



TOHATSU OUTBOARD MOTOR

M3.5B

SERVICE MANUAL

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1

SPECIFICATIONS

MODEL NAME	M3.5B
Model No.	3FO
Dimensions mm (in.)	Overall length: Approx. 550 (21.7) Overall width: Approx. 220 (8.7) Overall height: S Approx. 955 (37.6) L Approx. 1082 (42.6)
Transom Height mm (in.)	S: Approx. 435 (17) L: Approx. 562 (22)
Weight kg (Lbs)	S: Approx. 13.0 (28.7) L: Approx. 13.5 (29.8)
Bore & stroke mm (in.)	47 × 43 (1.85 × 1.69)
Number of cylinders	1
Displacement CC (cu. in.)	74.6 (4.6)
Max. output kw (PS)/rpm	2.58 (3.5)/4750
Full throttle speed range	4200 ~ 5300 rpm
Fuel consumption at full throttle	1.7 liter/hr
Lubrication	Gasoline/Oil Mixture (gasoline 50 : oil 1)
Cooling system	Water cooled (by Rubber impeller)
Starting system	Recoil manual starter
Ignition system	Pointless CD ignition type magneto
Intake system	Reed valve
Fuel tank	Integral tank 1.4 liters (0.37 gals.)
Spark plug	NGK BP6HS-10 or Champion L87YC (gap 1mm)
Ignition timing	BTDC 15° ~ 20° (Electric advancer)
Engine rotation	Clockwise
Speed control	Throttle lever
Shift system	Dog clutch (F-N)
Gear ratio	13 : 28
Tilt up angle (degrees)	70°
Max. steering angle (degrees)	360° (full pivot)
Number of tilt stages (degrees)	4 (4° ~ 19°)
Transom board-recommended thickness mm (in.)	40 ~ 60 (1.57 ~ 2.36)
Propeller (no. of blades × diameter × pitch mm (in.))	7" 3 × 188 × 178 Standard specification (3 × 7.44 × 7)

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PRECAUTIONS DURING DISASSEMBLY AND RE-ASSEMBLY

- ① Secure the outboard motor to a work stand during repairs.
- ② Be careful not to damage the painted surfaces or the adjacent faces of the cylinders and crank cases, etc.
- ③ After disassembly, replace the packing, gaskets, "O" rings, oil seals, spring pins.
Replace defective snap rings.
- ④ Always replace parts with genuine Tohatsu parts, and use Tohatsu gear oil.
- ⑤ Always use the proper special tools and follow the correct procedures.
- ⑥ Pay special attention to the marking on the parts when disassembling, and make simple identification marks on un-marked parts to make reassembly easier.
- ⑦ Clean disassembled parts and inspect for wear and damage.
- ⑧ When reassembling, pay careful attention to details such as the precise fitting parts, airtightness, obstruction of oil and grease supply holes, packing, wiring and piping.
For parts which require many nuts and bolts systematically tighten diagonally opposite nuts and bolts starting with large gauge bolts and ending with small gauge bolts. Work from the inside to the outside to ensure the bolts are tightened securely.
- ⑨ When inserting oil seals, be careful not to damage the lip and make sure the seals is in the proper direction.
Apply only specified grease to the lips.
- ⑩ When applying liquid packing material, be careful to use the proper thickness and quantity.
If the quantity is too great, the excess may overflow or seep into the case and cause adverse effects.
Read the directions carefully before using adhesives.

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SERVICING DATA

Note: Unit in millimeter unless otherwise specified.

Part name	Items	Standard value	Limit for adjustment or replacement	
Engine	Piston	Clearance between piston and cylinder wall (minimum clearance).	0.06 ~ 0.09	0.15 and over
	Cylinder	Bore	47.00 ~ 47.01	47.05 and over
	Cylinder head	Deformation of attaching face		0.05 and over
	Piston ring	Gap between piston ring ends Clearance with piston ring groove	0.18 ~ 0.33 0.01 ~ 0.05	0.9 and over 0.1 and over
	Piston pin	Clearance with piston pin hole	0.001 ~ 0.016	0.05 and over
	Connecting rod	Small end deflection (in the axial direction)	0.6 ~ 0.8	1.5 and over
		Big end side gap	0.13 ~ 0.32	0.5 and over
	Crank shaft	Off-centering of crank shaft	Less than 0.05	0.05 and over
	Reed valve	Lift (height of the reed valve stopper end)	6.0 ~ 6.2	6.0 ~ 6.2 and over
Cylinder compression	Compression (Measured on a warm engine operating of full throttle.)	5.5 kg/cm ² and over/500 rpm	Less than 4 kg/cm ² /500 rpm	
Oil seal	Crank shaft oil seal upper Crank shaft oil seal upper		If the lip portion is aged or if the rubber has lost its resilience or if it makes a slack fit with the shaft then it must be replaced.	
Fuel system	Carburetor Venturi tube dia. Main jet Jet needle Needle jet Cut away Valve seat dia. Float engine set (From packing surface)	ϕ 13 #92 ϕ 1.98—3/4 ϕ 2.080 0.75 ϕ 1.4 2.0		
Electrical equipment	Magneto	Ignition timing (when throttle valve is fully opened after warm up) Spark performance at 500 rpm Exciter coil	BTDC 20° $\pm 2.5^\circ$ / 5000 rpm 10mm (0.394 in.) and over 350 Ω \pm 70 Ω	
	Ignition coil	Primary Second	0.21 Ω \pm 0.032 Ω 3.2K Ω \pm 0.48K Ω	
	Spark plug	NGK BP6HS-IO CHAMPION L87YC10	Spark plug gap 0.9 ~ 1.0 0.9 ~ 1.0	1.25 over 1.25 over
Drive system	Bevel gear	Backlash between gear A and B Gap between bush for bevel gear A and propeller shaft	0.05—0.15 0.030—0.058	0.3 over 0.1 over
	Bushing drive shaft (for transom L)	Gap between bushing and shaft	0.016—0.073	0.5 over

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PERIODICAL INSPECTION

CHECK ITEM	MAINTENANCE FREQUENCY	INSPECTION POINT	REMARKS
Checking torque	New engine after 10 hrs operation.	Locations: Cylinder head, carburetor, crank case, starter, drive shaft housing, gear case, etc.	Refer to torque table (page 9)
Spark plug	Every 30 hrs	Check plug gap. Remove dirt and carbon deposits.	NGK BP6HS-10 CHAMPION L87YC-10 Plug gap: 0.9~1.0 mm
Fuel system	Every 50 hrs	Discharge water and clean the: fuel tank, fuel pipes. Check for fuel leakage, air in the system and damaged pipe clips, etc.	Fuel pipes must be replaced every two years.
Carbon deposits	Every 100 hrs	Remove carbon from the combustion chamber, exhaust manifold, piston ring grooves, etc.	
Carburetor	Every 100 hrs	Remove all dust and water. Clean with a non-flammable cleaner using compressed air. Check float valve for wear.	Replace worn float valves with one from a carburetor repair kit.
Ignition timing		Check with timing tester.	Refer to service date (page 5)
Starter rope	In every use	Inspect for damage or wear.	
Cooling water passages	Every 100 hrs	Remove fur and sediment from the cooling water pump passageways, the cooling water pipe, cylinder block and cylinder head.	Symptoms: Overheating due to poor cooling water circulation.
Cooling water check	During use	Ensure that the cooling water is circulation by nothing discharge from port. See that inlet is free from blockage.	
Gear oil	a) Change oil after 10 hrs initial run. b) fill up the short- age after every 50 hrs run, c) and change oil after every 200 hrs run, and also after prolonged winter storage when the new season starts.	Check for water and foreign matter when changing or adding gear oil. Check gear case when water, foreign matter or abnormality in supplying oil is found.	TOHATSU gear oil (GL-5 SAE #80 or #80W) Capacity: approx. 180 cc
Grease up	Every 50 hrs		Refer to sealing agents adhesives and lubricants (page 8)

CHECK ITEM	MAINTENANCE FREQUENCY	INSPECTION POINT	REMARKS
Cylinder compression	Every 100 hrs	Check with compression gauge.	Check at full throttle on a warm engine. Refer to service date (page 5)
Clutch operation	At every operation	Check for correct clutch play and engagement.	
Reverse lock operation	At every operation.	Check for correct lock.	
Tilt up operation	Every 100 hrs	Adjust by tightening bracket bolt.	
Stop switch operation	Check daily	Confirmation of normal short-circuit operation.	
Leads and pipes	Check daily	Connectors, clamps Pipes and leads for damage.	
Leakage of lubrication oil	Check daily	Bearing housing lubricating port, drain oil port.	
Leakage of gasoline	Check daily	Carburetor, fuel tank Crank case	
Start-up	At every operation	Engine start-up Choke lever and throttle lever operation.	
Accelerating condition	At every operation	Check for smoothness of knocking when gradually accelerating the engine from idling. Check for smoothness of stalling when rapidly accelerating or decelerated.	After warming-up.
Anodes	Every 100 hrs	Check for wear and deformation.	Replace without delay.

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SEALING AGENTS, ADHESIVES, & LUBRICANTS

Item	Sealing Agents Adhesives Lubricants			Low temperature standing grease	Tohatsu grease	Lithium grease	Tohatsu engine oil	Tohatsu gear oil	Remarks
	Three Bond 1342	Three Bond 1401	Three Bond 1104						
Piston							●		Ring groove, piston pin hole, outer of piston
Piston pin							●		Outer surface
Piston rings							●		
Cylinder liner							●		Inner wall
Small end bearings							●		Rotating part
Big end bearings							●		Rotating part
Main bearings							●		Rotating part
Crank shaft oil seal upper						●			Lip
Crank shaft oil seal lower						●			Lip
Crank case head oil seal					●				Lip, Seal grease
Adjacent faces of the cylinder and crank case			●						Take care to apply the correct thickness of grease.
Carburetor				●					Sliding part
Spark plug cap									Three Bond 1782
Exciter coil screw	●								Screw
Ignition coil screw	●								Screw
CD unit screw	●								Screw
Starter case				●					
Starter spring				●					
Steering handle bolt	●								Screw
Shift lever									O-ring groove TOHATSU grease Sliding part Silicon grease
Shift rod lever					●				
Propeller shaft housing bolt		●							Screw
Ditto "O"-ring					●				
Propeller shaft oil seal					●				Lip
Pump case oil seal					●				Lip
Water tube grommet upper			●						
Water tube grommet lower							●		
Pivot bushing					●				Apply it thinly to the inner portion (inside).
Pump case bolt		●							Screw
Thrust supporter					●				
Drive shaft				●					Engine side splined portion — Molybdenum disulfide
Friction piece					●				
Clamp screw					●				Screw
Cam rod bushing O-ring					●				
Cam rod O-ring					●				
Gear oil							●		Approx. 180 cc
Tilt stopper					●				
Gear case bolt		●							Screw

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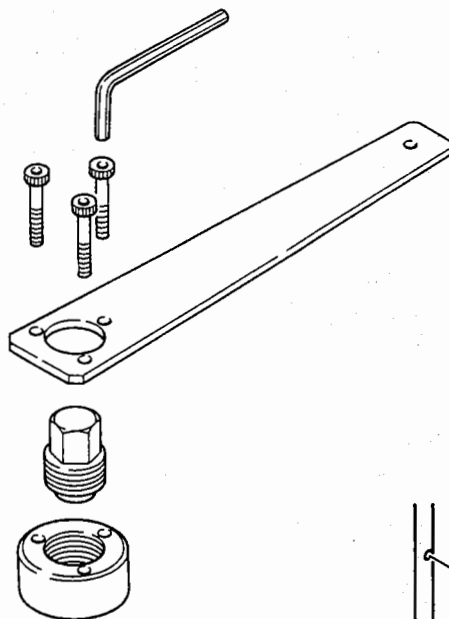
TORQUE TABLE

No.	Item	Screw dia. (mm)	Torque (kg-m)
1	Cylinder head bolt	6	0.9 – 1.1
2	Magneto nut	10	4.0 – 4.5
3	Stern bracket nut	8	1.4 – 1.6
4	Spark plug	14	2.5 – 3.0
5	Other bolts and nuts	4	0.13 – 0.18
		5	0.27 – 0.36
		6	0.47 – 0.64
		8	1.14 – 1.54
6	Emergency stop switch	16	0.2 – 0.25

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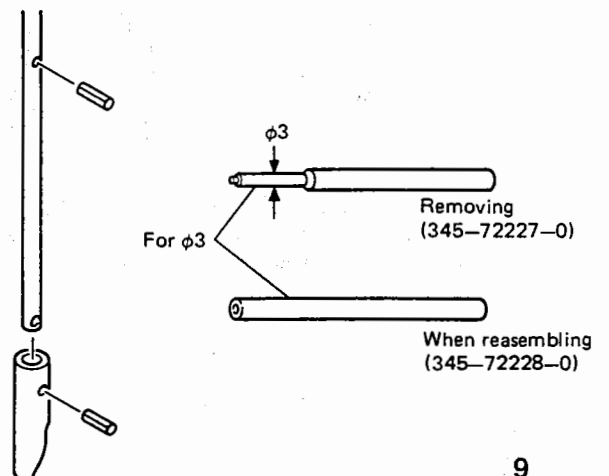
SPECIAL TOOLS

1. Flywheel Magneto Tool (309-72214-0)



2. Spring pin tool

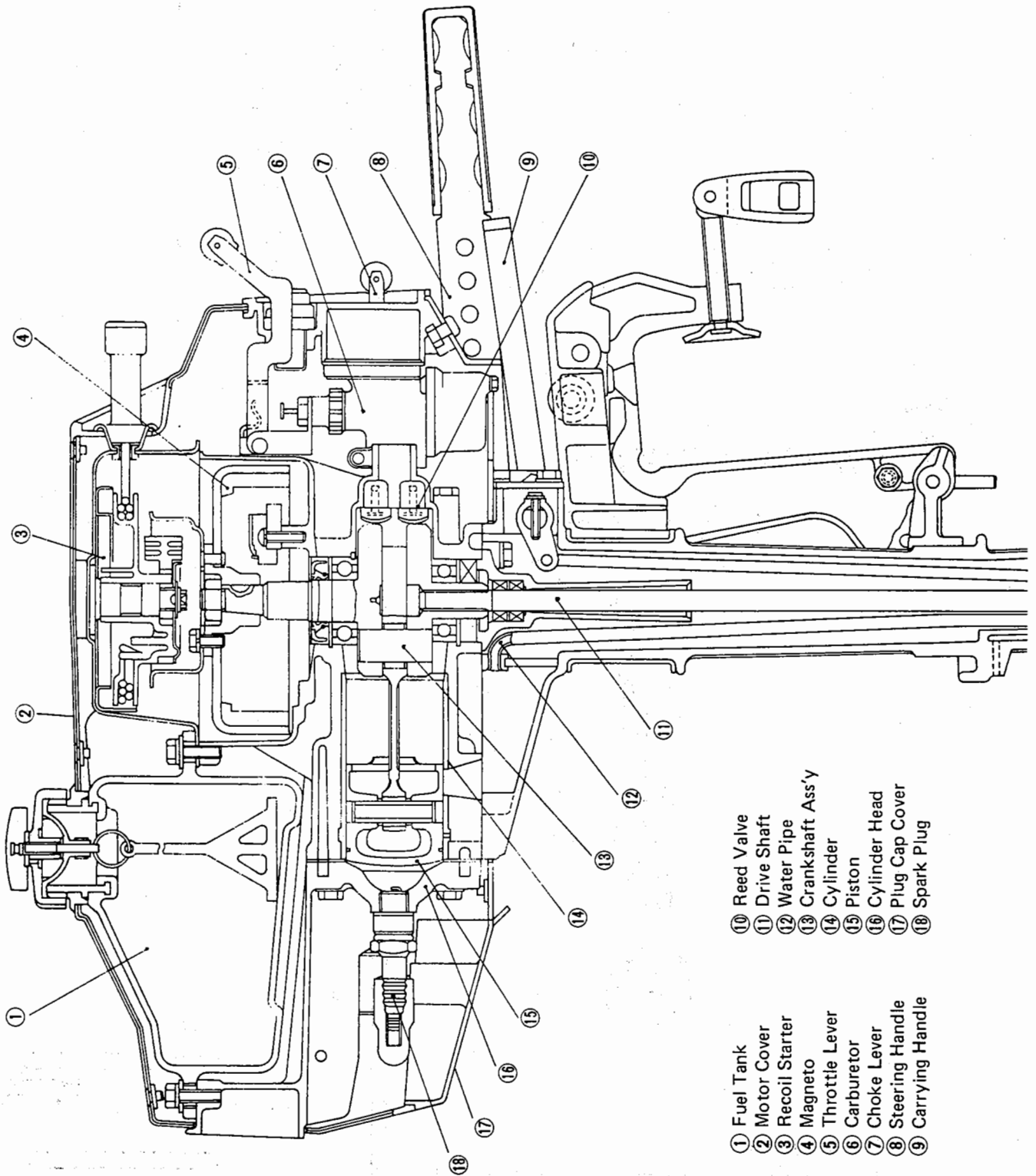
The clutch pin use a spring pin. Use the exclusive tool.



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REMOVAL, DISASSEMBLY AND RE-ASSEMBLY OF POWER UNIT

(1) Structural Drawing of Power Unit



- | | |
|-------------------|--------------------|
| ① Fuel Tank | ⑩ Reed Valve |
| ② Motor Cover | ⑪ Drive Shaft |
| ③ Recoil Starter | ⑫ Water Pipe |
| ④ Magneto | ⑬ Crankshaft Ass'y |
| ⑤ Throttle Lever | ⑭ Cylinder |
| ⑥ Carburetor | ⑮ Piston |
| ⑦ Choke Lever | ⑯ Cylinder Head |
| ⑧ Steering Handle | ⑰ Plug Cap Cover |
| ⑨ Carrying Handle | ⑱ Spark Plug |

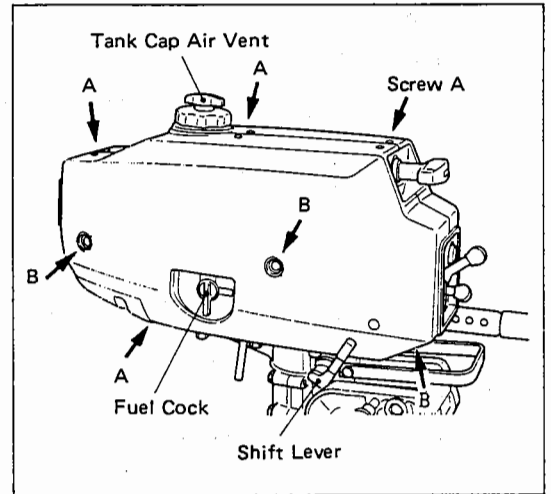
(2) Disassembly of Power Unit

NOTE: Remove the spark plug cap from the spark plug before starting procedures.

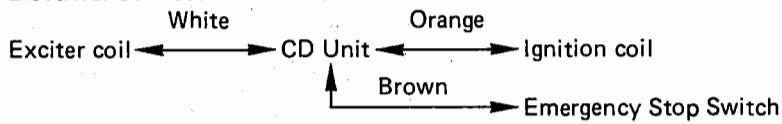
a. Confirming the condition and position of levers, cocks, etc.

- ① Fuel cock closed
- ② Tank Cap Air Vent Closed
- ③ Shift Lever Neutral (N)

b. Motor Cover removal (screw A and B)

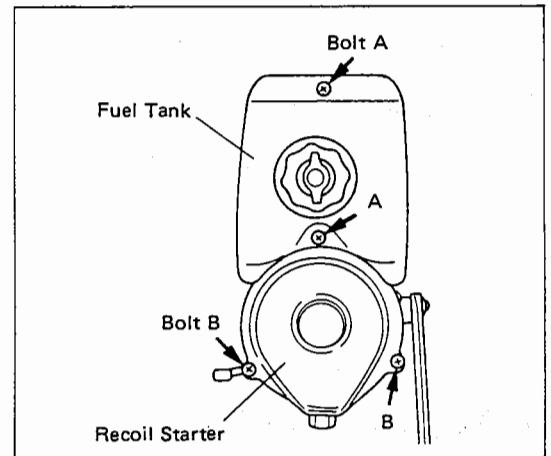


c. Electrical Connections Removal

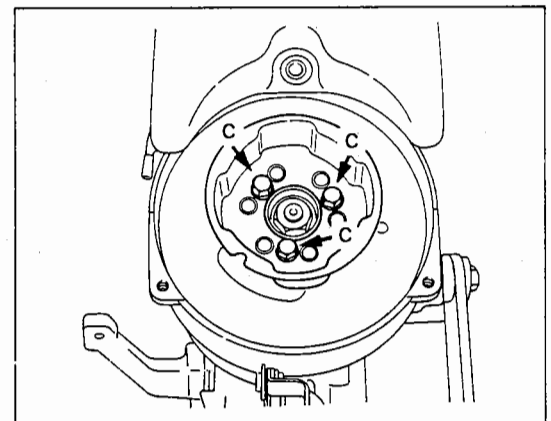


d. Fuel Tank Removal (bolt A)

e. Recoil Starter Removal (bolt B)



f. Starter Pulley Removal (bolt C)

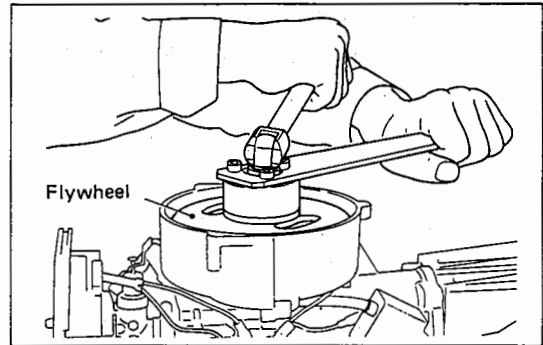


g. Magneto Removal

- ① Remove Magneto Nut

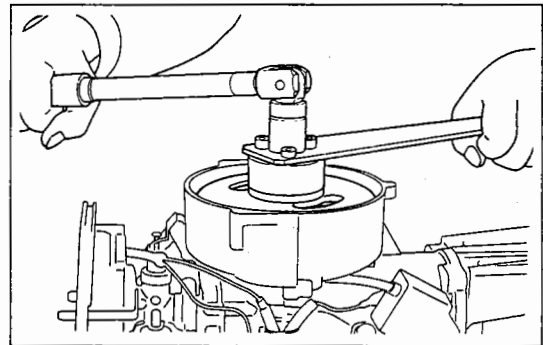
NOTE: Magneto nut is turn counterclockwise to loosen.

Remarks: Use a flywheel puller Ass'y.



- ② Pulling Out Flywheel

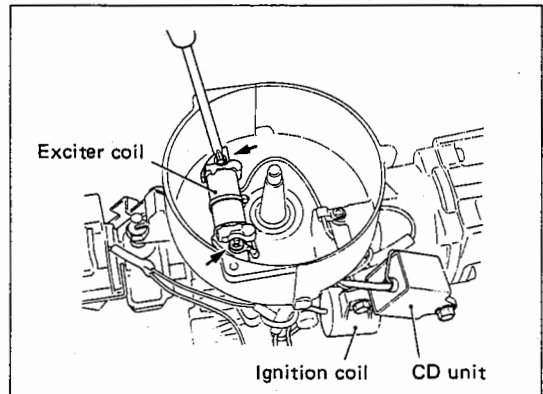
Remarks: Use a flywheel puller Ass'y.



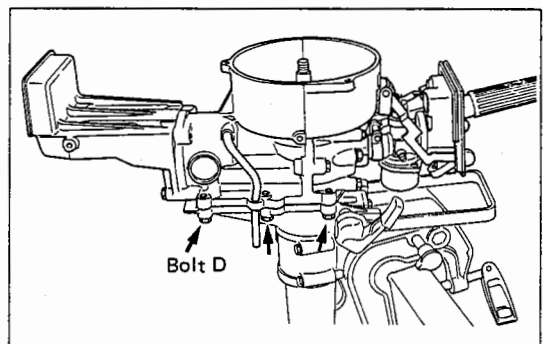
- ③ Remove Exciter Coil

- ④ Remove of CD Unit

- ⑤ Remove Ignition Coil

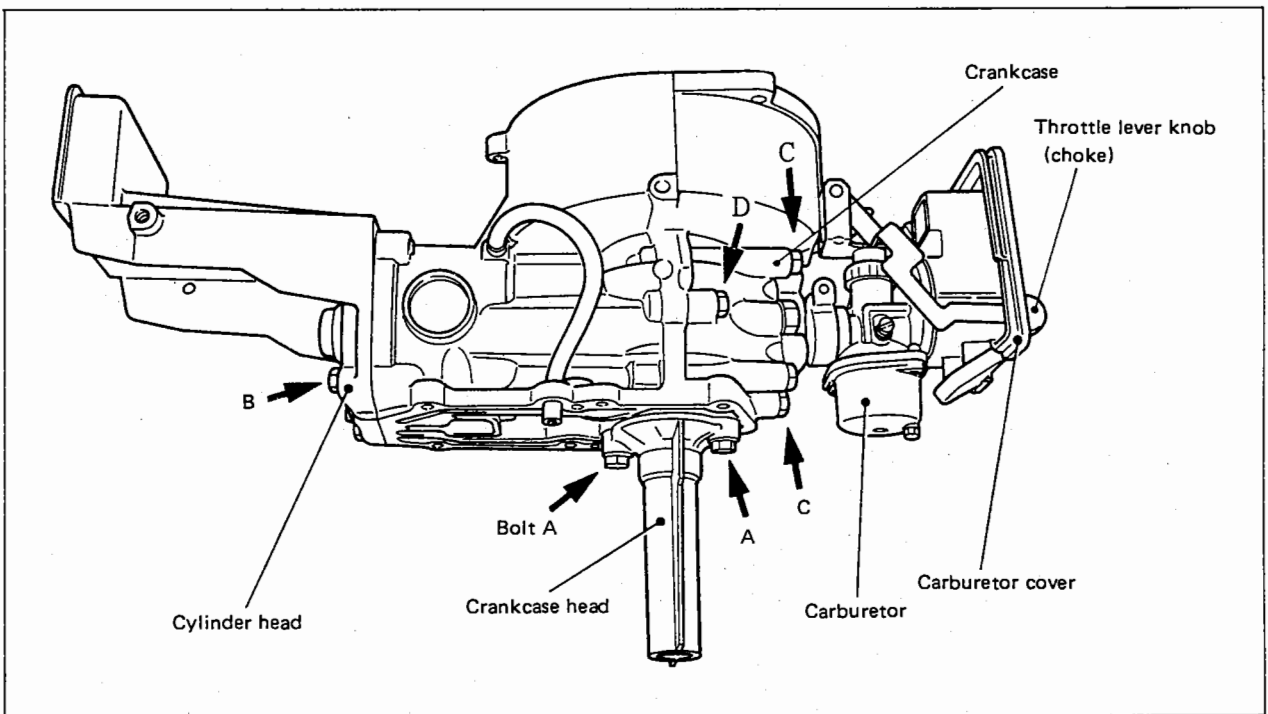


h. Engine Block Removal (bolt D)



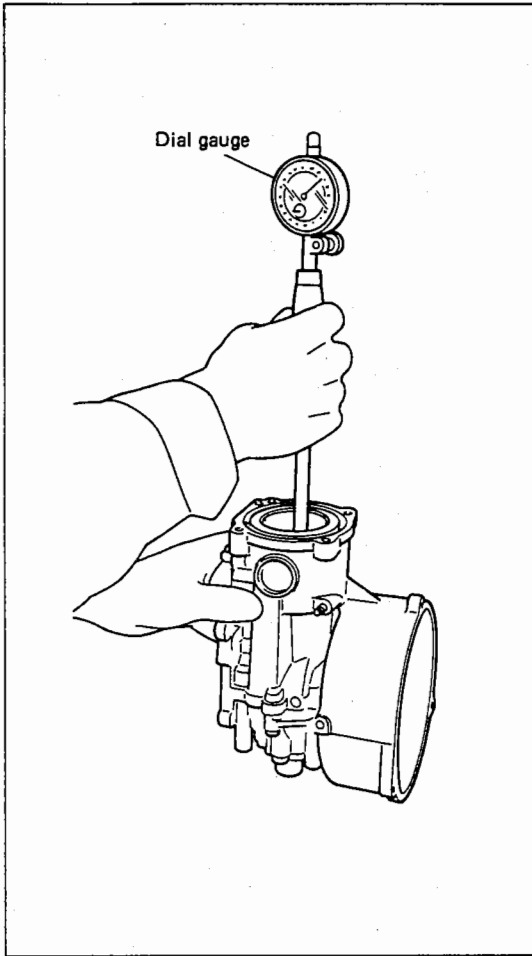
i. Crankshaft Removal

- ① Remove choke and throttle lever knob.
- ② Remove carburetor cover.
- ③ Remove carburetor.
- ④ Remove crankcase head. (bolt A)
- ⑤ Remove cylinder head. (bolt B)
- ⑥ Remove crankcase. (bolt C and D)

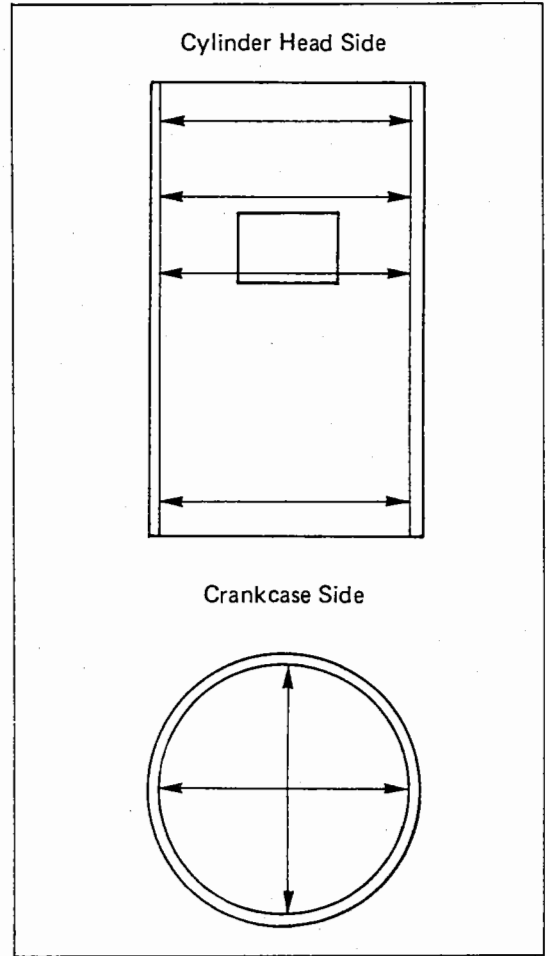


(3) Inspection of Engine Parts

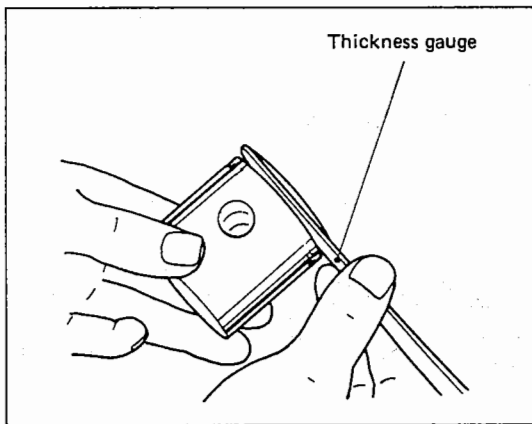
Part Number	Check Point	Remedy
Cylinder head	<ol style="list-style-type: none"> 1. Carbon deposits in combustion chamber 2. Warpage of cylinder head sealing surface 3. Corrosion on cylinder head sealing surface 4. Clogging of cooling water passages 	<ol style="list-style-type: none"> 1. Clean. 2. Correct. (Place sandpaper #400 on surface plate and rub cylinder head against it.) 3. correct or replace it as required. 4. Clean.
Cylinder	<ol style="list-style-type: none"> 1. Carbon deposits around exhaust port 2. Build-up of salt deposit in water jacket 3. Wear in cylinder bore. Measure bore with cylinder gauge to determine piston clearance. (Fig. 1 & 2) 4. Engine seizure 5. Scored or scuffed cylinder walls 	<ol style="list-style-type: none"> 1. Clean 2. Clean. 3. If wear exceeds limits, replace or rebore and hone. Replacement pistons and piston rings are available in 0.5mm oversize. 4. Replace or after boring, fit oversize pistons. 5. Remove scratches using sandpaper #400—#600.
Piston	<ol style="list-style-type: none"> 1. Carbon deposits on piston crown and ring grooves 2. Scratches on piston 3. Piston ring clearance (Fig. 3) 4. Wear in piston pin hole 5. Wear in piston skirt (Fig. 4) 	<ol style="list-style-type: none"> 1. Clean 2. Remove using sandpaper #400—#600. 3. Replace if it exceeds maximum limits. 4. Replace if it exceeds maximum limits. 5. Replace if it exceeds maximum limits.
Piston ring	<ol style="list-style-type: none"> 1. Ring end gap If no ring gauge is available, measure the ring end gap by placing ring in lower part of cylinder where wear is least. (Fig. 5 & 6) 2. Width and thickness 	<ol style="list-style-type: none"> 1. Replace if it exceeds maximum limits. 2. Replace if they reduces minimum limits.
Crankshaft	<ol style="list-style-type: none"> 1. Deflection of crankshaft (Fig. 7&8) 2. Deflection of connecting rod 3. Side gap at big end 4. Wear in small end 	<ol style="list-style-type: none"> 1. Repair or replace if it exceeds maximum limits. 2. Replace if it exceeds maximum limits. 3. Replace if it exceeds maximum limits. 4. Replace if it exceeds maximum limits.
Reed valve	<ol style="list-style-type: none"> 1. Height of valve stopper (Fig. 9) 2. Cracked or damaged reeds 3. Deformation of valve seat 	<ol style="list-style-type: none"> 1. Correct. 2. Replace. 3. Replace.



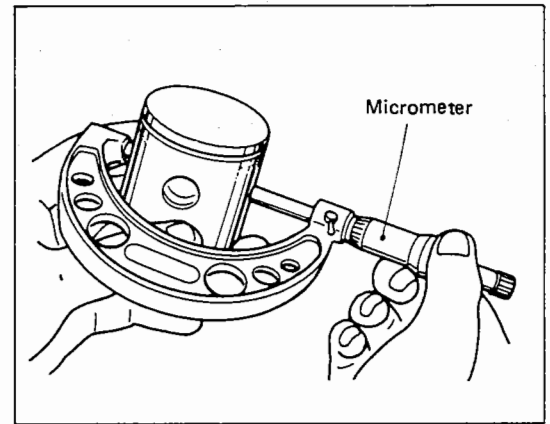
(Fig. 1) Cylinder Measuring Procedure



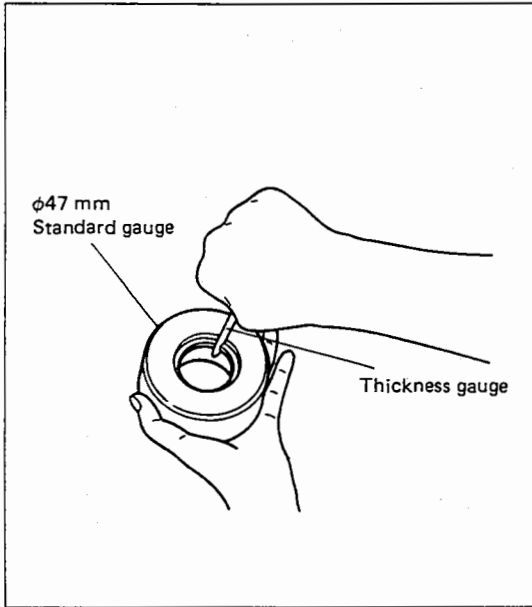
(Fig. 2) Cylinder Measuring Position



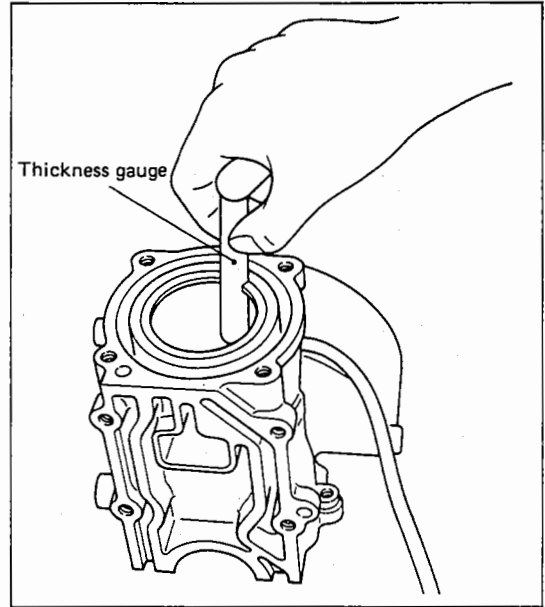
(Fig. 3) Piston Ring Groove Measurement



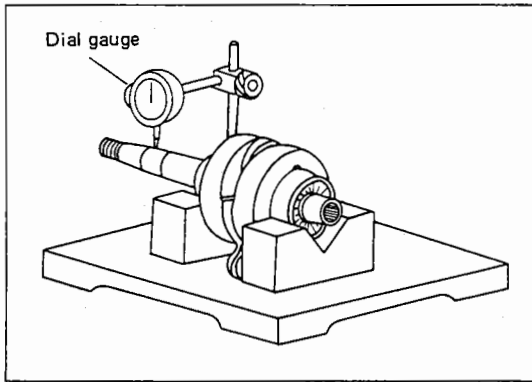
(Fig. 4) Piston Abrasion Measurement



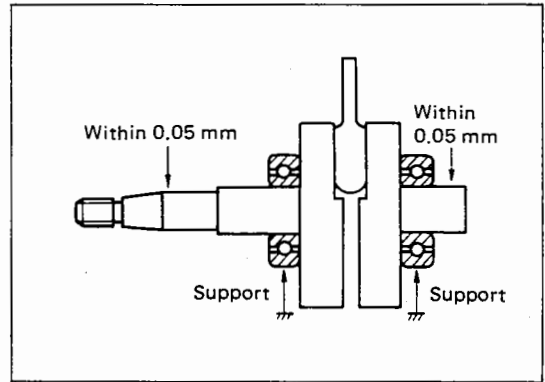
(Fig. 5) Measurement of Piston Ring End Gap Using Standard Gauge



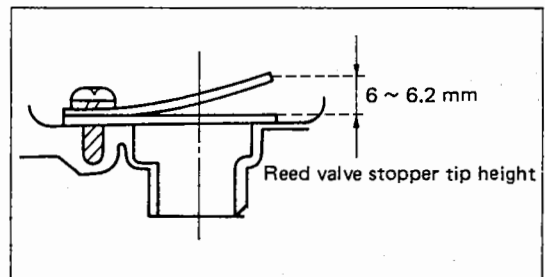
(Fig. 6) Measurement of End Gap of Piston Ring
(When a standard gauge is not available, measure at a spot on the top of a cylinder where the ring does not move.)



(Fig. 7) Measurement of Crankshaft Deflection



(Fig. 8) Spot where Crankshaft Deflection is Measured



(Fig. 9) Reed Valve Assembly

(4) Precautions for Engine Assembly

a. Assembling Crankshaft

- Piston direction: Mount the ↓ marked part on the top to the exhaust port side.
- Piston ring position: Fit the piston knock to the ring end.
- Piston pin clip: Use a new one.

b. Installing crankshaft to cylinder

- Engine oil application: Piston ring, needle roller bearing, piston, cylinder liner.
- Thrust plate upper/lower position: Position the cylinder and fit it in the groove.
- Main bearing knock position: Position the cylinder and fit it in the groove.
- Crankshaft after fitted: Confirm that it rotates when lightly pushed by hand.
- Crankshaft oil seal upper: Face the dust lip toward magneto and make it sure that it does not fall down by touching the thrust plate.
- Crankshaft oil seal lower: Face the dust lip toward crankcase head and make it sure that it does not fall down by touching the thrust plate.

c. Assembling Crankcase

- Reed valve: Check if there is any warping or scar.
- Valve stopper: Confirm lift height.
- Cylinder and Crankcase Fitting: Apply liquid gasket.
- Crankcase after mounted: Confirm that it rotates when lightly pushed by hand.

d. Assembling Magneto

- Degreasing: Degrease the crankshaft A and the flywheel taper sec. with thinner or acetone. Be sure to make it free of remaining piece of waste cloth or dust.

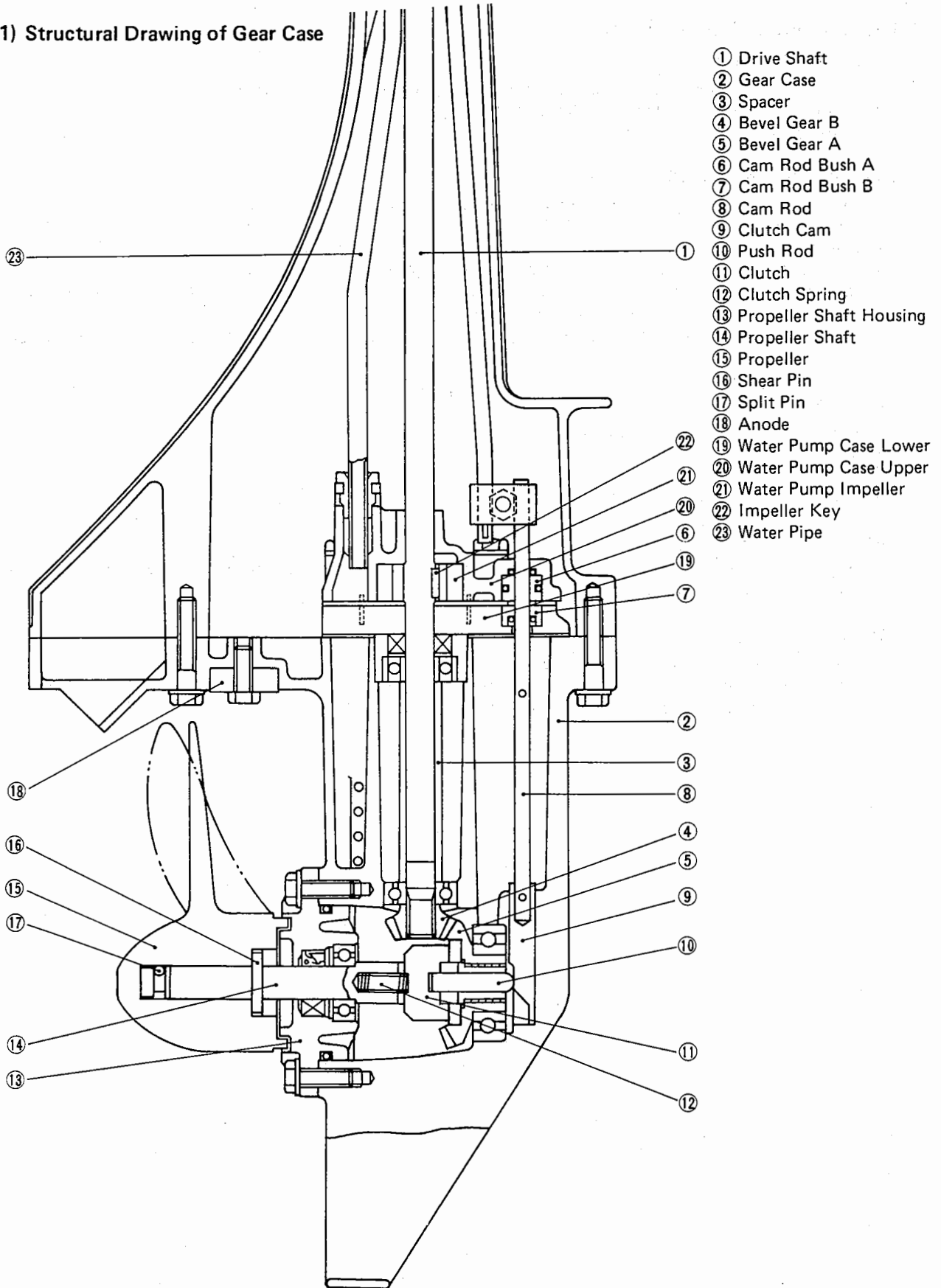
e. Others

- Check if there is any abrasion or damage of the lip of the oil seal.
- Upon fitting a bearing and oil seal, apply the specified grease or gear oil.
(Refer to "Sealing agents, adhesives and lubricants.") (P. 8)

9

REMOVAL, DISASSEMBLY AND RE-ASSEMBLY OF GEAR CASE

(1) Structural Drawing of Gear Case



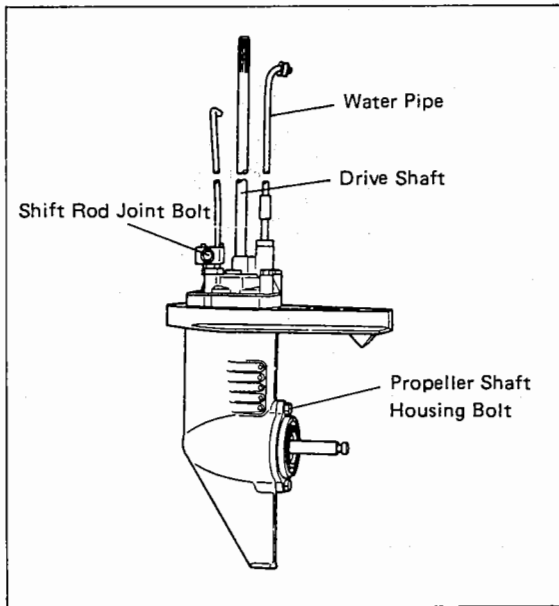
- ① Drive Shaft
- ② Gear Case
- ③ Spacer
- ④ Bevel Gear B
- ⑤ Bevel Gear A
- ⑥ Cam Rod Bush A
- ⑦ Cam Rod Bush B
- ⑧ Cam Rod
- ⑨ Clutch Cam
- ⑩ Push Rod
- ⑪ Clutch
- ⑫ Clutch Spring
- ⑬ Propeller Shaft Housing
- ⑭ Propeller Shaft
- ⑮ Propeller
- ⑯ Shear Pin
- ⑰ Split Pin
- ⑱ Anode
- ⑲ Water Pump Case Lower
- ⑳ Water Pump Case Upper
- ㉑ Water Pump Impeller
- ㉒ Impeller Key
- ㉓ Water Pipe

(2) Disassembly of Gear Case

- ① Remove the power unit (together with a motor cover).
(Refer to "h. Removal Engine Block". (P. 12))
- ② Confirm that the shift lever is set to Neutral (N).
- ③ Remove the propeller (split pin).
- ④ Oil Discharge
Remove the oil plug (lower and upper).
NOTE: Discharged oil disposal
- ⑤ Remove the shift rod from the shift rod lever.
- ⑥ Pull up the water pipe from the drive shaft housing.
- ⑦ Remove gear case fitting bolts (bolt B).
- ⑧ Remove the gear case ass'y.
- ⑨ Loosen a shift rod joint bolt.

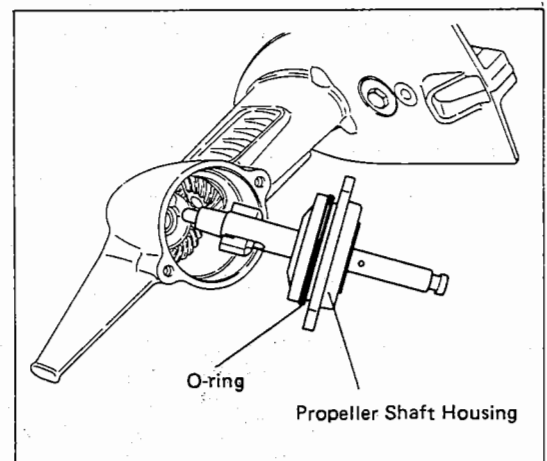
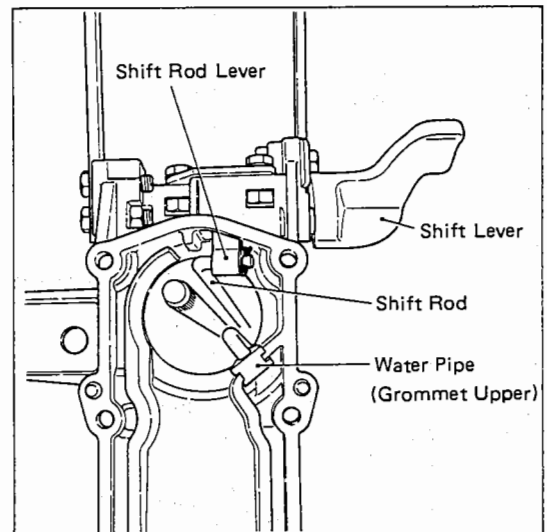
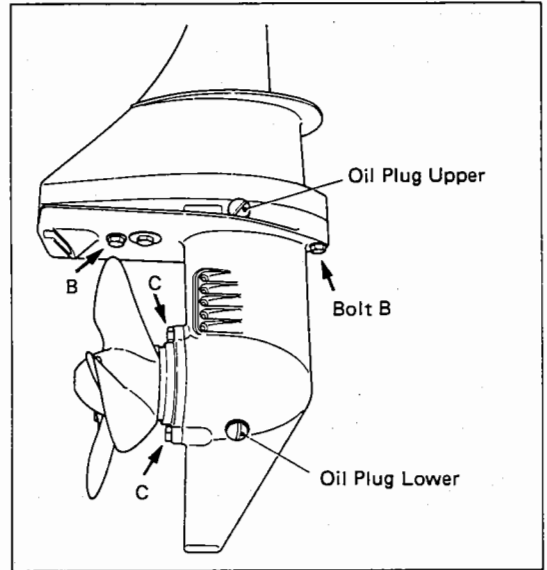
NOTE: a. You can only loosen bolts. Never remove them from the shift rod.
b. Append timing marks to a cam rod and a shift rod joint so that the surface of the clutch cam is at right angles to the push rod.

- ⑩ Remove propeller shaft housing bolts (bolt C).



- ⑪ Remove the propeller shaft housing
Together with the propeller shaft and the clutch.

NOTE: 1. Push rod dropping.
2. Check to confirm O ring deformation or damage.



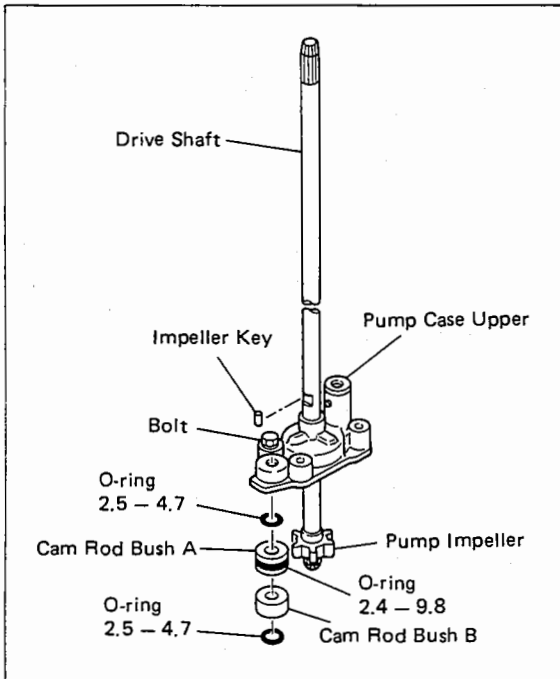
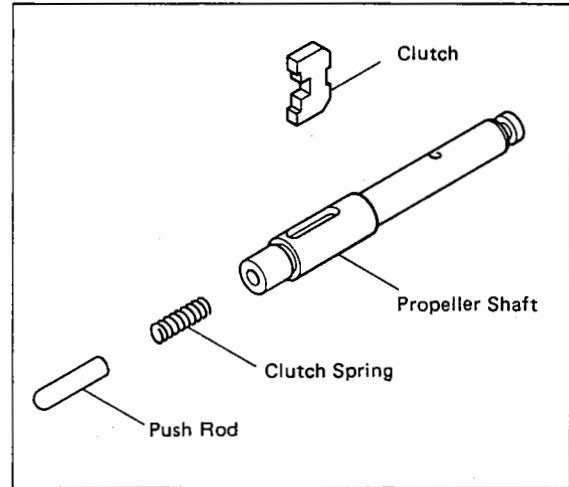
⑫ Remove the clutch.

NOTE: Pay attention not to apply excessive force to the clutch spring.

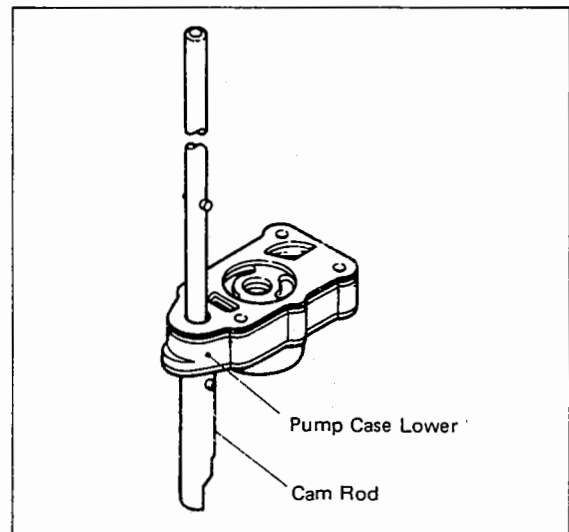
⑬ Remove the pump impeller.

Remove pump case bolts.
Remove the pump case, cam rod push and impeller.

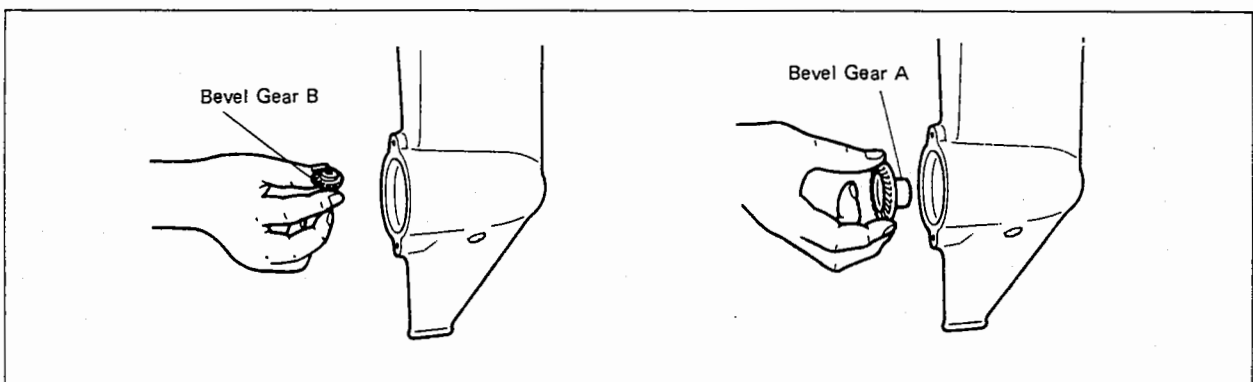
NOTE: Checking damage/abrasion of cam rod bush O-rings.



⑭ Remove the cam rod and the drive shaft.
Pull them up together with the pump case lower.



⑮ Remove the bevel gear B and A.



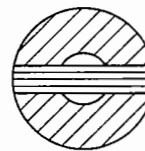
(3) Inspection for Gear Case

PART	ITEM	MEASURES
Bevel Gear A/B, Clutch Shifts	<ul style="list-style-type: none"> ○ Abrasion on bevel gear A claw sec. ○ Abrasion on clutch claw sec. ○ Hitting of gear teeth of bevel gears A/B ○ Backlash of bevel gear A/B ... 0.05~0.15mm ○ Abrasion of O-rings of cam rod and cam rod bush. 	Replace for excessive abrasion. Replace for extensive abrasion. Replace depending on extent. Replace depending on extent. Replace.
Propeller Shaft	<ul style="list-style-type: none"> ○ Abrasion of clutch fitting groove 	Replace depending on extent.
Drive Shaft	<ul style="list-style-type: none"> ○ Drive shaft deflection (With supported at both ends, within 0.05mm for bearing sec., within 0.1mm for others) ○ Spline abrasion 	Correct or replace. Replace depending on extent.
Water Pump	<ul style="list-style-type: none"> ○ Damage of pump impeller ○ Abrasion and deformation of pump case liner 	Replace. Replace.
Anode	<ul style="list-style-type: none"> ○ Abrasion of gear case anode 	Replace.

(4) Precautions on Assembly of Gear Case

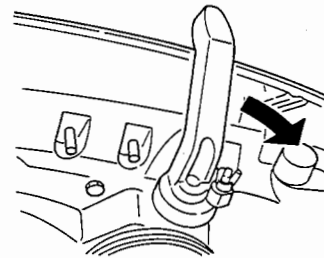
a. Clutch

- Install the clutch and the propeller shaft and confirm that the clearance is minimized and the movement is smoothly carried out.
- Take care that the spring pin (3φx8mm) for connecting the clutch cam with the cam rod does not fly out from the circumference of the clutch cam.
- Apply TOHATSU grease to the "O" rings portions inside and outside the cam rod bushing.
- Confirm that the cam rod is operated smoothly when it is installed and operated upwards and downwards.
- Upon connecting the cam rod and the shift rod with the shift rod joint, set the shift lever to Neutral Side.
- Following fitting the shift rod and the shift rod lever, when it is not aligned with the shift lever stopper, remove the drive shaft housing grommet and loosen to adjust the shift rod joint bolt.



Take care that the tip of the pin does not project from the circumference.

Clutch cam



Setting the shift lever at the FORWARD position

b. Bevel Gear

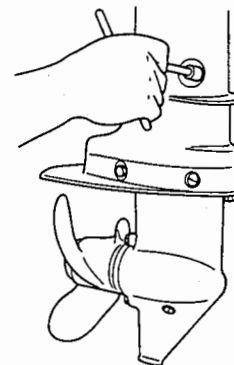
- Upon fitting the bearing for Bevel gear A, push the outer ring.
- Thickness of backlash adjustment shim: 0.1, 0.15 mm.

c. Water Pump

- Confirm that the pump impeller key is correctly positioned.
- Confirm insertion of cam rod O-rings.
- Confirm the order and fitting of the gasket and the guide plate.

d. Others

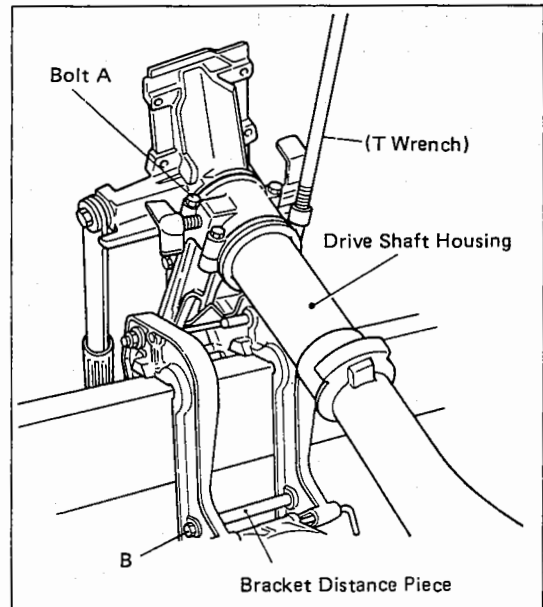
- Inspect the oil seal lip for abrasion or damage.
- Upon installing bearings, oil seals, and O-rings, apply gease or gear oil specified. (Refer to "Sealing Agents, Adhesives and Lubricants."). (P. 8)



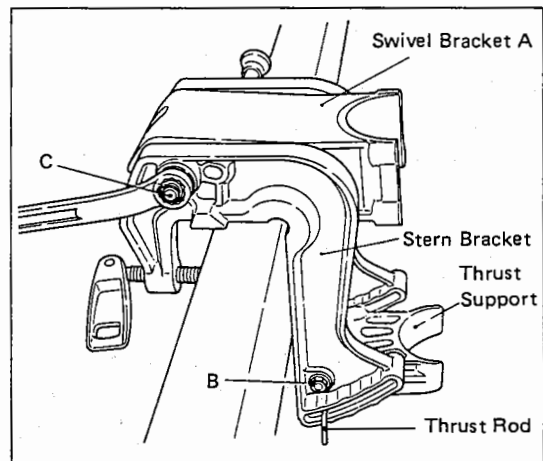
Installing the cam rod and shift rod

(5) Disassembly of Bracket

- ① Remove swivel bracket bolts. (bolt A)
- ② Remove the drive shaft housing.



- ③ Pull Out the thrust rod.
- ④ Remove the distance piece and bracket. (bolt B)
- ⑤ Remove the stern bracket. (bolt C and nut)
- ⑥ Loosen to remove the clamp screw.



(6) Precautions on Assembly of Bracket

- ① Apply grease around the pivot bushing, thrust supports and clamps.
(Refer to "Sealing Agents, Adhesives and Lubricants.") (P. 8)

10

REMOVAL, DISASSEMBLY AND RE-ASSEMBLY OF RECOIL STARTER

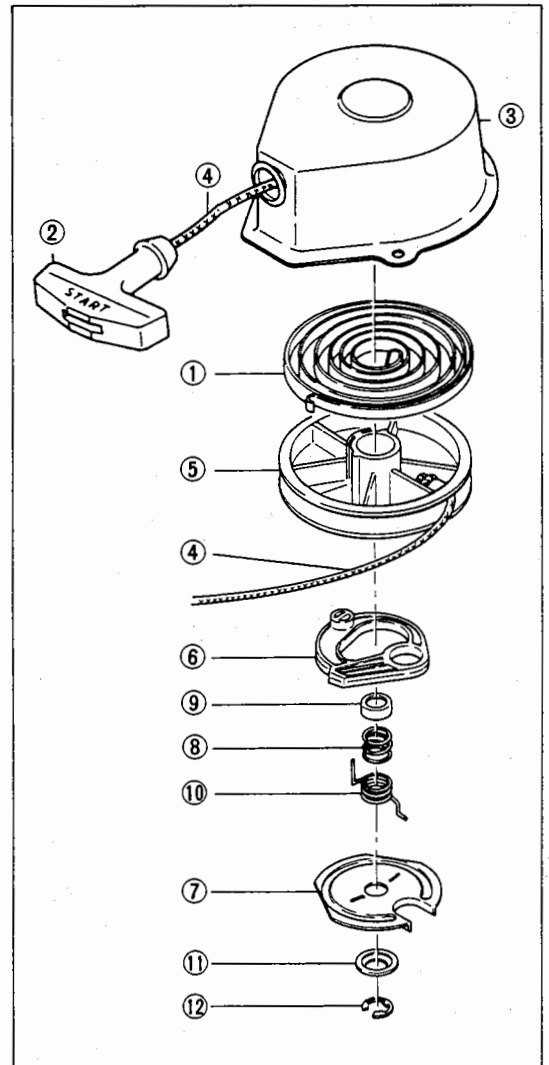
DISASSEMBLY

- ① Slightly pulling out the starter rope, fit it in the case notch and slowly loosen the starter spring.
- ② Remove the E-ring and the friction plate, remove the ratchet.
- ③ Subsequently removing the return spring and the spring, remove the reel.

PRECAUTIONS ON ASSEMBLY

- ① When setting the starter spring, wind it counterclockwise after attaching the outer end to the recessed portion of the reel.
- ② Wind the rope counterclockwise as seen from the reel side, pass the rope through the hole of the starter case and fix it to the starter handle after having wound it twice counterclockwise.
- ③ When attaching the ratchet make sure that the tooth is facing the right direction.
- ④ Adjustment of the starter spring tension is carried out after the assembly has been completed by inserting the rope in the notch of the reel, turning counterclockwise and winding the rope four times around the reel.
 - Starter rope tension
When the rope has been pulled out 30 cm
 $2 \pm 0.7 \sim 0.8$ kg.
- ⑤ If a chattering noise is heard when the starter assembly has been attached and the engine started, stop the engine, loosen the mounting bolts and retighten after having varying the position little until a position has been reached where the noise has been eliminated.

- ⑥ Lubricate the following places: Shaft (inside the starter case) ratchet and starter spring.



RECOIL STARTER COMPONENTS

- | | | |
|------------------|-------------------|----------------|
| ① Starter Spring | ② Starter Knob | ③ Starter Case |
| ④ Starter Rope | ⑤ Reel | ⑥ Ratchet |
| ⑦ Friction Plate | ⑧ Friction Spring | ⑨ Spring Cover |
| ⑩ Return Spring | ⑪ Thrust Washer | ⑫ E-Ring |

11

INSPECTION OF ELECTRICAL PARTS

(1) Flywheel Magneto

Connect a tester between the lead wire and the ground wire to read the resistance of the exciter coil. Also observe how the resistance changes as the wire is given a light tension or twisted. If it largely changes, the wire is about to be disconnected.

- a. Exciter Coil Lead wire white (W) – Earth Terminal 280 ~ 420 Ω
- b. Ignition Coil
 - Primary coil Lead wire orange (Or) – black/white (B/W) 0.18 ~ 0.24 Ω
 - Secondary coil High tension cord (B) – black/white (B/W) 2.7 ~ 3.7 Ω

(2) CD Unit

a. Precautions on Handling CD Unit

- 1) While the engine is running, do not remove lead wire or CD unit wiring, nor shortcircuit it.
- 2) Do not change positions for mounting the CD unit and ignition coil.
- 3) While the engine is running, do not touch the spark plug or high tension cord.
- 4) To measure compression, remove the lead wire and CD unit wiring.

b. Inspection of CD Unit

Use a test meter with an internal battery of 3V or less to measure the CD unit resistance. If a tester with a high voltage battery is used, the diodes in the CD unit may be damaged. Measure the resistance when the air temperature is at 20°C at meter readings may vary with the air temperature.

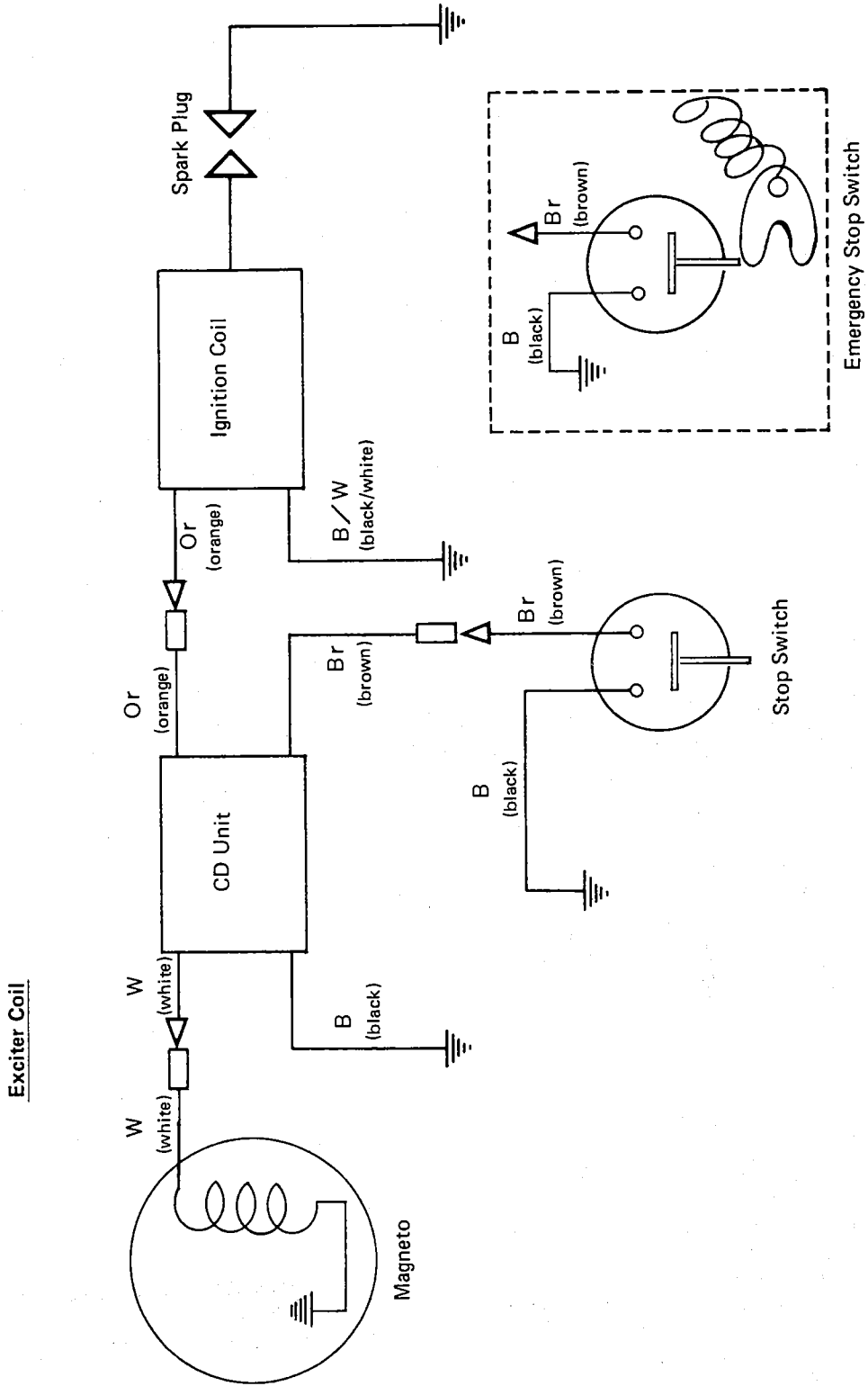
TESTER CHECK STANDARD VALUES

Tester: HIOKI MODEL 3030 Range: KΩ

		Tester Red Lead Wire			
		W (white) exciter	Or (orange) ignition coil	B (black) earth	Br (brown) stop cord
Tester Black Lead Wire	W (white) exciter	∞	∞	∞	0
	Or (orange) ignition coil	+9 21 -11 (10 ~ 30)	∞	5.3 ± 2 (3.3 ~ 7.3)	+9 21 -11 (10 ~ 30)
	B (black) earth	5.6 ± 2.2 (3.4 ~ 7.8)	∞	∞	5.6 ± 2.2 (3.4 ~ 7.8)
	Br (brown) stop cord	0	∞	∞	∞

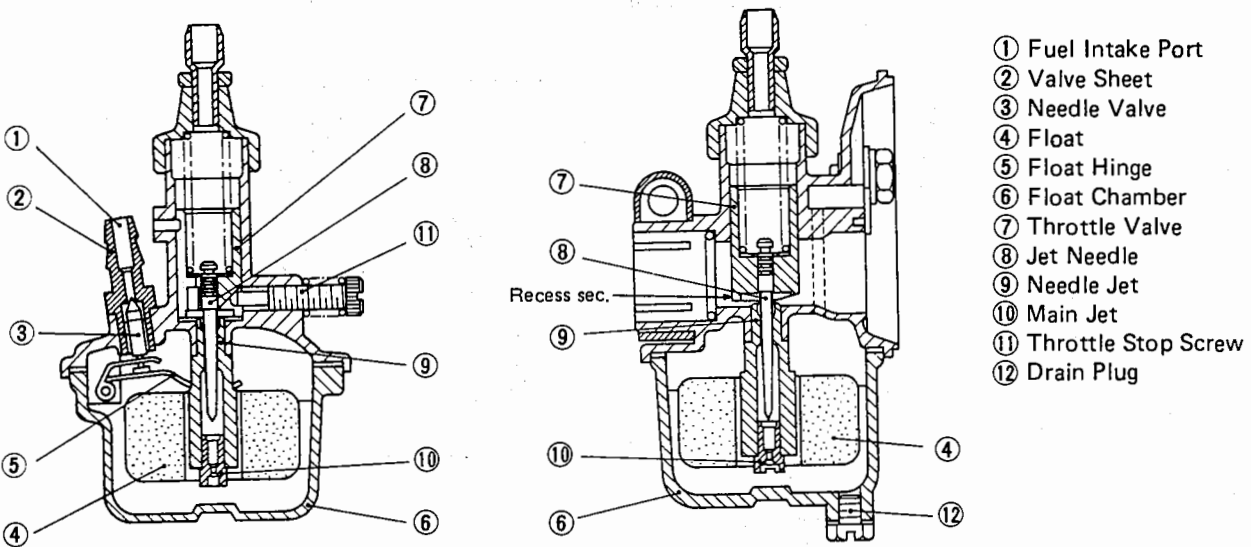
NOTE: The indicated values were measured with the test meter (HIOKI MODEL 3030) and may differ greatly when tested with other models.

ELECTRICAL WIRING DIAGRAM

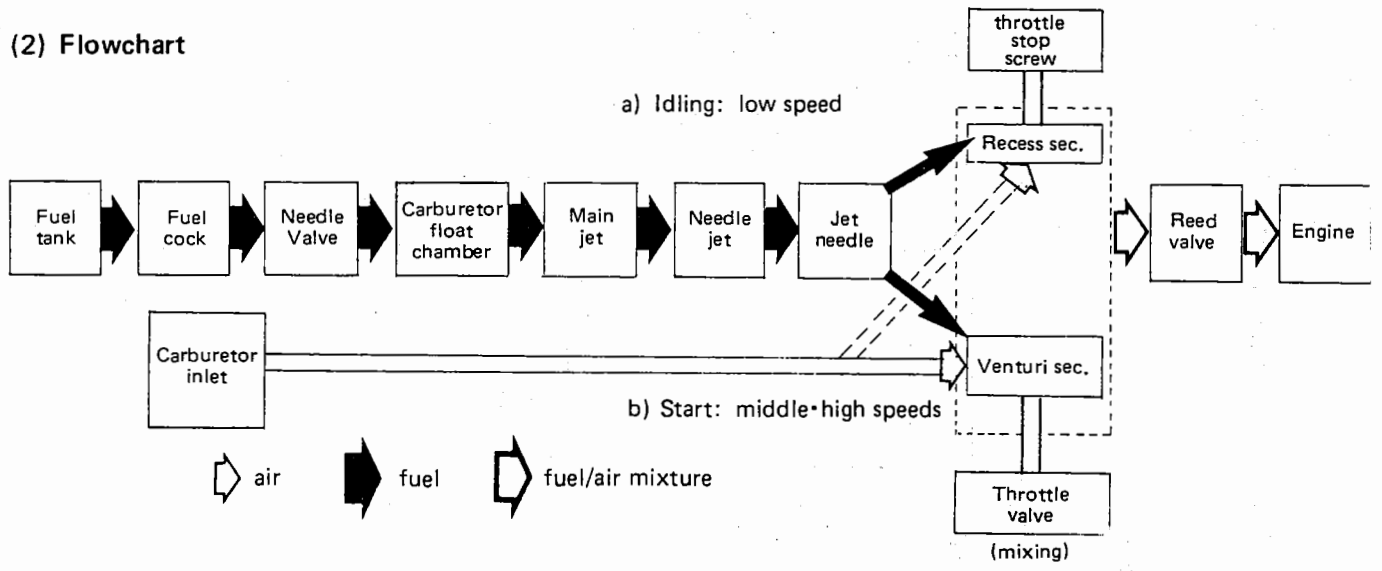


12 CARBURETOR

(1) Structural Drawing of Carburetor



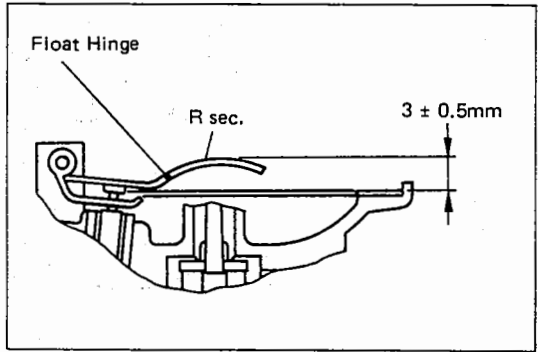
(2) Flowchart



(3) Float Height

Float height is adjusted by float hinge height.

Remove the float chamber and, with the carburetor body turned upside down, measure the height to the top of the float hinge (where the float comes in contact) from the top face of chamber packing. Set the both float hinges to be within 3 ± 0.5 mm. (0.118 ± 0.0196 in.) Adjust float hinge height as bending the R sec. by hand.



13

INSPECTION AND CHECK AFTER ASSEMBLY

(Test running and adjusting procedures in test tank after final assembly)

Water tank for running test and propeller test:

In running test in a water tank, it is required that the test propeller runs to load the engine properly.

a. Test propeller (Fig. 3)

- Used for break-in running of a new outboard motor.
- Used for operational testing of an outboard motor after being serviced.

b. Test tank

- The test tank must meet the dimensions shown in Fig. 1, 2.
- When fixing two or more motors in a water tank, the water tank is required to be separated by bulkhead according to the number of motors, each compartment satisfying the dimensions shown in Fig. 1, 2.
- Be careful to keep water temperature below 25°C during continuous running: otherwise, seizure will be caused. It is desirable to use cooling equipment or overflow equipment to allow cool water flow.
- Always use new, clean water: otherwise, carbon contained in the used, contaminated water will adhere to the internal wall of the cooling system on the motor, greatly reducing cooling efficiency.
- Keep the water tank in well ventilated environment by using air exhaust equipment to prevent the carburetor from sucking the exhaust gas from the motor.

c. Test propeller dimensions

Outside diameter: 148 mm

Width: 9 mm

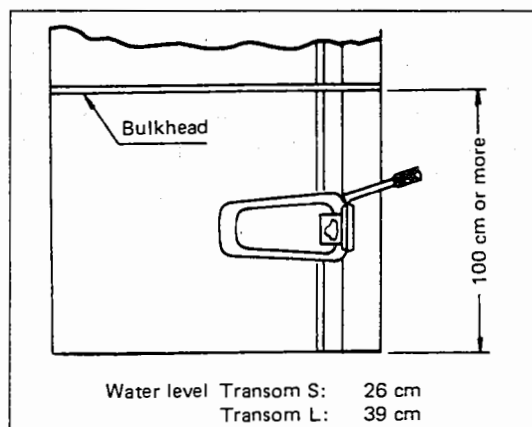
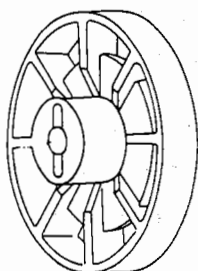


Fig. 1

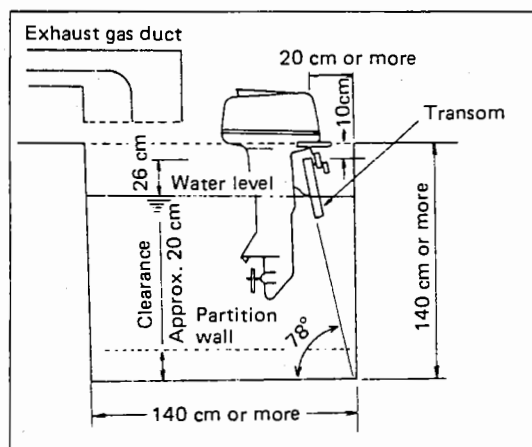


Fig. 2

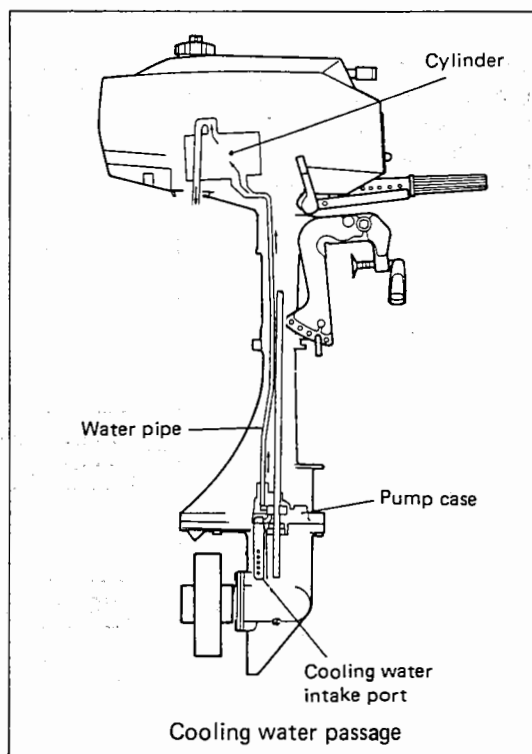
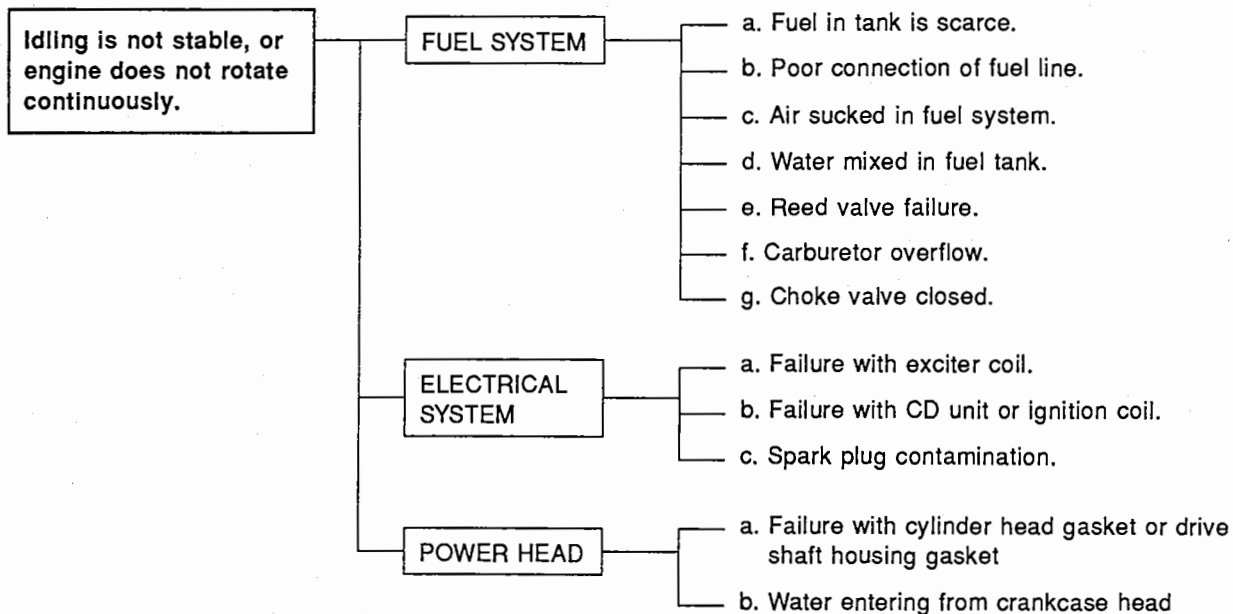
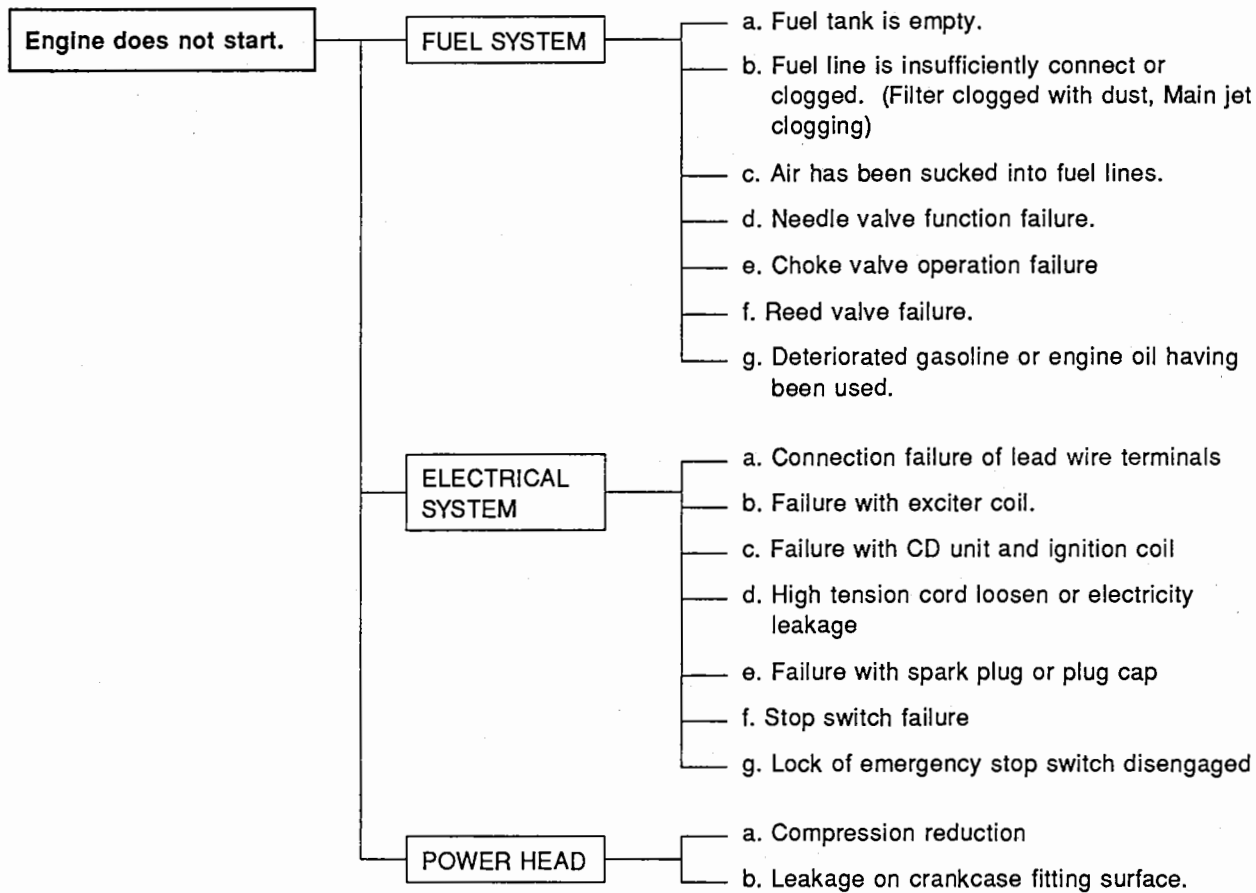


Fig. 3

14

TROUBLESHOOTING



Engine rotation does not increase.

FUEL SYSTEM

- a. Engine oil is of poor quality.
- b. Mixture ratio of fuel oil is high.
- c. Carburetor float positioned too high.
- d. Air sucked in fuel lines.
- e. Water mixed in fuel tank.
- f. Clogging of carburetor jets, etc.

POWER HEAD

- a. Scoring on piston or cylinder liner.
- b. Carbon accumulated in combustion chamber.
- c. Abnormal wear of piston ring or ring sticking.
- d. Overheat
- e. Failure with cylinder head gasket or drive shaft housing gasket.
- f. Failure with crankcase head oil seal.

LOWER UNIT

- a. Abnormal wear of pump impeller.
- b. Clogging of cooling water passage.

Although engine rotation goes up, boat speed does not increase.

PROPELLER

- a. Failure in propeller pitch selection.
- b. Shear pin damaged.
- c. Propeller blade worn or damaged.

OUTBOARD MOTOR INSTALLATION

- a. Transom height is not correct.
- b. Trim angle failure.

BOAT

- a. Boat bottom contaminated.
- b. Failure with cargo position.
- c. Overloading
- d. Inappropriateness of boat configuration.



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