# CHAPTER 1 SPECIFICATIONS

## 1. Specifications

| Item | 4A2 | 5A2S | 6A2S |
|---|---|---|---|

### Dimensions

| | | | | |
|---|---|---|---|---|
| Overall length | mm (in) approx. | | 680 (26.8) Handle is horizontally positioned. | |
| Overall width | mm (in) approx. | | 325 (12.8) Handle is horizontally positioned. | |
| Overall height | mm (in) approx. | S | 1,073 (42.2) | 1,020 (40.2) |
| | | L | 1,200 (47.2) | 1,147 (45.2) |
| Transom height | mm (in) approx. | | S : 435 (17.1) L : 562 (22.1) | |
| Weight | Kg (lb) approx. | S | 26 (57) | 25 (55) |
| | | L | 27 (59) | 26 (57) |

### Performance

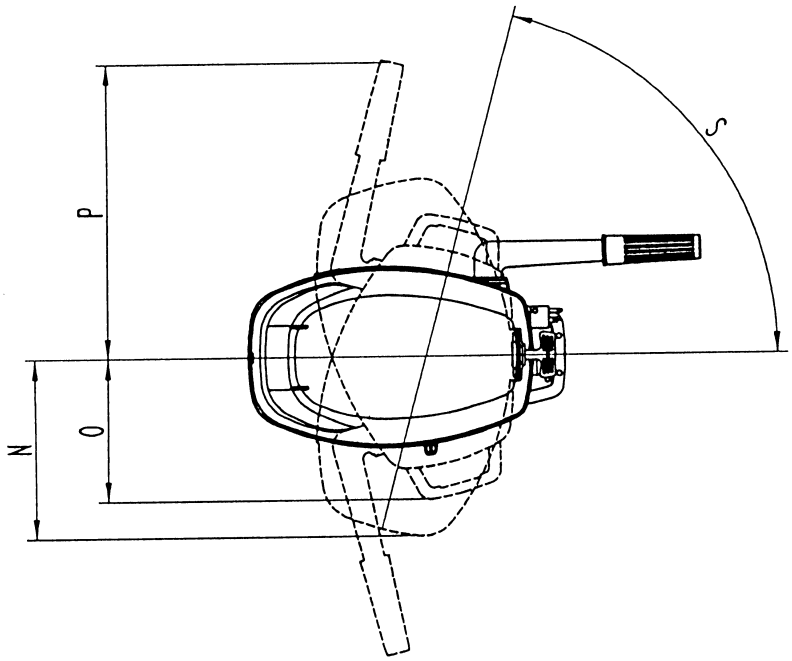
| | | | | |
|---|---|---|---|---|
| Maximum output | Kw (Hp) | 2.9 (4) | 3.7 (5) | 4.4 (6) |
| Maximum operating range | rpm | 4,500 – 5,500 | | 5,000 – 6,000 |
| Idling (Clutch off) | rpm | 1,300 | | |
| Trolling (Clutch in) | rpm | 1,100 | | |
| Fuel consumption at W.O.T. | L/hr | 1.5/5,000 rpm | 1.7/5,000 rpm | 2.0/5,500 rpm |

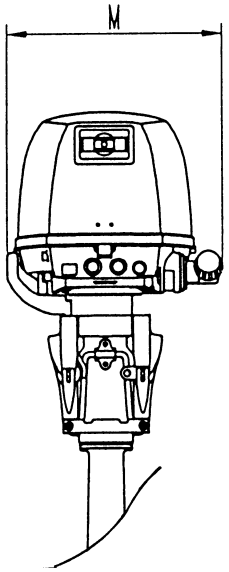
### Engine

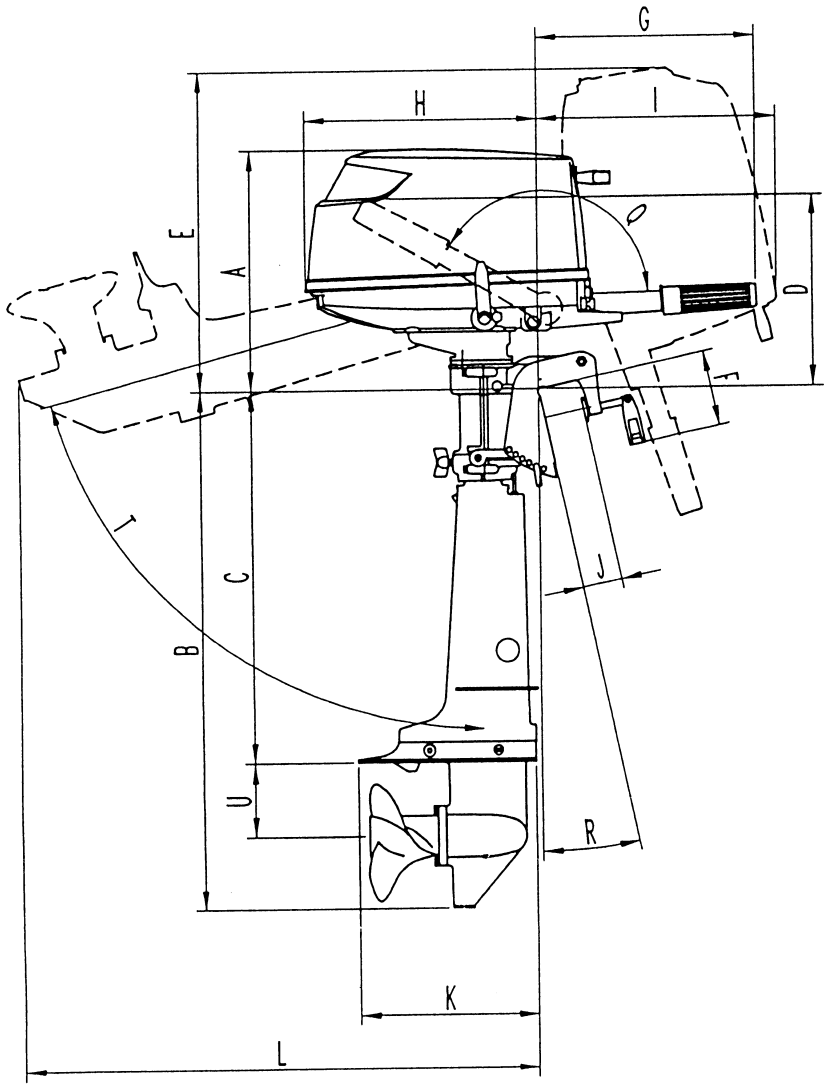
| | | | |
|---|---|---|---|
| Engine type | | 4-Stroke | |
| Number of cylinder | | 1 | |
| Bore and stroke | mm (in) | 59.0 × 45.0 (2.32 × 1.77) | |
| Displacement | mL (Cu in) | 123 (7.5) | |
| Valve system | | OHV, Cross flow | |
| Cooling system | | Water cooling | |
| Engine lubrication system | | Trochoid pump | |
| Starting system | | Manual starter | |
| Ignition system | | Flywheel magneto C.D. ignition | |
| Spark plug | | NGK DCPR6E | |
| Ignition timing | | BTDC 25° | |
| Carburetor | | Horizontal butterfly valve type | |
| Fuel pump | | Mechanical plunger type | |
| Direction of engine rotation | | Clockwise | |
| Engine oil | | API SF or SG or SH, SAE 10W-30/40 | |
| Volume of engine oil | mL (fl. oz.) approx. | 450 (15.2) | |
| Fuel tank capacity | L (US gal) | * 1.3 (0.34) Integral | 12 (3.17) Separate |
| Speed control | | Twist grip type (Option: Remote control) | |

* In case of dual fuel tank system, use it together with 12L separate tank.

## 2. Outline Dimensions




| | | | | |
|---|---|---|---|---|
| A | 4A2 | | | |
| | 418 | | | 16.5 |
| | 5A2S • 6A2S | | | |
| | 365 | | | 14.4 |
| B | S | 655 | | 25.8 |
| | L | 782 | | 30.8 |
| C | S | 435 | | 17.1 |
| | L | 562 | | 22.1 |
| D | 400 | | | 15.7 |
| E | 510 | | | 20.1 |
| F | 110 | | | 4.3 |
| G | 330 | | | 13.0 |
| H | 350 | | | 13.8 |
| I | 335 | | | 13.2 |
| J | 55 | | | 2.1 |
| K | 275 | | | 10.8 |
| L | S | 658 | | 25.9 |
| | L | 758 | | 29.8 |
| M | 325 | | | 12.8 |
| N | 265 | | | 10.4 |
| O | 210 | | | 8.3 |
| P | 445 | | | 17.5 |
| Q | 120° | | | |
| R | 12° | | | |
| S | 75° | | | |
| T | 75° | | | |
| U | 110 | | | 4.3 |

(mm) (in)

# CHAPTER 2 SERVICE DATA AND TOOLS

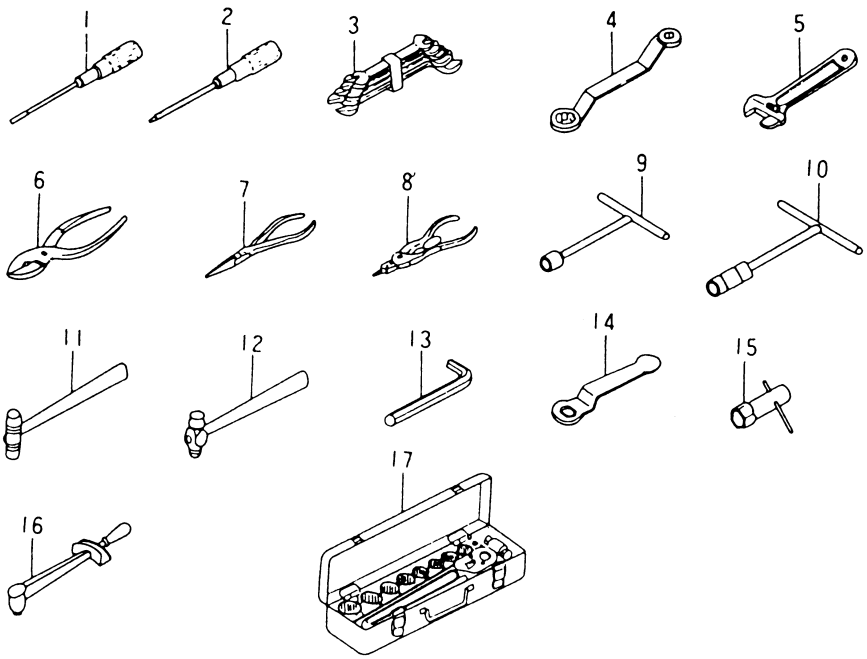
## 1. Service Data and Maintenance Standards

| | Description | Check Item | | Standard value |
|---|---|---|---|---|
| Engine-related Items | Cylinder head | Carbon deposit on the combustion chamber | | |
| | | Distortion of the mounting surface | | |
| | | Corrosion in the mated surface | | |
| | | Clogging cooling water passage | | |
| | Cylinder | Deposit in the water jacket | | |
| | | Wear-out of the inside diameter: Measure the bore with a cylinder gauge. | | 59.00 mm (2.323 in) |
| | | Seizure | | |
| | | Scratch and wearing down in the cylinder liner | | |
| | | Mating surfaces of the cylinder and cylinder headPiston | | |
| | Piston | Outside diameter<br>● Measure the diameter at a point 7 mm above the lower end of the piston skirt.<br>● Piston clearanc | | Diameter: 58.960 mm (2.3213 in)<br>Piston clearance: 0.020 – 0.055 mm (0.0008 – 0.0022 in) |
| | | Carbon deposit on the piston crown and in the piston ring groove. | | |
| | | Scratch on the sliding surface. | | |
| | | Measurement of clearance between the piston ring and ring groove | | Top: 0.04 – 0.08 mm (0.0016 – 0.031 in)<br>Second: 0.03 – 0.07 mm (0.0012 – 0.0028 in)<br>Oil: 0.01 – 0.18 mm (0.0004 – 0.0071 in) |
| | | Measurement of diameter of the piston pin hole | | Clearance between pin and hole<br>Loose: 0.002 – 0.012 mm (0.00008 – 0.00047 in) |
| | Piston ring | ● End gap | Note:<br>Measurement of the end gap: When no ring gauge is available, measure the lower part of the cylinder bore that is not so worn down. | |
| | | Top | | Top: 0.15 – 0.35 mm (0.0059 – 0.0138 in) |
| | | Second | | Second: 0.30 – 0.50 mm (0.0118 – 0.0197 in) |
| | | Oil | | Oil: 0.20 – 0.40 mm (0.0079 – 0.0157 in) |
| | Piston pin | Outer diameter | | 16.00 mm (0.63 in) |
| | Crank shaft | Deflection of the crank shaft:<br>Both the main bearings of the crank shaft should be supported on V-blocks. | | Less than 0.05 mm (0.002 in) (Both ends) |
| | | Outer diameter of the crank pin. | | 29.94 mm (1.1787 in) |
| | | Outer diameter of the oil pan bearing. | | 24.98 mm (0.9835 in) |
| | Connecting rod | Inner diameter of the small end | | 16.010 mm (0.6303 in) |
| | | Oil clearance of the big end | | 0.053 – 0.079 mm (0.0021 – 0.0031 in) |
| | | Side clearance of the big end | | 0.20 – 0.40 mm (0.008 – 0.016 in) |
| | Oil pan | Clearance between the cam shaft and bearing | | 0.02 – 0.05 mm (0.0008 – 0.002 in) |
| | | Clearance between the crank shaft and bearing | | 0.015 – 0.040 mm (0.0006 – 0.0016 in) |

| | Repair Limit | | | Measure |
|---|---|---|---|---|
| | 4A2 | 5A2S | 6A2S | |
| Electrical Items | | | | |
| | | | | |
| | | | | Adjust the side electrode.<br>However, if the electrode is excessively worn out, replace the spark plug. |
| | Spark gap : 1.2 mm (0.047 in) or more | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Cooling Items | If the valve opens at the room temperature, replace the thermostat.<br>While immersing the thermostat in water, raise the water temperature and check the temperature at which the valve opens.<br>Since there is a time lag in operation of the thermostat, keep the water temperature at 65 °C for about 5 minutes and measure the valve lift stroke. | | | |
| | When the blade periphery or upper/lower lip is worn, cracked or damaged. | | | Replace in a set. |
| | | | | |
| | | | | |
| Lower Unit Items | | | | Replace when it is excessively worn out. |
| | | | | Replace |
| | | | | |
| | (0.98 mm, 0.039 in or more)* | | | |
| | 0.3 mm (0.012 in) or more | | | |
| | 0.1 mm (0.004 in) or more | | | |
| | | | | |
| | 0.1mm (0.004 in) or more | | | |
| | | | | |
| | 0.5 mm (0.02 in) or more | | | |
| | | | | |
| | Replace depending on wear, bent or damage in the circumference. | | | |
| Other Items | When the lips have been deteriorated, degraded, damaged, or the interference has worn down to 0.5 mm (0.02 in) or less. | | | Replace |

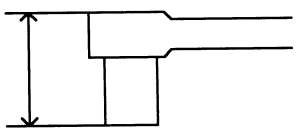
## 4. Tools and Instruments Required for Disassembly and Repair

(1) General tools




1. Straight-point screwdriver (200 mm)
   - do - (150 mm)
   - do - (100 mm)
2. Phillips screwdriver (200 mm)
   - do - (150 mm)
   - do - (100 mm)
3. Set of wrenches (6 pieces)
4. Box wrenches (10 × 13)
   - do - (17 × 21)
   - do - (21 × 23)
5. Adjustable wrench (300 mm)
6. Pliers
7. Needle-nose pliers
8. Snap ring pliers
9. T-bar socket wrench (10 mm)
   - do - (13 mm)
   - do - (17 mm)
10. T-bar universal wrench (10 mm)
    - do - (13 mm)
11. Plastic hammer
12. Hammer
13. L-shape hexagon wrench (8 mm)
    - do - (10 mm)
14. Box wrench (16 mm)
15. Socket wrench (16 mm)
16. Torque wrench (100 N – m)
17. Socket wrench set (6 N – m) (20 N – m*)

* If this tool is used for tightening the big end of the connecting rod, the height of the tool head is limited to 32 mm.



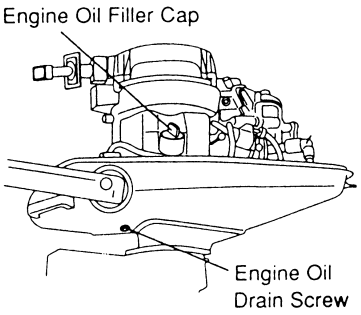
32 mm or less

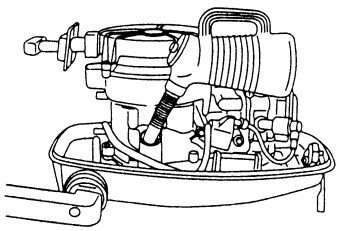
## 4. Change of Engine Oil

① Remove the oil filler cap and drain screw to drain engine oil out.

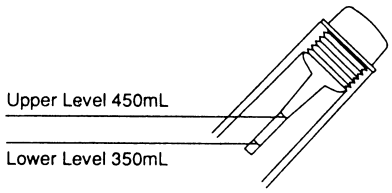
② After fastening the drain screw, pour new engine oil through the oil filler until it reaches the upper limit indication on the oil level gauge.

③ Finally, tightly fasten the oil filler cap.

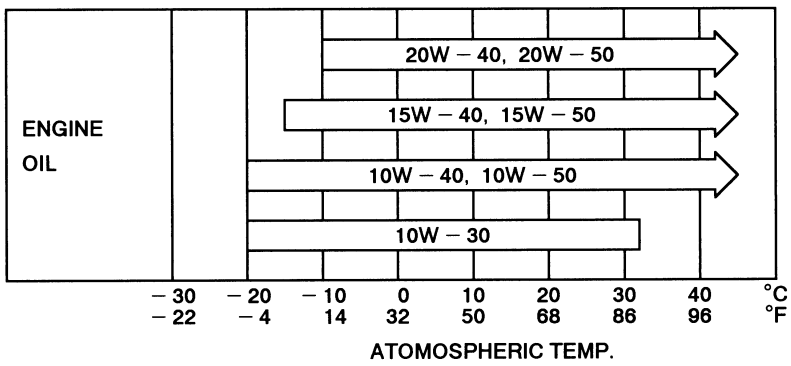


Note: Specified oil: SF/SG/SH class (API classification) SAE 10W – 30/40 oil for 4-stroke gasoline engine.
Or, use other engine oil whose viscosity is proper to the atmospheric temperature in the cruising area.




● Specified volume of engine oil: 450 ml (15.2 fl. oz.)

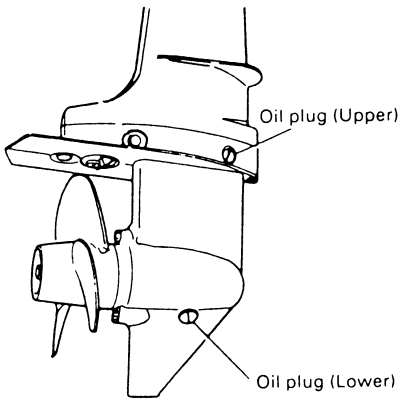



## 5. Change of Gear Oil

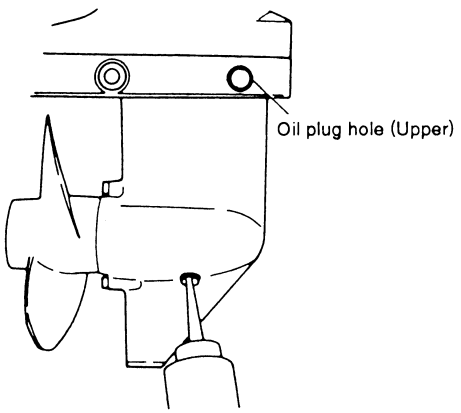
① Remove both the upper and lower oil plugs to drain out gear oil completely.

② While inserting the spout of the oiler into the lower oil plug hole, pour gear oil just as squeezing the oiler until it overflows from the upper oil plug hole.

③ After tightly fastening the upper oil plug, remove the oiler and tightly fasten the lower oil plug.



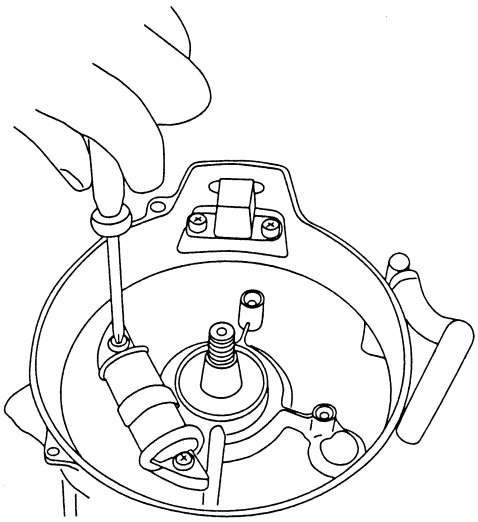

Note: Be sure to use genuine gear oil (GL5, SAE #80 – 90).
Specified volume of gear oil: 195 ml (6.6 fl. oz.) approx.



5) Exciter coil, pulsator coil

① Remove the exciter coil fitting screw (screw 520-2) and then remove the exciter coil.

② Remove the pulsator coil fitting screw (screw 512-2) and then remove the pulsator coil.



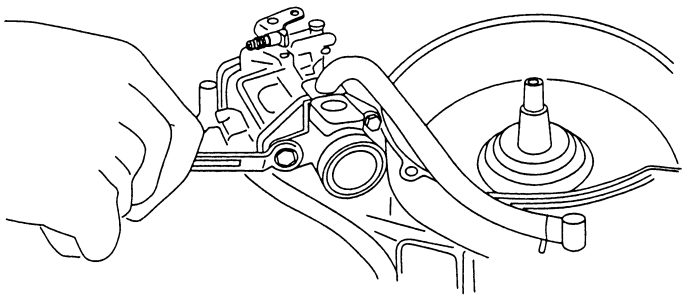
6) Alternator (optional)

① Remove the alternator fitting screw (screw 520-2) and then remove the alternator.

7) Carburetor, inlet manifold

① Remove the carburetor fitting bolt (H685-2) and then remove the carburetor together with the air silencer and insulator.

② Remove the inlet manifold fitting bolt (H625-2) and then remove the inlet manifold together with the O-ring.

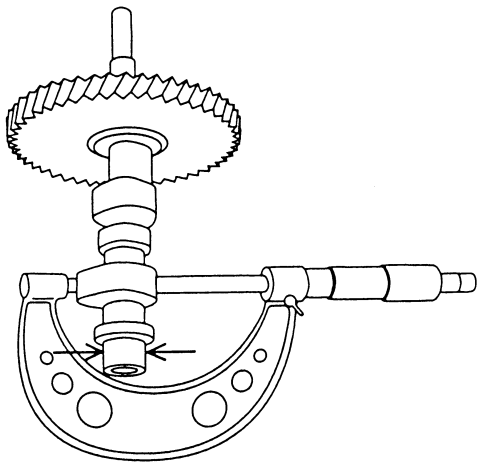


8) Fuel pump

① Remove the fuel pump fitting bolt (screw 630-2) and then remove the fuel pump.

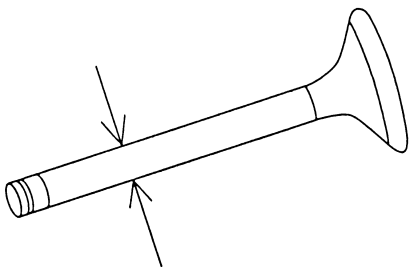
● Cam shaft

| | | Standard value | Out of the limit to use | Serial number |
|---|---|---|---|---|
| Outer dia. in bearing | | 13.980 mm 0.5504 in | If 13.950 mm (0.5492 in) or less, it needs replacement. | |
| Cam height IN & EX | 4A | 25.24 mm 0.9937 in | If 24.98 mm (0.9835 in) or less, it needs replacement. | ~11594 |
| | 5A | 26.59 mm 1.0469 in | If 26.33 mm (1.0366 in) or less, it needs replacement. | ~17908 |
| | 6A | 28.33 mm 1.1154 in | If 28.07 mm (1.1051 in) or less, it needs replacement. | 4A2: 11595~<br>5A2: 17910~<br>6A2: First one~ |



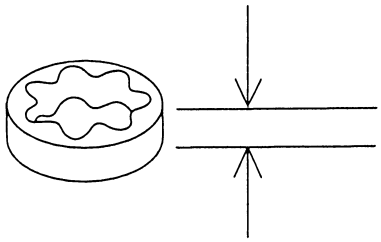
● Valve stem

| | Standard value | Out of the limit to use |
|---|---|---|
| IN | 5.47 mm 0.2154 in | If 5.45 mm (0.2146 in) or less, it needs replacement. |
| EX | 5.44 mm 0.2142 in | If 5.41 mm (0.2130 in) or less, it needs replacement. |



● Clearance between valve guide and valve stem

| | Standard value | Out of the limit to use |
|---|---|---|
| IN | 0.020 – 0.044 mm 0.00079 – 0.00173 in | If 0.07 mm (0.00276 in) or more, it needs replacement. |
| EX | 0.045 – 0.072 mm 0.00177 – 0.00283 in | If 0.10 mm (0.00394 in) or more, it needs replacement. |

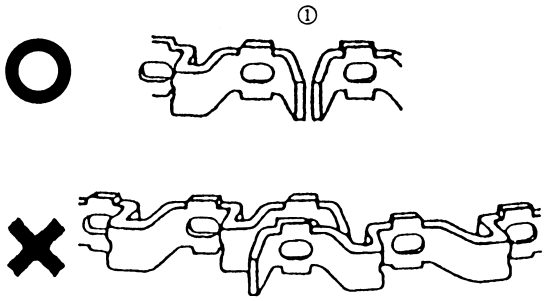


● Height of oil pump outer rotor

| Standard value | Out of the limit to use |
|---|---|
| 5.99 mm 0.2358 in | If 5.96 mm (0.2346 in) or less, it needs replacement. |

## 7. Reassembling Engine

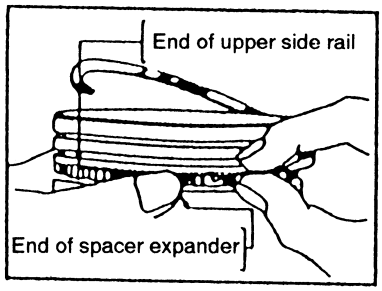
Reassemble the engine in the reverse order of disassembling with careful attention to the following points.




● Piston ring

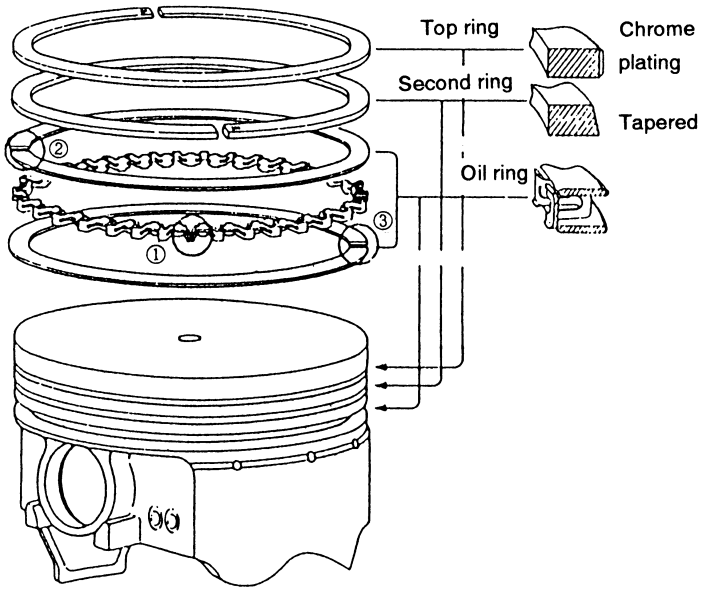
Incorporating oil rings

1. Set the expander in the oil ring groove, and check to see if its both ends correctly link with each other as shown in the figure. ... ①
2. While holding down the slit of the expander by a thumb, incorporate the upper side rail while shifting its ends to the left at angle of 90° to the slit of the expander. ... ②
3. In the same manner as the above step 2, incorporate the lower side rail while shifting its ends to the right at an angle of 90° to the slit of the expander. ... ③



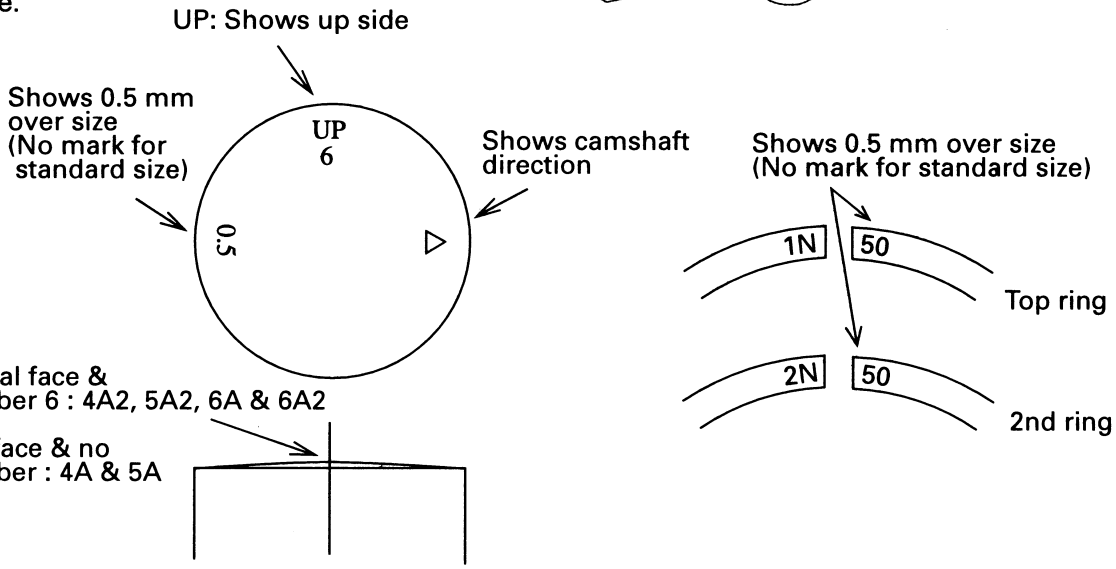

Incorporating compression rings

Incorporate compression rings with the brand and size marking side up from the bottom of the piston in the correct order.



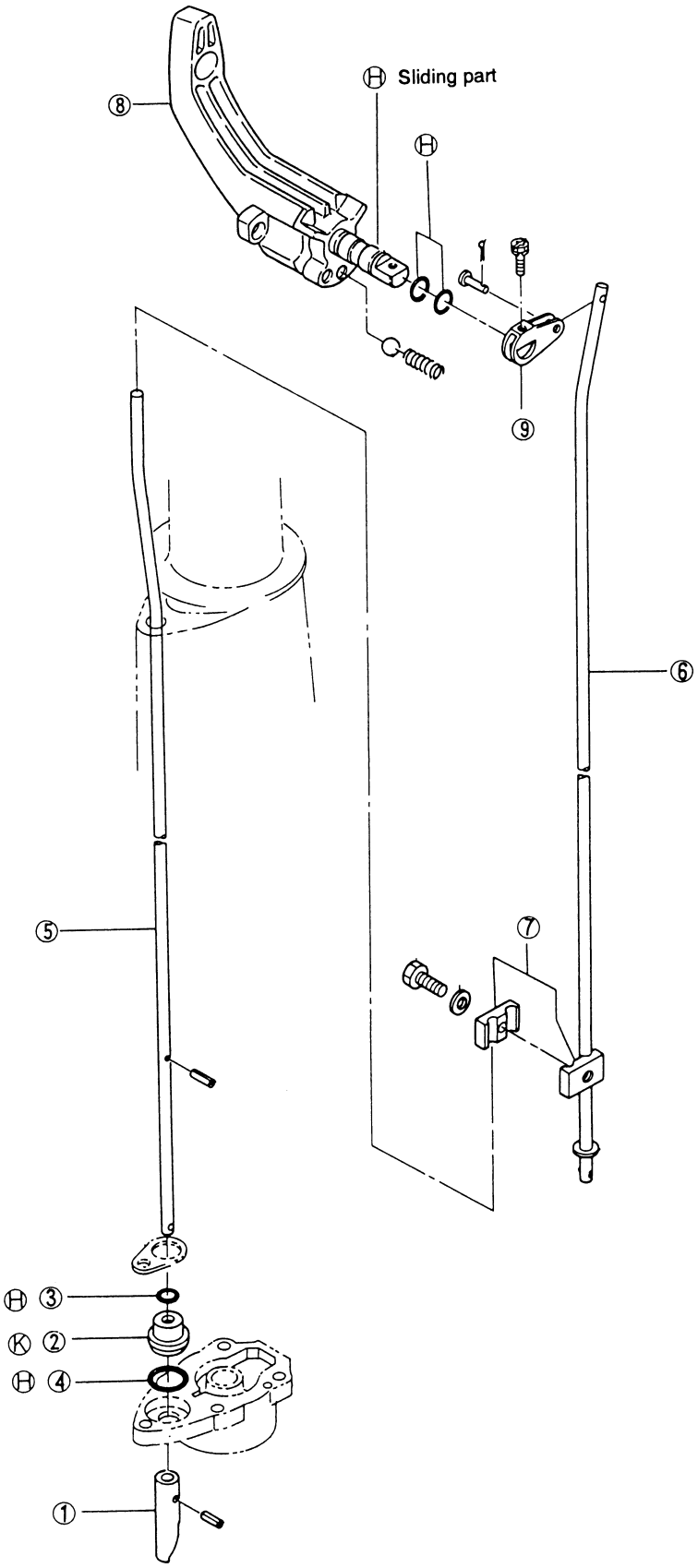

Check of correct setting of each piston ring

1. Ensure the end gap is not located on the line of thrust side or piston pin axis.
2. After setting all rings, again check that they are correctly set on the piston as shown in the figure.



## Gear Shift

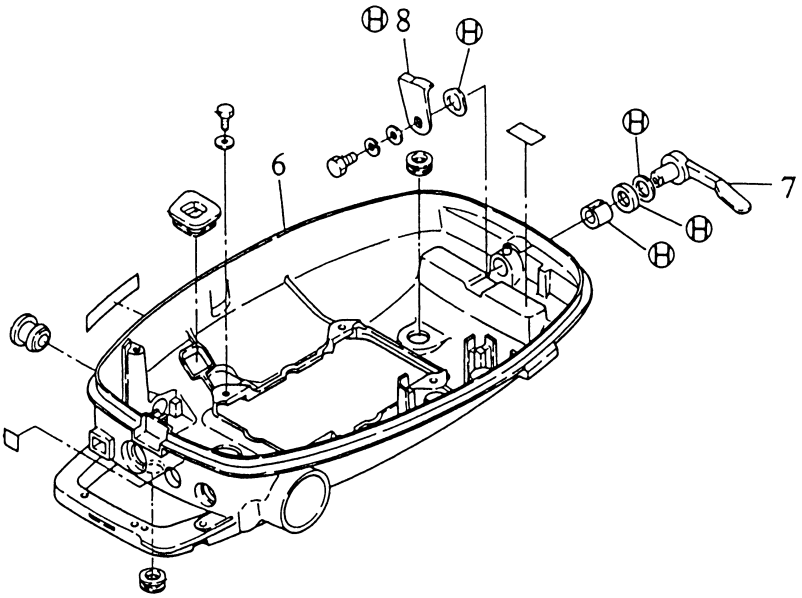
① Clutch cam
② Cam rod bushing
③ O-ring (2.4 – 4.7 mmø)
④ O-ring (2.4 – 15.4 mmø)
⑤ Cam rod
⑥ Shift rod
⑦ Shift rod joint
⑧ Shift lever
⑨ Shift rod lever



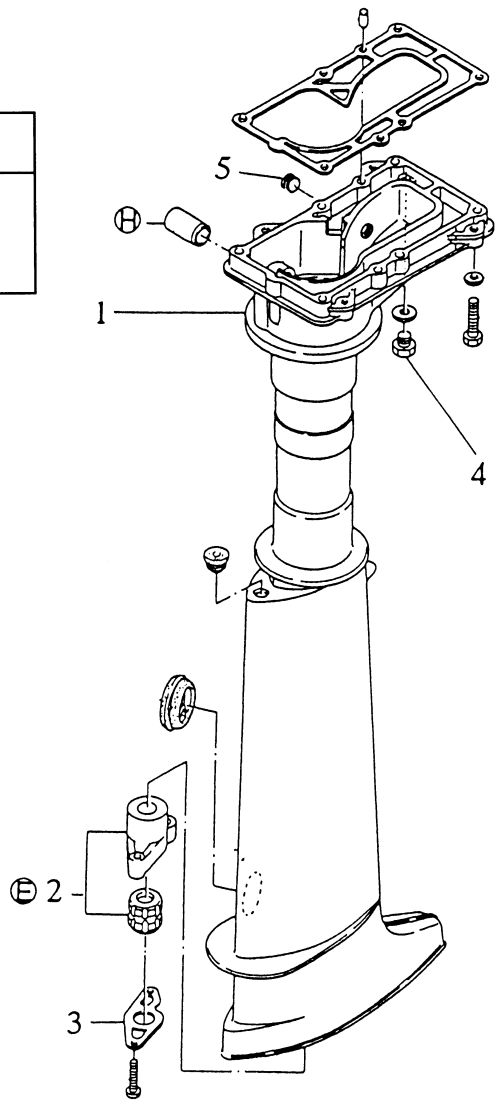

| Points to apply lubricants |
| --- |
| Ⓗmark: Genuine grease<br>Ⓚmark: Genuine gear oil |

## Drive Shaft Housing, Gear Case, Motor Cover

1 Drive shaft housing
2 Drive shaft bushing (L & UL only)
3 Drive shaft bushing stopper (L & UL only)
4 Water plug
5 Exhaust plug
6 Motor cover, lower
7 Hook lever
8 Cover hook




| Points to apply lubricants |
| --- |
| Ⓗ mark: Genuine grease<br>Ⓔ mark: Moliton Grease |



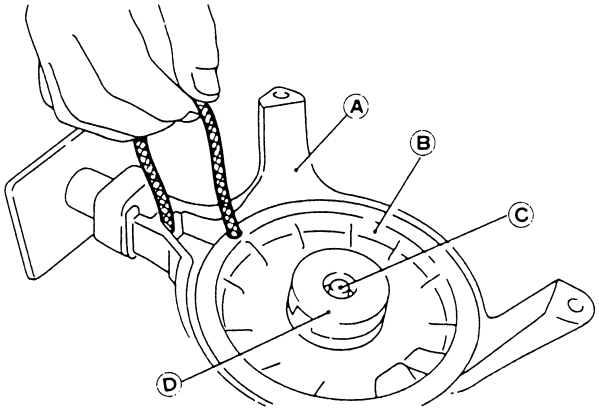
# CHAPTER 6 RECOIL STARTER

## 1. Disassembling

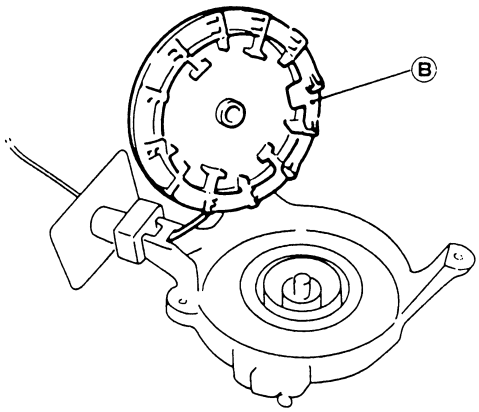
① Remove the rope from the starter handle. While holding the starter case Ⓐ and reel Ⓑ, turn the reel Ⓑ gently to rewind the starter spring for getting it loose.

- Loosen the starter shaft bolt Ⓒ and remove it, then remove the friction plate Ⓓ. Moreover, remove the following parts.
  - Friction spring
  - Ratchet
  - Return spring

② While turning the reel Ⓑ in the coiling direction, lift it upwards for removing.




Note: Carefully lift the reel Ⓑ up because the starter spring may vigorously break out of the spring case.




## 2. Reassembling

Reassemble the recoil starter in the reverse order of the disassembling with care attention to the following points.

- When resetting the starter spring in the starter spring case, engage the end hook of the starter spring with the notch on the starter spring case while holding the spring with the end hook rightwards.
- When coiling up the starter spring, turn the reel counterclockwise (in the direction to pull the rope). After the spring is entirely coiled up, continue to turn the reel by a quarter to one and a quarter turn before fixing the spring.

After the outboard motor is completely reassembled, operate the shifting lever to check to see if the shifting lever is locked at all positions except the neutral position.

Note: If the starter lock rod is deformed, it does not work correctly. Be careful not to bend it by hand, etc.

- Apply cold-resistant grease to both ends of the starter spring, starter shaft bolt and friction plate.
- Tighten the starter shaft bolt with the specified torque of 3.5 – 4 N – m (0.35 – 0.40 kg – m).
- Apply Three Bond 1342 to the thread of the starter shaft bolt.

## 2. Fuel pump

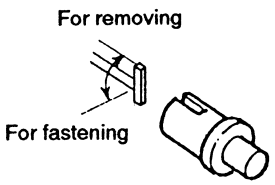
**⚠ CAUTION**

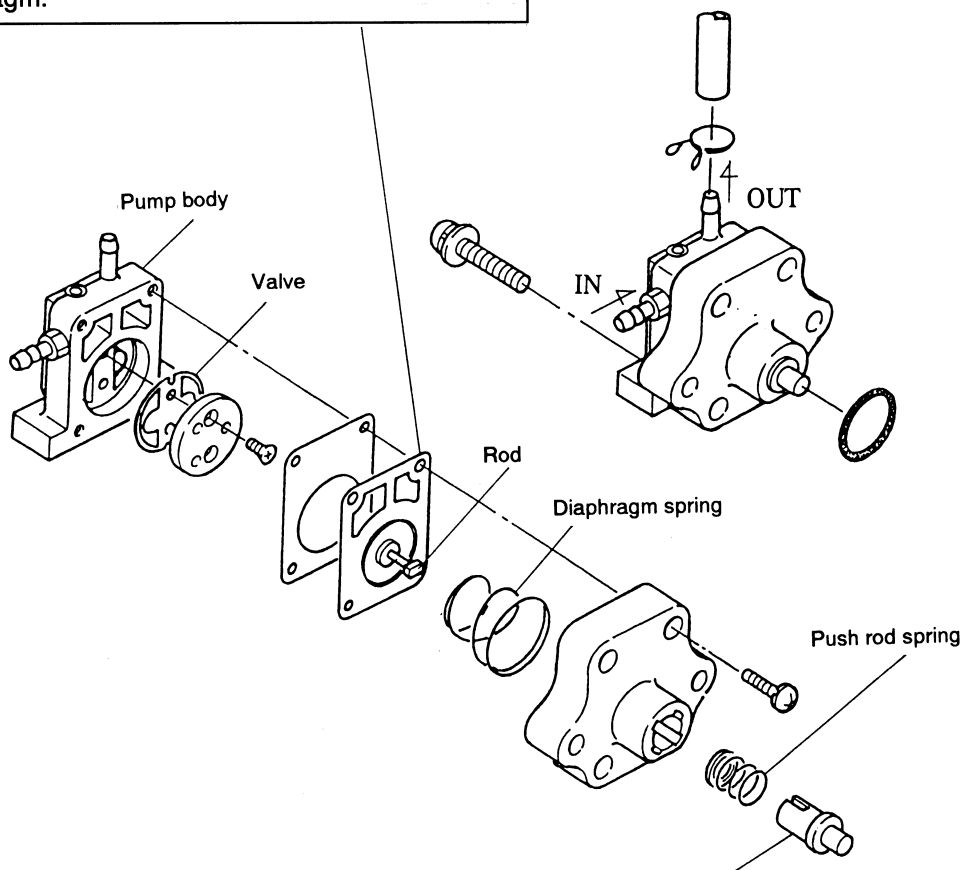
Fire and extreme heat are strictly prohibited through disassembly and reassembly of the fuel pump.

Diaphragm

Disassembling:
Turn the diaphragm clockwise or counterclockwise to set the foot of the diaphragm in parallel with the groove of the push rod, then remove the diaphragm.

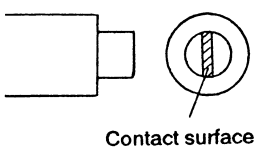
Inspection:
- Check to see if there is no burst, crack, swelling in the diaphragm.




Push rod

Inspection:
- Wear in the slipper surface
  If there is wear, even if it is a little, replace the push rod.
  Note: After reassembling, push the push rod by finger to check to see if it moves smoothly.



# CHAPTER 9 TEST RUN AND INSPECTION AFTER COMPLETE ASSEMBLY

● 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 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, 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

▽ Full throttle running for about 1 minute at 10 – minutes intervals

▽ Full throttle running for a short time

10 Properly adjust the length of the throttle wire (27) for remote control as follows. At first, fix the throttle wire (27) position on the throttle wire bracket (34).

Fix the position of the nut (K) so that the nut (K) is completely screwed in. Then. turn throttle lever A ass'y (17) fully to forward. (This is the fully opened throttle position.)

At this time, adjust the position of the nut (H) of the throttle wire (27) at throttle wire bracket (57) side so that the carburetor throttle valve is fully opened.

If the carburetor throttle valve is not fully opened even after the nut (H) is moved to the end of the outer tube, move the position of the wire to carburetor side by adjusting nut (K) of throttle wire bracket (34) and adjust the position of the nut (H) again.

After fixing the position, tlghten the nut and make sure whether carburetor throttle valve can be fully opened and closed by operating throttle lever A ass'y (17) again.

Make sure if there is any deformation of the lever and linkage because of the excessive stress.

11 Install cable clip ass'y (6) to lower motor cover (L) with bolts (78, 40) and nut (8).

12 Install sleeve guide ass'y (9 – 13) to remote control cable (B) of shift side and ball holder ass'y (13 – 16) to the remote control cable (A) of the throttle side.

REMARK) Distinguishing difference of throttle side and shift side of remote control cable:

Set the control lever of remote control box at neutral position and operate neutral warm up lever. At this moment, the cable which the inner cable moves is the throttle side cable.

13 Insert groove of the shift side remote control cable outer into the holder at the lower side of cable clip ass'y (6). Then, on the condition of the control lever of the remote control and shift lever of the outboard motor being at neutral positions, screw in sleeve guide (12) to remote control cable and make a suitable position for lock pin (9) to get into the hole of the shift lever, and push lock pin (9) into the shift lever and turn lock pin by 90° for locking.

REMARK) In case sleeve guide is not in the adjustable range to screw in, open the remote control box and adjust the length of cable terminal of the shift side.

14 Insert the groove of the throttle side remote control cable outer into the holder at the upper side of cable clip ass'y (6).

On the condition of the control lever being at neutral position and throttle lever A ass'y (17) to be at the fully closed position, screw in holder cap (16) to remote control cable in order to the ball joint is slightly pushed back. After fixing the position, make sure that levers and links do not give any forcible load in operation of the control lever at any position of the forward, reverse, fully opened throttle and fully closed throttle.

REMARK) In case holder cap is not in the adjustable range for screw in, open the remote control box and adjust the length of cable terminal of the throttle side.

15 Connect separate cord (brown) (35) between stop switch and CDI unit.

Insert the engine side and remote control side stop switch cords into the two female connector respectively.