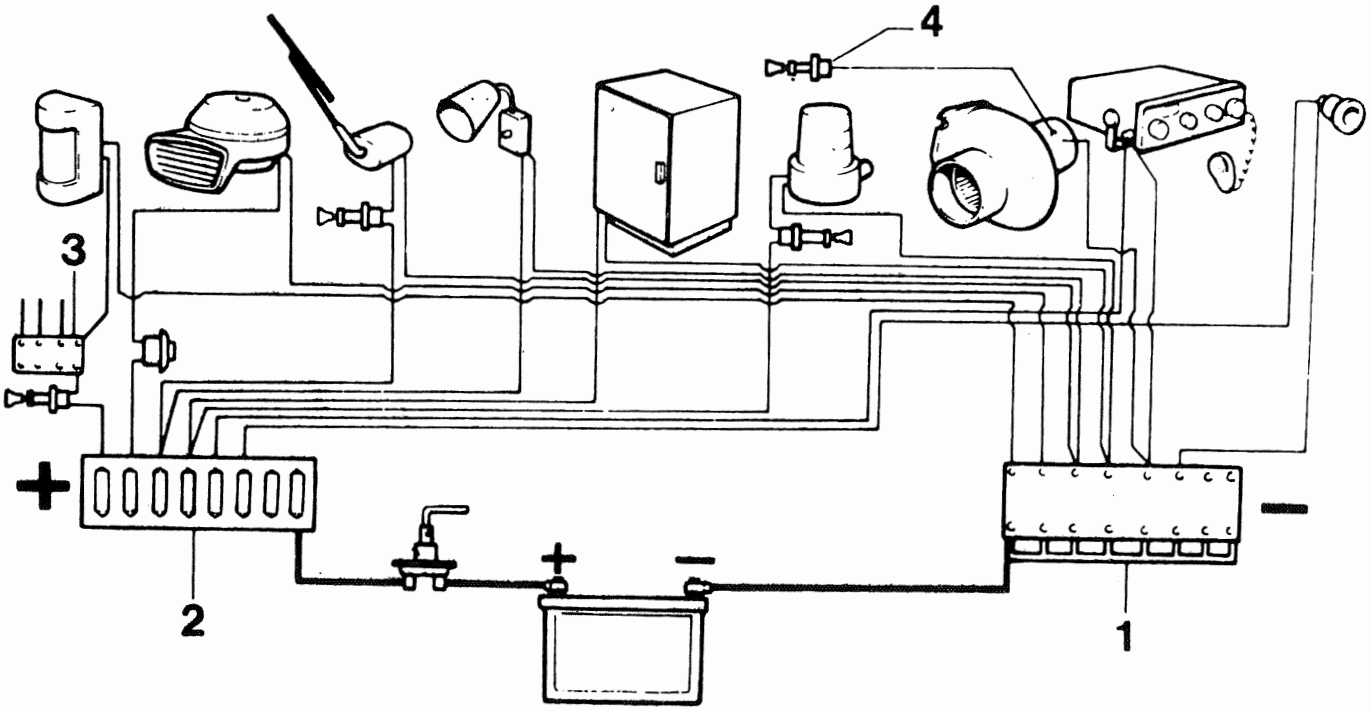
Cable	Colour	Guide	
Descr.	Colour	mm^2	AWG
A'	White	1.5	15
A''	Ivory	1.5	15
A'''	White	2.5	13
B	Black	1.5	15
B'	Black	0,75	18
B''	Black	70	00
C	Red	6	9
C'	Red	70	00
C''	Red	2.5	13
D	Grey	1.5	15
F	Yellow	1.5	15
G	Brown	1.5	15
H'	Blue	2.5	13
H''	Blue	1.5	15
H'''	Blue	4	11
I	Green/Red	1.5	15
I'	Green/Red	0,75	18
J	Green	1.5	15
J''	Green	0,75	18
J'''	Green	6	9
K	Yellow/Blue	0,75	18
K'	Yellow/Blue	1.5	15
L	Red/White	0,75	18
M	Blue/Red	0,75	18
N	White/Red	1.5	15

Wiring Diagram Flying Bridge

1. Rev. counter
2. Stop button
3. Start-button
4. Warning lamp, charging
5. Warning lamp, oil pressure
6. Warning lamp, temperature
7. Switch (spare)
8. Instrument light
9. Connector
10. Alarm
11. Alarm separator



PROPOSED WIRING FOR EXTRA EUQIPMENT



1. Central electric wiring panel, negative
2. Central electric wiring panel, positive and fuses
3. Connection for running lights
4. To be connected to 30 on the key-switch

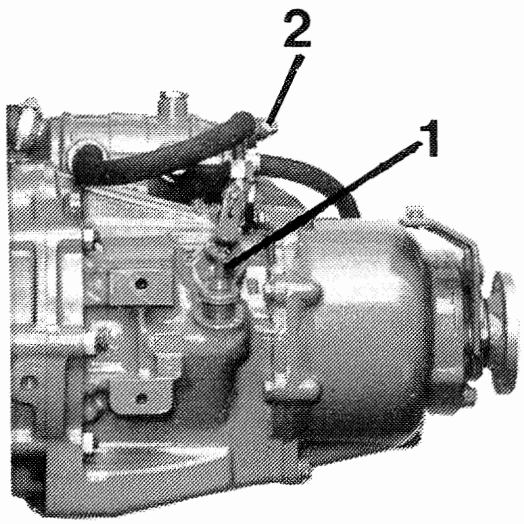
REVERSE- AND REDUCTION GEAR

Instructions for TMD40A, TAMD40A and MD40A with reverse gear Borg Warner, MS3B or MS3.

Reverse gear Borg-Warner

Reverse- and reduction gear type Borg Warner are available in ratios 1.91:1 or 2.1:1 or 2.91:1. It is a hydraulically operated reverse gear equipped with oil cooler. The reverse gear is equipped with a multidisc clutch. The discs are kept in position, while in operation, by oil under pressure. Change of direction of rotation is carried out via a planet-gear, which is hydraulically connected.

CHECK EVERY 14 DAYS



OIL LEVEL IN REVERSE GEAR

Check the oil level using the oil dipstick (1). The oil level should be between the marks on the dipstick. If necessary top up with oil of the same type as already in the reverse gear. See "Technical Data".

SERVICE EVERY 200 HOURS OF OPERATION

CHANGING OIL IN REVERSE GEAR

Drain the oil through the hole for the oil dipstick (1). See fig. above. Use an oil draining pump. When filling up, the reverse gear should be filled to the upper mark on the dipstick. Then start the engine and run it for a few minutes on idling speed in order to fill the oil cooler of the reverse gear. Stop the engine and check the oil level. Top up if necessary.

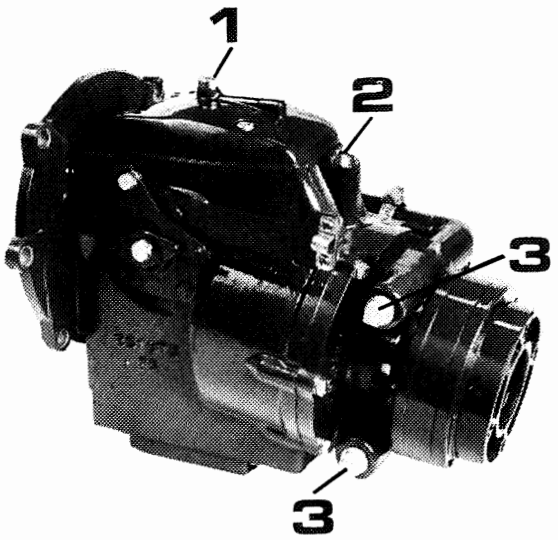
CORROSION PROTECTION

Replace the zinc plug mounted inside the plug (2), when it has been worn down by 50 %. Check every 200 hours, or at least once per season. Note! close the water intake cock when checking. Make sure that no water gets into the boat.

REVERSE GEAR TYP MS3B

Reverse gear model MS3B has a ratio of 1.93:1 or 1.54:1 forward as well as reverse. MS3B is equipped with an oil-cooler. For operating "Forward" and "Reverse" the Volvo Penta patented cone-clutch is used. The propeller shaft has a 8° down-angle. The outgoing shaft is equipped with a friction-clutch which will cut off the torque-peaks.

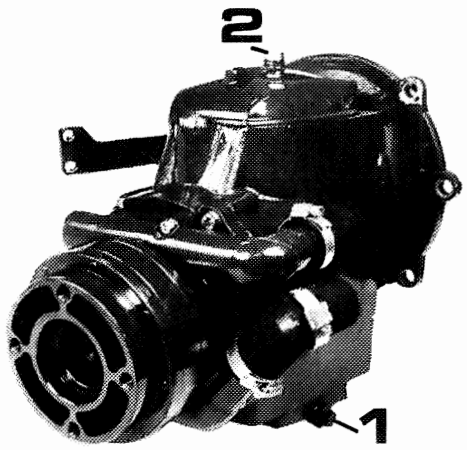
CHECK EVERY 14 DAYS



OIL LEVEL IN THE REVERSE GEAR

Check the oil level using the oil dipstick (1). The oil level should be between the marks on the dipstick. NOTE! The dipstick must not be screwed down when checking the oil level. Top up if necessary through the oil filler hole (2). Use the same type of oil as already in the reverse gear. See "Technical Data".

SERVICE EVERY 200 HOURS OF OPERATION



CHANGING OIL IN REVERSE GEAR

Drain the oil through the bottom plug (1) or use the oil draining pump and drain through the oil dipstick (2). When filling up, the reverse gear should be filled to the upper mark on the dipstick. Then start the engine and run it for a few minutes on idling speed in order to fill the oil cooler of the reverse gear. Stop the engine and check the oil level. Top up if necessary.

CORROSION PROTECTION

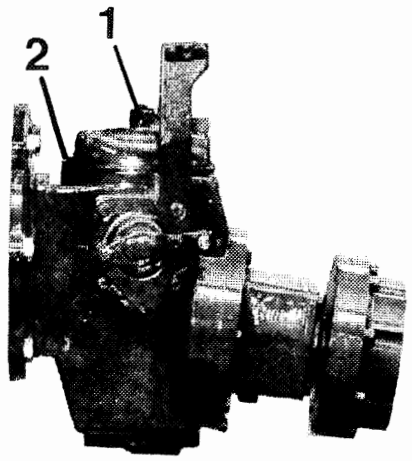
Replace the zinc plugs mounted inside the plugs (3), upper picture when it has been worn down by 50 %. (NOTE! Lower plug also cooling water drainage). Check every 200 hours, or at least once per season. Note! close the water intake cock when checking. Make sure that no water gets into the boat.

REVERSE AND REDUCTION GEAR

Reverse gear typ MS3

Reverse gear model MS3 has a ratio of 1.91:1 forward as well as reverse. MS3 is equipped with an oil-cooler. For operating "Forward " and "Reverse" the Volvo Penta patented cone-clutch is used. The propeller shaft has a 8° down-angle. The outgoing shaft is equipped with a friction-clutch which will cut off the torque-peaks.

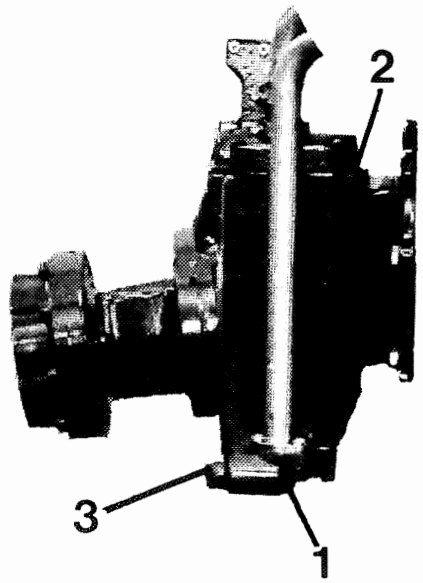
Check every 14 days



Oil level in the reverse gear

Check the oil level using the oil dipstick (1). The oil level should be between the marks on the dipstick. Top up if necessary through the oil filler hole (2). Use the same type of oil as already in the reverse gear. See "Technical Data".

Service every 200 hours of operation



Changing oil in reverse gear

Drain the oil through the bottom plug (1) or use the oil draining pump and drain through the oil filler hole (2). When filling-up, the reverse gear should be filled to the upper mark on the dipstick. Then start the engine and run it for a few minutes on idling speed in order to fill the oil cooler of the reverse gear. Stop the engine and check the oil level. Top up if necessary.

1. Oil drainage plug
2. Oil-filler
3. Cooling water drainage plug, zinc anode

LOA = m (ft.). Beam = m (ft.). Draught = m (ft.). Heigt above waterline = m (ft.). Displacement = Fuel tank cap. = l (Imp.gals. = US gals.). Water tank = l (Imp.gals. = US gals.). Battery cap., std. circuits = Ah. Battery cap., opt. equipment circuit = Ah.

The light bulbs have the following wattage:

Instruments: W. Cabin: W. Pentry: W. Toilet: W. Compass: W. Ports/Starboard lights: W. Stern light: W. Masthead lights: W. Searchlight: W. Cockpit: W.

The tool kit and the spare parts kit contain the following:

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CHECKS AND SERVICE HAVE BEEN CARRIED OUT AS FOLLOWS:

50 hours intervals

dat ——— / ——— – by ———
dat ——— / ——— – by ———
dat ——— / ——— – by ———
dat ——— / ——— – by ———
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100 hours intervals

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dat ——— / ——— – by ———
dat ——— / ——— – by ———

200 hours intervals

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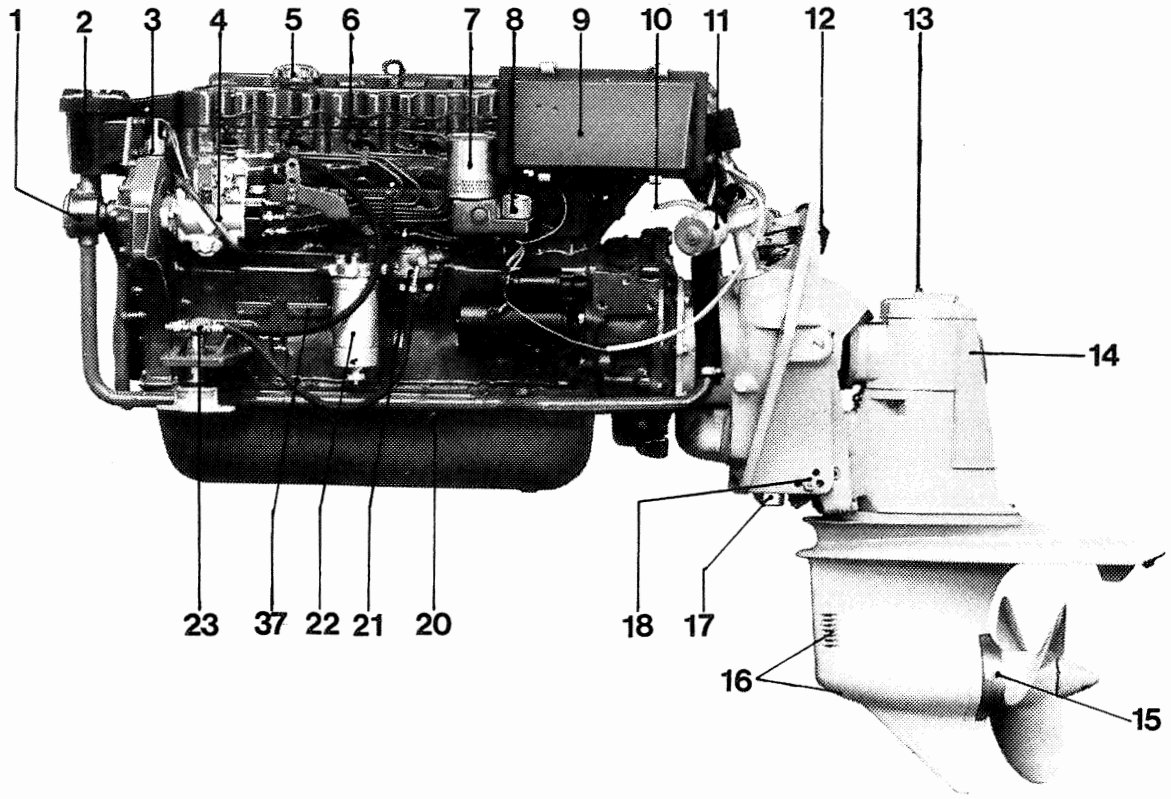
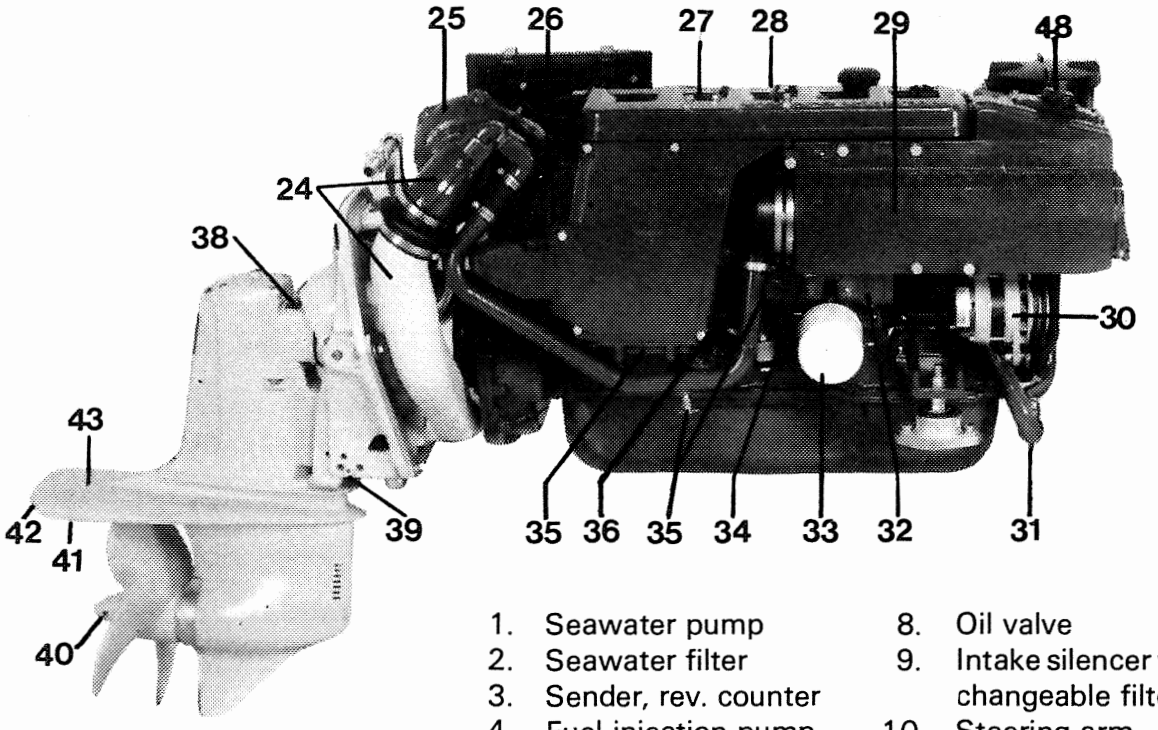
dat ——— / ——— – by ———
dat ——— / ——— – by ———

AQD40A/280B
AQAD40A/280B



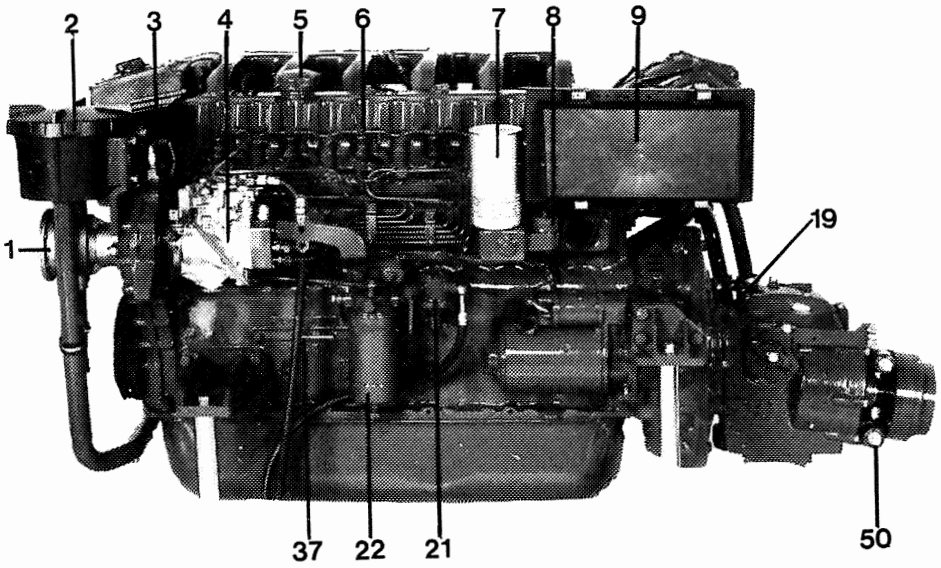
AQAD40A/280B



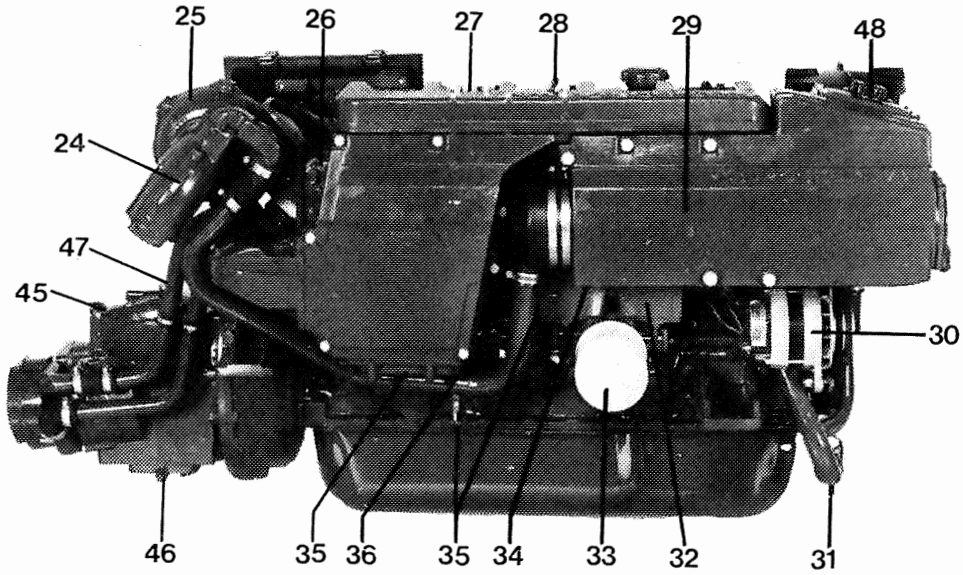
1. Seawater pump
2. Seawater filter
3. Sender, rev. counter
4. Fuel injection pump
5. Oil-filter
6. Injector
7. Crankcase
8. Oil valve
9. Intake silencer with exchangeable filter
10. Steering arm
11. Electro-mechanical lift
12. Rubber suspension

13. Oil dipstick
14. Shift mechanism cover
15. Zinc-ring
16. Cooling water intakes
17. Zinc-plate
18. Adjusting-pin
19. Serial number, rev. gear
20. Drainage, seawater
21. Fuel pump with hand primer
22. Fine filter
23. Fuel line connection for suction and return lines
24. Seawater cooled exhaust elbow
25. Turbocharger
26. Exhaust manifold
27. Tube for oil drainage pump
28. Oil dipstick
29. Heat exchanger
30. Alternator
31. Drainage, seawater
32. Oil cooler
33. Oil filter
34. Drainage, freshwater
35. Drainage seawater
36. Drainage freshwater
37. Serial number, engine
38. Serial number, outboard drive
39. Retaining pawl
40. Propeller cone
41. Trim tab
42. Exhaust- and cooling water outlet
42. Locking- screw for trim tab
44. Oil dipstick
45. Oil filling
46. Oil drainage
47. Oil dipstick
48. Freshwater filling
49. Cooling water drainage, oil cooler reverse gear (loosen the hose)
50. Cooling water drainage, oil cooler reverse gear

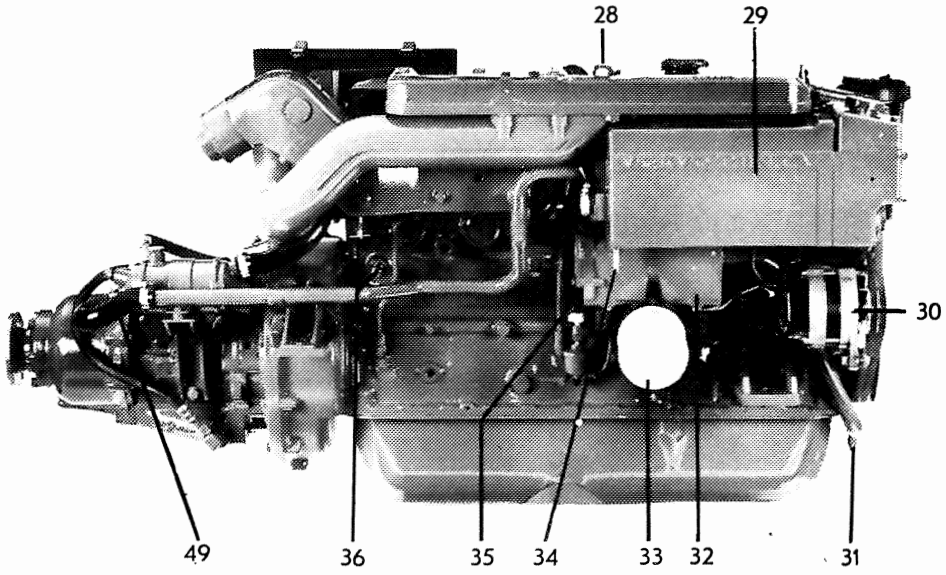
TAMD40A/MS3B



TAMD40A/MS3B



MD40A/BW



INDEX, ALPHABETICAL ORDER

Personal Information

Name . . . . . .

Address . . . . . .

Phone . . . . . .

Nearest Volvo Penta Dealer

Name . . . . . .

Address . . . . . .

Phone . . . . . .

Technical Information

Engine type . . . . . .

Serial number, engine . . . . . .

Reverse – reduction gear, type and ratio . . . . . .

Drive serial number, PZ . . . . . .

Propeller size . . . . . .

NOTES

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IMPORTANT INFORMATION

Warning!

Stop the engine before opening the hatch to the engine compartment. An engine which is in operation has rotating and moving parts which it is dangerous to touch.
Bear in mind the risk of a fire. All engine fuel is inflammable. Let an expert correct any faults in the fuel system and always use genuine Volvo Penta spare parts.

Frost Risk

The cooling system is filled with liquid and it should be drained when there is risk of frost. The fresh water part of the system can be filled with an anti-freeze mixture or drained. Note that in certain cases a suction action may occur when the sea-water system is being drained. Close all drainage points when the boat is not under constant supervision. Any incorrectly performed drainage can cause the boat to become filled with water and sink. Also bear in mind that the fresh water tank and the toilet can be damaged by frost.

To be Checked

The steering gear and controls must function perfectly and their operation should be checked at regular intervals. Never take any chances if you suspect that something is wrong. Take immediate action to remedy faults.
All rubber ages, so check all rubber parts at regular intervals. Parts which are of special importance are the fuel hoses and those rubber parts which have to do with the boat's flotation ability. If the hoses feel dry and hard or display any tendencies to crack they should be replaced immediately.

Safety Onboard

Check safety materials onboard. Run through in your mind what can happen and let yourself and your crew parctice drills to cope with events that you know can happen. You will benefit by being prepared if anything does happen. If you take good care of your boat and its engine then the risk of anything happening is a small one. Read the instruction book – before it happens.

AB VOLVO PENTA
S-405 08 Gothenburg
Sweden

7733025 09-1981