Welcome

This manual has been written to provide you as a Laser 28 owner with all information necessary to rig, tune and maintain your boat for optimum performance in the years to come. The section on Engine Commissioning is extremely important, and negligence of these instructions may jeopardize your Bukh Diesel warranty.

Please read the manual thoroughly and keep it handy as a ready reference.

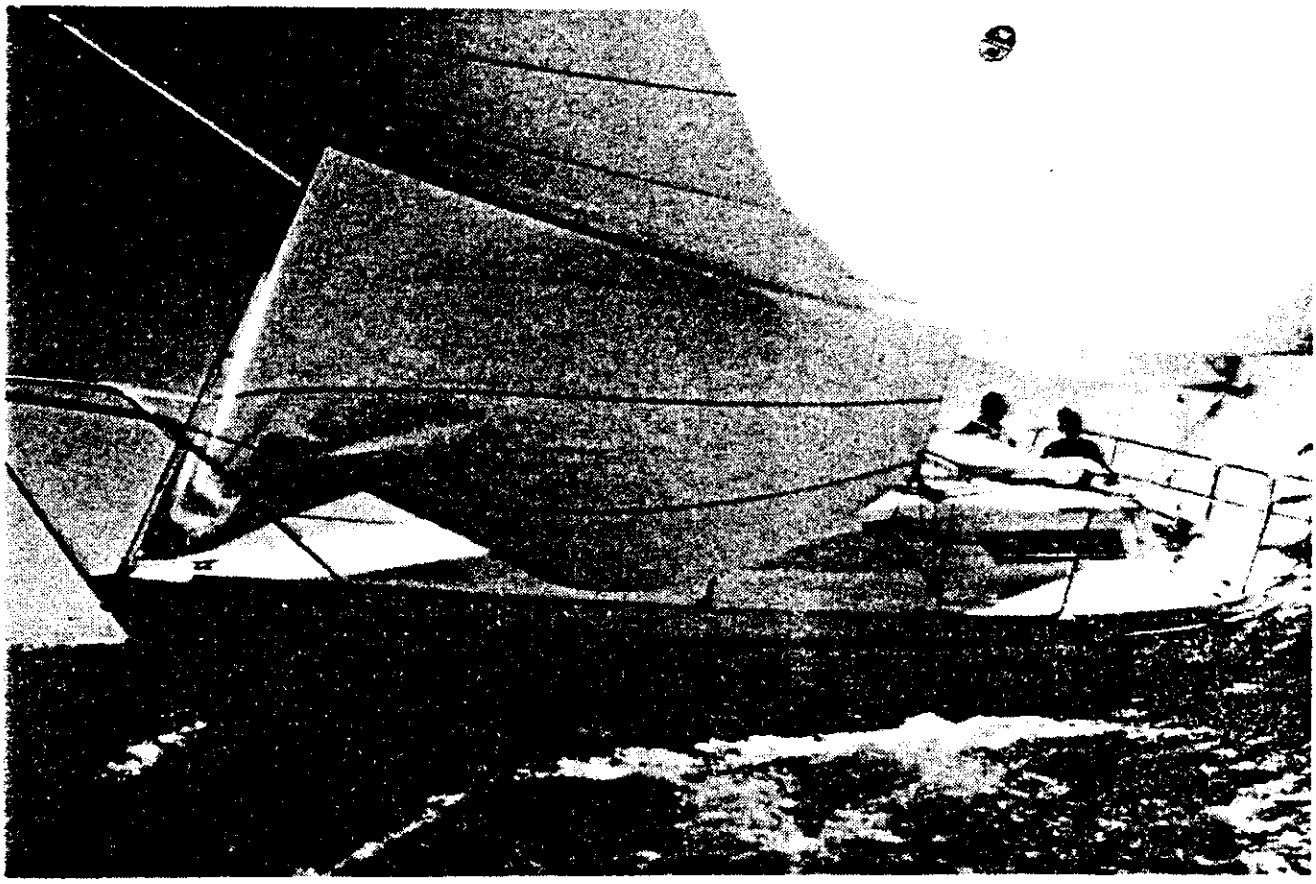


Table of Contents

Paint Preparation

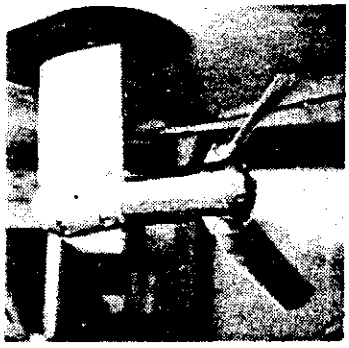
Your LASER 28 comes with a bolted on, lead keel which is faired into the hull, then painted with a hard epoxy paint, (Interlux 2000 system). In order to attain proper anti-fouling paint adherence, the keel must be chemically etched. For hull preparation, follow the paint manufacturer's instructions. (It is recommended not to sand a gelcoat finish before applying paint. We recommend first using a solvent wash to remove mold release agents, followed by an etch primer.)

Bottom Paint

Different climates have different marine growth problems, so your decision on bottom paint should be researched locally. Generally, a "hard" anti-fouling paint will provide a lower maintenance and "faster" finish than a "soft" paint.

IT IS A RECOMMENDATION OF THE ENGINE MANUFACTURER THAT COPPER BASED BOTTOM PAINT SHOULD NOT BE USED.

READ CAREFULLY AND FOLLOW CLOSELY THE PAINT MANUFACTURER'S INSTRUCTIONS FOR ANTI-FOULING APPLICATION.



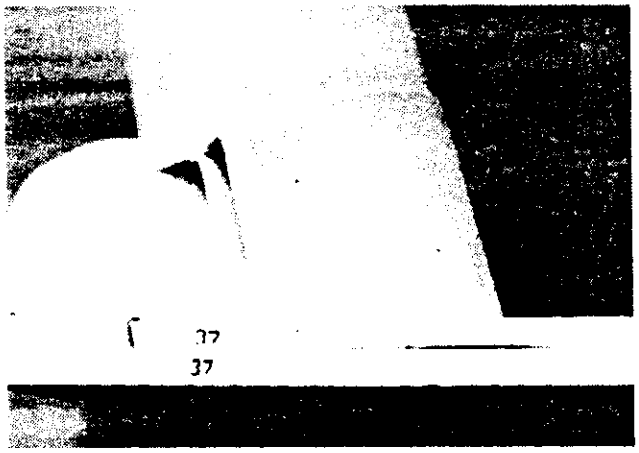
Sail Drive

The BUKH saildrive unit should receive an anti-fouling coating after a light sanding. Once again sand the factory finish to a matte surface but do not sand through the paint.

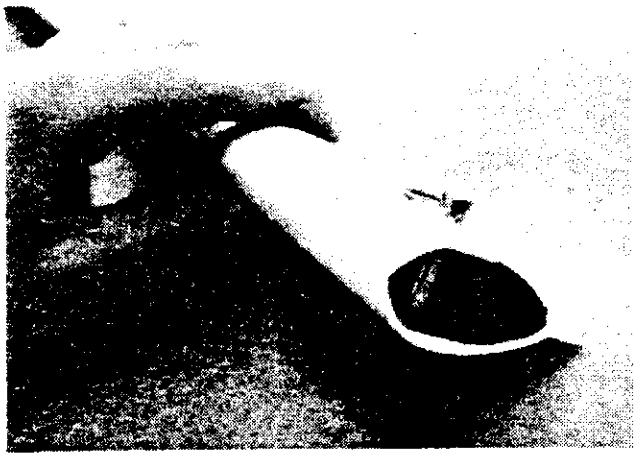
DO NOT PAINT THE ZINC ANODE OR IT WILL LOOSE ITS ELECTROLIC SACRIFICIAL ABILITIES.

DO NOT USE COPPER ANTI-FOULING ON THE SAILDRIVE UNIT.

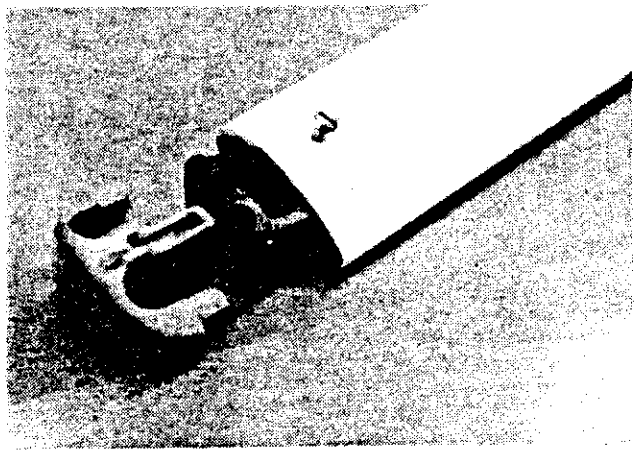
Standing Rigging



Each boat has a factory matched mast. Stamped numbers on both the mast base and the deck step will correspond with one another.



Clevis and cotter pins secure spreaders to mast.



Outboard ends of spreader castings capture the shroud and are held in the spreader by two self-tapping screws. Run the shroud through either forward or aft position, install screws and then tape on spreader endcap with rigging tape to minimize sail chafe.

The mast rigging consists of the following:

2 upper shrouds led through the spreader ends
2 lower shrouds originating below the spreaders
1 headstay with a pre-installed Tuff Luff system
1 backstay originating at the masthead
1 topping lift originating at the masthead

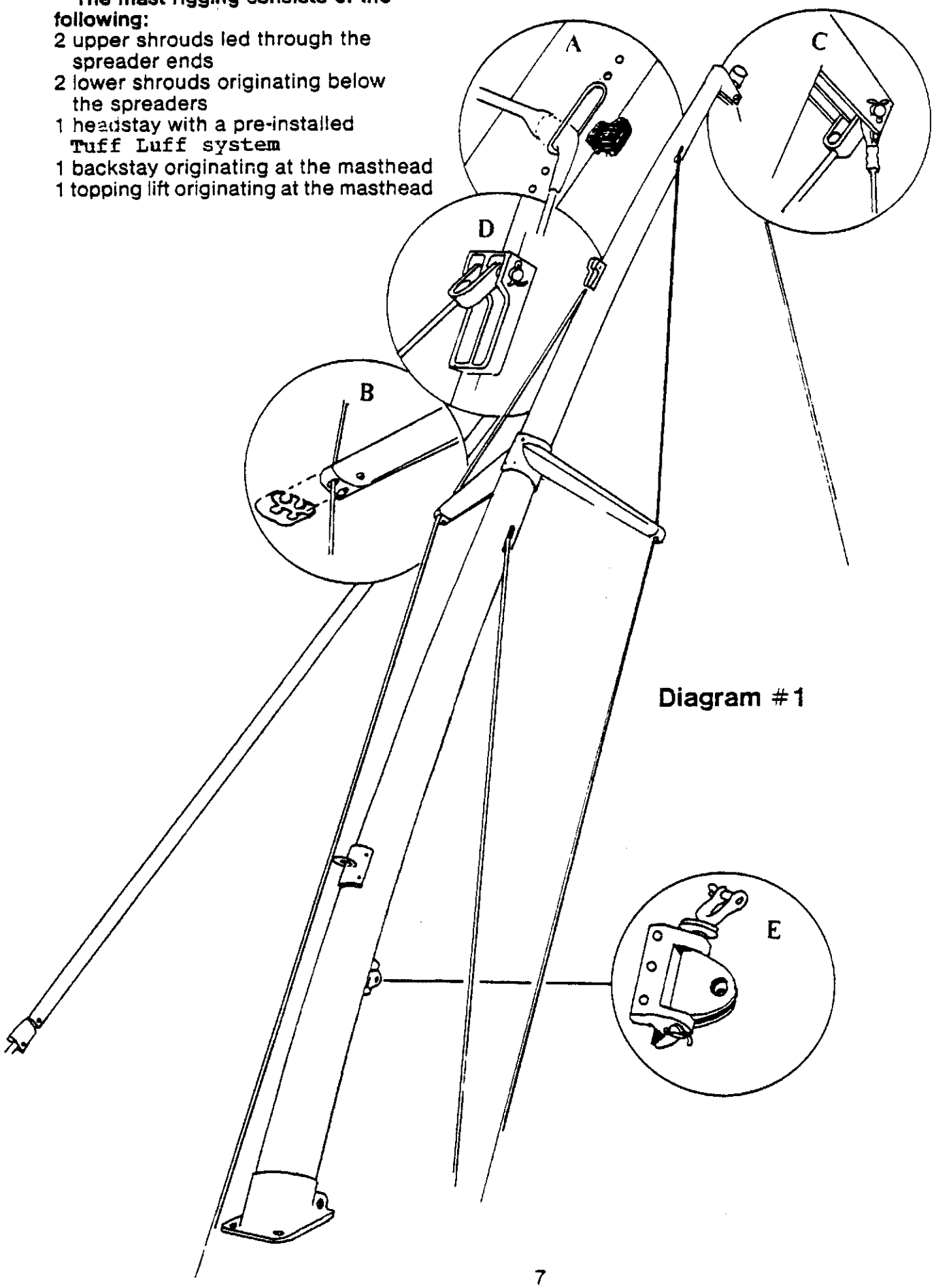
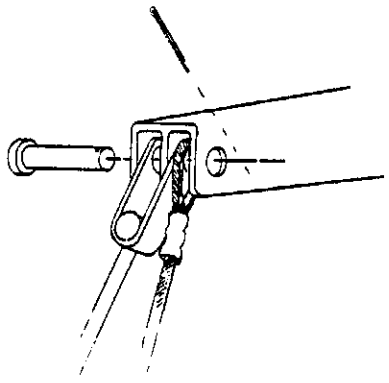


Diagram #1

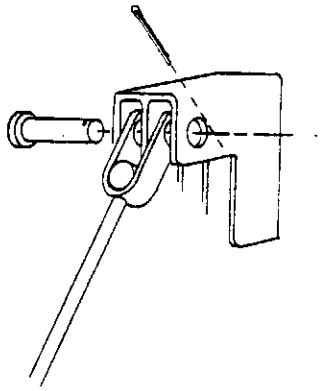
Diagram 1 Explanations

A. Shrouds attach to mast with an oblong tang inserted sideways then rotated 90°. Rubber buttons are then inserted to secure position of tang.

B. Run the upper shrouds through either spreader hole. After installing self tapping screws, white rubber covers are taped over ends to prevent spreader chafe.



C. Backstay and topping lift fasten to masthead box as illustrated.



D. Headstay is a similar arrangement.

E. Gooseneck shackle pin and swivel must be removed when raising mast so as not to damage cabin top.

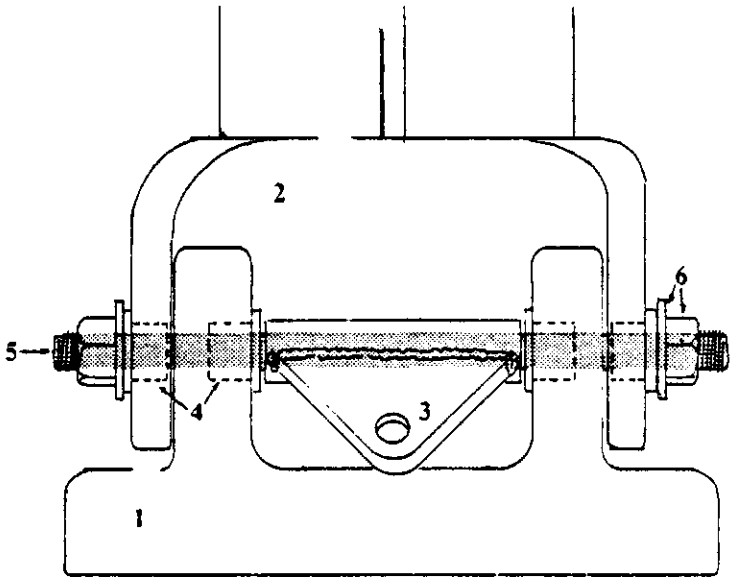
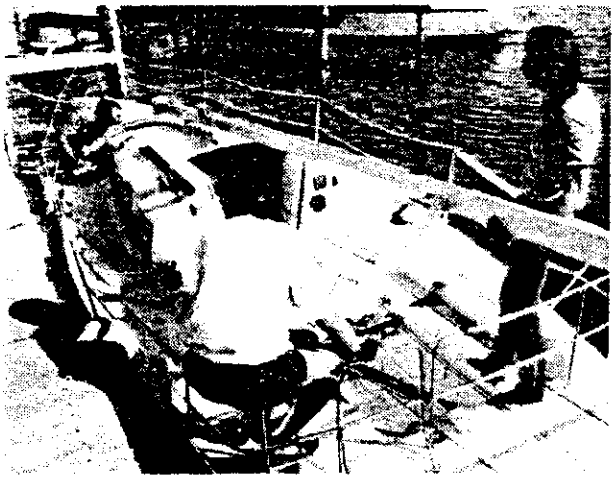


Diagram #2

1. Deck Plate
2. Mast Base
3. Vang Eye
4. Bushings (factory installed)
5. Axle
6. Nuts and Washers

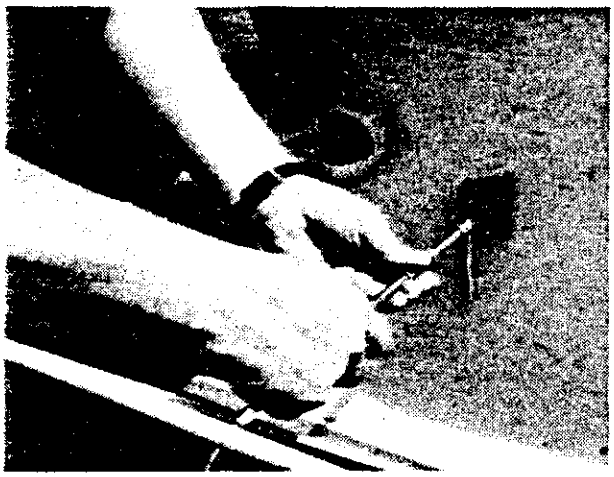
Mast Stepping Procedures

1. Remember to run all halyards down. The spinnaker pole bail is a convenient place to shackle and tie these off.
2. Remove gooseneck pin and swivel. Remove locknuts and washers from mast base studs.
3. Lay a blanket or fender on the hatch cover to protect that area from bruising. Also be sure that the gooseneck fitting is removed from mast.

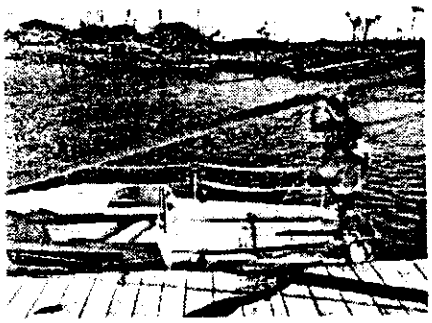


4. The mast will balance at the spreaders. Two people supporting it here, standing in the back of the cockpit allows a third person to attach the mast base to the deck (see diagram #2).

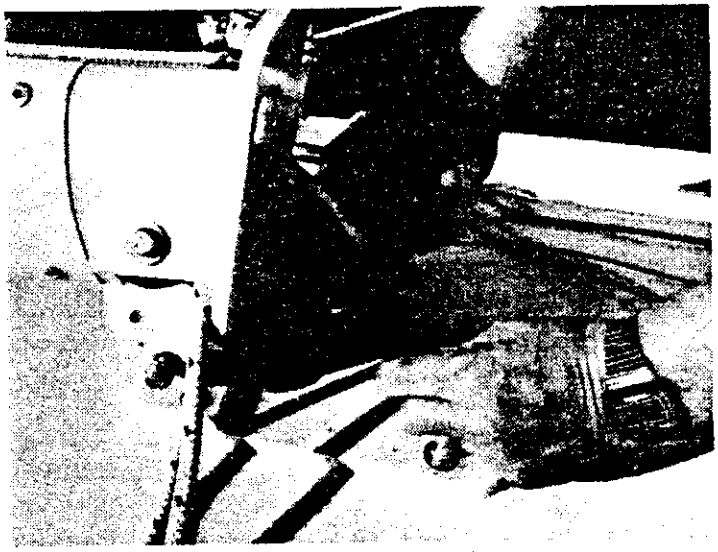
5. By raising or lowering spreaders, alignment is achieved for inserting the axle. (Don't forget the vang eye!)



6. As your helpers wait patiently, you may now attach the upper shrouds to the deck as shown. Be sure to back turnbuckles off all the way. The upper shrouds are captured in the after of the two locations.



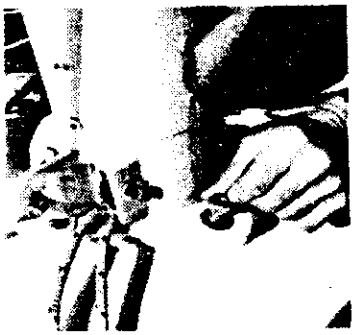
7. The lifting of the mast may now begin. The two cockpit helpers walk forward (three people make it easier) while lifting, as another person winches the spinnaker halyard attached to the welded bow shackle. When the mast is 80° vertical, it can easily be balanced and the mast base checked that all is clear.



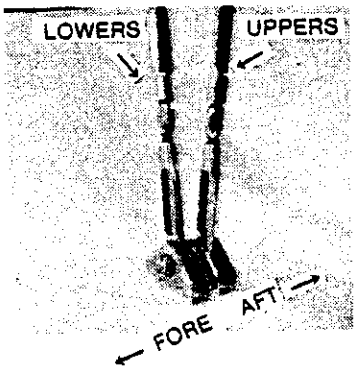
8a) EARLIER MAST WIRING WAS RUN THROUGH THE BASE OF THE MAST. ALIGN THE KEY-WAY OF MAST & DECK CONNECTORS AND PLUG TOGETHER.

CARE MUST BE TAKEN NOT TO CRUSH THIS CONNECTOR, BUT TO FEED IT UP INSIDE OF THE MAST.

8b) CURRENT MAST WIRING IS CONNECTED EXTERNAL OF THE MAST BASE THROUGH A 4-PIN ELECTRICAL CONNECTOR (BE SURE TO DISCONNECT THIS BE FORE LOWERING THE MAST).



9. Push mast all the way up and attach headstay, tightening the turnbuckle all the way. Install the mast base washers, then locknuts and tighten.



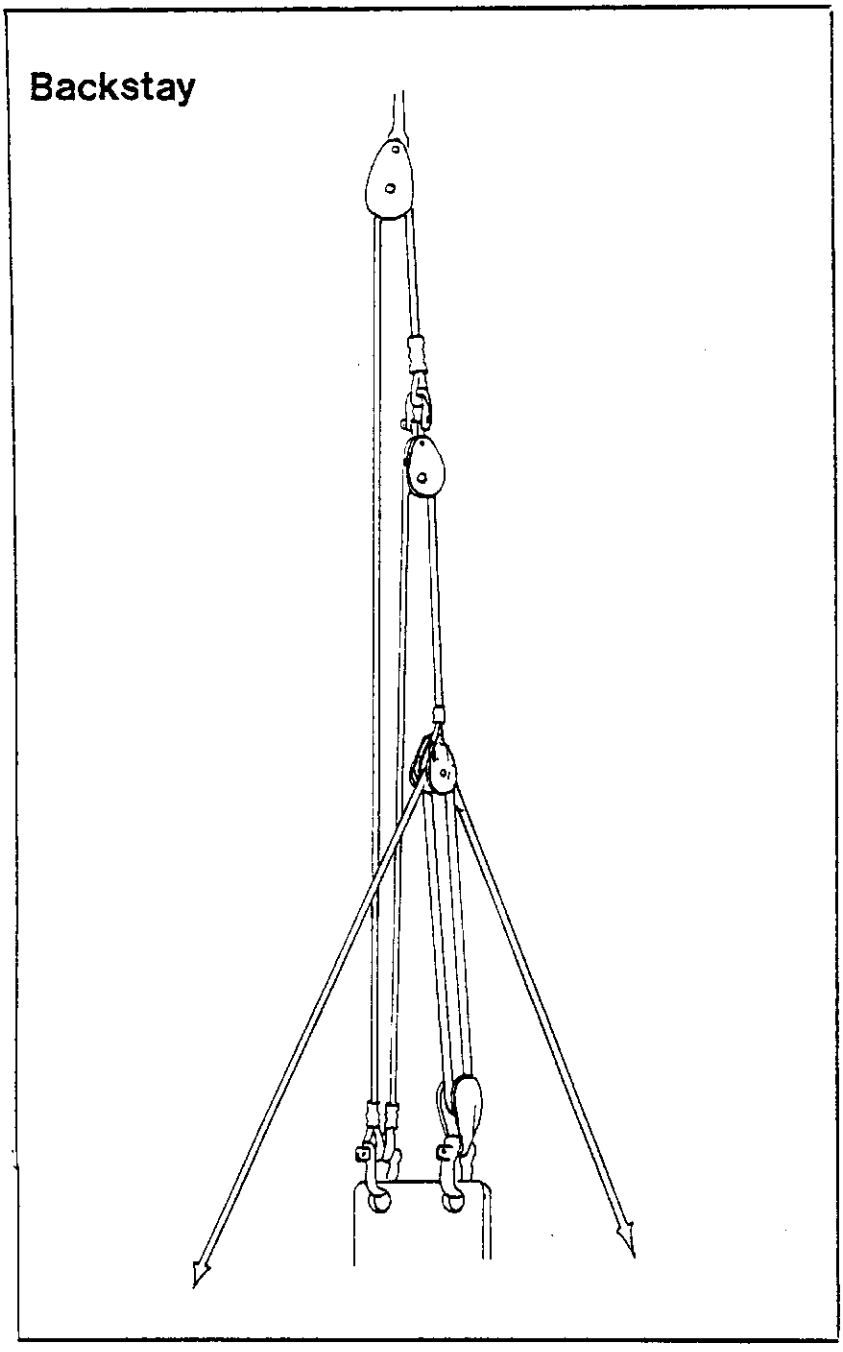
10. The lower shrouds are now attached, and the clevis pins driven all the way through and then secured with cotter pins.

Running Rigging Consists of the Following

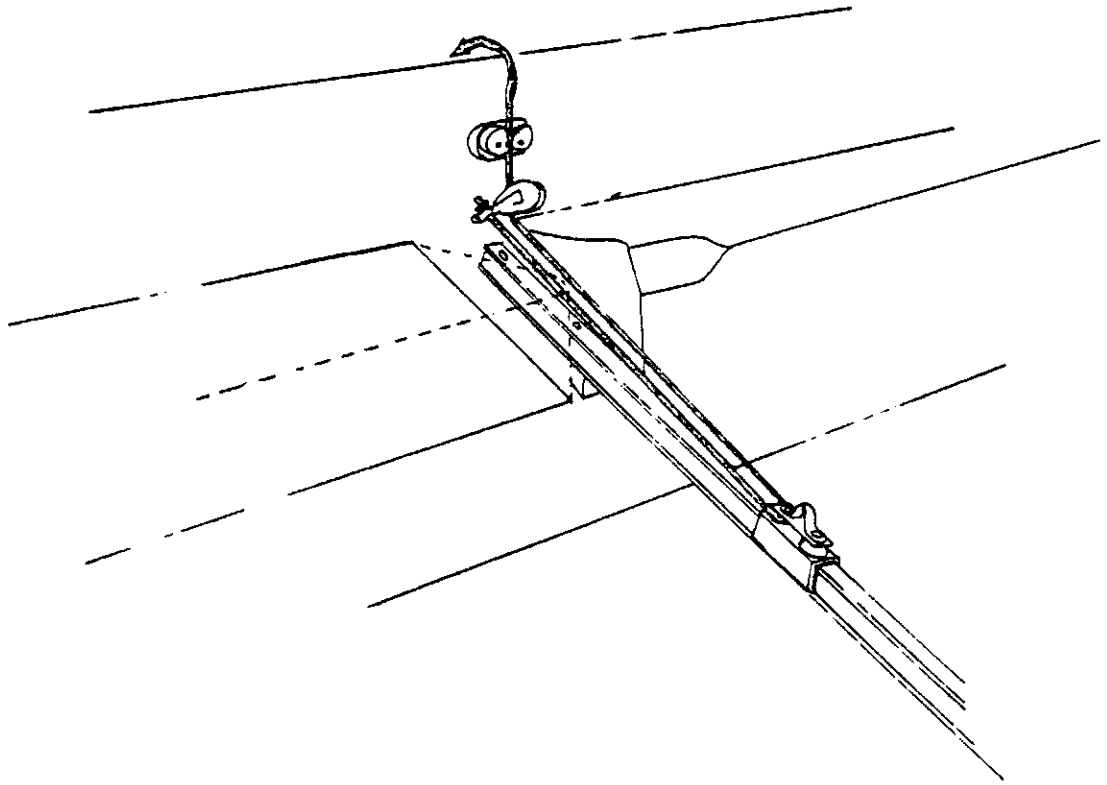
1 racing backstay, double ended yoke type led forward
1 mainsheet
1 boomvang
1 cunningham
2 barber haulers
2 spinnaker twingers
1 spinnaker downhaul
1 traveller
2 spinnaker sheets
2 jib sheets

In the boom:
2 reefing lines
1 main outhaul

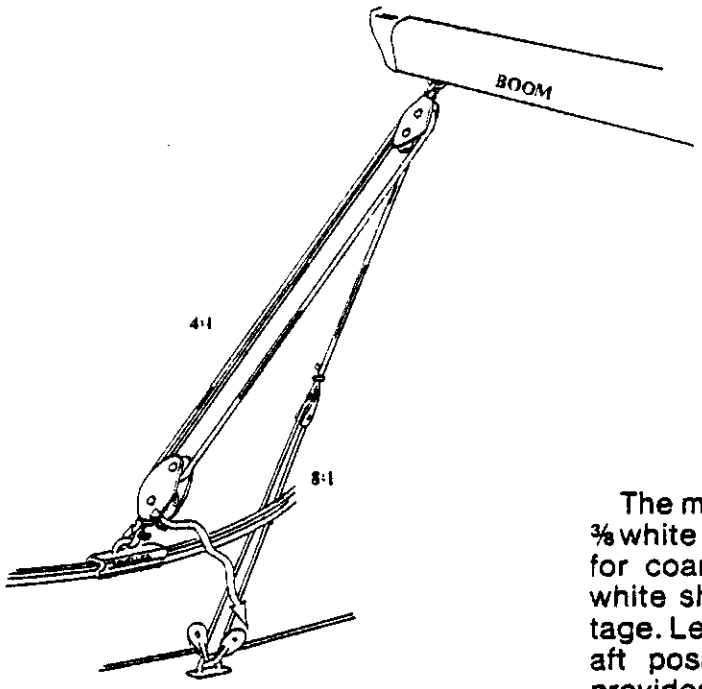
In the mast:
1 main halyard
2 jib halyards
1 spinnaker halyard
1 spinnaker topping lift



Traveller

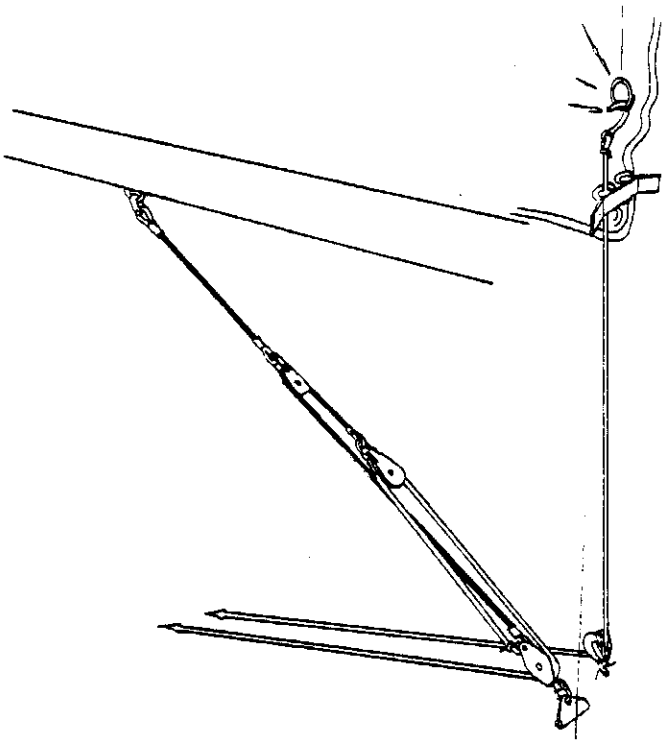


2 Part Mainsheet



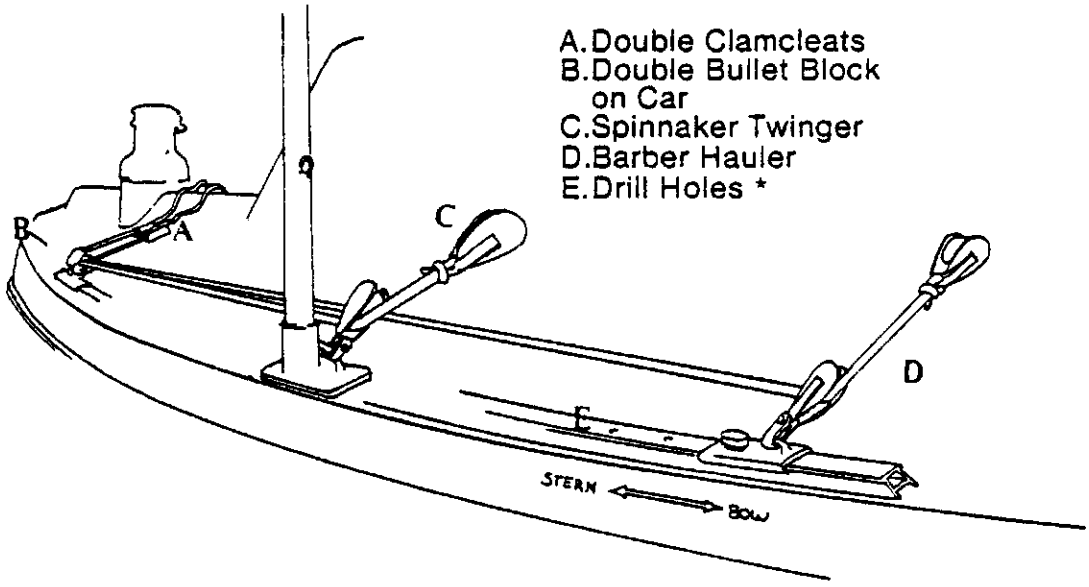
The mainsheet is doubled ended. The ⅜ white sheet works with a 4:1 purchase for coarse adjustment. The blue and white sheet operates at an 8:1 advantage. Leading the 8:1 sheet through the aft position of the double camcleat provides easy helmsman access.

Boom Vang and Cunningham



The boom vang is a 2 part wire strap indicated in black. The line indicated in white is led aft to the cockpit. The cunningham which also doubles for the inboard reefing hook, is led through a bail above the gooseneck then a block on the port side of the mast base, and aft to the cockpit.

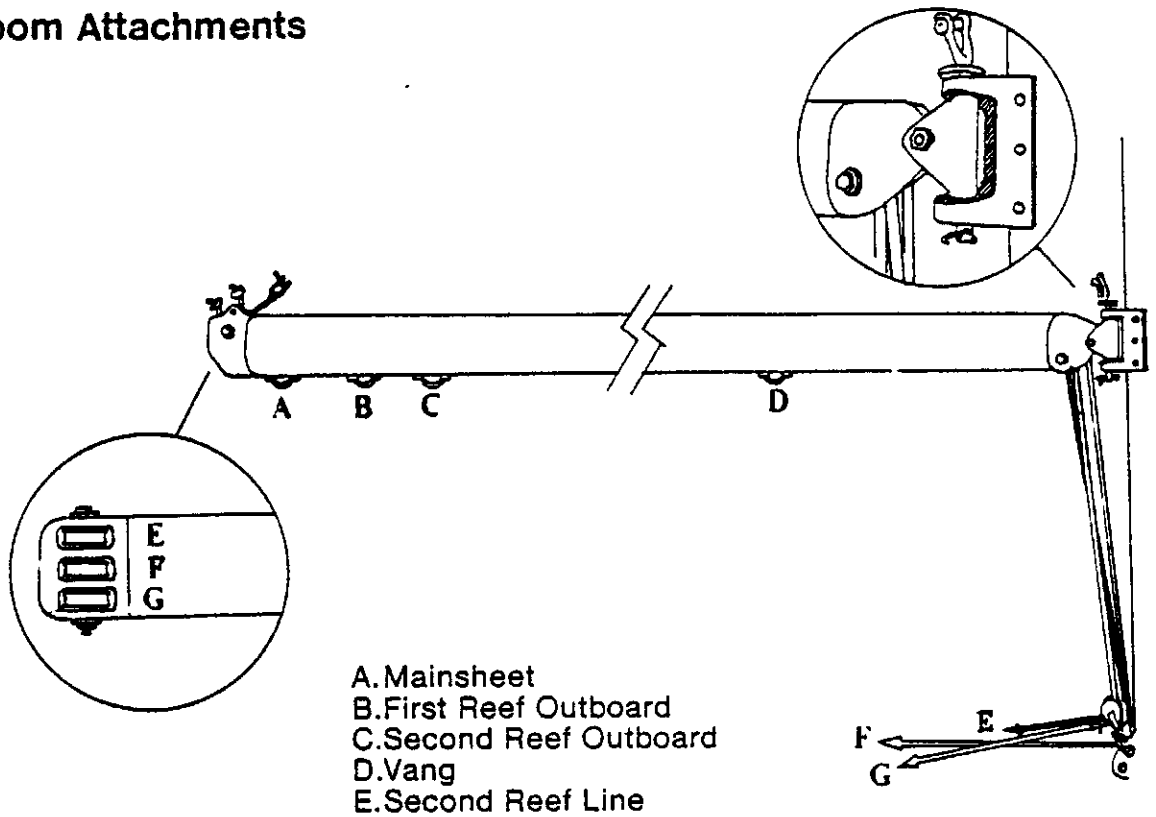
Barber Hauler and Twinger Lines



A. Double Clamcleats
B. Double Bullet Block on Car
C. Spinnaker Twinger
D. Barber Hauler
E. Drill Holes *

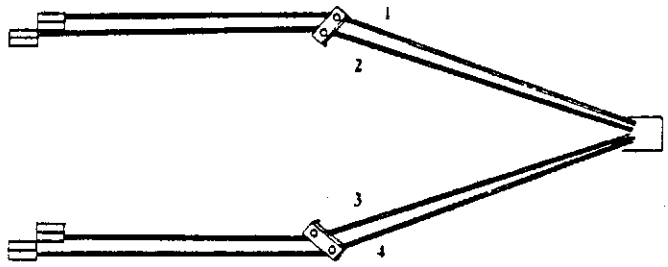
* 3/16" holes to be drilled by owner when they have found optimum positions

Boom Attachments

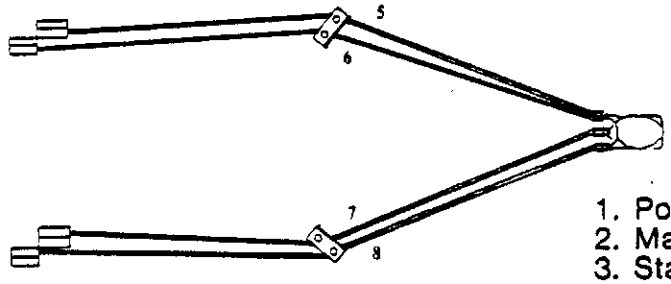


A. Mainsheet
B. First Reef Outboard
C. Second Reef Outboard
D. Vang
E. Second Reef Line
F. Outhal
G. Second Reef Line

Top Sheaves

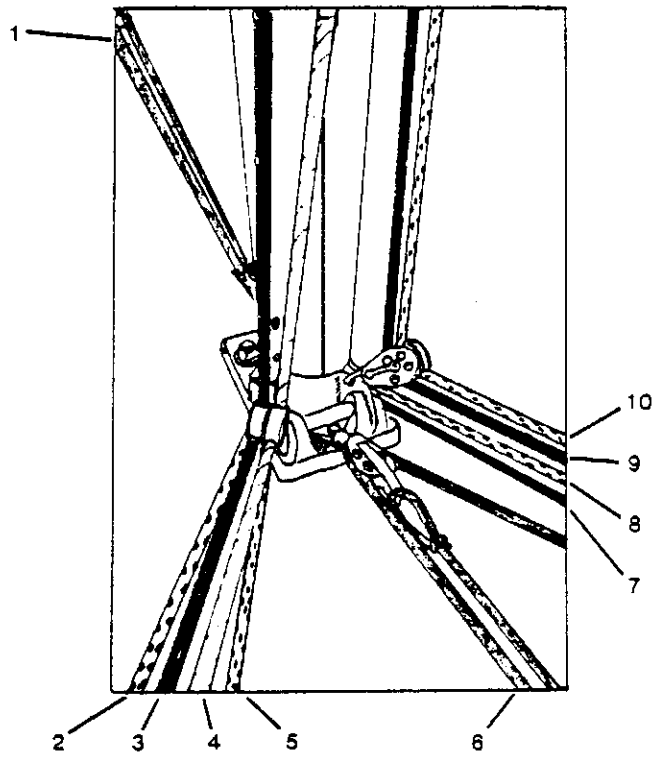


Bottom Sheaves



1. Port Jib Halyard
2. Main Halyard
3. Starboard Job Halyard
4. Spinnaker Halyard
5. Cunningham
6. Outhaul
7. Boom Vang and 2nd reef line
8. 1st Reef line

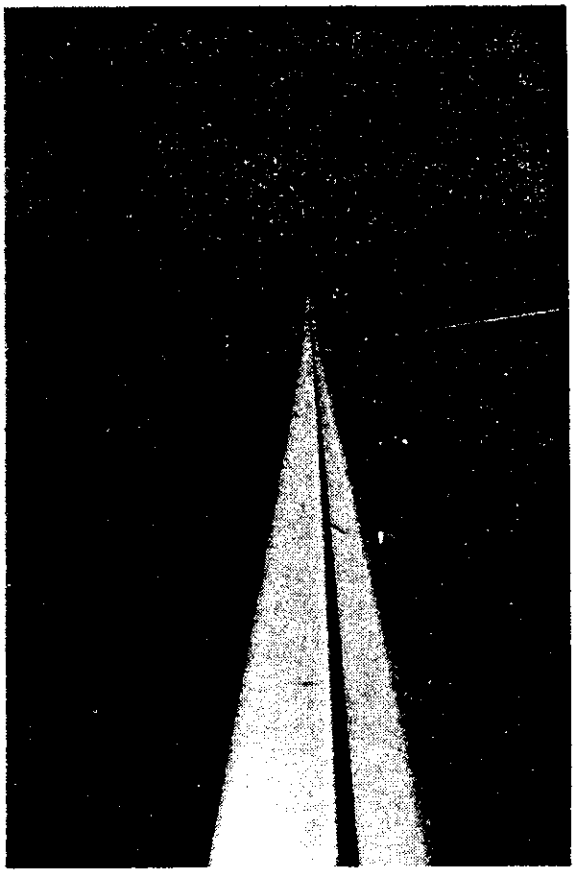
Halyard and Line Routing



1. Spinnaker pole downhaul
2. Port jib halyard
3. Cunningham
4. Outhaul
5. Main halyard
6. Boon Vang
7. Starboard jib halyard
8. Spinnaker halyard
9. First reef
10. Second reef

Initial Tuning of the Rig

1. Begin by tightening the headstay turnbuckle to the maximum. Install cotter pins and tape.



2. The upper shrouds will next be tightened successively by increasing backstay tension. Keep a little tension on the lowers also so that mast will only bend in fore and aft direction as backstay tension is applied.

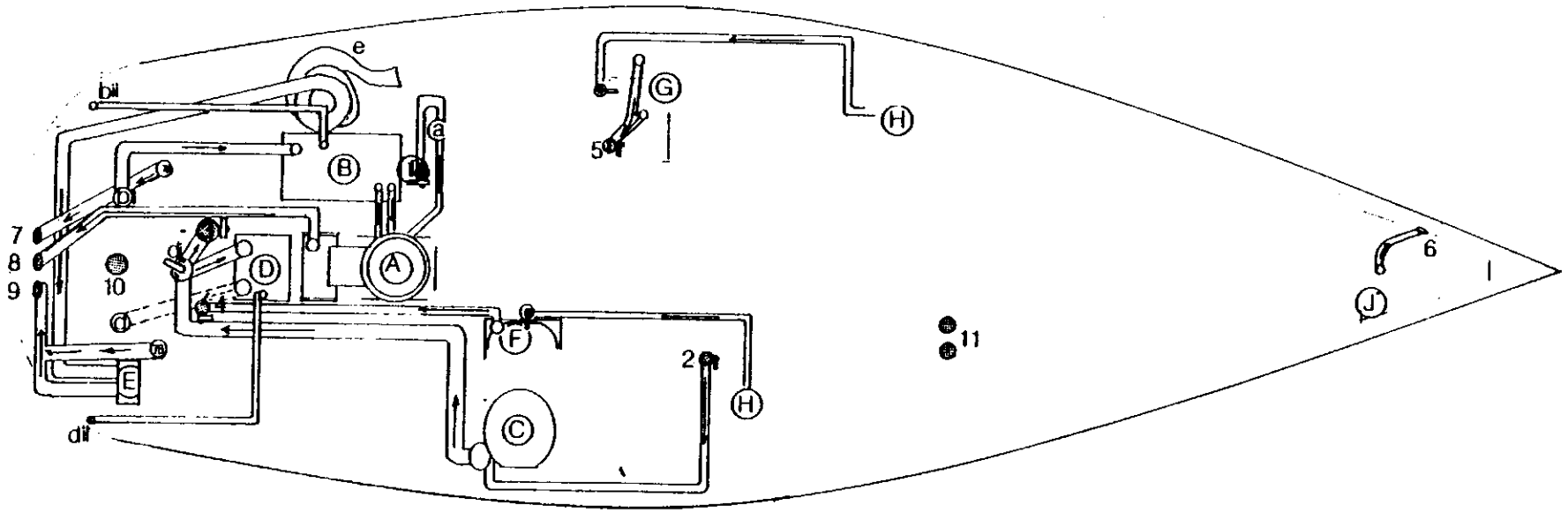
3. By cleating the main halyard so that the headboard shackle touches the deck evenly at stanchion bases port and starboard, we can assure that the masthead is exactly center line on the boat. Use the halyard as a "yard stick" and compare distance to deck both port and starboard. Adjust appropriate shroud so mast is straight on centerline.

4. With the backstay tightened so blocks are within 9" of one another, the upper shrouds should be hand tight. Release the backstay carefully and tighten the lower shrouds until firm, but not as tight as uppers. Sight up mast and use lowers to straighten athwartships. All turnbuckles should now have cotter pins installed and taped to prevent chafing.

5. Shrouds will stretch, so further adjustment should be addressed after a few hours of sailing.

6. Tightness of the rig for optimum performance will vary with local wind conditions: i.e. lighter breeze; less tension on lowers, heavier air; tighter lowers.

7. This explanation of rig tuning is basic only and should be used in conjunction with the tuning section and performance prediction tables found later in this manual.



Plumbing Systems

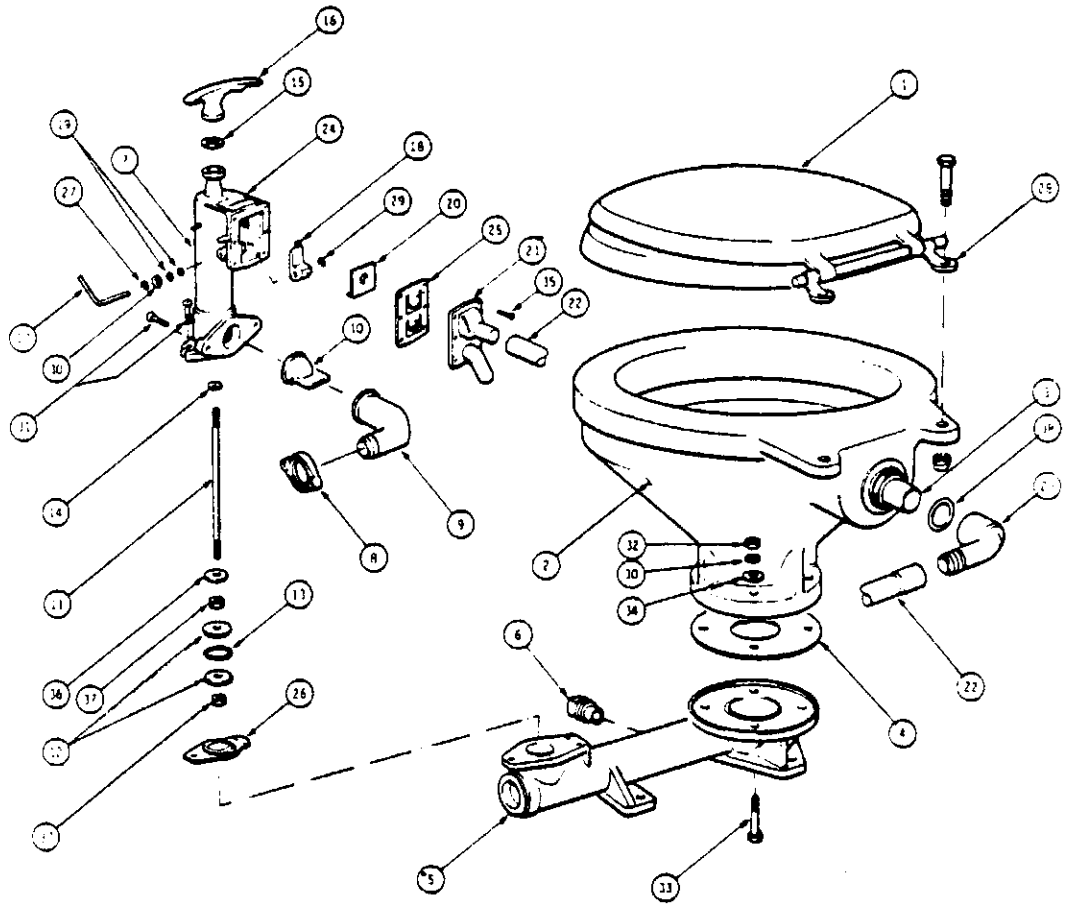
1. Engine cooling water inlet.
2. Head water inlet.
3. Head discharge.
4. Head sink discharge.
5. Galley & Icebox discharge.
6. Anchor locker discharge.
7. Cockpit discharge.

7A.Cockpit scupper.

Note: 7B. Starboard scupper exists through bilge pump discharge.

8. Engine exhaust discharge.
9. Bilge pump discharge.
10. Rudder shaft.
11. Thruhulls for instruments.

A. Engine
a (i) water strainer
B. Fuel tank
b (i) tank filler plate
b (ii) tank vent (transom)
C. Head
D. Holding tank (optional)
d (i) diverter valve
d (ii) tank vent (transom)
E. Bilge pump
F. Head sink
G. Galley sink
H. Fresh water storage
J. Anchor well



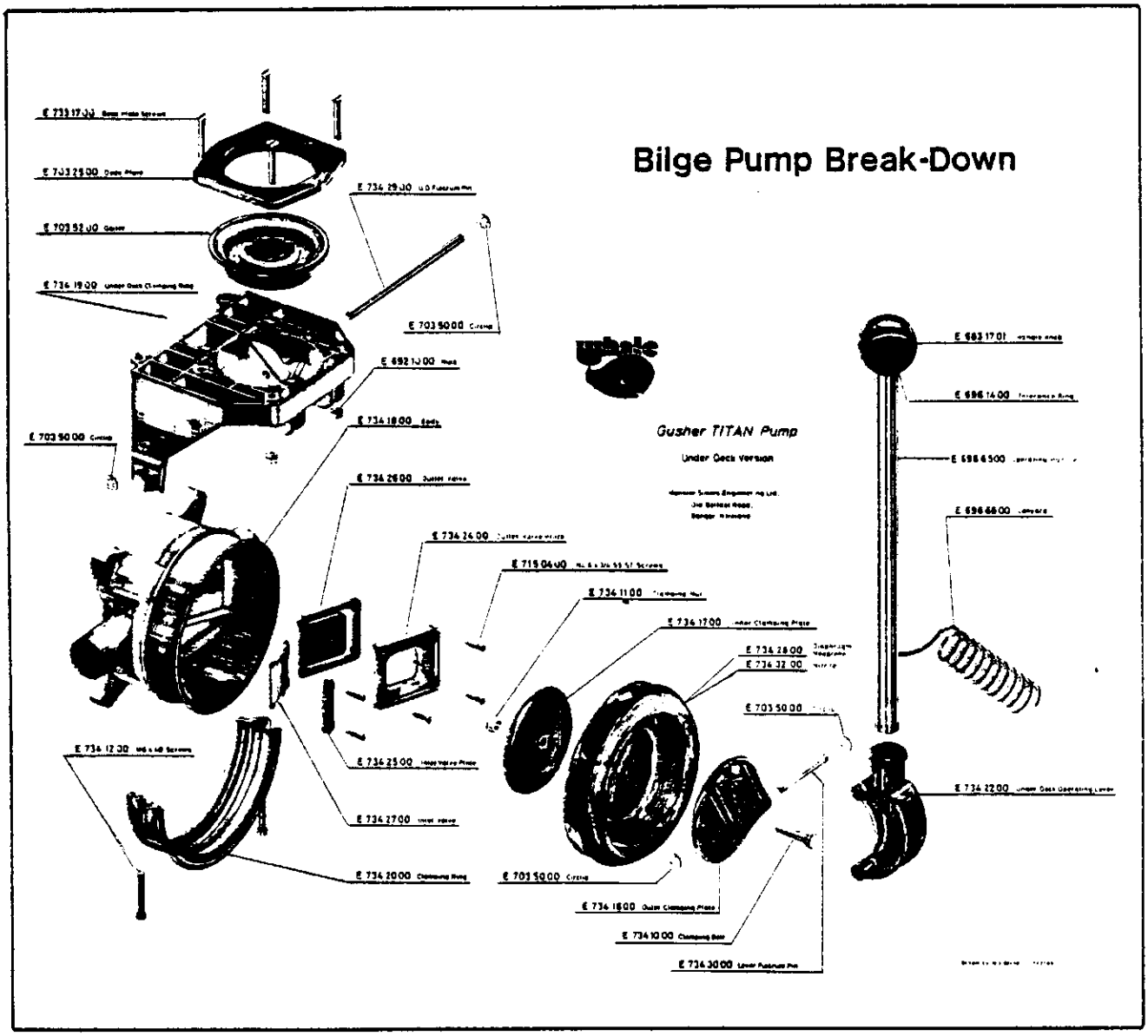
KEY	PART No.	DESCRIPTION	KEY	PART No.	DESCRIPTION
1.	59127-7001	Seat & Cover	18.	59127-7021	Valve Cam
	59127-7101	Seat & Cover**	19.	59127-7023	Valve Handle O-Ring Seal
2.	59127-8002	Bowl	20.	59127-7026	Intake Valve Seal
	59127-8102	Bowl**	21.	59127-7027	Valve Housing Cover
3.	59127-7057	Spud		59127-7127	Valve Housing Cover**
4.	59127-7004	Bowl Gasket ..... B	22.	59127-7029	Hose
5.	59128-7001	Base		59127-7129	Hose**
	59128-7101	Base**	23.	59127-7030	Intake Elbow
6.	59127-7006	Base Drain Plug ..... A		59127-7130	Intake Elbow**
7.	59127-7009	Pump Cylinder		59127-7043	Intake Elbow & Hose Assembly
	59127-7109	Pump Cylinder**		59127-7143	Intake Elbow & Hose Assembly**
	59127-7049	Cylinder C/W Seal & Label	24.	59127-7033	Instruction Decal
	59127-7149	Cylinder C/W Seal & Label**	25.	59127-7040	Double Valve Gasket ..... B
	59127-7050	Pump Unit, Complete	26.	59127-7041	Base Flap Valve Gasket ..... B
	59127-7150	Pump Unit, Complete**	27.	59127-7042	Control Handle Ret. Ring
8.	59127-7011	Discharge Flange	28.	59127-7047	Hinges C/W Nuts & Bolts
	59127-7111	Discharge Flange**		59127-7147	Hinges C/W Nuts & Bolts**
9.	59127-7012	Discharge Elbow	29.	59127-7052	Cam. Ret. Ring
	59127-7112	Discharge Elbow**	30.	57000-8485	1/4" St. Steel Washer ..... A
10.	59127-7013	Joker Valve ..... B	31.	57000-8510	1" x #14 S.S. Tap Screw ..... A
11.	59127-7014	Piston Rod	32.	57000-8113	1/4-20 Brass Nuts, Plated ..... A
12.	59127-7015	Piston	33.	57000-8396	1/4-20 x 1-3/4" Hex. S.S. Bolts ..... A
13.	59127-7016	Piston O-Ring ..... B	34.	57000-8195	11/16" Plastic Washer ..... A
14.	59127-7017	Seal ..... B	35.	57000-8515	3/4" x #10RH S.S. Tap Screw..... A
15.	59127-7018	Bumper Washer ..... B	36.	57000-8160	3/8" Brass Washer
16.	59127-7019	Pump Handle	37.	57000-8105	3/8"-16 Hex. Brass Nut
17.	59127-7031	Valve Control Handle	38.	59127-7051	Intake O-Ring

NOTE: A. PARTS INCLUDED IN FASTENER REPAIR KIT 59300-0101
B. PARTS INCLUDED IN SEAL AND GASKET REPAIR KIT 59300-0102
ALL PARTS A & B INCLUDED IN REPAIR KIT 59300-0100
**BONE COLOUR

Marine Toilet Operating Instructions

Make sure inlet and discharge seacocks or valves are open. Move valve lever to "Flush" position and operate pump, return valve lever to "Dry Bowl" position and empty bowl. Leave valve lever in "Dry Bowl" position when toilet is not in use. Close seacocks when boat is unattended.

To drain for winter lay-up, remove drain plug in the base and operate pump with valve lever in "Dry Bowl" position. In salt water areas, a thorough flushing with fresh water will assure troublefree use the following season. Do not use anti-freeze, acids, harsh alkalis, javex or household bleaches in cleaning. After long periods of non-use, the inside surface of the pump cylinder may be given thin coating to vaseline to assist in operation.



BUKH DV8SME Diesel

PLEASE READ THESE INSTRUCTIONS THOROUGHLY BEFORE STARTING YOUR ENGINE!

Every engine is fully factory tested; the testing is assurance that the engine is operating satisfactorily and is generating full power. You will expect the engine to work reliably and to achieve this you are asked to follow the instructions provided in this manual.

General Description

Model DV8SME consists of a one cylinder, 4 stroke, water cooled diesel engine with a vertical crankshaft directly coupled to a saildrive unit. The engine is mounted on a glass fiber foundation which is molded as part of the boat's structural backbone. Vibration from the engine has been reduced by fitting flexible supports between the engine and the foundation.

Engine

The engine is provided with a 12 volt electric start and a 15 amp alternator. If the electric start should fail due to a dry battery, the engine may be pull started with a starting line also provided.

The engine is directly saltwater cooled and for this purpose is equipped with a directly driven water pump. A built-in thermostat keeps the engine temperature constant.

The engine has a forced lubrication system; pressure is supplied through a built-in EATON pump. The saildrive has its own lubrication system.

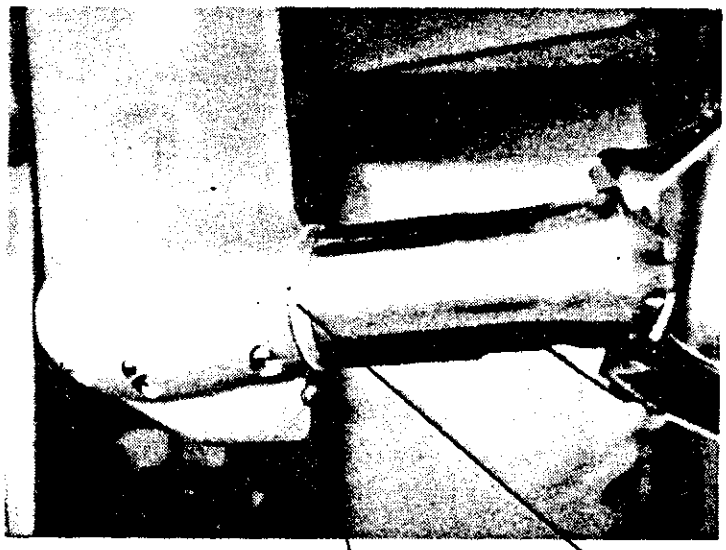
There are filters for fuel and air intake.

Saildrive

The saildrive will need no other attention than regular change of oil.

The saildrive is equipped with a double membrane preventing penetration of sea water. In the double membrane, a sensing element is fitted which releases an acoustic alarm if water penetrates between the two membranes.

The aluminum housing of the saildrive has been specially treated on the outside. Damage to the surface finish should be treated as soon as possible with a two part epoxy-polyamid paint.



The saildrive may then be coated with the same paint as the rest of the bottom of the boat. (THIS PAINT MUST NOT CONTAIN COPPER.)

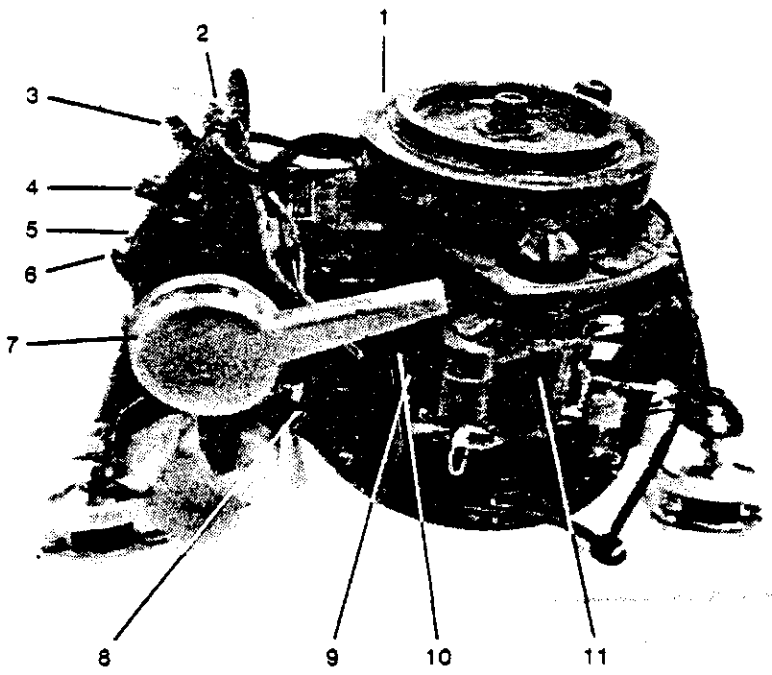
On the saildrive, within the propeller hub a disc shaped zinc-anode is fitted.

Check the disc twice a year and replace when showing signs of considerable corrosion.

IMPORTANT: THE ZINC MUST NOT BE PAINTED.

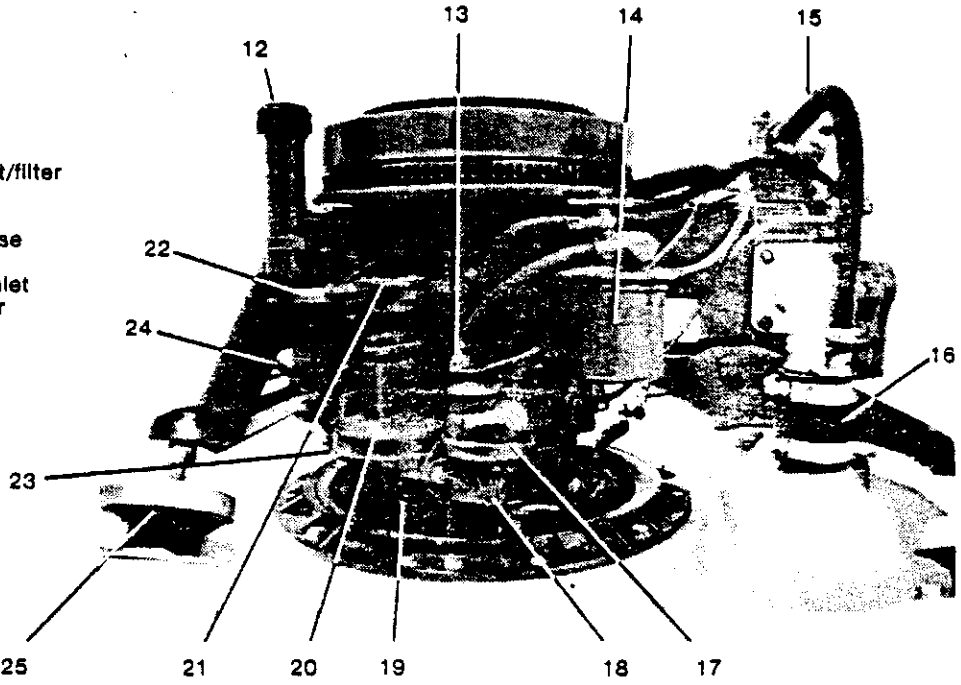
Engine Starboard Side

1. Flywheel
2. Thermostat housing
3. Water temperature sending unit
4. Injector
5. Rubber plug for cold start
6. Decompression lever
7. Air Filter casing
8. Gear shift lever
9. Throttle lever
10. Idle adjustment screw
11. Starter motor



Engine Port Side

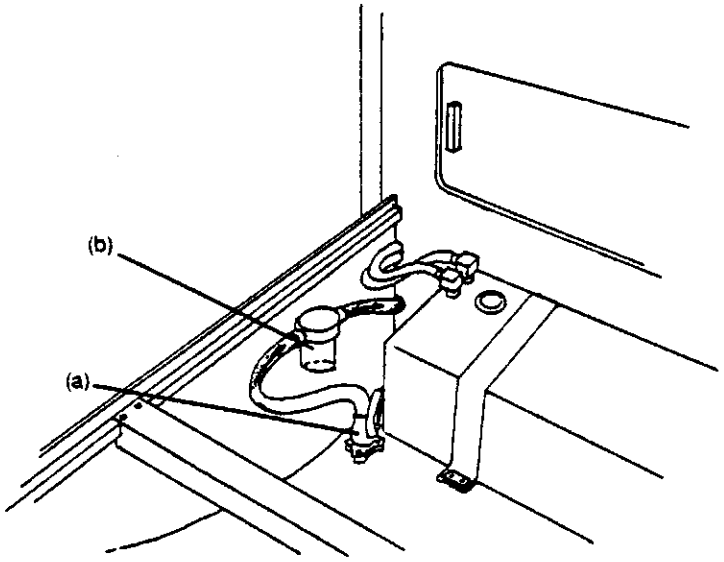
12. Oil filler/vacuum valve
13. Oil pressure sender unit/filter
14. Fuel filter
15. Cooling water drain
16. Cooling water outlet hose
17. Fuel lift pump
18. Lever for priming fuel inlet
19. Membrane alarm trigger
20. Water pump
21. Impeller housing
22. Cooling water inlet
23. Saildrive dipstick
24. Crankcase dipstick
25. Engine mounts



BUKH Diesel Commissioning

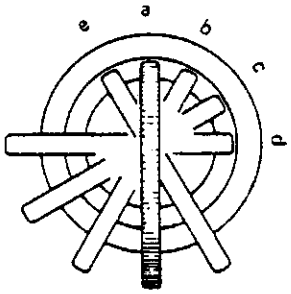
Before the engine is put to use, please familiarize yourself with the engine components, page 21.

1. Fill the fuel tank through the filler cap found aft, portside in the cockpit next to the tiller. The engine has been run tested before leaving the BUKH factory, leaving fuel in the engine, thus no initial priming is necessary.
2. Both crankcase and saildrive oils are filled prior to boat's delivery. Double check both oil levels before proceeding.



3. Cooling System
   The water pump impeller must next be primed. This step is most important; insufficient priming may damage the rubber impeller. To prime the pump, locate the water filter/strainer under the port quarterberth next to the fuel tank.
   (a) Close cooling water seacock.
   (b) Loosen the hose clamp that secures the filter to the bulkhead;
   (c) Unscrew filter and fill with water;
   (d) Reassemble filter and invert so water runs through hose towards engine;
   (e) Repeat 'c' and reassemble with bowl full;
   (f) Resecure filter to bulkhead;
   (g) BE SURE TO OPEN SEA COCK FOR COOLING WATER.

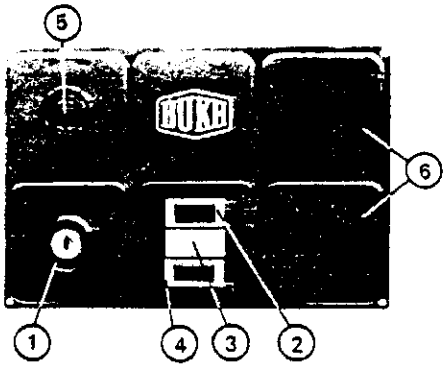
4. Engine Control
   Pull the black knob out for neutral gear then advance throttle lever 45° forward to start.



5. **Key Position**
   (a) Switched off
   (b) Warning instrument/amps alight
   (c) Engine running
   (d) Start
   (e) Engine stop

To start engine, push key in and turn clockwise until starter motor engages. Do not work starter motor for more than 10-15 seconds at a time.

TO TURN ENGINE OFF, TURN KEY COUNTER-CLOCKWISE AND PUSH IN TILL BUZZER RINGS AND ENGINE STOPS. RETURN KEY TO VERTICAL POSITION. IN THE (e) POSITION THE FUEL SHUT-OFF SOLENOID IS ACTIVATED AND LEAVING KEY IN THIS POSITION WILL DAMAGE SOLENOID AND THE HEAVY CURRENT CONSUMPTION COULD CAUSE AN ELECTRICAL FIRE.



Control Panel
1. Key switch.
2. Warning lamp for charging current (AMP, red).
3. Warning lamp for oil pressure (OIL, orange).
4. Warning lamp for cooling-water temperature (TEMP, blue).
5. Acoustic alarm for oil pressure and cooling-water temperature.
6. Blank (can be replaced by thermometer and manometer or fuel gauge and hour-counter).

After Starting

The engine should run at 900-1000 r.p.m. while idling.

*** NEVER ACCELERATE A COLD ENGINE – LET IT WARM UP FIRST.**

* Immediately after starting, check that both the oil pressure and charging warning lamps should go out.

* Check that cooling water is coming out through the exhaust within 30 seconds.

* If either of the last two conditions are wrong, stop the engine immediately and check offending system.

Emergency start by rope drive

1. Remove the companionway stairs clear from front of engine.
2. Put the gear into neutral position, pull out black knob and advance lever 45°.
3. Turn the engine counterclockwise by hand one revolution to the previous compression stroke.
4. Wrap the rope clockwise onto the pulley on the engine top.
5. Give the rope a fast pull and the engine will start.

Manoeuvering

1. The black knob when pulled out leaves the engine in neutral. Throttle may be increased in either direction (fore or aft) to control idling r.p.m.'s.
2. To put the engine in gear, return throttle to vertical position between two "clicks" you will feel. This provides an idle rate safe for shifting gears.
3. Only after a slow idle has been achieved should the black knob be engaged by pushing it in. As long as the throttle lever is in a vertical position, the engine is not yet engaged in gear.
4. By moving the throttle lever forward (counter clockwise) past the first "click", forward gear is engaged. Any further forward movement of the throttle increases engine r.p.m.'s.
5. Reverse gear is attainable by returning to the vertical position (idle position) first, then moving the throttle lever aft.
6. Reduce the load on engine gradually 10-15 minutes before stopping engine.

Checking Oil Lubrication Level

For proper reading, check level **before** operating engine. CHECKING OIL LEVELS BEFORE EACH USAGE IS GOOD PRACTICE. Check at a bare minimum every 14 days or every 25 hours of use.

To check:
(a) Remove and wipe dipstick.
(b) Re-insert dipstick slowly.
(c) Withdraw stick and check level.
(d) Fill as necessary.
(e) Repeat with saildrive.

Before Every Use
(a) Check amount of fuel in tank.
(b) Be sure cooling water seacock is open.

Running In

To ensure long life and maximum power, it is recommended to run the engine for the first 75 hours at not more than 50% of maximum engine output, corresponding to 2700 r.p.m.'s at load with propeller under normal load.

Avoid excessive engine load, such as towing another vessel. It is recommended to change the engine and gear oil and to clean the oil filter after the first 20-25 hours of running.

Starting Aid

In case of:
(a) Cold weather (temp. under 0°C);
(b) Insufficient compression;
(c) Long standstill;
the start can be made easier by removing the rubber plug (page 21, #5) and pouring a spoonful of lubricating oil through this hole. Wait a few seconds and replace the rubber plug.

Engine Maintenance

Changing of Engine Oil

Lubricating oil should be changed for the first time after 25 hours of use then avery 100 hours thereafter or at least every year. A hand pump with a plastic hose is supplied. The hose is put into the dipstick hole to the bottom and the oil is pumped out. Refill crankcase through oil filler hole using 2 litres of approved oil (see specifications).

Changing of saildrive oil

Normally the lubricating oil should be changed once a year when the boat has been put ashore. The old oil is drained off by removing a screw in the sail drive bottom. When the oil has run out, refill through dipstick hole.

Remember to replace and retighten the screw.

Checking Saildrive membrane sensing element

It is important for the sake of safety that this alarm is always serviceable, and it should be checked twice a year by short-circuiting the connections 1 and 2 (refer to engine electrical diagram) on the red control box. When short-circuiting here by means of a piece of wire or a screwdriver, the alarm should sound.

Cleaning Air Filter

The air cleaner has a wire gauze element to be cleaned with kerosene everv 200 hours, then blasted with compressed air in the opposite direction of the normal air intake.

Fuel System

A quality #2 diesel fuel from a reputable gas station should be used. Use only clean cans for storage and transportation. A diesel fuel conditioner is recommended.

Check that the fuel inlet on the transom is tightened and watertight after filling boat.

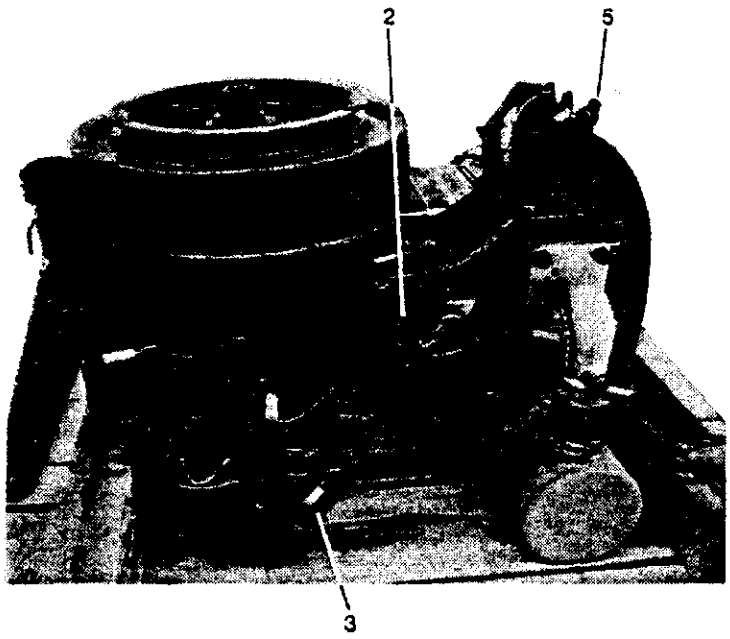
Drain the tank occasionally for condensation.

WE STRONGLY RECOMMEND INSTALLATION OF A SEPARATE WATER SEPARATOR FOR THIS OR ANY OTHER DIESEL ENGINE.

Fuel Filter

The filter (throw away cartridge) should be changed every 200 hours of running time or if water contamination occurs. IT IS STRONGLY RECOMMENDED THAT THE FILTER BE CHANGED AFTER THE FIRST 25 HOURS OF USE.

1. Unscrew the filter clockwise as seen from above.
2. Replace the seal as well as the filter.
3. The new filter should be tightened by hand, until the seal seats itself, then an additional ½ turn. Do not overtighten with a strap wrench.



Bleeding Fuel System

To be carried out after any work is done on the fuel system:

1. Fill fuel tank.
2. Loosen the slotted screw on the top of the fuel filter (2).
3. On the bottom of the fuel lift pump, there is a lever; pump this by hand until fuel discharges at (2).
4. Retighten (2) and start engine.
5. If engine does not yet start, loosen the fuel pipe connector at the cylinder head (5) and turn engine over until fuel discharges, at (5), then retighten fuel line.

Lubricating Oil Sump

Every 600 hours of running time the bottom cover of the engine should be removed and the sump cleaned with kerosene.

Vacuum Valve

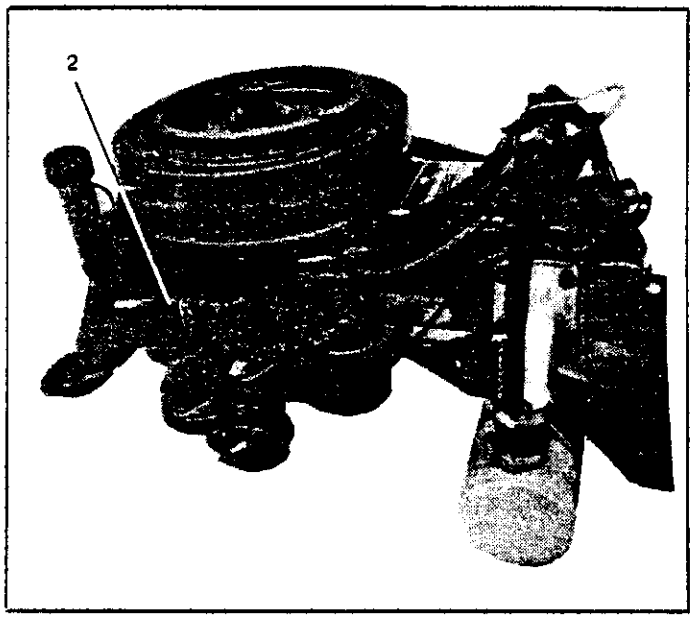
THIS VALVE IS FITTED ON THE OIL FILLER CAP AND MAINTAINS PROPER CRANKCASE PRESSURE. Clean valve every 100 hours by washing in kerosene.

Lubricating Oil Filter

The oil filter is located under the oil pressure sender unit. (The sender unit actually screws into it.) Clean the filter element every 200 hours in kerosene.

Cooling System

The engine is raw water cooled and utilizes a thermostat to maintain an engine temperature of 50° – 75° under all conditions.

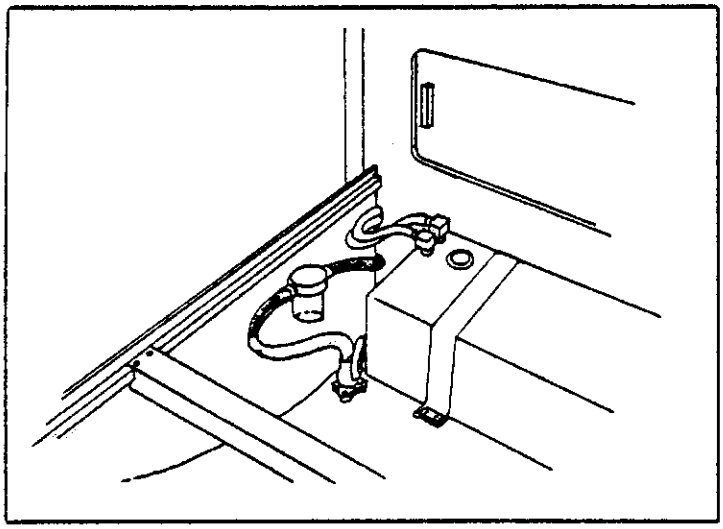


Replacement of Water Pump Impeller

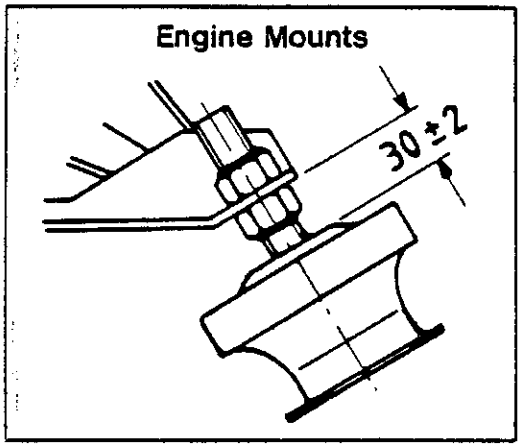
1. Close cooling water seacock.
2. Unscrew four screws from pump cover.
3. Carefully remove cover with paper gasket to reveal impeller.
4. Impeller may be grasped gently with needle nose pliers and removed by pulling straight up and out.
5. Change the rubber impeller from hub by removing the threaded pin.
6. Assemble in reverse order.

Cleaning & Priming Water Strainer – External of Engine

1. Close cooling water seacock.
2. Remove hose clamp securing strainer to bulkhead.
3. Unscrew filter bowl.
4. Empty strainer of dirt and water.
5. Refill with clean water and assemble in reverse order.



Engine Mounts

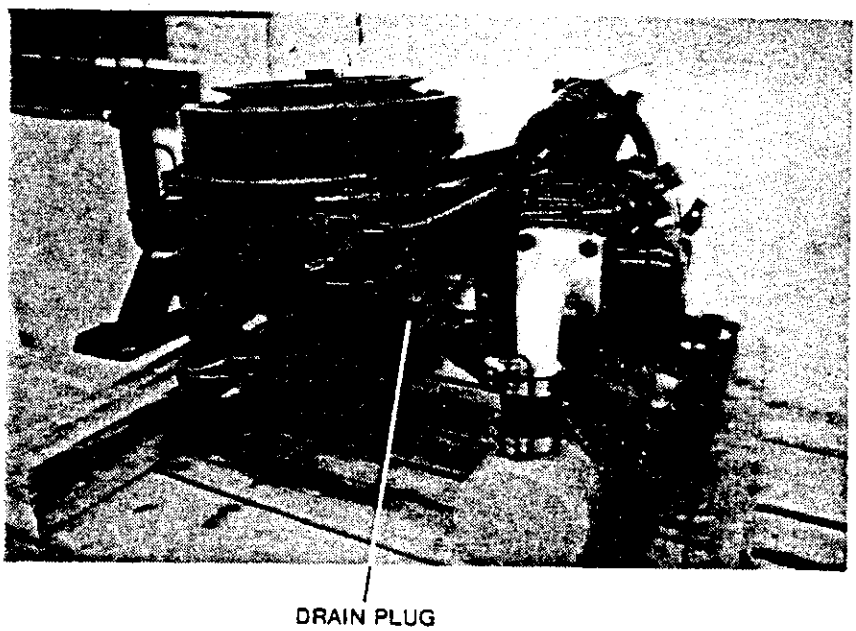


The rubber engine mounts securing the engine to the foundation should be checked for tightness every 100 hours. Should the engine ever be removed for servicing, the clearance between the mount and the engine chassis should be reset at 30 ± 2 mm.

Winter Storage of Engine

In the Water

A. Run engine to temperature and drain lubricating oil. Refill to full with new oil.
B. Add fuel conditioner ("Kleen Flo" is an acceptable product.) Top off fuel tank with #2 diesel.
C. Clean fuel filter, replace element and reprime system. (Clean fuel/water separator if one has been installed.)
D. Run the engine for 10 minutes to circulate the new mixture of fuel and conditioner.
E. Remove water drain plug from bottom of cylinder head on forward port side. The drain plug is a 14mm brass hex head. Drain water and re-install plug. Care must be taken not to lose copper washer.



DRAIN PLUG

Steps E to K inclusive may be performed in or out of the water.

F. Close thruhull seacock, remove water intake hose and place in a full pail of antifreeze solution suitable for local winter temperatures.
G. Run engine until antifreeze is exhausted from transom thruhull.
H. The engine may be left stored with antifreeze in place, but it is recommended that it be drained.
   * Be sure to drain raw water strainer as well.
I. Remove water pump cover plate, grease the impeller (vaseline is good) and replace the plate.
J. Remove the cold start access plug, squirt a tablespoon of oil into cylinder, and re-install rubber plug. Rotate engine by hand to pull oil into the cylinder.
K. Seal the air inlet by means of a cloth dipped in oil; do the same to the exhaust thruhull.
L. Drain saildrive leg of oil and refill with .4 litres of SAE#90.
M. Check condition of zinc anode and replace if necessary.
N. Disconnect battery and store it warm and dry. Charge fully before extended storage.

Caution

BE SURE TO REMOVE AIR INLET AND EXHAUST CLOTHS TO ELIMINATE DAMAGE WHEN RESTARTING IN SPRING.

Maintenance Table

	Every 25 hours	Every 100 hours	Every 200 hours	Every 600 hours	At each annual launching
Check:					
Engine oil level	×				×
Oil level in gearbox or S-drive	×				×
Liquid level of battery	×				×
Nozzles				×	
Valve clearance				×	
Change:					
Lubricating oil		×			×
S-drive oil			×		×
Fuel filter			×		
Clean:					
Vacuum valve		×	×		
Air filter					
Oil filter element		×			
Oil sump and oil suction filter				×	
Water separatot (if fitted)		×			

Analysis of Irregularities

Irregular operation / Cause	Vacuum valve does not function	Clearance in piston pin too big	Run in the engine	Wrong fuel	Leaking fuel oil pipe	Dirty oil sump	Oil pump worn out	Fuel filter choked	Empty fuel tank	Water in fuel tank	Oil level too low	Defective thermostat	Cooling water impeller defective	Valve guide worn out	Piston seized	Cylinder worn out	Rocker arm clearance too big	Governor spring damaged	Valve sticking	Fuel suction pipe choked	Wrong injection timing	Fuel pump worn out	Fuel pump seized	Fuel pump pressure valve defective	Inlet valve clearance incorrect	Nozzle does not atomize	Nozzle holes clogged up	Leaky oil gaskets	Oil level too high	Exhaust valve burnt	Connecting rod bearing seized	Overload	Control mechanism heavy	Cooling water system blocked	Fuel tank bleeding blocked	Over-pressure valve/seat defective	Main bearing worn out	Toothed bar in fuel pump sticks	Piston rings worn out	Lift pump defective/filter dirty	Air in fuel system	Battery run down	Elect. connections defective	Fuel pressure pipe cracked
Engine does not start				•	•				•						•					•			•	•													•			•		
Engine starts – but stops again					•			•		•					•					•	•		•						•								•			•		•
Too small output (HP)								•							•	•			•	•		•		•		•					•					•			•			
Lub. oil pressure too low						•	•				•																			•					•		•						
Noisy		•															•														•												
Blue smoke (idling)	•		•											•		•			•									•										•					
Black smoke (at load)																															•												
White smoke (at full load)								•	•											•	•					•	•										•						
Engine knocks in crankcase																														•							•						
Engine knocks in cylinder head		•		•															•		•																						
Revolutions uneven																		•					•									•					•						
Large consumption of lub. oil	•		•											•		•												•	•								•						
Lub. oil level increases																						•	•															•						
Leaking for lub. oil	•																											•															
Leaking oil filler cap	•																												•														
Lub. oil in exhaust			•																																			•					
Lub. oil in inlet																									•																			
Engine too warm (cooling water)												•	•		•						•											•											
Irregular ignition					•					•													•																					
Engine cannot be turned															•				•											•														
Engine cannot reach max. RPM								•							•			•		•			•								•				•			•			•		

TECHNICAL DATA FOR TYPE DV8SME

Engine type with 12 V electrical start	DV8SME
Working principle	4-stroke with direct injection
Number of cylinders	1
Bore	85 mm
Stroke	85 mm
Swept volume	0.482 litres
Compression ratio	18.5 : 1
Compression pressure	47 bars
Rating:	
Intermittend at 50 r.p.s. (3000 rpm)	6.6 kW (9 HP)
continuous at 50 r.p.s. (3000 rpm)	6.0 kW (8.2 HP)
Max. torque at 35 r.p.s. (2100 rpm)	24.5 Nm (2.57 kpm)
Direction of rotation, seen from above	clockwise
Idle speed	15-17 r.p.s. (900-1000 r.p.m.)
Inclination, max. sideways	30°
Flywheel diameter	294 mm
Valve clearance (cold engine)	0.2 mm (intake) 0.25 mm (exhaust)
Weight, incl S-drive	approx. 80 kg
Placing of the engine number	On crankcase by the starter
Sail-drive ratio	1.75:1

FUEL SYSTEM

Combustion system	direct injection
Injection pressure	210 kp/cm² (208 bars)
Injection timing	23° before TDC (59 mm arc measure)
Fuel pump	CIPA CPFR 1K70
Fuel lift pump	AC FISPA
Fuel filter	UNIVERSAL FILTER ITALIANA S.A.
Filter element	UFI No. 24.352.00
Fuel quality (gas oil)	BS 2869, Class A

LUBRICATING OIL SYSTEM

Oil pump type	EATON
Lubricating oil pressure (warm engine)	2.5 - 5.0 bars
Lubricating oil quality	Service CC or CD
Lubricating oil viscosity:	
Air temperature below 10°C	SAE10
Air temperature 10° to 40°C	SAE 15W40
Lubricating oil quantity, incl. filter	2 litres
Lubricating oil filter	Meshfilter, to be cleaned at repair only.

Sail Drive

Lubricating oil quality	Hypoid gear oil SAE90 or output gear oil
Lubricating oil quantity	0.4 litres

COOLING SYSTEM

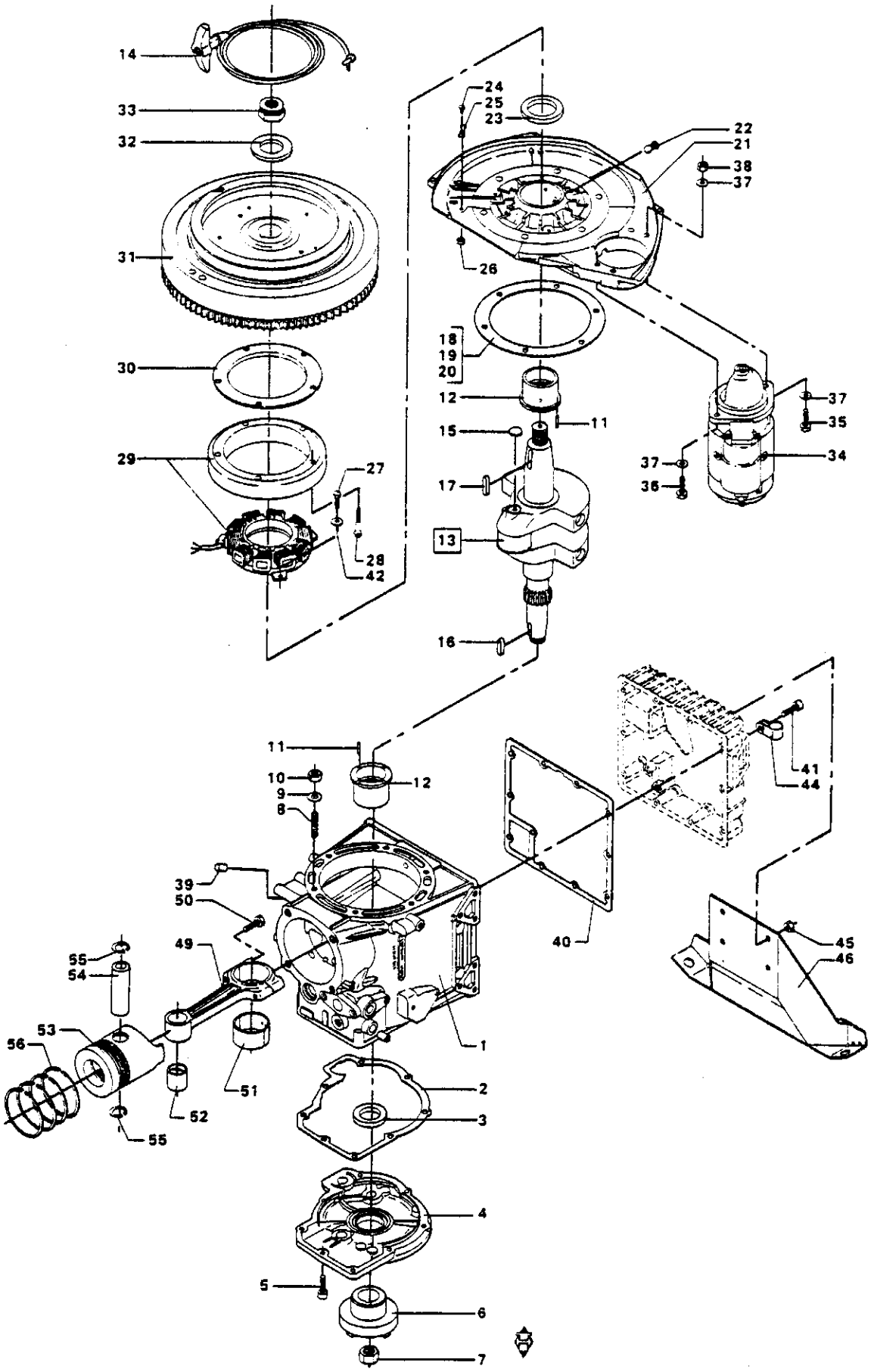
The engine has	direct cooling
Cooling water temperature	50 - 75°
Pump type	JOHNSON 10-35118-1
Pump capacity (at 50 r.p.s. - 3000 rpm)	10.litres/min.
Pump counter pressure, max.	0.6 bars
Pump suction pressure, max.	0.3 bars

ELECTRICAL SYSTEM

Battery voltage	12 Volt
Battery capacity, max.	88 Ah
Starter	PARIS RHONE D9E50
Starter relay	Built-on, electronic
Charging output	210 W
Stop Solenoid	Bosch 0330.101.024

TORQUES

Flywheel Nut	22-24 kpm
Connecting rod bolt	4 kpm
Cylinder cover	5 kpm
Screws for S drive to engine	4.2kpm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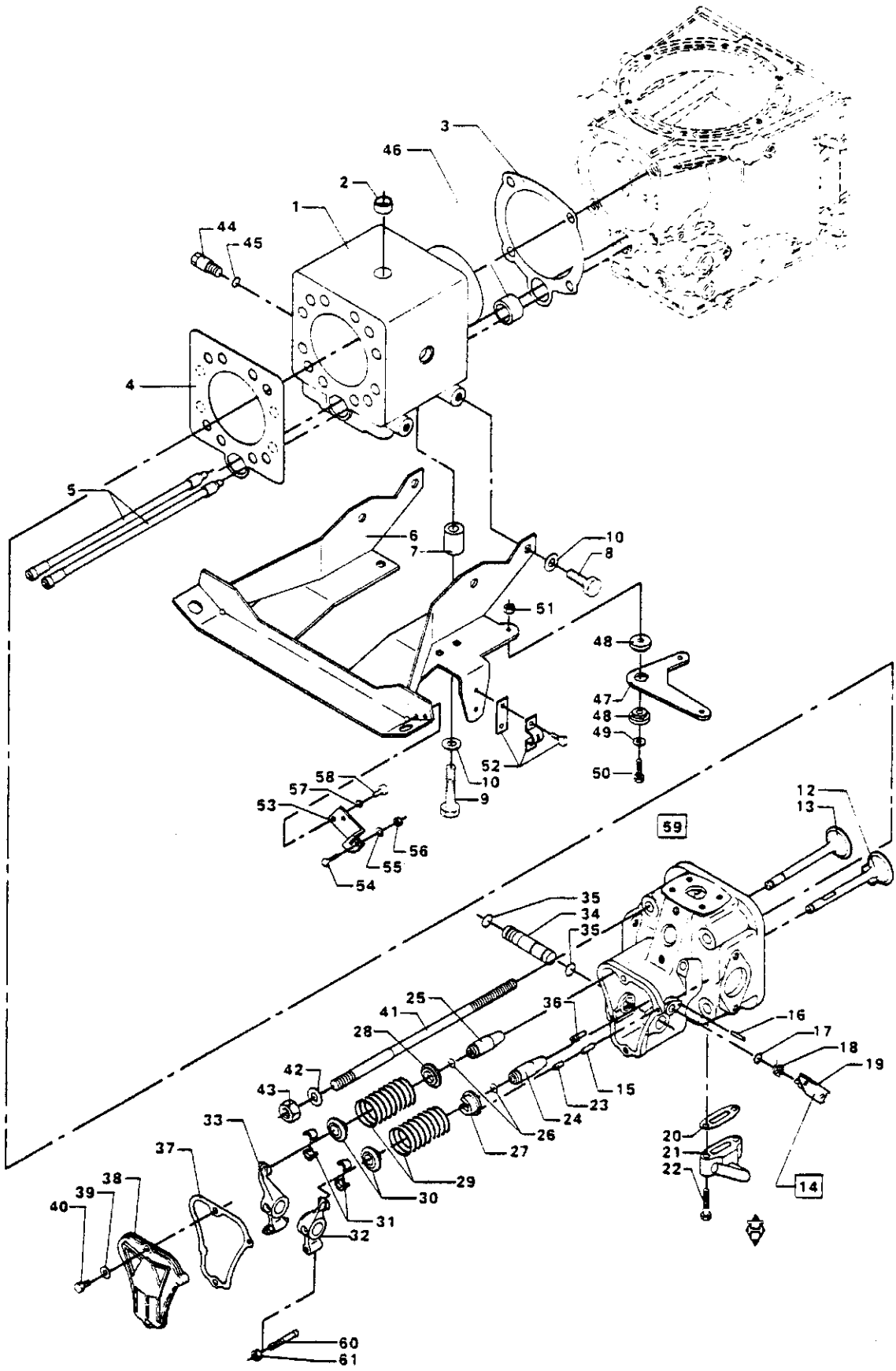
Pos. No.	Part No.	DV8 SME Qty.	Description
1	620L0509	1	Crank case
2	620L0520	1	Gasket, end cover
3	620L0519	1	Seal ring
4	620L0518	1	End cover, lower
5	620L0521	6	Cylinder screw
6	000E6342	1	Coupling half f. engine
7	000E6105	1	Nut
8	620L0515	6	Stud
9	620L0516	6	Washer
10	620L0517	6	Nut
11	620L0504	2	Clamping pin
12	620L0503	2	Main bearing liner std.
12	620L0683	2	Main bearing liner 0,25
12	620L0684	2	Main bearing liner 0,50
12	620L0685	2	Main bearing liner 0,75
13	037D0101	1	Crank cpl.
14	008E6920	1	Starting cord with handle
15	620L0502	1	Expansion disc f. crank shaft
16	620L0505	1	Key
17	620L0506	1	Key
18	620L0512	1	Gasket, end cover 0,1
19	620L0513	1	Gasket, end cover 0,2
20	620L0514	1	Gasket, end cover 0,3
21	620L0510	1	End cover, upper
22	620L0700	1	Over-pressure valve
23	620L0511	1	Seal ring
24	502D2208	1	Cyl. head slotted screw
25	551D0604	1	Clamp
26	510A1205	1	Nut
27	500C2311	3	Set screw
28	501A2316	5	Unbraco screw
29	612H0020	1	Charging alternator, 210 W
30	620L0672	1	Intermediate ring for impeller
31	008E7034	1	Flywheel with gear rim
32	620L0508	1	Washer
33	000E6919	1	Flywheel nut
34	612A1700	1	Starting motor, 12V
35	500C2419	1	Set screw
36	500C2416	1	Set screw
37	522C1225	3	Washer
38	510A1209	1	Nut
39	620L0528	1	Cover lid
40	620L0523	1	Gasket, bottom cover
41	620L0524	10	Machine bolt
42	522C1219	3	Washer
44	551D0121	1	Saddle
45	510A1208	4	Nut
46	008E6791	1	Engine support
49	620L0551	1	Connecting rod with screws
50	620L0554	2	Connecting rod screw
51	620L0555	1	Connecting rod bearing, std.
51	620L0686	1	Connecting rod bearing 0,25
51	620L0687	1	Connecting rod bearing 0,50
51	620L0688	1	Connecting rod bearing 0,75
52	620L0553	1	Connecting rod liner
53	620L0689	1	Piston cpl. ø 85 mm
53	620L0690	1	Piston cpl. ø 85,5 mm
53	620L0691	1	Piston cpl. ø 86 mm
53	620L0692	1	Piston cpl. ø 86,5 mm
54	620L0560	1	Piston pin
55	620L0559	2	Locking ring
56	620L0558	1	Piston ring set std. ø 85
56	620L0693	1	Piston ring set std. ø 85,5
56	620L0694	1	Piston ring set std. ø 86
56	620L0695	1	Piston ring set std. ø 86,5
56	037D4201	1	Set of gaskets cpl. (not ill.)
56	037D4202	1	Set of gaskets for valve grinding (not ill.)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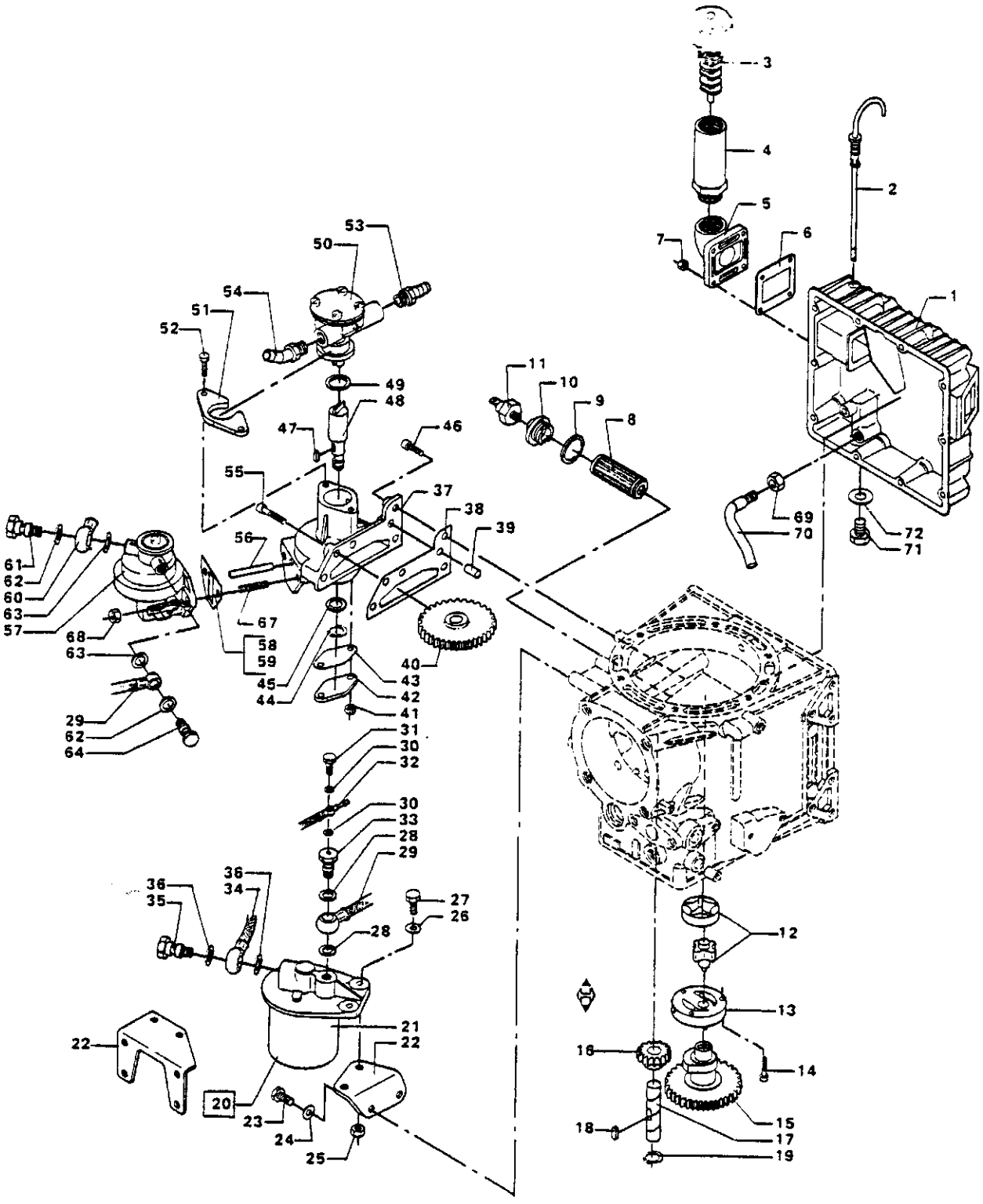
Pos. No.	Part No.	DV8 SME Qty.	Description
1	000E6198	1	Cylinder
2	539A0162	3	Cover lid, rustproof
3	000E6423	1	Gasket, crank case-cyl.
4	000E6339	1	Gasket for cylinder head
5	620L0658	2	Push rod
6	008E7009	1	Engine support at cylinder
7	000E7018	2	Distance piece
8	500C2413	4	Set screw
9	500C2419	2	Set screw
10	522F1023	6	Spring washer
12	620L0569	1	Inlet valve
13	620L0570	1	Exhaust valve
14	037D0401	1	Decompression handle
15	620L0589	1	Cylindric pin
16	620L0588	1	Clamping pin
17	620L0586	1	O-ring for valve lifter
18	620L0587	1	Spring f. valve lifter
19	620L0585	1	Valve lifter
20	000E6454	1	Gasket for water inlet
21	008E6638	1	Flange for cooling water inlet
22	500C2315	2	Set screw
23	620L0567	1	Clamping pin
24	620L0561	1	Valve guide, inlet
25	620L0563	1	Valve guide, exhaust
26	620L0571	2	Locking ring
27	620L0566	1	Spring guide, inlet
28	620L0568	1	Spring guide, exhaust
29	620L0572	2	Valve spring
30	620L0573	2	Spring guide, upper
31	620L0574	2	Lock for valve
32	620L0576	1	Rocker arm, inlet
33	620L0580	1	Rocker arm, exhaust
34	620L0581	1	Rocker arm shaft
35	620L0582	2	O-ring for rocker arm shaft
36	620L0583	1	Locking screw for shaft
37	620L0591	1	Gasket for valve cover
38	620L0590	1	Valve cover
39	522C1219	2	Washer
40	500C2311	2	Set screw
41	000E6331	4	Stud for cyl. head
42	000E4557	4	Washer
43	510A1210	4	Nut
44	009R2010	1	Plug 1/8 PT
45	522C3012	1	Gasket, copper
46	000E6440	1	Guide ring f. cylinder
47	000E6851	1	Toggle arm f. reverse
48	000E6852	2	Bearing bush
49	522C1219	1	Washer
50	500D2316	1	Machine bolt
51	511A2207	1	Nut, self-locking
52	544A0320	1	Clamp
53	000E6855	1	Cable holder
54	502D2208	1	Cyl. head slotted screw
55	522C0813	1	Washer
56	510A1205	1	Nut
57	522F1015	2	Spring washer
58	500C2258	2	Set screw
59	037D0402	1	Cylinder head compl.
60	620L0577	2	Adjusting screw for rocker arms
61	620L0578	2	Nut for adjusting screw

3) Up to s/n 800425

4) From s/n: 800426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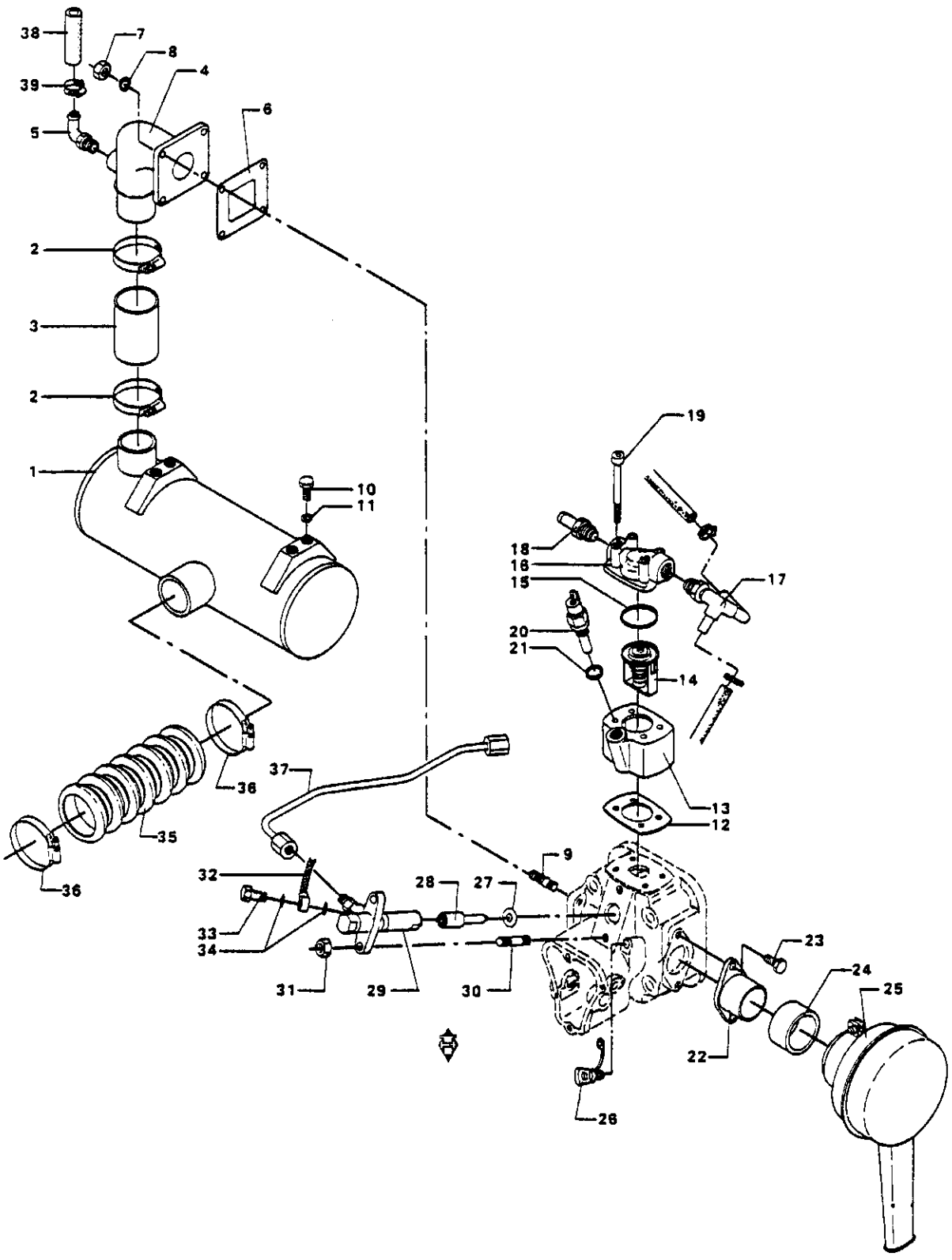
Pos. No.	Part No.	DV8 SME Qty.	Description
1	037D0202	1	Oil sump
2	620L0529	1	Dip stick
3	620L0534	1	Cover cpl. f. breather pipe
4	620L0533	1	Intermidiate pipe
5	620L0530	1	Elbow for breather pipe
6	620L0531	1	Gasket for elbow
7	510A1207	4	Nut
8	620L0668	1	Lubricating oil filter
9	620L0670	1	Gasket
10	000E6543	1	Locking screw f. oil filter
11	552J0970	1	Oil pressure switch
12	620L0662	1	Impeller set cpl. w/shaft
13	620L0665	1	Cover for oil pump
14	620L0666	3	Unbraco screw
15	620L0659	1	Injection cam
16	620L0544	1	Intermediate wheel
17	620L0545	1	Intermediate shaft
18	620L0538	1	Key
19	620L0546	1	Locking ring
20	620L0617	1	Fuel filter cpl.
21	620L0618	1	Fuel cartridge
22	000E6924	1	Bracket f. fuel filter
23	500C2363	2	Set screw
24	522F1020	2	Spring washer
25	510A1208	2	Nut
26	522C1223	2	Washer
27	500C2365	2	Set screw
28	522C3020	2	Gasket, copper
29	008E7001	1	Hose connection
30	522C3008	2	Gasket, copper
31	008E6748	1	Banjo bolt
32	008E7003	1	Hose connection
33	000E6742	1	Banjo bolt
34	008E7002	1	Hose connection
35	531Z0054	1	Banjo bolt
36	522C3020	2	Gasket, copper
37	620L0535	1	Housing f. water pump pinion
38	620L0548	1	Gasket for housing
39	620L0547	1	Cylindric pin
40	620L0536	1	Gear wheel f. water pump pinion
41	620L0543	2	Nut
42	620L0541	1	Cover
43	620L0542	1	Gasket for cover
44	620L0540	1	Locking ring
45	620L0539	1	Washer
46	620L0649	2	Unbraco screw
47	620L0538	1	Key
48	620L0537	1	Shaft f. water pump pinion
49	620L0674	1	Seal ring
50	610G0100	1	❑ Cooling water pump
51	000E4312	1	Flange
52	500C2365	2	Set screw
53	532V0047	1	Hose nipple
54	532V0434	1	Elbow hose nipple
55	620L0550	2	Unbraco screw
56	620L0614	1	Push rod f. fuel lift pump
57	620L0613	1	A Fuel lift pump, FISPA
58	620L0615	1	Gasket for fuel lift pump
59	620L0616	2	Gasket for fuel lift pump
60	531Z0072	1	Hose connection
61	531Z0160	2	Banjo bolt
62	522C3016	2	Gasket, copper
63	522C3015	2	Gasket, copper
64	531Z0160	2	Banjo bolt
67	620L0612	2	Stud
68	620L0517	2	Nut
69	620L0661	1	Counter nut
70	620L0660	1	Oil inlet pipe
71	620L0525	1	Closing screw
72	620L0526	1	Gasket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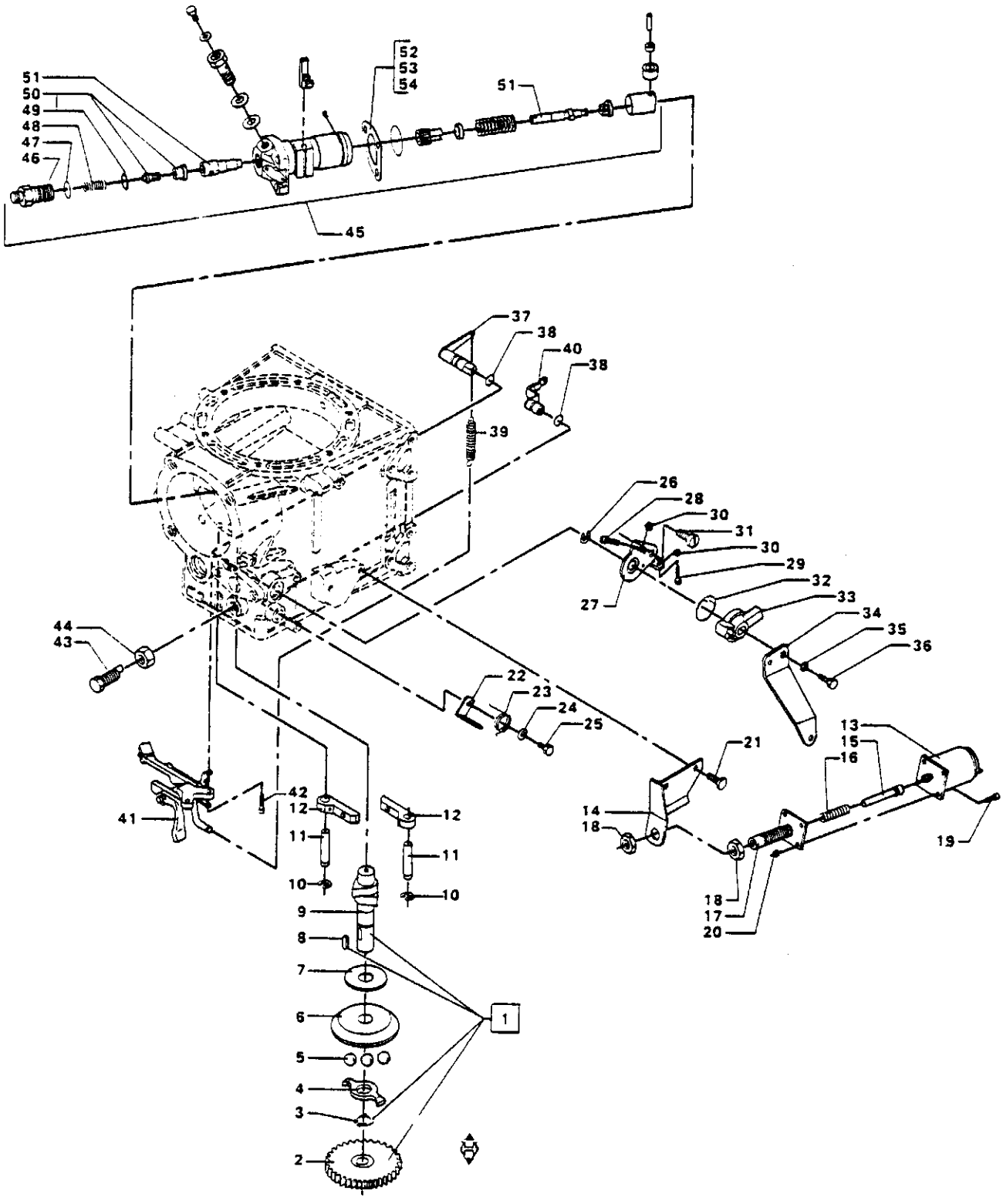
Pos. No.	Part No.	DV8 SME Qty.	Description
1	008E7004	1	Water lock muffler
2	569A0030	2	Clamping ring, rustproof
3	530Q0146	1	Rubber hose, 7 cm
4	000E7005	1	Exhaust elbow
5	532V0333	1	Elbow hose nipple
6	000D9762	1	Gasket for exhaust
7	510A3208	4	Nut
8	522F1020	4	Spring washer
9	503N2363	4	Stud
10	500E2363	4	Set screw
11	522F1020	4	Spring washer
12	000E1851	1	Gasket for thermostat housing
13	000E3680	1	Housing for thermostat
14	008E6577	1	Thermostat, direct cooling
15	000E2584	1	Gasket for thermostat
16	008E5947	1	Cover for thermostat housing
17	008E6673	1	Distributor pipe
18	532V1818	1	Hose nipple
19	501A2326	4	Unbraco screw
20	552J0919	1	Temperature switch
21	522C3020	1	Gasket, copper
22	008E6373	1	Inlet pipe
23	500C2363	2	Set screw
24	000E7013	1	Bush for air filter
25	008E6532	1	Air filter with screw
26	620L0592	1	Rubber plug
27	620L0599	1	Gasket for nozzle
28	620L0594	1	❐) Nozzle BOSCH
28	620L0711	1	❐) Nozzle CIPA
29	620L0593	1	Injector cpl.
29	620L0710	1	Injector cpl.
30	503N2367	2	Stud
31	510A1208	2	Nut
32	008E7003	1	Hose connection
33	620L0597	1	Banjo bolt
34	620L0598	2	Gasket
35	530Q0175	1	Accordion hose, 15 cm
36	569A0030	2	Clamping ring, rustproof
37	620L0671	1	Fuel pressure pipe
38	530P0011	1	27 cm Hose
39	569A0015	2	Clamping ring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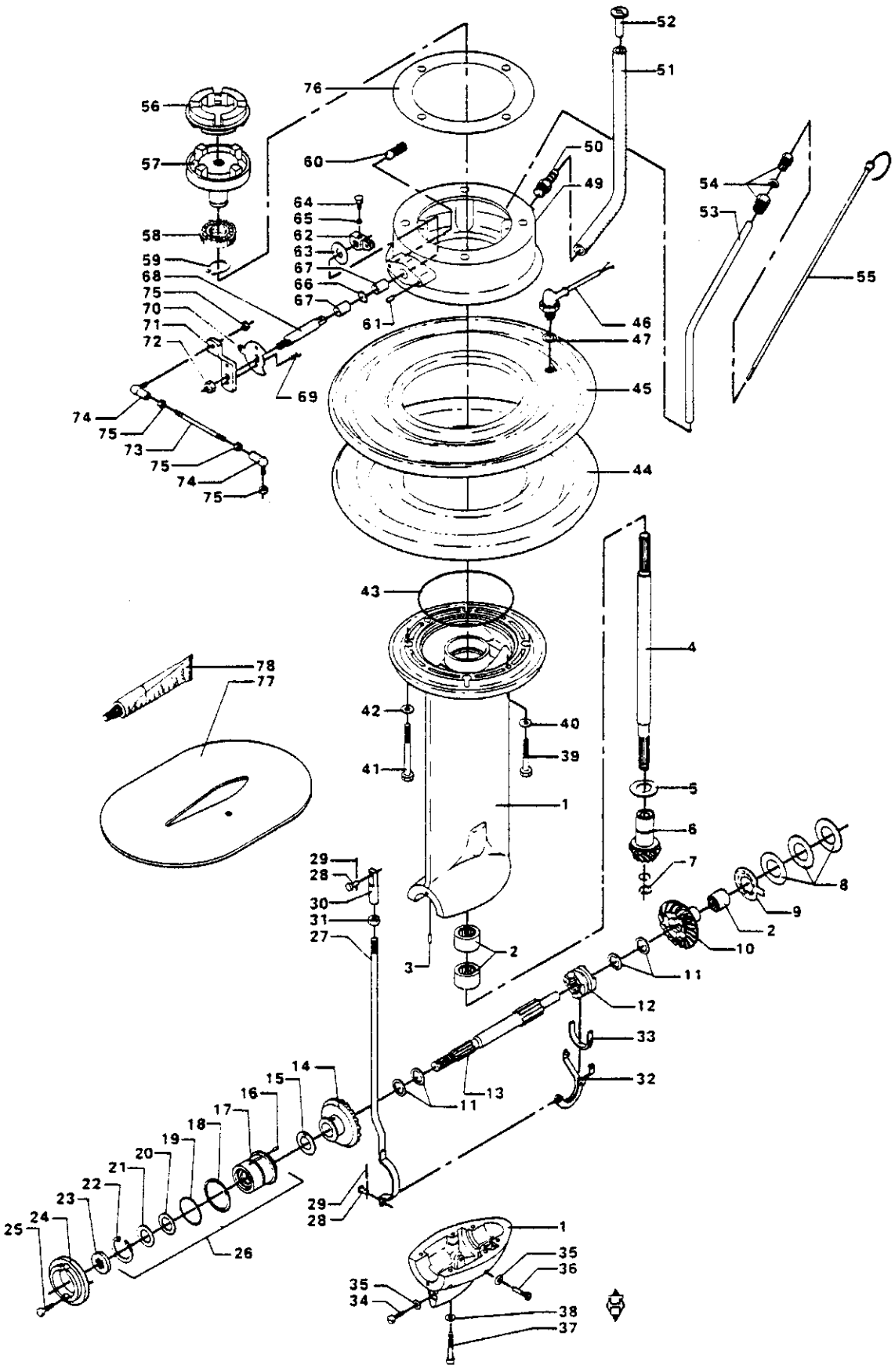
Pos. No.	Part No.	DV8 SME Qty.	Description
1	037D0801	1	Cam shaft, cpl.
2	620L0654	1	Timing gear f. cam shaft
3	620L0652	1	Locking ring
4	620L0622	1	Driver for balls
5	620L0621	8	Ball for governor
6	620L0620	1	Ball cup for governor
7	620L0619	1	Thrust washer for governor
8	620L0653	1	Key
9	620L0651	1	Cam shaft
10	620L0657	2	Locking ring
11	620L0655	2	Axle journal
12	620L0656	2	Guide for push rod
13	612E0060	1	Stop solinoid, 12V
14	008E6870	1	Bracket for stop magnet
15	000E2919	1	Stop pin for governor
16	000C1508	1	Spring for reversing handle
17	008E2347	1	Bracket for stop magnet
18	51082307	2	Nut, low
19	501A2258	4	Unbraco screw
20	510A1206	4	Nut
21	501P2359	2	Button-headed screw
22	000E6879	1	Stop lever
23	620L0640	1	Return spring for stop lever
24	522C1219	1	Washer
25	500C2308	1	Set screw
26	620L0632	1	Locking ring
27	620L0633	1	Stop plate f. adjusting
28	620L0635	1	Slotted screw
29	620L0636	1	Slotted screw
30	620L0543	2	Nut
31	620L0634	1	Slotted screw
32	620L0637	1	Spring for adjusting
33	620L0638	1	Throttle lever
34	000E6854	1	Throttle lever
35	522F1017	1	Spring washer
36	500C2311	1	Set screw
37	620L0630	1	Governor shaft w/arm
38	620L0631	2	O-ring
39	620L0629	1	Governor spring
40	620L0681	1	Stop arm incl. O-ring
41	620L0675	1	Governor arm cpl.
42	620L0628	2	Unbraco screw
43	620L0673	1	Eccentric f. full-load stop
44	620L0682	1	Counter nut
45	620L0600	1	Injection pump CIPA
46	620L0601	1	Pressure pipe nipple
47	620L0602	1	O-ring f. pressure pipe nipple
48	620L0603	1	Spring for pressure valve
49	620L0604	1	Seal ring f. pressure valve
50	620L0605	1	Pressure valve
51	620L0606	1	Pumping element
52	620L0609	1	Adjusting plate 0.1 mm
53	620L0610	1	Adjusting plate 0.2 mm
54	620L0611	1	Adjusting plate 0.3 mm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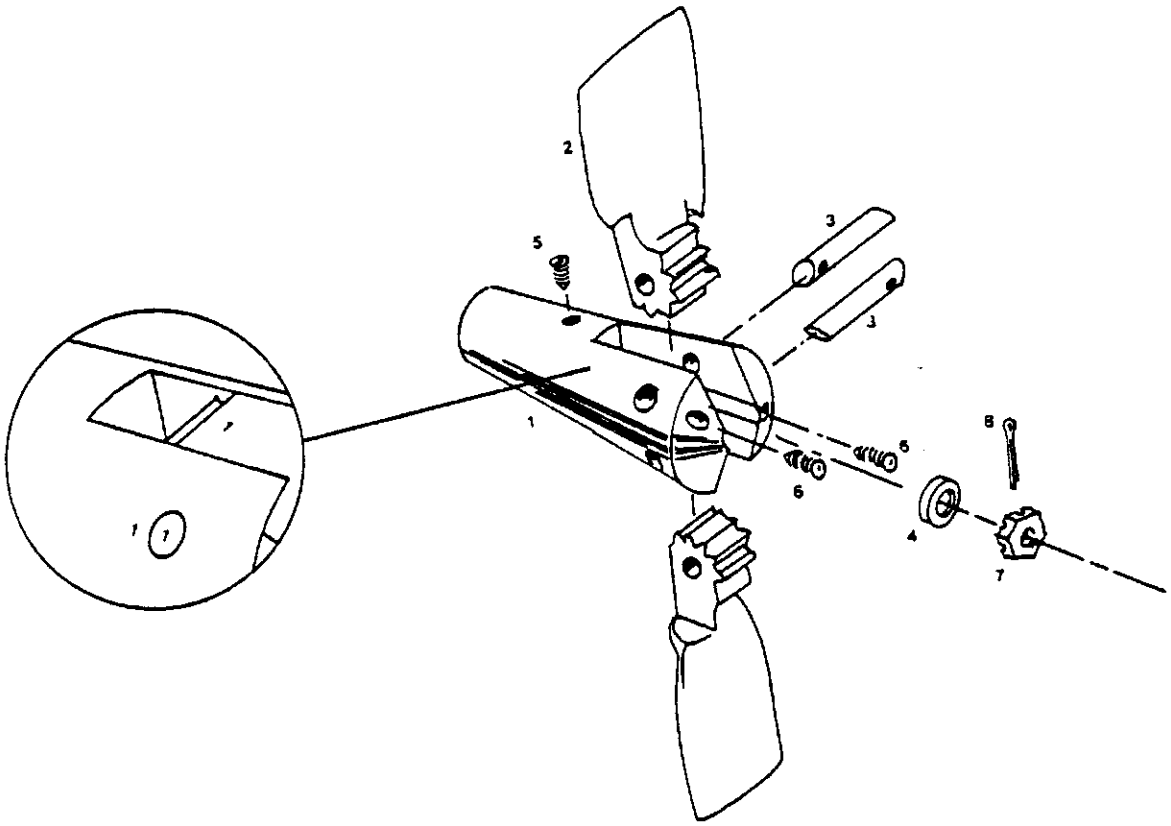
Pos. No.	Part No.	DV8 SME Qty.	Description
1	008E6300	1	Propeller housing
2	620A2102	3	Needle bearing
3	620A2109	1	Clamping pin
4	000E6344	1	Intermediate shaft
5	620A2157		□) Washer 0,1
5	620A2158		□) Washer 0,2
6	620A2101	1	Gear wheel
7	522A1012	1	Circlip for shaft
8	620A2161		□) Washer 0,5
8	620A2162		□) Washer 0,1
8	620A2165		□) Washer 1,0
8	620A2163		□) Washer 1,5
8	620A2164		□) Washer 2,0
9	620A2103	1	Thrust washer, front
10	620A2104	1	Gear wheel, ahead
11	620A2151		□) Washer 0,1
11	620A2155		□) Washer 0,7
11	620A2154		□) Washer 1,0
11	620A2152		□) Washer 1,5
11	620A2153		□) Washer 0,5
12	620A2105	1	Claw clutch
13	620A2106	1	Propeller shaft
14	620A2107	1	Gearwheel, reverse
15	620A2108	1	Thrust washer, rear
16	620A2109	1	Clamping pin
17	620A2110	1	Bearing housing
18	620A2167		□) Washer 0,1
18	620A2168		□) Washer 1,5
18	620A2169		□) Washer 2,0
19	620A2114	1	O-ring
20	620A2111	1	Seal ring
21	620A2112	1	Washer
22	620A2113	1	Locking ring
23	620A2115	1	Stop washer
24	000E6345	1	Zinc anode
25	502U2259	2	Slotted screw, rustproof
26	620A2123	1	Bearing housing cpl.
27	000E6346	1	Lever for reverse
28	620A2117	2	Key bolt
29	520J0205	2	Split pin
30	000E6347	1	Connecting piece
31	510A1207	1	Nut
32	620A2118	1	Shifter fork
33	620A2119	1	Clamp for fork
34	502U2308	1	Slotted screw, rustproof
35	522C5006	2	Gasket
36	620A2120	1	Screw for fork
37	501G2316	6	Unbraco screw
38	522C4019	6	Washer
39	500K2368	2	Machine bolt, rustproof
40	522C4121	2	Washer, rustproof
41	500K2428	4	Machine bolt, rustproof
42	522C4123	4	Washer, rustproof
43	560K1124	1	O-ring
44	000E5822	1	Rubber membrane, lower
45	008E5821	1	Rubber membrane, upper
46	008E5838	1	Sensing element f. membrane
47	522C3023	1	Gasket, copper
49	000E6310	1	Intermediate piece
50	532V0047	1	Hose nipple
51	530P0011	1	Fuel hose, 32,5 cm
52	539K0102	1	Plug, long, Gottfred
53	000E6896	1	Pipe for dip stick
54	532V1314	1	Leading-in pipe f. tank
55	008E6890	1	Dip stick cpl.
56	620H0202	1	Clutch element
57	000E6343	1	Clutch half for drive
58	545A4672	1	Ball bearing SKF
59	522A1025	1	Circlip
60	522V1012	1	Ball lock, rustproof
61	520H0457	1	Retaining pin
62	620A2122	1	Arm
63	522C0229	1	Washer
64	500C2311	1	Set screw
65	522F1017	1	Spring washer
66	560F0011	1	O-ring
67	545X0324	2	Oil bronze bearing
68	000E7050	1	Reversing shaft
69	502L2207	2	Slotted screw, rustproof
70	620A2121	1	Position plate
71	000E7049	1	Reversing lever
72	511A2208	1	Nut, self-locking
73	000E6856	1	Connecting rod
74	541A2002	2	Ball joint
75	510A1206	4	Nut
76	000E6639	1	Gasket
77	000E6921	1	Skin fitting
78	523A0000	1	Glue

□) Acording to requirement

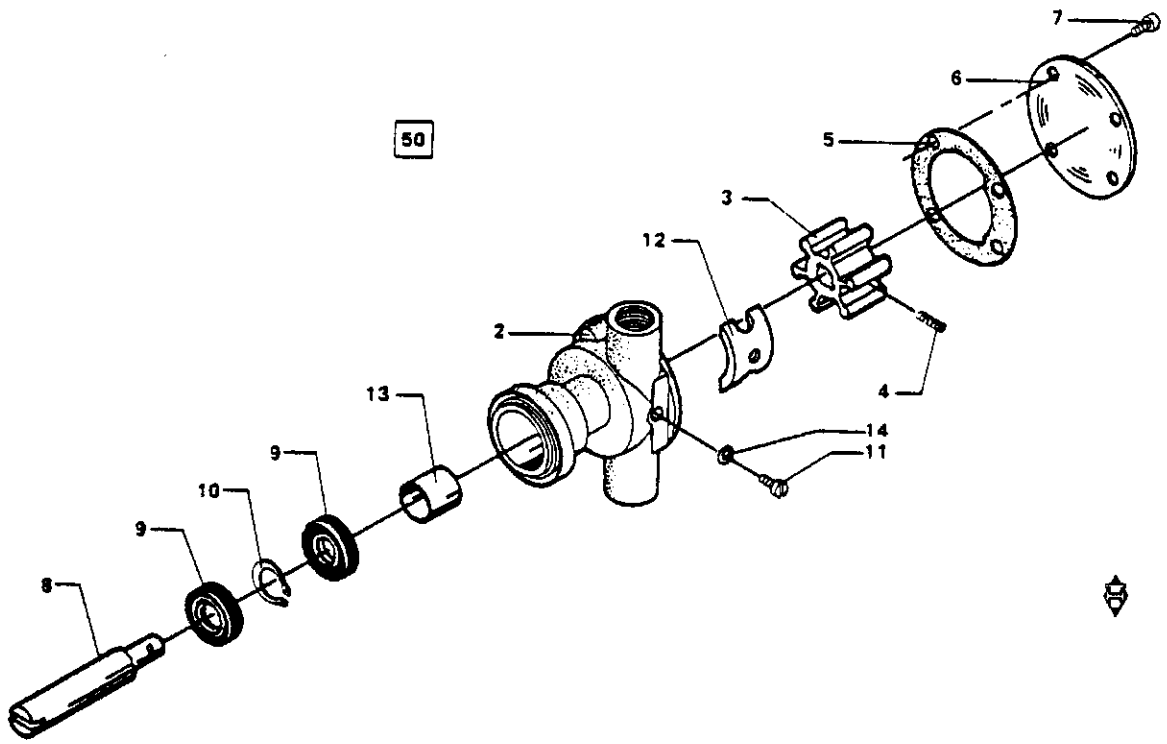
Gori Propeller Fitting Instructions



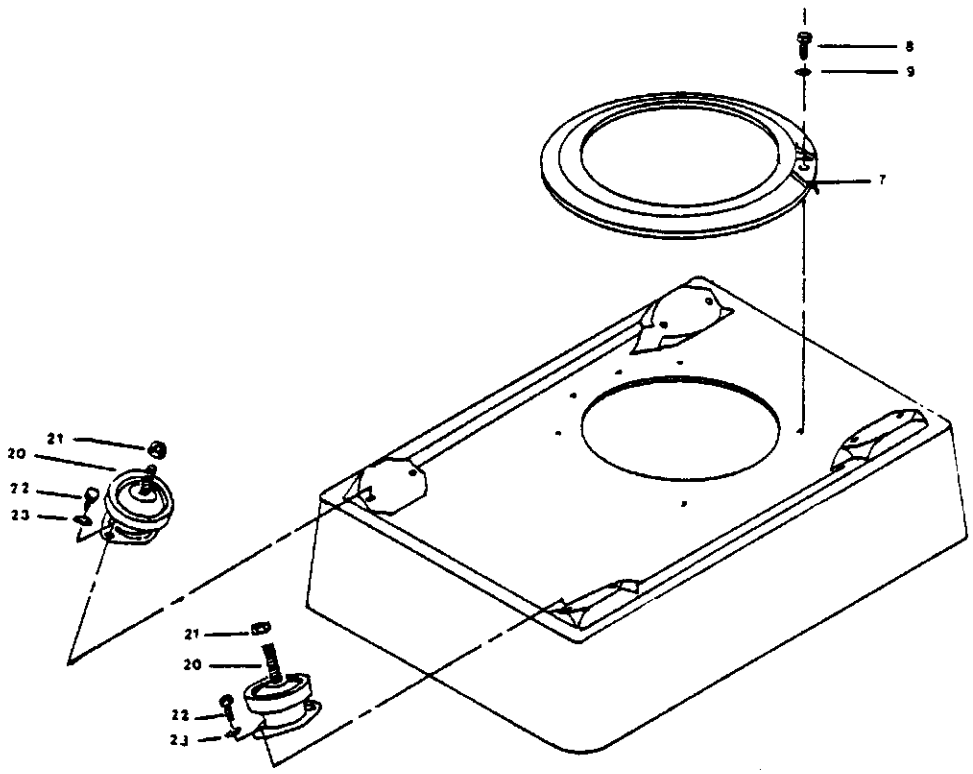
1. Hub
2. Blades
3. Hinge pins
4. Plastic spacer
5. & 6. Allen screws
7. Slotted nut
8. Split pin

Take the propeller apart.
Grease the drive shaft with water resistant grease.
Mount hub, install lockwasher and nut, tighten nut finger tight until one of the recesses in the nut is flush with the hole in drive shaft. (Note: Nut appears to on "backwards" as slots are against plastic spacer)

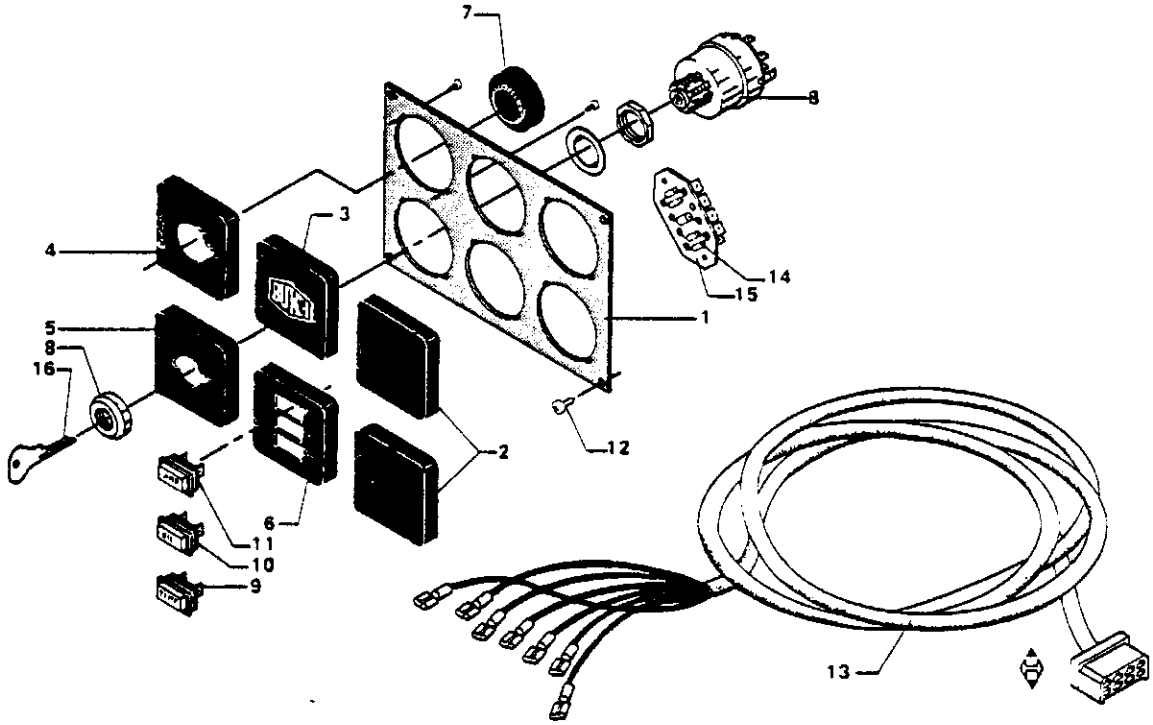
Insert and secure split pin.
Check that the hub is not jammed on the shaft.
Grease the blade shoulders and gears, then install using the hinge pins.
Align numbers on pins and hub (see inset).
Smear the Allen screws and corresponding holes with Locktite and install, tighten carefully.
Check that the blades open and close freely.



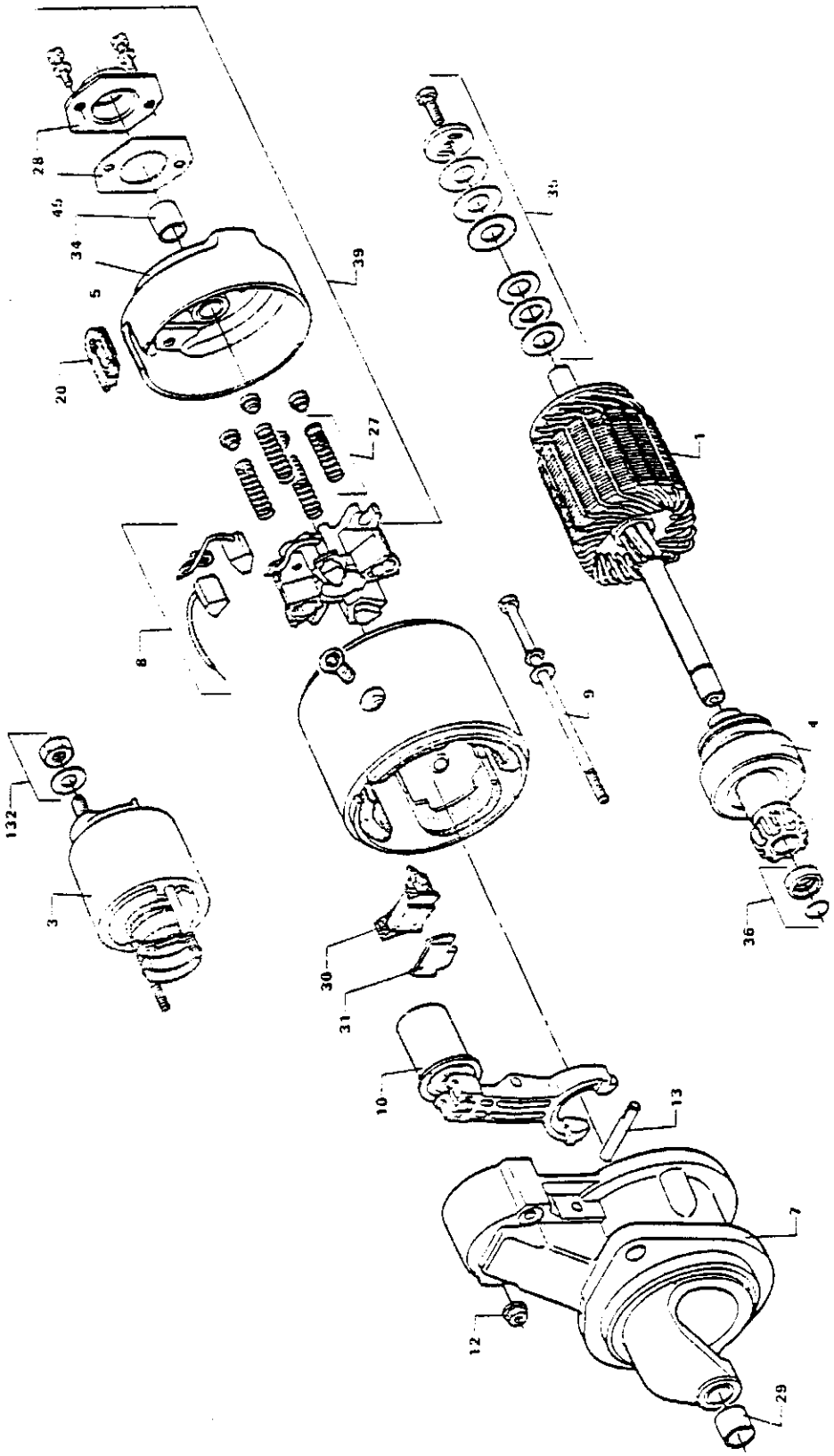
Pos. No.	Part No.	DV8 DV10/20 Qty.	Description	Pos. No.	Part No.	DV8 DV10/20 DV36/48 Qty.	Description
50	610G0100	1	Cooling water pump complete	9	56180127	2	x) Seal ring
2	610G0101	1	Pump housing	10	610G0109	1	x) Circlip
3	610G0102	1	x) Impeller with bush	11	502K0303	1	x) Screw
4	503D0162	1	x) Screw	12	610G0106	1	x) Cam
5	610G0103	1	x) Gasket	13	610G0107	1	Bush
6	610G0104	1	x) Cover	14	522C3001	1	x) Gasket copper
7	502J2207	4	Screw		610G0108	1	Repair kit
8	610G0105	1	x) Shaft				x) Parts, which form part of repair kit



Pos. No.	Part No.	DV8 SME Qty.	Description
7	000E6048	1	Ring for membrane
8	500K2366	12	Set screw, rustproof
9	522C4121	12	Washer, rustproof
20	541E0926	4	Flex. supports
21	511A2212	8	Nut, galvanized
22	500K2415	8	Set screw, rustproof
23	522C4123	8	Washer, rustproof



Pos. No.	Part No.		Description
1	000E4555	1	Control panel
2	552T0052	2	Blind flange
3	000E4703	1	Blind flange w/name plate
4	000E7029	1	Cover w/hole for alarm
5	000E4701	1	Cover w/hole f. key contact
6	000E4700	1	Cover w/holes
7	552J0930	1	Audible alarm
8	552K0006	1	Ignition switch w/keys
9	552A0350	1	Warning light (blue)
10	552A0352	1	Warning light (orange)
11	552A0353	1	Warning light (red)
12	502M9330	4	Self-tapping screw
13	030D2301	1	Bundle of cables f. control panel
14	008E7347	1	Distributor plate
15	502M9209	2	Self-tapping screw
16	612Z0499	2	Key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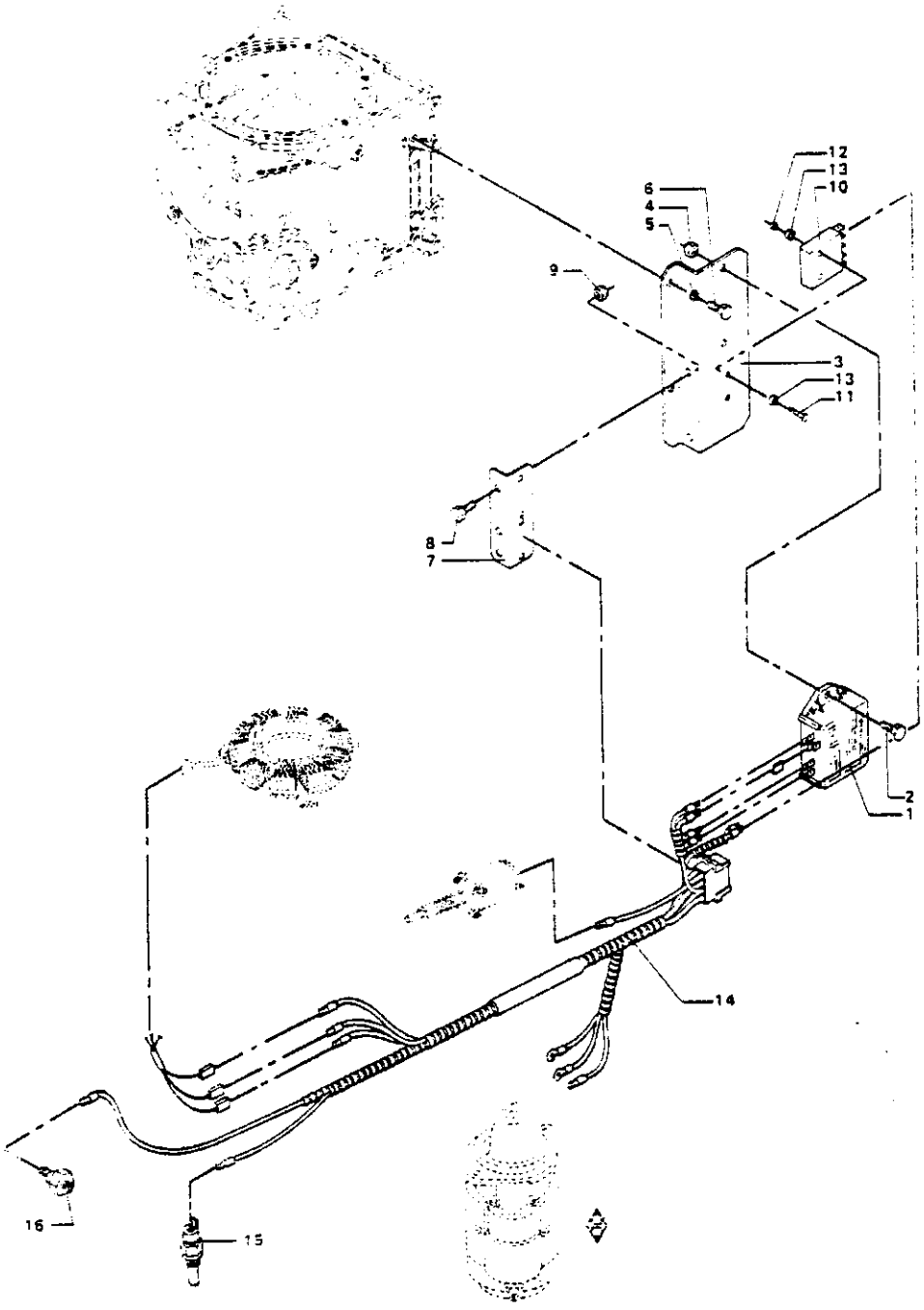
Pos. No.	Part No.	DV8 Qty.	Description
	612A1700	1	Starting motor
1	612A1701	1	Armature
2	612A1652	1	Field coil set
3	612A1653	1	Relay
4	612A1702	1	Starting drive
5	612A1655	1	End cover at commutator with bushing
7	612A1703	1	Bearing cover
8	612A1657	1	Brush set
9	612A1658	1	Through bolt
10	612A1704	1	Shift lever, compl.
12	612A1705	1	Bolt with nut f. coil housing
13	612A1661	1	Shift lever axle
20	612A1662	1	Rubber fitting
24	612A1663	1	Pole shoe screw
27	612A1664	1	Brush spring
28	612A1665	1	Cover for bearing
29	612A1666	1	Drive end bushing
30	612A1667	1	Rubber gasket
31	612A1668	1	Gasket plate, sheet iron
34	612A1669	1	Commutator end shield bushing
35	612A1670	1	Armature brake assembly
36	612A1671	1	Pinion stop assembly
39	612A1672	1	Brush holder ring, assembly
45	612A1673	1	Gasket
132	612A1674	1	Screw set for terminal



Pos. No.	Part No.	DV8 SME Qty.	Description	Pos. No.	Part No.	DV8 SME Qty.	Description
1	612J0020	1	Charging regulator	9	511A2208	2	Nut, self-locking
2	500C2363	2	Set screw	10	008E5840	1	Control box
3	000E6907	1	Bracket f. charging regulator	11	500D2265	2	Machine bolt
4	511A2208	2	Nut, self-locking	12	510A1206	2	Nut
5	522F1020	2	Spring washer	13	522C5055	4	Ring DUBO, nylon
6	500C2361	2	Set screw	14	008E6906	1	Harness cpl.
7	000E5174	1	Bracket f. multiple plug	15	552J0919	1	Temperature switch
8	500C2361	2	Set screw	16	552J0970	1	Oil pressure switch

Engine Electrical System

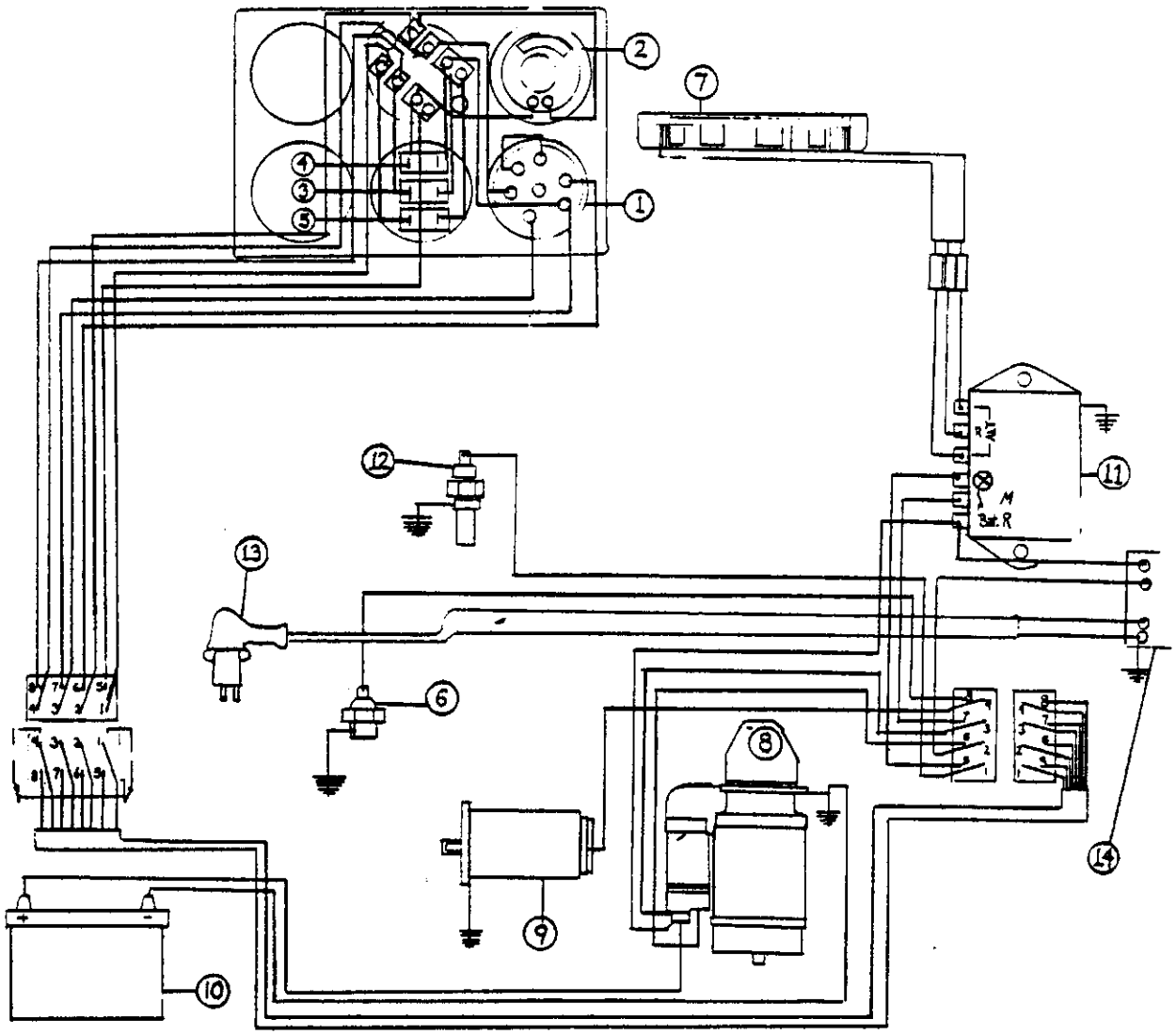
The alternator is under the flywheel.

The maximum charging current of the alternator is 15 amp.

As shown below, the regulator should always be connected to the battery when the engine is running.

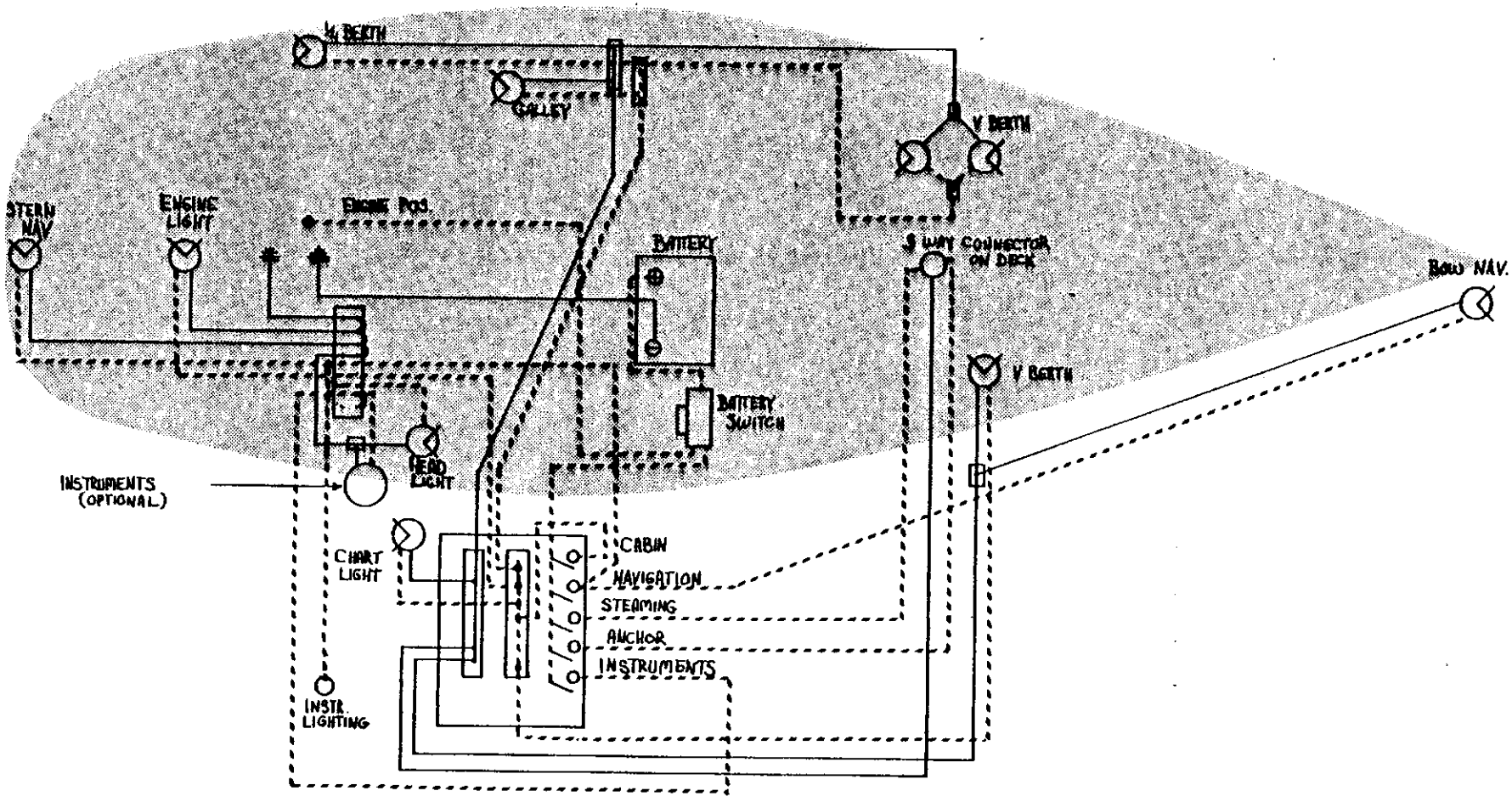
When two batteries are installed, keep both batteries switched **on** so charging is equally distributed!

The electrolyte level should always be 5-6 mm above the plates in the battery; if not the case, top off with distilled water.



1. Key Switch
2. Acoustic Alarm
3. Warning Light/Oil Pressure
4. Warning Light/Electrical Charge
5. Warning Light/Water Temperature
6. Switch for Oil Pressure
7. Alternator
8. Starter Motor
9. Stop Solenoid
10. Battery
11. Regulator
12. Cooling Water Switch
13. Sensing Element for Membrane
14. Control Box

ELECTRICAL SYSTEM

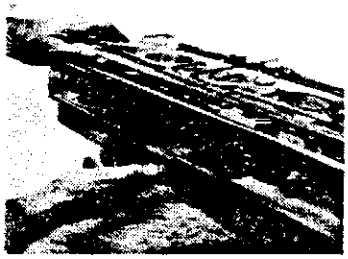


Origo 3000

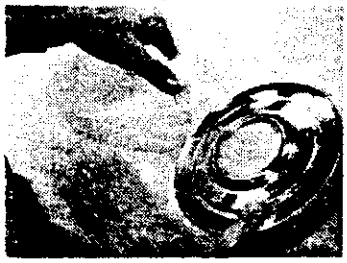
This stove is a non-pressurized alcohol type with the fuel absorbed in a non-flammable pulp. There are no valves to develop leaks or other components in needs of regular service.

As always, when working with an open flame, certain precautions are required. Please follow these instructions before using.

If an accident should occur, remember that burning alcohol can be extinguished with water.



To open stove
Turn knobs to 0 position, burner opening fully covered. Pull the forward lower edge of the stove top slightly forward while pressing the catch **PRESS.**



To fill
Tank must not be filled near open flame or other heat source. Lift out tank unit, be sure it is cool, then hold tank as shown in the second photo and pour fuel directly into opening covered by wire mesh.

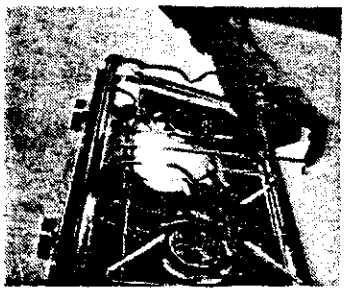
During use, the tank is heated causing fuel to expand. It is therefore important not to overfill tank. Check quantity by raising tank to vertical. When fuel is visible in recess, stop filling.

After filling, make certain no excess fuel remains in stove. Always wipe tanks dry. Seat tank(s) securely in their retainers so that top closes completely.

To light
Turn knob counter-clockwise to open burner. Place a lighted match at burner opening (match can be dropped in and removed at next filling). If stove is warm (from previous use), burner may ignite suddenly and simultaneously snuff itself out. If this happens, blow down into burner opening to dissipate vapor and re-light.

Winterize stove by burning remaining fuel.

To extinguish
Turn regulator knob clockwise.



To clean
At the back of the stove is an oblong hole. To remove grid, slide hook out of this retaining hole and grid can be lifted off.

Tank capacity:
approximately 2.5 pints each tank
Fuel:
denatured alcohol, methylated spirits

CAUTION: TO BE USED ONLY WITH DENATURED ALCOHOL.
MUST NEVER BE USED WITH GASOLINE, KEROSENE, DIESEL OR ANY OTHER TYPE OF FUEL.

Gelcoat Repairs

SCRATCHES in the gelcoat surface can often be eliminated by wet sanding. Use 400, 600, 800 then 1000 grade, wet sandpaper wrapped around a wooden block. If a dark-coloured tinge begins to appear, stop sanding; you are wearing through the gelcoat and getting too close to the fiberglass. Polish the sanded area with a rubbing compound (available from hardware stores for cleaning and polishing cars).

DEEPER GOUGES AND DENTS require filling with gelcoat. Done properly, these repairs are quick, simple and inexpensive, but please read these instructions carefully and completely before attempting any repairs.

Tools and materials required:

Chisel
Dry sandpaper, grade 60 or 80
Clean rags
Paper cup or other non-metallic disposable container
Gelcoat, available from your dealer
Catalyst (hardener), sold at hardware stores (MEK Peroxide 60%)
Wooden spatula or coffee sticks
Transparent tape, preferably one inch or wider
Wet sandpaper, grade 400, 600, 800 and 1000
Sanding block
Bucket of water
Polishing compound

1. Eliminate all loose gelcoat with chisel; only take off loose material.
2. Sand areas with dry sandpaper to provide rough surface, including at least one inch of undamaged gelcoat all around.
3. Clean area thoroughly of dust and loose particles.
4. Fill at least half a paper cup with gelcoat and add 2 parts catalyst to 100 parts gelcoat. That's about half a teaspoon to half a cup (4 fluid ounces). Mix thoroughly with the wooden coffee stick for at least two minutes.

The catalyst sets off a chemical reaction which will progressively harden the gelcoat. The time required will vary with the ambient temperature and humidity, and the amount of catalyst in the gelcoat. The warmer it is, the faster the reaction. (Under 10°C (50°F) reaction may be very slow and additional catalyst needed.) Let gelcoat sit in cup for about 5 minutes to start reaction going.

WARNING: *Avoid catalyst contamination with other materials. Avoid catalyst contact with skin and clothing. Should this accidentally happen, flush with plenty of water. If eyes are affected seek medical attention as soon as possible after immediate and prolonged flushing with water.*

5. Apply gelcoat with wooden spatula or coffee stick until the area is evenly covered.
   On horizontal surface: Smooth out to a slightly raised surface over the entire area.
   On sloping or vertical surfaces: To keep the gelcoat from dripping, cover small patches with Saran wrap or, for larger areas, add a spoonful of talcum or baby powder to the gelcoat/catalyst mixture to give it a firmer consistency. This will lighten the color of the gelcoat, but makes the application much easier.
   Let gelcoat harden for 30 to 45 minutes.
   Fill the cup of leftover gelcoat with water and let it cool down completely before throwing it away. Catalyzed gelcoat in a large mass can generate enough heat to cause combustion and is a source of many "fiberglass fires".

6. Remove all the wrap. If not covered with wrap, a thin layer which is only on the surface of the patch will still be tacky as gelcoat does not cure in the presence of air. The rest should now be hard. Scrape off any tacky gelcoat with the chisel and start sanding with the 400 grade wet sandpaper dipped frequently in water; continue with 600, 800 and finally 1000. If only 600 grade is available, use it with lots of water – you will have to polish with compound a little longer to obtain a perfect finish. Wrapping the sandpaper around a small wooden block will help fairing the patch into the hull, Check the patch constantly while sanding, if a dark-coloured tinge appears, stop sanding. You are wearing through the gelcoat and getting too close to the fiberglass.

7. Polish the patch with the polishing compound and a clean rag.

BOAT MAINTENANCE

HULL

The topsides of your boat will stay cleaner and resist fading if you apply a marine grade wax and then buff it out according to the manufacturer's instructions. Any nicks or deep scratches incurred in the gelcoat should be attended to as soon as possible. (See page 52 for gelcoat repair information). Prudence in docking and port tacking the fleet should keep these problems to a minimum.

ENGINE

When under sail, put engine shifter into gear, this eliminates free wheeling of the propellor. Note: you also might like to remove the shifter arm by pulling it straight out, so that your mainsheet doesn't get inter-twined with it.

PLUMBING SYSTEM

The plumbing system on board your Laser 28 uses non-return valves to prevent siphoning and to prevent water backing up through existing drains. We recommend these non-return valves be periodically removed and cleaned to ensure proper functioning. These non-return valves are 1/2" in diameter and 1 1/2" long and made of white plastic and are inserted into 1/2" PVC drain hoses. They will be found on the drainage hoses listed below:

1. Head sink (earlier models only)
2. Ice Box
3. Bilge pump
4. Sump pump for shower

FORWARD HATCH

The plastic latch cams used under the foward hatch for locking purposes are designed to break under excessive load, rather than breaking the Plexiglass-formed hatch. Please be careful when locking your hatch not to over-tighten the latch handles!

* * *

Sail Care

Often sail care is overlooked when putting a boat away. To protect your investment and your boat speed, please be good to your sails.

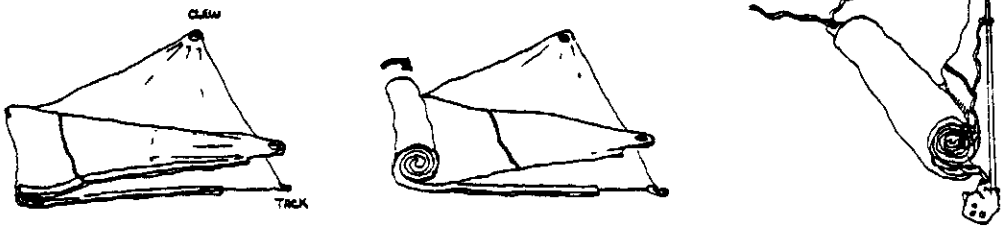
Main and Genoa

To store either on the boom or in the bag, flake these sails **loosely**, never quite on the same creases each time.

1. release main outhaul, when flaking on boom.
2. as with all sails, the drier the better.
3. watch for signs of chafe on main near spreaders, at batten pockets and at rings. If wear is occuring, add chafe patches or repair accordingly.

Jibs 100% and 106%

1. These sails are "yarn tempered" for optimum retention of sail shape. It is most important to dry thoroughly and they must not be stored under compression.
2. Fold very loosely or much better yet roll them, (which makes them easy to set (see diagram) when brought on deck in tube bags).



Halyard Tension

Never over tension halyards, outhauls or sheets, as such tension will stretch bolt ropes, put undue strain on patches, rings, make sail shape look lousy and possibly do permanent damage to sail shape.

Spinnakers

1. Keep spinnakers stored in a cool dry environment (the back seat of a hot auto will "cook" a spinnaker's "stabilkote" finish.
2. After using, dry spinnakers as thoroughly as possible to prevent bleeding of colours as well as the growth of mildew.
3. Don't stuff a 'chute into too small of a bag or turtle as it will damage the coated cloth. It will also make the chute smaller when hoisted in light air.

Rips and Tears

The largest cause of sail damage is snagging on rigging that should be padded and properly taped. Be sure all cotter pins, wire ends and anything else potentially "sharp" is protected.

Sail Repair

By promptly fixing small tears, one may save themselves a lot of money. In 25 knots of breeze, that ¾" tear in a spinnaker could suddenly become a $100.00 repair, it could also considerably change your status while racing.

Keep plenty of Rip stop and "sticky back" tape on board (available through sailmakers). In a pinch, duct tape will work, but before the problem intensifies, have it corrected properly.