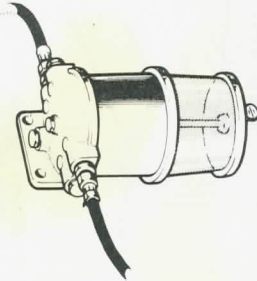
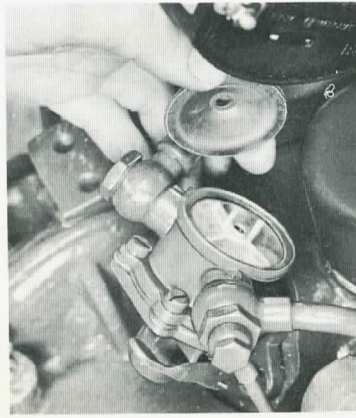


Extra fuel filter



If an extra fuel filter is fitted together with a water separator, 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 with the hand primer and vent the system. The fuel filter element should be changed at least once a season.

FUEL STRAINER



The fuel pump on the engine has a built-in strainer which is accessible after removing the cover. Clean the strainer at least once a season.

Immediately after starting the engine, check for leakage.

Always vent the fuel system. See under "Venting the fuel system".

Injector

All work on the injector of the engine must be carried out by an authorized service workshop. Check the opening pressure, spray pattern and also check for leakage every third year.

Venting the fuel system

In order for the engine to be able to start, the fuel system must be vented on the following occasions:

When changing the fine filter.

With leakage and work on the fuel lines.

When draining through the drain hole.

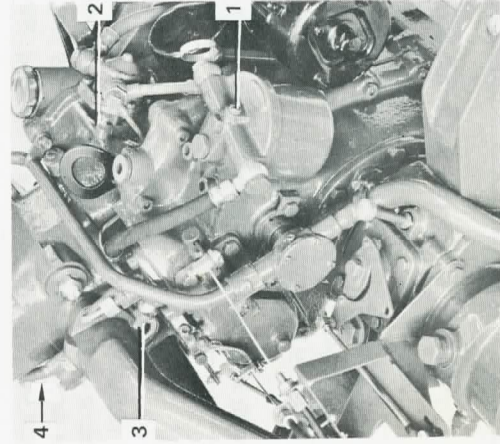
When cleaning the fuel pump strainer.

After running the fuel tank empty.

When installing the fuel injection pump.

Venting is as follows:

1. Open the vent screw on the fuel filter.
2. Pump forward the fuel with the help of the hand primer until fuel free from air bubbles flows out. Close the vent screw. If the pumping effect is poor, turn over the engine a bit so that the pump drive cam alter its position.
3. If the fuel injection pump has been removed, or when starting an entirely new engine for the first time, the fuel injection pump must be vented. To do this open the vent screw on the pump. Pump with the hand primer until fuel free from air comes out. Slacken the injector delivery pipe nut and turn over the engine by means of the starter motor until fuel comes from the delivery pipe. Tighten up the delivery pipe nut and start the engine.



1. Vent screw, fuel filter
2. Hand primer
3. Vent screw, injection pump
4. Delivery pipe nut

SERVICE IN CONNECTION WITH LAYING-UP AND LAUNCHING THE BOAT

INHIBITING

IDLE ENGINE FOR BRIEF PERIODS WITH BOAT IN WATER

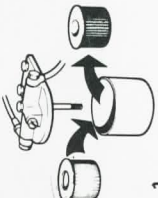
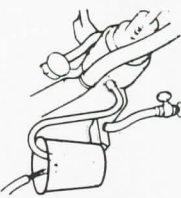
In order to prevent damage to the engine caused by corrosion, the engine should be run warm at least every 14 days as long as the boat is in the water. If the boat is not to be used for over a month, a long-term inhibiting should be carried out.

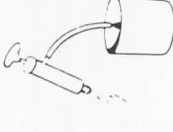
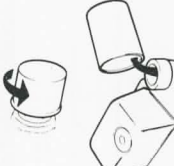
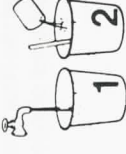
INHIBITING WHEN LAYING UP FOR THE WINTER

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 boat on land

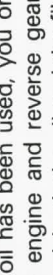
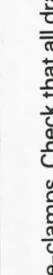
 1	Change the fuel filter. Pump fuel forward and vent the system. See "Venting the fuel system" (page 19). Check the fuel hoses as well as the complete fuel system for leakages. If an extra fuel filter is fitted, this filter cartridge must also be changed.
 2	Drain the cooling water from engine and reverse gear (pos 7 and 9 pages 28 - 29). Disconnect the reverse gear suction line from the reverse gear. Connect a hose with an inner diameter of 1/2" and insert the free hose end into a container with fresh water. Arrange to have water added to the container.

 3	Run the engine at idle for about 5-10 minutes, so that it is flushed throughout with fresh water. Check that nothing is plashed near the exhaust outlet. Drain all water from the engine and reverse gear. Then close all drain points. NOTE! Let not the propeller rotate.
 4	Pump out all oil from the engine. (On reverse- and reduction gear, the oil in this must be changed each 200 hours of operation.) Use the oil drainage pump.
 5	Change the oil filter. Fill up the engine and reverse- and reduction gear 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, exceeding 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.
 6	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. As an alternative, a freeze-resistant 30% glycol mixture can be used.
 7	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.

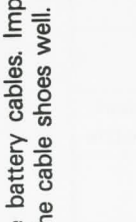
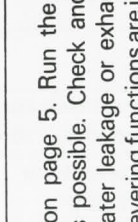
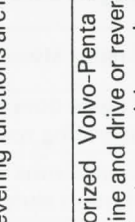
LAYING-UP AND LAUNCHING

	The rust-proofing mixture does not have anti-freezing properties, therefore it has to be drained off the engine and reverse gear, (28-29). 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. If it's difficult to reach the water drain plug on the gear it can be fitted up with Volvo Original Ethylene glycol. NOTE! Do not remove the impeller if undamaged. Reconnect hoses which have been removed.	8
	Clean the outside of engine and 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. Maintenance of folding propeller, see page 35.	9
	Remove the battery. For proper maintenance it needs to be charged to prevent it from being damaged.	10

SERVICE IN CONNECTION WITH LAUNCHING

	If Volvo Penta diesel engine oil has been used, you only need to check the oil level in the engine and reverse gear. If preservative oil has been used, both the oil and the filter must be replaced. See under "Service after every 50 hours of operation".
	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. Prevent marine growth by painting the bottom of the boat with anti-fouling paint. Vent the fuel system (see page 19). Maintenance of folding propeller, see page 35.

LAYING-UP LAUNCHING

	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. Launch the boat.	13
	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 manoeuvring functions are in order.	14
	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.	15

NOTES

[illegible]

TRACING FAULTS WITH INTERRUPTIONS IN OPERATION

The fault tracing scheme given below lists only the most usual reasons for 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 reasons for the faults listed below. When in doubt always contact the nearest Volvo Penta service shop.

Engine does not start	Engine stops	Engine does not reach correct operating speed at full throttle	Engine runs unevenly or vibrates abnormally	Engine becomes abnormally hot	Reason	
x					See	pp 5, 12, 16 17, 27
x	x				Main switch not switched on; flat battery, breakage in electric cables or blown fuse.	pp 17, 18
x	x				Empty fuel tank, closed fuel cock, blocked fuel filter.	pp 17, 18, 19
x	x	x	x		Water, air or impurities in fuel.	pp 18, 26
	x		x		Defective injector.	p 25
		x			Idling speed not properly adjusted.	
					Boat overloaded.	
					Marine growth on boat bottom.	
			x		Damaged propeller.	
				x	Blockage in cooling water intake, cooling jackets, defective impeller or thermostat.	p 15

Technical Data

General

Engine designation	MD5A
Operation	4-stroke diesel with direct injection
Number of cylinders	1
Propeller shaft output ¹⁾ kW (h.p.) at 41.7 rev/sec (2500 rev/min)	5.5 (7.5)
Max. operating speed rev/sec (rev/min)	41.7 (2500)
Bore, mm (in)	84 (3.307)
Stroke, mm (in)	80 (3.150)
Displacement, dm ³ (in ³)	0.443 (27)
Compr. pressure, MPa (kp/cm ² = lbf/in ²)	200–220
(starter motor speed)	(20–22 = 284–313)
Idling speed, rev/sec (rev/min) approx	12 (700)
Direction of rotation looking at flywheel	Clockwise
Engine inclination underway:	
Rearwards, max.	15°
To the sides, max.	20°
Engine weight, incl. reverse gear, kg (lb.)	111 (244)

Valves

Valve clearance, hot engine	
Inlet, mm (in)	0.30 (0.0012)
Exhaust, mm (in.)	0.35 (0.0014)

Reverse gear

Type designation	MSB
Reduction ratio "Forward" and "Reverse"	1.91:1

Lubricating system

Engine	
Oil capacity, engine, litres (Imp.qts., excl. filter)	2.0 (1.80 = 2.10)
incl. filter	2.1 (1.85 = 2.20)
Oil quality	Diesel lubricating oil Service CD (DS)
Viscosity:	
above +10°C (140°F)	SAE 20W/30 ²⁾
below +10°C (140°F)	SAE 10W ³⁾
Oil pressure, hot engine, idling speed, MPa (kp/cm ² = lbf/in ²)	15–25 (1.5–2.5 = 21–35)
at full speed, MPa (kp/cm ² = lbf/in ²)	40–50 (4.0–5.0 = 57–71)

- 1) Propeller shaft output acc. to DIN Leistung B für Dauerbetrieb.
- 2) Volvo Penta CD Double Grad oil.
- 3) Volvo Penta CD Single Grade oil.

Reverse gear

Oil quality/Viscosity	See under "Engine"
Oil capacity, litre (qt.)	0.55 (0.5)

Cooling system

Thermostat, starts opening at °C (°F)	60°±2 (140±2)
fully open at °C (°F)	90° (195)

Fuel system

Fuel injection pump, make	Bosch
Feed pressure MPa (kp/cm ² = lbf/in ²)	7.5 (0.75 = 11)
Injector, make	Bosch
opening pressure MPa (kp/cm ² = lbf/in ²)	1800 (180 = 2560)
Pre-injection angle, crankshaft degrees B.T.D.C.	25–28°
Fuel quality "Autodiesel"	Cet. rating minimum 45

Electrical system

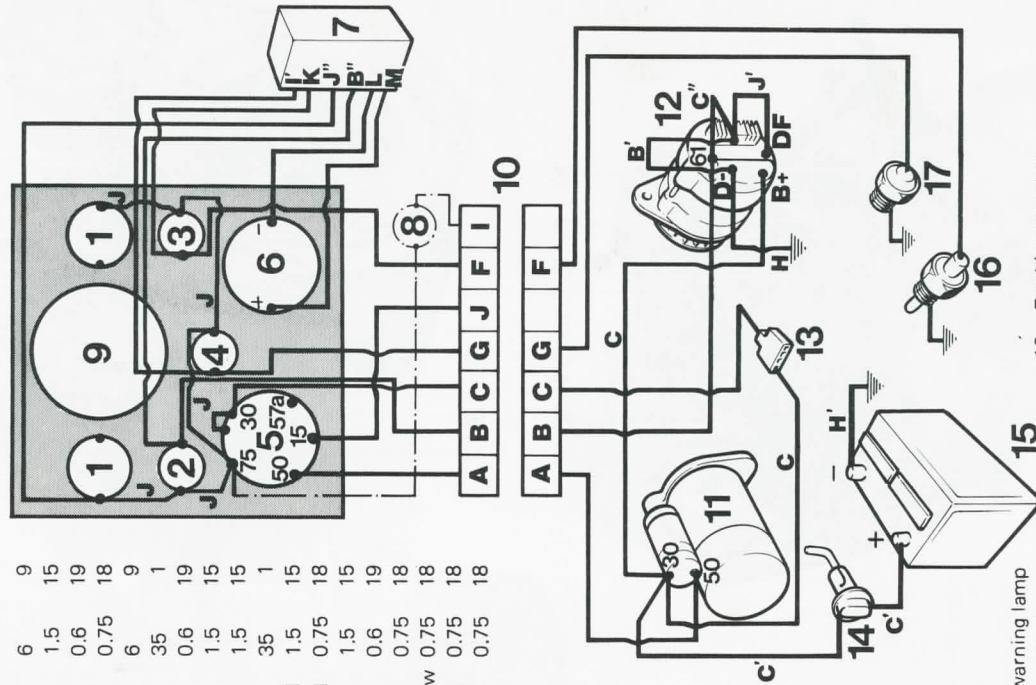
Battery voltage	12V
Battery capacity, standard	60 Ah
max.	120 Ah
Starter motor	0.8 kW (1.1 h.p.)
Alternator	35A (420W)
Battery electrolyte specific gravity:	
Charging carried out at g/cm ³	1.230
Fully charged battery, g/cm ³	1.275–1.285

Tightening torques

Cylinder head nuts, Nm (kpm = lb.ftf)	70 (7.0 = 50)
Connecting rod bolts, Nm (kpm = lb.ftf)	70 (7.0 = 50)
Crankshaft main bearings, Nm (kpm = lb.ftf)	70 (7.0 = 50)
Flywheel nut, Nm (kpm = lb.ftf)	500 (50.0 = 362)
Injector nuts, Nm (kpm = lb.ftf)	10 (1.0 = 7)

Cable colour code

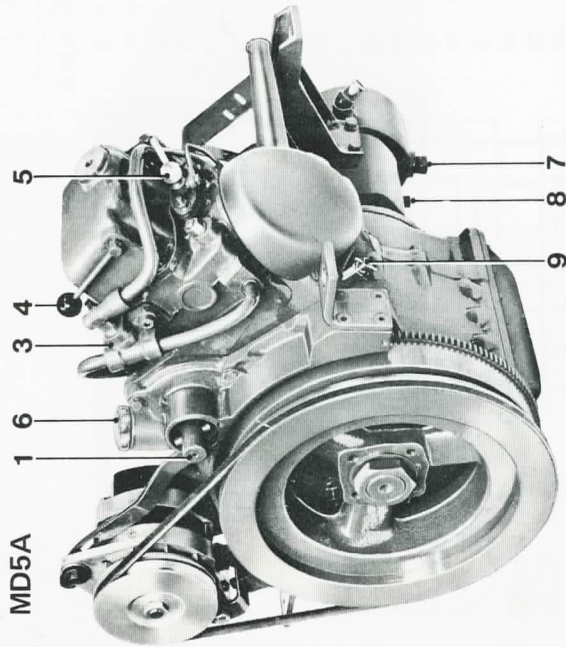
Marking	Colour	mm ²	A.W.G.
A	White	6	9
B	Black	1.5	15
B'	Black	0.6	19
B''	Black	0.75	18
C	Red	6	9
C'	Red	35	1
C''	Red	0.6	19
F	Yellow	1.5	15
G	Brown	1.5	15
H'	Blue	35	1
I	Green/Red	1.5	15
I'	Green/Red	0.75	18
J	Green	1.5	15
J'	Green	0.6	19
J''	Green	0.75	18
K	Blue/Yellow	0.75	18
L	White/Red	0.75	18
M	Blue/Red	0.75	18



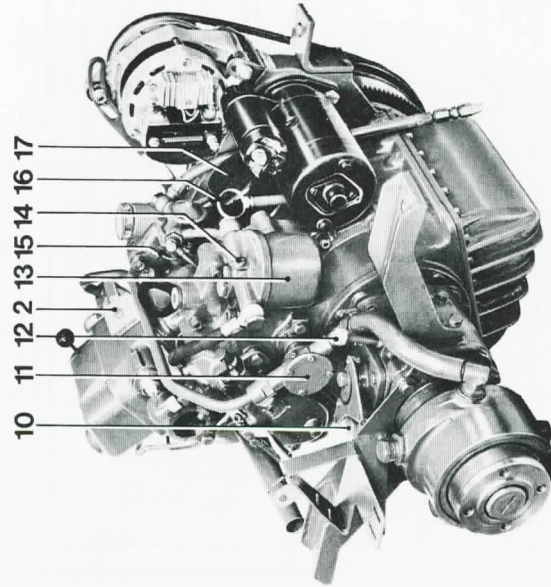
List of components

- Extra switch
- Battery charging warning lamp
- Excessive temp. warning lamp
- Low oil pressure warning lamp
- Key switch
- Siren
- Alarm unit
- Battery charging warning lamp (for battery circuit, opt. equipm.)
- Place for instruments, op. equipm.
- Rapid connector
- Starter motor
- Alternator
- Fusebox
- Main switch
- Battery
- Temperature sender
- Oil pressure sender

MD5A

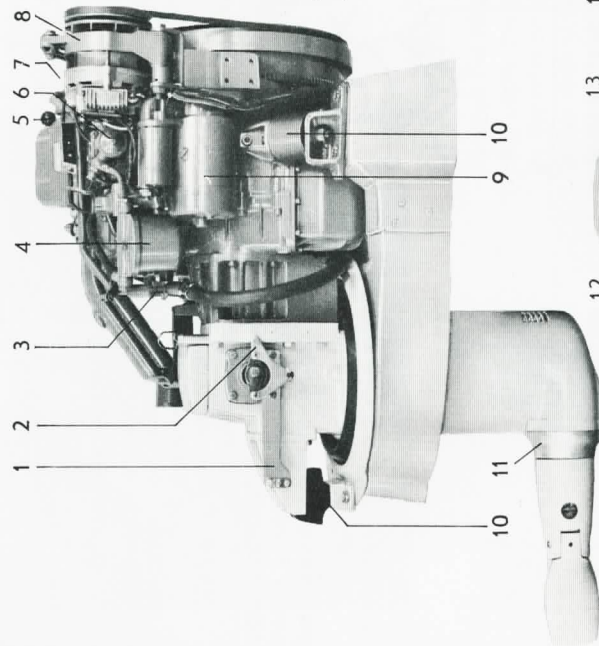


1. Connection for manual starting crank
2. Fusebox
3. Thermostat housing
4. Decompression handle
5. Injector
6. Oil filler cap, engine
7. Reverse gear water drainage
8. Reverse gear oil drainage
9. Engine water drainage
10. Reverse gear oil filler
11. Cooling water pump
12. Reverse gear oil dipstick
13. Fuel filter
14. Vent screw
15. Fuel hand primer
16. Engine oil dipstick
17. Oil filter

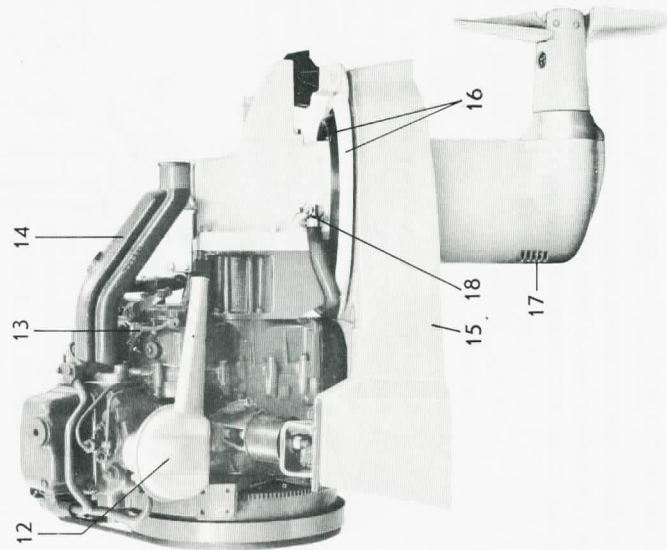


- 10
- 11
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- 17

MD5A/110S

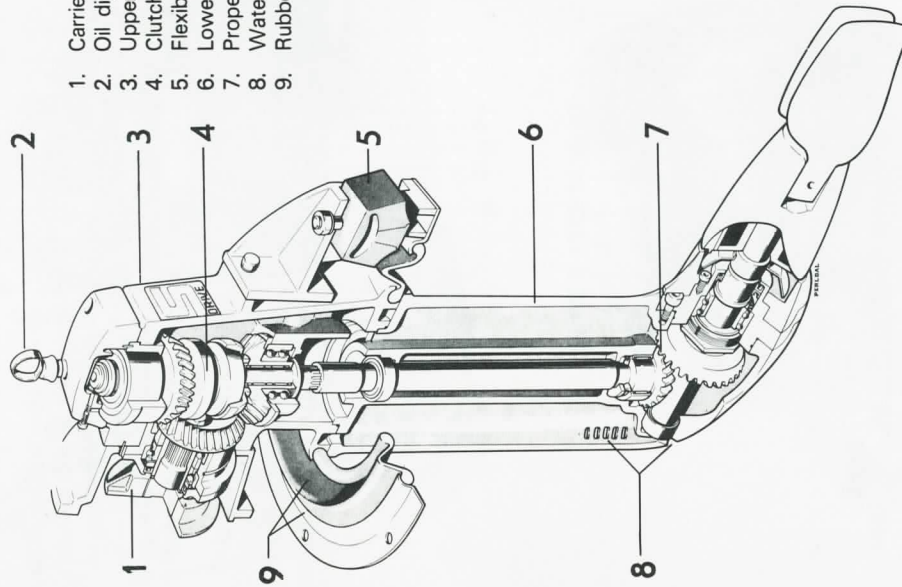


1. Bracket for control cable
2. Arm for gear change
3. Sea water pump
4. Fuel filter
5. Decompression lever. Engine not equipped with hand start
6. Fuel pump.
7. Oil filter for engine
8. Alternator
9. Starter motor
10. Rubber engine suspension
11. Zinc anode



12. Air intake silencer with filter
13. Speed control arm
14. Water cooled exhaust elbow
15. Engine bed
16. Seal between bed and drive
17. Cooling water intake
18. Cock for cooling water

S-drive 110S



1. Carrier with rubber element
2. Oil dipstick
3. Upper gear housing
4. Clutch cone, type Silent Shift
5. Flexible suspension
6. Lower gear housing
7. Propeller shaft gear with helical bevel gears
8. Water intake for engine cooling system
9. Rubber membrane between drive and hull

MD5A/110S

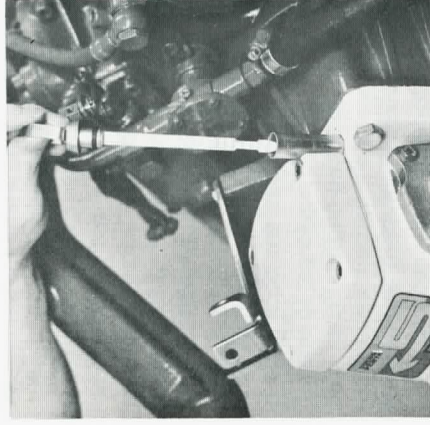
The following supplementary instructions cover the description and maintenance of the S-drive 110S, also the equipment components and data which differ between the reverse gear equipped engine and the engine equipped with the sailboat drive. For maintenance and description of the engine, the previous information should be followed.

OIL LEVEL IN DRIVE

Check every 14 days that the oil level is within the dipstick's markings.

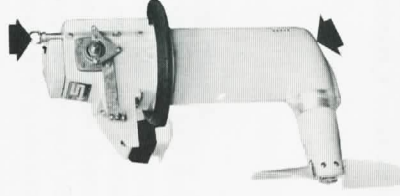
The oil dipstick has a bajonet fitting, therefore it must be turned when lifting and replacing. Note the sealing ring on the dipstick. When checking the oil level the dipstick must be turned to the locked position.

Oil filling is done through the hole for the dipstick. NOTE: Do not overfill. Regarding choice of oil, refer to "Technical Data" page 32.



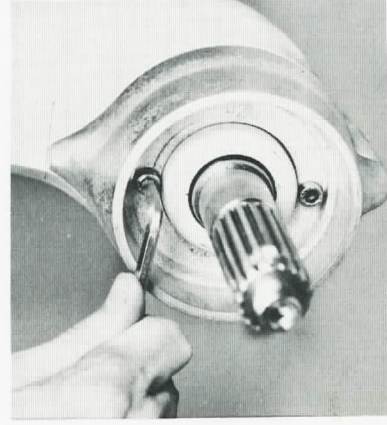
CHANGING DRIVE'S OIL

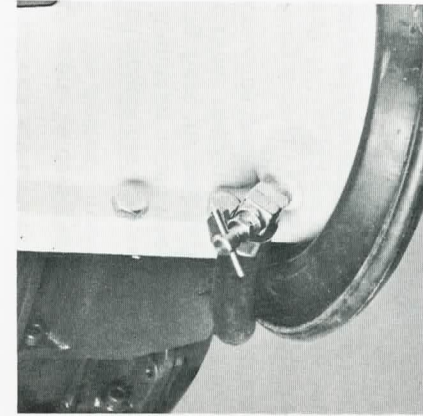
Remove the oil dipstick. Unscrew the drain plug under the propeller gear housing and let the oil drain off. Refit the drain plug together with O-ring. Fill with oil through the dipstick's hole. NOTE: Do not overfill. Regarding choice of oil, refer to "Technical Data" page 32.



ZINC ANODE

Change the zinc anode if it has corroded by more than 50 %. Remove the propeller and spacer ring together with the deflector and remove the two allen screws holding the zinc anode. Scrape the contact surface of the drive and fit a new zinc anode. Make sure that there is a good metallic contact between the zinc anode and the drive. NOTE: The zinc anode must not be painted. Check that the propeller blade runs easily (folding propeller) and lubricate the joints. Apply Molykote or similar in the hub and on the axle. The propeller should not be mounted on the boat when it is laid up for the winter. Protect the axle.





COOLING SYSTEM

The cooling water intake for the engine's cooling is located in the drives' lower gear housing. Check, when the boat is taken up on land, that the grill and the round hole on the front of the drive is free from marine growth. If there is a danger of freezing and when inhibiting, the cooling water is drained from the drive and the pump by the cock on the drive. **NOTE. When draining while the boat is still afloat, the cock must be closed first.** Do not forget to open the cock when restarting engine. When laying up for the winter the vacuum valve should be removed from the system, disassembled and the salt deposits cleaned off.

GENERAL MAINTENANCE

When the boat is ashore, check the paintwork on the drive and, if necessary, touch up with genuine Volvo Penta paint. Paint the drive with anti-fouling paint which does not contain copper. If the rubber membrane is removed the space between the rubber seal and the rubber membrane should also be painted. Check from the outside that the rubber membrane at the bottom through-hull aperture of the drive is in place and from the inside that the rubber seal between the bed and the drive feels elastic and has not been subjected to mechanical damage.

The rubber seals should be changed every 5 years.

RUNNING

Important

When changing from engine power to sailing, the propeller's rotation is stopped by engaging reverse. During sailing the control should be in either the neutral or reverse position if a folding propeller is used. If a fixed propeller is used then the control must be in the neutral position.

TECHNICAL DATA

Type designation	MD5A/110S
Sailboat drive, type	110S
Ratio	1.66:1
Oil capacity, dm ³ (Imp qts, Us qts.)	1.8 (1.6, 1.9)
Oil quality	Diesel, lube oil CD
Viscosity	SAE20W/30 ¹⁾
Total weight, engine and sailboat drive kg (lbs)	128 (281)

¹⁾Volvo Penta CD oil, Double grade.

FOLDING PROPELLER

NOTES

[illegible]

Alternator	7, 14, 16, 27	Lubricating oil	3, 25
Battery	12	Main switch	5, 6
Belt tensioning	12, 14,	Oil change	12, 13
Charging regulator	7, 16	Oil dipstick, engine	28
Controls	2, 6	Oil dipstick, reverse gear	28
Cooling system	8	Oil filter	14, 20, 28
Cylinder head bolts	15	Oil lever check	11
De-inhibiting	22	Preparations before starting	4
Drain cocks	28	Running	6
Electrical system	16	Safety equipment	4
Engine assembly	7	Sea-water pump	8, 15, 28
Fault tracing scheme	24	Sailboat drive 110S	30, 31, 32
Folding propeller	6, 35	Starter motor	17
Fuel	3	Starting	5
Fuel filters	17	Technical Data	25, 26
Fuel pump	8	Thermostat	8, 26
Fusebox	7, 17	Valve clearances	13, 25
Hand primer	8, 17, 23, 28	Venting the fuel system	19
Hand starter	5, 28	Wiring diagrams	27
Impeller	15		
Inhibiting	20		
Injector	18, 23		
Instruments	2, 27		

Notes

Oil Filter # 834337-8
 Extra Fuel Filter CHU 296 / FRAM C-119 1A
 Fuel Filter 829913 / FRAM P-4102
 seals for water pump 833996-2

ANCHOR LIGHT PHILLIPS 1158
 Belt - Volvo # 9668435 NAPA # 13453

Engine oil 30W cc/cd
 Sail drive oil 30W cc/cd

269-1903

Personal information

Name
 Address
 Phone

Nearest Volvo Penta dealer

Name
 Address
 Phone

Technical information

Engine type Volvo Penta 3000 MD5C
 Serial number, engine 31279
 Reverse gear type 1205 Ratio 22:1
 Reverse gear, or S-drive, serial no (KC 120) 4650
 Propeller size

VOLVO PENTA

Publ nr 3463

5-1978

SUPPLEMENT TILL INSTRUKTIONSBOK 2955A

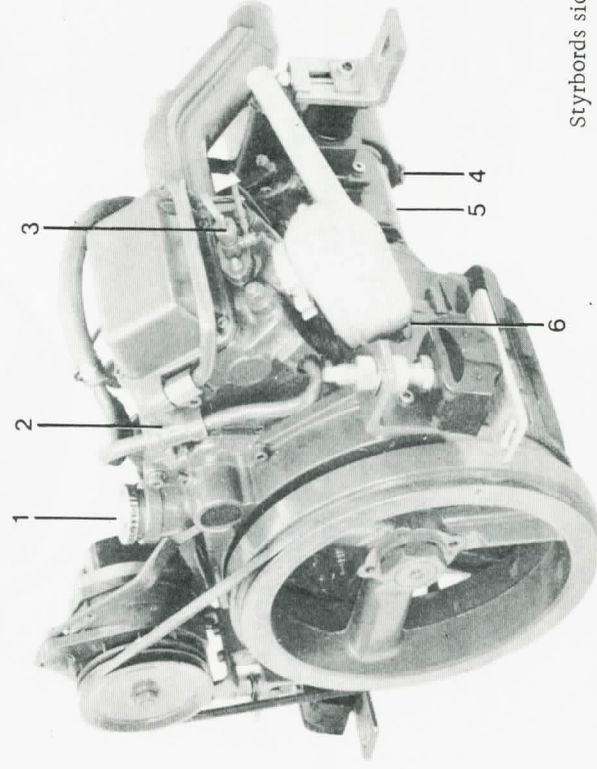
Detta supplement gäller för motor MD5B. Det som skiljer MD5A från MD5B är att MD5B har en ny typ av motorupphängning som ger lägre ljud- och vibrationsnivå, samt att MD5B inte har någon handstart.

Instruktionsboken för MD5A gäller i alla avseenden även för MD5B.

SUPPLEMENT TO INSTRUCTION BOOK 2956A

This supplement applies to engine MD5B. The difference between the MD5A and the MD5B is that the MD5B has a new type of engine suspension which gives a lower sound and vibration level and the MD5B has no hand starter.

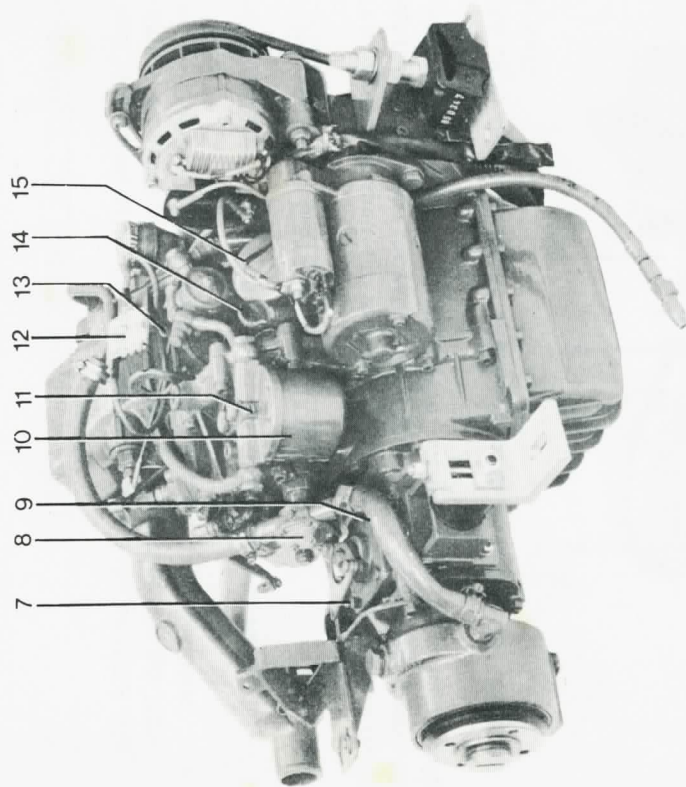
The Instruction Book for the MD5A applies **in** all respects for the MD5B as well.



Styrbords sida: V. g. v.
Starboard side: P. t. o

1. Oljepåfyllning, motor
2. Termostathus
3. Insprutare
4. Vattenavtappning, backslag
5. Oljeavtappning, backslag
6. Vattenavtappning, motor

1. Oil filler cap, engine
2. Thermostat housing
3. Injector
4. Reverse gear, water drainage
5. Reverse gear, oil drainage
6. Engine, water drainage



7. Oljefyllning, backslag
8. Sjövattenpump
9. Oljemätsticka, backslag
10. Bränslefilter
11. Luftningskruv
12. Säkringsbox
13. Handpump, bränsle
14. Oljemätsticka, motor
15. Oljefilter

7. Reverse gear, oil filler
8. Cooling water pump
9. Reverse gear, oil dipstick
10. Fuel filter
11. Vent screw
12. Fuse box
13. Fuel, hand primer
14. Engine, oil dipstick
15. Oil filter