NOTICE

This manual has been prepared by Yamaha primarily for use by Yamaha dealers and their trained mechanics when performing maintenance procedures and repairs to Yamaha equipment. It has been written to suit the needs of persons who have a basic understanding of the mechanical and electrical concepts and procedures inherent in the work, for without such knowledge attempted repairs or service to the equipment could render it unsafe or unfit for use.

Because Yamaha has a policy of continuously improving its products, models may differ in detail from the descriptions and illustrations given in this publication. Use only the latest edition of this manual. Authorized Yamaha dealers are notified periodically of modifications and significant changes in specifications and procedures, and these are incorporated in successive editions of this manual.

Important information
Particularly important information is distinguished in this manual by the following notations:

⚠️ The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

⚠️ WARNING
Failure to follow WARNING instructions could result in severe injury or death to the machine operator, a bystander, or a person inspecting or repairing the outboard motor.

⚠️ CAUTION
A CAUTION indicates special precautions that must be taken to avoid damage to the outboard motor.

⚠️ NOTE
A NOTE provides key information to make procedures easier or clearer.
<table>
<thead>
<tr>
<th>Contents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>General information</td>
<td>1</td>
</tr>
<tr>
<td>Specifications</td>
<td>2</td>
</tr>
<tr>
<td>Periodic checks and adjustments</td>
<td>3</td>
</tr>
<tr>
<td>Fuel system</td>
<td>4</td>
</tr>
<tr>
<td>Power unit</td>
<td>5</td>
</tr>
<tr>
<td>Lower unit</td>
<td>6</td>
</tr>
<tr>
<td>Bracket unit</td>
<td>7</td>
</tr>
<tr>
<td>Electrical systems</td>
<td>8</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>9</td>
</tr>
<tr>
<td>Index</td>
<td></td>
</tr>
</tbody>
</table>
General information

How to use this manual ................................................................................................ 1-1
  Manual format .......................................................................................................... 1-1
  Symbols .................................................................................................................... 1-2

Safety while working ..................................................................................................... 1-3
  Fire prevention ......................................................................................................... 1-3
  Ventilation ................................................................................................................. 1-3
  Self-protection .......................................................................................................... 1-3
  Parts, lubricants, and sealants ................................................................................ 1-3
  Good working practices .......................................................................................... 1-4
  Disassembly and assembly ...................................................................................... 1-4

Identification ................................................................................................................ 1-5
  Applicable models .................................................................................................... 1-5
  Serial number ......................................................................................................... 1-5

Features and benefits ................................................................................................... 1-6
  Hour meter ................................................................................................................. 1-6
  Exhaust components (Factory option) ....................................................................... 1-7
  Piston and cylinder ................................................................................................... 1-8
  Connecting rod ......................................................................................................... 1-9
  Gasket ..................................................................................................................... 1-10
  Reduction gear and clutch ...................................................................................... 1-11
  Power unit mount bolt ............................................................................................. 1-12

Propeller selection ...................................................................................................... 1-13
  Propeller size .......................................................................................................... 1-13
  Selection .................................................................................................................. 1-13

Predelivery checks ..................................................................................................... 1-14
  Checking the fuel system ......................................................................................... 1-14
  Checking the gear oil ............................................................................................... 1-14
  Checking the battery ............................................................................................... 1-14
  Checking the outboard motor mounting position ................................................... 1-14
Checking the remote control cables ................................................................. 1-15
Checking the steering system ....................................................................... 1-15
Checking the gearshift and throttle operation ............................................ 1-15
Checking the tilt system ............................................................................. 1-15
Checking the engine start switch and engine stop switch, engine shut-off switch .... 1-16
Checking the pilot water outlet ............................................................... 1-16
Test run ....................................................................................................... 1-16
Break-in ....................................................................................................... 1-17
After test run ............................................................................................ 1-17
How to use this manual

Manual format
The format of this manual has been designed to make service procedures clear and easy to understand. Use the information below as a guide for effective and quality service.

1. Parts are shown and detailed in an exploded diagram and are listed in the components list.
2. Tightening torque specifications are provided in the exploded diagrams and after a numbered step with tightening instructions.
3. Symbols are used to indicate important aspects of a procedure, such as the grade of lubricant and lubrication point.
4. The components list consist of parts and part quantities, as well as bolt, screw, O-ring, and hose dimensions.
5. Service points regarding removal, checking, and installation are shown in individual illustrations to explain the relevant procedure.

NOTE:
For troubleshooting procedures, see Chapter 9, “Troubleshooting.”
Symbols
The symbols below are designed to indicate the content of a chapter.

General information | Fuel system | Bracket unit
---|---|---
GEN INFO | FUEL | BRKT
Specifications | Power unit | Electrical systems
SPEC | POWR | ELEC
Periodic checks and adjustments | Lower unit | Troubleshooting
CHK ADJ | LOWR | TRBL SHTG
Symbols 1 to 6 indicate specific data.

- **1**: Special tool
- **2**: Specified oil or fluid
- **3**: Specified engine speed
- **4**: Specified tightening torque
- **5**: Specified measurement
- **6**: Specified electrical value (Resistance, Voltage, Electric current)

Symbols 7 to 12 in an exploded diagram indicate the grade of lubricant and the lubrication point.

- **7**: Apply Yamaha 4-stroke motor oil
- **8**: Apply water resistant grease (Yamaha grease A)
- **9**: Apply molybdenum disulfide grease
- **10**: Apply corrosion resistant grease (Yamaha grease D)
- **11**: Apply low temperature resistant grease (Yamaha grease C)
- **12**: Apply injector grease

Symbols 13 to 18 in an exploded diagram indicate the type of sealant or locking agent and the application point.

- **13**: Apply Gasket Maker
- **14**: Apply Yamabond 4
- **15**: Apply LOCTITE 271 (Red)
- **16**: Apply LOCTITE 242 (Blue)
- **17**: Apply LOCTITE 572
- **18**: Apply silicon sealant
Safety while working
To prevent an accident or injury and to ensure quality service, follow the safety procedures provided below.

Fire prevention
Gasoline is highly flammable. Keep gasoline and all flammable products away from heat, sparks, and open flames.

Ventilation
Gasoline vapor and exhaust gas are heavier than air and extremely poisonous. If inhaled in large quantities they may cause loss of consciousness and death within a short time. When test running an engine indoors (e.g., in a water tank) be sure to do so where adequate ventilation can be maintained.

Self-protection
Protect your eyes by wearing safety glasses or safety goggles during all operations involving drilling and grinding, or when using an air compressor. Protect your hands and feet by wearing protective gloves and safety shoes when necessary.

Parts, lubricants, and sealants
Use only genuine Yamaha parts, lubricants, and sealants or those recommended by Yamaha, when servicing or repairing the outboard motor.

Under normal conditions, the lubricants mentioned in this manual should not harm or be hazardous to your skin. However, you should follow these precautions to minimize any risk when working with lubricants.

1. Maintain good standards of personal and industrial hygiene.
2. Change and wash clothing as soon as possible if soiled with lubricants.
3. Avoid contact with skin. Do not, for example, place a soiled rag in your pocket.
4. Wash hands and any other part of the body thoroughly with soap and hot water after contact with a lubricant or lubricant soiled clothing has been made.
5. To protect your skin, apply a protective cream to your hands before working on the outboard motor.
6. Keep a supply of clean, lint-free cloths for wiping up spills, etc.

Good working practices

Special tools
Use the recommended special tools to protect parts from damage. Use the right tool in the right manner—do not improvise.

Tightening torques
Follow the tightening torque specifications provided throughout the manual. When tightening nuts, bolts, and screws, tighten the large sizes first, and tighten fasteners starting in the center and moving outward.

Non-reusable parts
Always use new gaskets, seals, O-rings, cotter pins, circlips, etc., when installing or assembling parts.

Disassembly and assembly
1. Use compressed air to remove dust and dirt during disassembly.
2. Apply engine oil to the contact surfaces of moving parts before assembly.
3. Install bearings with the manufacture identification mark in the direction indicated in the installation procedure. In addition, be sure to lubricate the bearings liberally.
4. Apply a thin coat of water-resistant grease to the lip and periphery of an oil seal before installation.
5. Check that moving parts operate normally after assembly.
Identification
Applicable models
This manual covers the following models.

<table>
<thead>
<tr>
<th>Applicable models</th>
</tr>
</thead>
<tbody>
<tr>
<td>200AET, L200AET</td>
</tr>
</tbody>
</table>

Serial number
The outboard motor serial number is stamped on a label attached to the port clamp bracket.

Model name
Approved model code
Starting serial No.

<table>
<thead>
<tr>
<th>Model name</th>
<th>Approved model code</th>
<th>Starting serial No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>200AET</td>
<td>60H</td>
<td>L: 800101-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>X: 850101-</td>
</tr>
<tr>
<td>L200AET</td>
<td>60J</td>
<td>X: 800101-</td>
</tr>
</tbody>
</table>

NOTE:
If the serial number label is removed, VOID marks will appear on the label.
Features and benefits

Hour meter

A hour meter is incorporated for easier control of interval time for the periodic maintenance. As the main switch is turned on, all segments light up for 2 seconds to check that the Light Emitting Diode is not failed. Then, the meter indicates the total of hours which the engine has been run since manufacture. The indicated hour is the accumulated time detected by the pulse signal from the lighting coil. The accumulated hour is held forever, and cannot reset.
**Exhaust components (Factory option)**

The cylindrical components have been painted externally and internally after the anodic oxide coating to make a film for additional corrosion-resistance.
**Piston and cylinder**
Following items have been given to improve the durability for the piston and cylinder. A hard anodic oxide coating has been given to the piston pin boss and piston ring groove of the #1 and #2 piston. Multilayer plating has been given to the piston ring. The cylinder sleeve without the exhaust slit has been adopted not to accumulate some deposits, which can prevent the piston rings from entwining. Also, the shape of the exhaust port has been given the gradual curve design to obtain the best engine performance and avoid scuffing of the piston ring.
Connecting rod
A process of the carburizing and quenching has been given to the inside of the small end to increase the strength.
The small end bearing has been given 18 rollers, adding one roller from the previous model, to increase the durability.
The mating face of the big end bearing has been given a large area to increase the rigidity after assembling the bearing cap, which increases the rigidity.
Also, a silver plating (30-40µ) has been given to the outside portion of the big end to increase the less friction.
**Gasket**
The intake manifold gasket has been given a silicon bead to increase more sealer.
Reduction gear and clutch
The process of the double shot-peening has been given to the surface of the teeth portion of the pinion gear, forward gear and dog clutch to increase the durability.
**Power unit mount bolt**

A fully threaded bolt coated with a sealing material to the thread portion has been adopted for mounting the power unit.

This gives a sealing function to the bolt, which will help prevent the bolt from sticking by the salt water entering into the thread hole and crystallizing.

Also, the bolt can come out by turning, due to the full thread structure and the sealing material having a function as an insulator, even if the bolt hole has been choked with corroded particles.

Therefore, an easier servicing such as removing the power unit can be obtained.

**NOTE:**

Apply a sealing material such as LOCTITE 572 to the bolt thread if the bolt is reused.
Propeller selection
The performance of a boat and outboard motor will be critically affected by the size and type of propeller you choose. Propellers greatly affect boat speed, acceleration, engine life, fuel economy, and even boating and steering capabilities. An incorrect choice could adversely affect performance and could also seriously damage the engine.

Use the following information as a guide for selecting a propeller that meets the operating conditions of the boat and the outboard motor.

Propeller size
The size of the propeller is indicated on the propeller blade or outside of the propeller boss.

Selection
When the engine speed is at the full throttle operating range (4,500 – 5,500 r/min), the ideal propeller for the boat is one that provides maximum performance in relation to boat speed and fuel consumption.

**Regular rotation model**

<table>
<thead>
<tr>
<th>Propeller size (in)</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 1/2 x 23-M</td>
<td></td>
</tr>
<tr>
<td>13 3/8 x 23-M</td>
<td></td>
</tr>
<tr>
<td>13 3/8 x 25-M</td>
<td></td>
</tr>
<tr>
<td>13 3/4 x 17-M</td>
<td></td>
</tr>
<tr>
<td>13 3/4 x 19-M2</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>13 3/4 x 21-M</td>
<td></td>
</tr>
<tr>
<td>14 x 19-M</td>
<td></td>
</tr>
<tr>
<td>14 1/2 x 17-M</td>
<td></td>
</tr>
<tr>
<td>14 5/8 x 16-M</td>
<td></td>
</tr>
<tr>
<td>15 1/4 x 15-M</td>
<td></td>
</tr>
<tr>
<td>15 3/4 x 13-M</td>
<td></td>
</tr>
</tbody>
</table>

**Counter rotation model**

<table>
<thead>
<tr>
<th>Propeller size (in)</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 3/4 x 17-ML</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>13 3/4 x 19-ML</td>
<td></td>
</tr>
<tr>
<td>13 3/4 x 21-ML</td>
<td></td>
</tr>
<tr>
<td>13 3/8 x 23-ML</td>
<td></td>
</tr>
<tr>
<td>14 1/2 x 17-ML</td>
<td></td>
</tr>
</tbody>
</table>
Pre-delivery checks
To make the delivery process smooth and efficient, the pre-delivery checks should be completed as explained below.

Checking the fuel system
1. Check that the fuel hoses are securely connected and that the fuel tank is full with fuel.

CAUTION:
Use pre-mixed fuel only. Fuel and oil mixing ratio is 50:1. For break-in period, 25:1 mixture shall be used.

Checking the gear oil
1. Check the gear oil level.

Checking the outboard motor mounting position
1. Check that the anti-cavitation plate is aligned with the bottom of the boat. If the mounting height is too high, cavitation will occur and propulsion will be reduced. Also, the engine speed will increase abnormally and cause the engine to overheat. If the mounting height is too low, water resistance will increase and reduce engine efficiency.

NOTE:
The optimum mounting height is affected by the combination of the boat and the outboard motor. To determine the optimum mounting height, test run the outboard motor at different heights.

2. Check that the clamp brackets are secured with the mounting bolts.

Features and benefits / Propeller selection

Checking the battery
1. Check the capacity, electrolyte level, and specified gravity of the battery.

Recommend battery:
- CCA / SAE (Minimum): 380 (A)
- CCA / EN (Minimum): 430 (A)
- RC (Minimum): 124 (Minute)
- 20HR (Minimum): 70 (AH)
- JIS: 65D31-95E41
- Electrolyte specified gravity: 1.280 at 20°C (68°F)

2. Check that the red and black battery cables are securely connected.
Checking the steering system
1. Check that the steering operates smoothly.

![Steering System Illustration](image1)

2. Check that there is no interference with wires, hoses, or remote control cable when the outboard motor is steered.

Checking the gearshift and throttle operation
1. Check that the gearshift operates smoothly when the remote control lever is shifted from neutral into forward or reverse.

![Gearshift and Throttle Illustration](image2)

2. Check that the throttle operates smoothly when the remote control lever is shifted from the fully closed position to the fully open position.

Checking the tilt system
1. Check that the outboard motor tilts up and down smoothly when operating the power trim and tilt unit.

![Tilt System Illustration](image3)

**CAUTION:**
The shift/throttle cable joint must be screwed in a minimum of 8.0 mm (0.31 in) ☞.
2. Check that there is no abnormal noise produced when the outboard motor is tilted up or down.

3. Check that there is no interference with wires, hoses, or remote control cable when the tilted-up outboard motor is steered.

4. Check that the trim meter points down when the outboard motor is trimmed all the way down. Also check that the trim meter moves toward up position when the outboard motor is trimmed up.

**Checking the engine start switch and engine stop switch, engine shut-off switch**

1. Check that the engine starts when the engine start switch is turned to START.

2. Check that the engine turns off when the engine start switch is turned to OFF.

3. Check that the engine turns off when the engine shut-off cord is pulled from the engine shut-off switch.

**Checking the pilot water outlet**

1. Start the engine, and check that cooling water is discharged from the pilot water outlet.

2. Check that the gearshift operates smoothly.

3. Operate at trolling speed.

4. Run the outboard motor for one hour at 3,000 r/min or at half throttle, then for another hour at 4,000 r/min or at 3/4 throttle.

5. Check that the outboard motor does not tilt up when shifting into reverse and that water does not flow in over the transom.

**NOTE:**
The test run is part of the break-in operation.
Break-in
Perform the break-in operation in the following four stages.
1. Keep the engine running at idle for the initial ten minutes.
2. Fifty minutes at 3,000 r/min. or less.
3. One hour at 4,000 r/min. or less.
4. For another eight hours, run at 5,000 r/min. or less, with repeated wide-open-throttle operation that lasts five minutes or less.

After test run
1. Check for water in the gear oil.
2. Check for fuel leakage in the cowling.
3. After a test run and while the engine is at idle, flush the cooling water passage with fresh water using the flushing kit.
Specifications

General Specifications ........................................................................................................ 2-1

Maintenance specifications .......................................................................................... 2-3
  Power Unit .................................................................................................................. 2-3
  Lower Unit ............................................................................................................... 2-4
  Electrical ................................................................................................................. 2-5
  Dimensions .............................................................................................................. 2-7

Tightening torques ....................................................................................................... 2-9
  Specified torques ....................................................................................................... 2-9
  General torques ......................................................................................................... 2-10
## General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimension</strong></td>
<td></td>
<td>200AET</td>
</tr>
<tr>
<td>Overall length</td>
<td>mm (in)</td>
<td>828(32.6)</td>
</tr>
<tr>
<td>Overall width</td>
<td>mm (in)</td>
<td>600(23.6)</td>
</tr>
<tr>
<td>Overall height (L)</td>
<td>mm (in)</td>
<td>1,577(62.1)</td>
</tr>
<tr>
<td>Overall height (X)</td>
<td>mm (in)</td>
<td>1,703(67.0)</td>
</tr>
<tr>
<td>Transom height</td>
<td>mm (in)</td>
<td>516(20.3)</td>
</tr>
<tr>
<td>Transom height (X)</td>
<td>mm (in)</td>
<td>642(25.3)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td></td>
<td>180(396)</td>
</tr>
<tr>
<td>(L)</td>
<td>kg (lb)</td>
<td>184(405)</td>
</tr>
<tr>
<td>(X)</td>
<td>kg (lb)</td>
<td>186(410)</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum output</td>
<td>kW(HP)</td>
<td>147.1(200)</td>
</tr>
<tr>
<td>Full throttle operating range</td>
<td>r/min</td>
<td>5,000 r/min</td>
</tr>
<tr>
<td>Maximum fuel consumption</td>
<td>L(US gal,Imp gal)/hr</td>
<td>81(21.4,17.8)</td>
</tr>
<tr>
<td>Idle speed</td>
<td>r/min</td>
<td>700</td>
</tr>
<tr>
<td><strong>Power unit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td>2-stroke,90,V6</td>
</tr>
<tr>
<td>Total displacement</td>
<td>cm³ (cu. in)</td>
<td>2,596(158.4)</td>
</tr>
<tr>
<td>Bore x Stroke</td>
<td>mm (in)</td>
<td>90.0(3.54) x 68.0(2.68)</td>
</tr>
<tr>
<td>Compression ratio</td>
<td></td>
<td>5.9</td>
</tr>
<tr>
<td>Minimum compression pressure(*2)</td>
<td>kPa(kg/cm²)</td>
<td>520(5.2)</td>
</tr>
<tr>
<td>Control system</td>
<td></td>
<td>Remote control</td>
</tr>
<tr>
<td>Starting system</td>
<td></td>
<td>Electric motor</td>
</tr>
<tr>
<td>Enrichment system</td>
<td></td>
<td>Choke valve</td>
</tr>
<tr>
<td>Ignition control system</td>
<td></td>
<td>CDI</td>
</tr>
<tr>
<td>Ignition timing</td>
<td>Degree</td>
<td>ATDC7-BTDC18</td>
</tr>
<tr>
<td>Advance pick up timing</td>
<td>Degree</td>
<td>ATDC 7</td>
</tr>
<tr>
<td>Maximum generator output</td>
<td>V,A</td>
<td>12,14 @ 5,500 r/min</td>
</tr>
<tr>
<td>Spark plug(*3)</td>
<td></td>
<td>B8HS-10,BR8HS-10</td>
</tr>
<tr>
<td>Cooling system</td>
<td></td>
<td>Water</td>
</tr>
<tr>
<td>Exhaust system</td>
<td></td>
<td>Through propeller boss</td>
</tr>
<tr>
<td>Lubrication system</td>
<td></td>
<td>Pre-mixed fuel (50:1)</td>
</tr>
</tbody>
</table>

(*1) Includes a stainless steel propeller and excludes oil and rigging parts.

(*2) At 20°C(68°F) and sea level.

(*3) BR8HS-10 is for Carib and China version.
# General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel and oil</strong></td>
<td></td>
<td>200AET/L200AET</td>
</tr>
<tr>
<td>Fuel type</td>
<td></td>
<td>Regular unleaded gasoline</td>
</tr>
<tr>
<td>Fuel rating</td>
<td>RON(*4)</td>
<td>84</td>
</tr>
<tr>
<td>Engine oil type</td>
<td>NMMA-certified</td>
<td>2-stroke outboard motor oil</td>
</tr>
<tr>
<td>Engine oil grade</td>
<td>API</td>
<td>Hypoid gear oil</td>
</tr>
<tr>
<td>Gear oil type</td>
<td>SAE</td>
<td>GL-4</td>
</tr>
<tr>
<td>Gear oil grade</td>
<td>cm³ (oz)</td>
<td>90</td>
</tr>
<tr>
<td>Gear oil quantity</td>
<td></td>
<td>980(34.5) / 870(30.6)</td>
</tr>
<tr>
<td><strong>Bracket unit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trim angle (At 12° boat transom)</td>
<td>Degree</td>
<td>– 4 – 16</td>
</tr>
<tr>
<td>Tilt-up angle</td>
<td>Degree</td>
<td>70</td>
</tr>
<tr>
<td>Steering angle</td>
<td>Degree</td>
<td>35+35</td>
</tr>
<tr>
<td><strong>Drive unit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gear shift positions</td>
<td></td>
<td>F-N-R</td>
</tr>
<tr>
<td>Gear ratio</td>
<td></td>
<td>1.86(14/26)</td>
</tr>
<tr>
<td>Reduction gear type</td>
<td></td>
<td>Spiral bevel gear</td>
</tr>
<tr>
<td>Clutch type</td>
<td></td>
<td>Dog clutch</td>
</tr>
<tr>
<td>Propeller shaft type</td>
<td></td>
<td>Spline</td>
</tr>
<tr>
<td>Propeller direction (Rear view)</td>
<td></td>
<td>Clockwise M</td>
</tr>
<tr>
<td>Propeller ID mark</td>
<td></td>
<td>Counterclockwise ML</td>
</tr>
<tr>
<td><strong>Electrical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommend battery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCA / SAE (Minimum)</td>
<td>A</td>
<td>380</td>
</tr>
<tr>
<td>CCA / EN (Minimum)</td>
<td>A</td>
<td>430</td>
</tr>
<tr>
<td>RC (Minimum)</td>
<td>Minute</td>
<td>120</td>
</tr>
<tr>
<td>20HR (Minimum)</td>
<td>AH</td>
<td>70</td>
</tr>
<tr>
<td>JIS</td>
<td></td>
<td>65D31-95E41</td>
</tr>
</tbody>
</table>

(*4) RON; Research Octane Number
## Maintenance specifications
### Power unit

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power unit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression pressure</td>
<td>kPa</td>
<td>700 (7.0, 101.5)</td>
</tr>
<tr>
<td>(reference data)</td>
<td>(kgf/cm², psi)</td>
<td></td>
</tr>
<tr>
<td>Compression pressure</td>
<td>kPa</td>
<td>520 (5.2, 75.4)</td>
</tr>
<tr>
<td>(minimum)</td>
<td>(kgf/cm², psi)</td>
<td></td>
</tr>
<tr>
<td><strong>Cylinder heads</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warpage limit</td>
<td>mm (in)</td>
<td>0.1 (0.04)</td>
</tr>
<tr>
<td>(lines indicate straightedge position)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cylinders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bore size</td>
<td>mm (in)</td>
<td>90.00 - 90.02 (3.5433 - 3.5441)</td>
</tr>
<tr>
<td>Bore size limit</td>
<td>mm (in)</td>
<td>90.10 (3.5472)</td>
</tr>
<tr>
<td>Taper limit</td>
<td>mm (in)</td>
<td>0.08 (0.0031)</td>
</tr>
<tr>
<td>Out-of-round limit</td>
<td>mm (in)</td>
<td>0.05 (0.0020)</td>
</tr>
<tr>
<td><strong>Pistons</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piston diameter (D)</td>
<td>mm (in)</td>
<td>89.895 - 89.915 (3.5392 - 3.5400)</td>
</tr>
<tr>
<td>Measuring point (H)</td>
<td>mm (in)</td>
<td>10 (0.39)</td>
</tr>
<tr>
<td>Piston pin boss inside diameter</td>
<td>mm (in)</td>
<td>23.074-23.085 (0.9084-0.9089)</td>
</tr>
<tr>
<td>Oversize piston 1st</td>
<td>mm (in)</td>
<td>+ 0.25 (0.0098)</td>
</tr>
<tr>
<td>Oversize piston diameter 2nd</td>
<td>mm (in)</td>
<td>+ 0.5 (0.0196)</td>
</tr>
<tr>
<td>Oversize piston diameter</td>
<td>mm (in)</td>
<td>90.395 - 90.415 (3.5589 - 3.5596)</td>
</tr>
<tr>
<td><strong>Piston pins</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside diameter</td>
<td>mm (in)</td>
<td>23.065 - 23.070 (0.9081 - 0.9083)</td>
</tr>
<tr>
<td><strong>Piston rings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top ring, 2nd ring</td>
<td>mm (in)</td>
<td>1.97 - 1.99 (0.0776 - 0.0783)</td>
</tr>
<tr>
<td>Dimension B</td>
<td>mm (in)</td>
<td>2.7 - 2.9 (0.1063 - 0.1142)</td>
</tr>
<tr>
<td>Dimension T</td>
<td>mm (in)</td>
<td>0.3 - 0.4 (0.0118 - 0.0157)</td>
</tr>
<tr>
<td>End gap</td>
<td>mm (in)</td>
<td>20 (0.79)</td>
</tr>
<tr>
<td>Measuring point (H)</td>
<td>mm (in)</td>
<td>0.02 - 0.06 (0.0008 - 0.0024)</td>
</tr>
<tr>
<td>Side clearance</td>
<td>mm (in)</td>
<td></td>
</tr>
</tbody>
</table>

* Measuring conditions:
  Ambient temperature 20°C (68°F), wide open the throttle valve and the choke valve, with plugs disconnected from all cylinders.
  The figures are for reference only.
## Connecting rods

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small-end inside diameter</td>
<td>mm (in)</td>
<td>28.070 - 28.082 (1.1051 - 1.1056)</td>
</tr>
<tr>
<td>Big-end inside diameter</td>
<td>mm (in)</td>
<td>46.010 - 46.025 (1.8114 - 1.8120)</td>
</tr>
<tr>
<td>Big-end side clearance</td>
<td>mm (in)</td>
<td>0.12 - 0.26 (0.0047 - 0.0102)</td>
</tr>
<tr>
<td>Small-end axial play limit</td>
<td>mm (in)</td>
<td>2.0 (0.08)</td>
</tr>
</tbody>
</table>

## Crankshaft

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crankshaft journal Diameter</td>
<td>mm (in)</td>
<td>53.975 - 53.991 (2.1250 - 2.1256)</td>
</tr>
<tr>
<td>Crank pin Diameter</td>
<td>mm (in)</td>
<td>35.985 - 36.000 (1.4167 - 1.4173)</td>
</tr>
<tr>
<td>Run-out limit</td>
<td>mm (in)</td>
<td>0.03 (0.0012)</td>
</tr>
</tbody>
</table>

## Thermostats

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening temperature</td>
<td>°C (°F)</td>
<td>50 (122)</td>
</tr>
<tr>
<td>Fully open temperature</td>
<td>°C (°F)</td>
<td>60 (140)</td>
</tr>
<tr>
<td>Valve open lower limit</td>
<td>mm (in)</td>
<td>3.0 (0.12)</td>
</tr>
</tbody>
</table>

## Carburetor

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID mark</td>
<td></td>
<td>64E01</td>
</tr>
<tr>
<td>Main jet</td>
<td>#</td>
<td>No.1,3:150 / No.2,4:154 / No.5:152 / No.6:158</td>
</tr>
<tr>
<td>Main air jet</td>
<td>#</td>
<td>270</td>
</tr>
<tr>
<td>Pilot jet</td>
<td>#</td>
<td>84</td>
</tr>
<tr>
<td>Pilot air jet</td>
<td>#</td>
<td>60</td>
</tr>
<tr>
<td>Pilot screw</td>
<td>turns out</td>
<td>1 1/8 ± 1/4 (7/8 - 1 3/8)</td>
</tr>
<tr>
<td>Float height (with gasket)</td>
<td>mm (in)</td>
<td>15.5 - 16.5 (0.61 - 0.65)</td>
</tr>
<tr>
<td>Engine idle speed</td>
<td>r/min</td>
<td>675 - 725</td>
</tr>
</tbody>
</table>

## Reed valves

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve stopper height</td>
<td>mm (in)</td>
<td>6.5 (0.26)</td>
</tr>
<tr>
<td>Warpage limit</td>
<td>mm (in)</td>
<td>0.2 (0.08)</td>
</tr>
</tbody>
</table>

## Lower unit

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gear backlash</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinion-to-forward gear</td>
<td>mm (in)</td>
<td>0.25 - 0.46 (0.0098 - 0.0181)</td>
</tr>
<tr>
<td>Pinion-to-reverse gear</td>
<td>mm (in)</td>
<td>0.74 - 1.29 (0.0291 - 0.0508)</td>
</tr>
<tr>
<td>Pinion shims</td>
<td>mm</td>
<td>0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50</td>
</tr>
<tr>
<td>Forward gear shims</td>
<td>mm</td>
<td>0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50</td>
</tr>
<tr>
<td>Reverse gear shims</td>
<td>mm</td>
<td>0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50</td>
</tr>
<tr>
<td>Propeller shaft shims</td>
<td>mm</td>
<td>—</td>
</tr>
<tr>
<td>Drive shaft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Run-out limit</td>
<td>mm (in)</td>
<td>0.1 (0.0039)</td>
</tr>
<tr>
<td>Propeller shaft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End play</td>
<td>mm (in)</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.25 - 0.35 (0.0098 - 0.0138)</td>
</tr>
</tbody>
</table>
## Electrical

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ignition system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing</td>
<td>Degree</td>
<td>ATDC 7</td>
</tr>
<tr>
<td>(standard ignition timing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(full advance)</td>
<td>Degree</td>
<td>BTDC 18</td>
</tr>
<tr>
<td>Piston position</td>
<td>Degree</td>
<td></td>
</tr>
<tr>
<td>(full advance)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulser coil output peak voltage (W/B - W/L, W/Br - W/Y, W/G - W/R)</td>
<td>mm (in)</td>
<td>2.05 (0.0807)</td>
</tr>
<tr>
<td>at cranking 1(*1)</td>
<td>V</td>
<td>2.5</td>
</tr>
<tr>
<td>at cranking 2(*1)</td>
<td>V</td>
<td>2.0</td>
</tr>
<tr>
<td>at 1,500 r/min</td>
<td>V</td>
<td>9.5</td>
</tr>
<tr>
<td>at 3,500 r/min</td>
<td>V</td>
<td>16.0</td>
</tr>
<tr>
<td>Pulser coil resistance(*2)</td>
<td>Ω</td>
<td>256 - 384</td>
</tr>
<tr>
<td>(W/B - W/L, W/Br - W/Y, W/G - W/R)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge coil output peak voltage (Br - R)</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>at cranking 1(*1)</td>
<td>V</td>
<td>80</td>
</tr>
<tr>
<td>at cranking 2(*1)</td>
<td>V</td>
<td>90</td>
</tr>
<tr>
<td>at 1,500 r/min</td>
<td>V</td>
<td>165</td>
</tr>
<tr>
<td>at 3,500 r/min</td>
<td>V</td>
<td>165</td>
</tr>
<tr>
<td>(L - B/R)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at cranking 1(*1)</td>
<td>V</td>
<td>30</td>
</tr>
<tr>
<td>at cranking 2(*1)</td>
<td>V</td>
<td>30</td>
</tr>
<tr>
<td>at 1,500 r/min</td>
<td>V</td>
<td>160</td>
</tr>
<tr>
<td>at 3,500 r/min</td>
<td>V</td>
<td>165</td>
</tr>
<tr>
<td>Charge coil resistance(*2)</td>
<td>Ω</td>
<td>428 - 642</td>
</tr>
<tr>
<td>(Br - R)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L - B/R)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDI unit output peak voltage (B/W - B)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at cranking (loaded)</td>
<td>V</td>
<td>65</td>
</tr>
<tr>
<td>at 1,500 r/min</td>
<td>V</td>
<td>140</td>
</tr>
<tr>
<td>at 3,500 r/min</td>
<td>V</td>
<td>135</td>
</tr>
<tr>
<td>Spark plug gap mm (in)</td>
<td>1.0 - 1.1 mm (0.039 - 0.043 in)</td>
<td></td>
</tr>
<tr>
<td>Ignition spark gap mm (in)</td>
<td>6 (0.24)</td>
<td></td>
</tr>
<tr>
<td>Spark plug cap resistance</td>
<td>Ω</td>
<td>4.0 - 6.0</td>
</tr>
<tr>
<td>Ignition coil resistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary coil (B/W-B)</td>
<td>Ω at 20°C (68°F)</td>
<td>0.18 - 0.24</td>
</tr>
<tr>
<td>Secondary coil (LEAD-B)</td>
<td>Ω at 20°C (68°F)</td>
<td>3.26 - 4.88</td>
</tr>
<tr>
<td><strong>Thermoswitch</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON °C (°F)</td>
<td>84 - 90 (183 - 194)</td>
<td></td>
</tr>
<tr>
<td>OFF °C (°F)</td>
<td>60 - 74 (140 - 165)</td>
<td></td>
</tr>
<tr>
<td><strong>Choke solenoid</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resistance</td>
<td>Ω</td>
<td>3.4 - 4.0</td>
</tr>
</tbody>
</table>

(*1) Cranking 1: unloaded  Cranking 2: loaded  
(*2) The figures are for reference only.
### Maintenance specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>200AET</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L200AET</td>
</tr>
<tr>
<td><strong>Starter motor</strong></td>
<td></td>
<td>Bendix</td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>kW</td>
<td>1.1</td>
</tr>
<tr>
<td>Cranking time limit</td>
<td>Second</td>
<td>30</td>
</tr>
<tr>
<td>Brushes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard length</td>
<td>mm (in)</td>
<td>17 (0.67)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in)</td>
<td>10 (0.39)</td>
</tr>
<tr>
<td>Commutator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard diameter</td>
<td>mm (in)</td>
<td>33 (1.30)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in)</td>
<td>32 (1.26)</td>
</tr>
<tr>
<td>Mica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard undercut</td>
<td>mm (in)</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in)</td>
<td>0.2 (0.008)</td>
</tr>
<tr>
<td><strong>Charging system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuse</td>
<td>A</td>
<td>20</td>
</tr>
<tr>
<td>Lighting coil output peak voltage</td>
<td>(G - G/W)</td>
<td></td>
</tr>
<tr>
<td>at cranking (*1)</td>
<td>V</td>
<td>3</td>
</tr>
<tr>
<td>at 1,500 r/min (*1)</td>
<td>V</td>
<td>20.0</td>
</tr>
<tr>
<td>at 3,500 r/min (*1)</td>
<td>V</td>
<td>50.0</td>
</tr>
<tr>
<td>Lighting coil resistance (*2)</td>
<td>Ω</td>
<td>0.20 - 0.30</td>
</tr>
<tr>
<td>(G - G/W)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectifier Regulator output peak voltage</td>
<td>(R - B)</td>
<td></td>
</tr>
<tr>
<td>at 1,500 r/min (*1)</td>
<td>V</td>
<td>18</td>
</tr>
<tr>
<td>at 3,500 r/min (*1)</td>
<td>V</td>
<td>45</td>
</tr>
<tr>
<td>Charging current</td>
<td>V, A</td>
<td>12, 14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>at 6,000 r/min</td>
</tr>
<tr>
<td><strong>Power trim and tilt system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trim sensor</td>
<td>Ω</td>
<td>9 - 11</td>
</tr>
<tr>
<td>Resistance</td>
<td>Ω</td>
<td>9 - 379</td>
</tr>
<tr>
<td>Fluid type</td>
<td></td>
<td>ATF Dexron II</td>
</tr>
<tr>
<td>Brushes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard length</td>
<td>mm (in)</td>
<td>9.8 (0.386)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in)</td>
<td>4.8 (0.189)</td>
</tr>
<tr>
<td>Commutator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard diameter</td>
<td>mm (in)</td>
<td>22 (0.87)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>mm (in)</td>
<td>21 (0.83)</td>
</tr>
<tr>
<td>Hydraulic pressure (UP)</td>
<td>MPa (kgf/cm²)</td>
<td>10 - 12 (100 - 120)</td>
</tr>
<tr>
<td>(DOWN)</td>
<td>MPa (kgf/cm²)</td>
<td>6 - 9 (60 - 90)</td>
</tr>
<tr>
<td>(*1) Unloaded</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(*2) The figures are for reference only.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Dimensions**

**Exterior**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L: 946(37.2)</td>
<td>1,032(40.6)</td>
</tr>
<tr>
<td>X: 1,072(42.2)</td>
<td>1,144(45.0)</td>
</tr>
<tr>
<td>L: 516(20.3)</td>
<td>569(22.4)</td>
</tr>
<tr>
<td>X: 642(25.3)</td>
<td>631(24.8)</td>
</tr>
<tr>
<td>L: 48(1.9)</td>
<td>54(2.1)</td>
</tr>
<tr>
<td>X: 62(2.4)</td>
<td>61(2.4)</td>
</tr>
<tr>
<td>L: 45(1.8)</td>
<td>205(8.1)</td>
</tr>
<tr>
<td>X: 634(25.0)</td>
<td>634(25.0)</td>
</tr>
<tr>
<td>L: 762(30.0)</td>
<td>788(31.0)</td>
</tr>
<tr>
<td>X: 627(33.0)</td>
<td>70(2.8)</td>
</tr>
</tbody>
</table>
## Clamp bracket

### Maintenance specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>200AET</th>
<th>L200AET</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>mm (in)</td>
<td>125.4 (4.9)</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>mm (in)</td>
<td>254 (10.0)</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>mm (in)</td>
<td>163.5 (6.4)</td>
<td></td>
</tr>
<tr>
<td>B4</td>
<td>mm (in)</td>
<td>50.8 (2.0)</td>
<td></td>
</tr>
<tr>
<td>B5</td>
<td>mm (in)</td>
<td>180 (7.1)</td>
<td></td>
</tr>
<tr>
<td>B6</td>
<td>mm (in)</td>
<td>367 (14.5)</td>
<td></td>
</tr>
<tr>
<td>B9</td>
<td>mm (in)</td>
<td>18.5 (0.7)</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>mm (in)</td>
<td>82 (3.2)</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>mm (in)</td>
<td>13 (0.5)</td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td>mm (in)</td>
<td>55.5 (2.2)</td>
<td></td>
</tr>
</tbody>
</table>
### Tightening torques

#### Specified torques

<table>
<thead>
<tr>
<th>Part to be tightened</th>
<th>Thread size</th>
<th>Tightening torques</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N • m</td>
<td>kgf • m</td>
</tr>
<tr>
<td><strong>POWER UNIT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flywheel nut</td>
<td>M20</td>
<td>160</td>
<td>16</td>
</tr>
<tr>
<td>Crankcase bolt 1st</td>
<td>M10</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Crankcase bolt 2nd</td>
<td>M8</td>
<td>39</td>
<td>3.9</td>
</tr>
<tr>
<td>Crankcase bolt 1st</td>
<td>M8</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Crankcase bolt 2nd</td>
<td>M8</td>
<td>18</td>
<td>1.8</td>
</tr>
<tr>
<td>Intake manifold 1st</td>
<td>M6</td>
<td>4</td>
<td>0.4</td>
</tr>
<tr>
<td>Intake manifold 2nd</td>
<td>M6</td>
<td>8</td>
<td>0.8</td>
</tr>
<tr>
<td>Cylinder head 1st</td>
<td>M8</td>
<td>15</td>
<td>1.5</td>
</tr>
<tr>
<td>Cylinder head 2nd</td>
<td>M8</td>
<td>29</td>
<td>2.9</td>
</tr>
<tr>
<td>Cylinder head cover 1st</td>
<td>M6</td>
<td>4</td>
<td>0.4</td>
</tr>
<tr>
<td>Cylinder head cover 2nd</td>
<td>M6</td>
<td>8</td>
<td>0.8</td>
</tr>
<tr>
<td>Connecting rod cap 1st</td>
<td>M8</td>
<td>19</td>
<td>1.9</td>
</tr>
<tr>
<td>Connecting rod cap 2nd</td>
<td>M8</td>
<td>36</td>
<td>3.6</td>
</tr>
<tr>
<td>Connecting rod cap 3rd</td>
<td>M8</td>
<td>Loosen completely</td>
<td></td>
</tr>
<tr>
<td>Connecting rod cap 4th</td>
<td>M8</td>
<td>19</td>
<td>1.9</td>
</tr>
<tr>
<td>Connecting rod cap 5th</td>
<td>M8</td>
<td>36</td>
<td>3.6</td>
</tr>
<tr>
<td>Exhaust outer cover 1st</td>
<td>M6</td>
<td>4</td>
<td>0.4</td>
</tr>
<tr>
<td>Exhaust outer cover 2nd</td>
<td>M6</td>
<td>8</td>
<td>0.8</td>
</tr>
<tr>
<td>PCV cover 1st</td>
<td>M6</td>
<td>4</td>
<td>0.4</td>
</tr>
<tr>
<td>PCV cover 2nd</td>
<td>M6</td>
<td>8</td>
<td>0.8</td>
</tr>
<tr>
<td>Cylinder head accessory plug 1st</td>
<td>M14</td>
<td>23</td>
<td>2.3</td>
</tr>
<tr>
<td>Cylinder head accessory plug 2nd</td>
<td>M14</td>
<td>21</td>
<td>2.1</td>
</tr>
<tr>
<td>Power unit mount bolt</td>
<td>M8</td>
<td>21</td>
<td>2.1</td>
</tr>
<tr>
<td>Spark plug</td>
<td>M14</td>
<td>25</td>
<td>2.5</td>
</tr>
<tr>
<td>Electric relay terminal nut</td>
<td>M6</td>
<td>4</td>
<td>0.4</td>
</tr>
<tr>
<td>Starting motor mount bolt</td>
<td>M8</td>
<td>29</td>
<td>2.9</td>
</tr>
<tr>
<td>Starting motor (+) terminal nut</td>
<td>M8</td>
<td>9</td>
<td>0.9</td>
</tr>
<tr>
<td>Ignition coil</td>
<td>M6</td>
<td>8</td>
<td>0.8</td>
</tr>
<tr>
<td>Battery cable terminal nut</td>
<td>M6</td>
<td>4</td>
<td>0.4</td>
</tr>
<tr>
<td>Battery cable terminal nut</td>
<td>M8</td>
<td>6</td>
<td>0.6</td>
</tr>
<tr>
<td>Hour meter</td>
<td>M5</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>LOWER UNIT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinion nut</td>
<td>M16</td>
<td>93</td>
<td>9.3</td>
</tr>
<tr>
<td>Propeller nut</td>
<td>M18</td>
<td>54</td>
<td>5.4</td>
</tr>
<tr>
<td>Gear oil plug</td>
<td>M6</td>
<td>9</td>
<td>0.9</td>
</tr>
<tr>
<td>Ring nut</td>
<td>M8</td>
<td>145</td>
<td>14.5</td>
</tr>
<tr>
<td>Trim tab</td>
<td>M10</td>
<td>39</td>
<td>3.9</td>
</tr>
<tr>
<td>Lower case mount bolt</td>
<td>M10</td>
<td>39</td>
<td>3.9</td>
</tr>
<tr>
<td>Upper case mount bolt</td>
<td>M8</td>
<td>21</td>
<td>2.1</td>
</tr>
<tr>
<td>Exhaust manifold</td>
<td>M8</td>
<td>18</td>
<td>1.8</td>
</tr>
<tr>
<td>Muffler</td>
<td>M8</td>
<td>18</td>
<td>1.8</td>
</tr>
</tbody>
</table>
### Tightening torques

<table>
<thead>
<tr>
<th>Part to be tightened</th>
<th>Thread size</th>
<th>Tightening torques</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N • m</td>
</tr>
<tr>
<td><strong>BRACKET UNIT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper rubber mount nut</td>
<td>M12</td>
<td>71</td>
</tr>
<tr>
<td>Lower rubber mount nut</td>
<td>M14</td>
<td>51</td>
</tr>
<tr>
<td>Through tube nut</td>
<td>7/8&quot;</td>
<td>15</td>
</tr>
<tr>
<td>Trim sender cam screw</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Trim rod reciever nut</td>
<td>M10</td>
<td>36</td>
</tr>
<tr>
<td><strong>PTT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserver cap</td>
<td></td>
<td>0.7</td>
</tr>
<tr>
<td>Reserver mount bolt</td>
<td>1/4&quot;</td>
<td>5</td>
</tr>
<tr>
<td>Motor unit mount bolt</td>
<td>1/4&quot;</td>
<td>5</td>
</tr>
<tr>
<td>Gear housing case mount bolt</td>
<td>5/16&quot;</td>
<td>8</td>
</tr>
<tr>
<td>Gear housing bolt</td>
<td>3/16&quot;</td>
<td>6</td>
</tr>
<tr>
<td>Filter plug</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Manual valve</td>
<td>M14</td>
<td>3</td>
</tr>
<tr>
<td>Tilt cylinder end cap</td>
<td></td>
<td>130</td>
</tr>
<tr>
<td>Trim cylinder end cap</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>Tilt piston nut</td>
<td></td>
<td>96</td>
</tr>
</tbody>
</table>

### General torques

This chart specifies tightening torques for standard fasteners with a standard ISO thread pitch. Tightening torque specifications for special components or assemblies are provided in applicable sections of this manual. To avoid warpage, tighten multi-fastener assemblies in a crisscross fashion and progressive stages until the specified tightening torque is reached. Unless otherwise specified, tightening torque specifications require clean, dry threads. Components should be at room temperature.

<table>
<thead>
<tr>
<th>Nut(A)</th>
<th>Bolt (B)</th>
<th>General torque specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N • m</td>
</tr>
<tr>
<td>8mm</td>
<td>M5</td>
<td>5</td>
</tr>
<tr>
<td>10mm</td>
<td>M6</td>
<td>8</td>
</tr>
<tr>
<td>12mm</td>
<td>M8</td>
<td>18</td>
</tr>
<tr>
<td>14mm</td>
<td>M10</td>
<td>36</td>
</tr>
<tr>
<td>17mm</td>
<td>M12</td>
<td>43</td>
</tr>
</tbody>
</table>
Periodic checks and adjustments

Special service tools ........................................................................................................ 3-1

Maintenance interval chart ............................................................................................... 3-2

Top cowling ......................................................................................................................... 3-3
   Checking the top cowling ............................................................................................... 3-3

Hour meter ............................................................................................................................ 3-3
   Checking the hour meter ............................................................................................... 3-3

Fuel system .......................................................................................................................... 3-3
   Checking the fuel joint and fuel hoses (fuel joint - to - carburetor) .......................... 3-3
   Checking the fuel filter ................................................................................................. 3-4

Power unit ............................................................................................................................ 3-4
   Checking the spark plugs ............................................................................................... 3-4
   Checking the thermostat ............................................................................................... 3-5
   Checking the cooling water passage ............................................................................ 3-5

Control system .................................................................................................................... 3-6
   Checking the throttle cable operation .......................................................................... 3-6
   Checking the ignition timing (with timing light) .......................................................... 3-6
   Checking the ignition timing ......................................................................................... 3-7
   Adjusting the ignition timing ....................................................................................... 3-8
   Checking the carburetor synchronization ..................................................................... 3-12
   Adjusting the carburetor synchronization .................................................................... 3-13
   Adjusting the engine idle speed .................................................................................. 3-14
   Adjusting the carburetor pickup timing ...................................................................... 3-15
   Adjusting the choke solenoid ...................................................................................... 3-16
   Adjusting the throttle link and the throttle cable operation ......................................... 3-16
   Checking the gearshift operation .................................................................................. 3-17

Power trim and tilt unit ...................................................................................................... 3-17
   Checking the power trim and tilt operation .................................................................. 3-17
   Checking the power trim and tilt fluid level .................................................................. 3-18
<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower unit</td>
<td>3-19</td>
</tr>
<tr>
<td>Checking the gear oil level</td>
<td>3-19</td>
</tr>
<tr>
<td>Changing the gear oil</td>
<td>3-19</td>
</tr>
<tr>
<td>Checking the lower unit (for air leakage)</td>
<td>3-20</td>
</tr>
<tr>
<td>Checking the propeller</td>
<td>3-21</td>
</tr>
<tr>
<td>General</td>
<td>3-21</td>
</tr>
<tr>
<td>Checking the anodes</td>
<td>3-21</td>
</tr>
<tr>
<td>Checking the battery</td>
<td>3-21</td>
</tr>
<tr>
<td>Lubrication</td>
<td>3-22</td>
</tr>
</tbody>
</table>
Periodic checks and adjustments

Special service tools

Timing light
90890-03141

Dial gauge set
90890-01252

Digital tachometer
90890-06760

Leakage tester
90890-06840
### Maintenance interval chart

Use the following chart as a guideline for general maintenance. Adjust the maintenance intervals according to the operating conditions of the outboard motor.

<table>
<thead>
<tr>
<th>Item</th>
<th>Remarks</th>
<th>Initial (10 hours)</th>
<th>Every (50 hours)</th>
<th>Every (100 hours)</th>
<th>Every (200 hours)</th>
<th>Refer to Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top cowling</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top cowling fit</td>
<td>Check/adjust</td>
<td></td>
<td></td>
<td></td>
<td>○</td>
<td>3-3</td>
</tr>
<tr>
<td><strong>Fuel system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel joint and fuel hoses</td>
<td>Check</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>3-3</td>
</tr>
<tr>
<td>Fuel filter</td>
<td>Check/replace</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>3-4</td>
</tr>
<tr>
<td>Fuel tank(*)</td>
<td>Clean</td>
<td></td>
<td></td>
<td></td>
<td>○</td>
<td></td>
</tr>
<tr>
<td><strong>Power unit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition timing</td>
<td>Check</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>3-6,7</td>
</tr>
<tr>
<td>Spark plugs</td>
<td>Clean/adjust/replace</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>Piston rings</td>
<td>Check/replace</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>5-31</td>
</tr>
<tr>
<td>Thermostat</td>
<td>Check</td>
<td>○</td>
<td>○</td>
<td></td>
<td>○</td>
<td>3-5</td>
</tr>
<tr>
<td>Pressure control valve</td>
<td>Check</td>
<td>○</td>
<td>○</td>
<td></td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>Flywheel magnet nut</td>
<td>Check</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carburetor(”2)</td>
<td>Check</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>Motor exterior</td>
<td>Check</td>
<td>○</td>
<td></td>
<td></td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>Cooling water passage(”3)</td>
<td>Clean</td>
<td>○</td>
<td>○</td>
<td></td>
<td>○</td>
<td></td>
</tr>
<tr>
<td><strong>Control system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carburetor link</td>
<td>Check/adjust</td>
<td></td>
<td></td>
<td></td>
<td>○</td>
<td>3-12,13,15</td>
</tr>
<tr>
<td>Throttle cable</td>
<td>Check/adjust</td>
<td>○</td>
<td>○</td>
<td></td>
<td>○</td>
<td>3-6,16</td>
</tr>
<tr>
<td>Shift cable</td>
<td>Check/adjust</td>
<td>○</td>
<td>○</td>
<td></td>
<td>○</td>
<td>3-17</td>
</tr>
<tr>
<td>Engine idle speed</td>
<td>Check/adjust</td>
<td>○</td>
<td>○</td>
<td></td>
<td>○</td>
<td>3-14</td>
</tr>
<tr>
<td><strong>Power trim and tilt unit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power trim and tilt unit</td>
<td>Check</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>3-17</td>
</tr>
<tr>
<td><strong>Lower unit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gear oil</td>
<td>Change</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>3-19</td>
</tr>
<tr>
<td>Impeller/Woodruff key</td>
<td>Check/replace</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>6-8,38</td>
</tr>
<tr>
<td>Oil seals</td>
<td>Check/replace</td>
<td>○</td>
<td>○</td>
<td></td>
<td>○</td>
<td>–</td>
</tr>
<tr>
<td>Drive shaft</td>
<td>Check/replace</td>
<td>○</td>
<td>○</td>
<td></td>
<td>○</td>
<td>6-21,49</td>
</tr>
<tr>
<td>Propeller</td>
<td>Check</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>3-21</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anodes/Trim tab</td>
<td>Check/replace</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>3-21</td>
</tr>
<tr>
<td>Battery</td>
<td>Check/charge</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>3-21</td>
</tr>
<tr>
<td>Wiring and connectors</td>
<td>Adjust/reconnect</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>–</td>
</tr>
<tr>
<td>Nuts and bolts(”4)</td>
<td>Tighten</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>–</td>
</tr>
<tr>
<td>Lubrication points</td>
<td>Lubricate</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>Exhaust system deterioration</td>
<td>Check/replace</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>–</td>
</tr>
</tbody>
</table>

**NOTE:**

(*1) If equipped with a portable fuel tank.

(*2) Do not adjust the carburetor if it is operating correctly.

(*3) The engine should be flushed with fresh water after operating in salt, turbid, or muddy water.

(*4) Do not retighten the cylinder head and crankcase bolts.
Top cowling
Checking the top cowling
1. Check the fitting by pushing the cowling with both hands. Adjust if necessary.

2. Loosen the bolts 1.

3. Move the hook 2 up or down to adjust its position.

NOTE:
• To loosen the fitting, pull up the hook 2 in the direction of arrow 3.
• To tighten the fitting, push down the hook 2 in the direction of arrow 5.

4. Tighten the bolts 1.

5. Check the fitting again, and repeat steps 2-4 until the proper fitting is obtained.

6. Check the rubber seal for cracks or damage. Replace if necessary.

Hour meter
Checking the hour meter
1. Turn the ignition switch to ON.

2. Check that the total hour of operation is displayed after the entire Light Emitting Diode has been illuminated for two seconds.

Fuel system
Checking the fuel joint and fuel hoses (fuel joint - to - carburetor)
1. Check the fuel hose connections and the fuel hose joint for leaks.

2. Check the fuel filter, fuel pump, and carburetor for leaks. Check the fuel hoses for deterioration. Replace them if necessary.
Checking the fuel filter
1. Check that the float ① is in the appropriate position. If water is accumulated, drain it by loosening the drain screw ②.

2. Check the filter element ③ for dirt and accumulated residue, and check the filter cup ④ for foreign substances and cracks. Clean with straight gasoline, and replace the fuel filter element if necessary.

Power unit
Checking the spark plugs
1. Disconnect the spark plug wire before removing the spark plugs.

2. Clean the electrodes ① with a spark plug cleaner or wire brush. Replace the spark plug if necessary.

3. Check the electrodes for erosion and excessive carbon deposits. Replace the spark plug if necessary.

4. Check the spark plug gap ⑤. Adjust if out of specification.

Specified spark plug:
- B8HS-10 (NGK)
- BR8HS-10 (NGK)

Spark plug gap ⑤:
- 1.0 - 1.1 mm (0.039 - 0.043 in)

NOTE:
• Be sure not to spill any fuel when removing the fuel filter cup.
• Apply a thin coat of gasoline to the O-ring ⑤ before assembly.
5. Install the spark plug, tighten it finger-tight to the position ⑤, then apply the specified torque with a spark plug wrench to the position ⑥.

4. Check the thermostat valve lift ③ at the specified water temperature. Replace the thermostat if the valve lift is out of specification.

<table>
<thead>
<tr>
<th>Water temperature</th>
<th>Valve lift ③</th>
</tr>
</thead>
<tbody>
<tr>
<td>50°C (122°F)</td>
<td>0 mm (0 in) – (When the valve begins to open.)</td>
</tr>
<tr>
<td>above 60°C (140°F)</td>
<td>more than 3.0 mm (0.12 in)</td>
</tr>
</tbody>
</table>

**NOTE:**
Clean the spark plug gasket and the seating face before installing the spark plug.

Checking the thermostat
1. Remove the thermostat cover ①, and thermostat ②.

2. Suspend the thermostat in the container with water.

3. Slowly heat the water.

4. Check the thermostat valve lift ③ at the specified water temperature. Replace the thermostat if the valve lift is out of specification.

Checking the cooling water passage
1. Check the cooling water inlet cover ①, and cooling water inlet for clogs. Clean if necessary.

2. Place the lower unit in water, and then start the engine.
3. Check the water flowing out of the cooling water pilot hole. If there is no water flow, check the cooling water passage inside the outboard motor.

Control system

**WARNING**
Whenever servicing the running engine, take precautions not to touch the rotating parts or the areas carrying the high-voltage current.

**CAUTION:**
The sequence of the services specified below shall be strictly followed and pursued to the end, when adjusting the ignition timing and other aspects related to the throttle system.
1. Adjusting the ignition timing
2. Synchronizing the carburetor
3. Adjusting the carburetor pick-up
4. Adjusting the engine idle speed
5. Adjusting the throttle cable
6. Adjusting the choke valve

Checking the throttle cable operation
1. Check that the standard ignition timing adjusting screw \( \text{1} \) touches the fully closed stopper \( \text{2} \) on the cylinder block when the remote control lever is in neutral.

2. Check that magnet control lever \( \text{3} \), and accelerator cam \( \text{4} \) move smoothly as the remote control lever is moved.

3. If adjustment is required, adjust the ignition timing first.

Checking the ignition timing (with timing light)
1. Attach the timing light to the spark plug wire to \#1 cylinder, and start the engine.
Periodic checks and adjustments

2. Check the ignition timing while engine is running at idle speed.

CAUTION: Make sure that the shift lever is in neutral position.

IGNITION TIMING AT IDLE SPEED:
ATDC 7°

3. Check the ignition timing while engine is running at wide open throttle (i.e. at fully advanced position).

IGNITION TIMING AT WIDE OPEN THROTTLE:
BTDC 18°

NOTE:
Turn the flywheel clockwise. Turning it to the opposite direction will damage the water pump impeller.

Checking the ignition timing
1. Disconnect the throttle cable.

2. Remove the intake silencer and flywheel cover.

3. Turn the flywheel clockwise until the ignition timing mark on the flywheel magnet is aligned with the pointer mark on the timing plate at the full advance.

NOTE:
Turn the flywheel clockwise. Turning it to the opposite direction will damage the water pump impeller.

4. Move the magnet control lever until it touches the full advanced stop screw.

IGNITION TIMING (FULL ADVANCE):
BTDC 18°

Timing light:
90890-03141
5. Check that the mark ⑥ on flywheel magnet is aligned with the mark ⑦ on base assembly.

6. Turn the flywheel clockwise until the ignition mark on the flywheel magnet is aligned with the pointer mark ⑨ on the timing plate at the standard ignition timing.

7. Move the magnet control lever ① until the standard ignition timing adjusting screw ③ touches the fully closed stopper ④ on the cylinder block.

8. Check that the mark ⑥ on flywheel magnet is aligned with the mark ⑦ on base assembly.

9. Adjust the ignition timing when the alignment of the marks ⑥⑦ could not be attained for either or both of the fully advanced ignition timing and standard ignition timing.

**Adjusting the ignition timing**

1. Disconnect the throttle cable.

2. Remove the intake silencer and flywheel cover.

3. Remove all the spark plugs.

4. Set the #1 cylinder at top dead center.
5. Mount the dial gauge in the spark plug hole on #1 cylinder.

8. Slowly turn the flywheel clockwise until the #1 cylinder piston comes to the specified position.

**NOTE:**

Secure the dial gauge after retracting it by approximately 3mm (0.118 in).

Dial gauge set: 90890-01252

6. Slowly turn the flywheel clockwise observing the dial gauge, and identify the top dead center of the #1 cylinder piston by the gauge.

**NOTE:**

To move the piston to the specified position, flywheel should be turned almost one full revolution, and the pointer mark on the timing plate should come close to BTDC 18° marking on the flywheel.

Specified position: 2.05 mm (0.0807 in)

9. Adjust the position of timing plate 5 so that the pointer mark ② comes to the full advance angle on the flywheel scale.

**NOTE:**

Turn the flywheel clockwise. Turning it to the opposite direction will damage the water pump impeller.

7. Adjust the gauge so that the indicator points at zero at the top dead center identified above.

Full advanced timing: BTDC 18°
10. Secure the timing plate ⑤ at the adjusted position and mark the position with paint.

11. Adjust the fully advanced stop screw ② so that the stopper ⑬ has the specified length.

![Image of timing plate and stopper](60H30250)

**Specified length ⑫: 25.0 mm (0.98 in)**

12. Move the magnet control lever ① until it touches the fully advanced stop screw ②.

![Image of magnet control lever and stop screw](60H30160)

13. Adjust the length of magnet control link so that the timing mark ⑭ on the flywheel aligns with the mark ⑮ on the base assembly.

![Image of magnet control link and flywheel](60H30180)

14. Turn the flywheel clockwise to align the pointer mark ⑯ on the timing plate with standard ignition angle on the flywheel scale.

![Image of flywheel and pointer mark](60H30260)

**Magnet control link length ⑰: 65mm (2.56in) (reference)**

15. Move the magnet control lever ① until the standard ignition timing adjusting screw ⑱ touches the fully closed stopper ⑲ on the cylinder block.

![Image of magnet control lever and cylinder block](60H30190)

**Standard ignition timing: ATDC 7°**
16. Adjust the length of standard ignition timing adjusting screw ③ so that the timing mark ① on the flywheel aligns with the mark ② on the base assembly.

![Image of flywheel and base assembly]

17. Make sure that the carburetor pick-up timing is correct.

18. Install the spark plugs.

![Image of spark plug installation]

Spark plug:
25 N・m (2.5 kgf・m, 18 ft・lb)

19. Install the intake silencer and flywheel cover.

20. Connect the throttle cable.

21. Start the engine, and check the engine idle speed.

![Image of engine speedometer]

Engine idle speed: 675-725 r/min

22. Check the ignition timing by means of the timing light.

![Image of timing light use]

Timing light: 90890-03141

Ignition timing at idle speed:
ATDC 7°
Ignition timing at wide open throttle:
BTDC 18°
Checking the carburetor synchronization
1. Disconnect the throttle cable.

2. Remove the intake silencer and flywheel cover.

3. Loosen the throttle lever tightening screw ① clockwise on the central carburetor.

NOTE: The throttle lever tightening screw ① has left hand threads.

4. Loosen the idle adjusting screw ② on the central carburetor to make a gap between the screw tip and the throttle arm stopper ③.

5. Visually check that the throttle valves are all closed.

NOTE: Move the throttle lever slightly to help the visual check.

6. Tighten the throttle lever tightening screw ① counterclockwise, to make the accelerator cam ④ aligned with the centerline of the roller ⑤.

7. Connect the throttle cable.

8. Install the intake silencer and the flywheel cover.

9. Start the engine and adjust the engine idle speed by turning the idle adjusting screw.

| Engine idle speed: 675-725 r/min |
| Digital tachometer: 90890-06760 |
Periodic checks and adjustments

Adjusting the carburetor synchronization

NOTE: Make sure the ignition timing is properly adjusted before synchronizing the carburetor.

1. Disconnect the throttle cable.

2. Remove the intake silencer and flywheel cover.

3. Loosen the throttle lever tightening screw ① clockwise on the central carburetor.

   NOTE: The throttle lever tightening screw ① has left hand threads.

4. Loosen the idle adjusting screw ② on the central carburetor to make a gap between the screw tip and the throttle arm stopper ③.

5. Loosen the throttle lever tightening screw ④ clockwise on the upper and lower carburetors.

   NOTE: The throttle lever tightening screw ④ has left hand threads.

6. On the upper and lower carburetors, tighten the throttle lever tightening screw ④ counterclockwise, while retaining the throttle lever ⑤ on the central carburetor at the fully closed position.
7. On the central carburetor, tighten the throttle lever tightening screw ① counterclockwise to make the accelerator cam ⑥ aligned with the centerline of the roller ⑦.

8. Install the intake silencer and flywheel cover.

9. Start the engine and adjust the engine idle speed by turning the idle adjusting screw ②.

**Engine idle speed: 675-725 r/min**

**Adjusting the engine idle speed**

1. Start the engine, warm it up for 5 minutes, and shut it off.

2. Loosen the throttle lever tightening screw ① clockwise on the central carburetor.

**NOTE:**

The throttle lever tightening screw ① has left hand threads.

3. Loosen the idle adjusting screw ② to make a gap between the screw tip and the throttle arm stopper ③.

4. Turn-in the pilot screws ④ until they are lightly seated, and then turn-out the pilot screws by the specified turns.

**Pilot screw turn-out:**

1 1/8 ± 1/4 (7/8-1 3/8)

**NOTE:**

Adjust the pilot screws at every carburetor.
5. Install the tachometer onto the spark plug wire of #1 cylinder, and start the engine.

6. Adjust the engine idle speed by turning the idle adjusting screw ⑤.

7. Tighten the throttle lever tightening screw ① counterclockwise on the central carburetor, to make the accelerator cam ⑥ aligned with the centerline of the roller ⑦.

8. Check the engine idle speed after opening and closing the throttle for several times.

Adjusting the carburetor pickup timing

1. Disconnect the throttle cable.

2. Move the magnet control lever ① until the standard ignition timing adjusting screw ② touches the fully closed stopper on the cylinder block.

NOTE:

- To increase the idle speed, turn the idle adjusting screw ⑤ in the direction of ⑧.
- To decrease the idle speed, turn the idle adjusting screw ⑤ in the direction of ⑥.

Engine idle speed : 675-725 r/min
3. Check that the accelerator cam ③ is aligned with the centerline of the roller ④.

4. Loosen the throttle lever tightening screw ⑤ clockwise to make the accelerator cam aligned with the centerline of the roller ④.

5. Tighten the throttle lever tightening screw ⑤ counterclockwise.

NOTE: The throttle lever tightening screw ⑤ has left hand threads.

6. Start the engine and adjust the engine idle speed by turning the idle adjusting screw.

| Engine idle speed | 675-725 r/min |

Adjusting the choke solenoid
1. Remove the intake silencer.

2. Make sure that the choke valve is fully open.

3. Check that the choke solenoid face ③ is between the marking ④ on the plunger. Adjust the position of the choke solenoid if necessary.

Adjusting the throttle link and the throttle cable operation

NOTE: Complete the ignition timing adjustment, throttle valves synchronization, engine idle speed adjustment, and carburetor pickup timing adjustment prior to the throttle link adjustment.

1. Loosen the locknut ①, remove the clip ②, and disconnect the throttle cable joint ③.

2. Adjust the length of the throttle cable joint ③ so that its hole is aligned with the set pin on the magnet control lever.

CAUTION: The throttle cable joint must be screwed in a minimum of 8.0mm (0.31in.) ③.
3. Connect the cable joint, install the clip 2, and tighten the locknut 1.

4. Check the throttle cable for smooth operation, and repeat steps 1-3 if necessary.

**Checking the gearshift operation**

1. Check that the gearshift operates smoothly when it is shifted from neutral into forward or reverse. Adjust the shift cable length if necessary.

2. Shift gear into neutral.

3. Loosen the locknut 1, remove the clip 3, and disconnect the shift cable joint 2.

4. Align the shift rod with the arrow A marked on the bottom cowling.

5. Adjust the length B of the shift cable joint 2 so that its hole is aligned with the set pin.

**CAUTION:**

The shift cable joint 2 must be screwed in a minimum of 8.0mm (0.31in.) B.

6. Connect the shift cable joint 2, install the clip 3, and tighten the locknut 1.

7. Check the shift cable for smooth operation, and repeat steps 3-6 if necessary.

**Power trim and tilt unit**

**Checking the power trim and tilt operation**

1. Fully tilt up and down the outboard motor for several times to check the entire trim and tilt range for smooth operation.

**NOTE:**

Make sure that you hear the smooth operating sound of the power trim and tilt motor.

2. Fully tilt up the outboard motor, and support it with the tilt stop lever 1 to check that the locking mechanism works properly.
### Checking the power trim and tilt fluid level

1. Fully tilt up the outboard motor and support it with the tilt stop lever ①.

2. Remove the reservoir cap ② and check the fluid level in the reservoir.

### WARNING

After tilting up the outboard motor, be sure to support it with the tilt stop lever ①. Otherwise, the outboard motor could suddenly lower if the power trim and tilt unit should lose fluid pressure.

3. If the fluid level is low, add sufficient fluid of the recommended type until it overflows out of the filler hole.

   ![Recommended power trim and tilt fluid: ATF Dexron II](image)

4. Install the reservoir cap ②, and tighten it to the specified torque.

   ![Reservoir cap ②: 0.7 N•m (0.07 kgf•m, 0.5 ft•lb)](image)

### NOTE:

If the fluid is at the correct level, the fluid should overflow out of the filler hole when the cap ② is removed.
Lower unit

Checking the gear oil level
1. Fully tilt down the outboard motor.

2. Remove the check screw [1] and check the gear oil level in the lower case.

![Diagram](60H30450)

**NOTE:**
If the oil is at the correct level, the oil should overflow out of the check hole when the check screw [1] is removed.

3. If the oil level is low, add sufficient gear oil of the recommended type until it overflows out of the check hole.

![Diagram](60H30455)

**Recommended gear oil:**
Hypoid gear oil
SAE: 90

4. Install the check screw [1].

Changing the gear oil
1. Fully tilt up the outboard motor.
2. Place a drain pan under the drain screw [1], remove the drain screw [1] and the check screw [2] to drain the oil.

![Diagram](60H30460)

3. Check the oil for metal powder possibly mixed in it, discoloration, and viscosity. Check the internal parts of the lower case if necessary.
4. Insert the gear oil tube or gear oil pump into the drain hole and slowly fill the gear oil until oil flows out of the check hole and no air bubbles are visible.

4. Insert the gear oil tube or gear oil pump into the drain hole and slowly fill the gear oil until oil flows out of the check hole and no air bubbles are visible.

Checking the lower unit (for air leakage)

1. Remove the check screw ①, and install the leakage tester.

2. Apply the specified pressure to the lower unit, to check whether the pressure is retained for 10 seconds.

**CAUTION:**
Do not over-pressurize the lower unit, otherwise the oil seals may be damaged.

NOTE: ______________
Cover the check hole with a rag while removing the leakage tester from the lower unit.

3. If pressure drops below specification, check the drive shaft and propeller shaft oil seals for damage.

---

**Recommended gear oil:**
Hypoid gear oil
SAE: 90

**Oil quantity:**
Regular rotation model:
980 cm³ (34.5 Imp qt)
Counter rotation model:
870 cm³ (30.6 Imp qt)
Checking the propeller
1. Check the propeller blades and splines for cracks, damage, or wear.

Checking the battery
1. Check the battery electrolyte level. If the level is at or below the minimum level mark  
2. Check the specific gravity of the electrolyte. Fully charge the battery if obtained value is out of specification.

General
Checking the anodes
1. Check the anodes and trim tab for scales, grease, or oil. Clean if necessary.

2. Replace the anodes and trim tab if excessively eroded.

CAUTION:
Do not oil, grease, or paint the anodes, otherwise they will not be able to prevent the galvanic corrosion effectively.

WARNING
Battery electrolyte is dangerous; It contains sulfuric acid which is poisonous and highly caustic. Always follow these preventive measures:
• Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.
• Wear protective eye gear when handling or working near batteries.

Antidote (EXTERNAL):
• SKIN - Wash with water.
• EYES - Flush with water for 15 minutes and get immediate medical attention.

Antidote (INTERNAL):
• Drink large quantities of water or milk followed with milk of magnesia, beaten egg, or vegetable oil. Get immediate medical attention.

Batteries generate explosive, hydrogen gas. Always follow these preventive measures:
• Charge batteries in a well-ventilated area.
• Keep batteries away from fire, sparks or open flame (e.g., welding equipment, lighted cigarettes).
• DO NOT SMOKE when charging or handling batteries.

KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.
**NOTE:**
Batteries vary per manufacturer. The procedures mentioned in this manual may not always apply, therefore, consult the instruction manual of the battery. Disconnect the black (–) battery cable first, then the red (+) battery cable.

Electrolyte specific gravity:
1.280 at 20°C (68°F)

**Lubrication**
1. Apply Yamaha grease A to the areas shown.
3. Apply Yamaha grease D to the areas shown.

NOTE: 
Apply grease to the grease nipples until it overflows from the bushings A.

2. Apply Yamaha grease C to the areas shown.
Fuel system

Special service tools ..................................................................................................... 4-1

Hose routing .................................................................................................................. 4-2
  Fuel hoses ................................................................................................................ 4-2

Fuel filter, fuel pump, fuel joint .................................................................................... 4-3
  Checking the fuel joint ............................................................................................ 4-6
  Checking the fuel filter ............................................................................................ 4-6
  Checking the fuel pump ........................................................................................... 4-7
  Disassembling the fuel pump ................................................................................... 4-8
  Assembling the fuel pump ....................................................................................... 4-8

Carburetor .................................................................................................................... 4-9
  Disassembling the carburetor .................................................................................. 4-12
  Checking the carburetor ......................................................................................... 4-12
  Assembling the carburetor ...................................................................................... 4-13
Special service tools

Vacuum/pressure pump gauge set
90890-06756
Hose routing
Fuel hoses

1. Fuel hose (fuel joint-to-fuel filter)
2. Fuel hose (fuel filter-to-fuel pump)
3. Fuel hose (fuel pump-to-carburetor)
### Fuel System: Fuel Filter, Fuel Pump, Fuel Joint

<table>
<thead>
<tr>
<th>No.</th>
<th>Part Name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 28 mm</td>
</tr>
<tr>
<td>2</td>
<td>Fuel joint</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bolt</td>
<td>4</td>
<td>M6 x 50 mm</td>
</tr>
<tr>
<td>4</td>
<td>Fuel pump</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Gasket</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>6</td>
<td>Fuel filter bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Fuel filter</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 16 mm</td>
</tr>
<tr>
<td>9</td>
<td>Fuel hose</td>
<td>1</td>
<td>Fuel joint-to-Fuel filter</td>
</tr>
<tr>
<td>10</td>
<td>Fuel hose</td>
<td>1</td>
<td>Fuel filter-to-Joint</td>
</tr>
<tr>
<td>11</td>
<td>Fuel hose</td>
<td>1</td>
<td>Joint-to-Fuel pump</td>
</tr>
<tr>
<td>12</td>
<td>Fuel hose</td>
<td>2</td>
<td>Fuel pump-to-Joint</td>
</tr>
<tr>
<td>13</td>
<td>Fuel hose</td>
<td>1</td>
<td>Joint-to-Joint</td>
</tr>
<tr>
<td>14</td>
<td>Fuel hose</td>
<td>2</td>
<td>Joint-to-Carburetor</td>
</tr>
<tr>
<td>15</td>
<td>Fuel hose</td>
<td>1</td>
<td>Joint-to-Carburetor</td>
</tr>
<tr>
<td>16</td>
<td>Joint</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Plastic tie</td>
<td>20</td>
<td>Not reusable</td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------</td>
<td>------</td>
<td>----------------------</td>
</tr>
<tr>
<td>1</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 16 mm</td>
</tr>
<tr>
<td>2</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fuel filter nut holder</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 14 mm</td>
</tr>
<tr>
<td>5</td>
<td>Fuel filter bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Fuel filter cap</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>8</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>9</td>
<td>Fuel filter element</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Red ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Fuel filter cup</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Fuel filter nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>15</td>
<td>Drain screw</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
## FUEL System

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fuel pump base</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Diaphragm</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Spring seat</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Spring</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Nut</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Fuel pump body</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Fuel pump valve</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Screw</td>
<td>8</td>
<td>M5 x 6 mm</td>
</tr>
<tr>
<td>9</td>
<td>Gasket</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>10</td>
<td>Diaphragm</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Diaphragm body</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Screw</td>
<td>6</td>
<td>M5 x 35 mm</td>
</tr>
</tbody>
</table>
Checking the fuel joint
1. Visually check the fuel hose connector for cracks or damage.

2. Connect the special service tool at the outlet of fuel hose connector.

3. Apply the specified pressure to check that the pressure is maintained for 10 seconds. Replace the fuel hose connector if necessary.

Checking the fuel filter
1. Check that the float ① is in the appropriate position. If water is accumulated, drain it by loosening the drain screw ②.

2. Check the fuel filter element ③ for clogging, contamination, or foreign substances, and check the fuel filter cap ④ for crack or leakage. Clean with straight gasoline, or replace them if necessary.

Note:
Apply a thin coat of gasoline to the O-ring ⑤ before assembling the fuel filter cap.

3. Finger-tight the ring nut to the full extent, so that the ridge on the ring nut is engaged into the stopper recess.
Fuel system

Checking the fuel pump

1. Disconnect the fuel hoses.

NOTE: To disconnect the fuel hoses, place a drain pan below the pump-hose connection so as not to spill any fuel.

2. Mount the special service tool at the fuel pump inlet.

3. Apply the specified positive pressure while closing the pump outlet with a finger. Make sure no air leakage is detected.

4. Apply the specified negative pressure to make sure that no air leakage is detected.

5. Mount the special service tool at the fuel pump outlet.

6. Apply the specified positive pressure to make sure that no air leakage is detected. Perform disassembly inspection, if necessary.

NOTE: Duly assemble the fuel pump valve to the fuel pump body, and moisten the inside of fuel pump with gasoline or the like to obtain better sealing ability.
Disassembling the fuel pump
1. Remove and disassemble the fuel pump to check the diaphragm for damage or breakage.

2. Check the seat valve for bending or damage. Also check the fuel pump body and the spring for damage.

3. Clean out the fouling on the fuel pump body.

Assembling the fuel pump

NOTE: Clean the parts, and keep the seat valve and the diaphragm in the gasoline before assembly to obtain prompt operation of the pump at the engine start.

1. Mount the seat valve on the pump body.

2. Mount the spring.

3. Mount the gasket, diaphragm, and cover.

NOTE: Make sure that the gasket and diaphragm are kept in place through the assembly process.
### Carburetor

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gasket</td>
<td>3</td>
<td>Not reusable</td>
</tr>
<tr>
<td>2</td>
<td>Nut</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Carburetor 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Carburetor 2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Carburetor 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Accelerator lever rod</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Choke rod</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Joint</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Choke nob</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Gasket</td>
<td>3</td>
<td>Not reusable</td>
</tr>
<tr>
<td>11</td>
<td>Intake silencer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Screw</td>
<td>12</td>
<td>M5 x 55 mm</td>
</tr>
<tr>
<td>13</td>
<td>Hose</td>
<td>1</td>
<td>M6 x 15 mm</td>
</tr>
<tr>
<td>14</td>
<td>Bolt</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Choke solenoid</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>17</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q’ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>1</td>
<td>Plug</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Gasket</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Screw</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Plate</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Pilot screw</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Spring</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Screw</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Gasket</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Air bleed plug</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Slow air jet</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Carburetor body</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Needle valve</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Clip</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Pin</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Float</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Gasket</td>
<td>3</td>
<td>Not reusable</td>
</tr>
<tr>
<td>17</td>
<td>Screw drain</td>
<td>6</td>
<td>Not reusable</td>
</tr>
</tbody>
</table>

The table lists the parts of a carburetor with their respective quantities. Some parts are marked as 'Not reusable.'
## Fuel System

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Gasket</td>
<td>6</td>
<td>Not reusable</td>
</tr>
<tr>
<td>19</td>
<td>Main jet</td>
<td>6</td>
<td>No. 1,3 : 150 / No. 2,4 : 154 / No. 5 : 152 / No. 6 : 158</td>
</tr>
<tr>
<td>20</td>
<td>Plug</td>
<td>6</td>
<td>Not reusable</td>
</tr>
<tr>
<td>21</td>
<td>Gasket</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Slow jet</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Screw</td>
<td>12</td>
<td>M5 x 16 mm</td>
</tr>
<tr>
<td>24</td>
<td>Idle adjusting screw</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Carburetor 2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Carburetor 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Choke joint</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Disassembling the carburetor

NOTE:
- Write down how many turns you have actually turned out the pilot screw.
- Disassembled jets and other components shall be sorted out and kept in order, so that they are re-assembled to the original position without fail.
- Do not bend the plate of the float.

Checking the carburetor
1. Clean the fuel passage, air passage and the carburetor body, and blow off any clogging with compressed air.

WARNING
Wear appropriate protective eye gear during the cleaning process to prevent any eye injury by the blown-off fractions or liquid.

CAUTION:
Do not use steel wire and the like for cleaning the carburetor. Do not try to disassemble the main nozzle if it does not come out easily. Excessive force may impair the performance in the serious way.

NOTE: Clean the needle valve, main jet, and pilot jet after removal.

2. Check the carburetor body for cracks or damage. Replace it if necessary.

3. Check the pilot screws and needle valves for bending or stepped wear. Replace them if necessary.

4. Check the main jet, pilot jet, main air jet, pilot air jet, and main nozzle for clogging and contamination. Clean or replace them whenever appropriate.

5. Check the float for damage, and make sure it is at the appropriate height \( a \). Replace the float or needle or both if necessary.

- Measure the float's height at the end opposite to the needle valve.
- The float should be resting on the needle valve, but not compressing it.
- Measure the distance \( a \) i.e. from carburetor mating face to the float bottom. Invert the carburetor for the measurement.

Vertical position of the float \( a \) (with gasket):
15.5 - 16.5mm (0.61-0.65 in)
Assembling the carburetor

**CAUTION:**

- Do not apply the excessive force to push-in the needle valve.
- Do not apply the excessive force to screw-in the pilot screw.

**NOTE:**

Install the pilot screw 1, turn-in until it is lightly seated, and then turn out by the specified number of turns.

![Image of carburetor assembly]

Pilot screw 1 turn-out:

1 1/8 ± 1/4 (7/8 - 1 3/8)
Power unit

Special service tools ..................................................................................................... 5-1

Power unit ..................................................................................................................... 5-2
  Checking the compression pressure ........................................................................... 5-2

Removing the power unit ........................................................................................... 5-14
  Removing the flywheel magnet ............................................................................... 5-15
  Removing the electrical components ...................................................................... 5-15

Intake manifold ............................................................................................................ 5-17
  Removing the intake manifold ................................................................................. 5-18

Exhaust ........................................................................................................................ 5-20
  Removing the exhaust cover ................................................................................... 5-21

Cylinder head ............................................................................................................... 5-22
  Removing the cylinder head ................................................................................... 5-23

Cylinder block .............................................................................................................. 5-25
  Removing the crankcase ......................................................................................... 5-27
  Removing the piston, connecting rod assembly, and the crankshaft ...................... 5-28

Piston, Connecting rod ............................................................................................... 5-29
  Disassembling the piston, and the connecting rod assembly ................................... 5-30
  Checking the cylinder block ................................................................................... 5-30
  Checking the piston ................................................................................................ 5-31
  Checking the connecting rod .................................................................................. 5-33
  Checking the crankshaft ......................................................................................... 5-33
  Installing the crankshaft .......................................................................................... 5-34
  Assembling the piston and connecting rod ............................................................. 5-35
  Installing the piston and connecting rod .................................................................. 5-36
  Installing the cylinder head ..................................................................................... 5-37
  Mounting the exhaust cover .................................................................................... 5-39
  Mounting the intake manifold .................................................................................. 5-39
  Mounting the coils ................................................................................................... 5-40
  Installing the power unit .......................................................................................... 5-40
Special service tools

Compression gauge
90890-03160

Needle bearing attachment
90890-06654

Flywheel holder
90890-06522

Driver rod L3
90890-06652

Flywheel puller
90890-06521

Bearing Separator
90890-06534

Ball bearing attachment
90890-06663, 90890-06637

Bearing outer race attachment
90890-06626, 90890-06624

Driver rod LS
90890-06606

Piston ring compressor
90890-05158

Bearing inner race attachment
90890-06661, 90890-06662
**Power unit**

**Checking the compression pressure**

1. Start the engine, warm it up for 5 minutes, and then turn it off.
2. Remove the lock plate for the engine stop switch on the remote control box.
3. Remove all spark plugs, and mount the compression gauge on spark plug hole.

**CAUTION:**

Clear out the area around the spark plugs before removal, to prevent any dirt or dust from falling into the cylinder bore.

4. Fully open the throttle valve and the choke valve, keep cranking the engine until the reading on the compression gauge stabilizes, and then check the compression pressure.

5. If the measured compression pressure is below specification, or it varies among the cylinders, add a small amount of engine oil to the cylinder, and check the pressure again.

**NOTE:**

- If the compression pressure increases, check the piston, piston rings and cylinder bore for wear. Replace them if necessary.
- If the compression pressure does not change, check the cylinder head gasket and cylinder head. Correct or replace them, if necessary.

---

**Compression gauge:**

90890-03160

**Minimum compression pressure**

*(reference data):*

520 kPa (5.2 kgf/cm², 75.4 psi)
### Part List

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flywheel cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Intake silencer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Screw</td>
<td>12</td>
<td>M5 x 55 mm</td>
</tr>
<tr>
<td>4</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>5</td>
<td>Retaining plate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Air vent hose</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Dowel pin</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Gasket</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 30 mm</td>
</tr>
<tr>
<td>11</td>
<td>Bolt</td>
<td>6</td>
<td>M8 x 135 mm</td>
</tr>
<tr>
<td>12</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>13</td>
<td>Apron</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>15</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>16</td>
<td>Upper case cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Bolt</td>
<td>4</td>
<td>M8 x 30 mm</td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>18</td>
<td>Nut</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Grommet</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Collar</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Grommet</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------</td>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td>1</td>
<td>Nut</td>
<td>1</td>
<td>□: 30 mm</td>
</tr>
<tr>
<td>2</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Flywheel magnet assembly</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bolt</td>
<td>3</td>
<td>M6 x 60 mm</td>
</tr>
<tr>
<td>5</td>
<td>Stator assembly</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pulser coil assembly</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Screw</td>
<td>4</td>
<td>M6 x 18 mm</td>
</tr>
<tr>
<td>8</td>
<td>Stopper</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Base</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Timing plate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Screw</td>
<td>1</td>
<td>M6 x 10 mm</td>
</tr>
<tr>
<td>12</td>
<td>Woodruff key</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------</td>
<td>------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>1</td>
<td>Joint</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nut</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Magnet control rod</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Accelerator link</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 25 mm</td>
</tr>
<tr>
<td>6</td>
<td>Collar</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Wave washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Accelerator cam</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Cap</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Nut</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Fully advanced stop screw</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Standard ignition timing adjusting screw</td>
<td>1</td>
<td>M8 x 45 mm</td>
</tr>
<tr>
<td>14</td>
<td>Bolt</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Collar</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Bush</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
# Power unit

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Bush</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Magnet control lever</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Shift bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Bolt</td>
<td>2</td>
<td>M8 x 30 mm</td>
</tr>
<tr>
<td>25</td>
<td>Bush</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Clamp</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Cable joint</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Clip</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Magnet control lever</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
### Part List

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td>2</td>
<td>M8 x 45 mm</td>
</tr>
<tr>
<td>2</td>
<td>Starter motor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Shim</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>1</td>
<td>M8 x 35 mm</td>
</tr>
<tr>
<td>6</td>
<td>Wire lead</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Bolt</td>
<td>1</td>
<td>M8 x 16 mm</td>
</tr>
<tr>
<td>10</td>
<td>Negative battery lead</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Wiring harness</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 16 mm</td>
</tr>
<tr>
<td>13</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>PTT relay</td>
<td>1</td>
<td>Sb</td>
</tr>
<tr>
<td>16</td>
<td>PTT relay</td>
<td>1</td>
<td>Lg</td>
</tr>
<tr>
<td>17</td>
<td>Starter relay</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Note: Torque values are also provided (29 N·m, 9 N·m, 6 N·m).
<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Holder</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Wire lead</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Connector</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Washer</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Nut</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Cover</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Positive battery lead</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Fuse</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Fuse holder</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Plastic tie</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Tube</td>
<td>1</td>
<td>Not reusable</td>
</tr>
</tbody>
</table>
## Power unit

### Parts List

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Grommet</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Washer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bolt</td>
<td>3</td>
<td>M6 x 30 mm</td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 12 mm</td>
</tr>
<tr>
<td>6</td>
<td>Screw</td>
<td>4</td>
<td>M6 x 19 mm</td>
</tr>
<tr>
<td>7</td>
<td>CDI unit cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Screw</td>
<td>4</td>
<td>M6 x 15 mm</td>
</tr>
<tr>
<td>9</td>
<td>Ignition coil</td>
<td>6</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 12 mm</td>
</tr>
<tr>
<td>11</td>
<td>Bolt</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CDI unit</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Wire</td>
<td>1</td>
<td>Charge coil</td>
</tr>
<tr>
<td>14</td>
<td>Wire</td>
<td>1</td>
<td>Pulser coil</td>
</tr>
<tr>
<td>15</td>
<td>Wire</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Wire</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Wiring harness</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>---------------</td>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td>18</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Collar</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Plug cap</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------</td>
<td>------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Wiring harness</td>
<td>1 B</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wiring harness</td>
<td>1 B</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Wiring harness</td>
<td>1 R</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Wiring harness</td>
<td>1 G</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 12 mm</td>
</tr>
<tr>
<td>6</td>
<td>Wire lead</td>
<td>1</td>
<td>Rectifier Regulator (G/W)</td>
</tr>
<tr>
<td>7</td>
<td>Wire lead</td>
<td>1</td>
<td>Rectifier Regulator (G)</td>
</tr>
<tr>
<td>8</td>
<td>Rectifier Regulator</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>10</td>
<td>Nut</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Spring washer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Washer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Spring washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Screw</td>
<td>2</td>
<td>M6 x 24 mm</td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------</td>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td>18</td>
<td>Hour meter</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Screw</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 25 mm</td>
</tr>
<tr>
<td>21</td>
<td>Collar</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Grommet</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 12 mm</td>
</tr>
<tr>
<td>25</td>
<td>Clamp</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Plastic tie</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>27</td>
<td>Choke solenoid</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>28</td>
<td>O-ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 15 mm</td>
</tr>
</tbody>
</table>
Removing the power unit

NOTE: 
If the power unit is to be disassembled, it is recommended to loosen the nut on flywheel magnet assembly before removing the power unit to improve working efficiency.

1. Disconnect the battery cable ①.

2. Disengage the remote control connector. Remove the shift cable ② and the throttle cable ③.

3. Remove the flywheel magnet cover and the intake silencer.

4. Disconnect the fuel hose ④.

5. Disconnect the wiring for power trim and tilt system, the pilot jet hose, and water pressure control valve hose. Remove the mounting bracket bolts ⑤ for shift rod assembly.

6. Remove the upper case cover ⑥ and the apron ⑦.

7. Lift up the power unit after removing the bolts and nuts. Remove the dowels.
Removing the flywheel magnet
1. Remove the nut on the flywheel magnet.

NOTE:
Screw-in the flywheel puller set bolt until the flywheel magnet comes off completely.

Flywheel puller: 90890-06521

3. Remove the Woodruff key.

Removing the electrical components
1. Remove the stator assembly.

2. Remove the pulser coil assembly.

3. Remove the starter motor.

CAUTION:
Apply force in the direction of the arrows shown. While working, take precautions against the slipping off of the flywheel holder.

CAUTION:
• Screw-in the flywheel puller set bolts evenly to the full extent.
• Make sure that the puller plate is set in parallel with the flywheel magnet.
4. Remove the starter relay, and the power trim and tilt relay assembly.

5. Remove the Rectifier Regulator, hour meter, and magnet control lever.

6. Remove the CDI unit cover.

7. Remove the CDI unit.

8. Remove the bracket.
## Intake manifold

### Diagram Note
- **1** 4 N·m (0.4 kgf·m, 3 ft·lb)
- **2** 8 N·m (0.8 kgf·m, 6 ft·lb)

### Table

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gasket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reed valve</td>
<td>6</td>
<td>Not reusable</td>
</tr>
<tr>
<td>3</td>
<td>Gasket</td>
<td>6</td>
<td>Not reusable</td>
</tr>
<tr>
<td>4</td>
<td>Clamp</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>16</td>
<td>M6 x 25mm</td>
</tr>
<tr>
<td>6</td>
<td>Bolt</td>
<td>12</td>
<td>M5 x 15mm</td>
</tr>
<tr>
<td>7</td>
<td>Hose</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Hose</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Hose</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Hose</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Clamp</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Hose</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Bolt</td>
<td>4</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>14</td>
<td>Bushing</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Damper bracket</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Removing the intake manifold

1. Remove the carburetor and the fuel hoses.

2. Remove the intake manifold, and the reed valve plate assembly.

**NOTE:**
Loosen the bolts in the sequence shown.

3. Remove the reed valve assembly.

4. Check the reed valves for cracks or damage. Replace them if necessary.
5. Check the reed valves for bending. Replace them if the bending exceeds the specified limit.

6. Measure the valve stopper height. Replace the stopper if the height exceeds the specified limit.

7. Install the reed valves.

**NOTE:**

Use new gaskets.

Valve bending limit: 0.2 mm (0.08 in)

Valve stopper height: 6.5 mm (0.26 in)
Exhaust

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td>7</td>
<td>M6 x 20mm</td>
</tr>
<tr>
<td>2</td>
<td>Cylinder cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Gasket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Gasket</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>Exhaust inner cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Exhaust outer cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bolt</td>
<td>29</td>
<td>M6 x 35mm</td>
</tr>
<tr>
<td>8</td>
<td>Gasket</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>9</td>
<td>Pressure control valve cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 20mm</td>
</tr>
<tr>
<td>11</td>
<td>Pressure control valve seat</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Pressure control valve</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Clamp</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 12 mm</td>
</tr>
<tr>
<td>16</td>
<td>Clamp</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Removing the exhaust cover

1. Remove the pressure control valve.

2. Remove the exhaust outer cover, and the exhaust inner cover.

NOTE: Loosen the bolts in the sequence shown.

3. Remove the cylinder block exhaust inner cover.

4. Check the pressure control valve for cracks or damage. Also check the pressure control valve seat for deformation. Replace them if necessary.

5. Check the spring for fatigue or deformation. Replace it if necessary.

6. Check the exhaust cover for distortion or corrosion. Replace it if necessary.
### Cylinder head

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gasket</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>2</td>
<td>Cylinder head</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>3</td>
<td>Thermostat</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>4</td>
<td>Gasket</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>Cylinder head cover</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Gasket</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Thermostat</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Thermostat cover</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Bolt</td>
<td>8</td>
<td>M6 x 40 mm</td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
<td>36</td>
<td>M6 x 30 mm</td>
</tr>
<tr>
<td>11</td>
<td>Bolt</td>
<td>24</td>
<td>M8 x 60 mm</td>
</tr>
<tr>
<td>12</td>
<td>Clamp</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Bolt</td>
<td>2</td>
<td>M8 x 20 mm</td>
</tr>
<tr>
<td>14</td>
<td>Engine hanger</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Spark plug</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Exhaust / Cylinder head

**No. Part name Q'ty Remarks**

![Exhaust / Cylinder head diagram](image_url)
Removing the cylinder head

1. Remove the spark plugs.
2. Remove the thermostat cover and the thermostat.

**NOTE:**

Loosen the bolts in the sequence shown.

3. Remove the cylinder head cover.

**NOTE:**

Loosen the bolts in the sequence shown.

4. Remove the thermostatic.
5. Remove the cylinder head.

6. Check the anodes on the cylinder block. Clean the anode's surface, and replace if it has been eroded into half or smaller.

**CAUTION:**

Do not oil, grease, or paint the anodes, otherwise they will not be able to prevent the galvanic corrosion effectively.

7. Clean out the mineral deposits and contamination on the cylinder head. Also check the possible corrosion on the cylinder head. Replace it if necessary.

8. Remove the carbon deposits on the surface of combustion chamber.

**CAUTION:**

Do not scratch the contacting surface of the cylinder head and cylinder block.
9. Check the cylinder head warpage. Replace the cylinder head if measured warpage exceeds the specified limit.

![Cylinder head diagram]

**NOTE:**
Check the warpage in the direction shown, using a straightedge and a thickness gauge.

**Warpage limit: 0.1mm (0.04in)**
Cylinder block

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q’ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 20mm</td>
</tr>
<tr>
<td>2</td>
<td>Oil seal</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>3</td>
<td>Upper bearing housing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>O-ring</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>Needle bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Crankcase</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Dowel</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bolt</td>
<td>8</td>
<td>M10 x 60mm</td>
</tr>
<tr>
<td>9</td>
<td>Bolt</td>
<td>12</td>
<td>M8 x 30mm</td>
</tr>
<tr>
<td>10</td>
<td>Oil seal housing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Oil seal</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>12</td>
<td>Oil seal</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>13</td>
<td>Bolt</td>
<td>4</td>
<td>M6 x 20mm</td>
</tr>
<tr>
<td>14</td>
<td>Gasket</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>15</td>
<td>Cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 16 mm</td>
</tr>
<tr>
<td>17</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------</td>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td>1</td>
<td>Crankshaft</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Big-end bearing</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Connecting rod cap</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Connecting rod bolt</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Circlip</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Main journal bearing</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Cylinder block</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Anode</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Screw</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Piston/connecting rod assembly</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Gasket</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Accessory plug</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Seal ring</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Cir clip</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Remarks: Not reusable

**Torque Specifications:**
- 19 N·m (1.9 kgf·m; 14 ft·lb)
- 36 N·m (3.6 kgf·m; 27 ft·lb)
- Loosen completely
- 19 N·m (1.9 kgf·m; 14 ft·lb)
- 36 N·m (3.6 kgf·m; 27 ft·lb)

**Special Note:**
- Use a 23 N·m (2.3 kgf·m; 17 ft·lb) torque wrench for tightening.
Removing the crankcase
1. Remove the bearing housing.
2. Remove the O-ring, oil seal, and needle bearing from the bearing housing.

NOTE: Once removed, oil seal and needle bearing must be replaced with the new one.

Ball bearing attachment:
- 90890-06663
- Driver rod LS: 90890-06606

3. Install a new needle bearing into the bearing housing.

Bearing inner race attachment:
- 90890-06661

4. Install a new O-ring and a new oil seal into the bearing housing.

5. Remove the oil seal housing.

6. Remove the O-ring and oil seal.

7. Install a new O-ring and a new oil seal.

Ball bearing attachment:
- 90890-06637
- Bearing outer race attachment:
  - 90890-06624
  - Driver rod LS: 90890-06606
8. Remove the crankcase.

Removing the piston, connecting rod assembly, and the crankshaft

1. Loosen the connecting rod bolts to pull out the piston toward the cylinder head.

**CAUTION:**
- Take precautions not to scratch the cylinder sleeve surface with the connecting rod big end when pulling out the piston.
- On the plane of the connecting rod / connecting rod cap mating area, mark the cylinder number from which they came with a permanent marker, so that the original condition of the mating face can be restored.
- Removed bearings must be sorted out and kept in order so that they will not be mixed up.

2. Remove the crankshaft.

**NOTE:**
Loosen the bolts in the sequence shown.

9. Check the crankcase for corrosion. Also check the mating face of the crankcase and the cylinder block for possible distortion.

**CAUTION:**
Removed roller bearings shall be placed in order on the table, with the split parts mated together.
Piston, Connecting rod

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connecting rod</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Piston</td>
<td>3</td>
<td>Starboard</td>
</tr>
<tr>
<td>3</td>
<td>Washer</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Needle bearing</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Piston pin clip</td>
<td>12</td>
<td>Not reusable</td>
</tr>
<tr>
<td>6</td>
<td>Piston pin</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Piston ring set</td>
<td>6</td>
<td>Port</td>
</tr>
<tr>
<td>8</td>
<td>Piston</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Disassembling the piston, and the connecting rod assembly
1. Remove the piston pin clip, and then remove the piston pin.
2. Separate the piston from the connecting rod.
3. Remove the bearing and washer at the connecting rod small end.
4. Remove the piston ring.

**CAUTION:**
Disassembled piston, piston ring, piston pin, connecting rod, and bearing must be sorted out and kept in order so that the components from different cylinders will not be mixed up.

Checking the cylinder block
1. Check the cylinder sleeve for cracks or damage.
2. Remove any rust or deposits on the cooling water passage wall, and check it for corrosion. Clean or replace if necessary.

**CAUTION:**
Do not scratch the contacting surface of the cylinder head and cylinder block.

3. Check the anode. Clean the anode’s surface, and replace if it has been eroded into half or smaller.

**CAUTION:**
Do not oil, grease, or paint the anodes, otherwise they will not be able to prevent the galvanic corrosion effectively.

4. Remove the carbon deposit on the exhaust passage wall, and check it for cranks or damage. Replace if necessary.

**CAUTION:**
Do not scratch the contacting surface of the cylinder head and cylinder block.
5. Measure the cylinder bore with cylinder gauge. Calculate the cylinder bore diameter (D), taper (T), and roundness (R). If the results exceeded the specified limit, rebore the cylinder sleeve, or replace the cylinder block.

**Checking the piston**

1. Check the piston outside diameter. Replace the piston if the diameter is out of specification.

   - **Piston outside diameter:**
     - 89.895 - 89.915mm
     - (3.5392 - 3.5400 in)
     - at 20°C (68 °F)
     - @: 10 mm (0.39 in)

2. Check the piston clearance. Replace the piston and the piston ring, or the cylinder block if out of specification.

   - **Piston clearance:**
     - 0.100 - 0.106mm (0.0039 - 0.0042 in)
     - at 20°C (68 °F)

3. Check the piston ring dimensions of B and T. Replace the piston ring if the dimension is out of specification.

   - **Piston ring dimensions**
     - (Top ring, Second ring):
       - B: 1.97 - 1.99mm
         - (0.0776 - 0.0783 in)
       - T: 2.7 - 2.9mm (0.1063 - 0.1142 in)
         - at 20°C (68 °F)

**NOTE:**

- Measure the cylinder bore diameter at 6 positions shown.
- To obtain the cylinder bore diameter (D), calculate the largest of D1-D6 measurements.
- Taper (T) is obtained by subtracting D5 from D1, and D6 from D2 and selecting the maximum value.
- To obtain the out of round (R), calculate the difference between D1 and D2, D3 and D4, and D5 and D6 respectively. The largest difference of the three shall apply.
- Oversize pistons is available in two sizes.
4. Check the piston ring side clearance. Replace the piston and the piston rings as a set if the measurement is out of specification.

NOTE:
• Install the piston rings in accordance with the specification, and measure the piston ring side clearance with the thickness gauge.
• Piston ring peripheral face shall be flush with piston external surface when measuring the piston ring side clearance.

Piston ring side clearance: 0.02 - 0.06mm (0.0008 - 0.0024 in) at 20°C (68°F)

5. Measure the piston ring end gaps. Replace the piston ring if the measurement is out of specification.

NOTE: Push-in the piston ring with the piston crown to the specified measuring position ♂ in the cylinder. Make sure that the cylinder sleeve bore diameter falls within the specified limit.

Piston ring end gap:
- 0.3 - 0.4mm (0.0118 - 0.0157 in) at 20°C (68°F)
- H: 20mm (0.79 in)

6. Measure the piston pin boss inside diameter. Replace the piston if the measurement is out of specification.

Piston pin boss inside diameter:
- 23.074 - 23.085mm (0.9084 - 0.9089 in) at 20°C (68°F)

7. Measure the piston pin outside diameter. Replace the piston pin if the measurement is out of specification.

Piston pin outside diameter:
- 23.065 - 23.070mm (0.9081 - 0.9083 in) at 20°C (68°F)
Checking the connecting rod
1. Check the internal surfaces of big end and small end for scratch. Replace if necessary.

2. Check the bearings at the small end and at the big end. Replace the bearings if necessary.

Checking the crankshaft
1. Remove the cir clip, and the crankshaft lower bearing.

NOTE: Use a commercially available bearing puller.

2. Check the bearing for run-out or roughness. Replace the bearing if necessary.

3. Remove the seal ring.

4. Check the seal ring for cranks or damage.

5. Measure the crankshaft journal diameter. Replace the crankshaft if the measurement is out of specification.

Crankshaft journal diameter:
53.975 - 53.991 mm
(2.1250 - 2.1256 in)
at 20°C (68°F)

6. Measure the crank pin diameter. Replace the crankshaft if the measurement is out of specification.

Crank pin diameter:
35.985 - 36.000 mm
(1.4167-1.4173 in)
at 20°C (68°F)

7. Measure the crankshaft run-out.

NOTE: Measure the run-out at the crankshaft journals using the V-block and the dial gauge.

Run-out limit: 0.03 mm (0.0012 in)
8. Install bearings and connecting rods to the crankshaft.

   Connecting rod:
   1st: 19N • m (1.9kgf • m, 14 ft • lb)
   2nd: 36N • m (3.6kgf • m, 27 ft • lb)
   3rd: Loosen completely
   4th: 19N • m (1.9kgf • m, 14 ft • lb)
   5th: 36N • m (3.6kgf • m, 27 ft • lb)

9. Measure the axial play at the connecting rod big end. Replace the bearing and the connecting rod if the measurement is out of specification.

   Axial play limit:
   2 mm (0.08 in)

NOTE:
   For measurement, set the dial gauge at the connecting rod small end in parallel to the crankshaft.

10. Measure the connecting rod side clearance. Replace the connecting rod if the measurement is out of specification.

   Connecting rod side clearance:
   0.12 - 0.26 mm (0.0047 - 0.0102 in) at 20°C (68°F)

11. Check the crankshaft journal bearings. Replace the bearings if necessary.

### Installing the crankshaft

1. Install the crankshaft bearing, and the circlip.

2. Install the two roller bearings to the center of crankshaft.

   **NOTE:**
   - Dowel hole on the roller bearings shall face the engine bottom.
   - Install the roller bearings so that the split ends are engaged correctly.

3. Install the seal rings on the crankshaft.
4. Assemble the crankshaft and the cylinder block.

NOTE:
- The dowels on the cylinder block shall be fitted into the dowel holes on the roller bearings.
- Align the seal ring end gap with the crankcase center line.

5. Install the bearing housing and the oil seal housing, and temporarily tighten the bolts.

NOTE:
- Bearing housing shall be installed with the arrow pointing to the exhaust cover.
- Oil seal housing shall be installed with the tab facing the exhaust cover.

Assembling the piston and connecting rod

1. Install the piston rings ①, ②.

NOTE: Install the piston rings with the recess for the locating pin facing up toward the piston crown.

2. Install the connecting rod, needle bearing, washer, piston pin, and the new clip.

NOTE:
- As assembled, "YAMAHA" marking on the connecting rod ③ shall be aligned with the marking on the piston ④.
- Make sure that piston and piston pin bearings are installed in the original combination.
Installing the piston and the connecting rod.

1. Insert the piston and connecting rod assembly into the cylinder.

   ![Image of piston and connecting rod]

   **NOTE:**
   - "UP" marking shall come to the upper part of the power head.
   - Make sure that the piston and connecting rod assembly is inserted into the cylinder that they came from. Assemblies with "S" mark are to be installed on the starboard side, and assemblies with "P" mark are to be installed on the port side.

   ![Image of piston ring compressor]
   
   **Piston ring compressor : 90890-05158**

2. Install the connecting rod caps.

   ![Image of connecting rod caps]

   **NOTE:**
   - Make sure that the split face of the connecting rod caps are mated correctly to the original position.
   - Apply oil on the bolts' seating face and the threaded area.

3. Tighten the connecting rod bolts alternately in the following procedure.

<table>
<thead>
<tr>
<th>Connecting rod:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st : 19 N • m (1.9 kgf • m, 14 ft • lb)</td>
</tr>
<tr>
<td>2nd : 36 N • m (3.6 kgf • m, 27 ft • lb)</td>
</tr>
<tr>
<td>3rd : Loosen completely</td>
</tr>
<tr>
<td>4th : 19 N • m (1.9 kgf • m, 14 ft • lb)</td>
</tr>
<tr>
<td>5th : 36 N • m (3.6 kgf • m, 27 ft • lb)</td>
</tr>
</tbody>
</table>

   ![Image of connecting rod tightening]

4. Install the dowels.

5. Install the crankcase.

   ![Image of crankcase installation]

   **NOTE:**
   Clean the mating face of the cylinder block and crankcase. Apply thin coating of Gasket Maker on the mating face so that it will not be squeezed out of the edge.
6. Tighten the crankcase bolts.

**NOTE:**
Tighten the bolts to the specified torques in two stages and in the sequence shown. Apply some oil on the bolt's seating face and the threaded area.

<table>
<thead>
<tr>
<th>Crankcase bolt:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st:</strong></td>
</tr>
<tr>
<td>M10 bolt:</td>
</tr>
<tr>
<td>20 N • m (2.0 kgf • m, 15 ft • lb)</td>
</tr>
<tr>
<td>M8 bolt:</td>
</tr>
<tr>
<td>10 N • m (1.0 kgf • m, 7 ft • lb)</td>
</tr>
<tr>
<td><strong>2nd:</strong></td>
</tr>
<tr>
<td>M10 bolt:</td>
</tr>
<tr>
<td>39 N • m (3.9 kgf • m, 29 ft • lb)</td>
</tr>
<tr>
<td>M8 bolt:</td>
</tr>
<tr>
<td>18 N • m (1.8 kgf • m, 13 ft • lb)</td>
</tr>
</tbody>
</table>

7. Install the rest of the bolts on the bearing housing and the oil seal housing, and tighten them.

**NOTE:**
Tighten the bearing housing starting with the bolt (1).

---

**Installing the cylinder head**

1. Check the anode on the cylinder block.

**NOTE:**
Replace the anode if it has been eroded into half or smaller.

2. Install the cylinder head.

**NOTE:**
- Tighten the cylinder head bolts in the sequence shown.
- Apply some oil on the bolts' seating face and the threaded area.
3. Install the cylinder head cover.

NOTE:
Tighten the cylinder head cover bolts to the specified torque in two stages and in the sequence shown.

<table>
<thead>
<tr>
<th>Cylinder head cover bolt:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st: 4 N\cdot m (0.4 \text{ kgf}\cdot \text{ m}, 3 \text{ ft}\cdot \text{ lb})</td>
</tr>
<tr>
<td>2nd: 8 N\cdot m (0.8 \text{ kgf}\cdot \text{ m}, 6 \text{ ft}\cdot \text{ lb})</td>
</tr>
</tbody>
</table>

4. Install the thermostat and the thermostat cover.

NOTE:
Tighten the thermostat cover bolts to the specified torques in two stages and in the sequence shown.

<table>
<thead>
<tr>
<th>Thermostat cover bolt:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st: 4 N\cdot m (0.4 \text{ kgf}\cdot \text{ m}, 3 \text{ ft}\cdot \text{ lb})</td>
</tr>
<tr>
<td>2nd: 8 N\cdot m (0.8 \text{ kgf}\cdot \text{ m}, 6 \text{ ft}\cdot \text{ lb})</td>
</tr>
</tbody>
</table>

5. Install the thermostatic switch.

6. Install the spark plugs.

Spark plug: 25 N\cdot m (2.5 \text{ kgf}\cdot \text{ m}, 18 \text{ ft}\cdot \text{ lb})
Mounting the exhaust cover
1. Install the cylinder block exhaust cover.
2. Install the exhaust outer cover, and the exhaust inner cover.

3. Install the pressure control valve.

NOTE:
Tighten the exhaust outer cover bolts to the specified torque in two stages and in the sequence shown.

Exhaust outer cover bolt:
1st : 4 N • m (0.4 kgf • m, 3 ft • lb)
2nd : 8 N • m (0.8 kgf • m, 6 ft • lb)

Mounting the intake manifold
1. Install the reed valve plate assembly, and the intake manifold.

2. Install the hoses.

NOTE:
Tighten the intake manifold bolts to the specified torque in two stages and in the sequence shown.

Intake manifold bolt:
1st : 4 N • m (0.4 kgf • m, 3 ft • in)
2nd : 8 N • m (0.8 kgf • m, 6 ft • in)
Mounting the coils
1. Install the pulser coil assembly, and the stator assembly.

2. Mount the Woodruff key, and then install the flywheel magnet.

Installing the power unit
1. Clean the mating face of the power unit and the upper case, and install dowels and new gasket.

2. Install the power unit, and tighten the bolts and nuts.

3. Tighten the flywheel magnet.

4. Install the CDI unit and the bracket.

NOTE: Apply some engine oil on the nut before tightening.

CAUTION: Apply force in the direction of the arrows shown. While working, take precautions against the slipping off of the flywheel holder.

Power unit mounting bolt: 21 N·m (2.1 kgf·m, 15 ft·lb)

Flywheel magnet nut: 160 N·m (16 kgf·m, 116 ft·lb)

Flywheel holder: 90890-06522

Ignition coil: 8 N·m (0.8 kgf·m, 6 ft·lb)
5. Install the Rectifier Regulator, hour meter, and the magnet control lever.

6. Install the starter relay, and the power trim and tilt relay assembly.

7. Install the starter motor.

8. Install the upper case cover and the apron.

9. Install the mounting bracket for the shift rod assembly.

10. Connect the power trim and tilt motor leads, pilot jet hose, and water pressure control valve hose.

11. Install the carburetor.

Terminal nut:
4 N • m (0.4 kgf • m, 3 ft • lb)

Mounting bolt:
29N • m (2.9 kgf • m, 21 ft • lb)

Terminal nut:
9N • m (0.9 kgf • m, 6 ft • lb)
12. Connect the fuel hoses.

13. Connect the shift cable, and the throttle cable.

**NOTE:**
Adjust the shift cable and the throttle cable.

14. Install the flywheel magnet cover, and the intake silencer.

15. Connect the remote control connector.

16. Connect the battery cable.

Positive terminal nut ①:
4 N•m (0.4 kgf•m, 3 ft•lb)
Negative terminal bolt ②:
6 N•m (0.6 kgf•m, 5 ft•lb)
Lower unit

Special service tools ..................................................................................................... 6-1

Lower unit (regular rotation model) ............................................................................. 6-4
  Removing the lower unit ........................................................................................... 6-7
  Removing the water pump and shift rod ................................................................. 6-8
  Checking the water pump and shift rod ............................................................... 6-8

Propeller shaft, Propeller shaft housing (regular rotation model) ..................... 6-10
  Removing the propeller shaft housing assembly .................................................... 6-12
  Disassembling the propeller shaft housing assembly ........................................... 6-12
  Checking the propeller shaft housing assembly ................................................... 6-13
  Assembling the propeller shaft housing assembly ................................................. 6-14
  Disassembling the propeller shaft assembly .......................................................... 6-15
  Checking the propeller shaft assembly ................................................................. 6-15
  Assembling the propeller shaft assembly ............................................................... 6-16

Drive shaft and lower case (regular rotation model) ......................................... 6-17
  Removing the drive shaft and forward gear .......................................................... 6-18
  Disassembling the lower case ................................................................................ 6-18
  Checking the drive shaft housing ......................................................................... 6-19
  Assembling the drive shaft housing ...................................................................... 6-19
  Checking the forward gear .................................................................................... 6-20
  Assembling the forward gear ................................................................................ 6-20
  Checking the drive shaft ........................................................................................ 6-21
  Checking the pinion gear ...................................................................................... 6-21

Assembling the lower unit (regular rotation model) ........................................ 6-21
  Installing the lower case ........................................................................................ 6-21
  Installing the water pump ...................................................................................... 6-24
  Installing the speedometer hose ......................................................................... 6-24
  Installing the lower unit ......................................................................................... 6-25

Shimming (regular rotation model) ....................................................................... 6-27
  Shimming ................................................................................................................. 6-28
  Selecting the pinion shims ...................................................................................... 6-28
  Selecting the forward gear shims .......................................................................... 6-29
  Selecting the reverse gear shims .......................................................................... 6-30

Backlash (regular rotation model) ......................................................................... 6-31
  Measuring the forward and reverse gear backlash .............................................. 6-31
Lower unit (counter rotation model) ................................................................. 6-34
  Removing the lower unit .................................................................................. 6-37
  Removing the water pump and shift rod ........................................................... 6-38
  Checking the water pump and shift rod ........................................................... 6-38

Propeller shaft, Propeller shaft housing (counter rotation model) .................. 6-40
  Removing the propeller shaft housing assembly and propeller shaft ............... 6-42
  Checking the propeller shaft assembly ............................................................ 6-43
  Disassembling the propeller shaft housing assembly ....................................... 6-44
  Checking the propeller shaft housing assembly .............................................. 6-44
  Assembling the propeller shaft and propeller shaft assembly ......................... 6-44

Drive shaft and lower case (counter rotation model) ...................................... 6-46
  Removing the drive shaft and reverse gear ...................................................... 6-47
  Disassembling the lower case ......................................................................... 6-47
  Checking the drive shaft housing .................................................................... 6-48
  Assembling the drive shaft housing .................................................................. 6-48
  Checking the reverse gear ................................................................................ 6-49
  Assembling the reverse gear ............................................................................ 6-49
  Checking the drive shaft .................................................................................. 6-49
  Checking the pinion gear .................................................................................. 6-49

Assembling the lower unit (counter rotation model) ........................................ 6-50
  Installing the lower case .................................................................................. 6-50
  Installing the water pump ................................................................................ 6-52
  Installing the speedometer hose ...................................................................... 6-53
  Installing the lower unit ................................................................................... 6-53

Shimming (counter rotation model) ................................................................. 6-55
  Shimming ......................................................................................................... 6-56
  Selecting the pinion shims .............................................................................. 6-56
  Selecting the reverse gear shims ..................................................................... 6-57
  Selecting the forward gear shims .................................................................... 6-58
  Selecting the propeller shaft shims .................................................................. 6-59

Backlash (counter rotation model) ................................................................. 6-61
  Measuring the forward and reverse gear backlash ......................................... 6-61
Special service tools

- Ring nut wrench 4
  90890-06512

- Ring nut wrench extension
  90890-06513

- Bearing housing puller claw L
  90890-06502

- Stopper guide plate
  90890-06501

- Center bolt
  90890-06504

- Bearing separator
  90890-06534

- Stopper guide stand
  90890-06538

- Bearing puller assembly
  90890-06535

- Driver rod L3
  90890-06652

- Needle bearing attachment
  90890-06653, 90890-06610, 90890-06612

- Driver rod SS
  90890-06604

- Bearing depth plate
  90890-06603
Special service tools

- Bearing inner race attachment
  90890-06642, 90890-06661, 90890-06639, 90890-06660, 90890-06662

- Driver rod LS
  90890-06606

- Drive shaft holder 6
  90890-06520

- Bearing outer race attachment
  90890-06619

- Pinion nut holder
  90890-06505

- Shift rod push arm
  90890-06052

- Bearing outer race puller assembly
  90890-06523

- Pinion height gauge
  90890-06710

- Ball bearing attachment
  90890-06636, 90890-06633, 90890-06629

- Digital caliper
  90890-06704

- Driver rod LL
  90890-06605

- Shimming plate
  90890-06701
Backlash indicator
90890-06706

Magnet base
90890-06705

Magnet base plate
90890-07003

Dial gauge set
90890-01252

Ring nut wrench
90890-06578
### Special service tools / Lower unit (regular rotation model)

#### Lower unit (regular rotation model)

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q’ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower unit</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>2</td>
<td>Check screw</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Gasket</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dowel</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>6</td>
<td>M10 x 45mm</td>
</tr>
<tr>
<td>6</td>
<td>Drain screw</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bolt</td>
<td>1</td>
<td>M10 x 45mm</td>
</tr>
<tr>
<td>8</td>
<td>Bolt</td>
<td>1</td>
<td>M10 x 70mm</td>
</tr>
<tr>
<td>9</td>
<td>Spacer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Propeller</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Propeller nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Cotter pin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Trim tab</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Cap</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Special service tools / Lower unit (regular rotation model)
<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td>3</td>
<td>M6 x 20mm</td>
</tr>
<tr>
<td>2</td>
<td>Oil seal</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>3</td>
<td>Oil seal housing</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>4</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>Spring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>6</td>
<td>Circlip</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>7</td>
<td>Shift rod</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Joint</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Plastic tie</td>
<td>3</td>
<td>Not reusable</td>
</tr>
<tr>
<td>10</td>
<td>Hose</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Joint</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Bolt</td>
<td>4</td>
<td>M8 x 45mm</td>
</tr>
<tr>
<td>13</td>
<td>Cover</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>14</td>
<td>Water seal damper</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>15</td>
<td>Water pump housing</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>16</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>17</td>
<td>Insert cartridge</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
## Lower unit (regular rotation model)

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>19</td>
<td>Impeller</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Outer plate cartridge</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Gasket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Dowel</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Woodruff key</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>24</td>
<td>Seal damper</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Guide</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Cooling water inlet cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Cooling water inlet cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Bolt</td>
<td>1</td>
<td>M5 x 45 mm</td>
</tr>
<tr>
<td>30</td>
<td>Washer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Washer</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
Removing the lower unit

1. Disconnect the battery cable.

2. Remove the lock plate for the engine stop switch.

3. Set the gear shift in neutral position.

4. Remove the drain screw, and the check screw to drain the gear oil.

5. Remove the cotter pin.

6. Place a block of wood between the anti-cavitation plate and the propeller, and remove the propeller.


7. Disconnect the speedometer hose.


8. Put the alignment mark ③ on the trim tab ① and remove it. Remove the lower unit from the upper case after loosening and removing the bolts.


NOTE: Mounting bolt appears when the trim tab is removed. Make sure that the mounting bolt is removed as well.
Lower unit (regular rotation model)

Removing the water pump and shift rod
1. Remove the water pump ① and the shift rod ②.

NOTE:
• Remove the Woodruff key from the drive shaft, and then the outer plate cartridge.
• Make sure that the dowels were removed from the lower case.

Checking the water pump and shift rod
1. Check the water pump housing ① for deformation. Also check the insert cartridge ② for wear or deformation.

2. When the insert cartridge is removed, always replace the O-ring ③ with a new one, and insert the projection on the insert cartridge into the water pump housing hole at the time of reassembly.

NOTE: When mounting the insert cartridge, apply small amount of Yamabond 4 to it, and insert the projection on the insert cartridge into the water pump housing hole.

3. Check the impeller for cracks or wear. Replace if necessary.
4. Check the Woodruff key (4) and the groove (8) for wear. Replace if necessary.

5. Check the shift rod for deformation or wear. Replace if necessary.
Propeller shaft, Propeller shaft housing (regular rotation model)

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slide shift</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ball</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Slider</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ball</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ball</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Dog clutch</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Cross pin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Cross pin ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Propeller shaft</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Reverse gear</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Reverse gear shim</td>
<td>*</td>
<td>As required</td>
</tr>
<tr>
<td>14</td>
<td>Thrust washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Ball bearing</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>16</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>17</td>
<td>Propeller shaft housing</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

145 N·m (14.5 kgf·m, 105 ft·lb)
<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q’ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Key</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Needle bearing</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>20</td>
<td>Oil seal</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>21</td>
<td>Claw washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Ring nut</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Removing the propeller shaft housing assembly.
1. Pull up the claw washer tabs, and remove the ring nut.

2. Remove the propeller shaft housing assembly, and the straight key.

NOTE: Make sure that the shims left in the lower case have been removed.

Disassembling the propeller shaft housing assembly
1. Remove the reverse gear.

NOTE: To remove the reverse gear, squeeze-in the bearing separator between the washer plate and the reverse gear.

Ring nut wrench 4: 90890-06512
Ring nut wrench extension: 90890-06513

Bearing housing puller claw L 1: 90890-06502
Center bolt 2: 90890-06504
Stopper guide plate 3: 90890-06501

Bearing separator 1: 90890-06534
Stopper guide stand 2: 90890-06538
Bearing puller assembly 3: 90890-06535
Bearing puller claw 1 4: 90890-06536

To remove the reverse gear, squeeze-in the bearing separator between the washer plate and the reverse gear.
2. Remove the ball bearing.

![Image of ball bearing removal](60h60150)

3. Remove the oil seal. Also remove the needle bearing.

![Image of oil seal and needle bearing](60h60160)

**NOTE:**
When the oil seal or the needle bearing is removed, always replace them with new ones.

**CAUTION:**
Shimming is required when the reverse gear, ball bearing, or propeller shaft housing is replaced.

---

**Checking the propeller shaft housing assembly**

1. Clean the propeller shaft housing, and check it for cracks, corrosion, or damages. Replace if necessary.

![Image of propeller shaft housing](60h60170)

2. Check the teeth and dogs of the reverse gear for cracks or wear. Replace the gear if necessary.

![Image of reverse gear](60h60180)

---

Stopper guide stand ②:
90890-06538
Bearing puller assembly ③:
90890-06535
Bearing puller claw 1 ④:
90890-06536

Driver rod L3:
90890-06652
Needle bearing attachment:
90890-06653
Assembling the propeller shaft housing assembly

1. Install a new needle bearing into the propeller shaft housing to the specified depth using a press.

2. Install the new oil seals into the propeller shaft housing to the specified depth.

NOTE: First, drive-in the inner oil seal halfway into the propeller shaft housing, and then drive-in the outer oil seal to the specified depth.

3. Install the ball bearing onto the reverse gear.

CAUTION: Place an appropriate plate on the dogs before using a press to prevent any damage to the gear teeth.

4. Install the reverse gear assembly to the propeller shaft housing.

NOTE: • Shimming is required when reverse gear or ball bearing is replaced. • Place an appropriate plate on the dogs before using a press to prevent any damage to the gear teeth.

Driver rod SS ①: 90890-06604
Needle bearing attachment ②: 90890-06610
Bearing depth plate ③: 90890-06603

Installation depth ④:
24.75 - 25.25mm (0.9744 - 0.9941 in)

Bearing inner race attachment ⑤:
90890-06661

Installation depth ⑥:
4.75 - 5.25 mm (0.1870 - 0.2067 in)
Disassembling the propeller shaft assembly

1. Remove the slide shift ①.

2. Remove the cross pin ring ②, pull out the cross pin ③, and remove the dog clutch ④.

**NOTE:** Mark the dog clutch so that it will be reinstalled in correct orientation.

3. Pull out the slider assembly ⑤.

**NOTE:** Take precautions so that the balls will not jump out while pulling out the slider.

Checking the propeller shaft assembly

1. Check the propeller shaft for bends for wear. Replace if necessary.

2. Measure the propeller shaft run-out.

3. Check the dog clutch for breakage or wear. Replace if necessary.

4. Check the slide shift and the slider for wear. Replace if necessary.
Assembling the propeller shaft assembly

1. Assemble the slider assembly.

![Diagram of propeller shaft assembly]

**NOTE:**
It is recommended to apply grease or the like to the balls to make the assembling work easier.

2. Insert the slider assembly ① into the propeller shaft ②.

**NOTE:**
Make sure that the cross pin holes are aligned when inserting the slider assembly.

3. Install the dog clutch ③ in the marked orientation, and fit-in the cross pin ④.

![Diagram showing dog clutch installation]

**NOTE:**
A new dog clutch may be installed in either ways.

4. Install the cross pin ring.

**NOTE:**
Make sure that the spring is not twisted or overlaid as installed.
Drive shaft and lower case (regular rotation model)

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drive shaft</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Drive shaft sleeve</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Oil seal</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>4</td>
<td>8 x 25mm</td>
</tr>
<tr>
<td>6</td>
<td>Drive shaft housing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Needle bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>9</td>
<td>Pinion shim</td>
<td>*</td>
<td>As required</td>
</tr>
<tr>
<td>10</td>
<td>Thrust bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Needle bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Pinion</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Forward gear shim</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>15</td>
<td>Taper roller bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Needle bearing</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>17</td>
<td>Forward gear</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Removing the drive shaft and forward gear

NOTE:
Shimming is required when the forward gear or taper roller bearing is replaced.

1. Loosen the pinion nut.

Drive shaft holder 6 ①: 90890-06520
Pinion nut holder ②: 90890-06505
Socket adapter 3 ②: 90890-06508

2. Remove the drive shaft housing.

3. Remove the drive shaft, and then the pinion gear.

4. Remove the drive shaft sleeve.

5. Remove the forward gear.

Disassembling the lower case

1. Remove the taper roller bearing outer race.

Bearing outer race puller assembly ①: 90890-06523

2. Remove the needle bearing outer race.

Ball bearing attachment ②: 90890-06636
Driver rod LL ③: 90890-06605
Checking the drive shaft housing
1. Check the drive shaft housing for cracks or damage. Also check the needle bearing for run-out and roughness, and the oil seals for damage. Disassemble them if necessary.

2. Remove the cover and the oil seals.

3. Remove the needle bearing.

NOTE:
When the needle bearing and oil seals are removed, always replace them with new ones.

Assembling the drive shaft housing
1. Install the needle bearing using a press.
Checking the forward gear
1. Check the teeth and dogs of the forward gear for cracks or wear. Also check the bearing for run-out or roughness. Disassemble them if necessary.

2. Remove the bearing.

Assembling the forward gear
1. Install the needle bearing.

2. Install a new taper roller bearing.

NOTE: Shimming is required when the taper roller bearing is replaced. Record the measured height of the new taper roller bearing.

Bearing separator ①: 90890-06534
Bearing inner race attachment ②: 90890-06639

NOTE: When the taper roller bearing is removed, always replace it with a new one.

3. Remove the needle bearing.

NOTE: When the needle bearing is removed, always replace it with a new one.

Needle bearing attachment ③: 90890-06612
Bearing depth plate ④: 90890-06603
Driver rod SS ⑤: 90890-06604

Installation depth ⑥:
20.95 - 21.45 mm (0.8248 - 0.8445 in)
Installation depth ⑦:
4.45 - 4.95 mm (0.1752 - 0.1949 in)

Bearing inner race attachment ④: 90890-06660
**Checking the drive shaft**

1. Check the drive shaft for bends or wear. Replace the shaft if necessary.

2. Measure the drive shaft run-out.

3. Check the needle bearing and the thrust bearing for run-out or roughness. Replace if necessary.

**CAUTION:**

Shimming is required when the thrust bearing is replaced.

---

**Assembling the lower unit (regular rotation model)**

**Installing the lower case**

1. Install the shims and the taper roller bearing outer race.

**CAUTION:**

Shimming is required when the forward gear, the taper roller bearing, or the lower case is replaced. Record the measured height of the bearing.

**Checking the pinion gear**

1. Check the pinion gear teeth for cracks or wear.

---

**Assembling the lower unit (regular rotation model)**

**Installing the lower case**

1. Install the shims and the taper roller bearing outer race.

**CAUTION:**

Shimming is required when the forward gear, the taper roller bearing, or the lower case is replaced. Record the measured height of the bearing.

**Checking the pinion gear**

1. Check the pinion gear teeth for cracks or wear.
3. Install the needle bearing rollers.

**NOTE:**
Apply some grease on the needle bearing rollers so that they will not fall off.

4. Install the forward gear assembly.

5. Install the drive shaft, the drive shaft sleeve, and the pinion gear. Then, temporarily tighten the nut.

**CAUTION:**
Shimming is required when the drive shaft housing or the drive shaft is replaced.

**NOTE:**
Install the drive shaft by lifting it up slightly, then aligning its splines with the pinion gear.

6. Insert the thrust bearing into the drive shaft, and install the drive shaft housing.

**NOTE:**
Shimming is required when the thrust bearing is replaced.

7. Tighten the pinion nut.

8. Install the slid shift to the propeller shaft.

9. Install the propeller shaft assembly.

**NOTE:**
- Set the dog clutch in neutral position.
- Set the shift rod joint with the stamped mark A facing upward.
10. Install the shift rod ⑦ assembly, and tighten the bolt.

11. Install the shim(s), washer, and propeller shaft housing assembly.

12. Align the key way, and install the key.

13. Install the claw washer, and tighten the ring nut.

14. Make sure that the shifting mechanism works properly.

**NOTE:**
Change the shift rod position to forward, to reverse, and to neutral. Make sure that propeller shaft rotating direction is correct in forward and in reverse. Also make sure that the position is correct in neutral.

15. Bend one of the claw washer tabs toward yourself.
Installing the water pump

1. Install the gasket ①, the dowels ②, and the outer plate cartridge ③.

2. Install the Woodruff key ④ into the drive shaft.

3. Install the impeller ⑤ after aligning it with the Woodruff key.

NOTE:
- Align the groove on the impeller with the Woodruff key.
- Apply Yamaha grease A on the sliding face between the impeller and the outer plate cartridge.

4. Install the O-ring into the water pump housing assembly ⑥, and install the water pump housing on the lower case.

Installing the speedometer hose

1. Apply Yamabond 4 to the speedometer hose, and tighten it.

NOTE: To install the water pump housing, apply Yamaha grease A to the inner face of the water pump housing assembly, and then turn the drive shaft clockwise while pushing down the pump housing.
Installing the lower unit

1. Install the dowels to the lower case.

2. Make sure that the shift rod is in neutral position. Install the lower unit to the upper case, and tighten the lower case bolts to the specified torque.

3. Install the trim tab 1 to its original position, and tighten the trim tab bolt to the specified torque.

4. Install the propeller and the propeller nut. Place a block of wood between the anti-cavitation plate and the propeller to keep the propeller from turning. Then, tighten the nut to the specified torque.

WARNING
• Place a block of wood between the anti-cavitation plate and the propeller. Do not touch the propeller with your hands.
• Disconnect the battery cable, and remove the lock plate for the engine stop switch, to prevent the engine from starting.

NOTE: If the grooves in the propeller nut do not align with the cotter pin hole, tighten the nut further until they are aligned.

| Lower case bolt: | 39 N • m(3.9 kgf • m, 29 lb • ft) |
| Trim tab bolt: | 39 N • m(3.9 kgf • m, 29 lb • ft) |
| Propeller nut: | 54 N • m(5.4 kgf • m, 40 lb • ft) |
Assembling the lower unit (regular rotation model)

5. Insert the gear oil tube or gear oil pump into the drain hole and fill the gear oil until it flows out of the check hole and no air bubbles are visible.

6. Install the check screw, and quickly install the drain screw.

Recommended gear oil:
- Hypoid gear oil
- SAE: 90

Oil quantity:
- Regular rotation model: 980 cm³ (34.5 imp oz)
Shimming (regular rotation model)
Shimming

NOTE:
- Shimming is not required when the original lower case and inner parts are reused for the lower unit reassembly.
- Shimming is required if either the lower case or the assembly parts are replaced for the lower unit reassembly.

Selecting the pinion shims

NOTE:
Obtain the pinion shim thickness (T3) by using the specified measurement(s) and the calculation formula.

Calculation formula:
Pinion shim thickness
(T3) = 80.00 + P/100 – M3 – M4

1. Measure the drive shaft housing ① and thrust washer ② height (M3).

NOTE:
- Install the thrust washer on the drive shaft housing, and turn the washer two or three times to make it seated properly.
- Take measurements at three points on the thrust bearing, and obtain the average.

2. Install the pinion height gauge to the drive shaft, and measure the distance between the pinion height gauge and the pinion.

3. Install the pinion gear to the drive shaft, and tighten the pinion gear nut to the specified torque.

4. Measure the distance between the pinion height gauge and the pinion gear (M4).

NOTE:
- Install the drive shaft in the center of the pinion height gauge.
- Tighten the wing nuts another 1/4 of a turn after they come in contact with the pinion height gauge plate.
5. Calculate the lower case standard (P/100).

NOTE:
- "P" stamped on the trim tab mounting face refers to the deviation of the lower case dimension from the standard. The numeral is in 1/100mm.
- If the numeral is unknown, assume that "P" is zero, and check the backlash when the unit is assembled. Readjustment shall be made if the measured backlash is out of specification.

6. Calculate the pinion shim thickness.

Calculation formula:
Pinion shim thickness (T3) = 80.00 + P/100 - M3 - M4

Example:
If "M3" = 46.85, "M4" = 32.52, and "P" = -5,
then:
T3 = 80.00 + (-5/100) - 46.85 - 32.52
   = 80.00 - 0.05 - 46.85 - 32.52
   = 0.58

7. Select the pinion shim(s) as follows.

<table>
<thead>
<tr>
<th>Calculated numeral at 1/100 place</th>
<th>Rounded numeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>0</td>
</tr>
<tr>
<td>3, 4, 5</td>
<td>2</td>
</tr>
<tr>
<td>6, 7, 8</td>
<td>5</td>
</tr>
<tr>
<td>9, 10</td>
<td>8</td>
</tr>
</tbody>
</table>

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

Example:
- If "T3" is 0.58mm, then the pinion shim is 0.55 mm.
- If "T3" is 0.70mm, then the pinion shim is 0.68 mm.

Selecting the forward gear shims

NOTE: Obtain the forward gear shim thickness (T1) by using the specified measurement(s) and the calculation formula.

Calculation formula:
Forward gear shim thickness (T1) = 28.60 + F/100 - M1

1. Measure the roller bearing height (M1).

NOTE:
- Turn the taper roller bearing outer race one or two or three times to make it seated properly.
- Take measurement at three points on the taper roller bearing, and obtain the average.
Shimming (regular rotation model)

2. Calculate the lower case standard (F/100).

NOTE: 
- "F" stamped on the trim tab mounting face refers to the deviation of the lower case dimension from the standard. The numeral is in 1/100 mm.
- If the numeral is unknown, assume that "F" is zero, and check the backlash when the unit is assembled. Readjustment shall be made if the backlash is out of specification.

3. Calculate the forward gear shim thickness.

Calculation formula:
Forward gear shim thickness
(T1) = 28.60 + F/100 - M1

Example:
If "M1" = 28.00, and "F" = -5, then:
T1 = 28.60 + (-5/100) - 28.00
    = 28.60 - 0.05 - 28.00
    = 0.55

4. Select the forward gear shim(s) as follows.

<table>
<thead>
<tr>
<th>Calculated numeral at 1/100 place</th>
<th>Rounded numeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2</td>
<td>0</td>
</tr>
<tr>
<td>3,4,5</td>
<td>2</td>
</tr>
<tr>
<td>6,7,8</td>
<td>5</td>
</tr>
<tr>
<td>9,10</td>
<td>8</td>
</tr>
</tbody>
</table>

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

Example:
If "T1" is 0.55 mm, then the forward gear shim is 0.52 mm.
If "T1" is 0.60 mm, then the forward gear shim is 0.58 mm.

Selecting the reverse gear shims

NOTE: 
Obtain the reverse gear shim thickness (T2) by using the specified measurement(s) and the calculation formula.

Calculation formula:
Reverse gear shim thickness
(T2) = M2 - 29.00 - R/100

1. Measure the reverse gear shim height (M2) from the thrust washer on the propeller shaft housing.

NOTE: 
Take measurements at three points on the reverse gear, and obtain the average.

<table>
<thead>
<tr>
<th>Shimming plate ①: 90890-06701</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital caliper ②: 90890-06704</td>
</tr>
</tbody>
</table>
2. Calculate the lower case standard (R/100).

![Diagram of lower unit]

**NOTE:**
- "R" @ stamped on the trim tab mounting face refers to the deviation of the lower case dimension from the standard. The numeral is in 1/100mm.
- If the numeral is unknown, assume that "R" is zero, and check the backlash when the unit is assembled. Readjustment shall be made if the backlash is out of specification.

3. Calculate the reverse gear shim thickness.

**Calculation formula:**
Reverse gear shim thickness 
\[ T2 = M2 - 29.00 - R/100 \]

**Example:**
If "M2" = 30.50, and "R" = -5, then:
\[ T2 = 30.50 - 29.00 - (-5/100) \]
\[ T2 = 30.50 - 29.00 + 0.05 \]
\[ T2 = 1.45 \]

4. Select the reverse gear shim(s) as follows.

<table>
<thead>
<tr>
<th>Calculated numeral at 1/100 place</th>
<th>Rounded numeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>3.4,5</td>
<td>2</td>
</tr>
<tr>
<td>6.7,8</td>
<td>5</td>
</tr>
<tr>
<td>9.10</td>
<td>8</td>
</tr>
</tbody>
</table>

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

**Example:**
If "T2" is 1.16mm, then the reverse gear shim is 1.15 mm.
If "T2" is 1.20mm, then the reverse gear shims is 1.18 mm.

---

**Backlash (regular rotation model)**

**NOTE:**
- Measure the backlash before installing the water pump.
- Set the gear shift in neutral position for the measurement.
- Measure the backlash for both forward and reverse gears.

**Measuring the forward and reverse gear backlash**

1. Set the gear shift in neutral.

2. Secure the propeller shaft by pressing it by the special tool.

| Shift rod push arm: 90890-06052 |

**NOTE:**
Tighten the center bolt to the specified torque.

<table>
<thead>
<tr>
<th>Center bolt ②:</th>
<th>5 N・m (0.5 kgf・m, 4 ft・lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing housing puller claw L ①:</td>
<td>90890-6502</td>
</tr>
<tr>
<td>Center bolt ②:</td>
<td>90890-06504</td>
</tr>
<tr>
<td>Stopper guide plate ③:</td>
<td>90890-06501</td>
</tr>
</tbody>
</table>
3. Install the backlash indicator onto the drive shaft.

**NOTE:**
Backlash indicator shall be installed at practically the closest position to the lower housing.

Backlash indicator ④: 90890-06706

4. Set the dial gauge onto the lower unit, and fix it where the dial gauge plunger contacts the mark ⑤ on the backlash indicator ③.

5. Set the lower unit upside down.

**NOTE:**
While checking, turn the drive shaft lightly without applying too much force.

6. Slowly turn the drive shaft clockwise and counterclockwise, and measure the backlash based on the dial gauge readings taken at the points where the drive shaft stops in each direction.

Shimming / Backlash (regular rotation model)

**NOTE:**
---

<table>
<thead>
<tr>
<th>Forward gear backlash:</th>
<th>Shim thickness(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.25 mm (0.0098 in)</td>
<td>To be decreased by (0.36-M) x 0.72</td>
</tr>
<tr>
<td>More than 0.46 mm (0.0181 in)</td>
<td>To be increased by (M-0.36) x 0.72</td>
</tr>
</tbody>
</table>

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

---

Forward gear backlash:
0.25 - 0.46 mm
(0.0098 - 0.0181 in)
7. Remove the special service tools, and secure the propeller shaft by pulling it by the propeller.

NOTE:
- Install a spacer at the back of the propeller, and tighten the propeller nut until the drive shaft does not turn any further.
- Do not install the washer.

8. Slowly turn the drive shaft clockwise and counterclockwise, and measure the backlash based on the dial gauge readings taken at the points where the drive shaft stops in each direction. Add or remove the reverse gear shim(s) if necessary.

NOTE: While checking, turn the drive shaft lightly without applying too much force.

---

**Reverse gear backlash:**

<table>
<thead>
<tr>
<th>Reverse gear backlash M</th>
<th>Shim thickness(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.74 mm (0.0291 in)</td>
<td>To be decreased by (1.02-M) x 0.72</td>
</tr>
<tr>
<td>More than 1.29 mm (0.0508 in)</td>
<td>To be increased by (M-1.02) x 0.72</td>
</tr>
</tbody>
</table>

**M: Measurement**

Available shim thickness:

0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

9. Remove all the special service tools, and install the water pump.
## Lower unit (counter rotation model)

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower unit</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Check screw</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Gasket</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Dowel</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>6</td>
<td>M10 x 45mm</td>
</tr>
<tr>
<td>6</td>
<td>Drain screw</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bolt</td>
<td>1</td>
<td>M10 x 45mm</td>
</tr>
<tr>
<td>8</td>
<td>Bolt</td>
<td>1</td>
<td>M10 x 70mm</td>
</tr>
<tr>
<td>9</td>
<td>Spacer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Propeller</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Propeller nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Cotter pin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Trim tab</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Cap</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
- Not reusable
<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td>3</td>
<td>M6 x 20mm</td>
</tr>
<tr>
<td>2</td>
<td>Oil seal</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>3</td>
<td>Oil seal housing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Circlip</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>7</td>
<td>Shift rod</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>8</td>
<td>Joint</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Plastic tie</td>
<td>3</td>
<td>Not reusable</td>
</tr>
<tr>
<td>10</td>
<td>Hose</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Joint</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Bolt</td>
<td>4</td>
<td>M8 x 45mm</td>
</tr>
<tr>
<td>13</td>
<td>Cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Seal</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>15</td>
<td>Water pump housing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>17</td>
<td>Insert cartridge</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------</td>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td>18</td>
<td>O-ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Impeller</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Outer plate cartridge</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Gasket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Dowel</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Woodruff key</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Seal damper</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Guide</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Cooling water inlet cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Cooling water inlet cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Bolt</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Washer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Washer</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

No. Part name Q'ty Remarks
18 O-ring 1 Not reusable
19 Impeller 1
20 Outer plate cartridge 1
21 Gasket 1
22 Dowel 2
23 Woodruff key 1
24 Seal damper 1
25 Guide 1
26 Nut 1
27 Cooling water inlet cover 1
28 Cooling water inlet cover 1
29 Bolt 1
30 Washer 3
31 Washer 4

M5 x 45 mm
Removing the lower unit
1. Disconnect the battery cable.

2. Remove the lock plate for the engine stop switch.

3. Set the gear shift in neutral position.

4. Remove the drain screw, and the check screw to drain the gear oil.

5. Remove the cotter pin.

6. Place a block of wood between the anti-cavitation plate and the propeller, and remove the propeller.

7. Disconnect the speedometer hose.

8. Put the alignment mark on the trim tab and remove it. Remove the lower unit from the upper case after loosening and removing the bolts.

**NOTE:**
Mounting bolt appears when the trim tab is removed. Make sure that the mounting bolt is removed as well.

**WARNING**
- Place a block of wood between the anti-cavitation plate and the propeller. Do not touch the propeller with your hands.
- Disconnect the battery cable, and remove the lock plate for the engine stop switch to prevent the engine from starting.
Removing the water pump and shift rod
1. Remove the water pump ① and the shift rod ②.

NOTE:
• Remove the Woodruff key, from the drive shaft and then the outer plate cartridge.
• Make sure that the dowels were removed from the lower case.

Checking the water pump and shift rod
1. Check the water pump housing ① for deformation. Also check the insert cartridge ② for wear or deformation.

2. When the insert cartridge is removed, always replace the O-ring ③ with a new one, and insert the projection on the insert cartridge into the water pump housing hole at the time of reassembly.

NOTE:
When mounting the insert cartridge, apply small amount of Yamahabond 4 to it, and insert the projection on the insert cartridge into the water pump housing hole.

3. Check the impeller for cracks or wear. Replace if necessary.
4. Check the Woodruff key (4) and the groove (8) for wear. Replace if necessary.

5. Check the shift rod for deformation or wear. Replace if necessary.
Lower unit / Propeller shaft, Propeller shaft housing (counter rotation model)

Propeller shaft, Propeller shaft housing (counter rotation model)

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slide shift</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ball</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Slider</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ball</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ball</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Dog clutch</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Cross pin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Cross pin ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Forward gear</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Forward gear shim</td>
<td>*</td>
<td>As required</td>
</tr>
<tr>
<td>12</td>
<td>Thrust washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Taper roller bearing</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>14</td>
<td>Propeller shaft</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Thrust bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Propeller shaft shim</td>
<td>*</td>
<td>As required</td>
</tr>
<tr>
<td>17</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
</tbody>
</table>

145 N • m (14.5 kgf • m, 105 ft • lb)
<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q’ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Propeller shaft housing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Key</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Needle bearing</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>21</td>
<td>Oil seal</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>22</td>
<td>Claw washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Ring nut</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Removing the propeller shaft housing assembly and propeller shaft

1. Pull up the claw washer tabs.

2. Remove the ring nut.

3. Remove the propeller shaft housing.

4. Remove the propeller shaft.

5. Remove the slide shift.

6. Remove the spring, pull out the cross pin, and remove the dog clutch.

NOTE: Mark the dog clutch so that it will be reinstalled in correct orientation.

7. Pull out the slider assembly.

NOTE: Take precautions so that the ball will not jump out while pulling out the slider.

NOTE: Make sure that the shims left in the lower case have been removed.

Ring nut wrench 4:
90890-06512
Ring nut wrench extension:
90890-06513

Bearing housing puller claw L:
90890-06502
Center bolt:
90890-06504
Stopper guide plate:
90890-06501
Checking the propeller shaft assembly

**CAUTION:**
Shimming is required when forward gear, taper roller bearing, or propeller shaft housing is replaced.

1. Check the propeller shaft for bends or wear. Replace if necessary.

2. Measure the propeller shaft run-out.

3. Check the dog clutch for breakage or wear. Replace if necessary.

4. Check the slide shift and the slider for wear. Replace if necessary.
5. Check the teeth and dogs of the forward gear for cracks or wear. Replace the gear if necessary.

Disassembling the propeller shaft housing assembly
1. Remove the oil seal. Also remove the needle bearing using a press.

NOTE: When the oil seal or the needle bearing is removed, always replace them with new ones.

Checking the propeller shaft housing assembly
1. Clean the propeller shaft housing, and check it for cracks or damage. Replace if necessary.

Assembling the propeller shaft and propeller shaft assembly
1. Install a new needle bearing into the propeller shaft housing to the specified depth using a press.

   ![Diagram of propeller shaft assembly]

   Driver rod SS ①: 90890-06604
   Needle bearing attachment ②: 90890-06610
   Bearing depth plate ③: 90890-06603

   Installation depth ⑤:
   24.75 - 25.25mm (0.9744 - 0.9941 in)

2. Install the new oil seals into the propeller shaft housing to the specified depth.

   ![Diagram of oil seal installation]

   Bearing inner race attachment ④: 90890-06642

   Installation depth ⑥:
   4.75-5.25 mm (0.1870 - 0.2067 in)
3. Install the propeller shaft shim, the thrust bearing and the propeller shaft to the propeller shaft housing.

4. Install the taper roller bearing and the thrust bearing to the propeller shaft housing.

5. Install the forward gear to the propeller shaft housing sub-assembly.

NOTE:  
- Place an appropriate plate on the dogs before using a press to prevent any damage to the gear teeth.
- Shimming is required when forward gear or taper roller bearing is replaced.

6. Assemble the slider assembly.

NOTE:  
It is recommended to apply grease or the like to the balls to make the assembling work easier.

7. Insert the slider assembly into the propeller shaft.

NOTE:  
Make sure that the cross pin holes are aligned when inserting the slider assembly.

8. Install the dog clutch in the marked orientation, and fit-in the cross-pin.

NOTE:  
A new dog clutch may be installed in either ways.

9. Install the cross pin ring.

NOTE:  
Make sure that the spring is not twisted or overlaid as installed.
Propeller shaft, Propeller shaft housing / Drive shaft and lower case (counter rotation model)

Drive shaft and lower case (counter rotation model)

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drive shaft</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Drive shaft sleeve</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Oil seal</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>Bolt</td>
<td>4</td>
<td>8 x 25mm</td>
</tr>
<tr>
<td>6</td>
<td>Drive shaft housing</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>7</td>
<td>Needle bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>9</td>
<td>Pinion shim</td>
<td>*</td>
<td>As required</td>
</tr>
<tr>
<td>10</td>
<td>Thrust bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Needle bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Pinion</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Reverse gear shim</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>14</td>
<td>Roller bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Needle bearing</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Thrust bearing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Reverse gear</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Removing the drive shaft and reverse gear

**NOTE:**
Shimming is required when the reverse gear or taper roller bearing is replaced.

1. Loosen the pinion nut.

2. Remove the drive shaft housing.

**NOTE:**
Note that the pinion gear shims may be stuck on the drive shaft housing.

3. Pull out the drive shaft, and remove the pinion gear.

4. Remove the drive shaft sleeve.

**NOTE:**
Make sure that none of the needles of the drive shaft needle bearing is missing.

5. Remove the reverse gear.

Disassembling the lower case

**NOTE:**
Remove the lower case only when shimming is required for the forward gear, or when replacing the taper roller bearing or needle bearing.

1. Remove the roller bearing.
2. Remove the needle bearing outer race.

**Checking the drive shaft housing**

1. Check the drive shaft housing for cracks or damage. Also check the needle bearing for run-out and roughness, and the oil seals for damage. Disassemble them if necessary.

2. Remove the cover and the oil seals.

3. Remove the needle bearing.

**NOTE:**

When the bearing and oil seals are removed, always replace them with new ones.

**Assembling the drive shaft housing**

1. Install the needle bearing.

2. First, drive-in the inner oil seal halfway into the drive shaft housing, and then drive-in the outer oil seal to the specified depth.

3. Install the cover.
Checking the reverse gear
1. Check the teeth and dogs of the reverse gear for cracks or wear. Also check the bearing for run-out and roughness.

2. Remove the needle bearing.

NOTE: When the needle bearing is removed, always replace them with a new one.

Assembling the reverse gear
1. Install the needle bearing.

Checking the drive shaft
1. Check the drive shaft for bends or wear. Replace if necessary.

2. Measure the drive shaft run-out.

3. Check the thrust bearing for run-out or roughness. Replace if necessary.

NOTE: Shimming is required when the thrust bearing is replaced.

Checking the pinion gear
1. Check the pinion gear teeth for cracks or wear.
Assembling the lower unit (counter rotation model)

Installing the lower case

1. Install the shims and the roller bearing.

   ![Diagram](60h61410)

   **CAUTION:**
   Shimming is required when the reverse gear, the roller bearing, or the lower case is replaced. Record the measured height of the bearing.

<table>
<thead>
<tr>
<th>Ball bearing attachment ①:</th>
<th>90890-06629</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver rod LL ②:</td>
<td>90890-06605</td>
</tr>
</tbody>
</table>

2. Install the needle bearing outer race.

   ![Diagram](60h600440)

3. Install the needle bearing rollers.

   **NOTE:**
   Apply some grease on the needle bearing rollers so that they will not fall off.

4. Install the drive shaft sleeve.

5. Install the reverse gear and the thrust bearing on the lower case.

6. Install the drive shaft and the pinion gear. Then, temporarily tighten the nut.

   **NOTE:**
   • Shimming is required when the drive shaft housing or the drive shaft is replaced.
   • Install the drive shaft by lifting it up slightly, then aligning its splines with the pinion gear.

7. Install the drive shaft housing assembly.

   ![Diagram](60h61450)

8. Insert the thrust bearing into the drive shaft, and install the drive shaft housing.

   **NOTE:**
   Shimming is required when the thrust bearing is replaced.

Ball bearing attachment ③: 90890-06633

Bearing outer race puller assembly ④: 90890-06523
9. Tighten the pinion nut.

10. Install the slide shift to the propeller shaft.

11. Install the shim(s), the propeller shaft and the propeller shaft housing assembly.

12. Install the shift rod assembly, and tighten the bolt.

13. Align the key way, and install the key.

14. Install the claw washer, and tighten the ring nut.

**NOTE:**
Set the dog clutch in neutral position.
15. Make sure that the shifting mechanism works properly.

NOTE: Change the shift rod position to forward, to reverse, and to neutral. Make sure that propeller shaft rotating direction is correct in forward and in reverse. Also make sure that the position is correct in neutral.

16. Bend one of the claw washer tabs toward yourself.

Installing the water pump
1. Install the gasket ①, the dowels ②, and the outer plate cartridge ③.

2. Install the Woodruff key ④ into the drive shaft.

3. Install the impeller ⑤ after aligning it with the woodruff key.

NOTE:  
- Align the groove on the impeller with the Woodruff key.
- Apply Yamaha grease A on the sliding face between the impeller and the outer plate cartridge.
4. Install the O-ring into the water pump housing assembly ⑧, and install the water pump housing on the lower case.

**NOTE:**
To install the water pump housing, apply Yamaha grease A to the inner face of the water pump housing assembly, and then turn the drive shaft clockwise while pushing down the pump housing.

**Installing the lower unit**
1. Install the dowels to the lower case.

2. Make sure that the shift rod is in neutral position. Install the lower unit to the upper case, and tighten the bolts to the specified torque.

3. Install the trim tab ① to its original position, and tighten the trim tab bolt to the specified torque.

**Installing the speedometer hose**
1. Apply Yamabond 4 to the speedometer hose, and tighten it.

**Lower case bolt:**
39 N·m (3.9 kgf·m, 29 lb·ft)

**Trim tab bolt:**
39 N·m (3.9 kgf·m, 29 lb·ft)
4. Install the propeller and the propeller nut. Place a block of wood between the anti-cavitation plate and the propeller to keep the propeller from turning. Then, tighten the nut to the specified torque.

5. Insert the gear oil tube or gear oil pump into the drain hole and fill the gear oil until it flows out of the check hole and no air bubbles are visible.

**WARNING**

- Place a block of wood between the anti-cavitation plate and the propeller. Do not touch the propeller with your hands.
- Disconnect the battery cable, and remove the lock plate for the engine stop switch, to prevent the engine from starting.

**NOTE:**

If the grooves in the propeller nut do not align with the cotter pin hole, tighten the nut further until they are aligned.

- Propeller nut: 54 N • m (5.4 kgf • m, 40 lb • ft)
Shimming (counter rotation model)
Shimming

NOTE:  
• Shimming is not required when the original lower case and inner parts are reused for the lower unit reassembly.
• Shimming is required if either the lower case or the assembly parts are replaced for the lower unit reassembly.

Selecting the pinion shims

NOTE:  
Obtain the pinion shim thickness (T3) by using the specified measurement(s) and the calculation formula.

Calculation formula:  
Pinion shim thickness  
(T3) = 80.00 + \( \frac{P}{100} \) - M3 - M4

1. Measure the drive shaft housing ① and thrust washer ② height (M3).

NOTE:  
• Set the thrust washer on the drive shaft housing, and turn it two or three times to make it seated properly.
• Take measurements at three points on the thrust bearing, and obtain the average.

2. Measure the datum distance on the drive shaft. Initially, install the pinion height gauge to the drive shaft.

3. Install the pinion gear to the drive shaft, and tighten the pinion gear nut to the specified torque.

4. Measure the distance between the pinion height gauge and the pinion gear (M4).

NOTE:  
• Install the drive shaft in the center of the pinion height gauge.
• Tighten the wing nuts another 1/4 of a turn after they come in contact with the pinion height gauge plate.
5. Calculate the lower case standard (P/100).

NOTE: 
- "P" @ stamped on the trim tab mounting face refers to the deviation of the lower case dimension from the standard. The numeral is in 1/100mm.
- If the numeral is unknown, assume that "P" is zero, and check the backlash when the unit is assembled. Readjustment shall be made if the measured backlash is out of specification.

6. Calculate the pinion shim thickness.

Calculation formula:
Pinion shim thickness 
(T3) = 80.00 + P/100 - M3 - M4

Example:
If "M3" = 46.85, "M4" = 32.52, and "P" = -5, then:
T3 = 80.00 + (-5/100) - 46.85 - 32.52
   = 80.00 - 0.05 - 46.85 - 32.52
   = 0.58

7. Select the pinion shim(s) as follows.

<table>
<thead>
<tr>
<th>Calculated numeral at 1/100 place</th>
<th>Rounded numeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>3.4, 5</td>
<td>2</td>
</tr>
<tr>
<td>6.7, 8</td>
<td>5</td>
</tr>
<tr>
<td>9.10</td>
<td>8</td>
</tr>
</tbody>
</table>

Available shim thickness: 
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

Example:
If "T3" is 0.58mm, then the pinion shim is 0.55 mm.
If "T3" is 0.70mm, then the pinion shim is 0.68 mm.

Selecting the reverse gear shims

NOTE: 
Obtain the reverse gear shim thickness (T1) by using the specified measurement(s) and the calculation formula.

Calculation formula:
Reverse gear shim thickness 
(T1) = 29.10 + F/100 - M1

1. Measure the roller bearing ① and the thrust bearing ② height (M1).
NOTE:

- Set the thrust bearing and the race on the roller bearing, and turn them two or three times to make them seated properly.
- Measure the bearing height at three points and obtain the average.

2. Calculate the lower case standard (F/100).

NOTE:

- "F" stamped on the trim tab mounting face refers to the deviation of the lower case dimension from the standard. The numeral is in 1/100 mm.
- If the numeral is unknown, assume that "F" is zero, and check the backlash when the unit is assembled. Readjustment shall be made if the backlash is out of specification.

3. Calculate the reverse gear shim thickness.

Calculation formula:
Reverse gear shim thickness
\( T_1 = 29.10 + \frac{F}{100} - M_1 \)

Example:
If "M_1" = 27.95, and "F" = -5, then:
\[
T_1 = 29.10 + \left(-\frac{5}{100}\right) - 27.95 \\
= 29.10 - 0.05 - 27.95 \\
= 1.10
\]

4. Select the reverse gear shim(s) as follows.

<table>
<thead>
<tr>
<th>Calculated numeral at 1/100 place</th>
<th>Rounded numeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>3.4,5</td>
<td>2</td>
</tr>
<tr>
<td>6.7,8</td>
<td>5</td>
</tr>
<tr>
<td>9.10</td>
<td>8</td>
</tr>
</tbody>
</table>

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

Selecting the forward gear shims

NOTE:

Obtain the forward gear shim thickness (T2) by using the specified measurement(s) and the calculation formula.

Calculation formula:
Forward gear shim thickness
\( T_2 = M_2 - 29.50 - \frac{R}{100} \)

1. Measure the forward gear shim height (M2) from the thrust washer on the propeller shaft housing. The measurement shall be made while the dog clutch is removed from the housing.

NOTE:

Take measurements at four points on the forward gear, and obtain the average.

Shimming plate (1): 90890-06701
Digital caliper (2): 90890-06704
2. Calculate the lower case standard (R/100).

NOTE: 
- "R" stamped on the trim tab mounting face refers to the deviation of the lower case dimension from the standard. The numeral is in 1/100mm. 
- If the numeral is unknown, assume that "R" is zero, and check the backlash when the unit is assembled. Shimming shall be readjusted if the backlash is out of specification.

3. Calculate the forward gear shim thickness.

Calculation formula:
Forward gear shim thickness (T2) = M2 - 29.50 - R/100

Example:
If "M2" = 30.5, and "R" = -5, then:
T2 = 30.5 - 29.50 - (-5/100)
= 30.5 - 29.50 + 0.05
= 1.05

4. Select the forward gear shim(s) as follows.

<table>
<thead>
<tr>
<th>Calculated numeral at 1/100 place</th>
<th>Rounded numeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>3.4, 5</td>
<td>2</td>
</tr>
<tr>
<td>6.7, 8</td>
<td>5</td>
</tr>
<tr>
<td>9, 10</td>
<td>8</td>
</tr>
</tbody>
</table>

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

Example:
If "T2" is 1.16mm, then the reverse gear shim is 1.15 mm.
If "T2" is 1.20mm, then the reverse gear shims is 1.18 mm.

Selecting the propeller shaft shims

NOTE: 
- Obtain the propeller shaft shim thickness (T4) by using the specified measurement(s) and the calculation formula.

Calculation formula:
Propeller shaft shim thickness (T4) = 29.00 - A/100 + B/100 - M5 - M6

1. Measure the height of the roller bearing outer race (1) from the inner race. (M5)

NOTE: 
Set the thrust bearing and the race on the roller bearing, turn them two or three times to make them seated properly. Measure the bearing height at three points and obtain the average.

Shimming plate (2): 90890-06701
Digital caliper (3): 90890-06704

2. Measure the thickness of propeller shaft flange (4) and the thrust bearing (5) (M6)
NOTE: ____________________________
Turn the thrust bearing two or three times to make it seated properly.
Measure the flange and bearing thickness at three points, and obtain the average.

Digital caliper: 90890-06704

3. Calculate the propeller shaft housing standard (A/100 and B/100).

NOTE: ____________________________
- "A" and "B" stamped on the propeller shaft housing refers to the deviation of the propeller shaft housing dimension from the standard. The numeral is in 1/100mm.
- If the numerals are unknown, make calculation assuming "A" and "B" are zero, and measure the end play when the unit is assembled. Shimming shall be readjusted if the end play is out of specification.

4. Calculate the propeller shaft shim thickness.

Calculation formula:
Reverse gear shim thickness
\[(T4) = 29.00 - A/100 + B/100 - M5 - M6\]

Example:
If "M5" = 15.15, "M6" = 13.15, "A" = -5, and "B" = -5, then:
\[T4 = 29.00 - (-5/100) + (-5/100) - 15.15 - 13.15 = 29.00 + 0.05 - 0.05 - 15.15 - 13.15 = 0.70\]

5. Select the propeller shaft shim(s) as follows.

<table>
<thead>
<tr>
<th>Calculated numeral at 1/100 place</th>
<th>Rounded numeral</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>3, 4, 5</td>
<td>2</td>
</tr>
<tr>
<td>6, 7, 8</td>
<td>5</td>
</tr>
<tr>
<td>9, 10</td>
<td>8</td>
</tr>
</tbody>
</table>

Available shim thickness: 0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

Example:
If "T4" is 0.45mm, then the propeller shaft gear shim is 0.42 mm.
If "T4" is 0.60mm, then the propeller shaft gear shim is 0.58 mm.

6. If "A" and "B" on the propeller shaft housing is unknown, measure the propeller shaft end play.

7. Install the shim, the thrust bearing, the propeller shaft, and the taper roller bearing on the propeller shaft housing.

8. After installation, secure the propeller shaft housing with a vise or the like to measure the end play. Shimming shall be readjusted if the measured end play is out of specifications.

Propeller shaft end play: 0.25-0.35 mm (0.0098 - 0.0138 in)

Magnet base ⑥: 90890-06705
Magnet base plate: 90890-07003
Dial gauge set ⑦: 90890-01252
Backlash (counter rotation model)

NOTE:
• Measure the backlash after removing the water pump.
• Set the gear shift in neutral position for the measurement.
• Measure the backlash for both forward and reverse gears.

Measuring the forward and reverse gear backlash
1. Set the gear shift in neutral

2. Secure the propeller shaft by pressing it by the special tool.

NOTE:
Tighten the center bolt until the drive shaft cannot be turned any further.

Center bolt ②: 5 N・m (0.5 kgf・m, 4 ft・lb)

3. Install the backlash indicator onto the drive shaft.

NOTE:
Backlash indicator shall be installed at practically the closest position to the lower housing, having 22.4mm of outer diameter.

4. Set the dial gauge onto the lower unit, and fix it where the dial gauge plunger contact the mark ⑥ on the backlash indicator ⑤.

5. Set the lower unit upside down.

6. Slowly turn the drive shaft clockwise and counterclockwise, and measure the backlash based on the dial gauge readings taken at the points where the drive shaft stops in each direction.

NOTE:
While checking, turn the drive shaft lightly without applying too much force.
Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

Forward gear backlash:
0.21 - 0.43 mm
(0.0083 - 0.0169 in)

Forward gear backlash \( M \) Shim thickness(mm)

| Less than 0.21 mm (0.0083 in) | To be decreased by \((0.32-M) \times 0.72\) |
| More than 0.43 mm (0.0169 in) | To be increased by \((M-0.32) \times 0.72\) |

M : Measurement

7. Remove the special service tools from the propeller shaft.

8. Turn the shift rod into the reverse position \( \textcircled{c} \) with the shift rod push arm.

9. Turn the drive shaft clockwise until the dog clutch is fully engaged.

10. Turn the shift rod to the neutral position \( \textcircled{d} \) with the shift rod push arm.

11. Turn the drive shaft counterclockwise by approximately 30°.

12. Turn the shift rod to the reverse position \( \textcircled{c} \) with the shift rod push arm.

13. Slowly turn the drive shaft clockwise and counterclockwise and measure the backlash when the drive shaft stops in each direction.

Reverse gear backlash:
0.98 - 1.30 mm
(0.0386 - 0.0512 in)
NOTE: When measuring the reverse gear backlash, turn the shift rod push arm towards the reverse position with force.

14. Add or remove shim(s) if out of specification.

<table>
<thead>
<tr>
<th>Reverse gear backlash M</th>
<th>Shim thickness(mm)</th>
<th>To be decreased by</th>
<th>To be increased by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.98 mm (0.0386 in)</td>
<td>(1.14-M) x 0.72</td>
<td>(M-1.14) x 0.72</td>
<td></td>
</tr>
<tr>
<td>More than 1.30 mm (0.0512 in)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

M : Measurement

Available shim thickness:
0.10, 0.12, 0.15, 0.18, 0.30, 0.40, 0.50

15. Remove the special service tools, and then install the water pump assembly.
Bracket unit

Special service tools ..................................................................................................... 7-1

Bottom Cowling ............................................................................................................. 7-2

Upper case .....................................................................................................................7-6
  Removing the upper case ................................................................. 7-10
  Disassembling the upper case .............................................................. 7-10
  Checking the upper case .......................................................... 7-12
  Assembling the upper case ...................................................... 7-12

Power trim and tilt unit .......................................................................................... 7-15
  Bleeding the power trim and tilt unit (Built-in) ........................................ 7-15
  Removing the power trim and tilt unit ...................................................... 7-17
  Checking the hydraulic pressure of the power trim and tilt unit .............. 7-18

PTT motor and Reservoir ...................................................................................... 7-21
  Disassembling the PTT motor ................................................................. 7-23
  Checking the PTT motor ................................................................................. 7-24
  Assembling the PTT motor .............................................................. 7-25
  Disassembling the reservoir .......................................................... 7-28
  Disassembling the gear pump unit ................................................................. 7-28
  Checking the reservoir and gear pump unit ...................................................... 7-30
  Assembling the reservoir and gear pump unit ...................................................... 7-30

Tilt cylinder and trim cylinder .............................................................................. 7-32
  Disassembling the tilt cylinder and trim cylinder ...................................................... 7-34
  Checking the tilt cylinder and trim cylinder ...................................................... 7-34
  Assembling the power trim and tilt unit .............................................................. 7-36
  Bleeding the power trim and tilt unit ...................................................... 7-39
  Installing the power trim and tilt unit .............................................................. 7-40

Steering arm ........................................................................................................... 7-41
  Removing the steering arm .............................................................. 7-42
  Installing the steering arm .............................................................. 7-42

Clamp brackets ........................................................................................................... 7-44
  Disassembling the clamp brackets .............................................................. 7-46
  Assembling the clamp brackets .............................................................. 7-46
  Install the upper case ................................................................................. 7-47
  Adjusting the trim sensor cam .............................................................................. 7-47
Special service tools

Hydraulic pressure gauge:
90890-06776

Up-relief fitting:
90890-06773

Down-relief fitting:
90890-06774

Trim & tilt wrench:
90890-06548
# Bottom Cowling

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Clip</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Shift rod</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bush</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Shift rod lever</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bush</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Shift rod bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Grease nipple</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Circlip</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>12</td>
<td>Rubber seal</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Ball</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Bushing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Bolt</td>
<td>2</td>
<td>M8 x 30 mm</td>
</tr>
<tr>
<td>17</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>----------------</td>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td>1</td>
<td>Wire harness clamp</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>3</td>
<td>Plate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bolt</td>
<td>1</td>
<td>M8 x 20 mm</td>
</tr>
<tr>
<td>5</td>
<td>Bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Clamp</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Pin</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Holder</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Washer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Hook</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Washer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Bushing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 10 mm</td>
</tr>
<tr>
<td>17</td>
<td>Lever</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------</td>
<td>------</td>
<td>---------------------</td>
</tr>
<tr>
<td>18</td>
<td>Bushing</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Trailer switch holder</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 28 mm</td>
</tr>
<tr>
<td>21</td>
<td>Trailer switch</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Rubber seal</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Screw</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Clamp</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 20 mm</td>
</tr>
<tr>
<td>27</td>
<td>Clamp</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Pilot jet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Hose</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Bolt</td>
<td>4</td>
<td>M8 x 35 mm</td>
</tr>
<tr>
<td>31</td>
<td>Read</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Grommet</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Collar</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------</td>
<td>------</td>
<td>-----------------</td>
</tr>
<tr>
<td>35</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Bolt M6 x 15 mm</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Retaining plate</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>Clamp</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Upper case

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nut</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Upper mount</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bolt</td>
<td>2</td>
<td>M12 x 190 mm</td>
</tr>
<tr>
<td>9</td>
<td>Bushing</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Nut</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Bolt</td>
<td>4</td>
<td>M10 x 45 mm</td>
</tr>
<tr>
<td>13</td>
<td>Mount housing</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Spring</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Lower mount</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------</td>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td>18</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Ground lead</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Bolt</td>
<td>2</td>
<td>M14 x 180 mm</td>
</tr>
<tr>
<td>21</td>
<td>Upper case assembly</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Ground lead</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Hose</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Bolt</td>
<td>3</td>
<td>M10 x 45 mm</td>
</tr>
<tr>
<td>25</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 10 mm</td>
</tr>
<tr>
<td>27</td>
<td>Bolt</td>
<td>4</td>
<td>M6 x 30 mm</td>
</tr>
<tr>
<td>28</td>
<td>Plastic tie</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------</td>
<td>------</td>
<td>---------------</td>
</tr>
<tr>
<td>1</td>
<td>Bolt</td>
<td>6</td>
<td>M8 x 45 mm</td>
</tr>
<tr>
<td>2</td>
<td>Gasket</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>3</td>
<td>Union joint</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Upper exhaust guide</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Gasket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Lower exhaust guide</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bolt</td>
<td>7</td>
<td>M8 x 30 mm</td>
</tr>
<tr>
<td>8</td>
<td>Gasket</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>9</td>
<td>Exhaust manifold</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
<td>4</td>
<td>M8 x 45 mm</td>
</tr>
<tr>
<td>11</td>
<td>Gasket</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>12</td>
<td>Muffler</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Bolt</td>
<td>4</td>
<td>M8 x 45 mm</td>
</tr>
<tr>
<td>14</td>
<td>Rubber damper</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Clip</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Rubber seal</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Dowel</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------</td>
<td>-----</td>
<td>---------------</td>
</tr>
<tr>
<td>18</td>
<td>Upper case</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Rubber seal</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Pipe</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Rubber seal</td>
<td>1</td>
<td>X transom</td>
</tr>
<tr>
<td>22</td>
<td>Muffler 2</td>
<td>1</td>
<td>X transom</td>
</tr>
<tr>
<td>23</td>
<td>Rubber seal</td>
<td>1</td>
<td>X transom</td>
</tr>
<tr>
<td>24</td>
<td>Bushing</td>
<td>1</td>
<td>X transom</td>
</tr>
<tr>
<td>25</td>
<td>Circlip</td>
<td>1</td>
<td>X transom</td>
</tr>
<tr>
<td>26</td>
<td>Cap</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Grommet</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Rubber seal</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

21 N·m (2.1 kgf·m, 15 ft·lb)
18 N·m (1.8 kgf·m, 13 ft·lb)
Removing the upper case
1. Disconnect the ground lead.

2. Remove the lower mount cover.

NOTE: Cover may pop up by the spring force. Hold it down by hand when loosening the screw.

3. Remove the lower case by loosening the upper mount and lower mount nuts.

Disassembling the upper case
1. Remove the pressure control valve hose, exhaust rubber seal, and upper exhaust guide rubber seal.

NOTE: Upper exhaust guide rubber seal is attached with adhesive.
5. Remove the muffler assembly, the rubber seal and dowels.

7. Remove the exhaust manifold.

5. Remove the muffler.

6. Remove the water tube and rubber damper from the muffler.

8. Remove the lower exhaust guide.

NOTE: In addition, remove the muffler 2 for X transom model. Muffler 2 is to be removed downward.
9. Remove the pressure control valve union joint from the upper exhaust guide.

Checking the upper case
1. Check the union joint and hose for damage. Replace if necessary.

2. Check the rubber damper for deterioration. Replace if necessary.

3. Check the water tube for deformation or corrosion. Replace if necessary.

4. Check the exhaust guide, exhaust manifold, and muffler for damage or corrosion. Replace if necessary.

Assembling the upper case
1. Install the pressure control valve union joint to the upper exhaust guide.
2. Install a new gasket and the lower exhaust guide onto the upper exhaust guide. Temporarly tighten the bolts.

3. Install exhaust manifold and a new gasket. Tighten up all the bolts.

4. Install the rubber damper and spring nut on the muffler. Also install the water seal and water tube.

**NOTE:**
Install the water tube so that it fits in the water pump.

5. Install a new gasket on the muffler that has been fitted with the components specified above.

6. Install a new rubber seal on the muffler assembly. Also install the dowels and a new rubber seal on the upper case.

**NOTE:**
Install the muffler 2 first for X transom model.

**Exhaust manifold bolts:**
18 N·m (1.8 kgf·m, 13 ft·lb)
7. Install the muffler assembly to the upper case.

NOTE: 
Apply Yamaha grease A at the tip of water pump tube, and positively fit it into the hole on the upper case.

8. Install the upper mount bracket.

9. Install the springs on the lower mount bracket, and attach the lower mount onto the upper case.

NOTE: 
Fit the spring in the groove for installation.

10. Install the pressure control valve union joint and hose, exhaust rubber seal, and upper exhaust guide rubber seal.

NOTE: 
Attach the upper exhaust guide rubber seal with adhesive.
Power trim and tilt unit
Bleeding the power trim and tilt unit (Built-in)

NOTE: ________________
Check the fluid level before bleeding if the power trim and tilt unit does not operate while PTT motor is working.

1. Turn the manual valve counterclockwise to the full extent.

2. Fully tilt up the outboard motor, and release it to let it down by its own weight. Repeat this operation four or five times.

3. Turn the manual valve clockwise to the full extent.

4. Let the fluid settle for 5 minutes.

5. Push and hold the power trim and tilt switch in the up position to check that the outboard motor is fully tilted up.

NOTE: ________________
Overhaul the power trim and tilt unit if the outboard motor cannot be tilted up to the full extent.

6. Lock the outboard motor with the tilt stop lever ①.

WARNING
After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the power trim and tilt unit should lose fluid pressure.

7. Remove the reservoir cap, and check the fluid level. If the level is low, add sufficient fluid of the recommended type.

NOTE: ________________
Repeat the procedures described above until the fluid level becomes stable.

Recommended power trim and tilt fluid:
ATF Dexron II
<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power trim and tilt unit</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PTT motor lead</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Shaft</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Plastic tie</td>
<td>3</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>Circlip</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>6</td>
<td>Bolt</td>
<td>2</td>
<td>M8 x 16 mm</td>
</tr>
<tr>
<td>7</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Shaft</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Bushing</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
<td>1</td>
<td>M6 x 10 mm</td>
</tr>
<tr>
<td>11</td>
<td>Ground lead</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Removing the power trim and tilt unit

1. Fully tilt up the outboard motor, and lock it with the tilt stop lever ①.

2. Disconnect the ground lead under the power trim and tilt unit.

3. Remove the plastic tie, and pull out the PTT motor lead.

4. Remove the bolts, and pull out the lower mount shaft.

**WARNING**

After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the power trim and tilt unit should lose fluid pressure.

**NOTE:**

If the power trim and tilt does not operate, loosen the manual valve and tilt up the outboard motor by hands. Tighten the manual valve.

Manual valve:
3 N·m (0.3kgf·m, 3 ft·lb)
5. Remove the circlip, and pull out the upper mount shaft.

NOTE: Pull out the upper mount pins downwardly at an angle, while holding the power trim and tilt unit with a hand.

6. Remove the collar.

Checking the hydraulic pressure of the power trim and tilt unit

1. Check the fluid level. If it is lower than the correct level, add sufficient fluid of the recommended type. Install the reservoir cap after checking the fluid level.

NOTE: If the fluid is at the correct level, the fluid should overflow out of the check hole when the cap is removed.

Reservoir cap:
- 0.7 N • m (0.07 kgf • m, 0.5 ft • lb)

Recommended power trim and tilt fluid:
- ATF Dexron II

2. Fully extend the power trim and tilt rods.

3. Remove the circlip (1) and manual valve (2). Install the hydraulic pressure gauge (4) and up-relief fitting (3).

NOTE: Quickly install the hydraulic pressure gauge and up-relief fitting so that the fluid will not flow out of the hole.

Hydraulic pressure gauge (4):
- 9 N • m (0.9 kgf • m, 6 ft • lb)
- 4 N • m (0.4 kgf • m, 3 ft • lb)

4. Tighten up the hydraulic pressure gauge and up-relief fitting.

Up-relief fitting (3): 90890-06776

Up-relief fitting (3): 90890-06773

Hydraulic pressure gauge (4):
- 9 N • m (0.9 kgf • m, 6 ft • lb)
- 4 N • m (0.4 kgf • m, 3 ft • lb)
5. Connect the power trim and tilt motor leads to the battery terminals, and fully retract the trim and tilt rods.

6. Connect the power trim and tilt motor leads to the battery terminals, and fully extend the trim and tilt rods. Measure the hydraulic pressure while keeping the rods at fully extended position.

7. Replace the up-relief fitting with the down-relief fitting.

8. Tighten up the hydraulic pressure gauge and down-relief fitting.

9. Check the fluid level. If it is lower than the correct level, add sufficient fluid of the recommended type. Install the reservoir cap after checking the fluid level.

**NOTE:**
If the fluid is at the correct level, the fluid should overflow out of the check hole when the cap is removed.
10. Connect the power trim and tilt motor leads to the battery terminals, and fully retract the trim and tilt rods. Measure the hydraulic pressure while keeping the rods at fully retracted position.

<table>
<thead>
<tr>
<th>Rods</th>
<th>PTT motor leads</th>
<th>Battery terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOWN</td>
<td>Green(G)</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Blue(L)</td>
<td>–</td>
</tr>
</tbody>
</table>

Hydraulic pressure (DOWN): 6-9 Mpa (60-90 kgf/cm²)

11. Connect the power trim and tilt motor leads to the battery terminals, and fully extend the trim and tilt rods.

<table>
<thead>
<tr>
<th>Rods</th>
<th>PTT motor leads</th>
<th>Battery terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP</td>
<td>Blue(L)</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Green(G)</td>
<td>–</td>
</tr>
</tbody>
</table>

12. If the hydraulic pressure falls within the specification, remove the hydraulic pressure gauge and down-relief fitting, and reinstall the manual valve and circlip. If the hydraulic pressure is out of specification, overhaul the power trim and tilt unit.
<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power trim and tilt motor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reservoir</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Reservoir cap</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>5</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>6</td>
<td>Bolt</td>
<td>3</td>
<td>1/4 x 35 mm</td>
</tr>
<tr>
<td>7</td>
<td>Bolt</td>
<td>4</td>
<td>1/4 x 35 mm</td>
</tr>
<tr>
<td>8</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>9</td>
<td>Filter</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Joint</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
No. | Part name   | Q'ty | Remarks     |
--- | ---------- | ---- |------------|
 1  | Screw     | 1   | M4 x 15 mm |
 2  | Stator    | 1   |            |
 3  | Armature  | 1   |            |
 4  | O-ring    | 1   | Not reusable|
 5  | Screw     | 2   | M4 x 10 mm |
 6  | Brush holder | 1  |            |
 7  | Brush 2   | 1   |            |
 8  | Brush 1   | 1   |            |
 9  | Brush holder | 1  |            |
10  | Brush spring | 2  |            |
11  | PTT motor base | 1  |            |
12  | Oil seal  | 1   | Not reusable|
13  | Bearing   | 1   |            |
14  | Screw     | 2   | M4 x 15 mm |
Disassembling the PTT motor

1. Remove the PTT motor, O-ring, filter, and drive pin.

CAUTION:

Make sure that the tilt rod and trim rods are fully extended when removing the PTT motor. If they are not, fluid may spurt out from the unit due to the internal pressure. Do not push down the tilt and trim rods while the PTT motor is removed. Fluid may spurt out from the unit.

2. Clean the filter, and check it for damage. Replace the filter if it is damaged.

3. Slide out the lead holder ① and rubber spacer ②. Then, slide out the stator ③. Remove the stator ③.

NOTE:
Place a clean cloth over the end of the armature shaft, and hold it with a pair of pliers, while pulling out the stator ③ carefully.

4. Remove the armature.

CAUTION:

Do not allow grease or oil to contact the commutator while working on it.

5. Disconnect the blue(L) lead ④.

NOTE:
Hold down the brush while pulling out the lead.

6. Disconnect the green (G) lead ⑤, and remove the brush ⑥.

CAUTION:

- Do not pull out the PTT motor lead from the stator.
- Do not touch the bimetal ⑨, otherwise the operation of the circuit breaker may be affected.
PTT motor and Reservoir

Checking the PTT motor
1. Check the blush length A. Replace the blush if it is shorter than the specified limit.

![Brush length limit A: 4.8 mm (0.19 in)](image)

2. Check the brush and circuit breaker for continuity. Replace them if there is no continuity.

![Armature coil continuity:](image)

<table>
<thead>
<tr>
<th>Commutator segments E</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment E - Laminations</td>
<td>No continuity</td>
</tr>
<tr>
<td>Segment E - Shaft G</td>
<td>No continuity</td>
</tr>
</tbody>
</table>

3. Check the commutator diameter. Replace it if the diameter is smaller than the limit.

4. Check the armature coil for continuity. Replace it if the continuity is out of specification.

5. Check the base for cracks or damage. Check that the bearing and oil seal have no flaw. Replace if necessary.
NOTE: When the bearings and oil seals are removed, always replace them with new ones.

**Assembling the PTT motor**

1. Connect the leads 1, and tighten up the screw 2.

2. Push the brush 3 into the brush holder while installing the armature 4.

3. Install the stator.

NOTE: Place a clean cloth over the end of the armature shaft, and hold it with a pair of pliers, while pushing-in the stator carefully.
### Part List

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td>2</td>
<td>M5 x 16 mm</td>
</tr>
<tr>
<td>2</td>
<td>Pump filter</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Gear</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ball</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Shuttle piston</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>O-ring</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>7</td>
<td>Main valve</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Ball</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Bolt</td>
<td>1</td>
<td>M8 x 85 mm</td>
</tr>
<tr>
<td>10</td>
<td>Bolt</td>
<td>2</td>
<td>M8 x 24 mm</td>
</tr>
<tr>
<td>11</td>
<td>Pump housing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Circlip</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Manual valve</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>14</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>15</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>16</td>
<td>Backup ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Part name</td>
<td>Q'ty</td>
<td>Remarks</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------</td>
<td>------</td>
<td>-----------------</td>
</tr>
<tr>
<td>18</td>
<td>Absorber valve pin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Ball</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Up-relief valve seat</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>O-ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Filter</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>24</td>
<td>Down-relief valve</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>25</td>
<td>Valve pin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>O-ring</td>
<td>4</td>
<td>Not reusable</td>
</tr>
<tr>
<td>27</td>
<td>Valve seat</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Pin</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Ball</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
</tbody>
</table>
Disassembling the reservoir

NOTE:
- Do not use rags or paper to clean the hydraulic system components. Small pieces of fibers remaining on them may cause malfunction of the system.
- Fluid may flow out while overhauling the power trim and tilt unit. Place an appropriate tray to prevent the fluid from spilling out on the floor.
- Hold the power trim and tilt unit in a vise to work on it. Put an aluminum plates on both sides of the unit.

1. Remove the reservoir and O-ring.

CAUTION:
- Make sure that the tilt and trim rods are fully extended when removing the reservoir. If they are not, fluid may spurt out from the unit due to the internal pressure.
- Do not push down the tilt rod and trim rods while the reservoir is removed. Fluid may spurt out from the reservoir mounting area.

Disassembling the gear pump unit

1. Remove the gear pump unit.

2. Drain the fluid from the reservoir to check any damage. Also check the cap and O-ring. Replace if necessary.

NOTE:
To remove the filter in the back, blow compressed air carefully not to make the filter jump out abruptly.
3. Remove the gear pump cover and gear pump.

NOTE:
Make sure that the shuttle piston and ball are removed, since they would be stuck on the gear pump cover.

4. Remove the up-relief valve assembly.

5. Remove the main valves.

NOTE:
To remove the main valves, cover the pump housing with a clean cloth, and blow compressed air through holes ① and ②.

⚠️ WARNING
Never look into the openings while removing the main valves.

6. Remove the manual valve.
Checking the reservoir and gear pump unit
1. Clean all the valves, pistons, balls, and filters. Check them for damages or wear. Check the gear pump for damages or wear. Replace them if necessary.

Assembling the reservoir and gear pump unit

**CAUTION:**
Reinstall the components and parts in their original direction and position.

1. Install a new O-ring ①, the up-relief valve seat ②, balls ③, and absorber valve pin ④, and spring ⑤ on the pump housing.

2. Install new O-rings ⑥ on the main valves ⑦. Then, attach them on the pump housing.

3. Install the gear pump ⑧.

4. Install the balls ⑨, shuttle pistons ⑩, and balls ⑪ into the gear pump cover.

**NOTE:**
Apply grease to the balls and shuttle pistons to prevent them from falling out of the gear pump.
5. Install the gear pump cover on the pump housing, and temporarily tighten the mounting bolts.

6. Make sure that the gear pump turns smoothly by hands. Then, tighten the mounting bolts to the specified torque.

   Gear pump cover bolts:
   6 N • m (0.6 kgf • m, 4 ft • lb)


8. Install the filter, down-relief valve, and filter to the pump housing.

9. Install a new O-ring to the manual valve.

10. Install the manual valve and circlip on the pump housing.

   Manual valve:
   3 N • m(0.3 kgf • m, 3 ft • lb)
### Tilt cylinder and trim cylinder

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tilt rod</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Trim piston assembly</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cylinder body</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Free piston</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Backup ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>O-ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Dust seal</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>8</td>
<td>Seal</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>9</td>
<td>Trim cylinder end screw</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>10</td>
<td>O-ring</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>11</td>
<td>Backup ring</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>O-ring</td>
<td>2</td>
<td>Not reusable</td>
</tr>
<tr>
<td>13</td>
<td>Dust seal</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>14</td>
<td>Tilt cylinder end screw</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>15</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>16</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>17</td>
<td>Tilt piston</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**

- Not reusable

**Torques**

- 130 N·m (13 kgf·m, 94 ft·lb)
- 78 N·m (7.8 kgf·m, 57 ft·lb)
- 96 N·m (9.6 kgf·m, 71 ft·lb)
<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>19</td>
<td>O-ring</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>20</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Ball</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Valve</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Disassembling the tilt cylinder and trim cylinder
1. Loosen the tilt cylinder end cap ①, and remove the tilt piston assembly ②.

**CAUTION:**
Make sure that the rods are fully extended before removing the tilt cylinder end cap.

Trim & tilt wrench: 90890-06548

2. Drain the fluid.

3. Loosen the trim cylinder end cap ③, and remove the trim piston assembly ④.

Trim & tilt wrench: 90890-06548

4. Drain the fluid.

5. Install the trim piston assembly, and temporarily tighten the trim cylinder end cap finger tight.

6. Cover the tilt cylinder opening with a clean cloth ⑤, and blow compressed air through hole ⑥ to remove the free piston ⑥.

**WARNING**
Never look into the openings while removing the free piston.

7. Loosen the trim cylinder end cap, and remove the trim piston assembly.

Checking the tilt cylinder and trim cylinder.
1. Disassemble the tilt piston assembly.
2. Check the tilt piston and free piston for scratches. Replace if necessary.

3. Air blow the contamination on the tilt piston absorber valve. Check the valve for wear, and check the spring for deterioration.

4. Check the tilt rod for bends or corrosion. Replace if necessary.

5. Check the trim piston for scratches. Replace if necessary. Check the trim rods for bends or corrosion. Replace if necessary.

6. Remove the filter plug and filter from the tilt cylinder, and check them.

7. Check the inner walls of tilt cylinder and trim cylinder for scratches. Replace if necessary.

8. Install the filter and filter plug on the tilt cylinder.

9. Install a new O-ring ②③ and the dust seal ① on the tilt cylinder end cap.
10. Install the tilt cylinder end cap 4 on the tilt rod 5.

11. Install a new O-ring 6, 7 on the tilt piston 8. Also install the ball 9, absorber pin 10, and spring 11 in this order.

12. Install the tilt piston sub-assembly and washer 12 on the tilt rod 5, and tighten the nuts 13.

**NOTE:**
Fill the tilt cylinders with the specified quantity of recommended fluid through the hole 8.

**Recommended power trim and tilt fluid:**
- ATF Dexron II
- Specified quantity: 30 cm³ (1.1 Imp oz)


14. Install new oil seal 17, dust seal 18, backup ring 19, and O-ring 20, 21 on the trim cylinder end cap and the trim piston.

15. Push-in the free piston 1 to the bottom of tilt cylinder.
3. Fill in the trim cylinders with fluid.

NOTE: Pour the recommended fluid through the holes  b, c, and d until the passages are filled with the fluid.

4. Install the trim rods.

CAUTION: Make sure that the trim rods are fully extended when they are installed. Once installed, never push down the trim rods. It is dangerous since the fluid may spurt out from the unit.

5. Tighten up the trim rod end caps ②.


NOTE: Refer to the illustration for the correct orientation when installing the valve pin and check valve assembly.

7. Install the gear pump unit.

8. Install the reservoir and a new O-ring.

Trim & tilt wrench: 90890-06548

Trim rod end cap: 78 N • m (7.8 kgf • m, 57 ft • lb)

Gear pump unit mounting bolts: 8 N • m (0.8 kgf • m, 6 ft • lb)

Reservoir mounting bolts: 5 N • m (0.5 kgf • m, 4 ft • lb)
9. Fill the tilt cylinder with the fluid.

NOTE: Pour the recommended fluid through the hole until gear pump unit top is filled up with the fluid.

10. Install the tilt piston assembly.

CAUTION:
• Make sure that the tilt rod are fully extended when they are installed.
• Once installed, never push down the tilt rod. It is dangerous since the fluid may spurt out from the unit.

11. Tighten up the tilt rod end cap.

12. Install the joint and filter on the gear pump unit.

13. Make sure that the gear pump unit is filled out with the fluid to the top. Then turn the gear pump with screwdriver for air bleeding.

NOTE: Pour the recommended fluid through the hole until gear pump unit top is filled up with the fluid.

14. Tighten up the tie rod end cap.

Trim & tilt wrench: 90890-06548

Trim rod end cap: 130 N m (13 kgf m, 94 ft lb)
Bleeding the power trim and tilt unit

NOTE:
- Make sure that the manual valve ① is tightened up.
- Fix the power trim and tilt unit in the upright position, and check the fluid level. If it is low, add the fluid of recommended type to the correct level.


NOTE:
Align the joint and armature shaft.

PTT motor mounting bolts:
5 N • m (0.5 kgf • m, 4 ft • lb)

15. Fill the reservoir with the recommended fluid to the specified level.

NOTE:
If the fluid is at the correct level, the fluid should overflow out of the check hole when the cap is removed.

16. Install the reservoir cap.

Recommended power trim and tilt fluid:
ATF Dexron II

1. Connect the power trim and tilt motor leads to the battery terminals, and fully retract the trim and tilt rods.

<table>
<thead>
<tr>
<th>Rods</th>
<th>PTT motor leads</th>
<th>Battery terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOWN</td>
<td>Green (G)</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>Blue (L)</td>
<td>–</td>
</tr>
</tbody>
</table>
2. Connect the power trim and tilt motor leads to the battery terminals, and fully extend the trim and tilt rods.

3. Repeat the procedures above for four or five times.

**NOTE:**
Wait for a few seconds before switching the PTT motor leads connections. Assist the rods movement by hands if they do not operate well.

4. Check the fluid level while the tilt rod is fully extended, and add sufficient amount of recommended fluid.

### Installing the power trim and tilt unit

1. Fully tilt up the outboard motor, and lock it with the tilt stop lever \( \mathbb{1} \).

### WARNING

After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the power trim and tilt unit should lose fluid pressure.

2. Install the collar.

3. Insert the upper mount pins while supporting the power trim and tilt unit by hands.

4. Install the circlip.

5. Insert the lower mount pins, and tighten up the bolts.

6. Install the clamps, route the PTT motor leads through the hole, and install the clamps.

7. Connect the ground lead under the power trim and tilt unit.
### Steering arm

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Steering arm</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bushing</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Swivel bracket</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>O-ring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bushing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Steering yoke</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Circlip</td>
<td>1</td>
<td>Not reusable</td>
</tr>
<tr>
<td>10</td>
<td>Nut</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Thrust receiver</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Damper</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Clamp bracket</td>
<td>1</td>
<td>Starboard</td>
</tr>
<tr>
<td>14</td>
<td>Clamp bracket</td>
<td>1</td>
<td>Port</td>
</tr>
</tbody>
</table>

*36 N·m (3.6 kgf·m, 26 ft·lb)*
Removing the steering arm
1. Remove the circlip ①.

2. Remove the steering yoke ② by striking it with a plastic hammer or the like.

3. Pull off the steering arm, and remove the washer, O-ring, and bushing.

Installing the steering arm
1. Install the washer and bushing onto the steering arm.

2. Place the swivel bracket in the upright position, and insert the steering arm into the swivel bracket.

3. Install the bushing, O-ring, and washer. Also install the steering yoke.

NOTE: Make sure that the orientation of steering yoke ③ and steering arm ④ is consistent at the time of installation.

4. Install the circlip.
5. Inject Yamaha grease A through the grease nipple.

**NOTE:**
Inject the grease until it comes out from both the upper bushing (C).
### Clamp brackets

**Part Number**
- 1: Swivel bracket assembly
- 2: Clamp bracket
- 3: Clamp bracket
- 4: Self-locking nut
- 5: Grease nipple
- 6: Ground lead
- 7: Washer
- 8: Bolt
- 9: Washer
- 10: Bushing
- 11: Trim sensor
- 12: Screw
- 13: Trim sensor cam
- 14: Screw
- 15: Clamp
- 16: Bolt
- 17: Bracket

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Swivel bracket assembly</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Clamp bracket</td>
<td>1</td>
<td>Starboard</td>
</tr>
<tr>
<td>3</td>
<td>Clamp bracket</td>
<td>1</td>
<td>Port</td>
</tr>
<tr>
<td>4</td>
<td>Self-locking nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Grease nipple</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Ground lead</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bolt</td>
<td>2</td>
<td>M6 x 11 mm</td>
</tr>
<tr>
<td>9</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Bushing</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Trim sensor</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Screw</td>
<td>2</td>
<td>M6 x 25 mm</td>
</tr>
<tr>
<td>13</td>
<td>Trim sensor cam</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Screw</td>
<td>1</td>
<td>M6 x 25 mm</td>
</tr>
<tr>
<td>15</td>
<td>Clamp</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Bolt</td>
<td>4</td>
<td>M6 x 30 mm</td>
</tr>
<tr>
<td>17</td>
<td>Bracket</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
60H5E11

No. | Part name          | Q'ty | Remarks
--- |--------------------|-----|---------
18  | Anode              | 1   |        
19  | Through tube       | 1   | M8 x 20 mm
20  | Bolt               | 1   |        
21  | Tilt stop lever    | 1   |        
22  | Bush               | 4   |        
23  | Collar             | 1   |        
24  | Distance collar    | 2   |        
25  | Spring pin         | 2   |        
26  | Pin                | 1   |        
27  | Spring             | 1   |        
28  | Spring hook        | 1   |        
29  | Bolt               | 1   | M6 x 10 mm
30  | Tilt stop lever    | 1   |        
31  | Ground lead        | 1   |        
32  | Washer             | 1   |        
33  | Bolt               | 1   | M6 x 10 mm

Remarks:

- **M8 x 20 mm**: Bolt 1 M8 x 20 mm
- **M6 x 10 mm**: Bolt 1 M6 x 10 mm
Disassembling the clamp brackets
1. Remove the power trim and tilt unit.
2. Remove the anode.
3. Disconnect the ground lead.
4. Remove the self-locking nuts and bolts.
5. Pull off the through tube, and disassemble the clamp brackets, trim sensor cam, and swivel bracket.
6. Remove the trim sensor.
7. Disassemble the tilt stop lever, and remove the trim rod receiver.

Assembling the clamp brackets
1. Install the trim rod receiver.
2. Install the tilt stop lever on the swivel bracket.
3. Install the trim sensor ① and bushing on the swivel bracket.
4. Install the through tube to go through the clamp brackets, washer, and swivel bracket in this order.

NOTE: Make sure that the trim sensor cam is installed between the swivel bracket holes.
   Adjust the trim sensor cam after assembly.

Clamp brackets

5. Install the bolts on the through tube, and tighten up the self-locking nut.

<table>
<thead>
<tr>
<th>Self-locking nut:</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 N \cdot m (1.5 kgf \cdot m, 11 ft \cdot lb)</td>
</tr>
</tbody>
</table>

6. Install the power trim and tilt unit. Then, install the anode.

NOTE: Install the ground lead between the power trim and tilt unit and the anode.

7. Install the ground lead between the clamp brackets and the swivel bracket.

8. Apply Yamaha grease A through the grease nipples.

NOTE: Apply the grease until it comes out of the bushing ③.
Install the upper case
1. Install the upper case and tighten the upper mount and lower mount nuts.

2. Install the lower mount cover.

3. Connect the ground lead.

Adjusting the trim sensor cam
1. Fully retract the power trim and tilt unit.

2. Loosen the trim sensor cam screw ①.

3. Fix the trim sensor ② cam where the specified trim sensor resistance is obtained.

4. Fully tilt up the outboard motor, and lock it with the tilt stop lever ③.

**WARNING**
After tilting up the outboard motor, be sure to support it with the tilt stop lever. Otherwise, the outboard motor could suddenly lower if the power trim and tilt unit should lose fluid pressure.
5. Check the trim sensor resistance. If the resistance is out of specification, adjust the trim sensor cam position, and check the trims sensor.

Trim sensor resistance:
Pink (P) - Black (B)
238.8-378.8 at 20°C (68°F)
Electrical systems

Special service tools ..................................................................................................... 8-1

Checking the electrical components ........................................................................... 8-2
  Measuring the peak voltage ...................................................................................... 8-2
  Measuring the lower resistance ................................................................................ 8-2

Electrical components .................................................................................................. 8-3
  Starboard view .......................................................................................................... 8-3
  Port view .................................................................................................................. 8-4
  Top view ................................................................................................................... 8-5
  Rear view .................................................................................................................. 8-6
  Wiring harness .......................................................................................................... 8-7

Ignition system .............................................................................................................. 8-8
  Checking the ignition spark gap ................................................................................ 8-9
  Checking and replacing the spark plug caps (Standard type) .................................... 8-9
  Checking the plug cap (with resister type) ............................................................... 8-10
  Checking the ignition coil ....................................................................................... 8-11
  Checking the pulser coil ......................................................................................... 8-11
  Checking the charge coil ......................................................................................... 8-12
  Checking the CDI unit ............................................................................................ 8-13
  Checking the thermoswitch ..................................................................................... 8-13

Starting system ............................................................................................................ 8-14
  Checking the fuse .................................................................................................... 8-15
  Checking the wiring harness (10 pins) .................................................................... 8-15
  Checking the starter relay ....................................................................................... 8-15

Starter motor ................................................................................................................ 8-16
  Removing the starter motor pinion .......................................................................... 8-18
  Checking the starter motor pinion .......................................................................... 8-18
  Checking the armature ........................................................................................... 8-18
  Checking the brushes ............................................................................................. 8-19
Choke solenoid ............................................................................................................ 8-19
  Checking the choke solenoid ................................................................................. 8-19

Charging system ........................................................................................................ 8-20
  Checking the lighting coil ...................................................................................... 8-21
  Checking the Rectifier Regulator .......................................................................... 8-21

Power trim and tilt ................................................................................................... 8-22
  Checking the power trim and tilt relay ................................................................... 8-23
  Checking the power trim and tilt switch / trailer switch ........................................ 8-23
  Checking the trim sender ....................................................................................... 8-23
Special service tools

Ignition tester
90890-06754

Digital circuit tester
90890-03174

Peak voltage adaptor B
90890-03172

Test harness (FWY-4)
90890-06771

Test harness (FWY-6)
90890-06772
Checking the electrical components
Measuring the peak voltage

**NOTE:**
Before troubleshooting the peak voltage, check that all electrical connections are tight and free from corrosion, and that the battery is fully charged to 12V.

The condition of the ignition system can be determined by measuring the peak voltage. Cranking speed is affected by many factors, such as fouled or weak spark plugs, or a weak battery. If one of these factors is present, the peak voltage will be lower than specification. In addition, if the peak voltage is lower than specification the engine will not operate properly.

![DC V](image)

**WARNING**
When checking the peak voltage, do not touch any of the connections of the digital circuit tester leads.

**NOTE:**
- Use the peak voltage adaptor with the digital circuit tester.
- When measuring the peak voltage, set the selector on the digital circuit tester to the DC voltage mode.
- Connect the positive pin on the peak voltage adaptor to the positive terminal of the digital circuit tester.

Measuring the lower resistance
When measuring a resistance of 10 or less with the digital circuit tester, the correct measurement cannot be obtained because of the internal resistance of the tester. To obtain the correct value, subtract the internal resistance from the displayed measurement.

\[
\text{Correct value} = \text{displayed measurement} - \text{internal resistance}
\]

**NOTE:**
Obtain the internal resistance of the digital circuit tester by connecting both of its probes and checking the display.
Electrical components
Starboard view

1. Thermoswitch
2. Hour meter
3. Rectifier Regulator
4. Choke solenoid
Port view

1. Starter motor
2. Starter relay
3. Power trim and tilt relay
Top view

1. Spark plug
2. Thermoswitch
3. Rectifier Regulator
4. Starter motor
5. Starter coil
6. Pulser coil
Rear view

1. Ignition coil
2. Spark plug
3. CDI unit
Wiring harness

Connect to:
① Battery
② Starter relay
③ Power trim and tilt relay
④ Power trim and tilt switch
⑤ CDI unit
⑥ Thermoswitch
⑦ Thermoswitch
⑧ Ground lead
⑨ Rectifier Regulator
⑩ Hour meter
⑪ Choke solenoid
⑫ Remote control

Sb : Sky blue
Ignition system

1. Spark plug
2. Ignition coil
3. Pulser coil
4. Stator coil
5. CDI unit
6. Thermoswitche

Checking the ignition spark gap
1. Disconnect the spark plug caps from the spark plugs.
2. Connect the spark gap tester to the spark plug cap.
3. Set the specified spark gap length on the adjusting knob.
4. Crank the engine and observe the spark through the discharge window of the spark gap tester. If it does not work properly, check the plug cap, ignition coil, or the specified peak voltages.

**WARNING**
- Do not touch any of the connections of the spark gap tester leads.
- Do not let sparks leak out of the removed spark plug caps.
- Keep flammable gas or liquids away, since this test can produce sparks.

Checking and replacing the spark plug caps (Standard type)
1. Check the spark plug caps for cracks or damage. Replace if necessary.
2. Remove the spark plug cap ①, and remove the plug cap spring ③ from the spark plug wire ②.

3. Cut to remove the insulation ③ on the spark plug wire ② by approximately 5mm from the wire end.

4. Press-in the plug cap spring ③ until it touches the spark plug wire ② conductor. Then bent ④ as shown.

Checking the plug cap (with resister type)
1. Remove the spark plug cap ① from the spark plug wire ② by turning the cap counterclockwise.

2. Measure the spark plug cap ① resistance.

3. Replace the plug cap ① if the resistance is out of specification.

4. Install the spark plug cap ① on the spark plug wire ② by turning the cap clockwise.

Spark plug cap resistance: 4.0 - 6.0 kΩ
Checking the ignition coil
1. Remove the spark plug cap from the spark plug.
2. Disconnect the ignition coil lead.
3. Measure the ignition coil resistance. Replace if out of specification.

Checking the pulser coil
1. Remove the CDI unit cover.
2. Connect the pulser coil coupler and the CDI unit with the test harness (6 pins).
3. Measure the pulser coil output peak voltage. If the measurement is below specification, check the leads and measure the pulser coil resistance. Replace the pulser coil if necessary.

Ignition coil resistance:
Primary coil A:
Black/white (B/W) – Black (B)
0.18 – 0.24Ω at 20°C (68°F)
Secondary coil B:
Spark plug wire – Black (B)
3.26 – 4.88 kΩ at 20°C (68°F)

Pulser coil output peak voltage:
White/black (W/B) – White/blue (W/L)
White/brown (W/Br) – White/yellow (W/Y)
White/green (W/G) – White/red (W/R)

<table>
<thead>
<tr>
<th>r/min</th>
<th>Unloaded</th>
<th>Loaded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cranking</td>
<td>1,500</td>
</tr>
<tr>
<td>DC V</td>
<td>2.5</td>
<td>2.0</td>
</tr>
</tbody>
</table>
Pulser coil resistance (use as reference):
- White/black (W/B) – White/blue (W/L) 256 - 384 Ω at 20°C (68°F)
- White/brown (W/Br) – White/yellow (W/Y)
- White/green (W/G) – White/red (W/R)

Checking the charge coil
1. Remove the CDI unit cover.
2. Connect the charge coil and CDI unit with the test harness (4 pins).
3. Measure the charge coil output peak voltage. If the measurement is below specification, check the leads, and measure the charge coil resistance. Replace if necessary.

Charge coil output peak voltage:
- Brown (Br) – Red (R)

<table>
<thead>
<tr>
<th>r/min</th>
<th>Unloaded</th>
<th>Loaded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cranking</td>
<td>1,500</td>
</tr>
<tr>
<td></td>
<td>DC V</td>
<td>80</td>
</tr>
</tbody>
</table>

Charge coil peak voltage:
- Blue (L) – Black/red (B/R)

<table>
<thead>
<tr>
<th>r/min</th>
<th>Unloaded</th>
<th>Loaded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cranking</td>
<td>1,500</td>
</tr>
<tr>
<td></td>
<td>DC V</td>
<td>30</td>
</tr>
</tbody>
</table>

Charge coil resistance (use as reference):
- Brown (Br) – Red (R): 428 - 642 Ω at 20°C (68°F)
- Blue (L) – Black/red (B/R): 64.4 - 96.6 Ω at 20°C (68°F)
Checking the CDI unit
1. Connect the digital circuit tester lead to the ignition coil lead and the ground lead.
2. Measure the CDI unit output peak voltage.
   If the measurement is below specification, check the lead, and measure the peak output voltages of pulser coil and charge coil.

Checking the thermoswitch
1. Place the thermoswitch ① in a container with water and slowly heat the water.
2. Check the thermoswitch ① for continuity at the specified temperature. Replace the thermoswitch ① if out of specification.

NOTE: Replace the CDI unit, if output peak voltages of the pulser coil and the charge coil are on or above specifications and the CDI unit output peak voltage is below specification.

Digital circuit tester : 90890-03174
Peak voltage adapter B : 90890-03172

CDI unit output peak voltage :
Black/white(B/W)-ground lead

<table>
<thead>
<tr>
<th>r/min</th>
<th>Loaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cranking</td>
<td>1,500</td>
</tr>
<tr>
<td>DC V</td>
<td>65</td>
</tr>
</tbody>
</table>

NOTE:
Check both left and right thermoswitches.
① Temperature
② Time
③ No continuity
④ Continuity

Thermoswitch ① continuity temperature:
Pink(P) – Black(B)
⑤ : 84 to 90°C (183 to 194 °F)
⑥ : 60 to 74°C (140 to 165 °F)
Starting system

1. Battery (12 volts)
2. Starter motor
3. Starter relay
4. PTT down relay
5. Fuse (20 amps)
6. Choke solenoid
7. Key switch panel

<table>
<thead>
<tr>
<th></th>
<th>W</th>
<th>B</th>
<th>R</th>
<th>Y</th>
<th>Br</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>START</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B : Black
R : Red
Br : Brown
L : Blue
Y : Yellow
Checking the fuse
1. Check the fuse for continuity. Replace if there is no continuity.

Checking the wiring harness (10 pins)
1. Check the wiring harness for continuity. Replace if there is no continuity.

Checking the starter relay
1. Connect the digital circuit tester leads to the starter relay terminals.
2. Connect the brown (Br) lead A to the positive battery terminal.
3. Connect the black (B) lead B to the negative battery terminal.
4. Check continuity between the starter relay terminals. Replace if there is no continuity.

5. Check that there is no continuity between the starter relay terminals after disconnecting the brown (Br) lead A or black (B) lead B. Replace if there is continuity.
Starting system Starter motor

Starter motor

<table>
<thead>
<tr>
<th>No.</th>
<th>Part name</th>
<th>Q'ty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bolt</td>
<td>2</td>
<td>M8 x 25 mm</td>
</tr>
<tr>
<td>2</td>
<td>Starter motor cover</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Clip</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Pinion stopper</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Spring</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Pinion</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Housing</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Armature</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Stator</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Spring</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Brush holder</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Washer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Nut</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Washer</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
No. | Part name      | Q'ty | Remarks            |
----|----------------|------|--------------------|
18  | Lower bracket  | 1    |                    |
19  | Bolt           | 1    | M8 x 25 mm         |
20  | Bolt           | 1    | M6 x 115 mm        |
Removing the starter motor pinion
1. Remove the starter motor cover.
2. Remove the adhesive.

**CAUTION:**
Attach with adhesive after reassembly.

3. Push down the pinion stopper ① as shown to remove the clip ②.

Checking the starter motor pinion
1. Check the teeth of the pinion for cracks or wear. Replace if necessary.
2. Check the pinion for smooth operation. Replace if necessary.

**NOTE:**
Turn the pinion clockwise to check that it operates smoothly, and turn it counterclockwise to check that it locks in place.

Checking the armature
1. Check the commutator for dirt. Clean with #600 grid sandpaper or by blowing the compressed air.
2. Measure the commutator diameter. Replace the armature if the measured diameter is smaller than the specified value.
3. Measure the commutator undercut ①. Replace the armature if the measurement is smaller than the specified value.

**Commutator diameter limit:**
32.0 mm (1.26 in)

**Commutator undercut limit ①:**
0.2 mm (0.0079 in)
4. Check the armature for continuity. Replace if out of specification.

2. Check the brush holder assembly for continuity. Replace if out of specification.

<table>
<thead>
<tr>
<th>Commutator segments</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment b - Armature core</td>
<td>No continuity</td>
</tr>
<tr>
<td>Segment b - Armature shaft</td>
<td>No continuity</td>
</tr>
</tbody>
</table>

**Checking the brushes**

1. Measure the brush length. Replace the brush assembly if the length is shorter than the specified limit.

**Brush continuity**

| Brush (1) – Brush (2) | No continuity |

**Choke solenoid**

**Checking the choke solenoid**

1. Disengage the choke solenoid bullet connector, and measure the choke solenoid resistance.

2. Connect the battery to the choke solenoid, and check if the plunger is pulled in.

**Armature continuity:**

| Segment b - Armature core | No continuity |
| Segment b - Armature shaft | No continuity |

**Choke solenoid resistance:**

3.4 - 4.0 Ω
Charging system

1. Battery
2. Fuse (20 amps)
3. Lighting coil
4. Rectifier Regulator
5. Hour meter

B : Black
R : Red
G : Green
Y : Yellow
G/W : Green/White
Checking the lighting coil
1. Remove the Rectifier Regulator cover, and connect the digital circuit tester lead to the lighting coil.
2. Measure the lighting coil output peak voltage. If the measurement is below specification, check the lead and measure the lighting coil resistance. Replace if necessary.

Checking the Rectifier Regulator
1. Remove the Rectifier Regulator cover, and connect the digital circuit tester lead to the Rectifier Regulator.
2. Measure the Rectifier Regulator output peak voltage. Replace the Rectifier Regulator, if the lighting coil output peak voltage is on or above specification and the Rectifier Regulator output peak voltage is below specification.

NOTE:
Disconnect the output lead (Red(R) - Black(B)) of the Rectifier Regulator when measuring the output peak voltage.

<table>
<thead>
<tr>
<th>r/min</th>
<th>Unloaded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cranking</td>
</tr>
<tr>
<td>DC V</td>
<td>3.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>r/min</th>
<th>Unloaded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,500</td>
</tr>
<tr>
<td>DC V</td>
<td>18</td>
</tr>
</tbody>
</table>

Lighting coil output peak voltage:
Green(G) - Green/white(G/W)

Rectifier Regulator output peak voltage:
Red(R) - Black(B)

Digital circuit tester : 90890-03174
Peak voltage adapter B : 90890-03172
Power trim and tilt

1. Battery (12 volts)
2. Fuse (20 amps)
3. PTT up relay
4. PTT down relay
5. Trailer switch
6. PTT motor
7. Trim sender

B : Black
R : Red
Sb : Sky blue
Lg : Light green
Gy : Gray
P : Pink
G : Green
L : Blue
Checking the power trim and tilt relay

1. Connect the digital circuit tester between power trim and tilt relay terminals ① and ②.

2. Connect the light green (Lg) lead or sky blue (Sb) lead ③ to the positive battery terminal and the black (B) lead to ④ the negative battery terminal as shown.

3. Check the continuity between the terminals ① and ②. Replace if there is no continuity.

4. Disconnect the black (B) lead ④. Check for continuity between terminals ① and ②. Replace if there is no continuity.

---

Checking the power trim and tilt switch / trailer switch

1. Check the power trim and tilt switch/trailer switch for continuity. Replace if out of specification.

---

![Diagram of power trim and tilt relay](image1)

---

Checking the trim sender

1. Disengage the trim sender coupler, and measure the trim sender resistance.

---

![Diagram of trim sender](image2)

---

### Lead color:

<table>
<thead>
<tr>
<th>Switch position</th>
<th>Sky blue (Sb)</th>
<th>Red (R)</th>
<th>Light green (Lg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Trim sender resistance:

- **Pink (P)** - **Black (B)**
  - 9 - 11 Ω at 20°C (68°F)
  - 239 - 379 Ω at 20°C (68°F)

---

**NOTE:**

Turn the lever ① and make sure that the resistance changes gradually.
Troubleshooting

Power unit ................................................. 9-1
  Starting system ........................................ 9-1
  Ignition system ....................................... 9-3
  Fuel system ............................................. 9-4
  Compression pressure ............................ 9-5
  Fuel system ............................................. 9-6
  Ignition system ....................................... 9-7
  Power unit ............................................. 9-8
  Air intake system ...................................... 9-9
  Fuel system ............................................. 9-10
  Ignition system ....................................... 9-11
  Cooling system ....................................... 9-13

Bracket unit ............................................... 9-14

Lower unit .................................................... 9-17

Electrical system .......................................... 9-18
NOTE:
• To diagnose a mechanical malfunction, use the troubleshooting charts pertaining to the trouble located in this chapter. Also, when checking and maintaining the outboard motor, see Chapters 4–8, to check the part necessary to carry out safety maintenance.
• Check that all electrical connections are tight and free from corrosion, and that the battery is fully charged to 12 V.

Power unit
Symptom: Engine does not crank.
• Check the starting system.
• Check the power unit.

Starting system

Check that the gear shift is in the neutral position.

Is the gear shift in neutral?

Yes

No

Set it to the neutral position.

Check the neutral switch inside remote control box for continuity.

Is there continuity?

Yes

No

Replace the neutral switch.

Check the engine start switch for continuity.

Is there continuity?

Yes

No

Replace the engine start switch.

Check the fuse for continuity.

Continued on next page.
Power unit

Is there continuity?
  Yes → Replace the fuse.
  No → Check the wiring harnesses for continuity.

Is there continuity?
  Yes → Replace the wiring harnesses.
  No → Replace the starter relay.

Check the starter relay operation.
  Good operating condition?
    Yes → Replace the starter relay.
    No → Replace the starter motor.

Check the starter motor operation.
  Good operating condition?
    Yes → Replace the starter motor.
    No → Check the power unit.
Symptom: Engine cranks, but will not start.
• Check the ignition system.
• Check the fuel system.
• Check the compression pressure of the power unit.

**Ignition system**

- Check the engine stop switch for continuity.
  - Is there continuity?
    - No: Replace the engine stop switch.
    - Yes: Check that the spark plugs produce sparks.
  - Are there sparks?
    - No: Check the spark plugs, and clean or replace them as required.
    - Yes: Check the ignition spark using the spark gap tester.
  - Good ignition spark condition?
    - No: Check the spark plug wire and spark plug cap for deterioration.
      - No deterioration?
        - No: Replace the spark plug wire or spark plug cap.
        - Yes: Measure the ignition coil resistance.
      - Yes: Replace the ignition coil.
    - Yes: Measure the pulser coil output peak voltage.

Continued on next page.
Is measured voltage exceeds the specified value?

Replace the pulser coil.

Measure the charge coil output voltage.

Is measured voltage exceeds the specified value?

Replace the charge coil.

Measure the CDI unit output peak voltage.

Is measured voltage exceeds the specified value?

Replace the CDI unit.

Check the ignition timing.

Check each component again.

Is ignition timing correct?

Adjust the ignition timing.

Check the fuel system.

Fuel system

Check that the fuel vent screw of the fuel tank is open.

Is the vent screw open?

Open the fuel vent screw.

Continued on next page.
Troubleshooting

Check the water accumulation or clogging of the fuel filter.

Is there water or residue? Yes → Clean the fuel system from the fuel tank to the fuel filter.
No → Check the fuel hose for kinks or fuel leakage.

Is there any kinks or fuel leakage? Yes → Correct or replace the faulty parts.
No → Check the fuel pump for leaks from the valve by applying the specified pressure to the pump.

Is there any leakage? Yes → Replace the fuel pump.
No → Check the carburetor operation.

Good operating condition? No → Adjust or replace the carburetor.
Yes → Check the compression pressure.

Compression pressure

Measure the compression pressure.

Does the measured pressure exceed the specified value? No → Check the cylinder head, cylinder head gasket, piston, piston rings, and cylinder block.
Yes → Check each component again.
Symptom: Engine starts but does not remain on.
- Check the fuel system.
- Check the ignition system.
- Check the compression pressure of the power unit.

**Fuel system**

Check that the fuel vent screw of the fuel tank is open.

- **Is the vent screw open?**
  - **Yes**
    - Check the water accumulation or clogging of the fuel filter.
    - **Is there water or residue?**
      - **Yes**
        - Clean the fuel system from the fuel tank to the fuel filter.
      - **No**
        - Check the fuel hose for kinks or fuel leakage.
        - **Is there any kinks or fuel leakage?**
          - **Yes**
            - Correct or replace the faulty parts.
          - **No**
            - Check the fuel pump for leaks from the valve by applying the specified pressure on the pump.
            - **Is there any leakage?**
              - **Yes**
                - Replace the fuel pump.
              - **No**
                - Check the carburetor operation.
                - **Good operating condition?**
                  - **No**
                    - Adjust or replace the carburetor.
                  - **Yes**
                    - Check the ignition system.

---

**WARNING**

- Do not touch any of the connections of the spark gap tester leads.
- Do not let sparks leak out of the removed spark plug caps.
- Keep flammable gas or liquids away, since this test can produce sparks.
Ignition system

Check that the spark plugs produce sparks.

Are there sparks?

Yes → Check the ignition spark using the spark gap tester.

No → Check the spark plugs, and clean or replace them as required.

Good ignition spark condition?

Yes → Check the spark plug wire and spark plug cap for deterioration.

No → Replace the spark plug wire or spark plug cap.

No deterioration?

Yes → Measure the ignition coil resistance.

Is the measured resistance fall within the specification?

No → Replace the ignition coil.

Yes → Measure the pulser coil output peak voltage.

Is measured voltage exceeds the specified value?

No → Replace the pulser coil.

Yes → Measure the charge coil output voltage.

Is measured voltage exceeds the specified value?

No → Replace the charge coil.

Yes → Continued on next page.
Power unit

Measure the CDI unit output peak voltage.

Is measured voltage exceeds the specified value? No → Replace the CDI unit.
Yes → Check each component again.

Check the ignition timing.

Is ignition timing correct? No → Adjust the ignition timing.
Yes → Check the power unit.

Does the measured pressure exceed the specified value? No → Check the cylinder head, cylinder head gasket, piston, piston rings, and cylinder block.
Yes → Check each component again.

Measure the compression pressure.
Symptom: The engine idle speed is not steady, but increases or decreases.
• Check the air intake system.
• Check the ignition system.
• Check the intake manifold.

Air intake system

Check the operation of the throttle cable and throttle link.

Good operating condition? No

Adjust the throttle cable and throttle link.

Yes

Check the carburetor operation.

Good operating condition? No

Adjust the carburetor.

Yes

Check the ignition spark using the spark gap tester.

Are there sparks? No

Check the ignition system.

Yes

Check the ignition timing.

Is ignition timing correct? No

Adjust the ignition timing.

Yes

Check the intake manifold gasket and the reed valve to verify the integrity of the air intake system.
Symptom: Engine does not accelerate when the throttle is opened quickly. The engine turns off when the throttle is opened quickly. Hesitation or stumble is observed in the course of acceleration.
- Check the fuel system
- Check the ignition system

**Fuel system**

Check that the fuel vent screw of the fuel tank is open.

Is the vent screw open? 
- No → Open the fuel vent screw.
- Yes → Check the water accumulation or clogging of the fuel filter.

Is there water or residue? 
- Yes → Clean the fuel system from the fuel tank to the fuel filter.
- No → Check the fuel hose for kinks or fuel leakage.

Is there any kinks or fuel leakage? 
- Yes → Correct or replace the faulty parts.
- No → Check the fuel pump for leaks from the valve by applying the specified pressure to the pump.

Is there any leakage? 
- Yes → Replace the fuel pump.
- No → Check the carburetor operation.

Good operating condition? 
- No → Adjust or replace the carburetor.
- Yes → Check the ignition system.

**WARNING**
- Do not touch any of the connections of the spark gap tester leads.
- Do not let sparks leak out of the removed spark plug caps.
- Keep flammable gas or liquids away, since this test can produce sparks.
Ignition system

Check that the spark plugs produce sparks.

Are there sparks?

Yes

Check the ignition spark using the spark gap tester.

No

Check the spark plugs, and clean or replace them as required.

Check the spark plug wire and spark plug cap for deterioration.

Good ignition spark condition?

Yes

No deterioration?

Yes

Measure the ignition coil resistance.

Is the measured resistance fall within the specification?

Yes

Replace the ignition coil.

No

Replace the spark plug wire or spark plug cap.

No

Measure the pulser coil output peak voltage.

Is measured voltage exceeds the specified value?

Yes

Replace the pulser coil.

No

Measure the charge coil output voltage.

Continued on next page.
Is measured voltage exceeds the specified value?

Yes

Replace the charge coil.

No

Measure the CDI unit output peak voltage.

Is measured voltage exceeds the specified value?

Yes

Replace the CDI unit.

No

Check the ignition timing.

Check each component again.

Is ignition timing correct?

Yes

Check each component again.

No

Adjust the ignition timing.
Symptom: Engine starts, but engine speed does not increase. Overheat warning buzzer is on.

- Check the cooling system.

### Cooling system

1. **Check the cooling water inlet for clogs or damages**
   - **Clogs or damages?**
     - Yes: Clean the cooling water inlet or replace it.
     - No: Check that cooling water is discharged from the cooling water pilot hole.

2. **Check that cooling water is discharged from the cooling water pilot hole.**
   - **Is water discharged?**
     - Yes: Check the water pump impeller.
     - No: Replace the impeller.

3. **Check the thermostat operation.**
   - **Good operating condition?**
     - Yes: Check the cooling water passage.
     - No: Replace the thermostat.

4. **Check the thermostatic**
   - **Good operating condition?**
     - Yes: Check the CDI unit.
     - No: Replace the thermostatic switch.

5. **Check each engine component.**
Bracket unit
Symptom: Power trim and tilt unit does not operate.

Listen to the operating sound of the power trim and tilt relay.

- Can the operating sound be heard?
  - Yes
  - No
    - Keep activating the trim switch, and check the voltage between each terminal. Between the sky blue (Sb) lead and the ground lead. Between the light green (Lg) lead and the ground lead.

Listen to the operating sound of the power trim and tilt motor.

- Can the operating sound be heard?
  - Yes
  - No
    - Can the power supply voltage obtained?
      - Yes
        - Replace the power trim and tilt relay.
      - No
        - Activate the power trim and tilt switch, and check the voltage between the blue (L) lead and green (G) lead.

- No
  - Can the power supply voltage obtained?
    - Yes
      - Replace the power trim and tilt relay.
    - No
      - Check that the manual valve is closed.

- Is it closed?
  - Yes
  - No
    - Close the valve.

Check the possible oil leakage from the power trim and tilt unit.

- Oil leakage detected?
  - Yes
    - Repair the oil leakage.
  - No
    - Continued on next page.
Check the power trim and tilt fluid level.

Is the fluid at specified level? No → Add fluid to the correct level.

Yes → Bleed the power trim and tilt fluid.

Restored to the normal condition? Yes → Check the fluid leakage again.

No → Measure the hydraulic pressure of the power trim and tilt.

Measured hydraulic pressure within the specification? Yes → Check the inner parts (valves, pistons, gears, etc.).

No → Disassemble the power trim and tilt unit, and check the filter for clogs or debris.

Is the filter clogged or contaminated? Yes → Clean or replace the filter.

No → Check the fluid passage for clogs or stuck foreign substances.

Clogs or stuck foreign substances? Yes → Clean the passage.

No → Check the inner parts (valves, pistons, gears, etc.).
Symptom: Power trim and tilt unit does not hold the outboard motor up.

- **Check that the manual valve is closed.**
  - **Is it closed?**
    - **Yes**
    - **Check the inner parts (valves, pistons, gears, etc.).**
    - **No**
      - **Close the valve.**
  
- **Check the possible oil leakage from the power trim and tilt unit.**
  - **Oil leakage detected?**
    - **Yes**
      - **Repair the oil leakage.**
    - **No**
      - **Check the power trim and tilt fluid level.**
        - **Is the fluid at specified level?**
          - **Yes**
          - **Check the inner parts (valves, pistons, gears, etc.).**
          - **No**
            - **Add fluid to the correct level.**
Lower unit
Symptom: Shift mechanism of the forward gear and reverse gear does not operate properly.

- Check the shift cable operation.
  - Good operating condition?
    - Yes: Check the operation of the shift rod.
      - Good operating condition?
        - Yes: Check the condition of the shift rod connection between the lower case and the upper case.
          - Connected properly?
            - Yes: Disassemble the lower case, and check or replace the relevant component.
            - No: Replace the shift rod.
        - No: Check the operation of detent mechanism in the bottom cowling, and the function of the components in the lower case.
    - No: Check the shift cables and links of the remote control box.
Electrical system
Symptom: Battery discharges quickly.
• Check the charging system.

Measure the output peak voltage of the lighting coil.

Is measured voltage above specification?

No → Replace the lighting coil.

Yes → Measure the Rectifier Regulator output peak voltage.

Is measured voltage above specification?

No → Replace the Rectifier Regulator.

Yes → Replace the battery, and check the power consumption of all electrical equipment aboard.
Index

A.

Adjusting the carburetor pickup timing .... 3-15
Adjusting the carburetor
synchronization ........................................... 3-13
Adjusting the choke solenoid ................. 3-16
Adjusting the engine idle speed ............ 3-14
Adjusting the ignition timing .............. 3-8
Adjusting the throttle link and the throttle cable
operation ..................................................... 3-16
Adjusting the trim sensor cam .............. 7-47
After test run ............................................ 1-17
Air intake system .................................. 9-9
Applicable models .................................... 1-5
Assembling the carburetor ................. 4-13
Assembling the clamp brackets .......... 7-46
Assembling the drive shaft
housing .................................................. 6-19, 6-48
Assembling the forward gear ............... 6-20
Assembling the fuel pump ..................... 4-8
Assembling the lower unit (counter rotation
model) ...................................................... 6-50
Assembling the lower unit (regular rotation
model) ...................................................... 6-21
Assembling the piston and connecting
rod .......................................................... 5-35
Assembling the power trim and tilt unit .... 7-36
Assembling the propeller shaft and propeller
shaft assembly ........................................... 6-44
Assembling the propeller shaft
assembly ..................................................... 6-16
Assembling the propeller shaft housing
assembly .................................................... 6-14
Assembling the PTT motor ................... 7-25
Assembling the reservoir and gear pump
unit ........................................................... 7-30
Assembling the reverse gear ............... 6-49
Assembling the upper case ................. 7-12

Checking the plug cap
(Standard type) ........................................... 8-9
Checking the anodes ............................. 3-21
Checking the armature ......................... 8-18
Checking the battery ............................ 1-14, 3-21
Checking the brushes ......................... 8-19
Checking the carburetor
synchronization ........................................... 3-12
Checking the CDI unit ........................... 8-13
Checking the charge coil ...................... 8-12
Checking the choke solenoid ................. 8-19
Checking the compression pressure ........ 5-2
Checking the connecting rod ............... 5-33
Checking the cooling water passage ........ 3-5
Checking the crankshaft ...................... 5-33
Checking the cylinder block ................. 5-30
Checking the drive shaft ....................... 6-21, 6-49
Checking the drive shaft housing ...... 6-19, 6-48
Checking the electrical components ........ 8-2
Checking the engine start switch and engine
stop switch, engine shut-off switch ........ 1-16
Checking the forward gear ................. 6-20
Checking the fuel filter ......................... 3-4, 4-6
Checking the fuel joint ......................... 4-6
Checking the fuel joint and fuel hoses (fuel
joint - to - carburetor) ......................... 3-3
Checking the fuel pump ....................... 4-7
Checking the fuel system ...................... 1-14
Checking the fuse ................................. 8-15
Checking the gear oil ............................ 1-14
Checking the gear oil level ................. 3-19
Checking the gearshift and throttle
operation ...................................................... 1-15
Checking the gearshift operation ........ 3-17
Checking the hour meter ....................... 3-3
Checking the hydraulic pressure of the power
trim and tilt unit .................................... 7-18
Checking the ignition coil .................... 8-11
Checking the ignition spark gap ............ 8-9
Checking the ignition timing ............... 3-7
Checking the ignition timing
(with timing light) ...................................... 3-6
Checking the lighting coil ................. 8-21
Checking the lower unit
(for air leakage) ...................................... 3-20
Checking the outboard motor mounting
position ..................................................... 1-14
Checking the pilot water outlet ............. 1-16
Checking the pinion gear ............... 6-21, 6-49
Checking the piston ............................ 5-31
Checking the plug cap
(with resister type) ...................................... 8-10

B.

Backlash (counter rotation model) ........ 6-61
Backlash (regular rotation model) ........ 6-31
Bleeding the power trim and tilt unit .... 7-39
Bleeding the power trim and tilt unit
(Built-in) ................................................... 7-15
Bottom Cowling ...................................... 7-2
Bracket unit .......................................... 9-14
Break-in ................................................... 1-17

C.

Carburetor .............................................. 4-9
Changing the gear oil ......................... 3-19
Charging system ..................................... 8-20
Disassembling the propeller shaft assembly ........................................ 6-15
Disassembling the propeller shaft housing assembly ....................... 6-13, 6-44
Disassembling the PTT motor .................................................. 7-23
Disassembling the reservoir .................................................. 7-28
Disassembling the tilt cylinder and trim cylinder .......................... 7-34
Disassembling the upper case ............................................. 7-10
Disassembly and assembly .................................................. 1-4
Drive shaft and lower case (counter rotation model) ..................... 6-46
Drive shaft and lower case (regular rotation model) ...................... 6-17

E.

Electrical .................................................. 2-5
Electrical components ........................................ 8-3
Electrical system ............................................ 9-18
Exhaust .................................................. 5-20
Exhaust components (Factory option) ........................................ 1-7

F.

Features and benefits ........................................ 1-6
Fire prevention ............................................ 1-3
Fuel filter, fuel pump, fuel joint ........................................ 4-3
Fuel hoses .................................................. 4-2
Fuel system .............................................. 3-3, 9-4, 9-6, 9-10

G.

Gasket .................................................. 1-10
General .................................................. 3-21
General torques ............................................ 2-10
General Specifications ........................................ 2-1
Good working practices ........................................ 1-4

H.

Hose routing .............................................. 4-2
Hour meter .............................................. 1-6, 3-3
How to use this manual ........................................ 1-1

I.

Identification .............................................. 1-5
Ignition system ............................................ 8-8, 9-3, 9-7, 9-11
Install the upper case ........................................ 7-47
Installing the crankshaft ........................................ 5-34
Installing the cylinder head ........................................ 5-37
Installing the lower case ........................................ 6-21, 6-50
Installing the lower unit ........................................ 6-25, 6-53
Installing the piston and connecting rod assembly ...................... 5-36
Installing the power trim and tilt unit .................................. 7-40

D.

Dimenstions .............................................. 2-7
Disassembling the carburetor ........................................ 4-12
Disassembling the clamp brackets ....................................... 7-46
Disassembling the fuel pump ........................................ 4-8
Disassembling the gear pump unit .................................... 7-28
Disassembling the lower case ........................................ 6-18, 6-47
Disassembling the piston, and the connecting rod assembly .......... 5-30

Checking the power trim and tilt
level .......................................................... 3-18
Checking the power trim and tilt
operation .................................................. 3-17
Checking the power trim and tilt relay ................................ 8-23
Checking the power trim and tilt switch / trailer switch ............ 8-23
Checking the propeller ......................................... 3-21
Checking the propeller shaft
assembly .................................................. 6-15, 6-43
Checking the propeller shaft housing
assembly .................................................. 6-13, 6-44
Checking the PTT motor ....................................... 7-24
Checking the pulser coil ....................................... 8-11
Checking the Rectifier Regulator .................................. 8-21
Checking the remote control cables ................................. 1-15
Checking the reservoir and gear pump
unit .......................................................... 7-30
Checking the reverse gear ...................................... 6-49
Checking the spark plugs ........................................ 3-4
Checking the starter motor pinion .................................. 8-18
Checking the starter relay ....................................... 8-15
Checking the steering system ..................................... 1-15
Checking the thermostat ........................................ 3-5
Checking the thermoswitch ...................................... 8-13
Checking the throttle cable operation ............................... 3-6
Checking the tilt cylinder and trim
cylinder .................................................. 7-34
Checking the tilt system ....................................... 1-15
Checking the top cowling ........................................ 3-3
Checking the trim sender ....................................... 8-23
Checking the upper case ........................................ 7-12
Checking the water pump and shift
rod ......................................................... 6-8, 6-38
Checking the wiring harness (10 pins) ............................. 8-15
Choke solenoid ........................................... 8-19
Clamp brackets ........................................... 7-44
Compression pressure ......................................... 9-5
Connecting rod ............................................. 1-9
Control system ............................................ 3-6
Cooling system ............................................. 9-13
Cylinder block ............................................. 5-25
Cylinder head ............................................. 5-22
Installing the power unit ........................................ 5-40
Installing the speedometer hose ......................... 6-24, 6-53
Installing the steering arm ........................................ 7-42
Installing the water pump ........................................ 6-24, 6-52
Intake manifold .................................................. 5-17

L.
Lower unit .......................................................... 2-4, 3-19, 9-17
Lower unit (counter rotation model) ....................... 6-34
Lower unit (regular rotation model) ............ 6-4
Lubrication .................................................................. 3-22

M.
Maintenance interval chart ....................................... 3-2
Maintenance specifications ................................. 2-3
Manual format .......................................................... 1-1
Measuring the forward and reverse gear backlash ........................................ 6-31, 6-61
Measuring the lower resistance .................................. 8-2
Measuring the peak voltage ........................................ 8-2
Mounting the coils ................................................... 5-40
Mounting the exhaust cover ....................................... 5-39
Mounting the intake manifold ..................................... 5-39

P.
Parts, lubricants, and sealants .................................. 1-3
Piston and cylinder .................................................. 1-8
Piston, Connecting rod ............................................ 5-29
Port view .................................................................. 8-4
Power trim and tilt ................................................... 8-22
Power trim and tilt unit ............................................. 3-17, 7-15
Power unit .................................................................. 2-3, 3-4, 5-2, 9-1, 9-8
Power unit mount bolt ............................................. 1-12
Predelivery checks .................................................... 1-14
Propeller selection .................................................... 1-13
Propeller shaft, Propeller shaft housing (counter rotation model) .................. 6-40
Propeller shaft, Propeller shaft housing (regular rotation model) .... 6-10
Propeller size .......................................................... 1-13
PTT motor and Reservoir .......................................... 7-21

R.
Rear view .................................................................. 8-6
Reduction gear and clutch ....................................... 1-11
Removing the crankcase ........................................... 5-27
Removing the cylinder head ..................................... 5-23
Removing the drive shaft and forward gear ................................................... 6-18
Removing the drive shaft and reverse gear ....................... 6-47
Removing the electrical components .................. 5-15

Removing the exhaust cover ....................................... 5-21
Removing the flywheel magnet ................................... 5-15
Removing the intake manifold .................................. 5-18
Removing the lower unit ........................................... 6-7, 6-37
Removing the piston, connecting rod assembly, and the crankshaft .............. 5-28
Removing the power trim and tilt unit .................. 7-17
Removing the power unit ........................................... 5-14
Removing the propeller shaft housing assembly and propeller shaft ............. 6-42
Removing the propeller shaft housing assembly ........................................... 6-12
Removing the starter motor pinion ................................ 8-18
Removing the steering arm ....................................... 7-42
Removing the upper case .......................................... 7-10
Removing the water pump and shift rod ........................................... 6-8, 6-38

S.
Safety while working .................................................. 1-3
Selecting the forward gear shims ......................... 6-29, 6-58
Selecting the pinion shims ......................................... 6-28, 6-56
Selecting the propeller shaft shims .......................... 6-59
Selecting the reverse gear shims ......................... 6-30, 6-57
Selection .................................................................. 1-13
Self-protection ......................................................... 1-3
Serial number .......................................................... 1-5
Shimming .................................................................. 6-28, 6-56
Shimming (counter rotation model) ....................... 6-55
Shimming (regular rotation model) ......................... 6-27
Special service tools ................................................. 3-1, 4-1, 5-1, 6-1, 7-1, 8-1
Specified torques ...................................................... 2-9
Sreering arm ............................................................ 7-41
Starboard view .......................................................... 8-3
Starter motor ............................................................. 8-16
Starting system ......................................................... 8-14, 9-1
Symbols .................................................................. 1-2

T.
Test run .................................................................. 1-16
Tightening torques .................................................... 2-9
Tilt cylinder and trim cylinder .................................. 7-32
Top cowling .............................................................. 3-3
Top view ................................................................. 8-5

U.
Upper case .................................................................. 7-6

V.
Ventilation ............................................................... 1-3
W.

Wiring harness ........................................... 8-7
WIRING DIAGRAM
200AET,L200AET

1. Starter motor
2. Starter relay
3. PTT up relay
4. PTT down relay
5. Trailer switch
6. PTT motor
7. Battery (12 volts)
8. Thermostatic switch
9. Ignition coil
10. CDI unit
11. Charge coil
12. Lighting coil
13. Purser coil
14. Rectifier Regulator
15. Hour meter
16. Choke solenoid
17. Trim sender
18. Fuse (20 amps)
19. Spark plug

A. To remote control box / switch panel
B. To trim meter
C. Cylinder head
D. Cylinder body
E. CDI magnet

Color code

B: Black
Br: Brown
G: Green
Gy: Gray
L: Blue
Lg: Light green
P: Pink
R: Red
Sb: Sky blue
W: White
Y: Yellow
B/R: Black/Red
B/W: Black/White
G/W: Green/White
W/B: White/Black
W/Br: White/Brown
W/L: White/Blue
W/R: White/Red
W/G: White/Green
W/Y: White/Yellow