

YANMAR

OPERATION MANUAL

MARINE DIESEL ENGINE

CHALLENGER'S MODEL ★

4JH2E

4JH2-TE ★

4JH2-HTE

4JH2-DTE

Thank you for purchasing your YANMAR DIESEL ENGINE

This manual describes the various engine parts and prescribes simple steps for normal engine maintenance.

Before starting up your new engine, we recommend that you read this manual carefully to insure proper handling and use. If you have any questions, please contact your nearest dealer or sales outlet.

Because of our continuing efforts to improve quality and performance, engine parts may sometimes be changed. This may result in some discrepancies in this manual.

CAUTION

This safety alert symbol indicates important safety messages. To insure the safest possible operation, carefully read the message that follows.



IMPORTANT

This stop symbol indicates important operation information. To insure maximum performance, carefully read the message that follows.

oil filter - yanmar # 129150-35150

Contents

I.	Specifications	1
	1-1. Engine specifications	1
	1-2. Marine gear specifications	1
II.	Names of parts	2
III.	Engine installation	4
	3-1. Inspection after unpacking	4
	3-2. Preparation of the engine foundation plate	4
	3-3. Engine installation	4
	3-4. Propeller, propeller shaft	5
	3-5. Cooling water supply device	5
	3-6. Fuel oil supply device	8
	3-7. Remote control	8
	3-8. Recommended battery capacity	9
IV.	After launching	10
V.	Fuel and lubricating oil	11
	5-1. Selection and handling of fuel oil	11
	5-2. Selection of lubricating oil	12
VI.	Starting the new engine for the first time	13
	6-1. Supply of fuel oil	13
	6-2. Supply of lubricating oil	13
	6-3. Bleeding air from the fuel system	15
	6-4. External inspection	15
	6-5. Checking the instrument panel alarm system	15
	6-6. Turning	16
VII.	Method of operation	18
	7-1. Starting	18
	7-2. Cautions after starting the engine	19
	7-3. Cautions during operation	19
	7-4. Stopping	21
VIII.	Storage	23
	8-1. Storing	23
	8-2. Removing engine from storage	23
IX.	Periodical inspection and maintenance	24
	9-1. Fuel oil system	25
	9-2. Lubricating oil system	28
	9-3. Cooling water system	29
	9-4. Inspection of engine body	30
	9-5. Washing the air intake silencer element	31
	9-6. Electrical equipment	31
	9-7. Inspecting the turbo-charger	32
X.	Trouble shooting	33
XI.	Fuel oil, lubricating oil and cooling water piping diagram	37
XII.	Electrical wiring diagram	40
XIII.	Optional device	44

To insure that you receive the proper parts, we need accurate data on your particular engine. The information needed is outlined in the illustration below.

For easy reference, please record the appropriate information in the spaces provided.

Engine Model Name Plate

MODEL	4JH2-DTE	• Your engine model	<input type="text"/>
CONT. RATING H.P.	80 / 3400 rpm		
SPEED OF PROPELLER SHAFT	rpm		
MAX. OUT PUT H.P.	88 / 3600 rpm	• Your engine number	<input type="text"/>
ENGINE NO.			

YANMAR DIESEL ENGINE
YANMAR DIESEL ENGINE CO., LTD.
MADE IN JAPAN

Marine Gear Model Name Plate

• KM4A

20
or
30

MODEL	KM4A	Yanmar marine gear model	<input type="text"/>
GEAR RATIO		Reduction ratio	<input type="text"/>
OIL	SAE 20/30 HD		
OIL QTY.	1.3 LTR	Yanmar marine gear number	<input type="text"/>
NO.			

KANZAKI
OSAKA JAPAN

• KBW21

MODEL	KBW21	Yanmar marine gear model	<input type="text"/>
GEAR RATIO		Reduction ratio	<input type="text"/>
OIL	ATF-A		
OIL QTY.	1.2 LTR.	Yanmar marine gear number	<input type="text"/>
NO.			

KANZAKI
OSAKA JAPAN

Marine Gear Model Name Plate

• KBW20

MODEL	KBW20	Yanmar marine gear model	<input type="text"/>
GEAR RATIO		Reduction ratio	<input type="text"/>
OIL	ATF-A		
OIL QTY.	1.2 LTR.	Yanmar marine gear number	<input type="text"/>
NO.			

KANZAKI
OSAKA JAPAN

• KM3P2

MODEL	KM 3 P 2	Yanmar marine gear model	<input type="text"/>
GEAR RATIO		Reduction ratio	<input type="text"/>
OIL	SAE 20/30 HD		
OIL QTY.	LTR.	Yanmar marine gear number	<input type="text"/>
NO.			

KANZAKI
OSAKA JAPAN.

Note: The outputs indicated on the engine name plate are continuous rating-DIN 6270A, and maximum output-DIN 6270B.

I. Specifications

1-1. Engine specifications

Model			4JH2E	4JH2-TE	4JH2-HTE	4JH2-DTE	
Type			Vertical 4-cycle water cooled diesel engine	Vertical 4-cycle turbo-charged water-cooled diesel engine			
No. of cylinders			4				
Continuous rating output (DIN 6270A)		hp/rpm	46/3400	57/3400	69/3400	80/3400	
Maximum output (DIN 6270B) (Crankshaft output)		hp/rpm	50/3600	62/3600	75/3600	88/3600	
Combustion system			Direct injection				
Firing order			1-3-4-2 (bTDC 17°±1°)				
Aspiration			Naturally aspirated	Exhaust turbocharger			
Direction of rotation		Crankshaft	Counter-clockwise viewed from flywheel				
		Propeller shaft	Clockwise viewed from stern (with KM3P2, KBW20, KBW21) Bi-rotation (with KM4A)				
Lubricating system			Forced lubrication with trochoid pump				
Lube oil capacity		Crank case	6.5ℓ (with KM3P2, KBW20, KBW21) / 8.0ℓ (with KM4A)				
Cooling system			Fresh water cooling by centrifugal pump with heat exchange				
Cooling water capacity		Water tank	6.0ℓ				
		Sub-tank	0.8ℓ				
Starting system			Electric				
Electrical equipment		Starting motor	12V-1.4kW				
		Alternator	12V-55A (12V-80A: Option)				
Dry Weight (with Marine gear) kg (lbs)		Marine gear	KM3P2	217 (478)	—	—	—
			KBW20	226 (498)	232 (511)	—	—
			KBW21	—	—	246 (542)	246 (542)
			KM4A	228 (503)	234 (516)	244 (538)	244 (538)

1-2. Marine gear specifications

(1) KM3P2

Model		KM3P2	
Type		Multi disc, wet, mechanical clutch	
Reduction ratio	Ahead	2.36	2.61
	Astern	3.16	
Lubricating system		Splash	
Lube oil capacity		0.35ℓ	
Cooling system		Forced cooling with fan mounted on flywheel	

(2) KBW20, KBW21

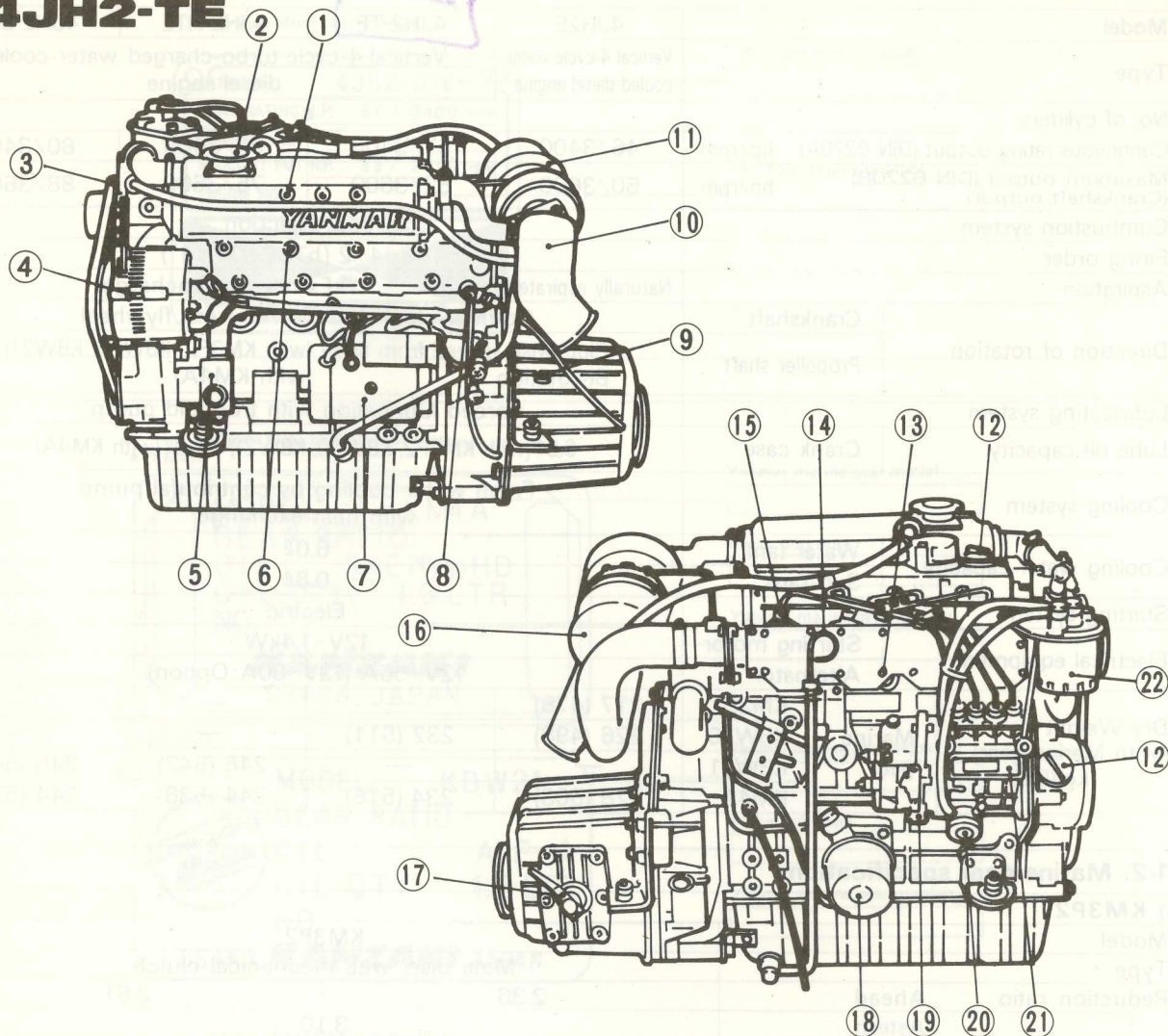
Model		KBW20	KBW21
Type		Multi disc, wet, mechanical clutch	
Reduction ratio	Ahead	2.17	2.62
	Astern	3.06	
Lubricating system		Splash	
Lube oil capacity		1.2 ℓ	
Cooling system		Forced cooling with fan mounted on flywheel	Sea water cooling and forced cooling with fan mounted on flywheel

(3) KM4A

Model		KM4-A	
Type		Multi disc, wet, mechanical clutch	
Reduction ratio	Ahead	1.47	2.63
	Astern	1.47	2.63
Lubricating system		Splash	
Lube oil capacity		1.3ℓ	
Cooling system		Sea water cooling and Forced cooling with fan mounted on flywheel	

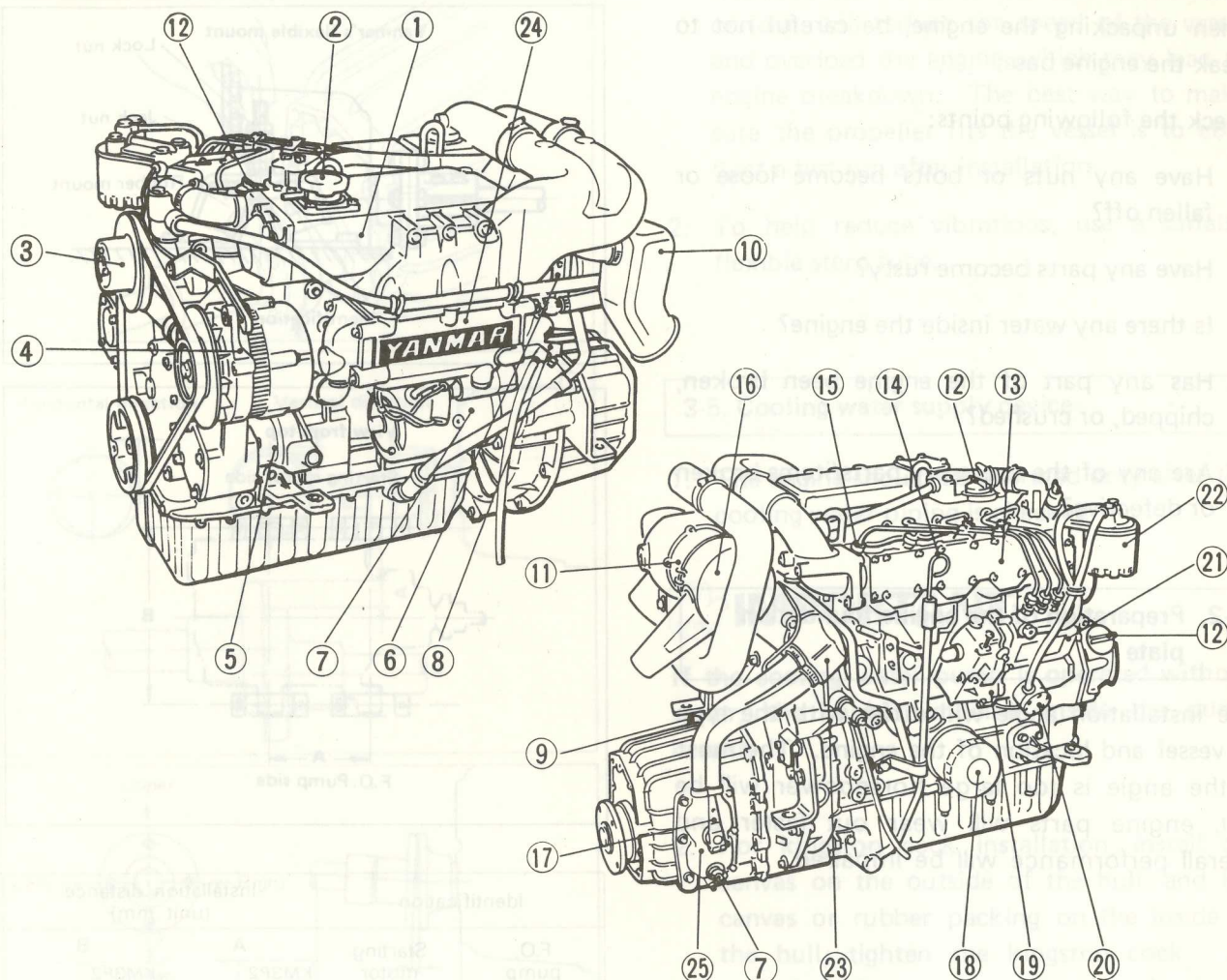
II. Names of parts

4JH2-TE



No.	Names of Parts	No.	Names of Parts
1	Fresh water tank (fresh water cooler)	12	Lube oil feed port
2	Pressure cap (water feed port)	13	Air intake manifold
3	Cooling water pump (fresh water)	14	Oil dipstick
4	Alternator	15	Fuel injection valve
5	Cooling water pump (sea water)	16	Air intake silencer
6	Exhaust manifold	17	Clutch shift lever
7	Starting motor	18	Lube oil filter
8	Exhaust manifold water drain plug	19	Speed control lever
9	Marine gear lube oil dipstick	20	Fuel feed pump
10	Mixing elbow	21	Fuel oil injection pump
11	Turbo-charger	22	Fuel oil filter

4JH2-HTE·4JH2-DTE



No.	Names of parts
1	Fresh water tank (fresh water cooler)
2	Pressure cap (water feed port)
3	Cooling water pump (fresh water)
4	Alternator
5	Cooling water pump (sea water)
6	Exhaust manifold
7	Starting motor
8	Sea water drain plug
9	Marine gear lube oil dipstick
10	Mixing elbow
11	Turbo-charger
12	Lube oil feed port
13	Air intake manifold

No.	Names of parts
14	Oil dipstick
15	Fuel injection valve
16	Air intake silencer
17	Clutch shift lever
18	Lube oil filter
19	Speed control lever
20	Fuel feed pump
21	Fuel oil injection pump
22	Fuel oil filter
23	Lube oil cooler
24	Air cooler
25	Clutch oil cooler

III. Engine installation

3-1. Inspection after unpacking

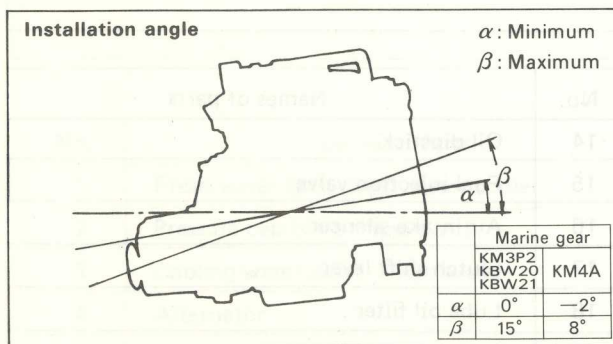
When unpacking the engine, be careful not to break the engine base.

Check the following points:

1. Have any nuts or bolts become loose or fallen off?
2. Have any parts become rusty?
3. Is there any water inside the engine?
4. Has any part of the engine been broken, chipped, or crushed?
5. Are any of the accessory parts/items broken or defective?

3-2. Preparation of the engine foundation plate

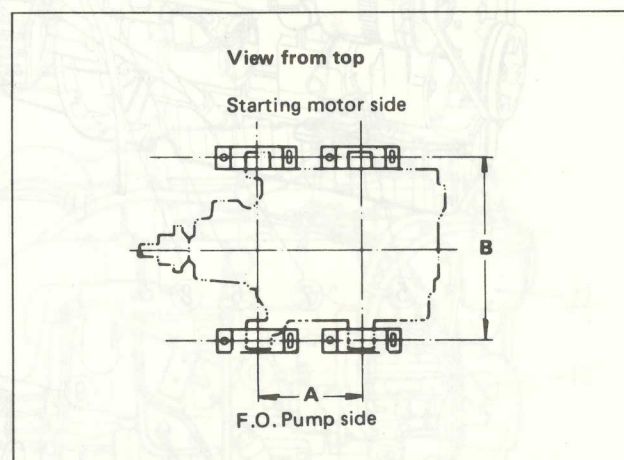
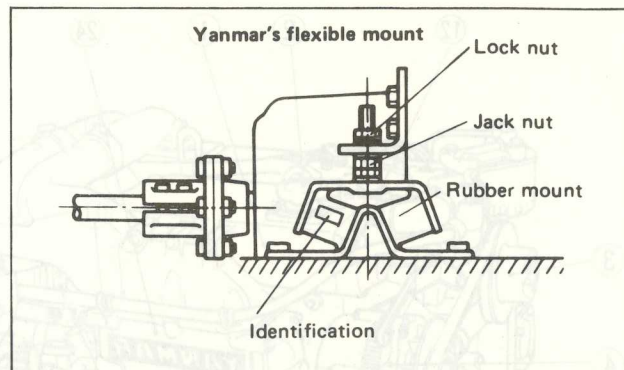
The installation angle will differ with the type of vessel and location of the engine. The most IF the angle is too large horsepower will be lost, engine parts will wear out faster and overall performance will be impaired.



3-3. Engine installation

1. For engine installation, be sure to use the flexible rubber mount.
Yanmar offers as an accessory flexible

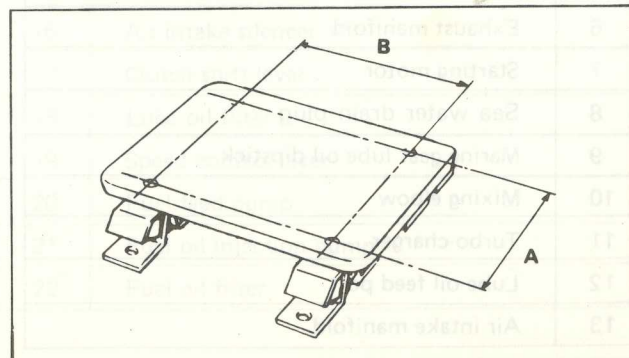
mounts which match the respective engine characteristics.



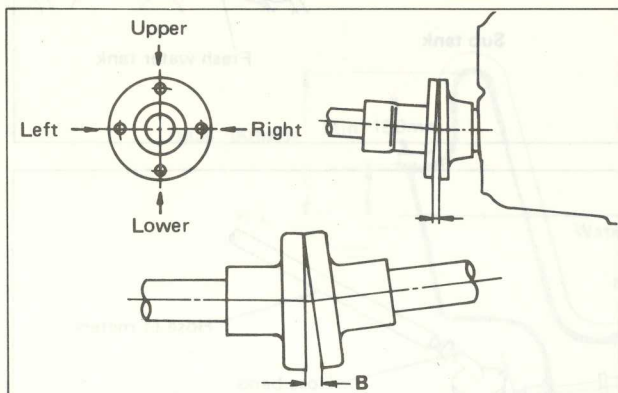
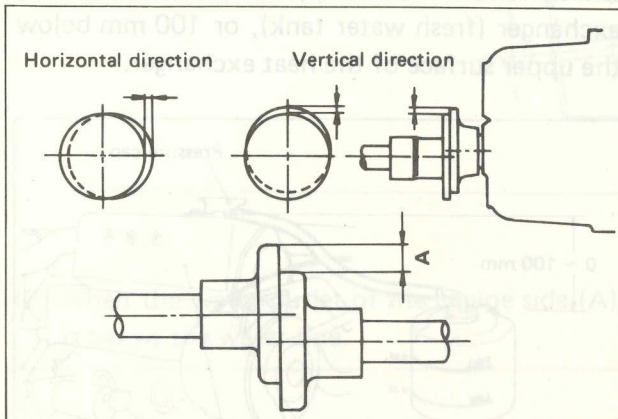
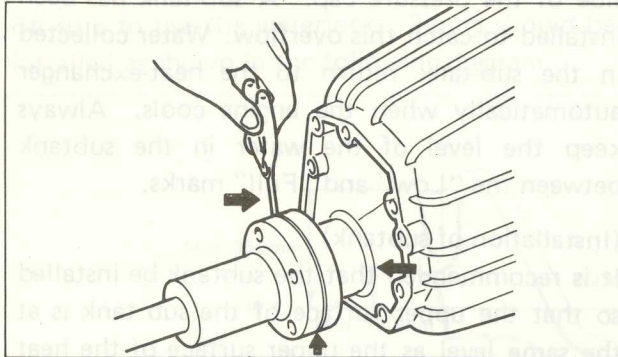
Identification		Installation distance (unit:mm)			
F.O. pump side	Starting motor side	A		B	
		KM3P2 KBW20 KBW21	KM4A	KM3P2 KBW20 KBW21	KM4A
150	200	492.5	560	470	490

When determining the overall height of the engine bed, remember that the weight of the engine will depress the rubber mounts approx. 4 mm.

For convenient installation, make the GUIDE PLATE as illustrated.



- Before connecting the clutch propeller shaft with the propeller shaft, make sure that the flange surfaces of both parts are parallel to each other, and that their centers line up.



	mm (in.)
Coupling misalignment A	0.1~0.3 (0.0039~0.0118)
Coupling face run-out B	0~0.2 (0~0.0079)

If necessary, adjust the height of the engine with jack nuts. The maximum tolerance should be less than 0.2 mm. After finishing centering, tighten the lock nuts, rubber mounts and propeller shaft.

IMPORTANT

After 50 hours of operation, make sure that the propeller shaft is still lined up, and readjust if necessary.

3-4. Propeller, propeller shaft

- Select a propeller which is suitable for the size and shape of the vessel, as well as for its intended use. A propeller that is too small or large will reduce the speed of the vessel and overload the engine, which may lead to engine breakdown. The best way to make sure the propeller fits the vessel is to conduct a test run after installation.
- To help reduce vibrations, use a suitable flexible stern tube.

3-5. Cooling water supply device

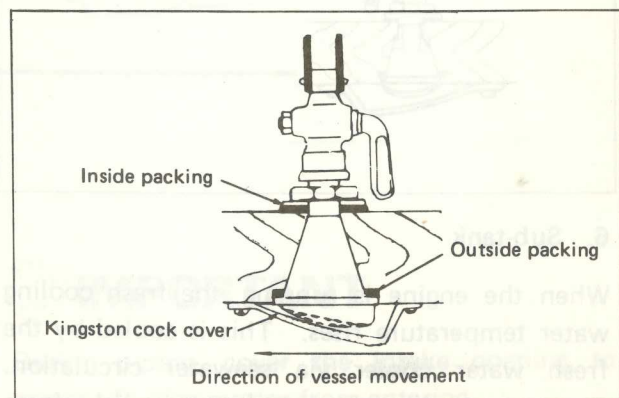
- The engine should be operated only after the cooling water piping is checked.



IMPORTANT

If the cooling water pump is operated without water, the rubber impeller inside the pump breaks.

- For kingston cock installation, install the canvas on the outside of the hull, and the canvas or rubber packing on the inside of the hull; tighten the kingston cock. Installation directions are given in the figure at below. Install the kingston cock cover as shown.



3. Piping

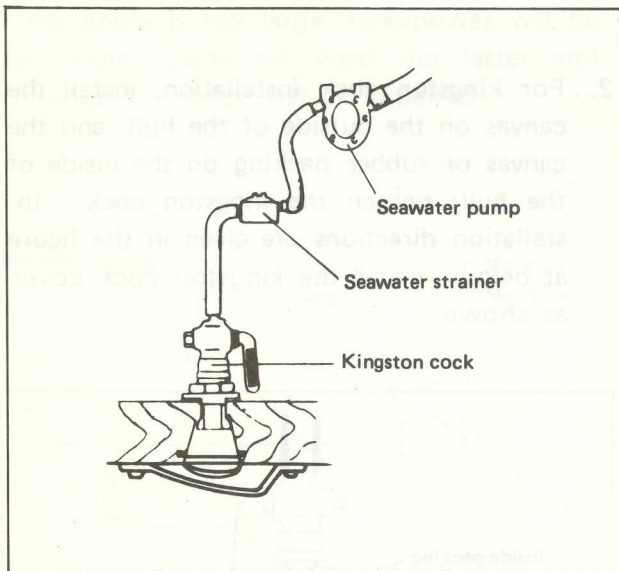
For the cooling water pipe, use a rubber hose with an inside diameter of 25.4 mm. Piping should be kept as straight and short as possible. If the pipe is too long, it will be difficult to draw water into the pump.

☛ See page 39 for piping diagram.

4. Connect the rubber hoses to the kingston cock, cooling water pump inlet, and mixing elbow outlet, and secure with hose clamps.

5. Seawater strainer

The seawater pump will be damaged if foreign matter is allowed to get into it. Therefore, attach a seawater strainer between the seawater pump inlet and the seawater cock when the seawater strainer is not already so equipped.



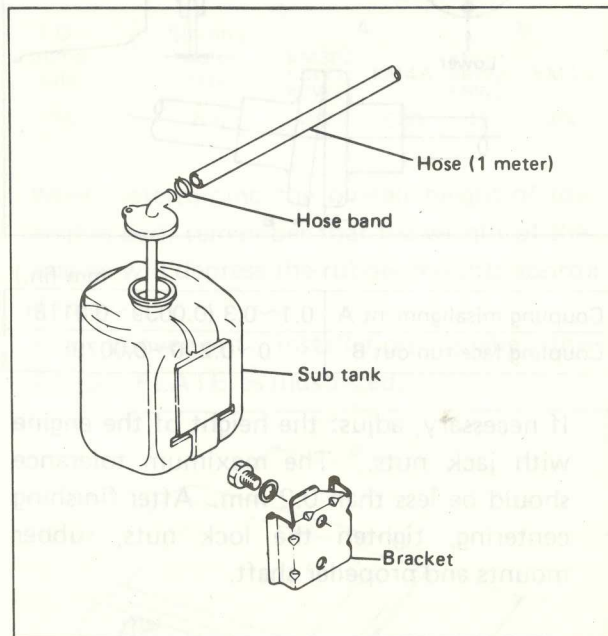
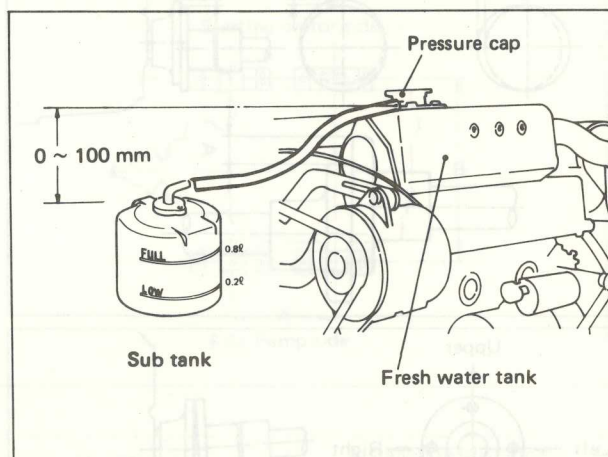
6. Sub-tank

When the engine is running, the fresh cooling water temperature rises. This is cooled by the fresh water cooler via seawater circulation. During operation, the temperature of the fresh water will rise and its cubic volume will increase,

and water will flow out of the hole on the side of the pressure cap. A sub-tank has been installed to catch this overflow. Water collected in the sub-tank return to the heat-exchanger automatically when the engine cools. Always keep the level of the water in the sub-tank between the "Low" and "Full" marks.

(Installation of subtank)

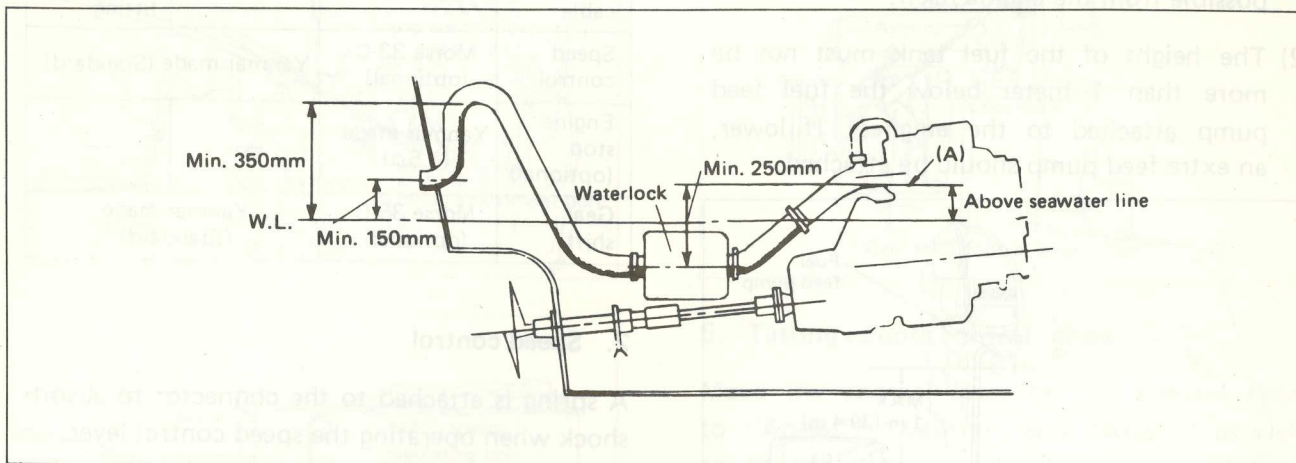
It is recommended that the sub-tank be installed so that the upper surface of the sub tank is at the same level as the upper surface of the heat exchanger (fresh water tank), or 100 mm below the upper surface of the heat exchanger.



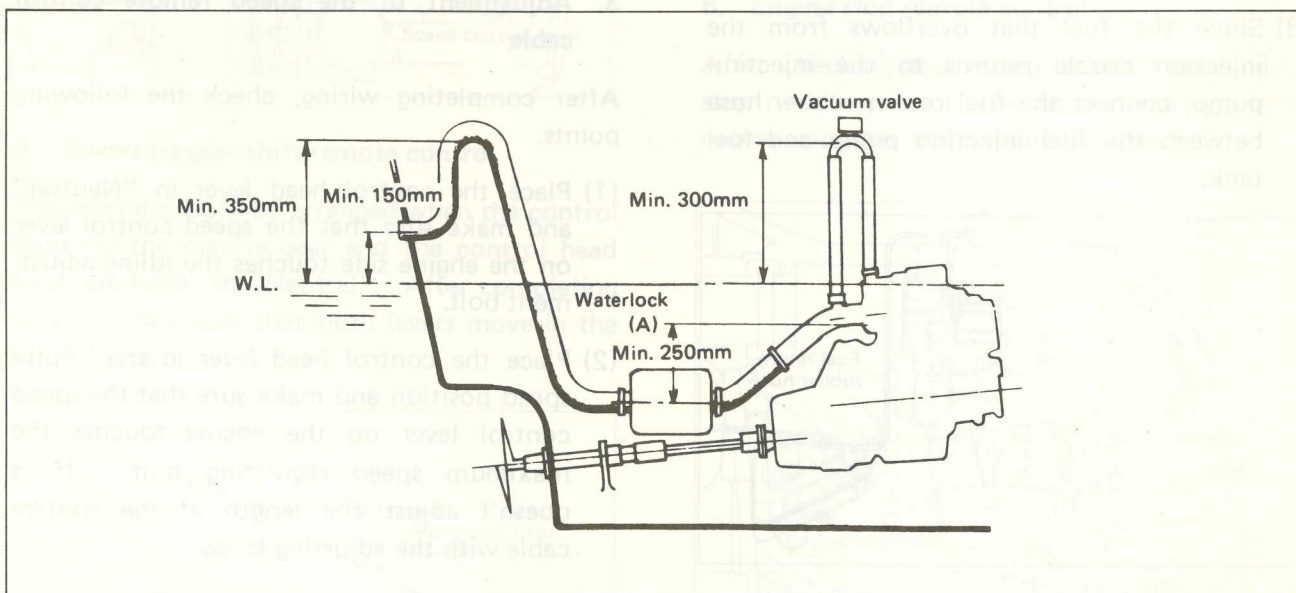
7. Exhaust pipe layout

Be sure to use the waterlock. Piping should be installed as shown in the following diagram.

- (1) When the water outlet of the engine side (A) is above the water line.



- (2) When the water outlet of the engine side (A) is below the water line.



8. Air ventilation and intake pipe

Intake air is essential for maximum engine performance. Therefore, the engine room must be adequately ventilated. Yanmar recommends that both an air intake port and forced discharge ventilator be installed in the engine room.

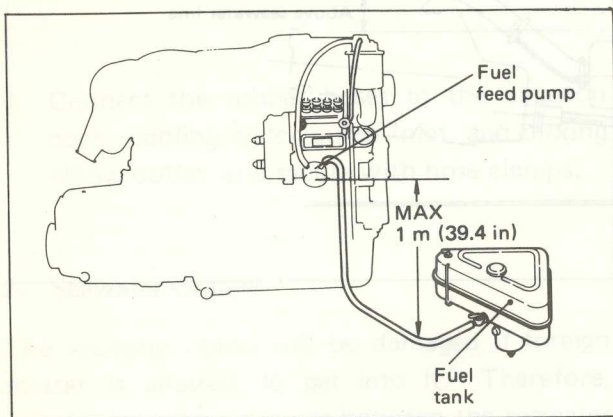


IMPORTANT

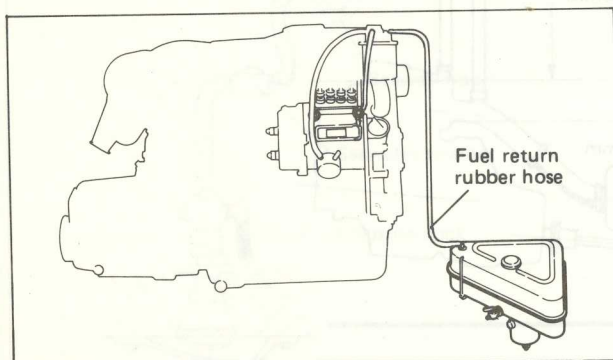
During piping, cover the intake opening to prevent foreign matter from entering.

3-6. Fuel oil supply device

- (1) The fuel tank should be installed as far as possible from the engine itself.
- (2) The height of the fuel tank must not be more than 1 meter below the fuel feed pump attached to the engine. If lower, an extra feed pump should be attached.



- (3) Since the fuel that overflows from the injection nozzle returns to the injection pump, connect the fuel return rubber hose between the fuel injection pump and fuel tank.



3-7. Remote control



IMPORTANT

This engine is designed to use a single lever handle remote control head. A two lever type can not be used.

1. Control cable

Recommended cable	Control cable	Cable clamp	Connecting metal fitting
Speed control	Morse 33-C (optional)	Yanmar made (Standard)	
Engine stop (optional)	Yanmar made (1.5φ)	—	—
Gear shift	Morse 33-C (optional)	Yanmar made (Standard)	

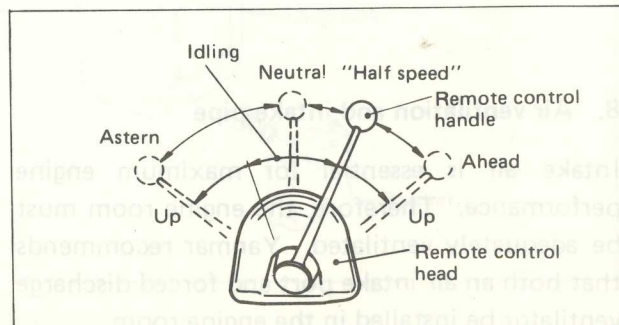
2. Speed control

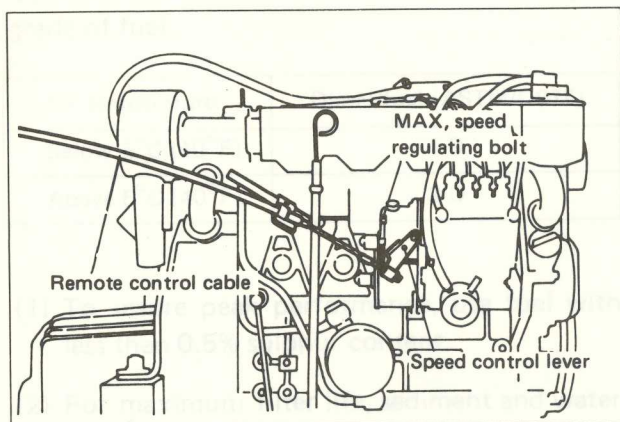
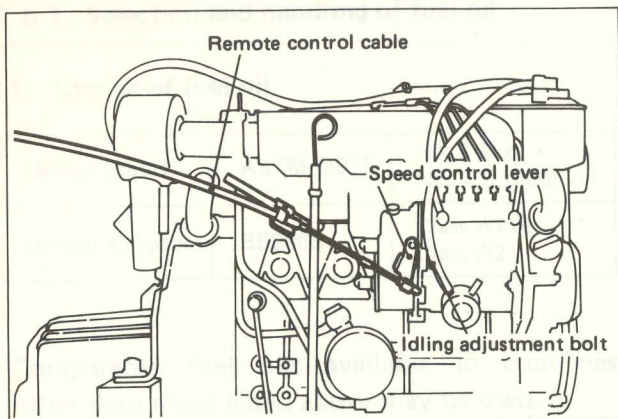
A spring is attached to the connector to absorb shock when operating the speed control lever. The wiring should be arranged so that the spring works when the throttle is "idling".

3. Adjustment of the speed remote control cable

After completing wiring, check the following points.

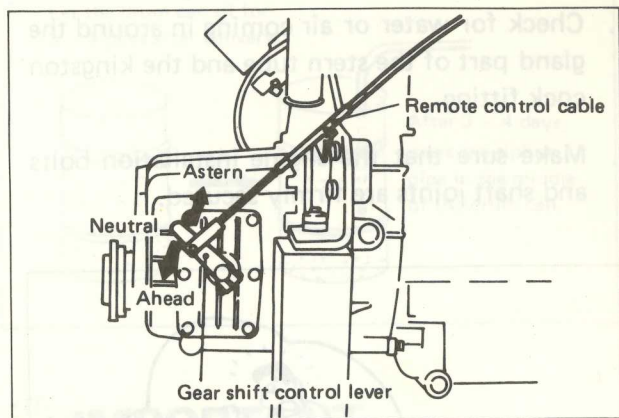
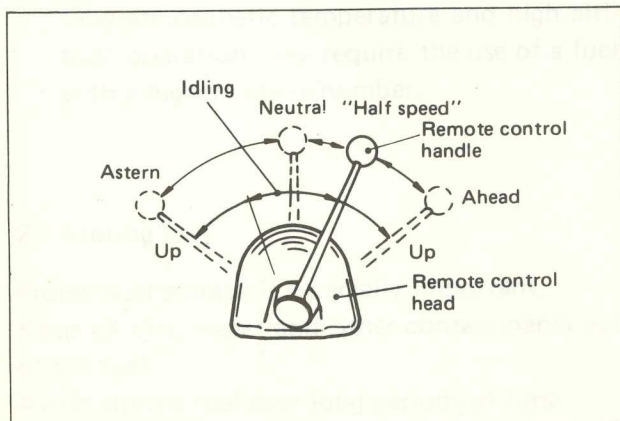
- (1) Place the control head lever in "Neutral" and make sure that the speed control lever on the engine side touches the idling adjustment bolt.
- (2) Place the control head lever in the "Full" speed position and make sure that the speed control lever on the engine touches the maximum speed regulating bolt. If it doesn't adjust the length of the control cable with the adjusting screw.





4. Reversing gear shift remote control

The wiring should be arranged when the control lever on the marine gear and the control head lever are both in "Neutral". After completing wiring, make sure that both levers move in the same direction.

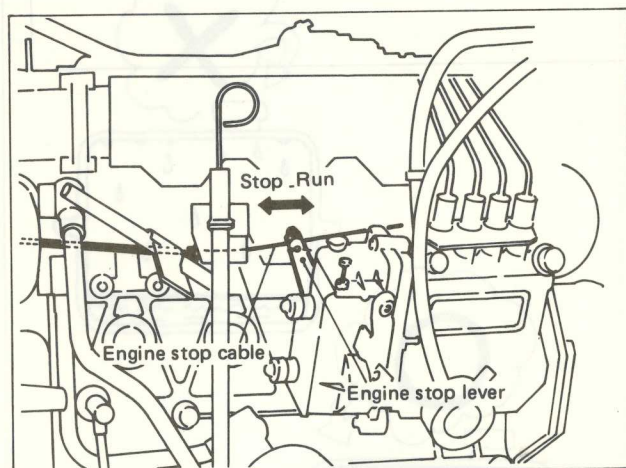


5. Testing remote control cables

Move the control lever on the control head to "Ahead", "Neutral" and "Astern" as well as to the "Low" and "Full" positions, and make sure that the clutch shift lever and the speed control lever on the engine side function properly.

6. Engine stop remote control

After checking the wiring, connect the engine stop remote control cable so that the stop lever moves smoothly throughout the stroke.



3-8. Recommended battery capacity

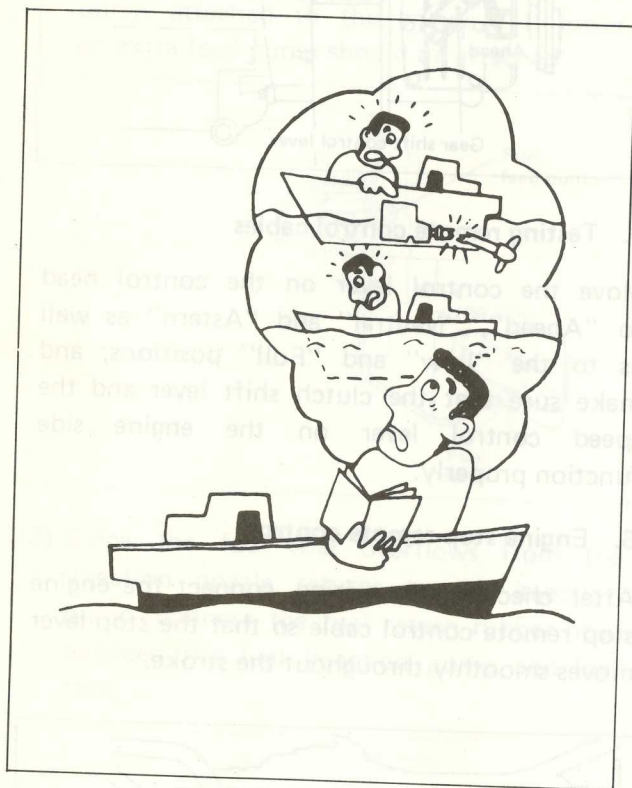
Use battery of sufficient capacity.

12V — 100AH (mini)

12V — 120AH (standard)

IV. After Launching

1. Check for water or air coming in around the gland part of the stern tube and the kingston cock fitting.
2. Make sure that the engine installation bolts and shaft joints are firmly secured.



V. Fuel and lubricating oil

5-1. Selection and handling of fuel oil

1. Choice of fuel oil

United States	ASTM/D975	No. 1-D or No. 2-D diesel oil
United Kingdom	BS2869	Class A1 or Class A2

Comparable fuel oils available in countries other than those listed above may be used.

Use the chart below to determine the correct grade of fuel.

Air temperature	Diesel/fuel (ASTM/D975)
Below 5°C (40°F)	1-D
Above 5°C (40°F)	2-D

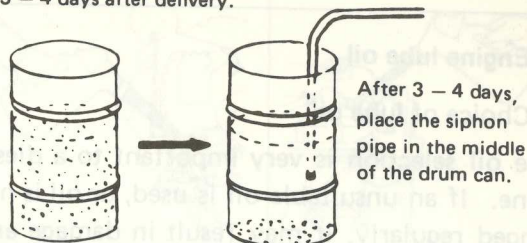
- (1) To insure peak performance, use fuel with less than 0.5% sulphur content.
- (2) For maximum filter life, sediment and water should not exceed 0.1%.
- (3) To maintain proper fuel delivery during cold weather operation, use grade No. 1-D diesel fuel as defined in ASTM Designation D975 with a pour point at least 5.6°C (42°F) below the lowest outside air temperature.
- (4) The recommended cetane number is 45. Low atmospheric temperature and high altitude operation may require the use of a fuel with a higher cetane number.

2. Storing fuel

Proper fuel storage is especially important. Keep all dirt, water and other contaminants out of the fuel.

Avoid storing fuel over long periods of time. Store fuel in a convenient place away from buildings.

Let the drum can sit for 3 - 4 days after delivery.

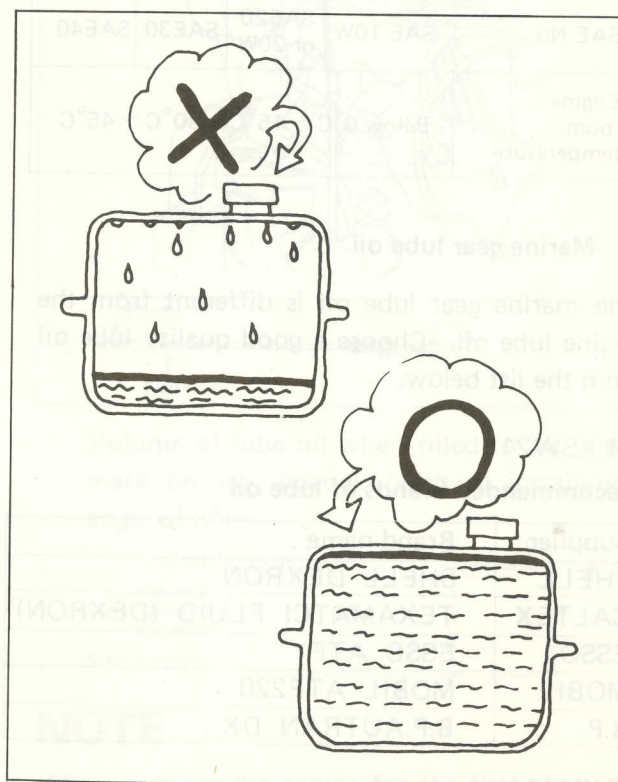


IMPORTANT

Water of dirt in the fuel may cause engine failure and rapid wear of the fuel injection equipment. Water and dirt in the fuel tank should be filtered out.

3. After each day's operation

Fill the fuel tank at the end of each day's operation. This prevents condensation in the fuel tank.



5-2. Selection of lubricating oil

1. Engine lube oil

(1) Choice of lube oil

Lube oil selection is very important to a diesel engine. If an unsuitable oil is used, or oil is not changed regularly, it may result in damage and shorter engine life.

(2) Kinds of lube oil

Choose a lube oil with API service classifications CD.

(3) Lube oil viscosity

The viscosity of the lube oil greatly influences engine starting and running performance. The lube oil weight number should match the season and temperature.

Recommended SAE viscosity

SAE No.	SAE 10W	SAE20 or 20W	SAE30	SAE40
Engine room temperature	Below 0°C ~ 15°C ~ 30°C ~ 45°C			

2. Marine gear lube oil

The marine gear lube oil is different from the engine lube oil. Choose a good quality lube oil from the list below.

(1) KBW21

Recommended brands of lube oil

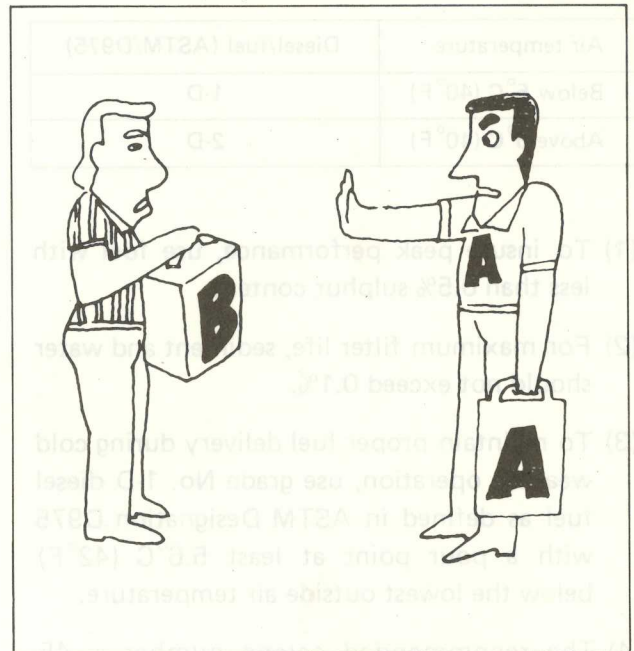
Supplier	Brand name
SHELL	SHELL DEXRON
CALTEX	TEXAMATCI FLUID (DEXRON)
ESSO	ESSO ATF
MOBIL	MOBIL ATF220
B.P.	B.P.AUTRAN DX

(2) KM4A

SAE 20/30 HD

NOTE

- 1) When selecting a lube oil, consult your nearest Yanmar dealer if you are not sure which oil is best.
- 2) Use of lube oils below the recommended standards will significantly shorten engine life.
- 3) Do not mix different lube oils since this lowers lubricating efficiency.



VI. Starting the new engine for the first time



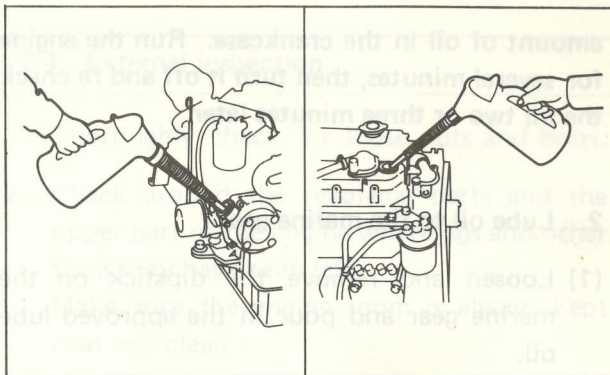
IMPORTANT

Before starting the engine for the first time, carefully check the following:

6-1. Supply of fuel oil

1. Add fuel to the fuel tank

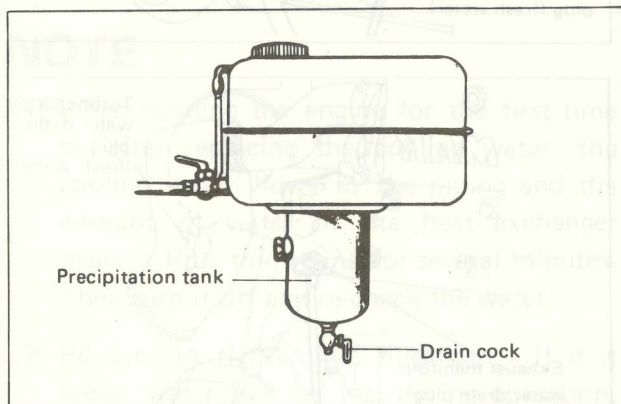
When you add fuel from a storage tank, put the inlet of the syphon in the middle of the storage tank. Make sure foreign matter floating on the surface or sediment on the bottom of the storage tank do not get into the fuel tank.



2. Draining the fuel tank

Be sure to equip the fuel tank with a precipitation tank, as shown in the figure, and install a drain cock to remove any dirt and water that have accumulated in the fuel.

Before starting the engine, open the drain cock to remove any water and dirt.



6-2. Supply of lubricating oil

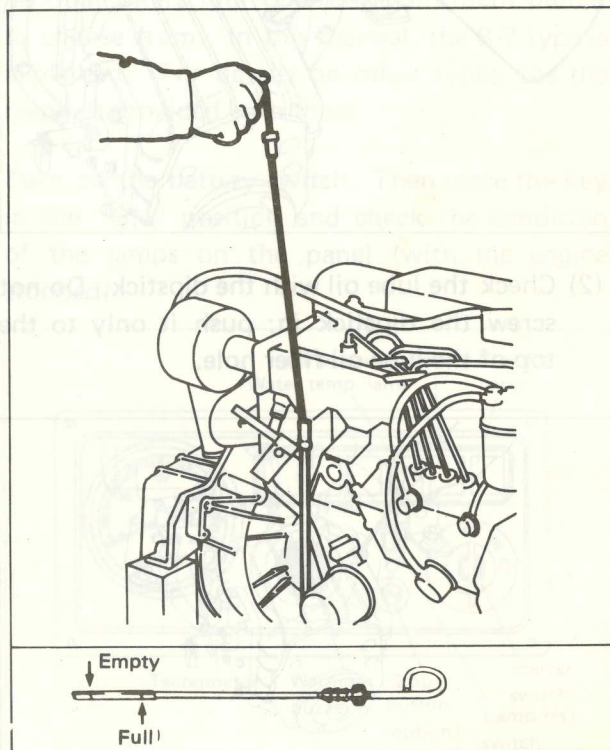
1. Lube oil to the crankcase

- (1) Remove the lube oil supply port (yellow cap) and add the approved lube oil.

There are two supply ports. One is on the cylinder head cover, the other is on the gear case cover.

See page 11 for the approved lube oil.

- (2) Check the amount of lube oil by inserting the dipstick as far as possible. The oil level should come up to the full mark.



Volume of lube oil when filled to the upper mark on the dipstick (with an installation angle of 8°).

ENGINE CRANKCASE		Installation angle
With KM3P2 KBW20 KBW21	6.5ℓ	8°
With KM4A	8.0ℓ	0°

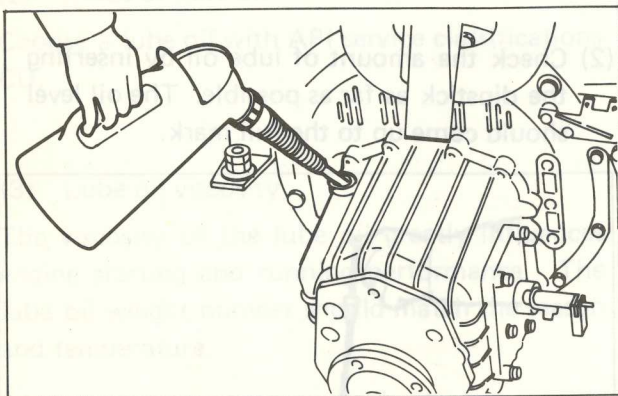
NOTE

When running the engine for the first time, the lube oil flows to the piping thus reducing the

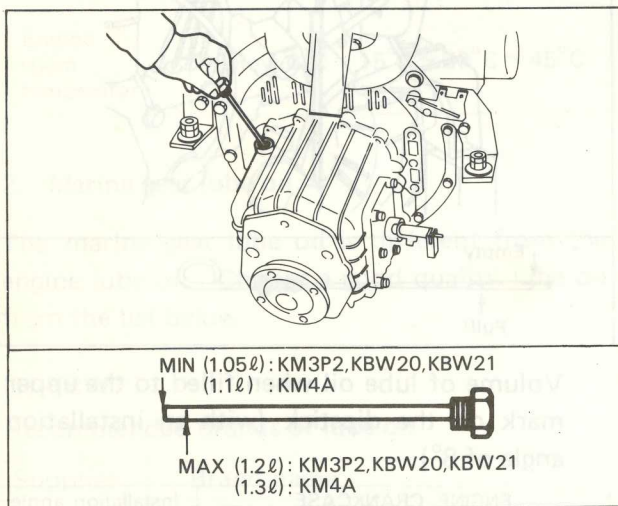
amount of oil in the crankcase. Run the engine for several minutes, then turn it off and re-check the oil two or three minutes later.

2. Lube oil to the marine gear

- (1) Loosen and remove the dipstick on the marine gear and pour in the approved lube oil.



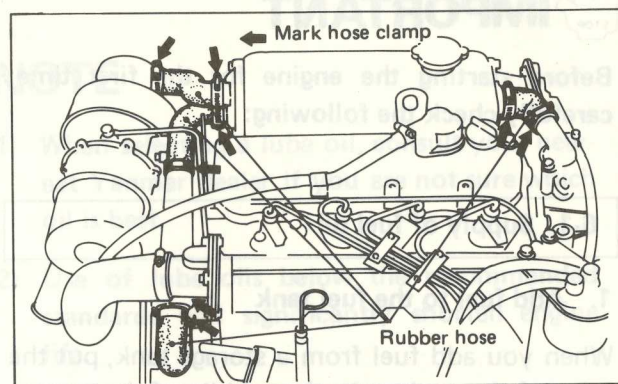
- (2) Check the lube oil with the dipstick. Do not screw the dipstick in; push it only to the top of the lube oil filler hole.



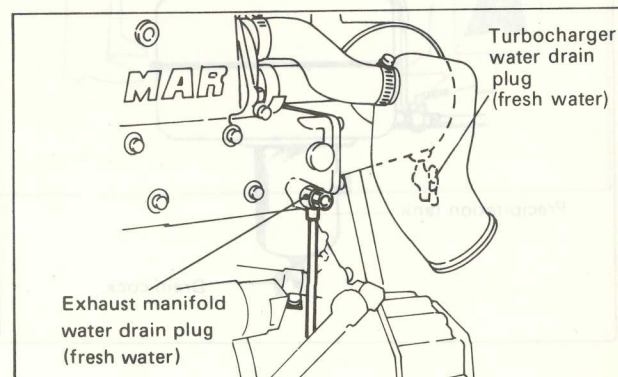
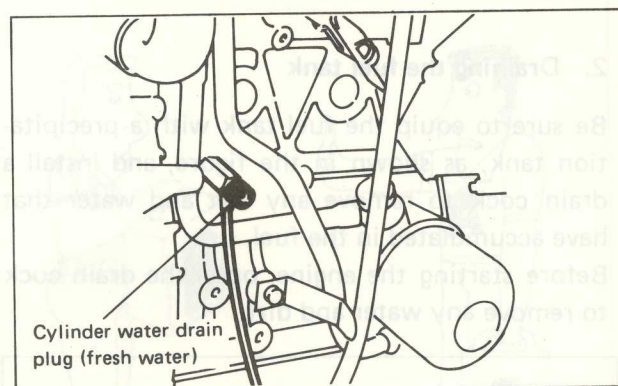
3. Supplying fresh water to the tank

- (1) Checks before supplying

- a) Make sure the hose clamp on the fresh water line is tight enough.



- b) Make sure the drain plugs on the cylinder block and exhaust manifold are tight enough.

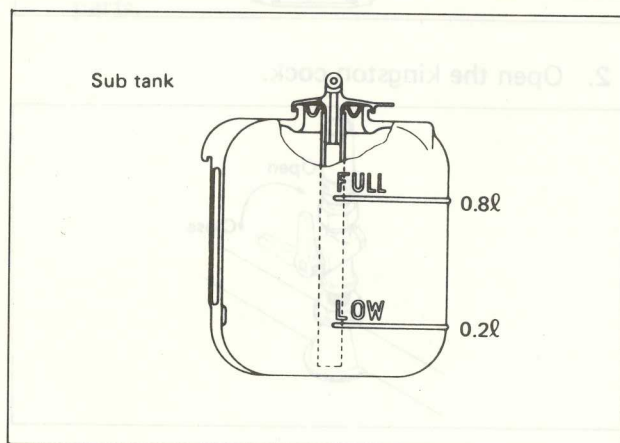
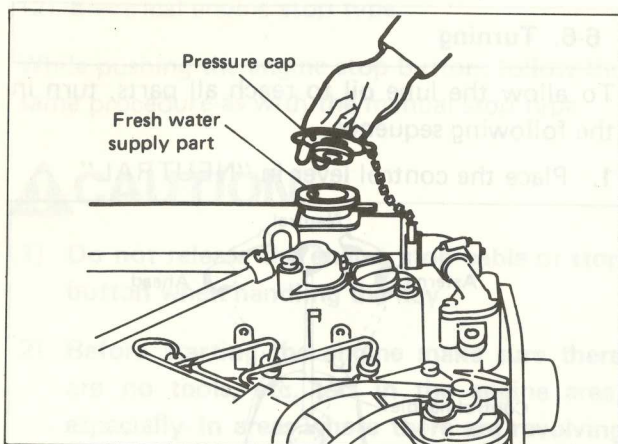


- (2) Supplying water

Remove the filler cap (pressure cap) on the fresh water tank, and add water until it overflows from the port. For the sub tank, add water up to the full mark.

- Fresh water capacity


Fresh water tank	6.0ℓ
Sub tank	0.8ℓ



NOTE

- (1) When running the engine for the first time or after replacing the cooling water, the cooling water flows to the piping and the amount of water in the heat exchanger drops. Run the engine for several minutes. Then turn it off and re-check the water.
- (2) Be sure to tighten the filler cap. If it is loose, water will be lost during operation, leading to engine overheating.
- (3) Be sure to use soft (tap) water and add anti-rust. If anti-rust is not added, scale and rust develop in the fresh water cooling system, lowering cooling efficiency.
- (4) In cold areas and during the winter, add anti-freeze, as well as anti-rust.

6-3. Bleeding air from the fuel system

 See page 25 for air bleeding procedures.

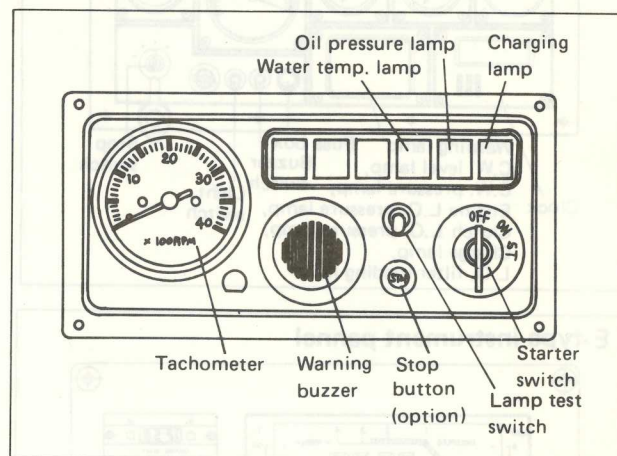
6-4. External inspection

1. Thoroughly check for loose nuts and bolts.
 2. Check around the revolving parts and the upper part of the engine where jigs and other tools may have been left.
- Make sure the engine room is always kept neat and clean.

6.5 Checking the instrument panel alarm system

Yanmar offers four different instrument panels to choose from. In this manual, the B-2 type is explained. For details on other types, see the manuals provided with them.

Turn on the battery switch. Then place the key in the "ON" position and check the condition of the lamps on the panel (with the engine stopped).

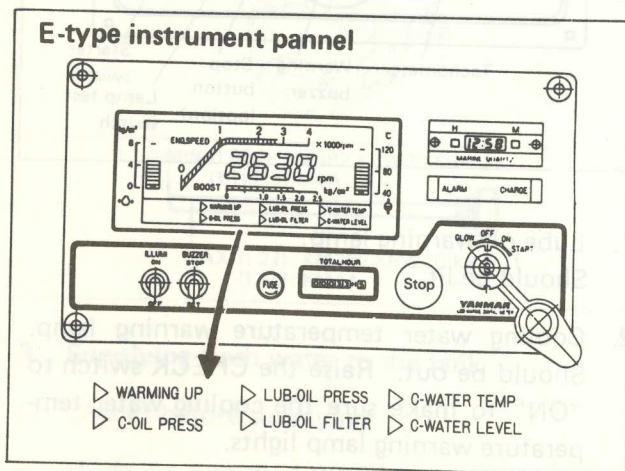
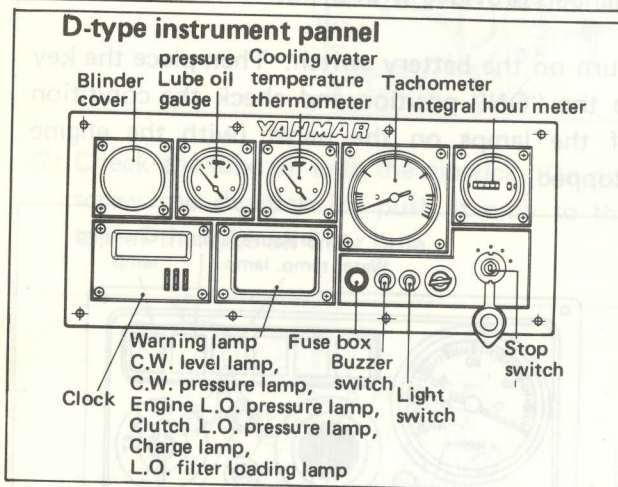
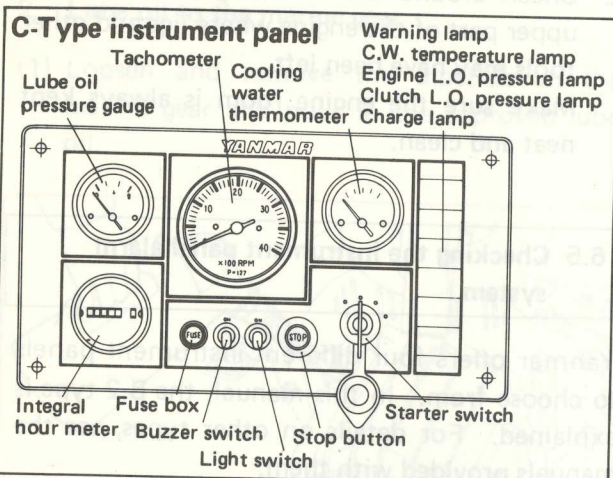


1. Lube oil warning lamp.
Should be lit.
2. Cooling water temperature warning lamp.
Should be out. Raise the CHECK switch to "ON" to make sure the cooling water temperature warning lamp lights.

NOTE

3. Charging warning lamp.
Should be lit.

4. Warning buzzer.
Should sound.



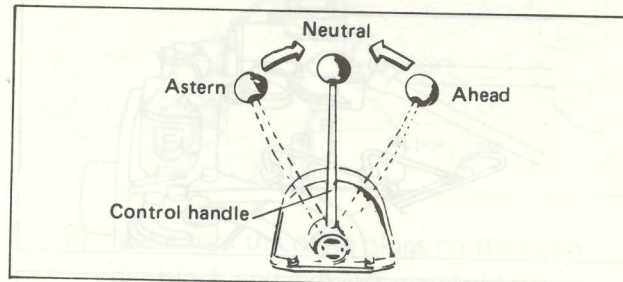
NOTE

All these signals will continue until the engine starts up or the key is turned off.

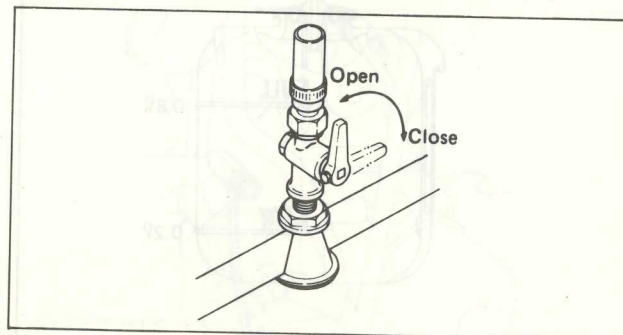
6-6. Turning

To allow the lube oil to reach all parts, turn in the following sequence.

1. Place the control lever in "NEUTRAL".



2. Open the kingston cock.

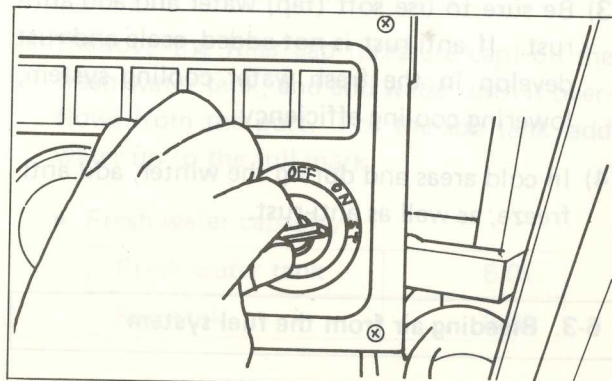


3. Pre-start test

Yanmar offers two engine stop methods. Conduct the following test depending on your stop method.

(1) Manual engine stop type

While pulling on the engine stop cable, insert the key into the starter switch, and turn it to "START". Run the engine for 3 – 5 seconds with the starting motor, and check for abnormal sounds.

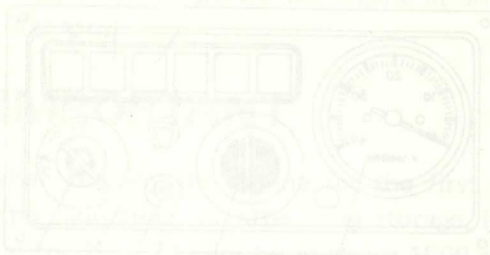


(2) Electrical engine stop type

While pushing the engine stop button, follow the same procedure as with the manual stop type.

! CAUTION

- 1) Do not release the engine stop cable or stop button when handling the key.
- 2) Before starting the engine make sure there are no tools, etc. left in the engine area, especially in areas where there are revolving parts.



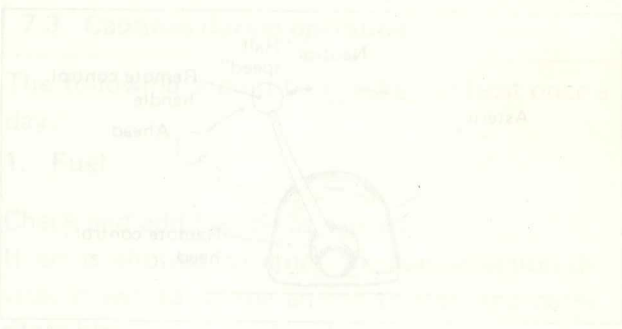
IMPORTANT

- 1) RELEASE the key switch when the engine starts.
If the key switch is released before the engine starts, wait until the starter motor and engine stop running before trying again.
- 2) Do not operate the starter motor more than 15 seconds at a time. If the engine does not start, wait at least one minute before trying again.

VII. Method of operation

1. Starting and Stopping

1. Pull out the engine warm up knob and place the control lever in the "HALF SPEED" position.



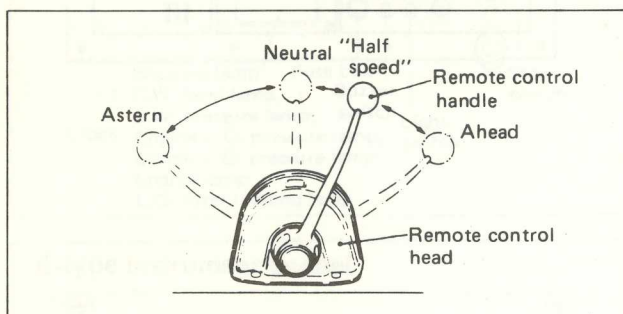
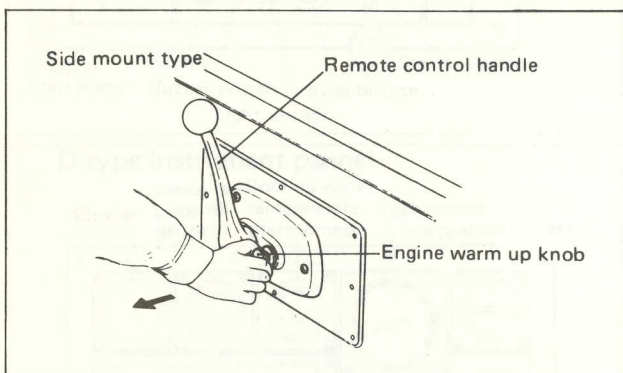
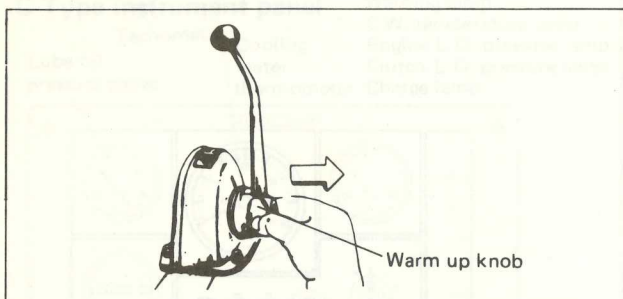
NOTE

1. The knob for engine warm up can only be operated when the control lever is placed in the "Neutral" position.
2. In the case of cold weather, pull the control knob of boost compensator for easy start.

VII. Method of operation

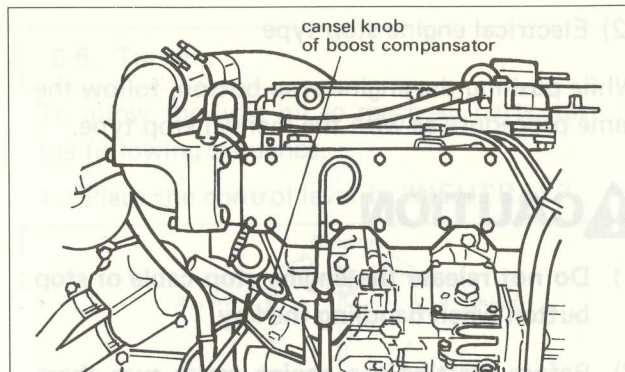
7-1. Starting

1. Pull out the engine warm up knob and place the control lever in the "HALF SPEED" position.

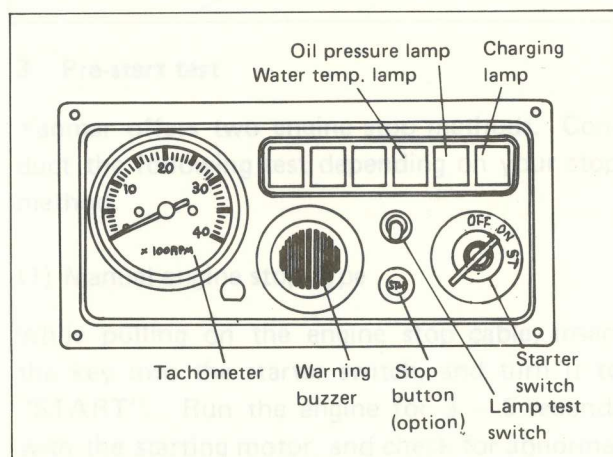


NOTE

1. The knob for engine warm up can only be operated when the control lever is placed in the "Neutral" position.
2. In the case of cold weather, pull the cancel knob of boost compensator for easy starting (4JH2-TE, 4JH2-HTE, 4JH2-DTE). In normal weather, this procedure is not necessary.



3. Turn the battery switch "ON".
4. Turn the key to the "START" position. The engine will start. When the engine starts, release the key. The key automatically returns to the "ON" position.
5. When the engine is started, return the remote control handle to the "NEUTRAL" position. (Do not turn off the battery switch even after the engine starts. In the "ON" position, power is supplied to the gauges and warning devices on the instrument panel.)



IMPORTANT

- 1) **RELEASE** the key switch when the engine starts.
If the key switch is released before the engine starts, wait until the starter motor and engine stop running before trying again.
- 2) Do not operate the starter motor more than 15 seconds at a time. If the engine does not start, wait at least one minute before trying again.

3) In the case that the cancel knob was pulled before starting, be sure to return it to its full stroke position.

4) When the engine is operated at a low idling speed (below 1000rpm) for a long time (over 2 hours), excessive carbon and fuel residue tends to accumulate due to incomplete combustion.

Carbon deposits on the injection holes of the fuel injection valve, exhaust valve, the turbine blades of the turbocharger, etc. cause a drop in engine output, knocking, and other troubles. To prevent these problems, be sure to blow off the carbon accumulations by full speed operation.

Operate the engine at over 2500rpm for one minute in every two 2 hours of continuous low idling operation.

7-2. Cautions after starting the engine

1. Warm up the engine for at least 5 minutes, since lube oil does not reach all the moving parts as soon as the engine is started, nor does the cooling water reach the specified temperature. Operate the engine at around 1000 rpm.



IMPORTANT

1. When running the engine for the first time after launching, or after long storage, let it run for 15 – 20 minutes at about 1000 rpm.
2. Be sure to break in the new engine. When the engine is new, engine parts are tight. Therefore, engine life can be seriously shortened if too heavy a load is placed on the engine before it is broken in. Keep the following in mind during the break-in period.

Do not run the engine at heavy load the first 5 hours after installation.

Be sure to operate below 3000 rpm.

3. With the control lever in "NEUTRAL", make sure that water comes out of the

cooling water outlet pipe after the engine starts up.

4. Check the warning lamps on the instrument panel with the key switch at "ON" position.

	Normal condition		Abnormal condition
	Key switch ON (with the engine stopped)	Engine start (over 650 rpm)	
Lube oil	ON	OFF	ON (Pressure down)
Cooling water	OFF	OFF	ON (Temp. rise)
Charge	ON	OFF	ON (No-charge)
Warning buzzer	BUZZ	OFF	BUZZ (Only for LOW pressure and C.W. temp. troubles)

If any of the warning lamps do not go off when the engine goes above 800 rpm, they are malfunctioning. Stop the engine immediately and contact your nearest Yanmar dealer.

7-3. Cautions during operation

The following should be checked at least once a day.

1. Fuel

Check and add fuel oil as needed.

If air is allowed to enter the fuel injection device, it will cause the engine to stop and necessitate bleeding of the fuel lines.

 See page 25 for air bleeding.

2. Lube oil

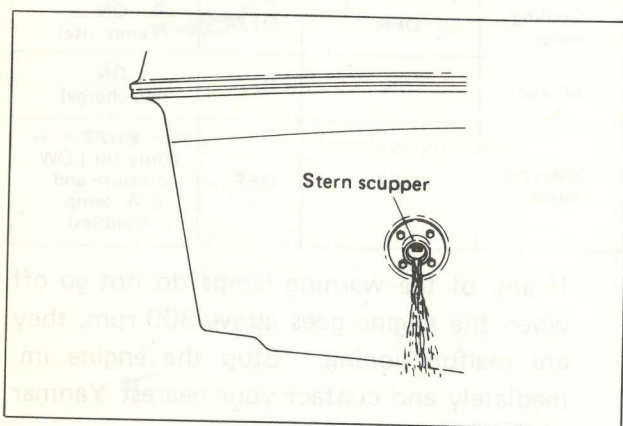
If the warning lamp stays on while the engine is running, it indicates a problem.


First, check the amount of oil.

3. Cooling water

Make sure the cooling water is flowing from the outlet pipe and that the cooling temperature lamp is out. If water comes out irregularly, or if the amount is small, check:

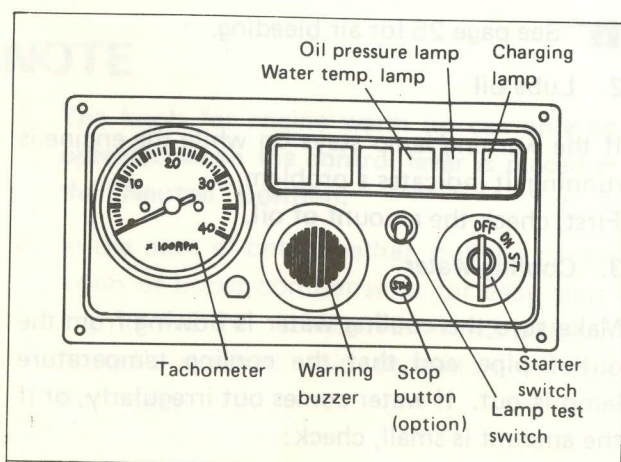
- (1) Whether air is being taken into the cooling water system. Air usually leaks in because of loose hoses on the kingston cock or seawater pump.
- (2) For damage of the cooling sea-water pump or fresh water pump.
- (3) If dirt has plugged up the cooling water pipe or the kingston cock.
- (4) Cooling water efficiency drops due to contamination of the heat exchanger.



 See page 29.

4. Charge

Make sure that the charge lamp is off. If the charge lamp does not go off, even when engine rpms are raised to more than 800, charging is not taking place because of some malfunction in the charge system. Consult your dealer.



5. Temperature of parts

Under full power, the surface temperature of each engine part will be about 80 ~ 85°C, or slightly hot to the touch. If the temperature is too high, there is some abnormality. These may include a shortage of oil or improper alignment of the propeller shaft. Consult your nearest dealer if the temperature of the engine parts is too high.

6. Exhaust smoke

Black exhaust smoke indicates that the engine is being overworked. Consequently, the life of the intake and exhaust valves, piston rings, cylinder liners, and fuel injection valve will be shortened.

7. Water/oil leaks

Check for any water or oil leaks, gas leakage, loose bolts, abnormal sounds, excessive generation of heat, and vibrations. If there is anything wrong, consult your nearest Yanmar dealer.

8. Engine resonance

A sudden, large vibration of the vessel may be caused when vibrations (resonance) of the engine and vibrations of the hull occur at the same time.

When this happens you should either increase or decrease engine speed.

9. Abnormal sounds during operation

If abnormal sounds are detected, or the warning buzzer sounds during operation, you should immediately stop the engine and consult your nearest dealer.



IMPORTANT

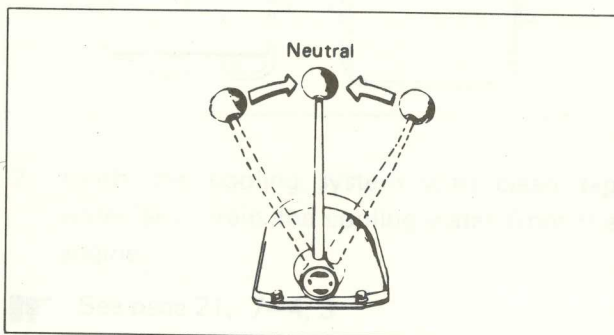
1. During the engine operation, do not touch nor drop objects onto the moving parts in order to prevent unexpected accidents.

2. Whenever the engine is heated, or just after stopped, do not touch any heated components like turbocharger, air pipe, fresh water tank, cylinder head cover, etc., to prevent a burn.

7-4. Stopping

1. Stopping procedure

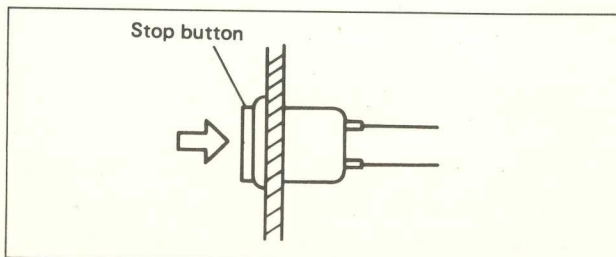
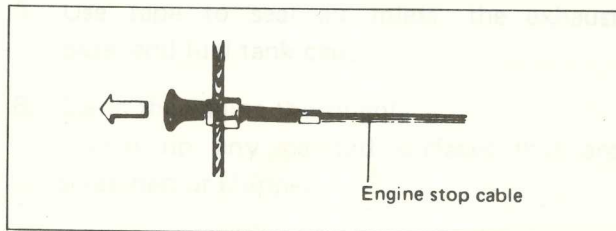
- (1) Place the control handle in the "neutral" position and run the engine at low idling Speed for about 5 minutes.



IMPORTANT

If the engine is stopped suddenly at a high temperature, the temperature of various parts will increase, and engine troubles may occur.

- (2) Set the engine to the lowest speed (about 800 rpm), cut the fuel, and stop the engine.

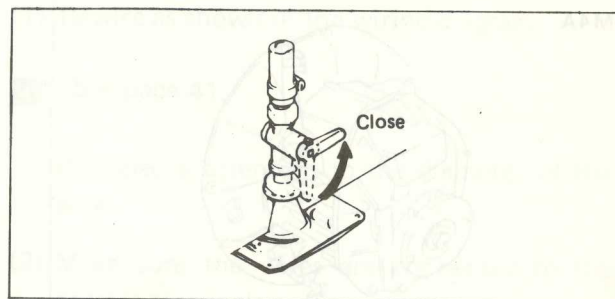


- (3) Turn off the key switch.

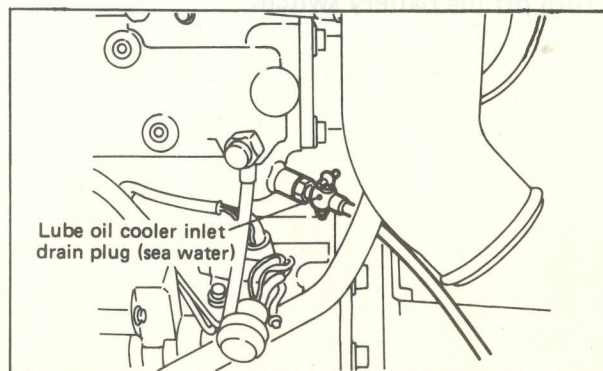
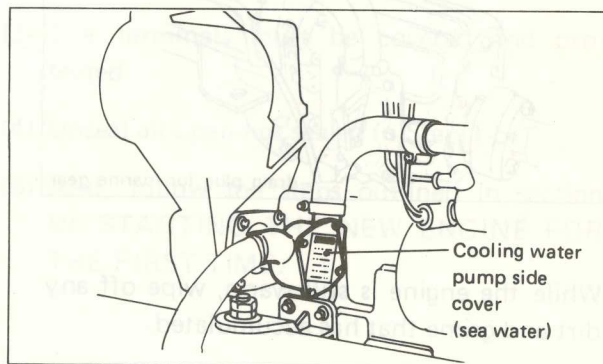
NOTE

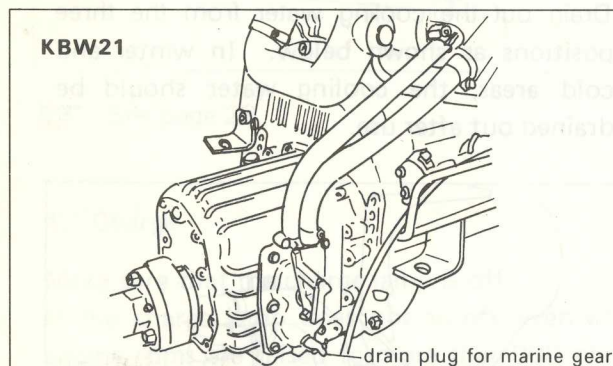
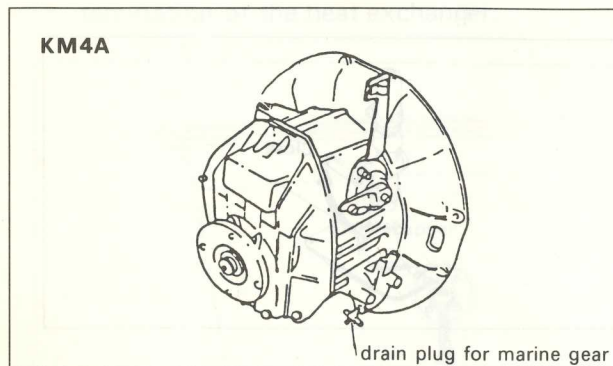
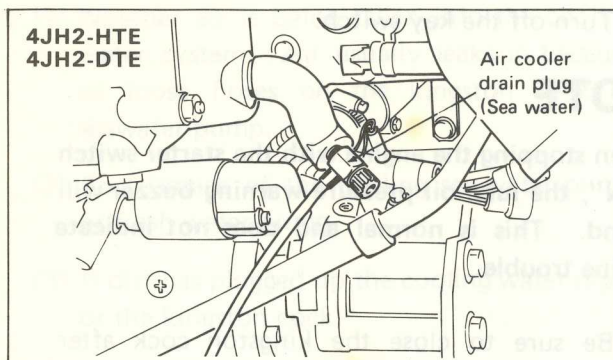
When stopping the engine with the starter switch "ON", the lube oil pressure warning buzzer will sound. This is normal and does not indicate engine trouble.

2. Be sure to close the kingston cock after stopping.



3. Drain out the cooling water from the three positions as shown below. In winter and cold areas, the cooling water should be drained out after use.





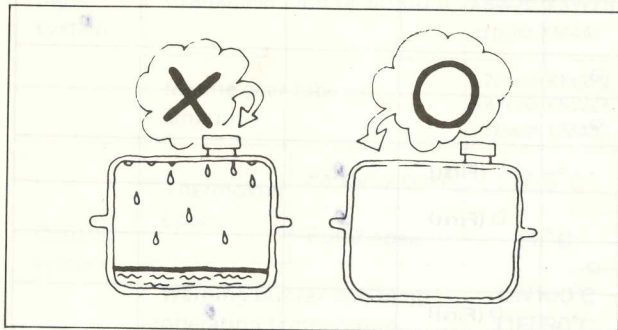
4. While the engine is still warm, wipe off any dirt and grime that has accumulated.
5. Turn off the battery switch.

VIII. Storage


8-1. Storing

When the engine is not to be used for several months, follow these steps for proper storage to minimize corrosion and wear.

1. Drain the fuel completely from the fuel tank, or moisture will form in the fuel system and mix with the fuel.



2. Flush the cooling system with clean tap water and drain the cooling water from the engine.

 See page 21. 7-4, 3

3. Apply an anti-rust compound to any parts which rust easily.
4. Since the battery automatically discharges, disconnect it when fully charged, wipe off the exterior and store in a dry, well-ventilated place.

Re-charge once a month during storage.

5. Use tape to seal air inlets, the exhaust pipe, and fuel tank cap.
6. Clean the engine thoroughly. Touch up any painted surfaces that are scratched or chipped.


7. If the vessel must be stored outside, cover it with a waterproof material.

8-2. Removing engine from storage

1. Wipe off anti-rust oil and make sure that the remote control system moves smoothly.

2. Wiring the battery

- (1) Rewire as shown in the wiring diagram.

 See page 41.

Pay special attention to the diameter of the wire.

- (2) Make sure the wires are connected to the correct terminals.



IMPORTANT

If wires are improperly connected, the A.C. generator may break.

- (3) The terminals must be covered and protected.
- (4) Unseal all openings sealed in Step 1-5.
- (5) Also, follow the steps outlined in section VI. STARTING THE NEW ENGINE FOR THE FIRST TIME.

IX. Periodical inspection and maintenance

		Before starting	After 50 hrs or one month	Every 150 hrs	Every 300 hrs	Every 600 hrs
Fuel system	Check the oil level	○				
	Fill with fuel	○				
	Drain the fuel tank		○ (First)		●	
	Replace the fuel filter				● (Replace)	
	Check the injection timing					●
	Check the injection spray condition					●
Lubricating system	Check the oil level	○				
	Replace the oil		○ (First)	●		
			○ (First)	●		
	Check the oil pressure warning lamp function	○				
	Replace the lube oil filter		○ (First)		●	
Cooling system	Seawater outlet	During operation				
	Adjust the tension of cooling water pump driving belt		○ (First)		●	
	Check the impeller of the cooling water pump (sea water pump)					● (Replace)
	Check the thermostat function					●
Air intake and exhaust system	Clean the steel and nylon mesh of the air intake silencer				●	
	Clean the exhaust/water mixing elbow				●	
	Clean the breather pipe				●	
	Check the exhaust gas condition	During operation				
	Compressor cleaning for turbocharger			●		
Electrical system	Check the charge lamp function	○				
	Check the electrolyte level in the battery	○				
	Adjust the tension of the alternator driving belt		○ (First)		●	
	Check the wiring connectors				●	
Cylinder head, etc.	Check for leakage of water and oil	○ (After starting)				
	Retighten all major nuts and bolts					●
	Retighten the cylinder head bolts		○ (First)			●
	Adjust intake/exhaust valve clearance		○ (First)			●
Remote control system, etc.	Checking the remote control operation		○ (First)			●
	Adjust the propeller shaft alignment		○ (First)			●

MAINTENANCE STANDARD

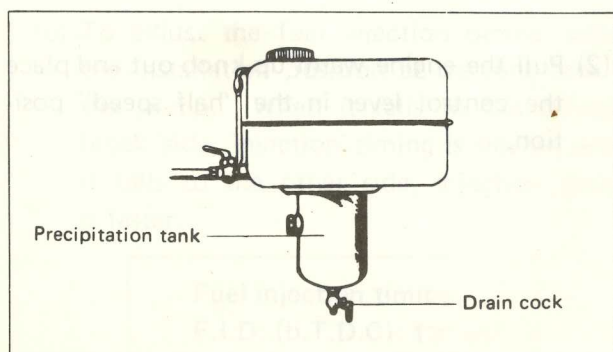
Fuel system	Fuel injection pressure	200±5kg/cm ²	
	Fuel injection timing	bTDC17°±1°	
Lubricating system	Warning buzzer and lamp operating pressure	Below 0.5kg/cm ²	
	Crankcase lube oil amount	6.5ℓ(with KM3P2, KBW20, KBW21) 8ℓ(with KM4A)	
	Marine gear lube oil amount	1.2ℓ(with KM3P2, KBW20, KBW21) 1.3ℓ(with KM4A)	
Cooling system	Thermostat open	Partially open	76.5°C
		Fully open	90°C
	Warning buzzer and lamp operating temperature	ON100°C OFF90°C	
Electrical system	Alternator belt tension (with 10kg thumb force)	10mm	
Cylinder head, etc.	Cylinder head tightening torque (M10)	8±0.5kg-m	
	Intake/exhaust valve clearance	0.2mm	

9-1. Fuel oil system

1. Fuel tank and fuel supply

(1) Fill the tank.

See page 10 for selection of fuel oil, and page 12 for filling method.



(2) Drain the fuel tank every 300 hours of operation.

Open the fuel tank drain cock to drain out any foreign matter which may have accumulated in the bottom of the tank.

When you start the new engine for the first time, or after long storage, drain after the first 50 hours of operation.

(3) If the vent in the fuel tank cap is blocked, fuel will not flow. Clean the fuel tank cap and blow dry periodically.

2. Air bleeding in the fuel system

If the engine is operated when the fuel tank is empty, or with the fuel tank outlet cock closed, air is sucked into the fuel oil system, and the engine stops. When this happens, vent air as in the following:

(1) Add fuel to the fuel tank.

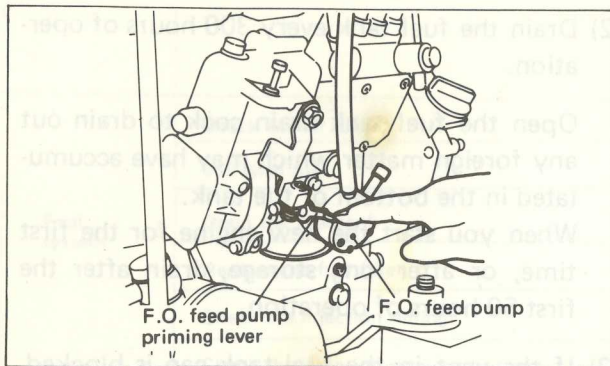
(2) Place the control lever in the "HALF SPEED" position.

(3) Move the fuel feed pump priming lever up and down to vent the air, until it comes heavy. Instead of this method, air bleeding by the starter motor is also available. In that case, turn the key switch in the "ST" position to run the engine. Repeat this procedure several times.

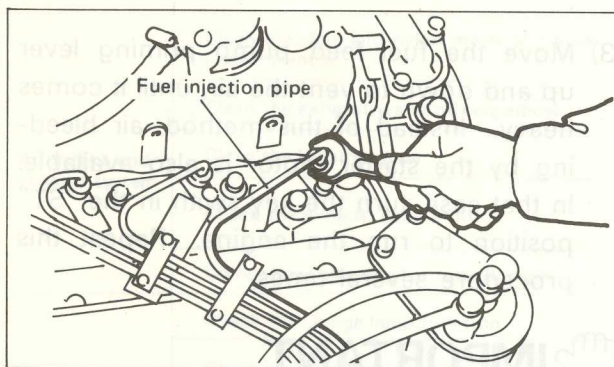


IMPORTANT

Do not operate the starter motor more than 15 seconds at a time. If the engine does not start, wait at least one minute before trying again.



- (4) Vent air in the fuel injection piping. Loosen the fuel injection pipe nipple on the fuel injection side and turn the starter motor by the same method described in (3). (In most cases without fuel injection pipes have been reassembled, this procedure is not necessary.)



- (5) After bleeding air, turn the engine with the starter motor. Make sure that the fuel injection for each cylinder gives off a high-pitched hissing sound.

3. Fuel injection timing and spray condition.

! CAUTION

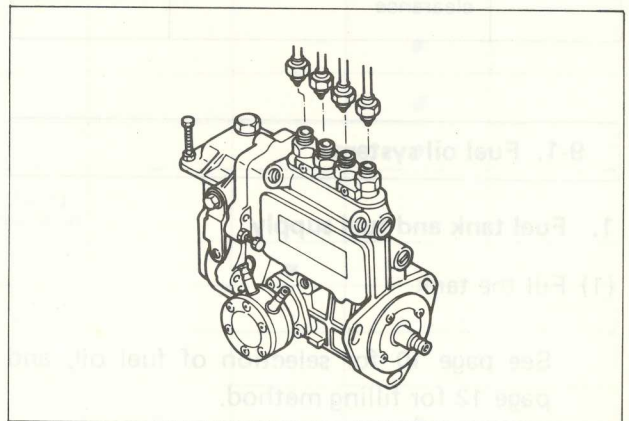
Diesel fuel escaping under pressure can have sufficient force to penetrate the skin, causing serious personal injury. Fluid escaping from a very small hole can be almost invisible. Use a piece of cardboard or wood to check suspected leaks. If injury occurs, see a doctor at once, or serious infection may result.

STOP IMPORTANT

Modification or alteration of the injection pump, the injection pump timing, or the fuel injection valves in ways not recommended by the manufacturer will terminate the warranty.

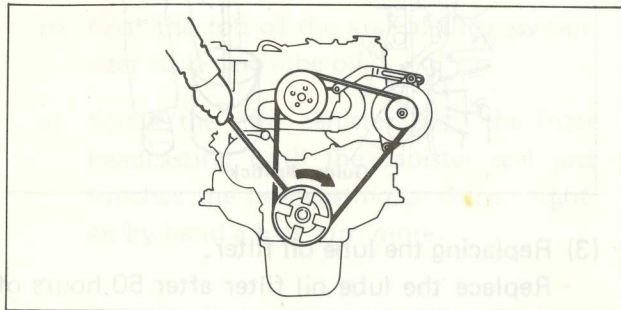
Check the fuel injection timing as follows:

- (1) Remove the high pressure pipe from the fuel injection pump.



- (2) Pull the engine warm up knob out and place the control lever in the "half speed" position.

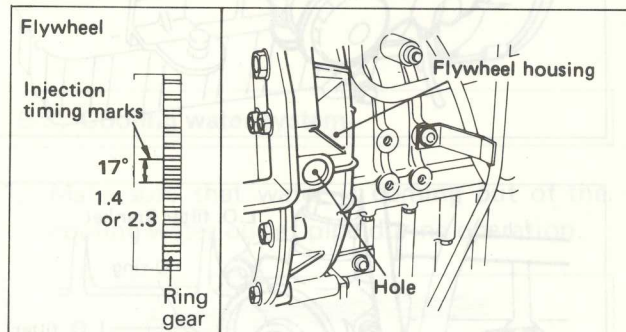
- (3) Insert a turning bar into the hole on the crank pulley on the front side. Crank the engine lightly to check the fuel injection timing.



- (4) Timing marks on the flywheel can be seen through the hole on the flywheel housing.

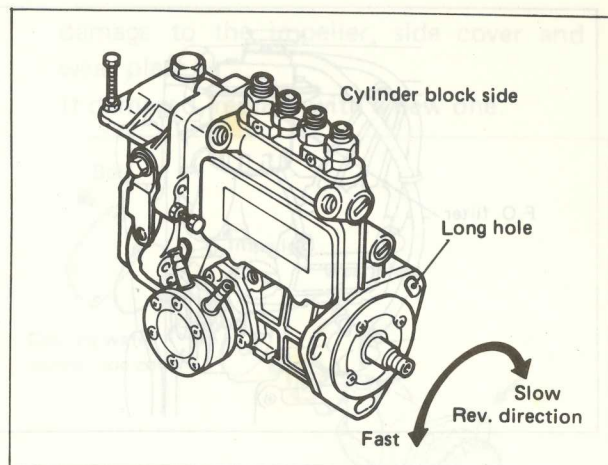
NOTE

All timing marks on the flywheel are indicated by number; for example, 1.4 or 2.3. These indicate top dead center of the pistons. Fuel injection timing marks are described 17° before this TDC mark.



- (5) Fuel should bubble out at the same time the timing mark on the flywheel and the indication mark on the flywheel housing line up.
- (6) To adjust the fuel injection timing, adjust the installation position at the long hole of the pump. When it falls to the cylinder block side, injection timing is slower; when it falls to the other side, injection timing is faster.

Fuel injection timing
F.I.D. (b.T.D.C): $17^\circ \pm 1^\circ$



- (7) Check the fuel injection timing for all of the cylinders.
- (8) Remove the fuel injection nozzle and check the injection spray condition. The spray should be cone-shaped.

If the spray is not cone-shaped, the following may apply:

- a) injection pressure too low.
- b) wear or sticking of the fuel injection nozzle.
- c) fuel bad.



IMPORTANT

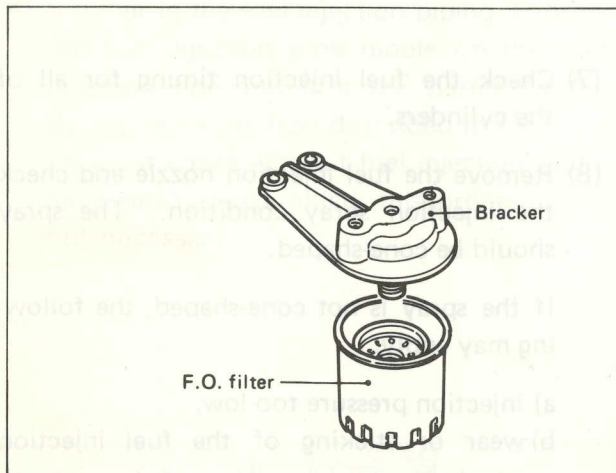
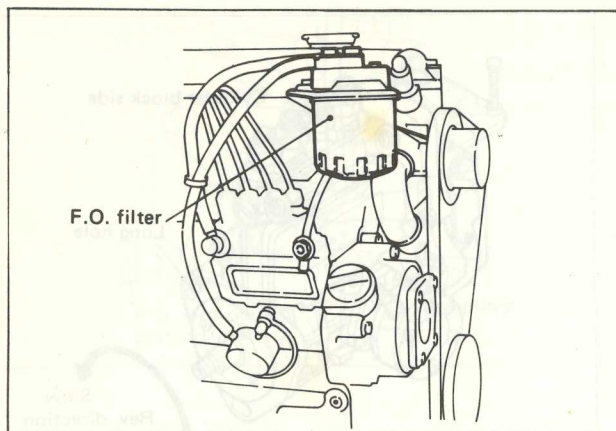
For disassembly, adjustment and inspection of the fuel injection pump and fuel injection valve, consult your nearest Yanmar dealer.

4. Replacing the fuel filter

- (1) Since the fuel oil filter is of the cartridge type, the element cannot be cleaned by removing the filter. Replace the filter as a unit after the specified period of use.

Replace: Every 300 hours

- (2) When installing the fuel oil filter, remove any dust and foreign matter from the contact surface.
- (3) After installing the filter, bleed out the air, run the engine, and check for oil leaks.



9-2. Lubricating oil system

1. Engine lube oil

- (1) Check the oil level before operation.

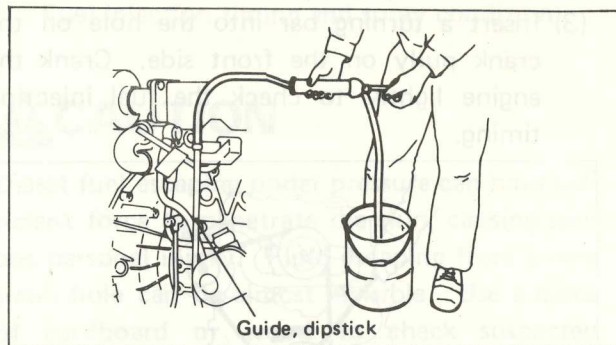
 See page 14

- (2) Replace the oil after 50 hours of operation (after starting for the first time or after long storage) and every 150 hours of operation.

Lube oil changes can be performed most effectively while the engine is still warm. The oil will flow easily and can be drained thoroughly.

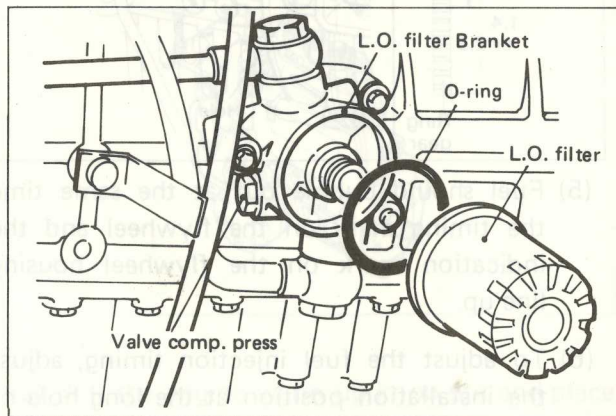
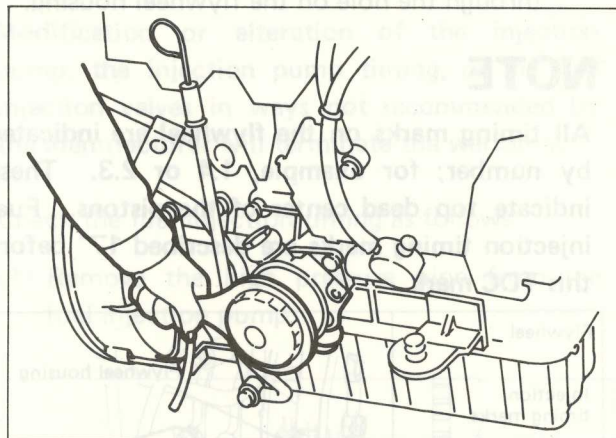
The oil should be pumped out through the dipstick hole. Put the evacuation pump rubber hose over the dipstick hole.

Outer diameter of dipstick hole. . . . $\phi 15$ and $\phi 19$.



- (3) Replacing the lube oil filter.

- Replace the lube oil filter after 50 hours of operation (First time or after long storage) and every 300 hours of operation.



- a) Unscrew the canister by hand or with a filter replacer tool.

- b) Make sure that the threaded adaptor is secure in the headcasting.
- c) Discard used canisters.
- d) Coat the top of the seal of the new canister with new lube oil.
- e) Screw the new canister onto the filter headcasting until the canister seal just touches the headcasting, and then tighten by hand a half turn more.



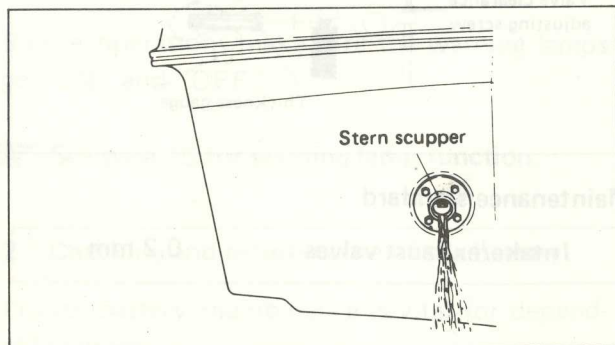
IMPORTANT

If the canister is too tight, it may be difficult to remove and may damage the filter.

- f) Start the engine and check for leaks. Check the oil level after running the engine for several minutes and fill when necessary.

9-3. Cooling water system

1. Make sure that water is coming out of the cooling water outlet pipe during operation.



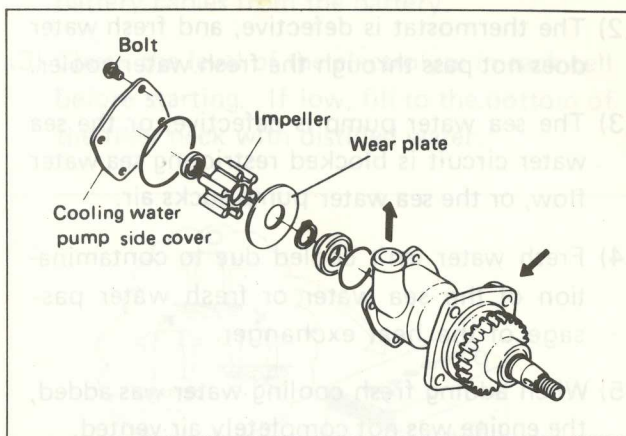
2. Inspection and replacement of cooling water pump

(1) Impeller of cooling water pump

- a) Remove the cooling water pump cover, take out the impeller, and check for

damage to the impeller, side cover and wear plate.

If damaged, replace with a new one.

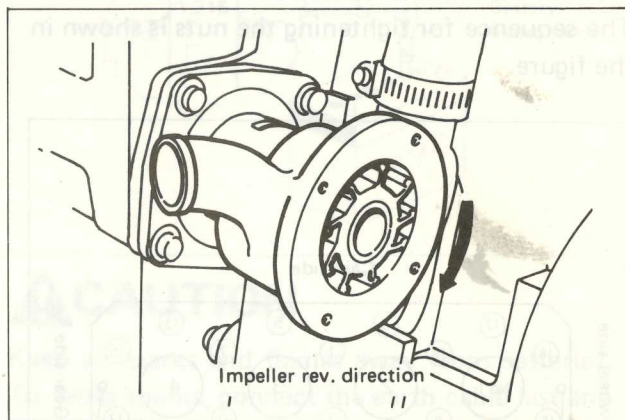


- b) When reassembling the pump, coat the fittings of the pump shaft and impeller, both sides of the impeller, and the vane tips with grease.



IMPORTANT

When installing the impeller, make sure the direction of the impeller corresponds to that indicated in the figure.



3. When the cooling water temperature is too high.

When the cooling water temperature exceeds 90°C, check the fresh water cooling system and sea water cooling system for the following:

- (1) The fresh water pump is defective, or the fresh water circuit is blocked, restricting fresh water flow.
- (2) The thermostat is defective, and fresh water does not pass through the fresh water cooler.
- (3) The sea water pump is defective, or the sea water circuit is blocked restricting sea water flow, or the sea water pump sucks air.
- (4) Fresh water isn't cooled due to contamination of the sea water or fresh water passage of the heat exchanger.
- (5) When adding fresh cooling water was added, the engine was not completely air-vented.

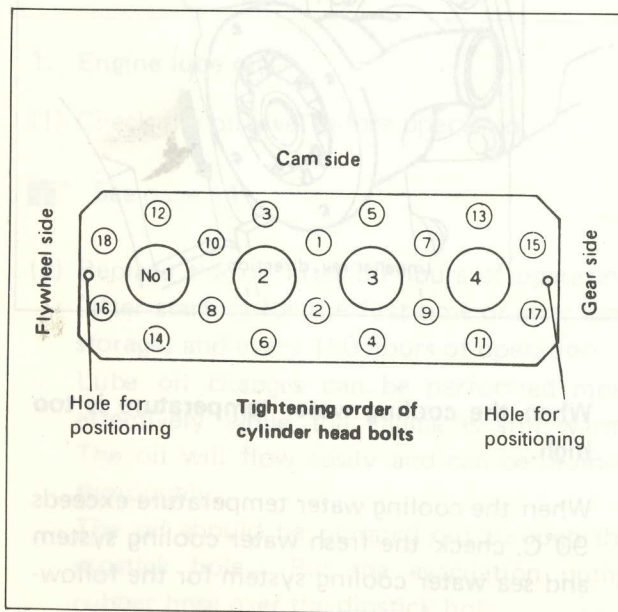
If the cause of the trouble cannot be located, consult your nearest Yanmar agent.

9-4. Inspection of engine body

1. Retightening cylinder head nuts

Retighten each nut with a torque wrench after the first 50 hours of operation.

The sequence for tightening the nuts is shown in the figure.



**Cylinder head bolts
tightening torque**

8 ± 0.5 kg-m

2. Exhaust/intake valve head clearance adjustment.

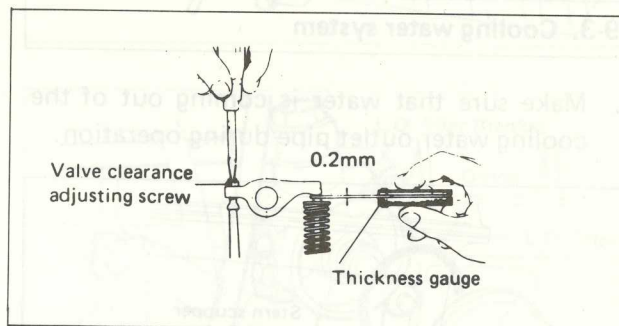
The clearance of the valve affects the overall performance of the engine, so it is important that it be correctly adjusted.

Check the clearance after the first 50 hours of operation and every 600 hours there after. Adjustment should be done while the engine is cold.

- (1) Remove the valve rocker arm cover.
- (2) Crank the engine and set the No. 1 (flywheel side) piston to top dead center (TDC) on the compression stroke.

NOTE

The valve rocker arm shaft should not move even when the crankshaft is turned to the left or right of the T mark.



Maintenance standard

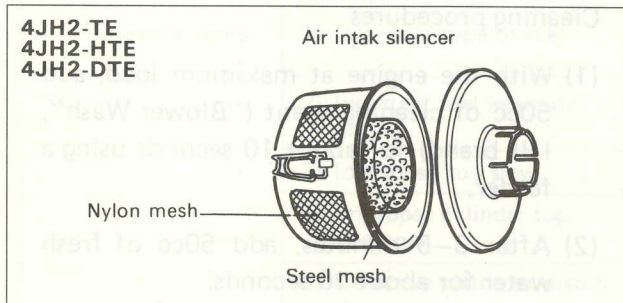
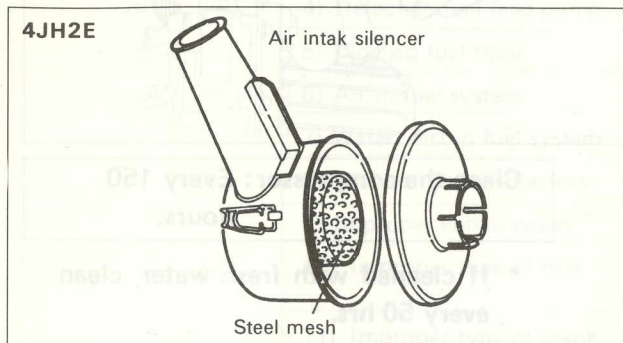
Intake/exhaust valves

0.2 mm

- (3) Check and adjust the intake and exhaust valve head clearances of the No. 1 cylinder. Loosen the valve clearance adjusting screw lock nut, adjust the clearance to the maintenance standard with a thickness gauge, and retighten the lock nut.

9-5. Washing the air intake silencer element

Wash the nylon mesh and the steel mesh inside the air intake silencer with a neutral detergent every 300 hours of operation.



9-6. Electrical equipment

1. Checking the warning lamps on the instrument panel.

Before operation, make sure the warning lamps go "ON" and "OFF".

☛ See page 15 for warning lamp function.

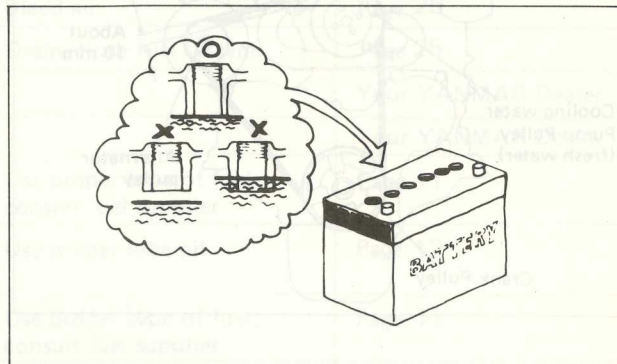
2. Checking and maintenance of the battery.

Proper battery maintenance is vital for dependable service.

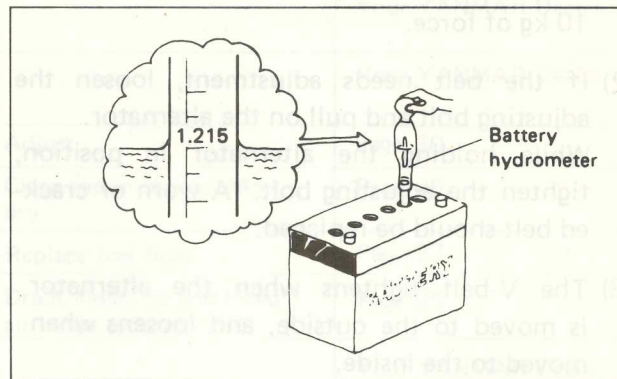
- (1) Keep the battery clean by wiping it with a damp cloth.
Keep all connections clean and tight.
Remove any corrosion, and wash the terminals with a solution of baking soda and water.

- (2) Keep the battery fully charged, especially during cold weather. If the battery needs to be charged, charge it after disconnecting the battery cables from the battery.

- (3) Check the level of the electrolyte in each cell before starting. If low, fill to the bottom of the filler neck with distilled water.



- (4) To check the battery, use a battery hydrometer. Check the specific gravity of the electrolyte in each cell. Charge the battery if the reading is below 1.215.



⚠ CAUTION

Keep all sparks and flames away from batteries. To avoid sparks, connect the earth cable last and disconnect it first.

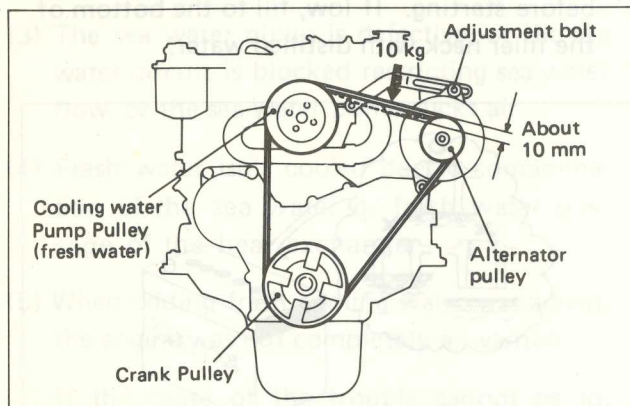


IMPORTANT

When adding distilled water in freezing weather, run the engine at least 30 minutes to ensure thorough mixing.

3. Checking and adjustment of the alternator (electric generator) V-belt tension.

If the V-belt is too tight, it can be easily damaged. Hand, if it is too loose, slippage results and generator efficiency drops. sults and generator efficiency drops.



(1) Checking the tension.

With the engine stopped, press the belt midway between the pulleys and measure the "give".

The belt should give 10 mm with about 10 kg of force.

(2) If the belt needs adjustment, loosen the adjusting bolt and pull on the alternator.

While holding the alternator in position, tighten the adjusting bolt. A worn or cracked belt should be replaced.

(3) The V-belt tightens when the alternator is moved to the outside, and loosens when moved to the inside.

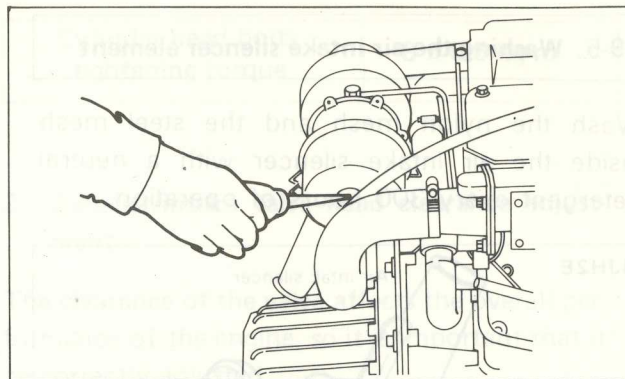


IMPORTANT

Make sure there is no oil on the belt, or slippage will result.

9-7. Inspecting the turbo-charger (Model RHB52, IHI make) for 4JH2-TE, 4JH2-HTE, 4JH2-DTE

1. Cleaning the turbo-charger compressor



Clean the compressor: Every 150 hours.

*** If cleaned with fresh water, clean every 50 hrs.**

2. Cleaning procedures

(1) With the engine at maximum load, add 50cc of cleaning agent ("Blower Wash", IHI brand) for about 10 seconds using a feeder.

(2) After 3-5 minutes, add 50cc of fresh water for about 10 seconds.

(3) Use a vinyl container or the like for adding the cleaning agent and water. If a large amount of cleaning agent or fresh water is fed into the turbo-charger all at once, trouble (damage to the compressor fan wheel, etc.) may occur. Pay careful attention to the amount fed and the time.

(4) If there is no change in the turbo-charging pressure or in the exhaust temperature, repeat the above cleaning procedures after 10 minutes. If there is still no change after repeating the cleaning procedures 3-4 times, the blower is heavily contaminated, or there is some other problem. Consult your nearest Yanmar dealer.

(5) After cleaning, run the engine with load for at least 15 minutes to allow it to dry.

X. Trouble shooting

Problem	Possible cause	Possible remedy	See
1) Engine * Engine hard to start or will not start	1) Incorrect speed control position	* Set remote control lever in the high idle speed position	Page 18
	2) No fuel	* Check fuel tank	
	3) Fuel shut off valve closed	* Open shut off valve	
	4) Defective fuel feed pump	* Replace fuel feed pump	Your YANMAR Dealer
	5) Clogged fuel filter	* Replace filter	Page 27
	6) Air in fuel system	* Bleed air	Page 25
	7) Water, dirt in fuel system	* Drain, flush fuel system	Page 25
	8) Dirty or faulty injectors		Your YANMAR Dealer
	9) Improper compression		Your YANMAR Dealer
	10) Improper type of fuel	* Use proper type of fuel; consult fuel supplier	Page 11
	11) Improper type of crank-case lube oil	* Use proper lube oil	Page 12
* Engine knocks	1) Improper type of fuel	* Use proper type of fuel; consult fuel supplier	Page 11
	2) Incorrect fuel injection timing	* Check injection timing	Page 24
	3) Idle speed too slow		Your YANMAR Dealer
	4) Improper cylinder top clearance		Your YANMAR Dealer
	5) Defective piston or piston ring		Your YANMAR Dealer
	6) Defective crankshaft bearing or piston pin bearing		Your YANMAR Dealer
	7) Improper valve clearance	* Adjust	Page 30
* Engine runs irregularly or stalls frequently	1) Vent in fuel tank cap obstructed	* Clean cap in solvent; blow dry	Page 25
	2) Clogged fuel filter	* Replace fuel filter	Page 27
	3) Water, dirt, or air in fuel system	* Drain, flush, fill and bleed air in the system	Page 25
	4) Dirty or faulty injectors		Your YANMAR Dealer
	5) Faulty governor linkage		Your YANMAR Dealer
	6) Defective fuel feed pump	* Replace fuel feed pump	Your YANMAR Dealer
	7) Improper valve clearance	* Adjust proper valve clearance	Page 30
	8) Defective valve spring	* Replace valve spring	Your YANMAR Dealer
	9) Improper compression		Your YANMAR Dealer
* Lack of engine power	1) Engine overloaded	* Reduce load (check, propeller matching)	Your YANMAR Dealer
	2) Air intake restricted	* Service air cleaner	Page 31
	3) Clogged fuel filter	* Replace fuel filter	Page 27
	4) Improper type of fuel	* Use proper fuel	Page 11

Problem	Possible cause	Possible remedy	See
	5) Improper valve clearance	* Adjust proper valve clearance	Page 30
	6) Dirty or faulty injectors		Your YANMAR Dealer
	7) Incorrect fuel injection	* Check the fuel injection timing	Page 27, your YANMAR Dealer
	8) Improper engine compression		Your YANMAR Dealer
	9) Vent in fuel tank cap obstructed	* Clean cap in solvent Blow dry	Page 25
* Engine overheats	1) Engine overloaded	* Reduce load	
	2) Defective cooling water	* Check cooling water pump	Page 29
	3) Loose or defective cooling water hose clamp	* Check hose clamp	Page 14
	4) Cooling system needs flushing	* Flush cooling system	Your YANMAR Dealer
	5) Defective thermostat	* Replace thermostat	Your YANMAR Dealer
	6) Defective temperature lamp or sender	* Check bulb, fuse and wiring	Page 15, your YANMAR Dealer if needed
	7) Cooling water leaks from water passage	* Check water passage	Page 27, your YANMAR Dealer
	8) Contamination of heat exchanger	* Check and clean heat exchanger	Your YANMAR Dealer
* Engine emits black or gray exhaust smoke	1) Improper type of fuel	* Use proper fuel	Page 11
	2) Clogged or dirty air intake	* Service air intake silencer	Page 31
	3) Defective injection pump	* Have your dealer check fuel injection pump	Your YANMAR Dealer
	4) Faulty injectors	* Have your dealer check injectors	Your YANMAR Dealer
	5) Incorrect fuel injection timing	* Check the injection timing	Page 26, and see your YANMAR Dealer
	6) Improper valve clearance	* Adjust valve clearance	Page 30
	7) Lube oil level too high	* Drain surplus	Page 28
	8) Improper lube oil	* Use proper viscosity oil	Page 12
* Low lube oil pressure	1) Low lube oil level	* Add lube oil	Page 13
	2) Improper lube oil viscosity	* Drain, add proper lube oil	Page 12
	3) Defective lube oil pump		Your YANMAR Dealer
	4) Defective oil pressure lamp and/or sender	* Replace lamp and/or sender	Page 15
* High lube oil consumption	1) Too light viscosity oil	* Use proper viscosity oil	Page 12
	2) Oil leaks	* Check for leaks in lines, around gasket and drain plug	
	3) Improper type of oil	* Use oil proper viscosity	Page 12
	4) Clogged breather system	* Clean breather system	
	5) Defective piston ring, piston, cylinder liner, valve guide and seat		Your YANMAR Dealer

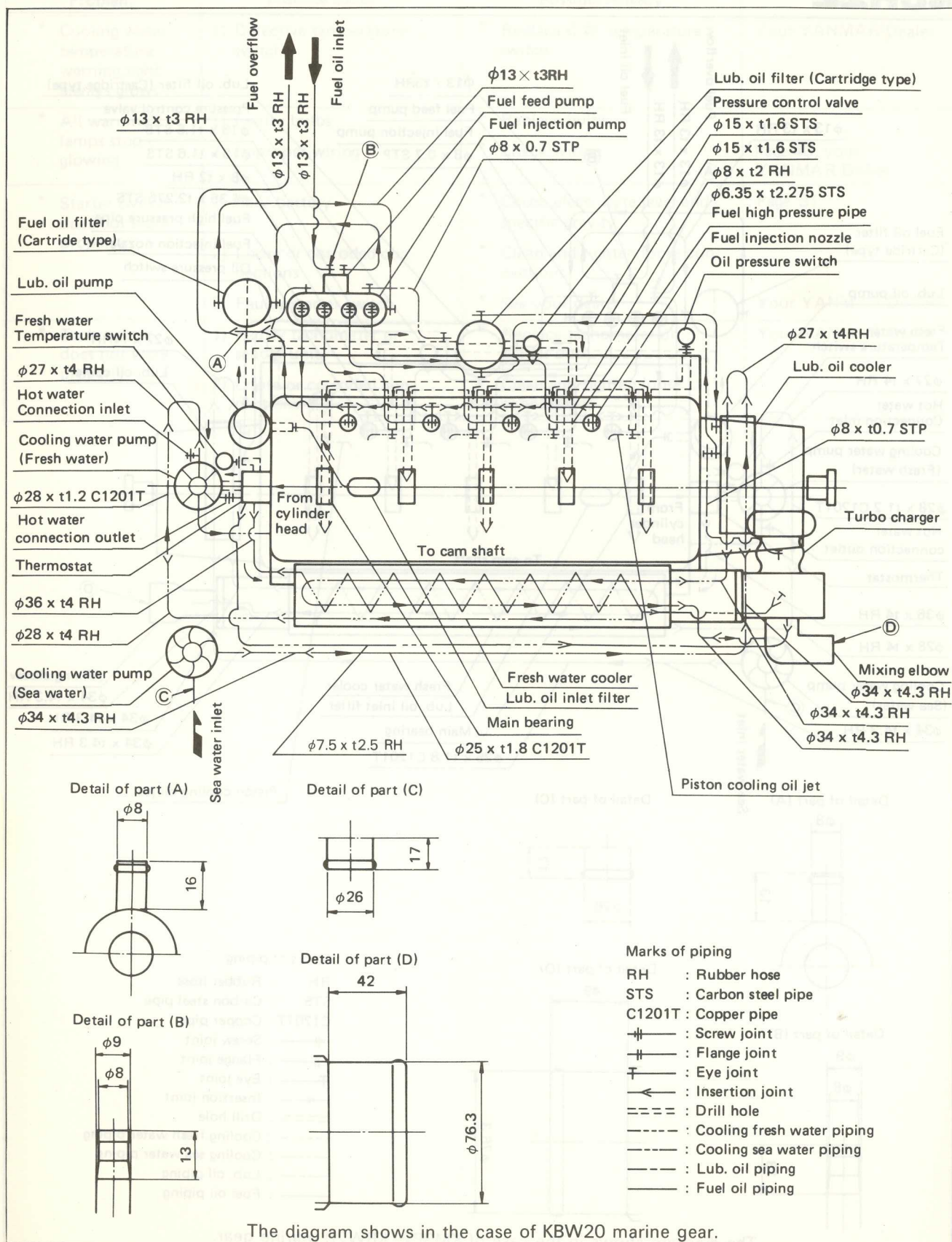
Problem	Possible cause	Possible remedy	See
* High fuel consumption	1) Improper type of fuel	* Use proper fuel	Page 11
	2) Clogged or dirty air intake silencer	* Service air intake silencer	Page 31
	3) Engine overloaded	* Reduce load	
	4) Improper valve clearance	* Adjust valve clearance	Page 30
	5) Incorrect fuel injection timing	* Check the injection timing	Page 26, your YANMAR Dealer
	6) Low engine temperature	* Check thermostat	See Diagram page 39
	7) Improper compression	* Have your dealer check compression	Your YANMAR Dealer
* Abnormal noise	1) Worn bearing or gear		Your YANMAR Dealer
	2) Defective bearing or gear		Your YANMAR Dealer
	3) Loose bolt or nut		Your YANMAR Dealer
	4) Low lube oil level	* Add lube oil up to specified level	Page 13
2) Electrical system * Battery will not charge	1) Loosen or corroded connections	* Clean and tighten connection	Page 31
	2) Sulfated or worn-out battery	* Check electrolyte level and specific gravity	Page 31
	3) Defective alternator	* Replace alternator	Your YANMAR Dealer
	4) Loose or defective alternator drive belt	* Adjust belt tension or replace belt	Page 32
* Charge warning lamp glows with engine running	1) Low engine speed	* Increase engine speed	
	2) Defective battery	* Check electrolyte level and specific gravity	Page 31
	3) Defective alternator	* Replace alternator	Your YANMAR Dealer
	4) Slipping alternator drive belt	* Tighten the belt after checking for oil on the belt	Page 32
* Starter does not work properly	1) Loose or corroded connections	* Clean and tighten loose connections	
	2) Low battery output	* Check electrolyte level and specific gravity	
	3) Defective magnetic switch	* Replace magnetic switch	Your YANMAR Dealer
	4) Defective starter switch	* Replace starter switch	Your YANMAR Dealer
	5) Defective wiring	* Check the wiring	Page 40
* Starter crank slow	1) Low battery output	* Check electrolyte level and specific gravity	Page 31
	2) Too heavy viscosity lube oil	* Use proper viscosity oil	Page 12
	3) Loose or corroded wiring	* Clean and tighten loose connections	

Problem	Possible cause	Possible remedy	See
* Cooling water temperature warning light always glows	1) Defective temperature switch	* Replace C.W. temperature switch	Your YANMAR Dealer
* All warning lamps stop glowing	1) Faulty bulbs 2) Improper wiring	* Replace bulbs * Check wiring	Page 40, your YANMAR Dealer
* Starter switch does not work properly	1) Poor battery 2) Loose or corroded connections 3) Faulty starter switch	* Check electrolyte level and specific gravity * Clean and tighten loose connections * See your dealer	Page 31 Your YANMAR Dealer
* Tachometer does not work properly	1) Faulty tachometer or sender unit 2) Loose or corroded connections	* Replace tachometer or sender unit * Clean and tighten loose connections	Your YANMAR Dealer

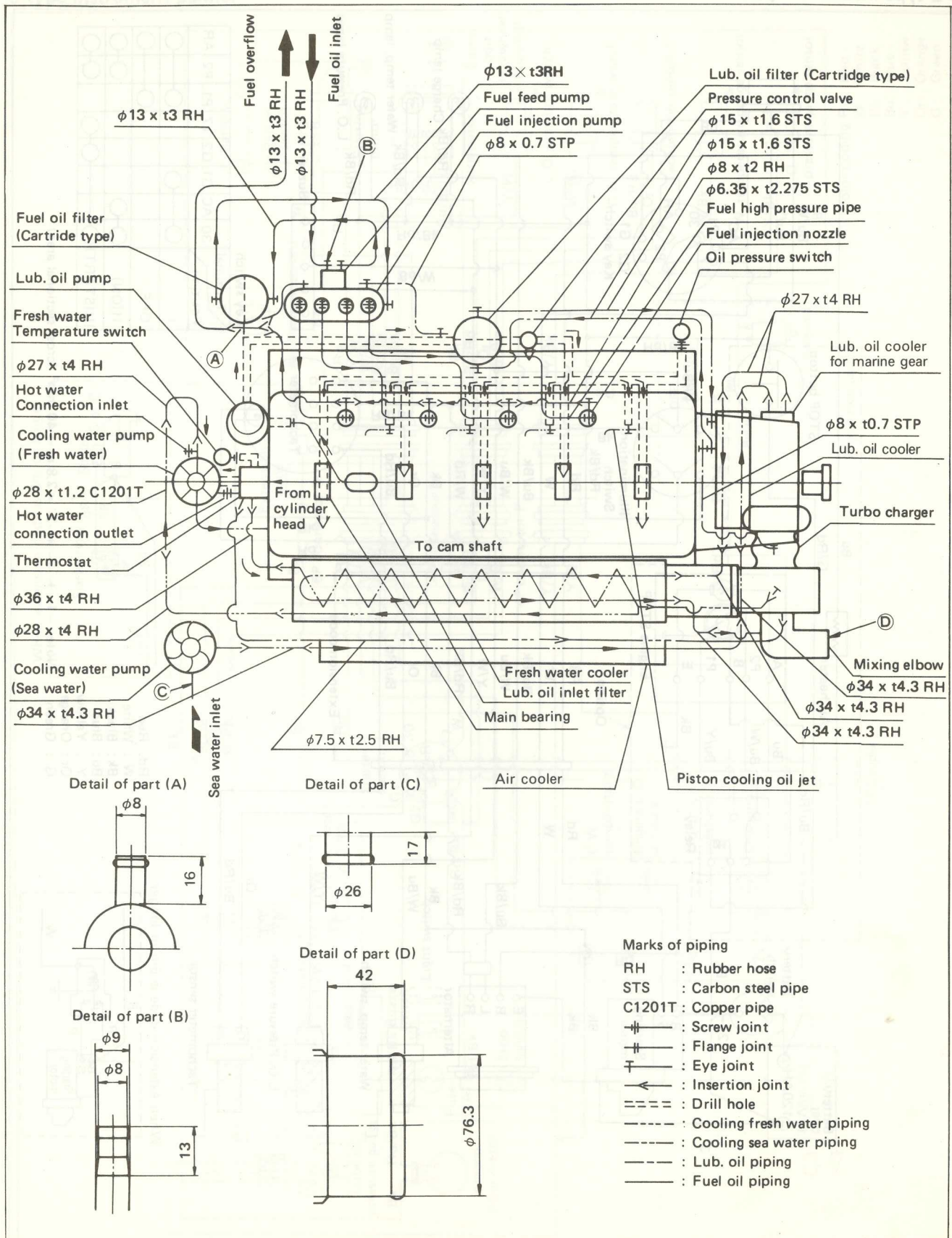
4JH2E



4JH2-TE

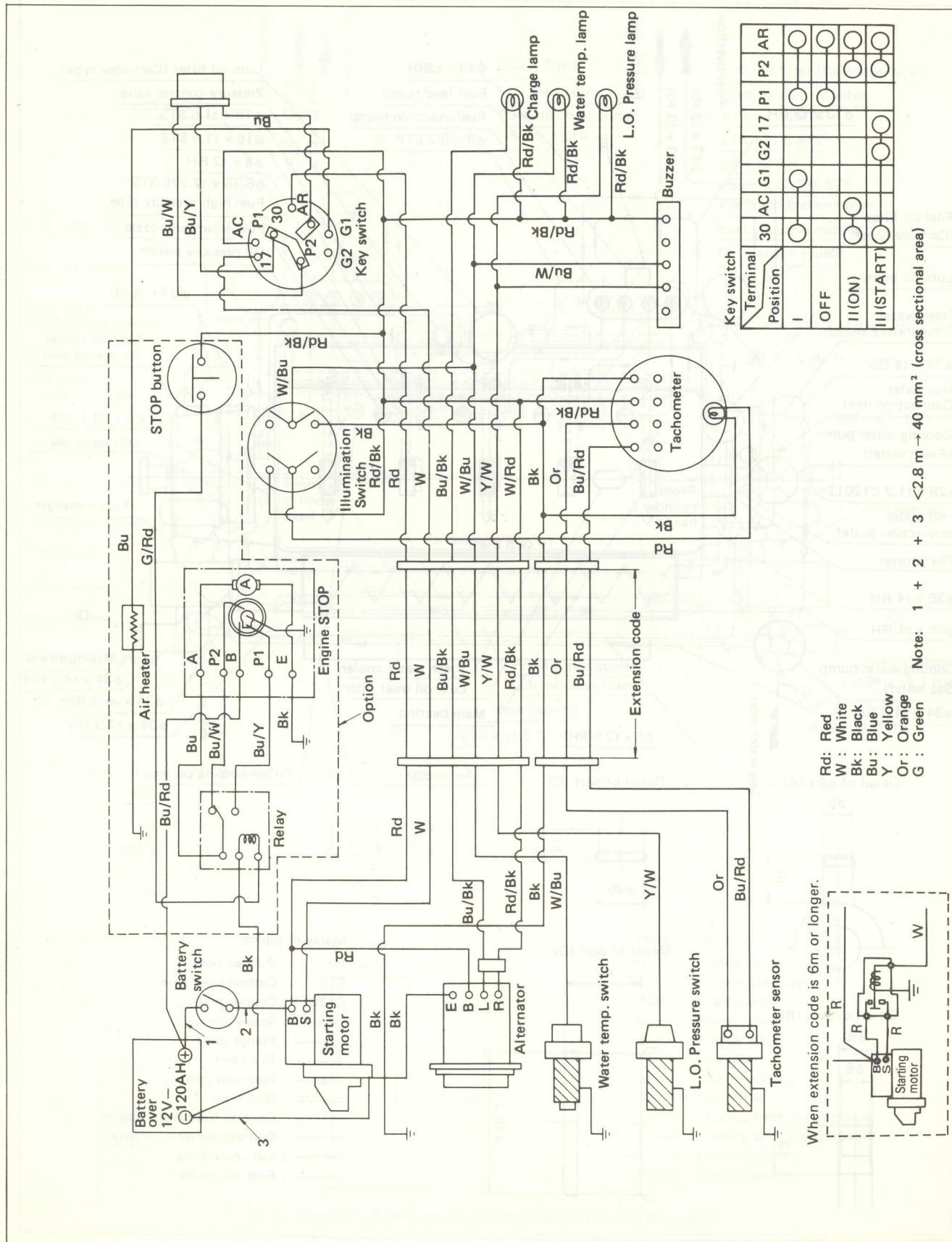


4JH2-HTE·4JH2-DTE

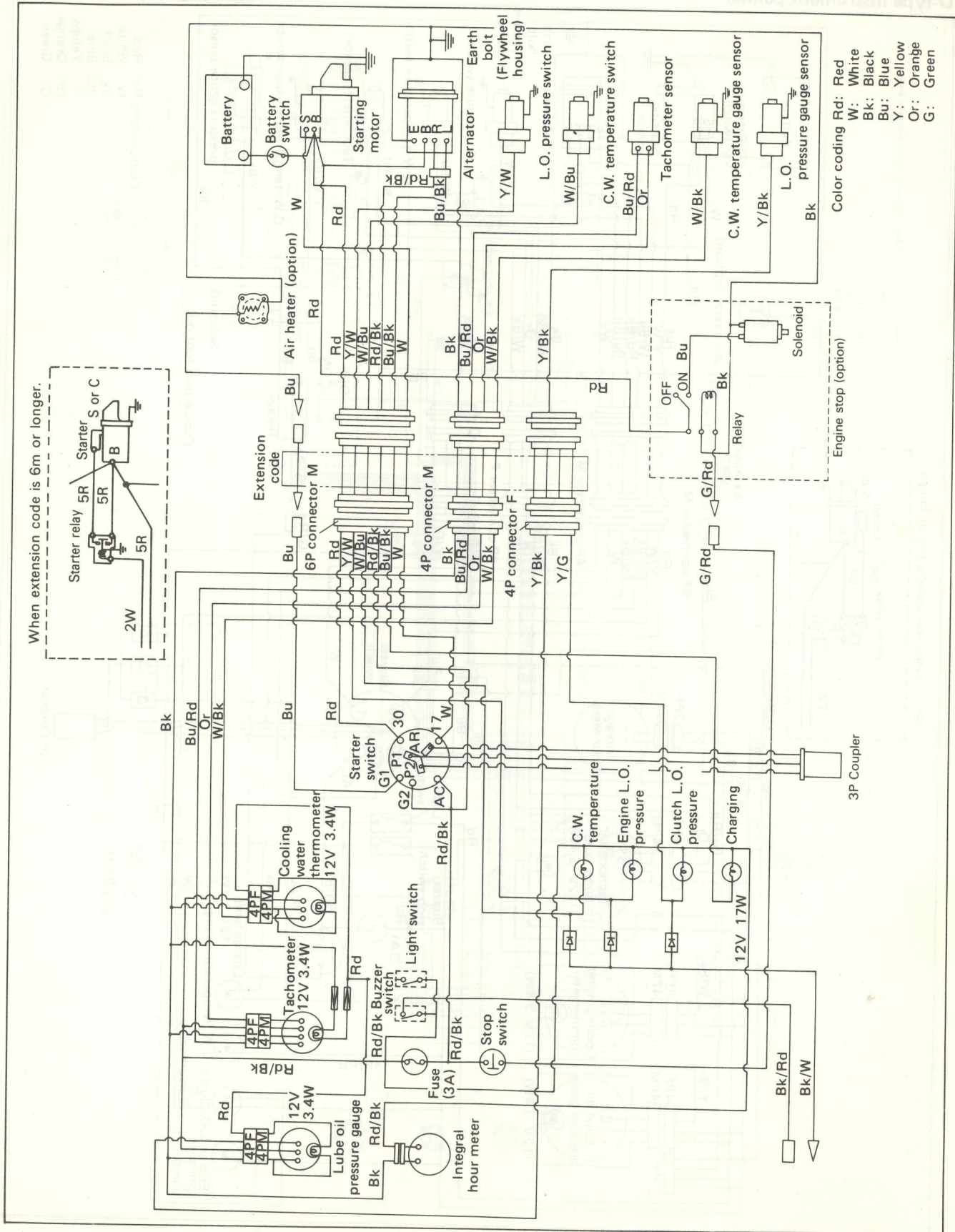


XII. Electrical wiring diagram

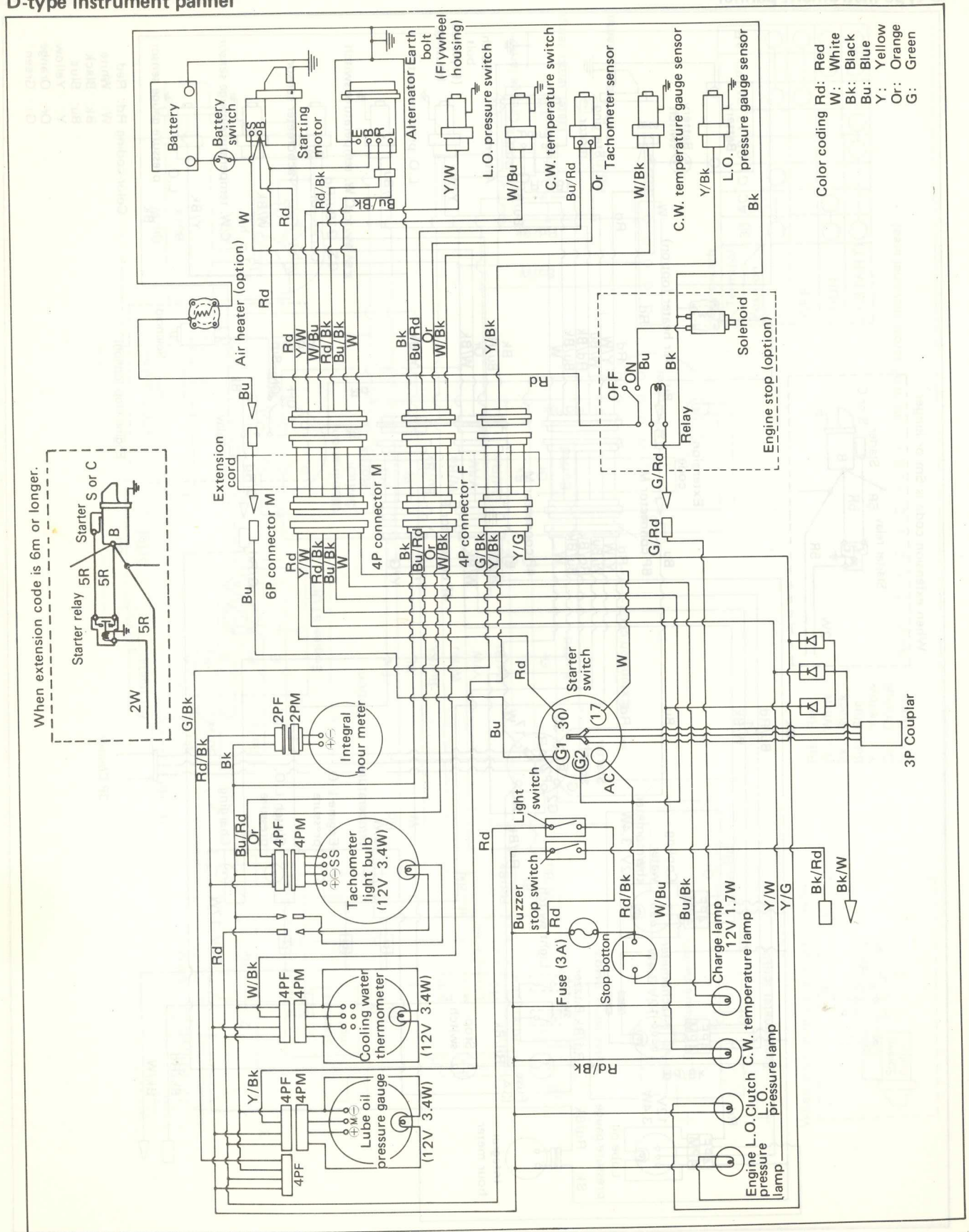
B-2 type instrument panel



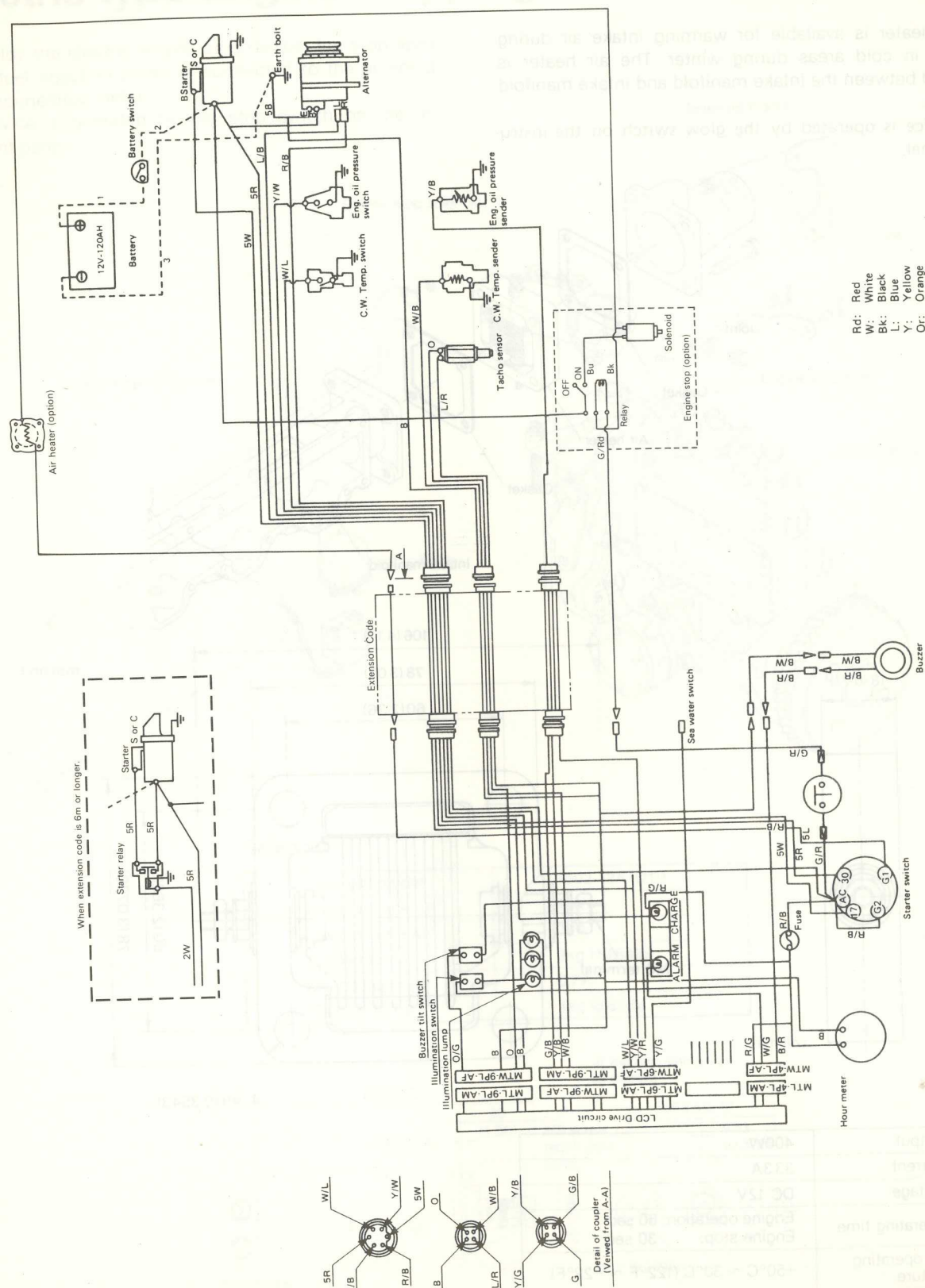
C-type instrument panel



D-type instrument panel



E-type instrument pannel



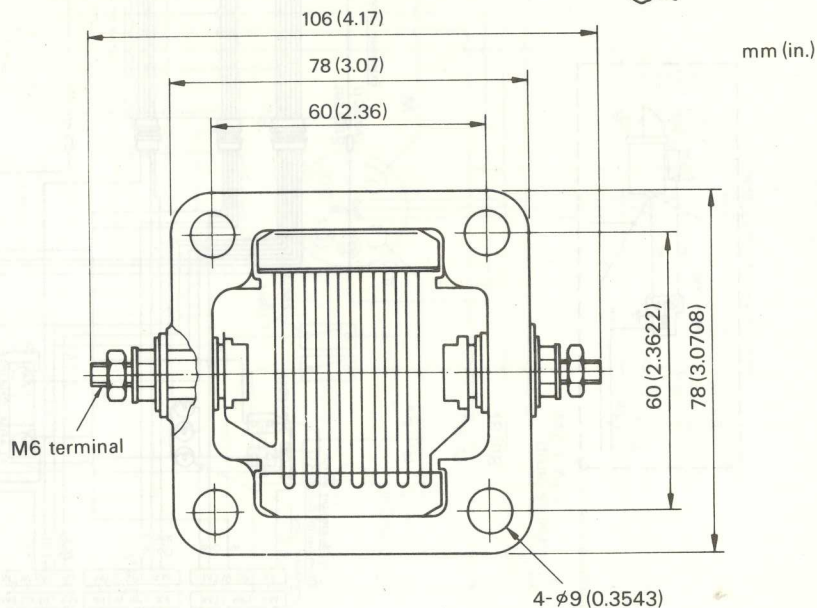
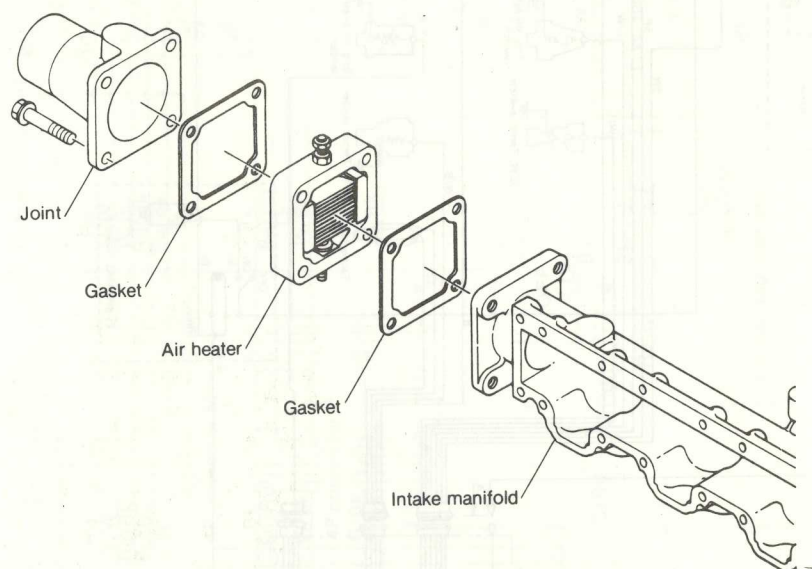
Instrument pannel (No. 1 station)

XIII. Optional Device

Air Heater (Optional)

An air heater is available for warming intake air during starting in cold areas during winter. The air heater is mounted between the intake manifold and intake manifold coupling.

The device is operated by the glow switch on the instrument panel.

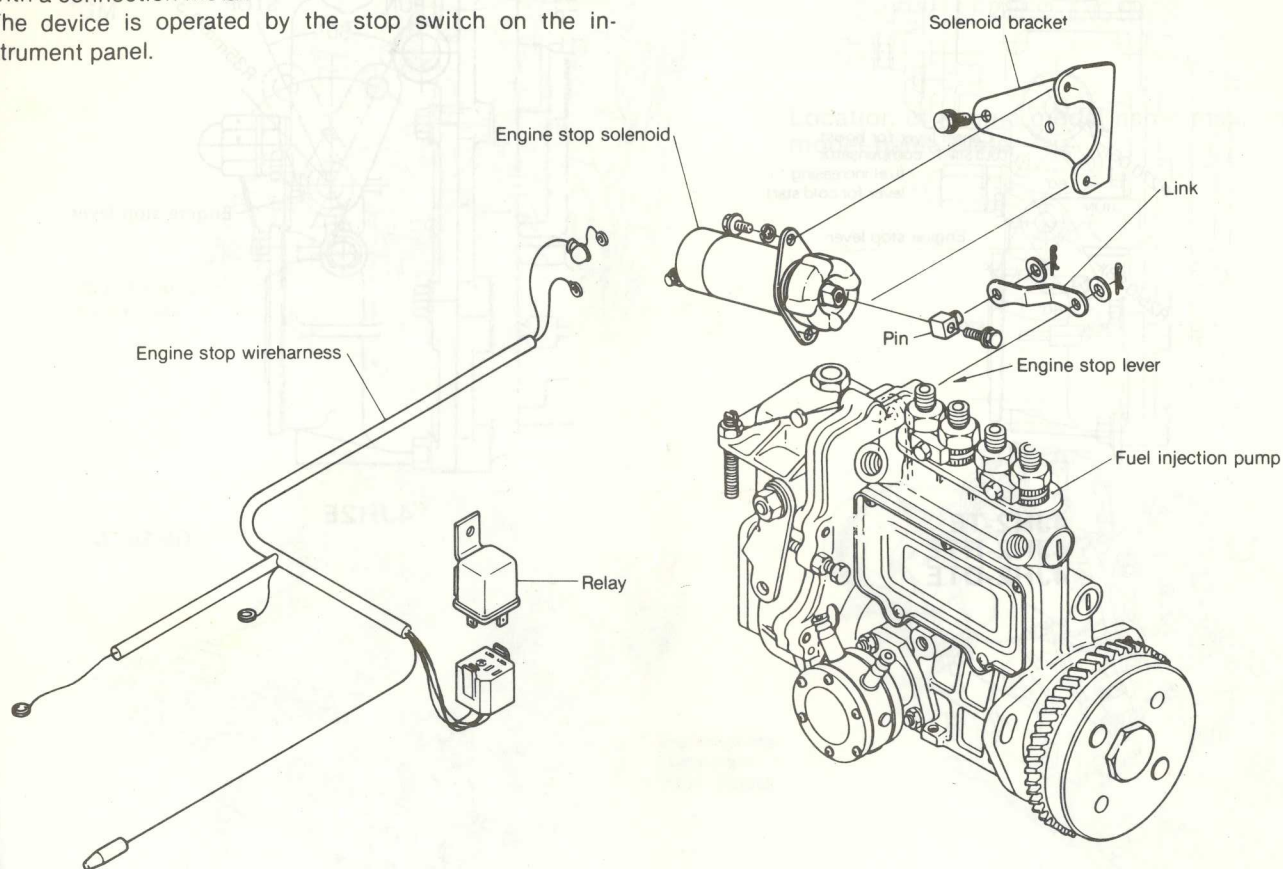


Rated output	400W
Rated current	33.3A
Rated voltage	DC 12V
Rated operating time	Engine operation: 60 sec. Engine stop: 30 sec.
Range of operating temperature	+50°C ~ 30°C (122°F ~ -22°F)
Part code No.	129100-77500

Electric type Engine Stopping Device

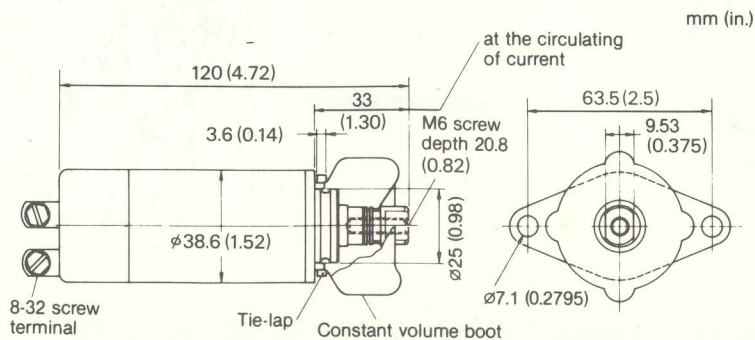
To employ the electric engine stop device, the stop lever of the fuel injection pump is connected to the solenoid with a connection metal.

The device is operated by the stop switch on the instrument panel.

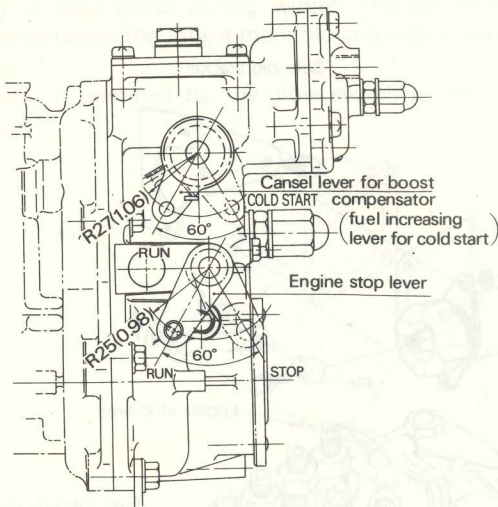


Solenoid

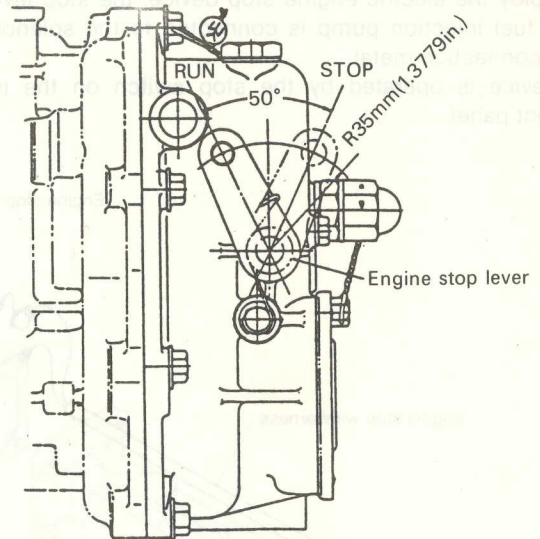
Solenoid model	1502-12A7U1B
Rated voltage	12V
Loaded current	30A
Loaded force	9kg (19.84lb)
No-load current	0.7A
No-load force	4kg (8.82lb)



Electric type Engine Stopping Device (A) relay



4JH2-TE
4JH2-HTE
4JH2-DTE



4JH2E



YANMAR DIESEL ENGINE CO., LTD.

1-1, 2-chome, Yaesu, Chuo-ku, Tokyo 104, Japan

Cable: YANMAR TOKYO Telex: 0222-4733, 0222-2310

"129573-0001E" Printed in Japan

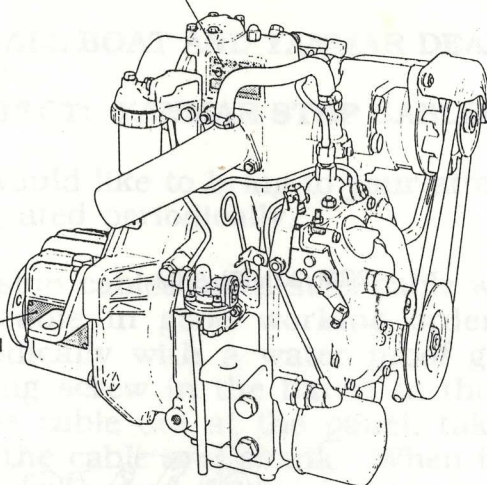
MORE POWER TO YOU!

MACK BORING & PARTS COMPANY

Engine model name plate

1GM

Clutch model
name plate



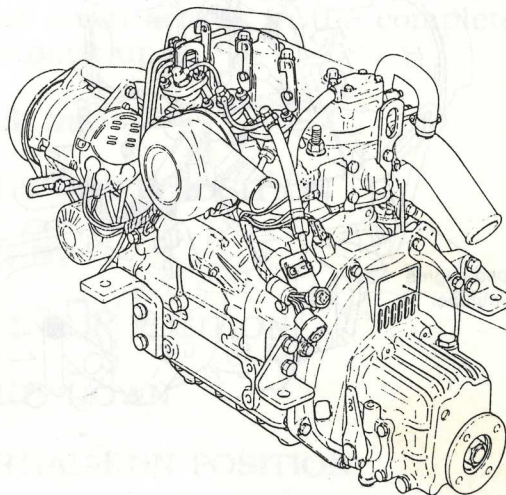
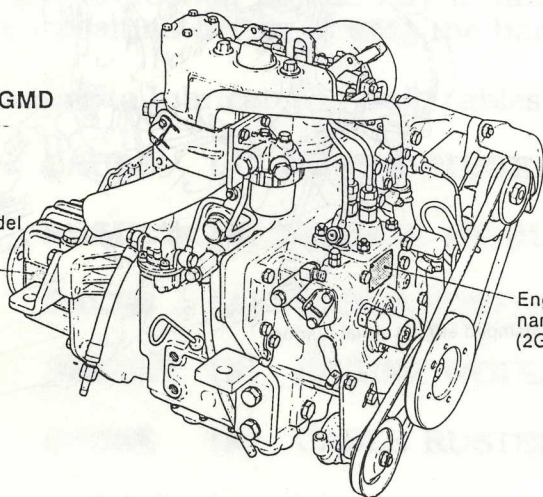
SUBJECT: ENGINE SERIAL NUMBER AND
TRANSMISSION NUMBER IDENTIFICATION SHEET FOR YANMAR
GM/HM SERIES ENGINES.

Location of engine model name plate and clutch
model name plate

2GM, 3GMD

Clutch model
name plate
(2GM)

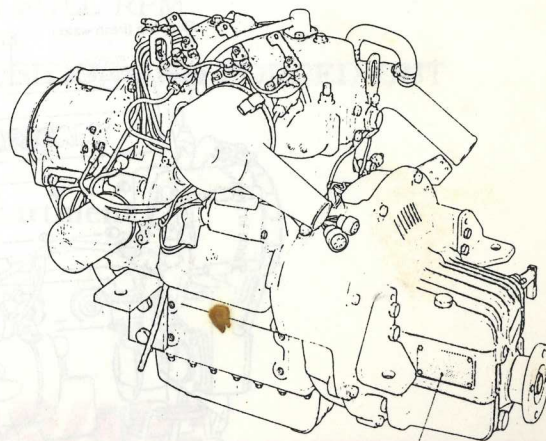
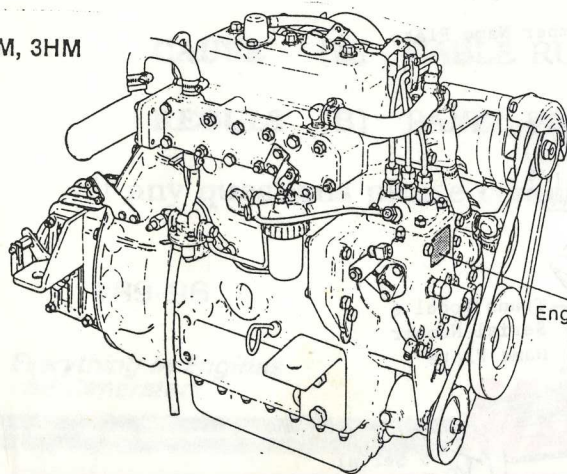
Engine model
name plate
(2GM, 3GMD)



Clutch model
name plate
(3GMD)

3GM, 3HM

Engine model name plate



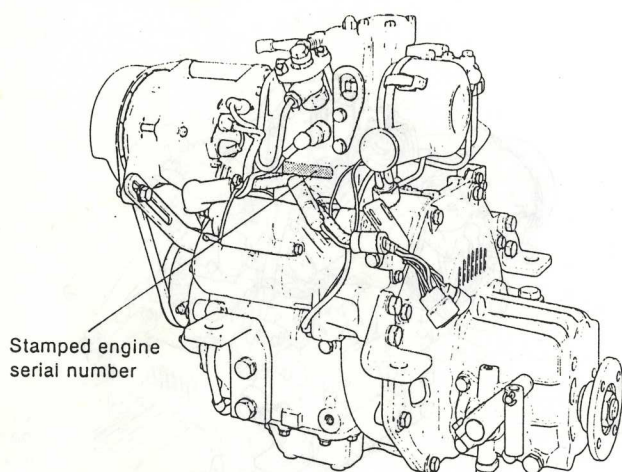
Clutch model name plate

* FOR LOCATION OF ENGINE SERIAL NUMBER, SEE BACK PAGE *

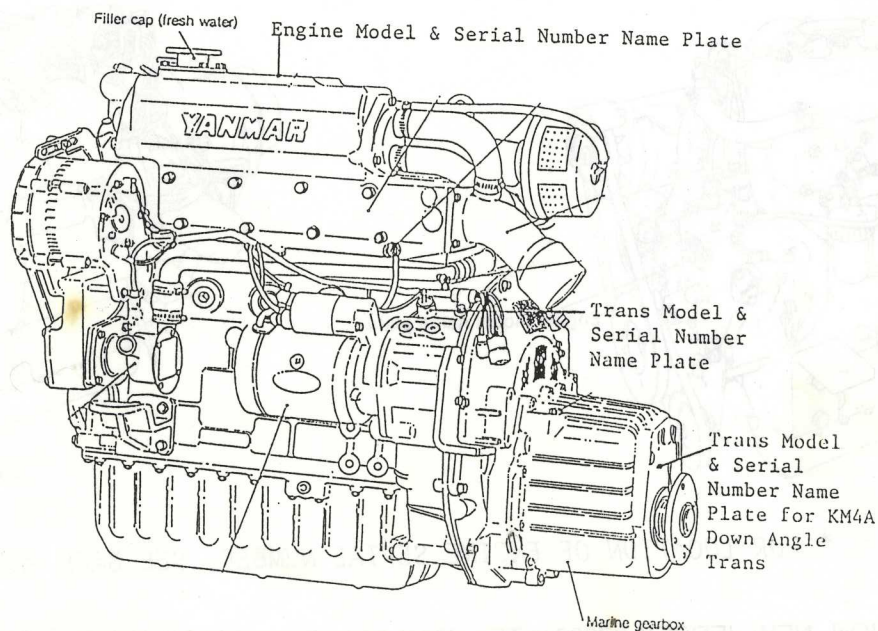
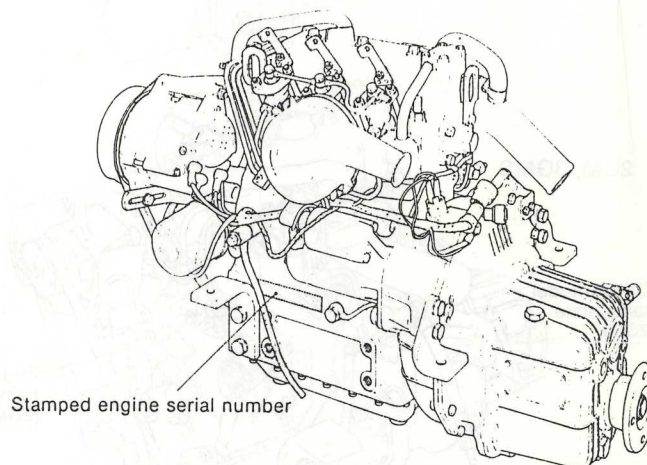
2365 ROUTE 22, UNION, NEW JERSEY 07083 • TEL. (201) 964-0700 • TELEX 139104 • FAX (201) 964-8475

Location of stamped engine serial number

1GM



2GM, 3GM(D), 3HM



BULLETIN BULLETIN BULLETIN

September 1, 1989

TO: ALL BOAT AND YANMAR DEALERS & OWNERS

SUBJECT: YANMAR STOP CABLES - REISSUE

We would like to bring to your attention that the stop cables are not being lubricated periodically.

The stop cables are a steel cable with a steel jacket. In order to maintain the cable in good working order it is important to grease the cable periodically with a water proof grease. This is done by loosening the locking screw in the barrel at the engine side of the cable. Pulling the inside cable out at the panel, take a water proof grease and generously coat the cable and shank. When the cable is reinserted, make certain the cable is pushed all the way in and the shut down arm is in the complete run position before locking the barrel screw back up.

Failure to lubricate the stop cables will result in:

CAUSE (A) CABLE RUSTED IN SHUT DOWN POSITION

RESULT (B) ENGINE WOULDN'T START

CAUSE (A) CABLE RUSTED IN FULL RUN POSITION

RESULT (B) ENGINE WOULDN'T SHUT DOWN

CAUSE (A) CABLE RUSTED IN PARTIAL RUN POSITION

RESULT (B) ENGINE WILL NOT REACH FULL RPM

CAUSE (A) CABLE RUSTED IN ANY POSITION AND FORCED OUT

RESULT (B) PANEL FACE WILL FRACTURE

If any questions please contact the service department.

#89-96

*Everything in Engines
and Generators*

MACK BORING & PARTS COMPANY



New York
1575 Lakeland Ave., Bohemia, L.I., NY 11716
(516) 563-3600



New Jersey
2365 Rt. 22, Union, NJ 07083 - Telex 139104
(201) 964-0700



Massachusetts
587 Granite Street, Braintree, Mass. 02184
(617) 848-9300

BULLETIN BULLETIN BULLETIN

September 1, 1989

IMPORTANT NOTICE

In order to activate the warranty of this engine, please complete form 1-A and 1-B enclosed.

FORM 1-A WARRANTY AND DELIVERY REPORT

This form will be packed with each engine and will be completed by the selling dealer and signed by the new owner. This form will be used to confirm the date of sale, model and serial number, (vital information in case of factory retrofit program) and to establish the starting date of the limited warranty.

Copies are provided for the dealers record, manufacturers, distributors and a copy to the owner.

The manufacturer's copy and the distributor's copy are to be mailed to the distributor nearest you. See reverse side of this sheet.

FORM 1-B PREPARATION SHEET

These forms are provided for the selling dealer's service personnel as a guide as to the proper checks to make on a new Yanmar engine. A quick glance tells us that these checks are general and can be used to start up any diesel. They will also start a history on this engine which will be useful to the factory and distributor in any proposed changes in design.

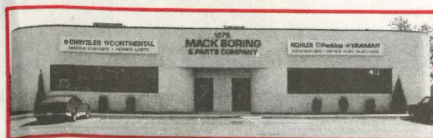
The disposition of the copies is the same as Form 1-A. They may be mailed at the same time. Failure to complete the forms can result in denial of warranty by the manufacturer or his agent. Proper preparation can head off many problems that occur.

If there are any questions as to proper use of these forms, do not hesitate to call our service department. The service department is at all times available to answer your questions of a technical nature.

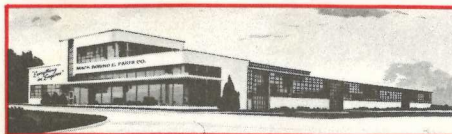
**THE ABOVE IS FOR INFORMATION ONLY AND IS NOT AN
AUTHORIZATION FOR REPAIRS.**

#89-99
*Everything in Engines
and Generators*

MACK BORING & PARTS COMPANY



New York
1575 Lakeland Ave., Bohemia, L.I., NY 11716
(516) 563-3600



New Jersey
2365 Rt. 22, Union, NJ 07083 - Telex 139104
(201) 964-0700



Massachusetts
587 Granite Street, Braintree, Mass. 02184
(617) 848-9300

YANMAR DISTRIBUTORS

California

Hawthorne Engines & Power Systems
2000 McKinley Street
National City, CA 92050
(619) 474-0993

Canada

Land Sea Power
1404 Hastings Street
Vancouver, B.C. 153 Canada
(604) 253-3535

Canada

T and T Diesel Power
Mississauga, Ontario
Canada 64Z 193
(416) 890-5662

Florida

Mastry Engine Center
2895 46th. Avenue, North
St. Petersburg, FL 33714
(813) 522-9471

Florida Branch

Mastry Engine Center
243 S.W. 6th. Street
Miami, FL 33130
(305) 854-1545

Louisiana

Star Power Services, Inc.
5217 River Road
Harahan, LA 70123
(504) 733-6897

Massachusetts

Mack Boring & Parts Company
587 Granite Street
Braintree, MA 02184
(617) 848-9300
Fax # (617) 848-0335

New Jersey

Mack Boring & Parts Company
2365 Rt. 22
Union, NJ 07083
(201) 964-0700
Fax # (201) 964-8475

New York

Mack Boring & Parts Company
1575 Lakeland Avenue
Bohemia, L.I., NY 11716
(516) 563-3600
Fax # (516) 563-7495

Washington

Emerson Power Products
426 S. Cloverdale Street
Seattle, WA 98108
206-764-3850

BULLETIN BULLETIN BULLETIN

September 1, 1989

WINTERIZING FRESH WATER COOLED DIESEL ENGINES

TO: YANMAR DEALERS AND BOATBUILDERS

BLEEDING THE FUEL SYSTEM (Purging of air which causes shutdown)

This bulletin contains helpful information for bleeding the fuel system of a Yanmar Diesel and other small diesels as well. Please post where your field service personnel can review.

Since the presence of air in the fuel system anywhere between the fuel tank and the injector will cause a no start or erratic running condition, always bleed the air from the system when the fuel system is disassembled, filter changed or run out of fuel.

- (1) Make sure fuel tank shut off is in "on" position.
- (2) Bleed the air from fuel filter. Loosen the air bleed screw at the top of the fuel filter body and operate the manual handle of the lift pump until the air bubbles completely expel in the fuel flowing from the filter.
- (3) Bleed the air from the fuel return pipe. Loosen the connector bolt of the fuel return pipe installed on the fuel injector, and bleed the air by operating the manual handle of the lift pump. (If there is more than one injector, bleed the one at the end of the line).
- (4) Bleeding the air from the fuel line - (line from the filter to the injector pump). Loosen the air venting screw at the injection pump and operate the manual handle of the lift pump until all the air bubbles are out.
- (5) Bleed the air from the fuel injector. Loosen the nipple on the fuel injector side, set the throttle to half and the decompression lever to the decompression position and crank engine. When no more bubbles appear in the fuel flowing from the end of the injection pipe, retighten the nipple.

**THIS BULLETIN IS FOR INFORMATION ONLY AND NOT AN
AUTHORIZATION FOR REPAIRS**

#89-100

*Everything in Engines
and Generators*

MACK BORING & PARTS COMPANY



New York
1575 Lakeland Ave., Bohemia, L.I., NY 11716
(516) 563-3600



New Jersey
2365 Rt. 22, Union, NJ 07083 - Telex 139104
(201) 964-0700



Massachusetts
587 Granite Street, Braintree, Mass. 02184
(617) 848-9300

BULLETIN BULLETIN BULLETIN

September 1, 1989

WINTERIZING FRESH WATER COOLED DIESEL ENGINES

STEP

(1) Drain crankcase and transmission and refill with fresh lubricant as specified in owner's manual. Change oil filters.

(2) Drain and clean all fuel filters and change elements, gaskets and seals. Bleed all air from fuel systems.

(3) Start engine and bring up to operating temperature. Slowly remove the radiator cap on expansion tank. Using an antifreeze hydrometer, check the antifreeze for proper protection (add antifreeze to lower the freezing point of the antifreeze solution). If the antifreeze solution is dirty, more than 2 years old, or weak it should be completely drained and replaced with the proper mixture of permanent antifreeze and water.

(4) Close the sea cock, remove the raw water pick up hose from the raw water pump. Attach a 4-foot section of hose to the raw water pump and immerse one end into a 5 gal. bucket of antifreeze solution. Start engine and run till antifreeze solution comes out exhaust stack or until bucket is empty. Attach the raw water pick up hose to the raw water pump. Tighten all clamps.

(5) Loosen water pump and alternator belts to lessen tension on belts during winter.

(6) For engines equipped with a hand crank - pull compression release levers and turn engine slowly with the hand crank. Slowly pour about 2 ounces of engine oil into the intake pipe or manifold while hand cranking the engine. This will allow for a thin coat of oil on the valves and upper cylinder. **DO NOT USE** the starter to turn engine or serious engine damage may result.

(7) Tape the openings of the intake and exhaust manifolds with duck tape to help prevent corrosion of the upper cylinder during lay up.

(8) Scrape all rust or corrosion from exposed metal parts and surfaces. Scrub all metal surfaces with detergent and rinse thoroughly. Paint any bare metal.

(9) Place a dust cover over engine. Do not leave the engine exposed to rain and sea breeze.

(10) Disconnect the battery cables, remove the battery from the boat. Clean the terminal ends and battery with a solution of baking soda and water, rinse thoroughly with clean water. Apply a light coat of grease on the terminal end of the battery and cables. Store the battery in a cool dry place. Use a trickle charger to keep battery charged. Do not charge battery near any open flame or in a confined area.

CAUTION: Wear safety goggles and rubber gloves to protect your eyes and skin.
#89-97

*Everything in Engines
and Generators*

TURN PAGE

MACK BORING & PARTS COMPANY



New York
1575 Lakeland Ave., Bohemia, L.I., NY 11716
(516) 563-3600



New Jersey
2365 Rt. 22, Union, NJ 07083 - Telex 139104
(201) 964-0700



Massachusetts
587 Granite Street, Braintree, Mass. 02184
(617) 848-9300

September 1, 1989

WINTERIZING RAW WATER COOLED DIESEL ENGINES

STEP

(1) Drain crankcase and transmission and refill with fresh oil as specified in owner's manual. Change oil filters.

(2) Close sea cock, remove raw water pick up hose from water pump, attach a 4-foot length of hose to water pump and immerse in a 5 gal. bucket of antifreeze solution. Remove hose from engine or manifold that leads to exhaust elbow. Attach about a 4-foot length of hose and immerse one end in the bucket of antifreeze solution. Start engine and run until water begins to warm up (about 3 to 5 min.) and thermostat opens. Stop engine. Replace hose that leads to exhaust elbow. Start engine and let run till water comes out exhaust pipe. Stop engine, remove hose from water pump to bucket, attach hose from sea cock to water pump and tighten all hose clamps.

(3) Loosen water pump and alternator to lessen tensions on belts during winter.

(4) Drain and clean all fuel filters and change elements, gaskets and seals. Bleed all air from fuel systems.

(5) Pull compression release lever and turn engine slowly with hand crank. Slowly pour about 2 ounces of engine oil into the intake pipe or manifold while engine is turning. **DO NOT USE** the starter to turn engine or serious engine damage may result.

(6) Tape the openings of the intake and exhaust manifolds with duck tape to help prevent corrosion of the upper cylinder during lay up.

(7) Scrape all rust or corrosion from exposed metal parts and surfaces. Scrub all metal surfaces with detergent and rinse thoroughly. Paint any bare metal.

(8) Place a dust cover over engine. Do not leave the engine exposed to rain and sea breeze.

(9) Disconnect the battery cables, remove the battery from the boat. Clean the terminal ends and battery with a solution of baking soda and water, rinse thoroughly with clean water. Apply a light coat of grease on the terminal end of the battery and cables. Store the battery in a cool dry place. Use a trickle charger to keep battery charged. Do not charge battery near any open flame or in a confined area.

CAUTION: Wear safety goggles and rubber gloves to protect your eyes and skin.

BULLETIN BULLETIN BULLETIN

September 1, 1989

TO: ALL O.E.M.'S AND YANMAR DEALERS

SUBJECT: PREVENTION OF INCORRECT WARRANTY PROCEDURE

In order to expedite rapid and efficient warranty claims and service we are requesting all O.E.M.'S and Yanmar Dealers to take the following steps:

- (1) Contact local Yanmar Distributor before any repairs are started.
- (2) Make sure all repairs are authorized by the local Yanmar Distributor and there is a clear understanding of labor rates, proper procedures, and payments to assure rapid and efficient service.
- (3) When filling out Yanmar Warranty Claim forms make certain that all information is correct and is recorded properly. Check the form carefully to be sure it is complete, otherwise warranty claims will be rejected by the local Yanmar Distributors.
- (4) Please save old defective parts as the prompt return of these items may be necessary to complete the warranty claims processing.
- (5) Please have all claims accompanied by labor and parts invoices.

If you have any questions, please contact your local Yanmar Distributor before you send in your warranty claim forms to assure prompt service.

Enclosures: Sample Warranty Form
Warranty Procedure
Serial Number Identification Sheet

#89-95

*Everything in Engines
and Generators*

MACK BORING & PARTS COMPANY



New York
1575 Lakeland Ave., Bohemia, L.I., NY 11716
(516) 563-3600



New Jersey
2365 Rt. 22, Union, NJ 07083 - Telex 139104
(201) 964-0700



Massachusetts
587 Granite Street, Braintree, Mass. 02184
(617) 848-9300