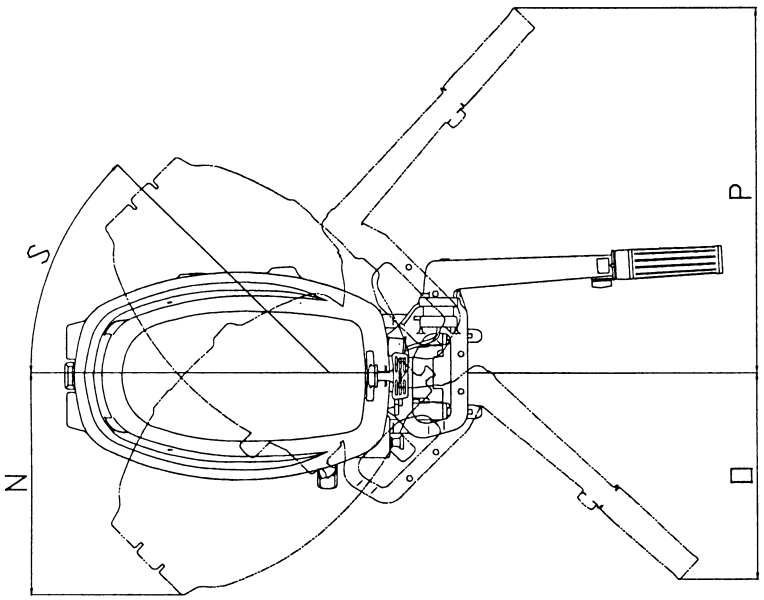
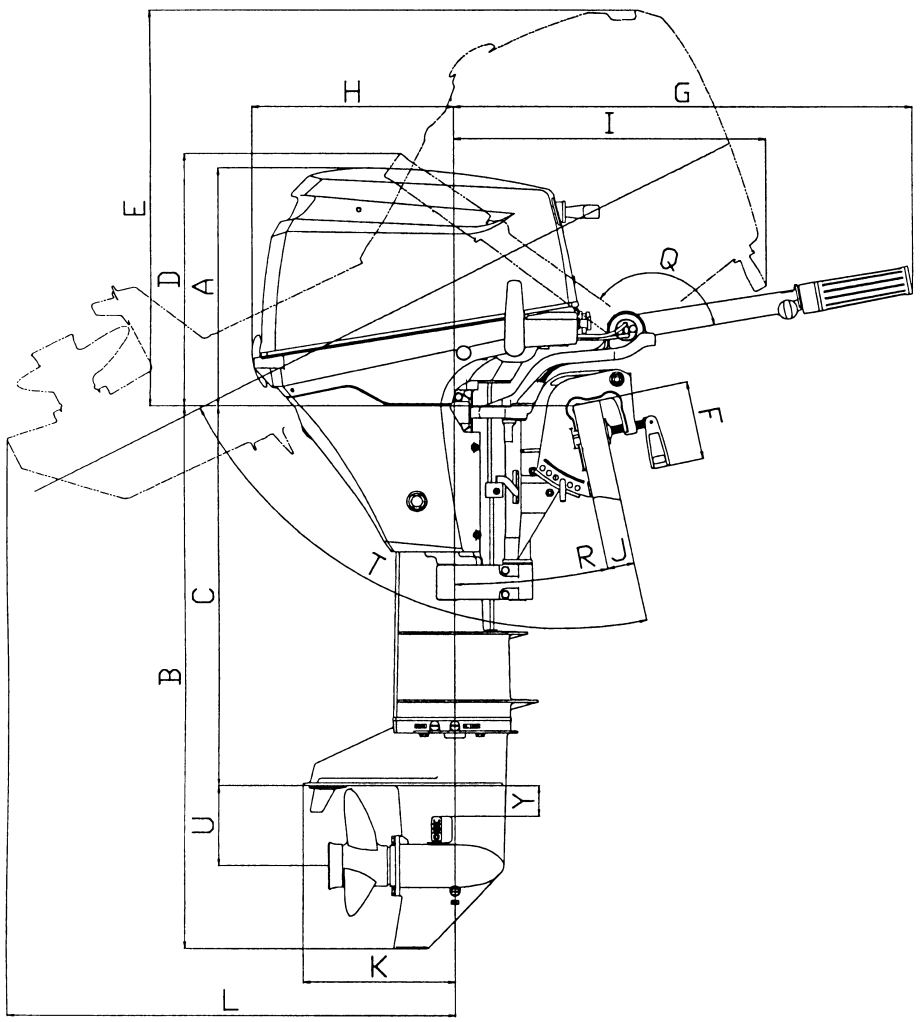
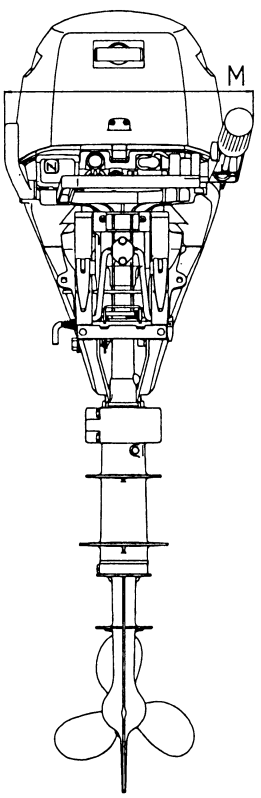
2. Dimensions



		(mm)	(in)
A		358	14.1
B	S	677	26.7
	L	804	31.7
	UL	931	36.7
C	S	435	17.1
	L	562	22.1
	UL	689	27.1
D	F type	380	15.0
E		594	23.4
F		116	4.6
G	F type	677	26.7
	P type	298	11.7
H		297	11.7
I		462	18.2
J		30−50	1.2−2.0
K		223	8.8
L	S	533	21.0
	L	660	26.0
	UL	783	30.8
M	F type	365	14.4
	P type	330	13.0
N		329	13.0
O	F type	306	12.1
	P type	194	7.6
P	F type	544	21.4
	P type	224	8.8
Q	F type	134	5.3
R		12°	
S		45°	
T		75°	
U		118	4.7
Y		46	1.8
Trim angle (Position)		4°−24° (6)	



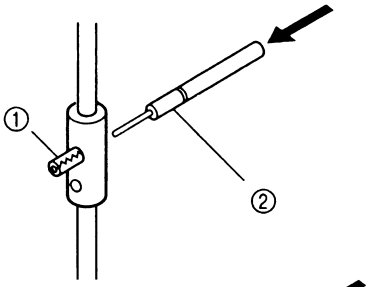


CHAPTER 2 SERVICE DATA AND TOOLS

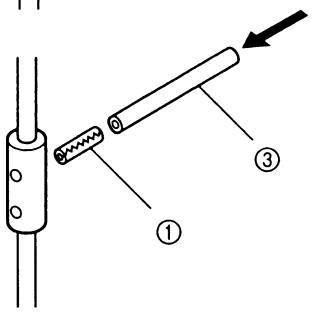
	Description	Check Item	Standard value	
Engine-related Items	Connecting rod	1. Inner diameter of the small end	14.01 mm (0.5516 in)	
		2. Oil clearance of the big end	0.015−0.041 mm (0.0006−0.0016 in)	
		3. Side clearance of the big end	0.1−0.25 mm (0.0039−0.0098 in)	
	Intake valve Exhaust valve	1. Valve clearance	IN 0.13−0.17 mm (0.0051−0.0067 in)	
			EX 0.18−0.22 mm (0.0071−0.0087 in)	
		2. Outer diameter of valve stem	IN 5.48 mm (0.2157 in)	
			EX 5.46 mm (0.2150 in)	
		3. Inner diameter of valve guide	IN 5.51 mm (0.2169 in)	
			EX 5.51 mm (0.2169 in)	
		4. Clearance to valve stem	IN 0.008−0.04 mm (0.0003−0.0016 in)	
			EX 0.025−0.057mm(0.0010−0.0022 in)	
		5. Contact width of valve seat	IN 1.0 mm (0.0394 in)	
			EX 1.0 mm (0.0394 in)	
	Valve spring	1. Free length	35 mm (1.378 in)	
	Cam shaft	1. Height of cam (both IN and EX)	23.63 mm (0.93 in)	
		2. Outer diameter of bearing	Pulley side 17.98 mm (0.7079 in) Oil pump side 15.97 mm (0.6287 in)	
		3. Clearance to holder (bearing)	0.02−0.05 mm (0.0008−0.002 in)	
	Rocker arm & Shaft	1. Inner diameter	13.01 mm (0.5122 in)	
		2. Outer diameter	12.99 mm (0.5114 in)	
		3. Shaft clearance	0.006−0.035mm(0.00024−0.0014 in)	
	Timing belt	1. Tension & Appearance		
	Engine block	1. Compression pressure at 500 rpm	0.88 MPa (9.0 kg/cm²)/500 rpm	
Fuel-related Items	Carburetor		8	9.8
		● Setting mark	3V1A	3V2A
		● Venturi	12 mm (0.47 in)	17 mm (0.67 in)
		● Throttle bore	23 mm (0.91 in)	23 mm (0.91 in)
		● Main jet (MJ)	#76	#92
		● Main air jet (MAJ)	#150	#135
		● Inner diameter of main nozzle	2.3 mm (0.09 in)	2.6 mm (0.10 in)
		● Slow jet (SJ)	#39	#39
		● Slow air jet (SAJ)	#90	#70
		● Opening angle of throttle (at W.O.T.)	75°	75°
		● Pilot screw (PS)	Blind	Blind
		● Fuel level (from flange surface to float bottom)	9.0 mm (0.35 in)	9.0 mm (0.35 in)
		● Idle speed (Clutch in)	900 rpm	900 rpm
	Oil pump	1. Inner diameter of pump body		
		2. Clearance between outer rotor and body		
		3. Height of outer rotor		
		4. Clearance between rotor and body side		
		5. Clearance between outer rotor and inner rotor		

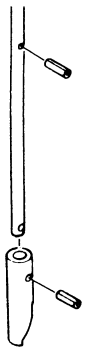
	Items / Description	Three Bond 1342	Three Bond 1401	Instantaneous Adhesive Three Bond 1741	Loctite 518	Bond G17	Low Temperature Lithium Grease	Grease for OBM	4st Engine Oil	Specified Gear Oil	Oil Compound Jyoetsu-Silicone KS-64	Remarks
Engine block	Starter case	●										Bolt and screw for Reel
							●					Friction plate, reel shaft part, Spiral spring, ratchet
	Starter seal rubber			●								
Driveshaft housing	Bolt (Engine)							●				Screw
	Oil seal						●					Lip
	Exhaust plug	●										Screw
	Seal rubber (Apron)			●								
	Bolt (Idle port cover)	●										Screw
Stern bracket	Bracket bolt							●				Sliding part
	Washer (Bracket bolt)							●				Sliding part
	Clamp screw							●				Screw
	Swivel bracket							●				Filling up inside with grease
	Steering shaft							●				Shaft
	Bushing (Steering shaft)							●				Sliding part
	Thrust plate							●				Sliding part
	O-ring (Steering shaft)							●				Sliding part
	Bushing (Tilt stopper)							●				Sliding part
	Friction plate							●				
	Bolt (Friction spring)							●				Screw
	Arm (Reverse lock)							●				Sliding part
	Shaft (Reverse lock arm)							●				Sliding part
Tiller handle	Bushing (Handle)							●				Inside and outside
	Bushing (Throttle shaft)							●				Inside and outside
	Throttle wire							●				Inside

4. Spring pin tool
   ① Spring pin
   ② Spring pin tool A (345-72227-0) (3 mm dia.)
   ③ Spring pin tool B (345-72228-0) (3 mm dia.)

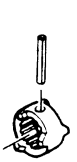


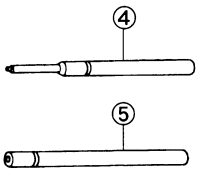
1. To remove the spring pin from the shift lever rod joint
   • Insert the tip of the spring pin tool A ② into the hole of the spring pin ① and lightly tap the tool end with a hammer in the direction of the arrow to remove the spring pin.
2. To insert the spring pin into the shift lever rod joint
   • Insert the spring pin ① into the hole of the spring pin tool B ② and lightly tap the tool end with a hammer while mating the spring pin with the spring pin hole of the clutch lever joint.





3. Removal and installation of clutch pin
   Use the following tools for removing and installing the clutch pin.
   ④ Spring pin tool A (369-72227-0) (ø3.5)
   ⑤ Spring pin tool B (369-72228-0) (ø3.5)



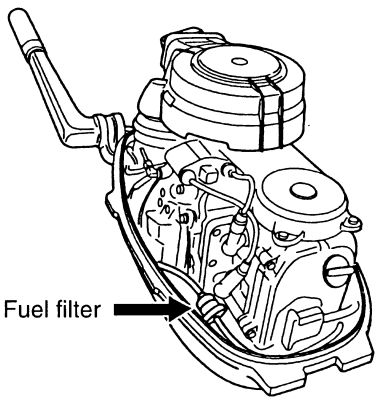


5. Inspection of Fuel System

Fuel filters are provided inside the fuel tank and engine.

① Engine filter

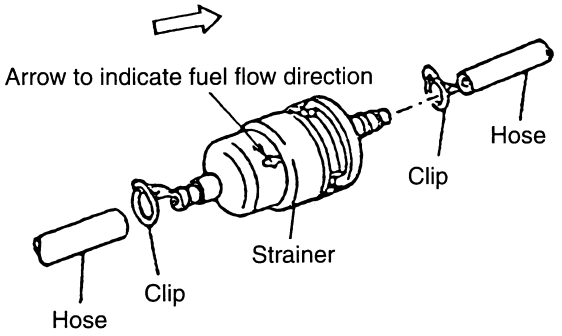
Replace the filter provided inside of engine cover if there is water or dirt inside.



Notes:
- Remove the fuel connector for replacing the fuel filter.
- Be careful not to connect the fuel filter in wrong direction.
- Fasten the hose with the clip without fail.

② Fuel tank filter

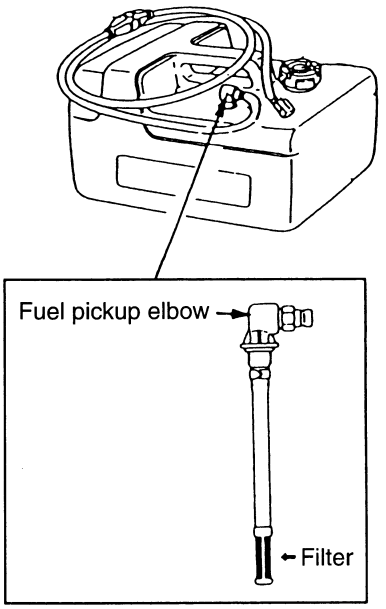
Remove the fuel pickup elbow of the fuel tank by turning it clockwise and clean the fuel filter.



③ Fuel tank

Water or dirt in the fuel tank will cause engine performance problems.

Check and clean the tank at specified times or after the motor has been stored for a long period of time (over three monts).

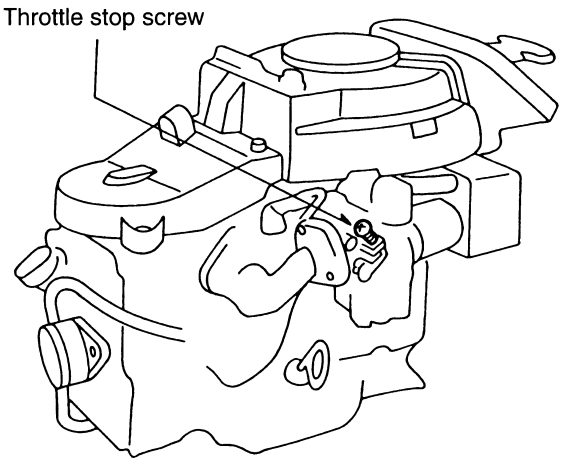


④ Idle carburetor adjustment

Turn the throttle stop screw with a screwdriver so that engine speed becomes as specified below.

Notes:
- Adjust engine speed with a tachometer after warming up the engine.
- Specified engine speed
  Clutch off: 950 rpm
  Clutch in : 900 rpm

Remarks: The pilot screw is not adjustable.



CHAPTER 4 POWER UNIT

1. General Notes on Service

When servicing the engine, pay attention to the following instructions that are mandatory and general notes on servicing the outboard motor in whole.
Work carefully during maintenance and repair to avoid injuries and accidents.

(1) When servicing the outboard motor, be sure to securely fix it on a proper workstand.
For servicing the power head, it is convenient to use the setting board.

(2) Be careful not to scratch or damage the mating surfaces of the cylinder, cylinder head, drive shaft housing and coated surfaces, etc. during servicing.

(3) Don't reuse packings, gaskets, O-rings, split pins that are once removed for servicing. Replace them with new ones when reassembling. Deformed snap rings must be also replaced.

(4) Be sure to use genuine parts. Always use genuine or specified oil and grease.

(5) For services that require to use a special tool(s), use the specified tool(s) following the instructions.

(6) On disassembling and removing parts, pay careful attention to mating point marks of respective parts. If no marks on it , make simple marks at those mating points for convenience for reassembling.

(7) To avoid losing small parts, temporarily restore bolts, nuts, washers, and other small parts to their respective original positions as far as circumstances permit.

(8) When parts are removed for disassembling, dust them off and wash them with solvent and then check to see if they are worn or damaged.

(9) While reassembling, pay attention to every detail such as mating, preciseness in centering, air-tightness, lubrication, grease-up, cleanliness of oil and fuel paths, packing, wiring, piping, etc.

1) When fastening a part for which many bolts and nuts are used (cylinder head, crank case, etc.), carefully tighten the bolts and nuts in order from inner ones to outer ones diagonally or circularly to avoid uneven tightening. (When removing bolts and nuts from such a part, carefully loosen and remove them in the reverse manner.)

2) When inserting an oil seal, be careful in setting the correct side up nor to scratch the mating surface (lip) to the shaft. Apply grease onto the lips.

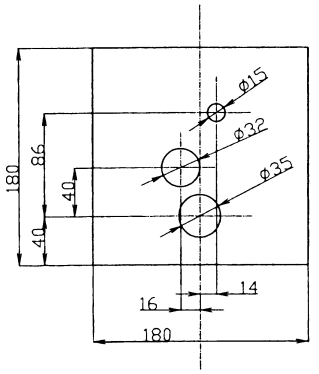
3) When applying liquid sealant, take care of its quantity and thickness. If too much sealant is applied, the excess may not only stick out and flow into the case but also have a bad influence. When using an adhesive, carefully follow the instructions.

4) If a fastener is hard to loosen and remove because of rust, spray penetrating oil to loosen and remove it after five or more minutes.

5) For details of service standards, tightening torques, parts that are specified to apply sealant, glue, grease, etc., refer to the service data table.

6) Bolts, nuts, and washers are indicated by the symbols below.

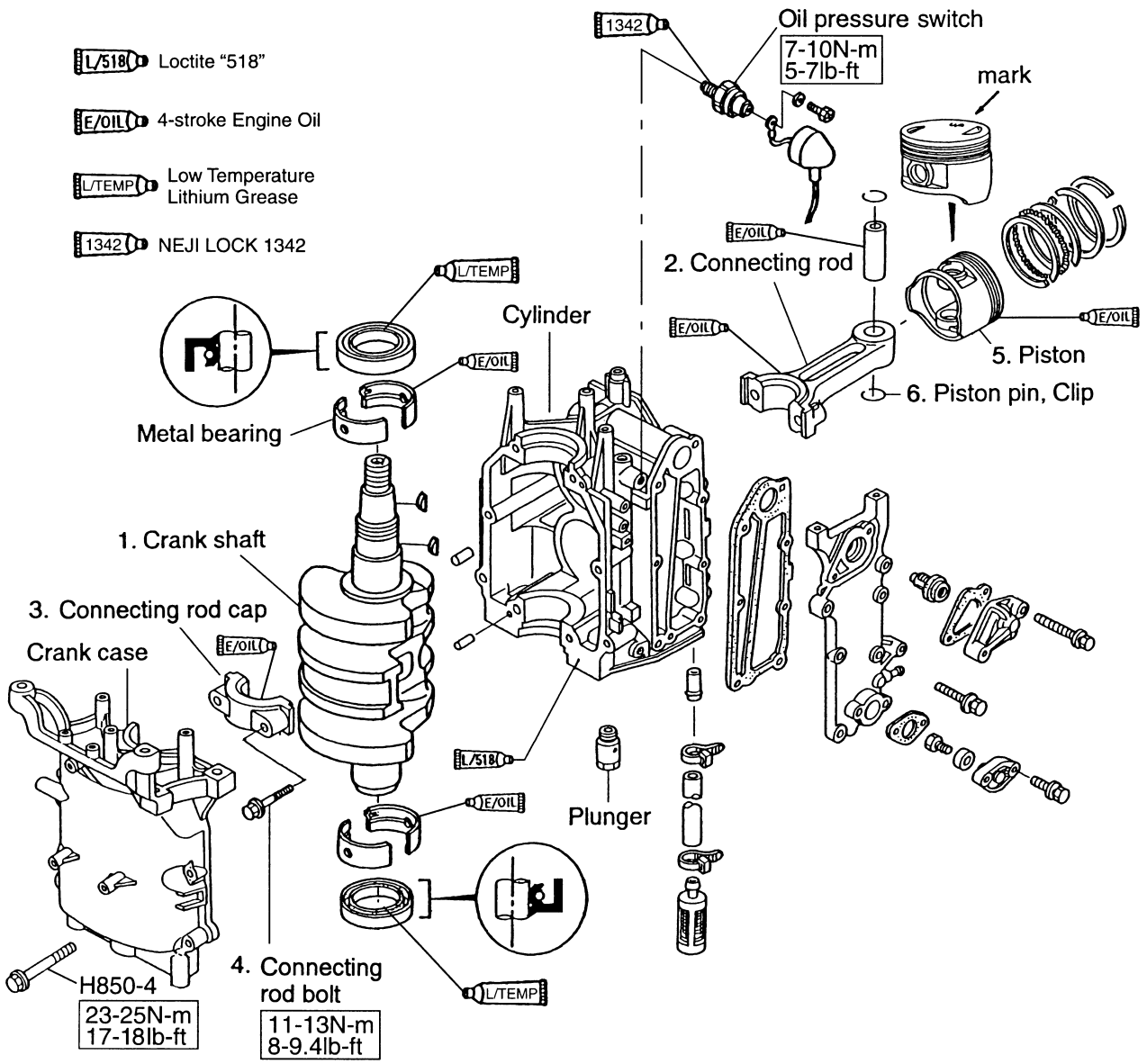
H820 — Hexagon headed bolt Diameter 8 mm Length 20 mm
N8 — Normal hexagon nut Diameter 8 mm
L8 — Hexagon lock nut Diameter 8 mm
W6 — Plain washer Diameter 6 mm
SW6 — Spring washer Diameter 6 mm
Screw 620 — Pan headed screw Diameter 6 mm Length 20 mm



Thickness : 30 or more
Unit : mm
Setting board for power unit

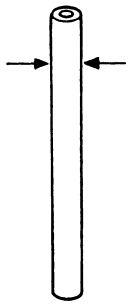
2) Crank shaft, pistons, cylinder/crank case and related parts

No.	Part name	Check point, etc.
1	Crankshaft	● Oil clearance at main bearings ● Oil clearance at big end of connecting rod Note: Align the tab of the metal bearing with the notch in the cylinder/crank case Note: There are two type of metal bearings (Thickness code: Black color and Brown color)
2	Connecting rod	Note: Pay attention to the connecting rod orientation for reassembling ("UP" mark must face the magneto side)
3	Connecting rod cap	Note: Mate the markings of the cap and connecting rod with each other ("UP" mark must face the magneto side)
4	Connecting rod bolt	Note: Tighten the bolts in careful manner; Gradually tighten the two bolts alternately several times so that they are evenly tightened.
5	Piston	Note: Pay attention to the piston direction ("UP" mark faces the magneto side)
6	Piston pin clip	Note: Don't use the clip that is once removed. Be sure to use a new part for reassembling.



● Outer diameter of rocker arm shaft

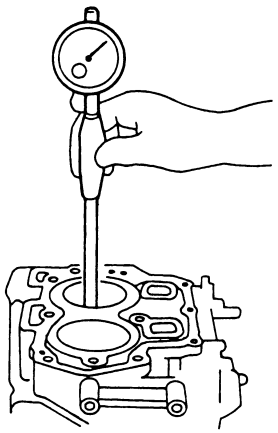
Standard value	Out of the limit to use
12.99 mm 0.5114 in	f 12.94 mm (0.5094 in) or less, it needs replacement.



3) Measurement with cylinder gauge

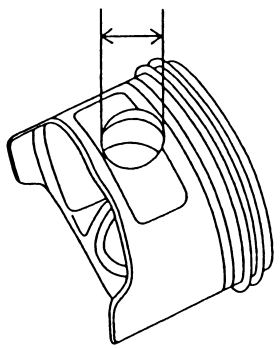
● Inner diameter of cylinder

Standard value	Out of the limit to use
55.00 mm 2.1654 in	If 55.06 mm (2.1677 in) or more, it needs replacement.



● Diameter of piston pin hole

Standard value	Out of the limit to use
14.002 mm 0.5513 in	Depends on clearance between pin and hole.

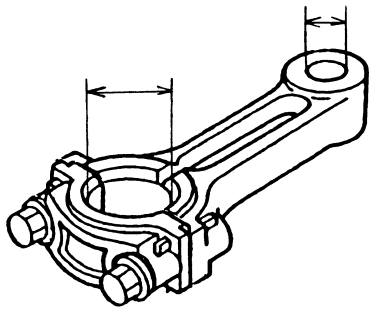


● Clearance between piston pin and piston pin hole

Standard value	Out of the limit to use
0.002−0.012 mm 0.00008−0.00047 in	If 0.04 mm (0.00157 in) or more, it needs replacement.

● Oil clearance at big end of connecting rod

Standard value	Out of the limit to use
0.015−0.041 mm 0.0006−0.0016 in	If 0.060 mm (0.0024 in) or more, it needs replacement.

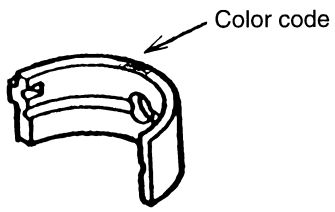


● Inner diameter of small end of connecting rod

Standard value	Out of the limit to use
14.01 mm 0.5516 in	If 14.04 mm (0.5528 in) or more, it needs replacement.

● Metel bearing thickness code

The codes are painted on the side of the bearing.



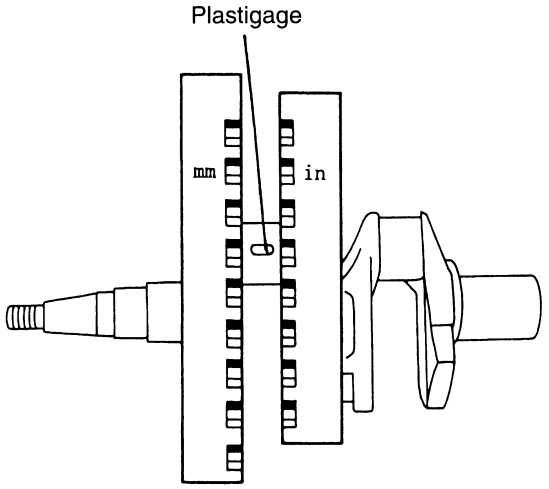
Color code	Thickness
Brown	1.488－1.494 mm 0.0586－0.0588 in
Black	1.494－1.500 mm 0.0588－0.0590 in

● Oil clearance at big end of connecting rod

1) Wipe oil out of the crank pin and big end bearing of connecting rod.
2) Set the Plastigage to the crank pin and fit it to the connecting rod. Tighten the bolt with the specified torque.

Tightening torque: 11－13 N-m (1.1－1.3 kg-m)
(8.0－9.4 lb-ft)

Note:
Do not turn the connecting rod.



3) Remove the connecting rod and check the Plastigage reading.

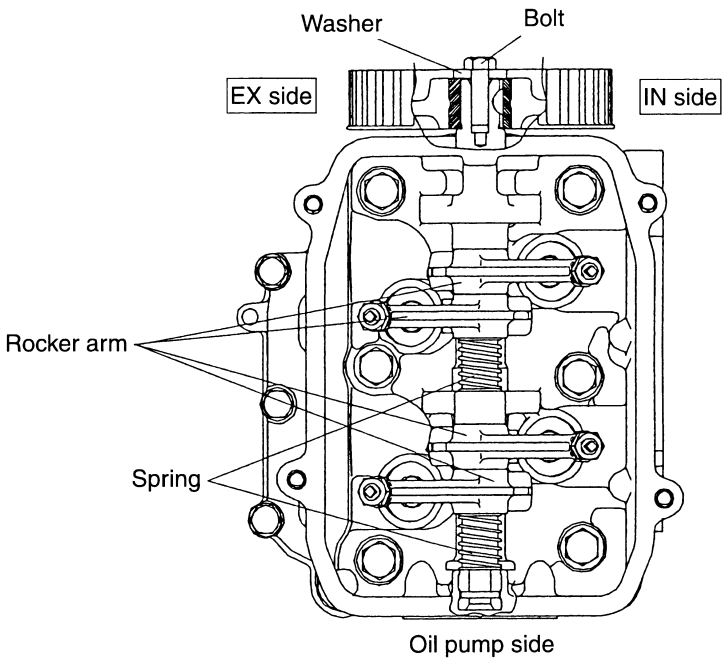
Standard value	Out of the limit to use
0.015－0.041 mm	f 0.06 mm (0.0024 in) or less, it needs replacement

● Rocker arm

• Temporarily set the tappet adjusting screw and tappet adjusting nut to the rocker arm.

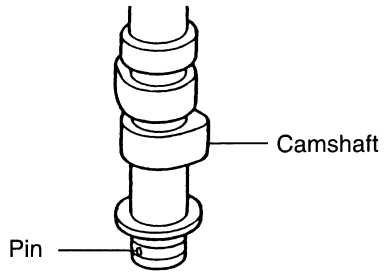
Note:
Set the tappet adjusting nut with the chamfered side down.

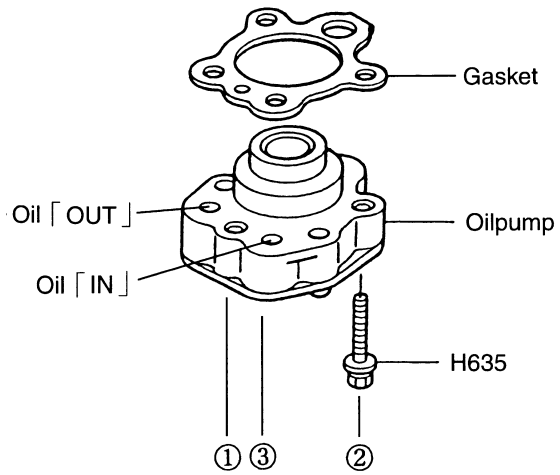
• Apply the engine oil for the 4-stroke cycle engine to the rocker arm shaft.
• Install the rocker-arm shaft from the oil pump side of the cylinder head. (Vertical orientation of the rocker-arm shaft can be disregarded.)
• Set the rocker-arm shaft springs and rocker arms on the rocker-arm shaft from the lower part to the upper part in order. (Refer to the figure on the right hand.)
• When setting the above-mentioned parts, apply the engine oil to every part.



● Oil pump

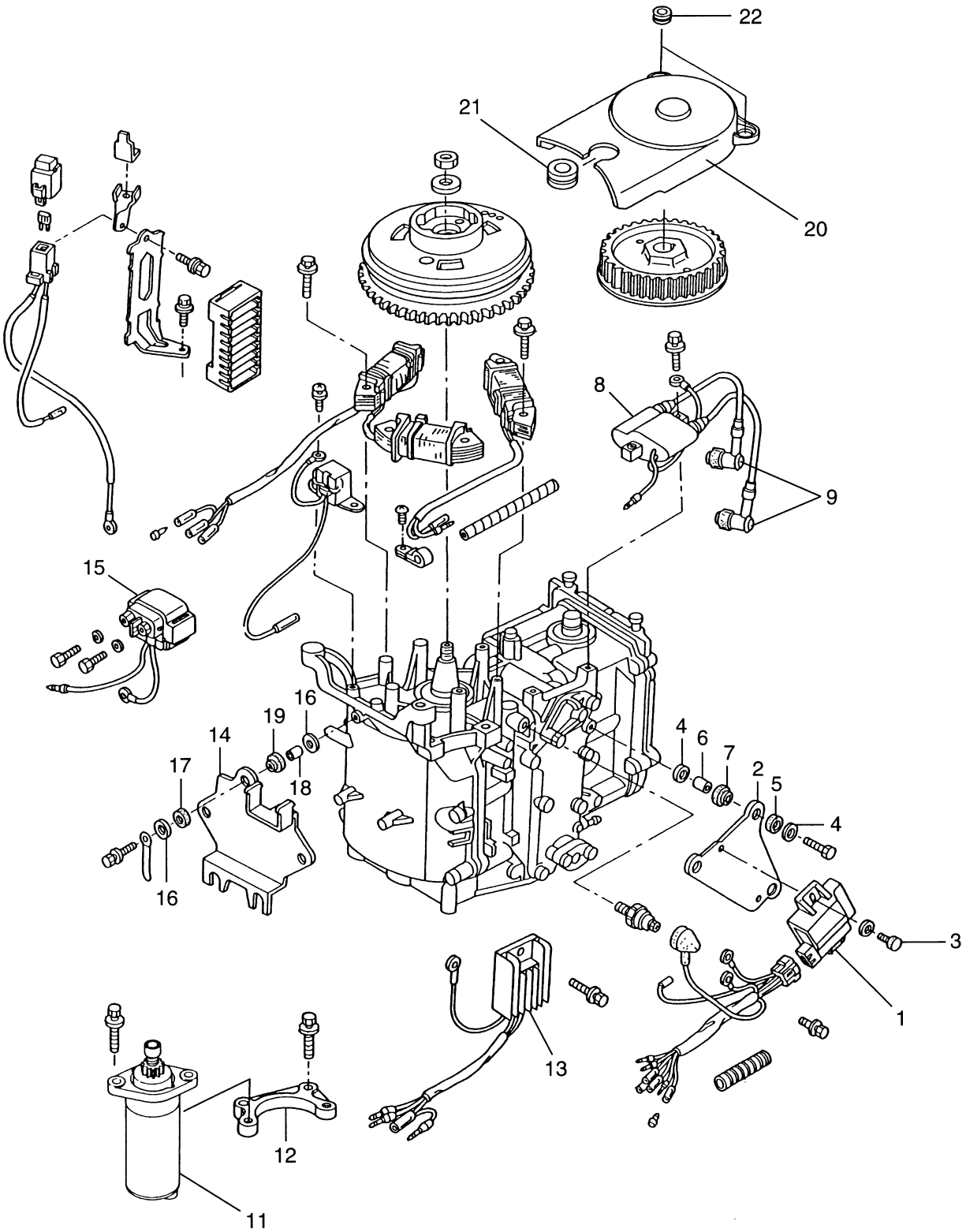
• Pour the engine oil of approximately 1.0 ml into the oil pump through the inlet and outlet ports.
• Apply 4-stroke cycle engine oil to the journal in the oil pump side of the cam shaft.
• When assembling the oil pump to the cylinder head, carefully set it so that the cam shaft pin and the notch on the oil pump shaft meet each other.
• Fasten the oil pump with the three M6 bolts with the tightening torque in two stages and in the tightening order specified below.
Tightening order: ①, ② and ③ (Refer to the figure.)





Tightening torque:
1st: 5 N-m (0.5 kg-m)
(3.6 lb-ft)
2nd: 8－10 N-m (0.8－1.0 kg-m)
(6－7 lb-ft)

Electrical system component parts



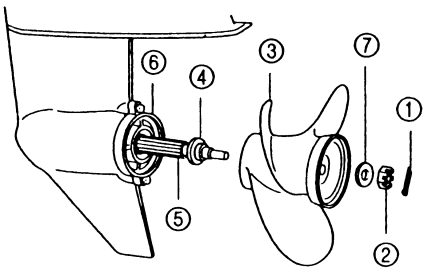
CHAPTER 5 LOWER UNIT

1. Disassembly of Gear Case

The gear case can be removed without removing the power unit from the outboard motor.

Removal of propeller

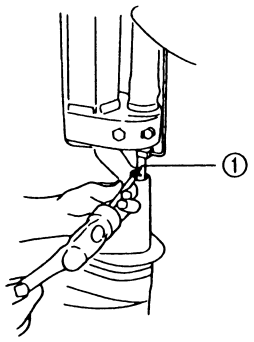
① Split pin
② Propeller nut
③ Propeller
④ Thrust holder
⑤ Propeller shaft
⑥ Propeller shaft housing
⑦ Washer



1. Remove the following:
   - Split pin ①
   - Propeller nut ②
   - Washer ⑦
   - Propeller ③
   - Thrust holder ④

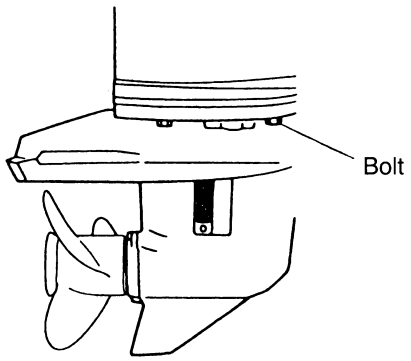
Removal of gear case

1. Remove the following:
   - Spring pin
     (Remove the spring from the upper side of gear shift rod joint ①.)



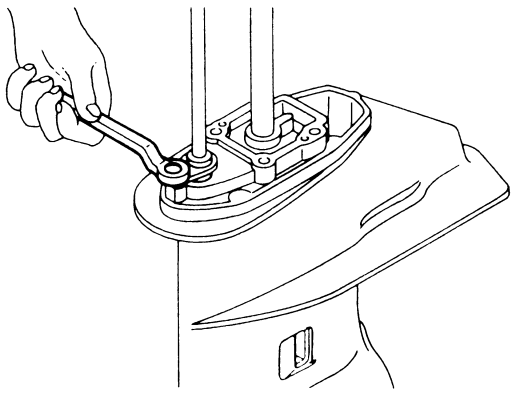
Note: Remove the spring pin using the spring pin tool.

2. Remove the following:
   - Gear case bolt (H635-4)
   - Gear case assembly
     (Pull out the assembly from the bottom.)

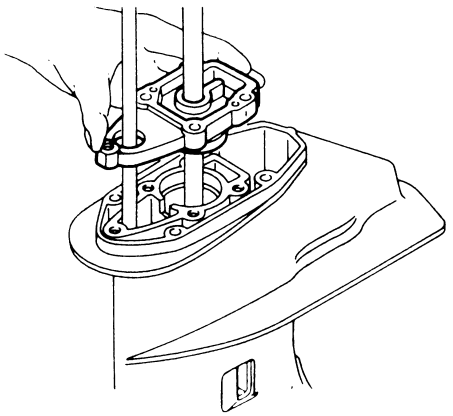


Removal of cam rod, drive shaft and bevel gear

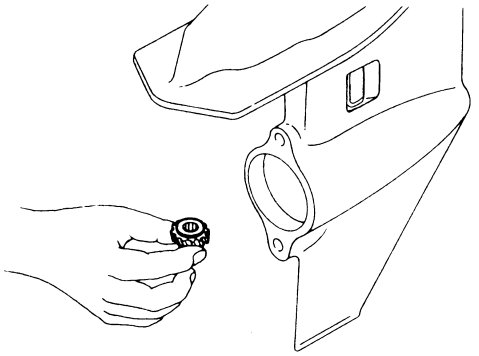
① Remove the cam rod bushing stopper bolt (H625-1) and pull out the cam rod bushing stopper.



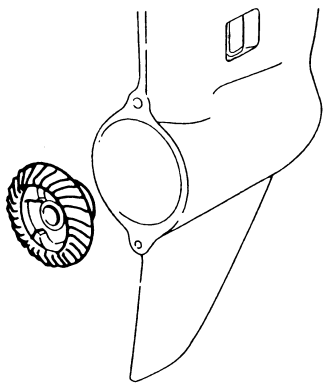
② Remove the lower pump case, cam rod and drive shaft as they are assembled.



③ Remove the bevel gear B.



④ Remove the bevel gear A.



3) C. D. unit

- Check to see if there is neither breakdown nor disconnection in the wire harness and terminals.
- Check connections and resistances referring to the following table that shows standard values.

Terminal board of C.D. unit

Tester's negative (–) terminals \ Tester's positive (+) terminals	1 Red/White Pulser (+)	2 Light green Oil pressure SW	3 Brown Stop SW	4 White/Red LED	5 Blue Exciter (H)	6 Black/Red Exciter (L)	7 Orange Ignition coil	8 Black Earth
1 Red/White Pulser (+)		ON (7.5kΩ)	ON (17kΩ)	OFF (∞)	ON (7.8kΩ)	ON (7.8kΩ)	CON (∞)	ON (3.0kΩ)
2 Light green Oil pressure SW	OFF (∞)		OFF (∞)	OFF (∞)	OFF (∞)	OFF (∞)	OFF (∞)	OFF (∞)
3 Brown Stop SW	OFF (∞)	OFF (∞)		OFF (∞)	OFF (∞)	OFF (∞)	OFF (∞)	OFF (∞)
4 White/Red LED	CON (90kΩ)	CON (220kΩ)	CON (1MΩ)		CON (250kΩ)	CON (250kΩ)	CON (∞)	CON (85kΩ)
5 Blue Exciter (H)	ON (100kΩ)	ON (130kΩ)	ON (3.5kΩ)	OFF (∞)		ON (130kΩ)	CON (∞)	ON (100kΩ)
6 Black/Red Exciter (L)	CON (60kΩ)	CON (130kΩ)	CON (400kΩ)	OFF (∞)	CON (130kΩ)		OFF (∞)	CON (550kΩ)
7 Orange Ignition coil	ON (7.5kΩ)	ON (11kΩ)	ON (30kΩ)	OFF (∞)	ON (11kΩ)	ON (11.5kΩ)		ON (3.7kΩ)
8 Black Earth	ON (3.0kΩ)	ON (4.0kΩ)	ON (12kΩ)	OFF (∞)	ON (4.0kΩ)	ON (4.0kΩ)	CON (∞)	

Notes:
- Before measuring the item marked with "CON", make a shortcircuit between the ignition terminal ⑦ and earth terminal ⑧.
- Since the value marked with "CON" is the capacitor characteristic, the tester reads a stable value shown in parentheses after the tester pointer shakes once.
- (∞) marked with "CON" indicates a minute value because the tester pointer shakes a little for this item.
- Condition of the above measurement: HIOKI 3030 tester was used with the measurement range of 1 kΩ.
- Tolerance of resistance: ± 20 %
- The values shown in the above table are just standards, and it is impossible to check each value accurately.

CHAPTER 10 TEST RUN AND INSPECTION

● Items to be checked during test run

While idling the engine, check the following items.

- Fuel leak from parts joined spots of the engine.
- Cooling water and/or oil leak from parts joined spots of the engine.
- Extraordinary noise
- Idle speed and stable idling
- Operation of the stop switch
- On/off operation of the engine oil warning lamp

  Off: The lamp goes out as the engine starts.

  On: The lamp goes on when the lead wire of the oil pressure switch is grounded to the body.
- Operation of the clutch
- Engine speed at acceleration and deceleration
- Cooling water discharge condition (Cooling water must vigorously be discharged from the water inspection hole.)

● Additional tightening after test run

Check the tightening condition of respective bolts and nuts after test run, and additionally tighten them with the specified tightening torque.

● Break-in

When any of the piston, piston ring, piston pin, crank shaft, connecting rod, cylinder, cam shaft, rocker arm, inlet/exhaust valve, etc. is replaced, perform a break-in of the engine for fitting the sliding surfaces.

Note: Perform a break-in of the engine according to the following standards.

Break-in period ·····10 hours

Minutes and hours	0	10 minutes	2 hours	3 hours	10 hours
Break-in manner	Trolling or idling	Half or less throttle opening, 3,000 rpm approx.	Three-quarter or less throttle opening, 4,000 rpm approx.	Three-quarter throttle opening, 4,000 rpm approx.	Normal running

▽ Navigation at the lowest speed

▽ W.O.T. running for about 1 minute at 10— minutes intervals

▽ W.O.T. running for a short time