MAXSYM 400i / 400i ABS / 600i ABS

SERVICE MANUAL

FOREWORD

HOW TO USE THIS MANUAL

CONTENTS

MECHANISM ILLUSTRATION

201404
This service manual contains the technical data of each component inspection and repair for the Sanyang MAXSYM 400i / 400i ABS / 600i ABS scooter. The manual is shown with illustrations and focused on “Service Procedures”, “Operation Key Points”, and “Inspection Adjustment” so that provides technician with service guidelines.

If the style and construction of the motorcycle, MAXSYM 400i / 400i ABS / 600i ABS, are different from that of the photos, pictures shown in this manual, the actual vehicle shall prevail. Specifications are subject to change without notice.

Service Department
Sanyang Industry Co., LTD.
How to Use This Manual

This service manual describes basic information of different system parts and system inspection & service for Sanyang MAXSYM 400i scooter. In addition, please refer to the manual contents in detailed for the model you serviced in inspection and adjustment.

The first chapter covers general information and trouble diagnosis.
The second chapter covers service maintenance information.
The third to the twelfth chapter covers the engine and driving systems.
The thirteenth to the sixteenth is contained the parts set of assembly body.
The seventeenth chapter is electrical equipment.
The eighteenth chapter is wiring diagram.
Please see index of content for quick having the special parts and system information.

There are 4 buttons, “Foreword”, “Contents”, “How to Use This Manual” and “Mechanism Illustration” in the PDF version, and can be access to these items by clicking on the buttons.

If user wants to look for the content of each chapter, selecting the words of each chapter on the contents can reach to each chapter. There are two buttons, “Homepage and contents, on the top line of first page of the each chapter. Thus, if the user needs to check other chapters, he can click the top buttons to back the homepage or contents. The content of each chapter can be selected too. Therefore, when needs to checking the content inside of the chapter, click the content words of the chapter so that can back to the initial section of the content. In addition, there is a “To this Chapter Contents” button at the second page of each content so that clicking the button can back to the contents of this chapter.
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</table>
Symbols and Marks
Symbols and marks are used in this manual to indicate what and where the special service is needed. If supplemental information is needed for these symbols and marks, explanations will be added in the text instead of using the symbols or marks.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!</td>
<td>Warning: Means that serious injury or loss of life may happen if procedures are not correctly followed.</td>
</tr>
<tr>
<td>!</td>
<td>Caution: Means that equipment damages may result if procedures are not followed.</td>
</tr>
<tr>
<td>![Engine oil]</td>
<td>Engine oil: Limits to use SAE 10W-30 API SG class oil. Warranty will not cover the damage that caused by not apply with the limited engine oil. (Recommended oil: KING MATE G-3 oil)</td>
</tr>
<tr>
<td>![Grease]</td>
<td>Grease: King Mate G-3 is recommended.</td>
</tr>
<tr>
<td>![Locking sealant]</td>
<td>Locking sealant: Apply sealant; medium strength sealant should be used unless otherwise specified.</td>
</tr>
<tr>
<td>![Oil seal]</td>
<td>Oil seal: Apply with lubricant.</td>
</tr>
<tr>
<td>![Renew]</td>
<td>Renew: Replace with a new part before installation.</td>
</tr>
<tr>
<td>![Brake fluid]</td>
<td>Brake fluid: Use recommended brake fluid DOT3 or WELLRUN brake fluid.</td>
</tr>
<tr>
<td>![Special tools]</td>
<td>Special tools: Special tools</td>
</tr>
<tr>
<td>![Correct]</td>
<td>Correct: Meaning correct installation.</td>
</tr>
<tr>
<td>![Wrong]</td>
<td>Wrong: Meaning wrong installation.</td>
</tr>
<tr>
<td>![Indication]</td>
<td>Indication: Indication of components.</td>
</tr>
<tr>
<td>![Directions]</td>
<td>Directions: Indicates position and operation directions.</td>
</tr>
<tr>
<td>![Components assembly directions each other]</td>
<td>Components assembly directions each other.</td>
</tr>
<tr>
<td>![Indicating the bolt installation direction]</td>
<td>Indicates where the bolt installation direction, --- means that bolt cross through the component (invisibility).</td>
</tr>
</tbody>
</table>
1. General Information

General Safety

Carbon Monoxide
Before you start the engine, make sure the place is well ventilated. Never start the engine in an unventilated place. If you have to start the engine in an unventilated place, an exhaust fume extractor is needed.

Caution

Exhaust fume contains toxic gas which may cause one to lose consciousness and even result in loss of life.

Gasoline
Gasoline is a low ignition point and explosive material. Work in a well-ventilated place, no flame or spark should be allowed in the work place or where gasoline is being stored.

Caution

Gasoline is highly flammable, and may explode under some conditions, keep it away from the children.

Used Engine Oil

Caution

Prolonged contact with the used engine oil (or transmission oil) may cause skin cancer although it might not be verified yet. We recommend that you wash your hands with soap right after contacting. Keep the used oil beyond reach of the children.

Hot Components

Caution

Components of the engine and exhaust system can be extremely hot after engine running. They remain very hot even after the engine has been stopped for a period of time. Before performing service work on these parts, wear the heat insulation gloves or wait until the temperature drops.

Battery

Caution

- Battery emits explosive gases; flame is strictly prohibited. Keep the place well ventilated when the battery is being charged.
- Battery contains sulfuric acid (electrolyte) which can cause serious burns, be careful not to spill it on your skin or eyes. If you get battery fluid on your skin, flush it off with water immediately. If you get battery fluid in your eyes, flush it off immediately with water and go to hospital to see an ophthalmologist doctor.
- If you swallow the battery fluid by mistake, drink a lot of water or milk, and take some laxative such as Epsom salts or vegetable oil and then go to see a doctor.
- Keep the battery and battery fluid beyond reach of the children.

Brake Shoes

Do not use compressed air or brush to clean the components of the brake system. Use a vacuum cleaner or the equivalent to avoid dust drifting in the air.

Caution

Inhaling brake shoes dust may cause disease or even cancer of the respiratory system.

Brake Fluid

Caution

Brake fluid spilled on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the top of the parts for protection when servicing the brake system. Keep the brake fluid beyond reach of the children.
Before Servicing

- Always use SANYANG genuine parts and recommended oil. Using improper parts may cause damage to or destruction of the vehicle.

- Special tools are designed for removal and installation of component parts without damaging them. Using wrong tools may result in parts damage.

- When servicing this vehicle, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the Britain system, using wrong tools and fasteners may damage this vehicle.

- Clean the outside of the parts or the cover before removing it from the vehicle. Otherwise, dirt and deposit accumulated on the part's surface may fall into the engine, chassis, or brake system to cause damage.

- Wash and clean parts with high flash point solvent, and then blow dry with compressed air. Pay special attention to O-rings or oil seals because most of the cleaning agents have bad effect on them.

- Never bend or twist control cables to avoid unsmooth control and premature worn out.

- Rubber parts may become deteriorated when old, and be damaged by solvent and oil easily. Check these parts before installation to make sure that they are in good condition, replace if necessary.

- When loosening a component which has different sized fasteners, operate with a diagonal pattern and work from inside out. Loosen the small fasteners first. If the bigger ones are loosen first, small fasteners may receive too much stress.

- Store complex components such as transmission parts in the proper assemble order and tie them together with a wire for ease of installation later.

- Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).

- Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap rings, and split pins.
1. General Information

- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length outside the hole is the same with other bolts, it is a correct bolt. Bolts for the same assembly should have the same length.

- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise indicated. Bolts and fasteners should be kept clean and dry. Do not apply oil to the threads.

- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.

- Remove residues of the old gasket or sealant before reinstallation, grind with a grindstone if the contact surface has any damage.

- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.

- Rubber and plastic boots should be properly reinstalled to the original correct positions as designed.

- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both races.
1. General Information

- Lubricate the rotation face with specified lubricant on the lubrication points before assembling.

- Check if positions and operation for installed parts is in correct and properly.

- Make sure service safety each other when conducting by two persons.

- Note that do not let parts fall down.

- Before battery removal operation, it has to remove the battery negative (-) cable firstly. Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.

- After service completed, make sure all connection points is secured. Battery positive (+) cable should be connected firstly.
- And the two posts of battery have to be greased after connected the cables.

- Make sure that the battery post caps are located in properly after the battery posts had been serviced.

- If fuse burned, it has to find out the cause and solved it. And then replace with specified capacity fuse.
1. General Information

- When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation.

- Do not pull the wires as removing a connector or wires. Hold the connector body.

- Make sure if the connector pins are bent, extruded or loosen.

- Insert the connector completely. If there are two lockers on two connector sides, make sure the lockers are locked in properly. Check if any wire loose.

- Check if the connector is covered by the twin connector boot completely and secured properly.

- Before terminal connection, check if the boot is crack or the terminal is loose.

- Insert the terminal completely. Check if the terminal is covered by the boot. Do not let boot open facing up.

- Secure wires and wire harnesses to the frame with respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses.

- Wire band and wire harness have to be clamped secured properly.

- Do not squeeze wires against the weld or its clamp.
1. General Information

- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.

- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.

- Keep wire harnesses far away from the hot parts.

- Secure the rubber boot firmly as applying it on wire harness.

- Route wire harnesses to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.

- Never use wires or harnesses which insulation has been broken. Wrap electrical tape around the damaged parts or replace them.

- Route harnesses so that they neither pull too tight nor have excessive slack.

- Never clamp or squeeze the wire harness as installing other components.

Never Touch

Never too tight
1. General Information

- Do not let the wire harness been twisted as installation.

- Wire harnesses routed along the handlebar should not be pulled too tight or have excessive slack, be rubbed against or interfere with adjacent or surrounding parts in all steering positions.

- Before operating a test instrument, operator should read the operation manual of the instrument. And then, conduct test in accordance with the instruction.

- With sand paper to clean rust on connector pins/terminals if found. And then conduct connection operation later.
## 1. General Information

### Specifications

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<thead>
<tr>
<th>MAKER</th>
<th>SANYANG</th>
<th>MODEL</th>
<th>LX40A</th>
</tr>
</thead>
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<tr>
<td><strong>Dimension</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Overall Length</td>
<td>2270 mm</td>
<td>Suspension System</td>
<td>Front TELESCOPIC FORK</td>
</tr>
<tr>
<td>Overall Width</td>
<td>825 mm</td>
<td>Rear</td>
<td>UNIT SWING</td>
</tr>
<tr>
<td>Overall Height</td>
<td>1410 mm</td>
<td>Tire Specifications</td>
<td>Front 120 / 70-15 56S</td>
</tr>
<tr>
<td>Wheel Base</td>
<td>1555 mm</td>
<td>Rear</td>
<td>160 / 60-14 65H</td>
</tr>
</tbody>
</table>

| **Curb Weight** | Front | 94 kg | Brake System | Front DOUBLE DISK (ø 275 mm) |
| Rear | 135 kg | Rear | DISK (ø 275 mm) |
| **Total** | 229 kg | **Performance** | Max. Speed | >152 km/hr |

| **Weight** | | | Climb Ability | <24° |
| Passengers/Weight | Two / 150 kg | | Primary Reduction | Belt |
| **Total Weight** | Front | 131 kg | Secondary Reduction | Gear |
| Rear | 248 kg | Clutch | Centrifugal, dry type |
| **Total** | 379 kg | Transmission | CVT |

| **Type** | 4-STROKE ENGINE | | **Fuel** | Above 92 unleaded | | Speedometer | 0 ~ 180 km/hr |
| **Installation and arrangement** | Vertical, below center, incline 80° | | **Cycle/ Cooling** | 4-stroke/ Liquid-cooled | | Horn | 93~112 dB/A |
| **Engine** | | | **Bore** | Ø 83.0 mm | | Muffler | Expansion & Pulse Type Right side, and Backward |
| **Stroke** | 73.8 mm | Exhaust Pipe Position and Direction | | | | | Forced circulation & splashing |
| **Number/Arrangement** | SINGLE CYLINDER | Lubrication System | | | | | |
| Displacement | 399 cc | | CO | <2.0 g/km | | | |
| Compression Ratio | 10.6 : 1 | Exhaust Concentration | HC | <0.3 g/km | | | |
| Max. HP | 33.3 ps / 7000 rpm | | NOx | <0.15 g/km | | | |
| Max. Torque | 3.52 kg-m / 5500 rpm | | E.E.C. | - | | | |
| Ignition | Full transistor ignition | | P.C.V. | √ | | | |
| Starting System | Electrical starter | | Catalytic reaction control system | √ | | |
## Specifications

<table>
<thead>
<tr>
<th></th>
<th>MAKER</th>
<th>SANYANG</th>
<th>MODEL</th>
<th>LX60A</th>
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<tbody>
<tr>
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<tr>
<td>Overall Length</td>
<td>2270 mm</td>
<td></td>
<td>Front</td>
<td>TELESCOPIC FORK</td>
</tr>
<tr>
<td>Overall Width</td>
<td>825 mm</td>
<td></td>
<td>Rear</td>
<td>UNIT SWING</td>
</tr>
<tr>
<td>Overall Height</td>
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<tr>
<td>Wheel Base</td>
<td>1560 mm</td>
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<tr>
<td><strong>Curb Weight</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td>99 kg</td>
<td></td>
<td>Front</td>
<td>DOUBLE DISK (ø 275 mm)</td>
</tr>
<tr>
<td>Rear</td>
<td>144 kg</td>
<td></td>
<td>Rear</td>
<td>DISK (ø 275 mm)</td>
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<tr>
<td>Total</td>
<td>243 kg</td>
<td></td>
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<tr>
<td><strong>Passengers/Weight</strong></td>
<td>Two / 150 kg</td>
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<tr>
<td><strong>Total Weight</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td>137 kg</td>
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<td>Rear</td>
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<tr>
<td>Total</td>
<td>393 kg</td>
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</tr>
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<td><strong>Type</strong></td>
<td>4-STROKE ENGINE</td>
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<tr>
<td>Installation and arrangement</td>
<td>Vertical, below center, incline 80°</td>
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<td><strong>Fuel</strong></td>
<td>Above 92 unleaded</td>
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<tr>
<td><strong>Cycle/ Cooling</strong></td>
<td>4-stroke/ Liquid-cooled</td>
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<td></td>
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</tr>
<tr>
<td><strong>Bore</strong></td>
<td>Ø 92.0 mm</td>
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<td></td>
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<tr>
<td><strong>Stroke</strong></td>
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<tr>
<td><strong>Number/Arrangement</strong></td>
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<tr>
<td><strong>Displacement</strong></td>
<td>565 cc</td>
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</tr>
<tr>
<td><strong>Compression Ratio</strong></td>
<td>10.2 : 1</td>
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</tr>
<tr>
<td><strong>Max. HP</strong></td>
<td>45.5 ps / 6750 rpm</td>
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</tr>
<tr>
<td><strong>Max. Torque</strong></td>
<td>5.0 kg-m / 5000 rpm</td>
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<td></td>
</tr>
<tr>
<td><strong>Ignition</strong></td>
<td>Full transistor ignition</td>
<td></td>
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</tr>
<tr>
<td><strong>Starting System</strong></td>
<td>Electrical starter</td>
<td></td>
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</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Curb</td>
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<tr>
<td>Rear</td>
<td>144 kg</td>
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<tr>
<td>Total</td>
<td>243 kg</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Passengers/Weight</strong></td>
<td>Two / 150 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>Max. Speed</td>
<td>&gt;165 km/hr</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Climb Ability</strong></td>
<td>&lt;28°</td>
<td></td>
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</tr>
<tr>
<td><strong>Primary Reduction</strong></td>
<td>Belt</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Secondary Reduction</strong></td>
<td>Gear</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clutch</strong></td>
<td>Centrifugal, dry type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transmission</strong></td>
<td>CVT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Speedometer</strong></td>
<td>0 ~ 180 km/hr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Horn</strong></td>
<td>93~112 dB/A</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Expansion &amp; Pulse Type</strong></td>
<td>Right side, and Backward</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Exhaust Pipe Position and Direction</strong></td>
<td>Forced circulation &amp; splashing</td>
<td></td>
<td></td>
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<tr>
<td><strong>Lubrication System</strong></td>
<td>Forcing circulation &amp; splashing</td>
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<tr>
<td><strong>Exhaust Concentration</strong></td>
<td>CO</td>
<td>&lt;2.0 g/km</td>
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<tr>
<td><strong>HC</strong></td>
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<td><strong>NOx</strong></td>
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<td><strong>E.E.C.</strong></td>
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<td><strong>P.C.V.</strong></td>
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<tr>
<td><strong>Starting System</strong></td>
<td>Electrical starter</td>
<td></td>
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</table>
Torque Values

The torque values listed in below are for more important tightening torque values. Please see standard values for those not listed in the table.

Standard Torque Values for Reference

<table>
<thead>
<tr>
<th>Type</th>
<th>Tighten Torque</th>
<th>Type</th>
<th>Tighten Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mm bolt · nut</td>
<td>0.45~0.6kgf-m</td>
<td>5 mm screw</td>
<td>0.35~0.5kgf-m</td>
</tr>
<tr>
<td>6 mm bolt · nut</td>
<td>0.8~1.2kgf-m</td>
<td>6 mm screw · SH nut</td>
<td>0.7~1.1kgf-m</td>
</tr>
<tr>
<td>8 mm bolt · nut</td>
<td>1.8~2.5kgf-m</td>
<td>6 mm bolt · nut</td>
<td>1.0~1.4kgf-m</td>
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<td>10 mm bolt · nut</td>
<td>3.0~4.0kgf-m</td>
<td>8 mm bolt · nut</td>
<td>2.4~3.0kgf-m</td>
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<tr>
<td>12 mm bolt · nut</td>
<td>5.0~6.0kgf-m</td>
<td>10 mm bolt · nut</td>
<td>3.5~4.5kgf-m</td>
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Engine Torque Values

<table>
<thead>
<tr>
<th>Item</th>
<th>Q’ty</th>
<th>Thread Dia. (mm)</th>
<th>Torque Value(kgf-m)</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>Cylinder stud bolt</td>
<td>4</td>
<td>10</td>
<td>1.0~1.4</td>
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<tr>
<td>Cylinder head nut</td>
<td>4</td>
<td>8</td>
<td>3.6~4.0</td>
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<tr>
<td>Cylinder head right bolt</td>
<td>2</td>
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<td>2.0~2.4</td>
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<tr>
<td>Cylinder head side cover bolt</td>
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<td>1.0~1.4</td>
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<tr>
<td>Cylinder head cover bolt</td>
<td>4</td>
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<tr>
<td>Cylinder head stud bolt (inlet pipe)</td>
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<td>Cylinder head stud bolt (EX. pipe)</td>
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<td>Air inject reed valve bolt</td>
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<td>3</td>
<td>0.07~0.09</td>
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<td>Tappet adjustment screw nut</td>
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<td>5</td>
<td>0.7~1.1</td>
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<td>Spark plug</td>
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<td>Camshaft Chain Tensioner bolt</td>
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<td>Carburetor insulator bolt</td>
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<td>Oil pump screw</td>
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<td>Engine left cover bolt</td>
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<td>1.3~1.7</td>
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<td>Mission filling bolt</td>
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<td>ACG. Flywheel nut</td>
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### Frame Torque Values

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<tr>
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<th>Thread Dia. (mm)</th>
<th>Torque Value (Kg-m)</th>
<th>Remarks</th>
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<td>Lock nut for steering stem</td>
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<tr>
<td>Steering top cone race</td>
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<td>BC1</td>
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<td>Front wheel axle nut</td>
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<tr>
<td>Rear wheel axle nut</td>
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<td>16</td>
<td>11.0~13.0</td>
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<td>Front cushion mounting bolt</td>
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<td>Rear cushion upper connection bolt</td>
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<td>Rear cushion under connection bolt</td>
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<td>Rear fork mounting bolt</td>
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<td>0.8~1.0</td>
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<td>Front brake disc mounting bolt</td>
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<td>8</td>
<td>4.0~4.5</td>
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<td>Rear brake disc mounting bolt</td>
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<td>8</td>
<td>4.0~4.5</td>
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<tr>
<td>Brake clipper mounting bolt</td>
<td>2</td>
<td>8</td>
<td>2.9~3.5</td>
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<td>Engine hanger link bolt</td>
<td>2</td>
<td>12</td>
<td>7.5~9.5</td>
<td>On frame side</td>
</tr>
<tr>
<td>Engine hanger link nut</td>
<td>1</td>
<td>12</td>
<td>7.5~9.5</td>
<td>On engine side</td>
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<tr>
<td>Main standard nut</td>
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<td>4.0~5.0</td>
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<td>Air cleaner bolts</td>
<td>2</td>
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<td>1.0~1.4</td>
<td></td>
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</tbody>
</table>
Troubleshooting

A. Engine cannot be started or difficult to be started

Check and adjustment | Fault condition | Probable causes
--- | --- | ---
Press the fuel injector feed pipe and confirm whether there is fuel in the feed pipe

The fuel supply to the fuel injector is sufficient | The fuel injector is not supplied with sufficient fuel

Check the spark plug ignition condition

Sparks | Weak sparks or no spark

Perform cylinder compression pressure test

Normal cylinder compression pressure | Low or no compression pressure

Restart the engine

No ignition | With signs of ignition but the engine cannot be started

Remove and check the spark plug

Dry spark plug | Wet spark plug

1. Check the fuel amount in the fuel tank
2. Check if the fuel pipe and the vacuum tube are blocked or not
3. Malfunction of fuel pump relay or wiring
4. Malfunction of fuel pump
5. The fuel strainer is blocked or not

1. Malfunction of spark plug
2. Spark plug contamination
3. Malfunction of ECU
4. Malfunction of the AC Generator
5. Ignition coil is in open or short circuit
6. Malfunction of main switch

1. Piston ring seized
2. Malfunction of cylinder valves
3. Worn cylinder and piston ring
4. Cylinder gasket leakage
5. Sand hole in the compression parts

1. Malfunction of throttle valve operation
2. Air sucked into intake manifold
3. Incorrect ignition timing

1. Contaminated or clogged fuel injector
2. Malfunction of throttle valve operation
3. Malfunction of fuel pressure regulator
B. Engine runs sluggish (Speed does not pick up, lack of power)

1. Check and adjustment

- Fault condition
- Probable causes

Accelerate gradually and check engine RPM

- Engine RPM can be increased
- Engine RPM cannot be increased

Check ignition timing (Using ignition lamp)

- Correct ignition timing
- Incorrect ignition timing

Check cylinder compression pressure (using compression pressure gauge)

- Normal compression pressure
- Abnormal compression pressure

Check if the fuel injector is clogged or

- Not clogged
- Clogged

Remove and check the spark plug

- No contamination or discoloration
- Contaminated or discolored

Check if the engine is overheated

- Normal
- Engine overheated

Continually drive in acceleration or high speed

- No knocking
- Knocking

1. Clogged air cleaner
2. Poor fuel supply
3. Clogged exhaust pipe
4. Clogged fuel injector

1. Malfunction of ECU
2. Malfunction of AC Generator

1. Worn out cylinder or piston ring
2. Cylinder gasket leakage
3. Sand hole in compression parts
4. Valve deterioration
5. Jammed piston ring

1. Replace the fuel injector
2. Incorrect spark plug heat range

1. Carbon deposit in the combustion chamber
2. Malfunction of fuel injector
3. Poor fuel quality
4. Abnormal ignition timing

1. Carbon deposit in the combustion chamber
2. Malfunction of fuel injector
3. Poor fuel quality
4. Abnormal ignition timing
1. General Information

C. Engine runs sluggish (especially in low speed and idling)

- Check and adjustment
- Fault condition
- Probable causes

1. Check ignition timing (using ignition lamp)
   - Normal
   - Abnormal
     - 1. Incorrect ignition timing (malfunction of ECU or AC)

2. Check for any air sucked in through the throttle body insulator gasket
   - No air sucked in
   - Air sucked in
     - 1. Abnormal throttle body insulator gasket
     - 2. Abnormal throttle body installation
     - 3. Abnormal inlet pipe gasket
     - 4. Damaged ABV pipe

3. Remove the spark plug and check the spark
   - Good spark
   - Poor spark

D. Engine runs sluggish (High speed)

- Check and adjustment
- Fault condition
- Probable causes

1. Check ignition timing
   - Normal
   - Abnormal
     - 1. Malfunction of ECU
     - 2. Malfunction of AC Generator

2. Check the fuel pump supply condition
   - Good
   - Poor
     - 1. Insufficient fuel in the fuel tank
     - 2. Pressed or clogged fuel pipe

3. Check if fuel injector clogged
   - Normal
   - Clogged
     - 1. Replace the fuel injector
E. CLUTCH AND DRIVING PULLEY

## 1. General Information

### E. CLUTCH AND DRIVING PULLEY

#### FAULT CONDITION

**Engine can be started but the vehicle cannot run**

- 1. Worn out or damaged drive belt
- 2. Damaged movable drive face
- 3. Damaged driven face spring
- 4. Broken clutch weight
- 5. Broken drive shaft groove
- 6. Worn out or damaged transmission gear

**Engine shuts down or trembles when the vehicle is running (rear wheel rotates during engine idling).**

- 1. Broken clutch spring
- 2. Clutch outer stuck with clutch weights
- 3. Connection parts between clutch and shaft worn out or burned

**Poor initial driving (poor climbing performance)**

- 1. Worn or deformed drive belt
- 2. Worn weight roller
- 3. Worn driven face
- 4. Deformed driven face spring
- 5. Grease on drive belt or drive / driven
Lubrication Points

- Steering stem bearing
- Acceleration cable/ Front & rear brake lever pivot
- Seat locker
- Front wheel bearing
- Side stand pivot
- Main stand pivot
- Rear wheel bearing
1. General Information

NOTE:
2. Maintenance Information

Precautions in Operation

<table>
<thead>
<tr>
<th>Precaution</th>
<th>Model</th>
<th>LX40A</th>
<th>LX60A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Tank Capacity</td>
<td></td>
<td>14.2 ± 0.5 L</td>
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<tr>
<td>Engine Oil</td>
<td>capacity</td>
<td>2,000 c.c.</td>
<td>2,300 c.c.</td>
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<tr>
<td></td>
<td>change (with oil filter replaced)</td>
<td>1,900 c.c.</td>
<td>2,000 c.c.</td>
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<tr>
<td></td>
<td>change</td>
<td>1,800 c.c.</td>
<td>1,900 c.c.</td>
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<tr>
<td>Transmission Gear Oil</td>
<td>capacity</td>
<td>350 c.c.</td>
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<td>change</td>
<td>330 c.c.</td>
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<tr>
<td>Capacity of coolant</td>
<td>Engine + radiator</td>
<td>1,500 c.c.</td>
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<td>Reservoir upper</td>
<td>350 c.c.</td>
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<tr>
<td>Clearance of throttle valve</td>
<td></td>
<td>2~6 mm</td>
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<td>Spark plug</td>
<td>CR8E (gap:0.6~0.7 mm)</td>
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<tr>
<td>Timing advance idle speed</td>
<td>BTDC 10º / 1,550 rpm</td>
<td>BTDC 13º / 1,550 rpm</td>
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<tr>
<td>Idling speed</td>
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<td>1,550±100 rpm</td>
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<tr>
<td>Cylinder compression pressure</td>
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<td>12.5 ± 2 kgf/cm²</td>
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<tr>
<td>Valve clearance</td>
<td>IN</td>
<td>0.10±0.02 mm</td>
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<tr>
<td></td>
<td>EX</td>
<td>0.15±0.02 mm</td>
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<tr>
<td>Tire dimension</td>
<td>Front</td>
<td>120/70-15 56S</td>
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<td></td>
<td>Rear</td>
<td>160/60-14 65H</td>
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<tr>
<td>Tire pressure (cold)</td>
<td>single</td>
<td>Front: 2.00 kg/cm² Rear: 2.30 kg/cm²</td>
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<tr>
<td></td>
<td>Load 90 Kg (full load)</td>
<td>Front: 2.00 kg/cm² Rear: 2.50 kg/cm²</td>
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<td>Battery</td>
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<td>12V11.2Ah (MF battery) / TTZ14S</td>
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## 2. Maintenance Information

### Periodical Maintenance Schedule

<table>
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<tr>
<th>No.</th>
<th>Item</th>
<th>Code</th>
<th>1 month every 1,000KM</th>
<th>3 months every 6,000KM</th>
<th>6 months every 12,000KM</th>
<th>1 year every 18,000KM</th>
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<tbody>
<tr>
<td>1</td>
<td>Air cleaner element</td>
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<td>Fuel filter</td>
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<td>3</td>
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<td>First replacement at 1000 km</td>
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<td>Further replacement every 12,000km</td>
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<td>5</td>
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<td>First replacement at 1000 km</td>
<td>Second replacement at 6,000km</td>
<td>Further replacement every 6,000km</td>
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<td>Tire pressure</td>
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<td>23</td>
<td>Lights/electrical equipment/multi-meters</td>
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<td>24</td>
<td>Main/side stands &amp; springs</td>
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<td>Cam chain</td>
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<td>27</td>
<td>Valve clearance</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Crankcase evaporative control system</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Evaporative control system</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Lines &amp; connections in cooling system</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Coolant reservoir</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Coolant</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>ECU input voltage</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>EFI sensor coupler</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Code:** I ~ Inspection, cleaning, and adjustment, R ~ Replacement, C ~ Cleaning (replaced if necessary), L ~ Lubrication

Have your motorcycle checked, adjusted, and recorded maintenance data periodically by your SYM Authorized Dealer to maintain the motorcycle at the optimum condition.

The above maintenance schedule is established by taking the monthly 1,000 kilometers as a reference which ever comes first.

**Remarks:**
1. These marks “☆” in the schedule are emission control items. According to EPA regulations, these items must be performed normally periodical maintenance following the user manual instructions. They are prohibited to be adjusted or repaired by unauthorized people. Otherwise, SYM is no responsible for the charge.
2. Clean or replace the air cleaner element more often when the motorcycle is operated on dusty roads or in the heavily-polluted environment.
3. Maintenance should be performed more often if the motorcycle is frequently operated in high speed and after the motorcycle has accumulated a higher mileage.
4. Preventive maintenance
   a. Ignition system – Perform maintenance and check when continuous abnormal ignition, misfire, after-burn, overheating occur.
   b. Carbon deposit removal – Remove carbon deposits in cylinder head, piston heads, exhaust system when power is obvious lower.
   c. Replace worn out pistons, cylinder head.
Engine Oil

Turn off engine, and park the vehicle in a flat surface with main stand.
Check oil level with oil dipstick
Do not screw the dipstick into engine as checking.
If oil level is nearly low level, fill out recommended oil to upper level.

Oil Change

⚠️ Caution

- Drain oil as engine warmed up so that to make sure oil can be drained smoothly and completely.

Place an oil pan under the vehicle, and remove oil drain bolt.
After draining, make sure washer can be re-used.
Install oil drain bolt.

**Torque value: 3.5~4.5kgf-m**

Add oil to crankcase (oil viscosity SAE 10W-40)
Recommended using King serial oil.

**Engine oil capacity:**
- Disassembly - 2000c.c.
- Replacement (oil filter replaced) - 1900c.c.
- Replacement – 1800c.c.

Install dipstick, start the engine for running several minutes.
Turn off engine, and check oil level again.
Check if engine oil leaks.

Engine Oil Strainer Clean

Drain engine oil out.
Remove oil strainer and spring.
Clean oil strainer.
Check if O-ring can be re-used.
Install oil strainer and spring.
Install oil strainer cap.

**Torque value : 1.3~1.7kgf-m**
2. Maintenance Information

**Gear Oil**
Oil level inspection
Park the vehicle on a flat surface with main stand.
Turn off the engine.

**Gear Oil Change**
Remove oil inspection bolt.
Remove drain plug and drain oil out.
Install the drain plug after draining.

*Torque value: 0.8~1.2kgf-m*
Add gear oil to specified quantity from the inspection hole.
Install the inspection bolt.

*Torque value: 1.0~1.4kgf-m*

**Gear Oil Quantity: 330 c.c. when replacing it.**
Make sure that the bolt washer can be re-used, and install the bolt.
Start engine and run engine for 2-3 minutes.
Turn off engine and make sure that oil level is in correct level.
Make sure that no oil leaking.

**Fuel Lines / Cable**
Remove luggage box.
Remove rear carrier.
Remove body covers.
Check all lines, and replace it when they are deteriorated, damaged or leaking.

⚠️ **Warning**
- Gasoline is a low ignition material so any kind of fire is strictly prohibited as dealing it.

**Acceleration Operation**
Have a wide open of throttle valve as handle bar in any position and release it to let back original (full closed) position.
Check handle bar if its operation is smooth.
Check acceleration cable and replace it if deteriorated, twisted or damaged.
Lubricate the cable if operation is not smooth
Measure handle bar free play in its flange part.

*Free play: 2~6 mm.*

Adjustment can be done in either end.
Secondary adjustment is conducted from top side.
Remove rubber boot, loosen fixing nut, and then adjust it by turning the adjustment nut.
Primary adjustment is conducted from bottom side.
Loosen fixing nut, and adjust by turning the adjustment nut.
Tighten the fixing nut, and check acceleration operation condition.

**Air Cleaner**

**Air Cleaner Element**
Remove 6 screws from the air cleaner cover.

Remove the air cleaner element.

⚠️ **Caution**

- The air cleaner element is made of paper so do not soap it into water or wash it with water.
2. Maintenance Information

P.C.V. system
Remove the plug from lower of the breather chamber hose.
Release the dry internal deposit.
Every 5,000 kilometers release oil

⚠️ Caution
- In releases the breather chamber hose in the transparent section is worthy of looking at as any deposit
- In the multi-rain or the accelerator in the situation rides, must reduce the maintenance traveling schedule
- In releases the breather chamber hose in the transparent section is worthy of looking at as any deposit

Valve Clearance

⚠️ Caution
- Checks and adjustment must be performed when the engine temperature is below 35°C.

Remove luggage box.
Remove cylinder head cover & side cover.
Remove ignition timing hole cap located in front upper side of engine right cover
Turn camshaft bolt in C.W. direction and let the “T” mark on the camshaft sprocket aligns with cylinder head mark so that piston is placed at TDC position in compression stroke.

⚠️ Caution
- Do not turn the bolt in C.C.W. direction to prevent from camshaft bolt looseness.

Valve clearance inspection and adjustment:
Check & adjust valve clearance with feeler gauge.
Valve clearance (IN) : 0.10±0.02 mm.
Valve clearance (EX) : 0.15±0.02 mm.
Loosen fixing nut and turn the adjustment nut for adjustment.

⚠️ Caution
- Re-check the valve clearance after tightened the fixing nut.

Special tool: Tappet adjuster
SYM-9001200-08
SYM-9001200-09
SYM-9001200-10

Special tool: Tappet adjuster wrench
SYM-9001200
Spark Plug
Recommended spark plug: CR8E
Remove luggage box
Remove central cover.
Remove spark plug cap.
Clean dirt around the spark plug hole.
Remove spark plug.
Measure spark plug gap.
**Spark plug gap: 0.6~0.7 mm**
Carefully bend ground electrode of the plug to adjust the gap if necessary.
Hold spark plug washer and install the spark plug by screwing it.
Tighten the plug by turning 1/2 turn more with plug socket after installed.
**Tighten torque: 1.0~1.2kgf-m**
Connect spark plug cap
2. Maintenance Information

Cylinder Compression Pressure
Warm up engine.
Turn off the engine.
Remove luggage box and central cover
Remove spark plug cap and spark plug.
Install compression gauge.
Full open the throttle valve, and rotate the engine by means of starter motor.

⚠️ Caution
- Rotate the engine until the reading in the gauge no more increasing.
- Usually, the highest pressure reading will be obtained in 4~7 seconds.

Compression pressure : 12.5±2 Kg/cm²
Check following items if the pressure is too low:
- Incorrect valve clearance.
- Valve leaking.
- Cylinder head leaking, piston, piston ring and cylinder worn out.
If the pressure is too high, it means carbon deposits in combustion chamber or piston head.

Drive Belt
Remove mounting bolt located under air cleaner.
Remove the engine left side cover and the cover.
Check if the belt is crack or worn out.
Replace the belt if necessary or in accord with the periodical maintenance schedule to replace it.
Width limit: 27.1 mm or above (LX40A)
27.2 mm or above (LX60A)

Clutch Disc Wear
Run the motorcycle and increase throttle valve opening gradually to check clutch operation.
If the motorcycle is in forward moving and shaking, check clutch disc condition then replace it.
2. Maintenance Information

Steering Handle Top Bearing

⚠️ Caution

- Check all wires and cables if they are interfered with the rotation of steering handle bar.

Lift the front wheel out of ground.
Turn handle from right to left alternative and check if turning is smoothly.
If handle turning is uneven and bending, or the handle can be operated in vertical direction, then adjust the handle top bearing.

Cushion

⚠️ Caution

- Do not ride the motorcycle with poor cushion.
- Looseness, wear or damage cushion will make poor stability and drive-ability.

Front cushion

Press down the front cushion for several times to check it operation.
Check if it is damaged.
Replace relative parts if damage found.
Tighten all nuts and bolts.

Rear Cushion

Press down the front cushion for several times to check it operation.
Check if it is damage
Replace relative parts if damage found.
Park motorcycle with main stand.
Turn the rear wheel forcefully and check if engine bracket bushing worn out
Replace the bushing if looseness found.
Tighten all nuts and bolts.
Disk Brake System

Brake System Hose
Make sure the brake hoses for corrosion or leaking oil.

Brake Fluid
Check brake fluid level in the brake fluid reservoir. If the level is lower than the LOWER limit, add brake fluid to UPPER limit. Also check brake system for leaking if low brake level found.

Caution
- In order to maintain brake fluid in the reservoir in horizontal position, do not remove the cap until handle stop.
- Do not operate the brake lever after the cap had been removed. Otherwise, the brake fluid will spread out if operated the lever.
- Do not mix non-compatible brake fluid together.

Filling Out Brake Fluid
Tighten the drain valve, and add brake fluid. Operate the brake lever so that brake fluid fulfilled inside the brake system hoses.

Added Brake Fluid
Add brake fluid to UPPER limit lever. Recommended brake fluid: DOT3 or DOT4 WELL RUN brake fluid.

Caution
- Never mix or use dirty brake fluid to prevent from damaging brake system or reducing brake performance.

Air Bleeding Operation
Connect a transparent hose to draining valve. Hold the brake lever and open air bleeding valve. Perform this operation alternative until there is no air inside the brake system hoses.

Caution
- Before closing the air bleeding valve, do not release the brake lever.
Brake Lining Wear

The indent mark on brake lining is the wear limitation. Replace the brake lining if the wear limitation mark closed to the edge of brake disc.

⚠️ Caution

- It is not necessary to remove brake hose when replacing the brake lining.

Remove the brake clipper bolt, and take out the clipper.

⚠️ Caution

- Do not operate the brake lever after the clipper removed to avoid clipping the brake lining.

Pry out the brake lining with a flat driver if lining is clipped.

Remove 2 cotter pins

⚠️ Caution

- In order to maintain brake power balance, the brake lining must be replaced with one set.

Remove the brake pad shafts and pads.
2. Maintenance Information

Brake Light Switch / Start Switch

The brake light switch is to light up brake lamp as brake applied. Make sure that starter motor can be operated only under brake applying.

Wheel / Tire

⚠️ Caution

- Tire pressure check should be done as cold engine.

<table>
<thead>
<tr>
<th>Tire size</th>
<th>Front tire</th>
<th>Rear tire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tire pressure as cold engine (Kg/cm²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load for under 90 Kg</td>
<td>2.00</td>
<td>2.25</td>
</tr>
<tr>
<td>Full loaded</td>
<td>2.00</td>
<td>2.50</td>
</tr>
</tbody>
</table>

Check if tire surface is stuck with nails, stones or other materials. Check if front and rear tires’ pressure is in normal. Measure tire thread depth from tire central surface. Replace the tire if the depth is not come with following specification

Front tire: 1.5 mm
Rear tire: 2.0 mm
2. Maintenance Information

**Battery**
Open the inner box lid.
Loosen screw & remove the battery cover

**Battery cable remove :**
1. Disconnect the cable negative terminal (\(-\)),
2. then the cable positive terminal (\(+\))
3. Remove the battery from the motorcycle.

If there is some rust on battery posts, clean it with steel brush
Install the battery in the reverse procedures of removal

⚠️ **Caution**
- If there is rust on the posts very serious, spray some hot water on the posts. Then, clean it with steel brush so that can remove rust for more easily.
- Apply some grease on the posts after rust removed to prevent from rust again.

**Nuts, Bolts Tightness**
Perform periodical maintenance in accord with the Periodical Maintenance Schedule.
Check if all bolts and nuts on the frame are tightened securely.
Check all fixing pins, snap rings, hose (pipe) clamps, and wire holders for security.
## Special Tools List

<table>
<thead>
<tr>
<th>NAME</th>
<th>No.</th>
<th>SYM Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve rocker arm shaft disassemble tool</td>
<td>SYM-1445100-01</td>
<td>-</td>
</tr>
<tr>
<td>L/Cover Radial Ball Brg 6006 Drive</td>
<td>SYM-9615010-REA 6006</td>
<td>SYM-1471110/20</td>
</tr>
<tr>
<td>Clutch spring compressor</td>
<td>SYM-2301000-L4A</td>
<td></td>
</tr>
<tr>
<td>Tappet adjusting wrench</td>
<td>SYM-9001200</td>
<td></td>
</tr>
<tr>
<td>Oil seal driver 45<em>65</em>10</td>
<td>SYM-9125500-L4A</td>
<td></td>
</tr>
<tr>
<td>Crank Shift Oil Seal Driver 35<em>55</em>7</td>
<td>SYM-9120900-L4A</td>
<td></td>
</tr>
<tr>
<td>PULLEY DRIVEN FACE OPENER</td>
<td>SYM-2321000-REA</td>
<td></td>
</tr>
<tr>
<td>Drive Shaft 25<em>40</em>7 Oil Seal Drive</td>
<td>SYM-9120200-L4A</td>
<td></td>
</tr>
<tr>
<td>Inner bearing puller</td>
<td>SYM-6204022</td>
<td></td>
</tr>
<tr>
<td>Inner Bearing Driver</td>
<td>SYM-6204024</td>
<td></td>
</tr>
<tr>
<td>Outer bearing puller</td>
<td>SYM-6204010</td>
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</table>
2. Maintenance Information

<table>
<thead>
<tr>
<th>Name</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driven pulley bearing installer</td>
<td>SYM-9100600-L4A DPB</td>
</tr>
<tr>
<td>Drive shaft bearing installer</td>
<td>SYM-9100420-A6305</td>
</tr>
<tr>
<td>Counter shaft bearing driver</td>
<td>SYM-9610000-L4A N1820</td>
</tr>
<tr>
<td>Clutch nut wrench</td>
<td>SYM-9020200</td>
</tr>
<tr>
<td>Universal holder</td>
<td>SYM-2210100</td>
</tr>
<tr>
<td>AC.G. FLYWHEEL PULLER</td>
<td>SYM-3110000-HMA</td>
</tr>
<tr>
<td>Final shaft bearing installer</td>
<td>SYM-9615000-L4A A6206</td>
</tr>
<tr>
<td>Water pump bearing installer</td>
<td>SYM-1923100-L4A A6203</td>
</tr>
<tr>
<td>Balance shaft bearing installer</td>
<td>SYM-1333200-L4A A6304</td>
</tr>
<tr>
<td>Water pump seal driver</td>
<td>SYM-9120500-L4A</td>
</tr>
<tr>
<td>Water pump mechanical seal driver</td>
<td>SYM-1721700-H9A</td>
</tr>
<tr>
<td>Water pump mechanical bearing driver N1010</td>
<td>SYM-9100100-L4A</td>
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</table>
## 2. Maintenance Information

<table>
<thead>
<tr>
<th>NAME</th>
<th>Crankshaft bearing install / remove tool</th>
<th>NAME</th>
<th>Crankshaft bearing install tool</th>
<th>NAME</th>
<th>Fuel pressure gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>SYM-9100310-L4A (L6C)</td>
<td>NO</td>
<td>SYM-9100310-L4A (L6C)</td>
<td>NO</td>
<td>SYM-HT07010</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME</th>
<th>Vacuum pressure gauge</th>
<th>NAME</th>
<th>Cylinder pressure gauge</th>
<th>NAME</th>
<th>Vehicle circuit test tool kit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>SYM-HT07011</td>
<td>NO</td>
<td>SYM-HT07008</td>
<td>NO</td>
<td>SYM-HE170008</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME</th>
<th>Vehicle circuit test harness kit</th>
<th>NAME</th>
<th>EFI System Diagnostic tool</th>
<th>Multi-meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>SYM-HE170008-01</td>
<td>NO</td>
<td>SYM-HE07007-01</td>
<td></td>
</tr>
</tbody>
</table>
3. Lubrication System

Precautions in Operation

- This chapter contains maintenance operation for the engine oil pump and gear oil replacement.

Specifications

<table>
<thead>
<tr>
<th>Engine oil</th>
<th>Disassembly: 2000 c.c. (LX40A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Change (with oil filter replaced): 1900 c.c. (LX40A)</td>
</tr>
<tr>
<td></td>
<td>Change: 1800 c.c. (LX40A) 1900 c.c. (LX60A)</td>
</tr>
<tr>
<td>Gear oil</td>
<td>Disassembly: 350 c.c.</td>
</tr>
<tr>
<td></td>
<td>Change: 330 c.c.</td>
</tr>
<tr>
<td>Oil</td>
<td>Oil viscosity SAE 10W-40</td>
</tr>
<tr>
<td></td>
<td>(Recommended King serial oils)</td>
</tr>
<tr>
<td>Gear oil</td>
<td>Gear oil viscosity SAE 85W-140</td>
</tr>
<tr>
<td></td>
<td>(Recommended SYM Hypoid gear oils)</td>
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</table>

<table>
<thead>
<tr>
<th>Items</th>
<th>Standard (mm)</th>
<th>Limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil pump Inner rotor clearance</td>
<td>0.15</td>
<td>0.20</td>
</tr>
<tr>
<td>Clearance between outer rotor and body</td>
<td>0.15~0.20</td>
<td>0.25</td>
</tr>
<tr>
<td>Clearance between rotor side and body</td>
<td>0.04~0.09</td>
<td>0.12</td>
</tr>
<tr>
<td>Torque value oil strainer</td>
<td>1.3~1.7 Kgf-m</td>
<td></td>
</tr>
<tr>
<td>Gear oil drain plug</td>
<td>1.1~1.4 Kgf-m</td>
<td></td>
</tr>
<tr>
<td>Gear oil inspection bolt</td>
<td>1.1~1.4 Kgf-m</td>
<td></td>
</tr>
<tr>
<td>Oil pump connection bolt</td>
<td>0.8~1.2 Kgf-m</td>
<td></td>
</tr>
</tbody>
</table>

Troubleshooting

Low engine oil level
- Oil leaking
- Valve guide or seat worn out
- Piston ring worn out

Dirty oil
- No oil change in periodical
- Cylinder head gasket damage
- Piston ring worn out

Low oil pressure
- Low engine oil level
- Clogged in oil strainer, circuits or pipes
- Oil pump damage
3. Lubrication System

**Engine Oil**

Turn off engine, and park the vehicle in a flat surface with main stand.
Check oil level with oil dipstick
Do not screw the dipstick into engine as checking.
If oil level is nearly low level, fill out recommended oil to upper level.

**Oil Change**

⚠️ **Caution**

Drain oil as engine warmed up so that to make sure oil can be drained smoothly and completely.

Place an oil pan under the vehicle, and remove oil drain bolt.
After draining, make sure washer can be re-used. Install oil drain bolt.
**Torque value: 1.1~1.5 Kgf-m**
Fill out engine oil (oil viscosity SEA 10W-40).
Recommended using King serial oil.

Install dipstick, start the engine for running several minutes.
Turn off engine, and check oil level again.
Check if engine oil leaks.

**Engine Oil Strainer Clean**

Drain engine oil.
Remove oil strainer and spring.
Clean oil strainer.
Check if O-ring can be re-used.
Install oil strainer and spring.
Install oil strainer cap.
**Torque value: 1.3~1.7 Kgf-m**
Add oil to crankcase (oil viscosity SAE 10W-40)
Recommended using King serial oil.
3. Lubrication System

Oil Pump Removal
Remove generator and starting gear.
Remove the oil separator (bolt x 2).

Remove snap ring and take out oil pump driving chain and sprocket.
**Torque value: 0.8~1.2 Kg-m**
Make sure that pump shaft can be rotated freely.

Remove 3 bolts on the oil pump, and then remove oil pump.

Oil Pump Disassembly
Remove the screws on oil pump cover and disassemble the pump as illustration shown.
3. Lubrication System

**Oil Pump Inspection**

Check the clearance between oil pump body and outer rotor.
Limit: 0.25 mm

Check clearance between inner and outer rotors.
Limit: 0.20 mm

Check clearance between rotor side face and pump body.
Limit: 0.12 mm

**Oil Pump Reassembly**

Install inner and outer rotors into the pump body.
Align the indent on driving shaft with that of the inner rotor.
Install the driving shaft.
Install fixing pin.
3. Lubrication System

Install the oil pump cover and fixing pin properly

Tighten screw
Make sure that oil pump shaft can be rotated freely.

**Oil Pump Installation**

Install the oil pump, and then tighten bolts.

**Torque value: 0.8~1.2 Kg-m**

Make sure that oil pump shaft can be rotated freely.
Install oil pump driving chain and sprocket, and then install snap ring onto oil pump shaft.

Install starting gear and generator.
3. Lubrication System

**Gear Oil**

Oil level inspection
Park the motorcycle on flat surface with main stand.
Turn off the engine and remove oil inspection bolt.

Gear lubrication oil quantity has to be measured with measurement device.
If oil level is too low, add gear oil.
Recommended using King serial oils.
Install oil inspection bolt.
**Torque value: 1.0~1.4 Kgf-m**

**Gear Oil Change**

Remove oil level inspection bolt.
Remove drain plug and drain oil out.
Install the drain plug after draining.
**Torque value: 1.0~1.4 Kgf-m**

Make sure that the drain plug washer can be reused.
Add oil to specified quantity from the inspection hole.
**Gear Oil Quantity: 330 c.c. when replacing it.**

Make sure that the bolt washer can be re-used, and install the bolt.
Start engine and run engine for 2-3 minutes.
Turn off the engine and make sure that oil level is in correct level.
Make sure that no oil leaking.
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**EFi System Components Diagram**

- Fuel pump
- ISC (Stepper motor)
- MAP Sensor
- TPS
- TA Sensor
- AISV
- TW Sensor
- O2 Sensor
- ECU
- Battery
- Power relay
- EFi Check light
- Roll over sensor
- Diagnostic tool

---

**4-1**
4. Fuel Injection System

EFi System Vehicle Configuration

Right

- TPS ISC
- MAP Sensor
- Injector
- Fuel pump
- TW Sensor
- O₂ Sensor
- CPS
- ECU

Left

- Diagnostic coupler
- Test switch
- EFi Check light
- Rollover sensor
- AISV
- TA Sensor
EFi System Operation

- Crankshaft Position Sensor
- Manifold Absolute Pressure Sensor
- Throttle Position Sensor
- Engine Coolant Temperature Sensor
- O2 Sensor
- Roll Over Sensor
- Intake Air Temperature Sensor
- Battery Voltage

(CPS) Engine Control Unit

- INJECTOR
- IGN COIL
- FUEL PUMP
- CHECK LIGHT
- AISV (Air Injection Solenoid Valve)
- ISC (Idle Speed Control Valve (Stepper motor))

Tuning tools
Diagnostic tool

To this chapter contents
4. Fuel Injection System

EFi System Introduction
Based on 4-stroke SOHC engine, displacement 400 c.c. electronically controlled fuel injection, fuel vapor absorbed by activated carbon canister. The engine burns off the blow-by-fuel-gas in the crankcase through the fuel-air separating device. The O2 sensor enhances the efficiency of the catalytic converter, by dynamically controlling the Fuel/Air ratio.

Electronic Fuel Injection Devices
Consist of fuel supply devices: fuel tank, fuel pump, fuel filter and fuel pressure regulator. And fuel control devices: fuel injector and ECU. The fuel is pumped from electrical fuel pump in the fuel tank, to the injector on the inlet pipe. The fuel pressure regulator keeps the fuel pressure around 294±6kPa. The signals from ECU enable the injector to spray fuel into the combustion chamber once every two crankshaft revolutions. The excessive fuel flows back to the fuel tank through the fuel pressure regulator. Fuel pump is placed within the tank to reduce the working noise, and the complicity of fuel pipes. Electronically controlled ignition and injection system effectively reduce the fuel consumption rate and pollution.

In the traditional gasoline engine, the carburetor supplies the fuel. The process is done by the engine vacuum and the negative pressure in the carburetor by mixing fuel and air. Under this condition, three major processes are done simultaneously in the carburetor:
1. Air quantity measurement.
2. Fuel quantity determination.
3. Mixing of fuel and air.

Electronic Fuel Injection System distributes the three major processes to three different devices:
1. MAP / TA sensor measures the air quantity and temperature and sends the signal to ECU as a reference.
2. ECU determines the amount of fuel to be injected, according to the default A/F rate.
3. ECU enables the injector to spray appropriate fuel amount. The independence of these three functions will raise the accuracy of the whole process.

EFi engine uses computer-programmed fuel injection, the main features are:
1. The quantity of fuel injected is decided according the condition of the engine. The engine RPM, and throttle position determines the fuel quantity and injection time-length. This throttle-controlled fuel injection is better responding and more accurate.
2. The quantity of fuel injection, and the determination of injection time length, are all controlled by 16-bit microcomputer.
3. The fuel pressure regulator maintains a 294±6 kPa pressure difference between intake pipe and fuel pipe, raising the accuracy of fuel injection.
4. By measuring the air pressure of intake pipe, this system gives the vehicle better accommodation to the environment.
5. Idle air by-pass system supplies fuel and air to stabilize the idle running, and cold starting.
6. O2 sensor feeds back the signal to minimize the exhaust pollution.
System Description
1. After Key-on, the sensors signal to be sent to the ECU. ECU controls the fuel pump relay to make the fuel pump operate. If the engine is not started, the fuel pump will be shut down within 2 to 3 seconds in order to save electricity.
   Fuel pressure regulator maintains fuel pressure at 294 ± 6kPa (about 3 kg / cm²). According to the operating conditions and environmental compensation coefficient, appropriate fuel will be injected. After Key-off or engine stopped operating, the fuel pump stops running.
2. Fuel impurities filtered by the fuel filter should be cleaned regularly.
3. When the engine can not be started, do not keep start motor running continuously which may lead to lack of battery power (less than 10 V) and the fuel pump will not be able to operate. The correct way is to use a new battery.

Injector
Eight-hole type injector provides two intake valves fuel injection quantity, enhances the effect of fuel atomization, and reduces HC emissions. Short-type injector cap can easily fix the injector, receive the fuel from the fuel pump, and limit injector rotation sliding. The signals from ECU control the fuel pressure regulator, using the diaphragm and spring to maintain the fuel pressure in 294 ± 6kPa (about 3 kg / cm²), and determine the fuel injection quantity by adjusting injection time width under different engine conditions.

Fuel Pump
Electrical fuel pump is placed inside the fuel tank, powered by the battery and controlled by ECU.
Fuel pressure: 294 ± 6kPa (about 3 kg / cm²)
4. Fuel Injection System

Ignition System

**Principle**
The computer programmed ignition system receives the signals from the Crankshaft position sensor, Throttle position sensor, O₂ Sensor, MAP sensor, Intake air temperature sensor, Engine coolant temperature sensor. Calculating the engine RPM, the 16-bit microcomputer determines the appropriate ignition timing, controls the ignition coil and triggers the spark plug. This way can not only make the engine achieve the maximum power output, but also help improve fuel consumption rate.

**Specifications**
1. Ignition timing: BTDC 10 ° / 1550RPM
2. Spark plug: NGK CR8E Clearance: 0.6 to 0.7 mm
3. ACG crankshaft position sensor coil resistance: 80 ~ 160 Ω (Green / White - Blue / Yellow)
4. Ignition coil primary circuit resistance: 2.8 Ω ± 15% (20 ° C) (Red / Yellow - Black / Yellow)
5. Battery Type / Capacity: TTZ14S / 12V 11.2Ah


**Sensors / Drivers**

**Crankshaft Position Sensor (CPS)**

**Description**

The magnetic field type sensor generates a voltage signal to calculate engine speed with ACG gear ring (18-1 tooth).

There is one tooth every 20 degree on the gear ring. But, one of the teeth is blank for the TDC calculating base.
4. Fuel Injection System

Manifold Absolute Pressure (MAP) / Engine Water Temperature (TW) / Intake Air Temperature (TA) Sensors

Engine water temperature / Intake air temperature sensor:
Use the variable resistor of negative temperature coefficient (thermistor) to sense the outside temperature. The electrical resistance value goes down when the temperature rises. On the contrary, the electrical resistance value becomes higher when the temperature falls. Sensors provide the temperature of the engine coolant and intake air to ECU to determine the injection and ignition timing.

Manifold absolute pressure sensor:
Manifold absolute pressure sensor (MAP Sensor) uses the piezoresistive resistor composed of silicon diaphragm, forming the Wheatstone bridge circuit to measure the atmospheric pressure and the intake manifold pressure, which are both transmitted to ECU for reference of engine control.
Function

$O_2$ Sensor measures the proportion of oxygen in the exhaust gas, sending signals to ECU which adjusts the air-fuel ratio by changing the fuel injection time. If the proportion of oxygen is too low, it means the rich air-fuel mixture with higher HC & CO concentration in the exhaust gas. If the proportion of oxygen is too high, it means the lean air-fuel mixture with higher temperature and higher NOx concentration.

1. $O_2$ Sensor outputs feedback signal to ECU which keeps the air-fuel mixture near the stoichiometric ratio approximately 14.6 and forms the closed loop control system.
2. When the air-fuel mixture is near the stoichometric ratio, CO / HC / NOx are converted most efficiently.
3. $O_2$ Sensor heater resistance: 6.7 ~ 10.5 Ω
4. $O_2$ Sensor amendment in the voltage value: between 100 ~ 900 mV
Throttle Position Sensor (TPS)

Basic Principle
TPS is a rotary variable electric resistor. When it is rotated, both electric resistance and voltage value change, determining the throttle position.

Function
TPS determines the throttle valve position and sends signal to ECU as reference of engine control.
Idle Speed Control Valve (ISC stepper motor)

**Function**
ECU controls ISC stepper motor to adjust the bypass intake air quantity and stabilize the idle speed.
Air Injection Solenoid Valve (AISV)

Function
AISV introduces appropriate air quantity to reduce pollutant emission.

Basic Principle
When the engine RPM and throttle opening are higher than the default value, ECU controls AISV opening or closure.
Precautions in Operation

General information

⚠️ Warning
- Gasoline is a low fire point and explosive material. Always work in a well-ventilated place and flame is strictly prohibited when working with gasoline.
- Before dismantling fuel system parts, leak fuel out first, or grip the fuel pipe by using pliers to prevent fuel from splashing.

⚠️ Cautions
- Do not bend or twist the throttle cable. Damaged cable will lead to unstable driving.
- When disassembling fuel system parts, pay attention to O-ring position, replace with new one as re-assembly.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle RPM</td>
<td>1550±100 rpm</td>
</tr>
<tr>
<td>Throttle handle free play</td>
<td>2~6 mm</td>
</tr>
<tr>
<td>Fuel pressure</td>
<td>294±6kPa (about 3.0kg/cm²)</td>
</tr>
</tbody>
</table>

Torque value
- Engine Temperature sensor: 0.74~0.88 kgf-m
- O₂ Sensor: 3.6~4.6 kgf-m

Special Tools
- Vacuum Gauge
- Fuel Pressure Gauge
- EFI System Diagnostic Scanner
- Fuel Pipe Pliers
 EFI System Components Description
ECU (Electronic Control Unit)

**Functional Description:**
- Powered by DC 8~16V, and has 33-pin socket on the unit.
- The hardware component consists of a 16-bit microcomputer that is its control center. It contains the functional circuit interface of engine condition sensing and the driving actuator for the fuel injector, fuel pump, as well as ignition coil.
- Its major software is a monitor strategy operation program that includes controlling strategy and self-diagnosis programs.

**Testing Procedures:**
1. Connect the diagnostic scanner to the diagnostic coupler on the vehicle.
2. Key-on but not to start engine, confirm ECU and the diagnostic scanner can be connected or not.
3. Diagnostic scanner will automatically display Version "certification" of the screen.
4. Confirm the application model, version is correct or not.
5. Check if the fault codes exist.
6. Remove the fault codes.
7. Start engine and check the parameters which shown on the diagnostic scanner.

**Detection judge:**
- Fault codes can be read and cleaned, and the fault codes will not appear again after re-start.

**Treatment of abnormal phenomena:**
1. Disconnected→ First, check whether the cartridge is correct and ECU is normal or not.
2. Unable to start→ ECU or relevant parts abnormal. Re-confirm after the replacement of abnormal parts.
3. Fault codes appear→ ECU or relevant parts abnormal. Troubleshoot and re-confirm.
Throttle Body

Functional Description:
- Throttle body is the inlet air flow regulating device (similar to the carburetor).
- Throttle valve pivot drives the throttle position sensor synchronously and makes ECU detect the throttle opening immediately.
- Throttle valve positioning screw has been adjusted and marked on the production line. Readjustment is not suggested.

Treatment of abnormal phenomena:
- If all fuel injection associated components identified no adverse, and other traditional engine components are also normal, the engine is still not smooth, please confirm whether the throttle body coke serious.
- If coke serious, please clean throttle body, and then adjust the injection system.
4. Fuel Injection System

MAP Sensor

Functional Description:
- Powered by 5V DC from ECU. It has 3-pin sockets on the sensor. One terminal is for power, and 1 terminal are for signal output. And, the rest one is for ground.
- The major component of the intake pressure sensor is a variable transistor IC. Its reference voltage is DC 5V, and output voltage range is DC 0~5V.
- It is a sensor by sensing pressure, and can measure the absolute pressure in intake process. It also conducts fuel injection quantity correction based on environmental position level.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Wire color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>Yellow / Black</td>
<td>5V voltage input</td>
</tr>
<tr>
<td>center</td>
<td>Black / Red</td>
<td>Signal output</td>
</tr>
<tr>
<td>Right</td>
<td>Green / Red</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Testing Procedures:
1. Inlet pressure sensor connector to properly (using the probe tool).
2. Open the main switch, but not to start engine.
3. Use "volta ge meter" DC stalls (DCV) to check inlet pressure sensor voltage.
4. Confirmed working voltage:
   - Voltage meter negative access to the inlet pressure sensor third pin (Green / Red).
   - Voltage meter positive access to the inlet pressure sensor first pin (Yellow / Black).
5. Confirmed plains output voltage values:
   - Voltage meter negative access to the inlet pressure sensor third pin (Green / Red).
   - Voltage meter positive access to the inlet pressure sensor second pin (Black / Red)

⚠️ Cautions
- Attentions to the tools required close to the probe wire waterproof apron penetrate skin and internal terminal before measurements to the correct value.

Detection judge:
- Working voltage value: 5.0±0.1V
- Plains output voltage values: 2.87±0.03V (Conditions: In the plains 101.3 kPa Measurement)

⚠️ Cautions
- The higher the altitude, the measurement value to the lower voltage.
- Sea-level atmospheric pressure = 1Atm = 101.3kPa = 760mmHg = 1013mbar

Treatment of abnormal phenomena:
- Inlet pressure sensor damaged, or poor contact couplers.
- Check whether the abnormal wire harness lines.
- Inlet pressure sensor anomaly, the proposed replacement of the sensor to measure the output voltage.
- ECU anomaly, the proposed replacement of the ECU to measure the working voltage.
**Functional Description:**
- Use ECU DC 5V power supply provided, has the two-pin coupler, a voltage output pin; another one for a grounding pin.
- Its main component is a negative temperature coefficient (resistance temperature rise smaller) thermistor.
- Installed in the air cleaner on the intake temperature sensor within the resistance, with the induction to the temperature change, and converted into voltage signals sent to the ECU then calculated the temperature and, in accordance with the ECU temperature and state amendments injection time and ignition angle.

**Testing Procedures:**
**Resistance Value Measurement:**
- Dismantled inlet temperature sensor connector.
- Use of the "Ohmmeter" Ohm stalls, inspection sensor resistance.

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Resistance value (KΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20</td>
<td>18.8 ± 2.4</td>
</tr>
<tr>
<td>40</td>
<td>1.136 ± 0.1</td>
</tr>
<tr>
<td>100</td>
<td>0.1553 ± 0.007</td>
</tr>
</tbody>
</table>

**Detection judge:**
Resistance value and the temperature between relationships as follows

**Treatment of abnormal phenomena:**
- Temperature sensor damaged or connector poor contact.
- Check whether the abnormal wire harness lines.
- Temperature sensor anomaly, the proposed replacement of the temperature sensor.
Functional Description:
- Use ECU provided DC 5V power supply, has the three-pin coupler, one for the power supply pin; one for a voltage output pin; one for a grounding pin.
- Its main component is a sophisticated type of variable resistor.
- Installed on the throttle body beside the throttle through (the accelerator) rotates, the output of linear voltage signal provided ECU perception and judgment then throttle position (opening), and in this signal with have the most appropriate fuel injection and ignition timing control.

<table>
<thead>
<tr>
<th>Pins</th>
<th>Wire color</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper</td>
<td>White / Brown</td>
<td>Signal output</td>
</tr>
<tr>
<td>Center</td>
<td>Yellow / Black</td>
<td>5V voltage input</td>
</tr>
<tr>
<td>Under</td>
<td>Green / Red</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Testing Procedures:
1. Sensor connected properly (using the probe tool), or can be removed connector to voltage measurements (direct measurement).
2. Opened the main switch, but do not to start engine.
3. Use "voltage meter" DC stalls (DCV) to check sensor voltage.
4. Confirmed working voltage:
   - Voltage meter negative access to the inlet pressure sensor third pin (Green / Red).
   - Voltage meter positive access to the inlet pressure sensor first pin (Yellow / Black).
5. Throttle output signal recognition (using the probe tool)
   - Voltage meter negative access to the sensor third pin (Green / Red).
   - Voltage meter positive access to the sensor first pin (white / Brown).
   - Measurements were full throttle at full throttle closed the values of the output voltage.

**Cautions**
- Attentions to the tools required close to the probe wire waterproof apron penetrate skin and internal terminal before measurements to the correct value.

Detection judge:
- Working voltage value: 5.0±0.1V
- TPS output voltage – throttle fully closed : 0.6±0.02V
- TPS output voltage – throttle fully opened: 3.78±0.26V
Also, can be used for diagnosis tool confirm to the throttle output signal.

1. Connected to the "diagnosis tool", and open the main switch, but not to start engine.
2. "Diagnosis tool" screen switches to a “data analysis (01 / 03)” screen.
3. Rotations throttle and check voltages.

**Treatment of abnormal phenomena:**
- Throttle sensor damage or connector poor contact.
- Check whether the abnormal wire harness lines.
- Throttle sensor anomaly, the proposed replacement of the throttle sensor to measure the voltage.

⚠️ **Warning**
- Throttle sensor prohibited removed from the throttle body to do any testing.
TW Sensor

Functional Description:
- Powered by 5V DC from ECU. It has the two-pin socket on the sensor. One terminal is for power output, and 1 terminal are for ground.
- Its main component is a negative temperature coefficient (resistance temperature rise smaller) thermistor.
- Installed in the cylinder head, the engine temperature sensor resistance, with the induction to the temperature change, and converted into voltage signals sent to the ECU was calculated engine temperature, ECU accordance with the engine warm up to amendment the injection time and ignition angle.

Testing Procedures:
- Dismantled engine temperature sensor.
- Use of the "meter" Ohm stalls, inspection sensor resistance.

Detection judge:
Resistance value and the temperature between relationships as follows:

<table>
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<tr>
<th>Temperature (°C)</th>
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<td>100</td>
<td>0.1553 ± 0.007</td>
</tr>
</tbody>
</table>

Treatment of abnormal phenomena:
- Temperature sensor damaged or couplers to poor contact.
- Check whether the abnormal wire harness lines.
- Temperature sensor anomaly, the proposed replacement of the temperature sensor.
4. Fuel Injection System

O2 Sensor

Functional Description:
- Use 8 ~ 16V DC power supply, has the 4-pin coupler, a power supply pins for heater; for a heater control pin; signal for a grounding pin; O2 for a signal pin.
- O2 Sensor output feedback signal to the ECU fuel ratio control in the vicinity of 14.5 ~ 14.7, a closed-loop fuel control.
- When the air-fuel ratio control in the near equivalent, CO / HC / Nox to have the highest conversion efficiency.

Testing Procedures:
1. Voltage confirmed:
   - Removed O2 Sensor and the wire harness between the coupler.
   - Open the main switch, but not to start engine.
   - Use "voltage meter" DC stalls (DCV) to check inlet pressure sensor voltage.
   - Confirmed working voltage:
     Voltage meter negative access to the wire harness sensor coupler 2nd pin (Red / Orange).
     Voltage meter positive access to the wire harness sensor coupler first pin (Red / Yellow).

2. Resistance Confirmation:
   - Remove O2 Sensor and the wire harness between the coupler.
   - Use of the "meter" Ohm stalls, Measurement O2 Sensor heater resistance.
   - Measurement resistance value
     Ohm meter negative access to the O2 sensor coupler 2nd pin (White).
     Ohm meter negative access to the O2 sensor coupler first pin (White).
1. Used the diagnosis tool to confirm of \( \text{O}_2 \) sensor work situations:
   - Connected the “diagnosis tool” to diagnosis coupler and open the main switch to start the engine.
   - Engine to be completely warm-up (idling state operation "5 minutes" above).
   - Screen will switch to the diagnosis tool of "DATA STREAM 01/01" screen, select " \( \text{O}_2 \) Sensor" project, and switches to a wave of images, turn the throttle engine speed to about 4500 rpm, Observation \( \text{O}_2 \) Sensor actuator circumstances.
   - Observation \( \text{O}_2 \) Sensor voltage values that the situation changes.

Detection judge:
   - Working voltage value: above 10V
   - Resistance value: 6.7~10.5Ω
   - \( \text{O}_2 \) Sensor amendment in the voltage value of between 100 ~ 900 mV beating; representatives pollution closed-loop control system to normal, if contrary to maintain a fixed value for abnormalities.

Treatment of abnormal phenomena:
   - \( \text{O}_2 \) sensor damaged, heater damaged or couplers to poor contact.
   - Check whether the abnormal wire harness lines.
   - \( \text{O}_2 \) Sensor anomaly, the proposed replacement of the \( \text{O}_2 \) Sensor, and measurements again.
Roll over sensor

**Functional Description:**
- Control power of the power relay coil, has the three-pin socket.
- When vehicles tilt angle greater than 65 degrees, roll over sensor will be the implementation of ECU system power off. At this point once again to restart the engine, the need to re-open a main switch.
- This as a safety device, when the dumping of vehicles, be cut off power supply of ECU, and engine stop.

**Testing Procedures:**
- Because of the roll over sensor for the electronic control agencies, not against removed after a single measurement.
- Normal state, after power is turned on the main switch, measurement of ECU power relays red / yellow line to the Green Line (ground), the power supply voltage measurement can determine whether it is normal for the roll over sensor.

**Detection judge:**
Voltage: Supply voltage = Battery voltage

**Treatment of abnormal phenomena:**
Vehicle state vertical, power relays or ECU without electricity supply.
- Roll over sensor internal short circuit or open circuit, or coupler bad contact.
- Check whether the abnormal wire harness lines.
- Roll over sensor anomaly, the proposed replacement of the roll over sensor.
4. Fuel Injection System

ISC (stepper motor):

**Functional Description:**
- Use ECU provided power, has the four-pin socket.
- 4-pin coupler for the two motor coils of the power supply and grounding wire, grounding ECU power through the control and management of the stepper motor actuators.
- If it's mainly low-power DC motors, drives idle speed control valve (ISC) of the movement to adjust the idle air flow channel size, control of idle speed of the engine in the cold or hot.

**Testing Procedures 1:**

**Resistance Confirmation:**
- Idle Air Control Valve will be demolished down coupler (directly in the body, can also measure).
- Use of the "meter" Ohm stalls (Ω), measurement of the two step motor coil resistance values.
  - A phase: ISCAP and ISCAN
  - B phase: ISCBP and ISCBN

Inspection of the actuation (testing can only be on engine, not a single test):
- Closure of the main switch.
- Use hand to touch Idle Air Control Valve body.
- Open the main switch.
- Feeling the Idle Air Control Valve Actuation.

**Cautions**
- Dynamic checking for Idle Air Control valve, can only be tested on the engine, not a single test.

**Detection judge:**
1. Resistance value:
   - A phase: $80 \pm 10\ \Omega$ (Environmental conditions: $15 ~ 25 \ ^\circ C$)
   - B phase: $80 \pm 10\ \Omega$ (Environmental conditions: $15 ~ 25 \ ^\circ C$)
2. Actuator inspection:
   In the above steps Idle Air Control Valve (ISC) Idling motor actuator control of inspection, ISC will be slightly vibration or "... da... da..." continuous sound.

**Treatment of abnormal phenomena:**
- Idle air control valve damage, or poor coupler contact.
- Check whether the abnormal wire harness lines.
- Idle Air Control Valve anomaly, the proposed replacement of the Idle Air Control Valve, further inspection of its actuator.
Fuel Injection System

Functional Description:
• Powered by DC 8~16V, and has four-pin socket on the pump.
• The two terminals are connected to power source and ground respective. The ECU is to control and manage the operation of fuel pump through electrical power.
• Its major component is a driving fan pump that equipped with a low electrical consuming DC motor. Powered by 12V voltage and keep fuel pressure inside the fuel pump in 294±6kpa (about 3 kg/cm²).
• The fuel pump is located inside of the fuel tank, and installed a filter in front of its inlet so that can prevent from foreign materials sucking into the fuel pump to damage it and the fuel injector.

Testing Procedures 1:
Fuel pump working voltage confirmed:
• Fuel pump coupler to properly (using the probe tool), or can be removed coupler working voltage measurements (direct measurement).
• Open the main switch, but not to start engine.
• Use "voltage meter" DC stalls (DCV) to check fuel pump voltage.
• Confirmed working voltage:
  Voltage meter negative access to the wire harness fuel pump coupler 2nd pin (Green).
  Voltage meter positive access to the wire harness fuel pump coupler first pin (Black / Purple).

Cautions
• Conducting fuel pump voltage measurement, if the main switch to open three seconds after the engine did not started, the ECU will automatically cut off the fuel pump power supply.

Detection judge 1:
1. Working voltage value: Above 10V
2. Resistance value: 1.5±0.5Ω
3. Fuel pressure: 294±6kPa (about 3kg/cm²)
4. Fuel Injection System

Testing Procedures 3:

Fuel pressure measurement:
- Use fuel pressure gauge, connected in series between the injector and the fuel tank.

⚠️ Cautions
- In the implementation of the fuel pressure measurement, will go to the demolition of the fuel hose, such as: injector or fuel pump hose, hydraulic measurements after, be sure to confirm whether there is a leakage of fuel situation in order to avoid danger.

Detection judge 3:
1. Fuel pressure: 294±6kPa (about 3kg/cm²)

Treatment of abnormal phenomena:
1. Fuel pump damages internal coil break, or coupler bad contact.
2. Fuel filter blockage.
3. Fuel pump anomaly, the proposed replacement of the fuel pump.
4. Fuel unit anomaly, the proposed replacement of the fuel unit.
Fuel Injector

**Functional Description:**
- Powered by DC 8~16V, and has two-pin socket on the injector.
- Its major component is the solenoid valve of high resistance driven by electronic current.
- The two terminals are connected to power source and ground respective. It is controlled by ECU to decide the injection timing, and the injector pulse width.

**Testing Procedures:**
1. Resistance Confirmation:
   - Use of the "meter" Ohm stalls (Ω), measurement of the injector resistance value.
2. Injector injection state examination:
   - Removed the injector fixed bolt and removed the injector from intake manifold, but not removal of harness coupler.
   - Injector and injector cap tightly by hands, fuel spills should not be the case.
   - Key-on and start the engine, injector injection state examination.

**Detection judge:**
1. Between the two pin resistance values: $10.5\pm0.53\Omega$
2. Injection state:
   - Fuel atomizing good, with a clear scattering angle → judged as normal.
   - Injection-state such as water, no obvious scattering angle → found abnormal.

**Treatment of abnormal phenomena:**
1. Injector abnormal, the proposed replacement of the new one injector.
2. Injection-state abnormal, for the following reasons:
   - Injector obstructive → the proposed replacement of the new one injector.
   - Fuel pressure shortage → confirmed hydraulic pressure, the proposed replacement fuel pump to confirm.

**Warning**
- Gasoline is lower ignited explosive materials, in the ventilation premises operations, and prohibited fire.
- In the inspection injector fuel injection state, the outflow of gasoline, and the application of appropriate collection containers, so as to avoid danger.
4. Fuel Injection System

Transistor ignition coil

Functional Description:
- Use 8 ~ 16V DC power supply, has the two-pin socket.
- Two-pin socket for the power supply and grounding. Its main components for the high conversion ratio transformer.
- Through computer programs when the ignition is controlled, from ignition timing (TDC) / crank position sensor, the throttle valve position sensor, engine temperature sensor, the inlet pressure sensor and O₂ Sensor, issued by the signal, with the engine Speed through the ECU to determine the appropriate ignition is, by the current of a crystal intermittent control, a 25000-30000 volts of secondary hypertension, flashover triggered spark plug, this approach will not only enable the engine to achieve maximum output function, also help to improve the efficiency of fuel consumption and pollution improvements.

Testing Procedures:
Resistance Confirmation:
- Removed coil first circuit plugs on the ignition coil (Red / Yellow & Black / Yellow).
- Use of the “meter” Ohm stalls (Ω), measurement of the ignition coil resistance value.

Detection judge:
- Ignition coil primary circuit: 2.8Ω±15% (20ºC)

Treatment of abnormal phenomena:
1. Ignition coil internal coil disconnection damaged, or plugs bad contact.
2. Ignition coil ignition is not abnormal, proposes to replace the ignition coil.

Crankshaft position sensor

Functional Description:
- Do not need for an external power supply, has two-pin of signal plug.
- Constitutes a major change in its reluctance induction coil.
- The spacing of flywheel and sensor should be 0.7 to 1.1 mm.
- Magnetic induction sensor is the use of flywheel on the Gear (18-1 tooth) rotary cutting induction coil changes in the magnetic field sensor with the inductive voltage signal for ECU judgment, calculated at the engine speed and crankshaft position, and with a most appropriate time of fuel injection and ignition control.

Testing Procedures:
Resistance Confirmation:
- Removed crankshaft position sensor coupler (Blue / Yellow & Green / White).
- Use of the “meter” Ohm stalls (Ω), measurement of the crankshaft position sensor resistance value.

Detection judge:
- Resistance value: 80~160Ω(20ºC)

Treatment of abnormal phenomena:
1. Sensor internal coil interrupted damaged, or coupler bad contact.
2. Check whether the abnormal wire harness lines.
3. Sensor coil anomaly, the proposed replacement of the new one.
AISV

Functional Description:
- Control power, has two-pin socket, one for the power supply pin, one for grounding pin.
- Secondary air injection solenoid valve at the Idle (3500 rpm below) actuator.
- At Idling, ECU control solenoid valve by the grounding circuit to be moving or closing.

Testing Procedures:
Resistance Confirmation:
- Use of the "meter" Ohm stalls (Ω), measurement of the secondary air injection solenoid valve resistance value.

Detection judge:
Resistance value = \(26 \pm 2.6\Omega\) (20\(^\circ\)C)

Treatment of abnormal phenomena:
- Secondary air injection solenoid valve internal short circuit or open circuit, or coupler bad contact.
- Check whether the abnormal wire harness lines.
- Secondary air injection solenoid valve anomaly, the proposed replacement of the new one.
4. Fuel Injection System

EFi System Circuit
## ECU Pin Configuration

(ON ECU)

<table>
<thead>
<tr>
<th>Pin NO.</th>
<th>Pin code</th>
<th>Wire color</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>IGP</td>
<td>R/Y</td>
<td>IGNITION POWER</td>
</tr>
<tr>
<td>02</td>
<td>LG</td>
<td>G</td>
<td>LOGIC GROUND</td>
</tr>
<tr>
<td>03</td>
<td>HEGO</td>
<td>L/O</td>
<td>O2 SENSOR</td>
</tr>
<tr>
<td>04</td>
<td>SG</td>
<td>G/R</td>
<td>SENSOR GROUND</td>
</tr>
<tr>
<td>05</td>
<td>TH</td>
<td>W/BR</td>
<td>THROTTLE POSITION SENSOR</td>
</tr>
<tr>
<td>06</td>
<td>VCC</td>
<td>Y/B</td>
<td>SENSOR POWER OUTPUT (+5V)</td>
</tr>
<tr>
<td>07</td>
<td>BATT</td>
<td>R</td>
<td>BATTERY</td>
</tr>
<tr>
<td>08</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>09</td>
<td>PG1</td>
<td>G</td>
<td>POWER GROUND1</td>
</tr>
<tr>
<td>10</td>
<td>PG2</td>
<td>G</td>
<td>POWER GROUND2</td>
</tr>
<tr>
<td>11</td>
<td>IG</td>
<td>B/Y</td>
<td>IGNITION COIL</td>
</tr>
<tr>
<td>12</td>
<td>CRK-P</td>
<td>L/Y</td>
<td>CRANK PULSE SENSOR</td>
</tr>
<tr>
<td>13</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>TA</td>
<td>G/BR</td>
<td>AIR TEMP. SENSOR</td>
</tr>
<tr>
<td>15</td>
<td>TEST</td>
<td>P/W</td>
<td>TEST SW</td>
</tr>
<tr>
<td>16</td>
<td>INJ</td>
<td>L/G</td>
<td>INJECTOR</td>
</tr>
<tr>
<td>17</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>MIL</td>
<td>Y/G</td>
<td>MULTI INDICATOR LAMP</td>
</tr>
<tr>
<td>19</td>
<td>FLPR</td>
<td>O/W</td>
<td>FUEL PUMP RELAY</td>
</tr>
<tr>
<td>20</td>
<td>ISCBP</td>
<td>G/B</td>
<td>IDLE SPEED CONTROL + B</td>
</tr>
<tr>
<td>21</td>
<td>ISCAP</td>
<td>L/B</td>
<td>IDLE SPEED CONTROL + A</td>
</tr>
<tr>
<td>22</td>
<td>HEGO HT</td>
<td>R/O</td>
<td>O2 SENSOR HEATER</td>
</tr>
<tr>
<td>23</td>
<td>CRK-M</td>
<td>G/W</td>
<td>CRANK PULSE SENSOR GND</td>
</tr>
<tr>
<td>24</td>
<td>TW</td>
<td>R/GR</td>
<td>WATER TEMP. SENSOR</td>
</tr>
<tr>
<td>25</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>26</td>
<td>ROLL</td>
<td>Y/P</td>
<td>ROLL OVER SENSOR</td>
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<tr>
<td>27</td>
<td>PM</td>
<td>B/R</td>
<td>MANIFOLD PRESSURE SENSOR</td>
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<tr>
<td>28</td>
<td>SOL</td>
<td>O/L</td>
<td>AISV</td>
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<td>29</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>30</td>
<td>K-LINE</td>
<td>W/G</td>
<td>DIAGNOSTIC TOOL</td>
</tr>
<tr>
<td>31</td>
<td>ICBN</td>
<td>B/W</td>
<td>IDLE SPEED CONTROL - B</td>
</tr>
<tr>
<td>32</td>
<td>ISCBN</td>
<td>B/W</td>
<td>IDLE SPEED CONTROL - A</td>
</tr>
<tr>
<td>33</td>
<td>RPM</td>
<td>B/Y</td>
<td>RPM SIGNAL</td>
</tr>
</tbody>
</table>
Troubleshooting

EFI Circuit inspection

Warning lights extinguished after 2 seconds?
- OK
- NG

Battery voltage above 12.5V?
- OK
- NG

Battery voltage & ECU of voltage less than 0.2 V?
1. Main switch OFF
2. Removed ECU coupler
3. Main switch ON
4. Use voltage meter measurement of the power-pin voltage difference
5. Confirmed ECU and battery supply voltage differential pressure within the 0.2 V voltage

Battery voltage – drive parts voltage of less than 0.2 V?
1. Main switch OFF
2. Removed the injector, fuel pump, O2 sensor, rollover sensor, ignition coil couplers
3. Measurement of the voltage between the couplers and ground of the voltage difference
4. Confirmed voltage difference and battery voltage of 0.2 V gap within?

ECU 5V voltage - sensor voltage of less than 0.2 V?
1. Main switch OFF
2. Use probe inserted throttle sensor, engine temperature sensor, the inlet pressure sensor power connector
3. Main switch ON
4. Use voltage meter measurement of the sensor connector voltage
5. Voltage standard value: 5.0±0.1V

Battery voltage - fuel pump voltage of less than 0.2 V?
1. Main switch OFF
2. Removed fuel pump power coupler
3. Potential probe then pumped two-pin connector
4. Main switch ON
5. Pumped in three second record supply voltage values
6. Confirmed pump and battery supply voltage differential pressure within the 0.2 V voltage

End
4. Fuel Injection System

Can not Start the engine or difficult to start inspection

Difficulties or can not to start engine

Warning lights extinguished after 2 seconds?

OK

NG

1. Inspection process in accordance with circuit inspection

Display warning lights Fault Code?

OK

NG

1. Use diagnosis tool to view EMS fault content
2. In accordance with Troubleshooting procedures on troubleshooting

Is Fuel system anomaly?

OK

NG

1. Fuel tank inadequate?
2. Fuel injector pressure-less than 294 ± 6kpr?
3. Pipeline fuel spills?
4. Pressure Regulating Valve anomaly?
5. Fuel pump pipe leakage?
6. Fuel pump anomaly?
7. Fuel injector anomaly?

Is Circuit anomaly?

OK

NG

1. Spark plug there sparks?
2. Spark plug humid?
3. Spark plug cover loose?
4. Crankshaft position sensor Short Circuit
5. The high-voltage power lines loose?
6. ECU anomaly?
7. Leaking oxygen sensor connector corrosion short circuit?

Is Engine anomaly?

OK

NG

1. Without valve clearance?
2. Valve timing, is not correct?
3. Valve jam?
4. Cylinder and piston ring wear?
5. Throttle adjustment screw adjustment of the air improper?

End
Idle flameout diagnosis

1. Link diagnosis tool to view EFI fault content
2. In accordance with Troubleshooting procedures on troubleshooting

Gasoline whether enough?

Throttle line is not too jammed to revert to full closure?

Idle CO value is set beyond the scope of (1.5% ~ 2.5%)?

Throttle body whether coke serious?

Idle Air Control Valve Actuation whether or failure?

EFI system more relevant institutions, each recognized by the detection, if still unable to rule out the idling flameout problem, it is recommended that engine checks whether there are other traditional institutions abnormal.
CO value revised anomaly

O2 Sensor equipped with the system, in principle, not adjusted CO value; such as CO value deviated from the normal range, check O2 Sensor and other agencies anomaly.

Idle flameout

Link diagnosis tool to view EFI fault content, its Idle CO value amend anomalies

Gasoline whether enough?

Whether loose battery connecter? Voltage is adequacy?

Throttle line is not too jammed to revert to full closure?

Connect with the diagnosis tool, into to view data steam screen.

Start engine and warm-to 70 °C ~ 95 °C, confirmed engine speed, idle control valve and fuel injection timing, oxygen sensor is abnormal?

Idle CO value is set beyond the scope of (1.5% ~ 2.5%)?

Idle functioning of 3 ~ 5 minutes, to confirm the engine is running normally after engine flame out, eliminating fault code operations?

EFI system more relevant institutions, each recognized by the detection, if still unable to rule out the idling flameout problem, it is recommended that engine checks whether there are other traditional institutions abnormal.
## 4. Fuel Injection System

### Integrated Troubleshooting Procedure

<table>
<thead>
<tr>
<th>Checking, adjusting Project</th>
<th>Detection of maintenance projects and steps</th>
<th>Fault status determination</th>
<th>Fault reasons</th>
<th>Parts specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Battery voltage</strong></td>
<td>Use meter direct measurement battery voltage</td>
<td>Battery voltage is 10 V above?</td>
<td>Battery electricity</td>
<td>Diagnosis tool display voltage required to achieve more than 10 V</td>
</tr>
<tr>
<td></td>
<td>Use diagnosis tool detection battery voltage</td>
<td>Diagnosis tool show whether the voltage of 10 V above?</td>
<td>Battery connector loose</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Harness circuit opening</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ECU coupler not connected properly</td>
<td></td>
</tr>
</tbody>
</table>

- **YES**
- **NO**

### Diagnosis fault code inspection

<table>
<thead>
<tr>
<th>Diagnostic tool detection fault code</th>
<th>Fault Code cleared after show again?</th>
<th>Fault Code cleared after show again?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the diagnosis tool detection fault code</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Elimination of fault codes, and then start engine</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **YES**
- **NO**

### Fuel quantity and fuel pressure

<table>
<thead>
<tr>
<th>Removed the injector on the intake manifold, but not removal of harness coupler. (Injector and injector cap tightly by hands, fuel spills should not be the case)</th>
<th>Injector whether injection?</th>
<th>Injector spray angle is normal?</th>
<th>Fuel pressure enough?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start the engine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examine whether injector fuel injection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between the tank and injector installation the pressure gauge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>check fuel pressure adequacy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than fuel tank</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injector fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pump relay fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pump fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECU fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pump filter obstructive</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **YES**
- **NO**

### Ignition situation

<table>
<thead>
<tr>
<th>Removed the spark plug from the cylinder head, but then power lines still ring</th>
<th>Examine whether the spark plug ignition?</th>
<th>Check spark plug sparks strength is normal?</th>
<th>Spark plug fault</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start the engine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>check spark plug sparks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spark plug fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roll over sensor fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECU fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition coil fault</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crankshaft position sensor fault</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **YES**
- **NO**

---

Continued next page
4. Fuel Injection System

Continued from previous page

Closed-loop systems for mobility
- Observation O2 sensor voltage changes (Standing motorcycle so that engine speed refueling between 4500 to 5500 rpm)

YES

O2 sensor voltage is maintained in a long time within a certain range beating
- O2 sensor fault
- ECU fault

NG

O2 sensor voltage beating specifications: 100 ~ 900 mV from the two groups within the interactive beating

Engine vacuum
- Use diagnosis tool to detect of the manifold pressure

YES

Diagnosis tool manifold pressure for compliance with specifications?
- Valve clearance is not normal
- Intake system leak

NG

Manifold pressure Specifications: 32~38 kPa

YES

Normal starting

Can not starting or starting difficulties

Finish

In traditional engine overhaul way to maintenance
4. Fuel Injection System

Remove fuel pump/fuel unit
Remove side cover.
Remove rear carrier
Remove rear body cover.
Remove floor panel.
Remove under cover.
(Refer to chapter 14)

Remove fuel pump lines coupler.
Release the fuel tube folder, removed the fuel tube.

Remove the fuel tank fixed bolts (Bolt × 2 on both sides), remove the fuel tank.

Remove / Install fuel pump and fuel unit
Remove fuel pump fixed bolts (Bolt × 6), remove fuel pump.
Install in the anti-demolition order.

⚠️ Cautions
- Then remove fuel pump, fuel in fuel tank internal to confirm not excessive.
- Then install fuel pump and fuel unit, attention direction.
- Confirm whether the fuel filter dirt, obstructive.
- Fuel pump installation, to confirm whether it is normal to the fuel out (the pressure about 3 kg/cm²).
Air Cleaner

Clean air cleaner element
Remove air cleaner cover (bolt × 8). Remove air cleaner filter (bolt × 6). Use compressed air to remove the adhesion of dirt, if not too much dirt cleared, please new replacement.

⚠️ Cautions
- Air cleaner filter for paper products, must not soak or cleaning by water.

Install air cleaner element
Install In the anti-demolition order.

⚠️ Cautions
- Air cleaner filter and air filter cover should be covered formation is the installation, not to skew a seam, resulting dust, foreign body aspiration in the engine.
4. Fuel Injection System

**EFi System Diagnosis Methods**
When the motorcycle injection system in the wrong signal, causing abnormal functioning of the engine or can not start engine, warning light at the meter will be lighting, to inform drivers to carry out maintenance.

Overhaul, the diagnosis tool can be used for troubleshooting (refer to diagnosis tool use guide), or manually by the meter warning light inspection revealed that the fault codes (refer to checking signal fault codes discriminate method), the two methods for maintenance.

If the fault has been ruled out or repaired after the inspection light will be extinguished, but ECU fault code will be recorded, so the need to get rid of fault codes. If a fault exists, this system has two kinds of methods to eliminate fault codes respectively in the diagnosis tool removal and manual removal.

**Using diagnostic tool for overhaul**
Diagnosis tool will connect to the motorcycle for coupler diagnosis, according to the use of diagnostic tool testing methods, when belong fuel injection system fault or parts fault, according to the diagnosis tool of the fault code display messages do describe parts of the inspection testing maintenance and replacement parts. When after the maintenance, the need to get rid of fault codes (Please refer to detailed steps diagnosis tool of instructions), or fault code will always be stored in the ECU.

**Manual inspection**
Use of cross-wiring (wire or paper clips, etc.) to cross-Joints Test Switch for grounding, in the meter of this check light are flashing, it means that the injection system or parts of abnormal situations, but not in the diagnosis tool can be - for the detection, inspection can enjoy for a long time flashing lights flashing and the short period of time to inform the cause of the malfunction (refer to check light fault information fault code table).
Check Light Fault Codes Differentiation

Check light flashing mode
If problem without diagnosis tool to be detected, it can be cross-access the test switch coupler, the motorcycle from the CHK lights flashing signal interpretation, and then the basis for the diagnosis of dynamic information tables on the priorities of light, and prompts you to the motorcycle to the emergence of some warning, or FLASH CODE is to determine what kind of fault, and exclusion.

Fault Code manual removal procedure:
When there is without diagnosis tool, can be manually cleared Fault Code, the implementation of the following steps:
1. Main switch OFF
2. Cross-access the test switch for interconnection access, and without opening up (cross-access movement must indeed).
3. Full throttle and do not open up.
4. Main switch ON
5. Described above, the No. 3 with the No. 4 movements continued liberalization of 5 seconds later, about 5 seconds after inspections at carnivals "flash twice" to complete the removal of fault code.
6. Then remove the cross-wiring.
## Fault Code and Sensors Table

<table>
<thead>
<tr>
<th>No.</th>
<th>Fault codes</th>
<th>Fault Description</th>
<th>Parts Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0120</td>
<td>Throttle position sensor fault</td>
<td>TP Sensor and wire</td>
</tr>
<tr>
<td>2</td>
<td>0105</td>
<td>Manifold absolute pressure sensor fault</td>
<td>MAP sensor and wire</td>
</tr>
<tr>
<td>3</td>
<td>0115</td>
<td>Engine temperature sensor fault (water)</td>
<td>TW Sensor and wire</td>
</tr>
<tr>
<td>4</td>
<td>0195</td>
<td>Engine oil temperature sensor fault (oil)</td>
<td>Engine temperature sensor and wire</td>
</tr>
<tr>
<td>5</td>
<td>0110</td>
<td>Intake air temperature sensor fault</td>
<td>TA Sensor and wire</td>
</tr>
<tr>
<td>6</td>
<td>1630</td>
<td>Roll over sensor fault</td>
<td>Roll over sensor and wire</td>
</tr>
<tr>
<td>7</td>
<td>0130</td>
<td>O₂ sensor fault</td>
<td>O₂ Sensor and wire</td>
</tr>
<tr>
<td>8</td>
<td>0201</td>
<td>INJ #1 fault</td>
<td>Injector and wire</td>
</tr>
<tr>
<td>9</td>
<td>0351</td>
<td>IG #1 fault</td>
<td>Ignition coil and wire</td>
</tr>
<tr>
<td>10</td>
<td>0230</td>
<td>Fuel pump fault</td>
<td>Fuel pump and wire</td>
</tr>
<tr>
<td>11</td>
<td>0135</td>
<td>O₂ sensor heater fault</td>
<td>O₂ Sensor and wire</td>
</tr>
<tr>
<td>12</td>
<td>1505</td>
<td>ISC Idle speed control motor fault</td>
<td>ISC stepper motor and wire</td>
</tr>
<tr>
<td>13</td>
<td>1410</td>
<td>Exhaust 2nd air control solenoid valve fault</td>
<td>AISV and wire</td>
</tr>
<tr>
<td>14</td>
<td>0335</td>
<td>Crankshaft position sensor fault</td>
<td>Crankshaft position sensor and wire</td>
</tr>
<tr>
<td>15</td>
<td>1205</td>
<td>MAP wire fault</td>
<td>MAP sensor and wire</td>
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<tr>
<td>16</td>
<td>0603</td>
<td>EEPROM fault</td>
<td>EEPROM</td>
</tr>
<tr>
<td>No.</td>
<td>Fault codes</td>
<td>Fault Description</td>
<td>Check light</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>1</td>
<td>0120</td>
<td>Throttle position sensor fault</td>
<td>Lighting</td>
</tr>
<tr>
<td>2</td>
<td>0105</td>
<td>Manifold Absolute Pressure sensor fault</td>
<td>lighting</td>
</tr>
<tr>
<td>3</td>
<td>0115</td>
<td>Engine temperature sensor fault</td>
<td>lighting</td>
</tr>
<tr>
<td>4</td>
<td>0195</td>
<td>Engine oil temperature sensor fault</td>
<td>lighting</td>
</tr>
<tr>
<td>5</td>
<td>0110</td>
<td>Intake temperature sensor fault</td>
<td>lighting</td>
</tr>
<tr>
<td>6</td>
<td>1630</td>
<td>Roll over sensor fault</td>
<td>lighting</td>
</tr>
<tr>
<td>7</td>
<td>0130</td>
<td>O2 sensor fault</td>
<td>lighting</td>
</tr>
<tr>
<td>8</td>
<td>0201</td>
<td>Ignition coil #1 fault</td>
<td>lighting</td>
</tr>
<tr>
<td>9</td>
<td>0351</td>
<td>Fuel pump fault</td>
<td>lighting</td>
</tr>
<tr>
<td>10</td>
<td>0230</td>
<td>O2 sensor heater fault</td>
<td>lighting</td>
</tr>
<tr>
<td>11</td>
<td>0135</td>
<td>ISC motor fault</td>
<td>lighting</td>
</tr>
<tr>
<td>12</td>
<td>1505</td>
<td>Exhaust 2nd air solenoid valve fault</td>
<td>lighting</td>
</tr>
<tr>
<td>13</td>
<td>1410</td>
<td>Crankshaft position sensor fault</td>
<td>lighting</td>
</tr>
<tr>
<td>14</td>
<td>0335</td>
<td>PM wire fault</td>
<td>lighting</td>
</tr>
<tr>
<td>15</td>
<td>0603</td>
<td>EEPROM fault</td>
<td>Not lit</td>
</tr>
</tbody>
</table>

This fault Please direct replacement ECU
4. Fuel Injection System

EFi System Diagnostic Tool - V70

**Note:**
- When problems occurred, can be used for diagnosis tool of the fault is detected, and exclusion.
- In addition to testing, troubleshooting, another of the operation can be carried out data analysis-type monitor.

**Method of Use:**
1. Maintain engine flameout state, do not open main switch.
2. Opened the luggage box lighting light cover (screw x2), connected to the diagnostic connector for diagnosis tool.
3. Then open the main switch and the diagnosis tool power switch after diagnosis display screen appeared the words connection.
4. Press the “ENTER” button into the main screen (there are 6 major functions: ECU ID, DATA STREAM, FREEZED DATA, TROUBLE CODE, ERASE TB CODE and CO ADAPTION)
5. Use ▲, ▼ select button under the function, press the “ENTER” button access into various functions. Example: select “DATA STREAM,” by the “ENTER” button, the screen showed that the existing fault codes; indicates no fault "system is OK."
6. Press “EXIT” button to leave of the various functions.
7. Must to close the main switch or power switch of the diagnosis tool after, and then can removal of diagnosis tool coupler.
Diagnostic Tool Use Note

Diagnosis of connectivity
1. For the diagnostic tool coupler access to the motorcycle injection system diagnostic signal coupler.
2. main switch ON.
3. Open the diagnosis left power switch, which turn on the LCD screen, the screen brightness adjustment knob to the appropriate brightness.
4. SYM and cartridge content display on screen (such as icon), by the beginning of the implementation of any button.
5. Display diagnostic software release; press the "ENTER" button to the implementation.
4. Fuel Injection System

Options main functional areas:
1. ECU ID
2. DATA STREAM
3. FREEZED DATA
4. TROUBLE CODE
5. ERASE TB CODE
6. CO ADAPTION

Use "▲" "▼" button, select mobile anti-white subtitles implementation of the project, and then press the "ENTER" key to the implementation.
4. Fuel Injection System

1. ECU ID
   In the directory functions used "▲" "▼" button, select ECU ID project, press the "ENTER" button to the implementation of information systems function.

   ECU ID containing two functions:
   1-1. ECU ID Datas
   1-2. ECU Pin Assign

   ![ECU ID Datas](image)

   1-1. ECU ID Datas
   Use "▲" "▼" button, select ECU ID projects, press the "ENTER" button to the implementation. A total of 2 page, use "◄ left" and "right ►" button, view ECU information.

   ![ECU ID information](image)
4. Fuel Injection System

1-2. ECU Pin Assign

Use "▲" "▼" button, select the ECU pin project, and press the "ENTER" button to the implementation of the ECU pin functions.

ECU pin assign total of 5 pages that can be used "◄ left" and "right ►" button, view the page note.
2. DATA STREAM

In the directory functions used "▲" "▼" button, select "DATA STREAM" project, press the "ENTER" key to the implementation.

A total of 3 pages, are able to use "◄ left" and "right ►" button, view injection system information. On the any screen, press the "EXIT" button, the function can return to the directory screen.
Data stream (1/3)

The screen showed the ECU captured by the engine of the state immediately.
The following data for the benchmark idling state:

- **Engine SPD** --- RPM (Idle:1550~1750) → Engine idle speed
- **FAULT NO.** --- (Normal:0) → Fault code number
- **BATT. VOLT** --- V (Above 12V) → Battery voltage
- **FUEL PUMP** --- (Idle:ON) → Fuel pump actuator state
- **MAP** --- kPa (Idle:32~38kPa) → Manifold pressure
- **TPS position** --- % (Idle: < 1.5%) → Throttle opening
- **TPS position** --- V (Idle:0.58~0.62) → Throttle sensor voltage
- **O2 SENSOR** --- mV (Idle:50~200mV) → O2 sensor voltage
- **O2 HEATER** --- (Idle: > 3500rpm=ON) → O2 heater actuator state
- **ENGINE TEMP** --- ºC (Stable:85~95ºC) → Engine temperature (cooling water temperature)

In the "DATA STREAM" of the screen use "▲" "▼" button to move the left side of the project "→" symbol selected items, press the "ENTER" button lock of the project, and press the "F4" button showed that the wave of projects.
Able to use "◄ left" and "right ►" button, can transform View wave numerical size.

Numerical analysis of images (1 / 3), the waveform can be displayed as shown in the following items:

- Engine SPD
- BATT. VOLT
- MAP
- TPS position %
- TPS position Voltage
- O2 SENSOR Voltage
- ENGINE TEMP
The screen showed the ECU captured by the engine of the state immediately. The following data for the benchmark idling state:

- **BARO** ----------- kPa (Above 98kPa) → Atmospheric pressure
- **Intake Air** ------- ºC (Outside Temp.) → Intake air temperature
- **2nd AIR VALVE** ----- V (Idle:ON) → Secondary air solenoid valve actuator state
- **INJECT TIME** ---- mS (Idle:1~3mS) → Injection time
- **IGN. ANGLE** ---------- (Idle:12~14) → Ignition timing
- **STEP MOTOR** --------- → Idle air control valve step motor actuator state
- **CRANKSHAFT** -------- (Idle:CW) → Crankshaft functioning direction
- **TEST TERMINAL** ---- (Idle:OPEN) → Test terminal state
- **IDLE SET** ---------- RPM (=1650 RPM) → Idle speed goal set value
- **ISC STEP**----------- (Idle:75~95) → Idle Air Control Valve stepper motor learning step

In the "DATA STREAM" of the screen use "▲" "▼" button to move the left side of the project "→" symbol selected items, press the "ENTER" button lock of the project, and press the "F4" button showed that the wave of projects.
Able to use "◄ left" and "right ►" button, can transform View wave numerical size.

Numerical analysis of images (2 / 3), the waveform can be displayed as shown in the following items:

- **BARO**
- **Intake Air**
- **INJECT TIME**
- **IGN. ANGLE**
- **IDLE SET**
- **ISC STEP**
4. Fuel Injection System

Data stream (3/3)

The screen showed the ECU captured by the engine of the state immediately. The following data for the benchmark idling state:

- **LEARNED STEP** (Set by ECU) → Idle Air Control Valve stepper motor learning step

In the "DATA STREAM" of the screen use "▲" "▼" button to move the left side of the project "→" symbol selected items, press the "ENTER" button lock of the project, and press the "F4" button showed that the wave of projects.

Able to use "◄ left" and "right ►" button, can transform View wave numerical size.

Numerical analysis of images (3 / 3), the waveform can be displayed as shown in the following items:

- **LEARNED STEP NO.**
3. FREEZED DATA

Objective: When a sensor fault, the EMS system will record all the parameters of fault signals, in order to facilitate fault diagnosis.

In the directory functions used "▲" "▼" button, select "FREEZED DATA" project, press the "ENTER" key to the implementation.

Only one page, at any screen, press the "EXIT" button, the function can return to the directory screen. In the "FREEZED DATA" of the screen use "▲" "▼" button to move the left side of the project "→" symbol selected items, press the "ENTER" button lock of the project, and press the "F4" button showed that the wave of projects.

Able to use "◄ left" and "right ►" button, can transform View wave numerical size.
4. TROUBLE CODE

In the functional directory select "TROUBLE CODE" project, press the "ENTER" button implementation, the message began to read fault.

**Fault Code:** electronic injection system that had happened fault of the message (whether or not completion of repair).

Without any fault is that showing "System is OK".

Press the "EXIT" button, the function can return to the directory screen.

If the system has faulty code, that is showing the fault code, that can be used "◄ left" and "right ►" or "▲" "▼" button to select the fault code (selected before the code "•" tags) that, press the "ENTER" button, the code can be read descriptions and fault handling.

Fault code in the note and treatment of the pages, if the first one page did End, they can press the "▲" "▼" button to turn the pages to read all content.
5. ERASE TB CODE

In the directory functions used "▲" "▼" button, select "ERASE TB CODE" project, press the "ENTER" key to the implementation.

**Conditions:** The main switch "ON", or in the engine running state, the fault code can be removed.

Fault code removed, namely showing the "ERASE TB SUCC.!!".
Press the "EXIT" button, the function can return to the directory screen.
6. CO ADAPTION

In the directory functions used "▲" "▼" button, select "CO ADAPTION" project, press the "ENTER" button into the CO adjustment screen.

Use "◄ left" and "right ►" or "▲" "▼" button, CO value can be adjusted.
CO ADAPT: CO adjusted value.
CO Read: CO read-back value.
Press the "EXIT" button, the function can return to the directory screen.
## Troubleshooting Table

<table>
<thead>
<tr>
<th>Abnormal phenomena</th>
<th>Comprehensive testing program</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test items</td>
<td>Power voltage</td>
<td>Fuel press.</td>
</tr>
<tr>
<td>Start state</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Difficult to start</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Idle state</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Without idle</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Idle not smooth</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>RPM NG</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>CO NG</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Acceleration</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Not smooth</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Inability and slow</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Flameout</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Idle flameout</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Acceleration flameout</td>
<td></td>
<td>○</td>
</tr>
<tr>
<td>Related spare parts</td>
<td>Roll over sensor</td>
<td>Fuel pump</td>
</tr>
</tbody>
</table>
### Comprehensive Maintenance List

<table>
<thead>
<tr>
<th>No.</th>
<th>Maintenance Project</th>
<th>Testing Procedures</th>
<th>Test Items</th>
<th>Determine benchmarks</th>
<th>Fault reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power and voltage</td>
<td>● Use meter direct measurement battery voltage</td>
<td>● Battery voltage</td>
<td>Battery voltage = 10V Above</td>
<td>Battery electricity, Battery connector loose, Harness circuit opening, ECU coupler not connected properly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Use diagnosis tool detection of battery voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fuel pressure</td>
<td>● Use fuel pressure gauge, connected in series between the injector and the Pressure Regulating Valve</td>
<td></td>
<td>Open main switch, but do not start the engine of pressure: = 250kPa (Stable value)</td>
<td>Fuel not enough, Security switch not disarm, Fuel pump relay fault, Fuel pump fault, Injector fault, ECU fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Main switch ON, but not start engine</td>
<td></td>
<td>Idle state: pressure = 294±6kPa (Beating situation from top to bottom)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Check fuel pressure</td>
<td></td>
<td>rotation throttle moment: pressure = 294±6kPa (Slightly beating)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Start engine (idle)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Check change of the fuel pressure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Throttle several rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Check to the change of fuel pressure again</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ignition state</td>
<td>The spark plug removed from the cylinder head, but the power lines still ring</td>
<td></td>
<td>Specifications: NGK-CR8H</td>
<td>Spark plug fault, Roll over sensor fault, ECU No. 5 pin fault, Ignition coil fault, Crankshaft position sensor fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Start engines or use for the diagnosis tool of output View spark plug ignition conditions</td>
<td></td>
<td>Ignition conditions: With traditional engines found ways</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Engine vacuum</td>
<td>Diagnosis tool to detect the use of</td>
<td>Manifold pressure</td>
<td>Manifold pressure =32–38kPa</td>
<td>Valve clearance abnormal, Intake system leak</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Injection state</td>
<td>The injector removed from the throttle body, but not dismantle pipeline</td>
<td></td>
<td>Not started, injector not leaking fuel</td>
<td>Security unit is configured not disarm, Fuel pump relay fault, Fuel pump fault, Injector fault, ECU fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Main switch ON, but not start engine</td>
<td></td>
<td>In started, the injection state must show fan shape</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Investigation the injector it's leaking fuel?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Once again start engines or use for the diagnosis tool of output function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Check injector fuel injection and the injection situation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Closed - loop control system</td>
<td>Use of diagnostic tool observation O2 Sensor voltage changes</td>
<td>Stable condition, sensor voltage variation (Idle continued 5 minutes later to measurement)</td>
<td>Idle stable condition: O2 Sensor voltage = 50 ~ 200mV (Show from top to bottom beating phenomenon)</td>
<td>O2 Sensor fault, ECU fault</td>
</tr>
<tr>
<td>7</td>
<td>Fault Code Detection</td>
<td>Use of the diagnosis tool existing fault-detection code or historical Fault Code</td>
<td>Diagnosis tool of the fault code is it can be eliminated</td>
<td>Without any residual Fault Code</td>
<td>throttle position sensor fault, Engine temperature sensor fault, Intake temperature sensor fault, Manifold pressure sensor fault, O2 Sensor fault, Crankshaft position sensor fault, ECU fault, Roll over sensor fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elimination of the implementation of fault codes, check can be eliminated</td>
<td>Start again, the fault is it will happen again</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Once again start engine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>● Check fault is it happen again</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: 1. Fuel pressure gauge connected between the fuel tank and injector, open the main switch to repeatedly shut down, fuel system makes pressure stability.
2. Injector and injector cap tightly by hands, fuel spills should not be the case
Precautions in Operation

- The engine has to be supported with special service tools that can be lifted or adjustable.
- The following parts can be serviced as engine mounted on frame.
- Carburetor.
- Cylinder head, cylinder, and piston.
- Driving pulley, driving belt, clutch, and driving disc assembly.
- Final gear reduction mechanism.

Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine oil capacity</td>
<td></td>
</tr>
<tr>
<td>Replacement</td>
<td>LX40A: 1800 c.c.</td>
</tr>
<tr>
<td>Disassembly (oil</td>
<td>LX40A: 1900 c.c.</td>
</tr>
<tr>
<td>filter replaced)</td>
<td></td>
</tr>
<tr>
<td>Gear oil capacity</td>
<td></td>
</tr>
<tr>
<td>Replacement</td>
<td>LX40A: 330 c.c.</td>
</tr>
<tr>
<td>Disassembly</td>
<td>LX40A: 350 c.c.</td>
</tr>
<tr>
<td>Coolant capacity</td>
<td></td>
</tr>
<tr>
<td>Engine &amp; radiator</td>
<td>LX40A: 1400 c.c.</td>
</tr>
<tr>
<td>Reservoir</td>
<td>LX40A: 350 c.c.</td>
</tr>
<tr>
<td>Total</td>
<td>LX40A: 1750 c.c.</td>
</tr>
</tbody>
</table>

Torque Value

- Engine mounting bolt: 4.0~5.0kgf-m
- Engine hanger bolt: 3.5~4.5kgf-m
- Rear shock absorber connection bolt (under): 2.4~3.0kgf-m
- Engine hanger stopper nut: 1.8~2.2kgf-m
- Engine bracket nut: 4.0~5.0kgf-m
5. Engine Removal

Removal of Engine
Disconnect the seat dampers.
Remove the air box cover.

Disconnect the air temperature sensor coupler.
Remove the air box.

Disconnect the starter motor wire.

Remove the spark plug cap.
5. Engine Removal

Remove fuel pipe, vacuum tube and throttle valve wire from the throttle body.
Disconnect the EFI system coupler.

Remove water hose from water pump.
Remove the thermo-sensor wires.

Remove the muffler (3 bolts, 2 nuts).
5. Engine Removal

Remove the parking brake cable.
Remove the rear brake caliper (2 bolts).

⚠️ Caution

Do not operate brake lever after the caliper is removed to avoid clipping the brake pad.

Remove the mounting bolt of rear right cushion.

Remove the mounting bolt of rear left cushion.

Remove the engine hanger lock nut.
Remove the engine hanger axle.
Remove the engine.

Engine Installation

Check if the bushings of engine suspension parts and shock absorber for damage.
Install engine in the reverse procedures of removal.

⚠️ Caution

- Pay attention of foot & hand safety as engine installation to avoid hurting.
- Do not bend or twist wires.
- Cables wires have to be routed in accordance with normal layout.

Engine Mounting Bolt:
Torque value: 4.0~5.0 kgf-m

Rear shock absorber bolt:
Torque value: UPPER: 3.5~4.5 kgf-m
LOWER: 2.4~3.0 kgf-m
Mechanism Diagram

1.0~1.4 kgf-m

2.0~2.4 kgf-m

3.6~4.0 kgf-m

0.7~1.1 kgf-m

1.0~1.2 kgf-m

Mechanism Diagram

1.0~1.4 kgf-m

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Cylinder Head Installation 6-14
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Cylinder Head Disassembly 6-6
Cylinder Head Inspection 6-8
# Precautions in Operation

- This chapter is contained maintenance and service for cylinder head, valve, and camshaft as well as rocker arm.
- Remove the engine from the frame before repairing the cylinder head.

## Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LX40A</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression pressure</td>
<td>12+/2 kg/cm²</td>
<td>---</td>
</tr>
<tr>
<td>Camshaft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of cam lobe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>35.640~35.730</td>
<td>35.600</td>
</tr>
<tr>
<td>Exhaust</td>
<td>35.290~35.370</td>
<td>35.250</td>
</tr>
<tr>
<td>Rocker arm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID of valve rocker arm</td>
<td>12.000~12.018</td>
<td>12.100</td>
</tr>
<tr>
<td>OD of valve rocker arm shaft</td>
<td>11.966~11.984</td>
<td>11.910</td>
</tr>
<tr>
<td>Valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD of valve stem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>4.975~4.990</td>
<td>4.900</td>
</tr>
<tr>
<td>Exhaust</td>
<td>4.955~4.970</td>
<td>4.900</td>
</tr>
<tr>
<td>Guide seat</td>
<td>5.000~5.012</td>
<td>5.030</td>
</tr>
<tr>
<td>Clearance between valve stem and guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>0.010~0.037</td>
<td>0.080</td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.030~0.057</td>
<td>0.100</td>
</tr>
<tr>
<td>Free length of valve spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner</td>
<td>33.700</td>
<td></td>
</tr>
<tr>
<td>Outer</td>
<td>38.800</td>
<td></td>
</tr>
<tr>
<td>Valve seat width</td>
<td>1.000</td>
<td>1.6</td>
</tr>
<tr>
<td>Tilt angle of cylinder head</td>
<td>---</td>
<td>0.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LX60A</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression pressure</td>
<td>12+/2 kg/cm²</td>
<td>---</td>
</tr>
<tr>
<td>Camshaft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of cam lobe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>36.810~36.890</td>
<td>36.770</td>
</tr>
<tr>
<td>Exhaust</td>
<td>36.440~36.520</td>
<td>36.400</td>
</tr>
<tr>
<td>Rocker arm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID of valve rocker arm</td>
<td>13.000~13.018</td>
<td>13.098</td>
</tr>
<tr>
<td>OD of valve rocker arm shaft</td>
<td>12.991~13.009</td>
<td>12.936</td>
</tr>
<tr>
<td>Valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OD of valve stem</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>4.975~4.990</td>
<td>4.900</td>
</tr>
<tr>
<td>Exhaust</td>
<td>4.955~4.970</td>
<td>4.900</td>
</tr>
<tr>
<td>Guide seat</td>
<td>5.000~5.012</td>
<td>5.030</td>
</tr>
<tr>
<td>Clearance between valve stem and guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intake</td>
<td>0.010~0.037</td>
<td>0.080</td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.030~0.057</td>
<td>0.100</td>
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<tr>
<td>Free length of valve spring</td>
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<td></td>
</tr>
<tr>
<td>Inner</td>
<td>33.700</td>
<td></td>
</tr>
<tr>
<td>Outer</td>
<td>38.800</td>
<td></td>
</tr>
<tr>
<td>Valve seat width</td>
<td>1.000</td>
<td>1.6</td>
</tr>
<tr>
<td>Tilt angle of cylinder head</td>
<td>---</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Torque Value
Cylinder head bolt (LH) 2.0~2.4 kg-m
Cylinder head Nut 2.0~2.4 kg-m
Sealing bolt of cam chain auto-tensioner 0.8~1.2 kg-m
Bolt of cam chain auto-tensioner 1.2~1.6 kg-m
Cam sprocket cover bolts 0.8~1.2 kg-m
Cam sprocket bolt 1.0~1.2 kg-m

Troubleshooting
Engine performance will be affected by troubles on engine top parts. The trouble usually can be determined or by performing cylinder compression test and judging the abnormal noise generated.

Low compression pressure
1. Valve
   - Improper valve adjustment
   - Burnt or bent valve
   - Improper valve timing
   - Valve spring damage
   - Valve carbon deposit.
2. Cylinder head
   - Cylinder head gasket leaking or damage
   - Tilt or crack cylinder
3. Piston
   - Piston ring worn out.

High compression pressure
- Too much carbon deposit on combustion chamber or piston head

Noise
- Improper valve clearance adjustment
- Burnt valve or damaged valve spring
- Camshaft wear out or damage
- Chain wear out or looseness
- Auto-tensioner wear out or damage
- Camshaft sprocket
- Rocker arm or rocker arm shaft wear out
Cylinder Head Removal

Remove engine. (Refer to chapter 5)

Remove 2 bolts of thermostat and then remove the thermostat. Remove hole bolt and spring for the cam chain tensioner. Loosen 2 bolts, and then remove tensioner. Remove thermostat (2 bolts).

Remove Air Injection system (AI) pipe mounting bolts. Remove spark plug.

Remove cylinder head cover (4 bolts).
Remove the side cover mounting blots of cylinder head, and then take out the side cover.

Remove left crankcase cover, and turn the drive face, and align the timing mark on the sprocket with that of cylinder head, piston is at TDC position.
Remove cam sprocket bolts and then remove the sprocket by prying chain out.

Remove the 2 cylinder head mounting bolts from cylinder head right side, and then remove 4 nuts and washers from cylinder head upper side. Remove the cylinder head.

Remove cylinder head gasket and 2 dowel pins. Remove chain guide.
Clean up residues from the matching surfaces of cylinder and cylinder head.

**Caution**

- Do not damage the matching surfaces of cylinder and cylinder head.
- Avoid residues of gasket or foreign materials falling into crankcase as cleaning.
6. Cylinder Head / Valve

Cylinder Head Disassembly
Remove cam shaft setting plate (1 bolt).

Remove rocker arm shafts and rocker arms.
Special Service Tool:
Rocker arm and cam shaft puller SYM-1445100

Remove cam shafts.
Special Service Tool:
Rocker arm and cam shaft puller SYM-1445100

Use a valve cotter remove & assembly tool to press the valve spring, and then remove valves.

⚠️ Caution
• In order to avoid loosing spring elasticity, do not press the spring too much. Thus, press length is based on the valve cotter in which can be removed.

Special Service Tool:
Valve cotter remove & assembly tool
SYM-1471110-SY125
Remove valve catters, spring retainers, springs and valves.

Remove valve stem seals.

Clean carbon deposits in combustion chamber. Clean residues and foreign materials on cylinder head matching surface.

⚠️ Caution
- Do not damage the matching surface of cylinder head.
6. Cylinder Head / Valve

Cylinder Head Inspection
Check if spark plug and valve holes are cracked. Measure cylinder head warp with a straightedge and thickness gauge.
Service limit: 0.05 mm

Camshaft
Inspect cam lobe height for damaged.
Service Limit (LX40A):
- IN: Replacement when less than 35.600mm
- EX: Replacement when less than 35.250mm
Service Limit (LX60A):
- IN: Replacement when less than 36.770mm
- EX: Replacement when less than 36.400mm

Inspect the camshaft bearing for looseness or wear out. If any damage, replace whole set of camshaft and bearing.

Rocker Arm
Measure the cam rocker arm I.D., and wear or damage, oil hole clogged?
Service Limit (LX40A):
Replace when it is less than 12.100 mm.
Service Limit (LX60A):
Replace when it is less than 13.098 mm.

Rocker Arm Shaft
Measure the active O.D. of the cam rocker arm shaft and cam rocker arm.
Service Limit (LX40A):
Replace when it is less than 11.910 mm.
Service Limit (LX60A):
Replace when it is less than 12.936 mm.
Valve spring free length
Measure the free length of intake and exhaust valve springs.
Service limit:
Inner spring  33.70 mm
Outer spring  38.80 mm

Valve stem
Check if valve stems are bend, crack or burn.
Check the operation condition of valve stem in valve guide, and measure & record the valve stem outer diameter.
Service Limit:  IN: 4.90 mm
             EX: 4.90 mm

Valve guide
⚠️ Caution
• Before measuring the valve guide, clean carbon deposits with reamer.

Tool: 5.0 mm valve guide reamer

Measure and record each valve guide inner diameters.
Service limit: 5.03 mm
The difference that the inner diameter of valve guide deducts the outer diameter of valve stem is the clearance between the valve stem and valve guide.
Service Limit:  IN→0.08 mm
             EX→0.10 mm

⚠️ Caution
• If clearance between valve stem and valve guide exceeded service limit, check whether the new clearance that only replaces new valve guide is within service limit or not. If so, replace valve guide.

Correct it with reamer after replacement.
If clearance still exceeds service limit after replaced valve guide, replace valve stem too.

⚠️ Caution
• It has to correct valve seat when replacing valve guide.
6. Cylinder Head / Valve

Valve Stem Replacement
Heat up cylinder head to 100~150 °C with heated plate or toaster.

⚠️ Caution
- Do not let torch heat cylinder head directly. Otherwise, the cylinder head may be deformed as heating it.
- Wear on a pair of glove to protect your hands when operating.

Hold the cylinder head, and then press out old valve guide from combustion chamber side.

Tool: Valve guide driver: 5.0 mm

⚠️ Caution
- Check if new valve guide is deformation after pressed it in.
- When pressing in the new valve guide, cylinder head still have to be kept in 100~150°C.

Adjust the valve guide driver and let valve guide height is in 13 mm.
Press in new valve guide from rocker arm side.

Tool: Valve guide driver: 5.0 mm
Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.

⚠️ Caution
- Using cutting oil when correcting valve guide with a reamer.
- Turn the reamer in same direction when it be inserted or rotated.

Correct valve seat, and clean up all metal residues from cylinder head.

Tool: Valve guide reamer: 5.0 mm
Valve Seat Inspection and Service

Clean up all carbon deposits onto intake and exhaust valves. Apply with emery slightly onto valve contact face. Grind valve seat with a rubber hose or other manual grinding tool.

**Caution**
- Do not let emery enter into between valve stem and valve guide.
- Clean up the emery after corrected, and apply with engine oil onto contact faces of valve and valve seat.

Remove the valve and check its contact face.

**Caution**
- Replace the valve with new one if valve seal is roughness, wear out, or incomplete contacted with valve seat.

Valve seat inspection

If the valve seat is too width, narrow or rough, corrects it.

Valve seat width

**Service limit: 1.6mm**

Check the contact condition of valve seat.

Valve seat grinding

The worn valve seat has to be ground with valve seat chamfer cutter. Refer to operation manual of the valve seat chamfer cutter. Use 45° valve seat chamfer cutter to cut any rough or uneven surface from valve seat.

**Caution**
- After valve guide had been replaced, it has to be ground with 45° valve seal chamfer cutter to correct its seat face.

Use 32° cutter to cut a quarter upper parts out.
6. Cylinder Head / Valve

Use 60° cutter to cut a quarter lower parts out. Remove the cutter and check new valve seat.

Use 45° cutter to grind the valve seat to specified width.

⚠️ Caution

• Make sure that all roughness and uneven faces had been ground.

Grind valve seat again if necessary.

Coat the valve seat surface with red paint. Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.

⚠️ Caution

• The contact surfaces of valve and valve seat are very important to the valve sealing capacity.

If the contact surface too high, grind the valve seat with 32° cutter. Then, grind the valve seat to specified width.

If the contact surface too low, grind the valve seat with 60° cutter. Then, grind the valve seat to specified width.
After the valve seat ground, coat valve seat surface with emery and then slightly press the ground surface. Clean up all emery coated onto cylinder and valve after ground.

Cylinder Head Reassembly
Lubricate valve stem with engine oil, and then insert the valve into valve guide. Install new valve stem oil seal. Install valve springs and retainers.

⚠️ Caution
- The closed coils of valve spring should face down to combustion chamber.

Put the valve cotters onto valve spring retainer. Use a valve cotter remove & assembly tool to press the valve springs, and then install valves.

⚠️ Caution
- In order to avoid damaging the valve stem and the cylinder head, in the combustion chamber place a rag between the valve spring remover/installer as compressing the valve spring directly.

Special Service Tool:
Valve cotter remove & assembly tool
SYM-1471110-SY125

Tap the valve stems gently with a plastic hammer to make sure valve retainer and valve cotter is settled.

⚠️ Caution
- Place and hold cylinder head on to working table so that can prevent from valve damaged.
Install camshaft into cylinder head.
Install valve rocker arm, rocker arm shaft and cam shaft setting plate.

**Cylinder Head Installation**

Clean up all residues and foreign materials onto the matching surfaces of both cylinder and cylinder head.
Install chain guide, dowel pins and a new cylinder head gasket onto the cylinder.

⚠️ **Caution**

- Do not damage the matching surfaces of cylinder and cylinder head.
- Avoid residues of gasket or foreign materials falling into crankcase as cleaning.

Install 4 washers and tighten 4 nuts on the cylinder head upper side, and then tighten 2 cylinder head mounting bolts of cylinder head right side.

**Torque value:**
- Nut 3.6~4.0kgf-m
- Bolt 1.0~1.4kgf-m

Install cam chain on to sprocket and align the timing mark on the sprocket with that of cylinder head.
Align sprocket bolt hole with camshaft bolt hole. Tighten the sprocket mounting bolts.

⚠️ **Caution**

- Make sure timing marks are matched.
Install cylinder head side cover (4 bolts).

Install thermostat (2 bolts). Loosen auto tensioner adjustment bolt and remove bolt and spring. Install tensioner and install spring and adjustment bolt.

Install cylinder cover (4 bolts).

Install Air Injection system (AI) pipe. (4 bolts) Install inlet pipe onto cylinder head. Install and tighten spark plug. **Torque value: 1.0~2.0kgf-m**

⚠️ **Caution**

- This model is equipped with more precision 4-valve mechanism so its tighten torque can not be exceeded standard value in order to avoid causing cylinder head deformation, engine noise and leaking so that motorcycle’s performance be effected.

Install the engine onto frame (refer chapter 5).
Valve Clearance Adjustment
Loosen Air Injection system (AI) pipe upper side bolt (2 bolts).
Remove cylinder head cover.

Remove the cylinder head side cover.

Remove left crankcase cover, and turn the drive face, and align the timing mark on the cam sprocket with that of cylinder head, piston is at TDC position.
Loosen valve clearance adjustment nuts and bolts located on valve rocker arm.
Measure and adjust valve clearance with feeler gauge.
After valve clearance had been adjusted to standard value, hold adjustment bolt and then tighten the Adjustment nut.
Standard Value:  
IN 0.10 ± 0.02 mm  
EX 0.15 ± 0.02 mm
Install the cylinder head side cover.
Start the engine and make sure that engine oil flows onto the cylinder head.
Stop the engine after confirmed, and then install the cylinder head cover and AI pipe.

⚠️ Caution
- If lubricant does not flow to cylinder head, engine components will be worn out seriously.
- Thus, it must be confirmed.
- When checking lubricant flowing condition, run the engine in idle speed. Do not accelerate engine speed.
Mechanism Diagram

1.0–1.4kgf-m
0.8–1.2kgf-m
1.2–1.6kgf-m
1.0–1.4kgf-m
# 7. Cylinder / Piston

## Precautions in Operation

### General Information
- Both cylinder and piston service cannot be carried out when engine mounted on frame.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Unit</th>
<th>LX40A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cylinder</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I.D.</td>
<td></td>
<td>82.995~83.015</td>
</tr>
<tr>
<td>Out of round</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warpage</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Piston/ Piston ring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance between piston ring and ring groove</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top</td>
<td></td>
<td>0.015~0.050</td>
</tr>
<tr>
<td>2^nd</td>
<td></td>
<td>0.015~0.050</td>
</tr>
<tr>
<td>Piston ring end gap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top</td>
<td></td>
<td>0.150~0.300</td>
</tr>
<tr>
<td>2^nd</td>
<td></td>
<td>0.300~0.450</td>
</tr>
<tr>
<td>Oil (side rail)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.200~0.700</td>
</tr>
<tr>
<td>Piston O.D. (2^nd)</td>
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<tr>
<td></td>
<td></td>
<td>82.450~82.500</td>
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<tr>
<td>Clearance between piston and cylinder</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>0.010~0.040</td>
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<tr>
<td>ID of piston pin boss</td>
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<td>20.002~20.008</td>
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<tr>
<td>Piston pin O.D.</td>
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<td></td>
</tr>
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<td></td>
<td></td>
<td>19.994~20.000</td>
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<tr>
<td>Clearance between piston and piston pin</td>
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<tr>
<td></td>
<td></td>
<td>0.002~0.014</td>
</tr>
<tr>
<td>Connecting rod small end I.D.</td>
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<tr>
<td></td>
<td></td>
<td>20.016~20.034</td>
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</table>
# 7. Cylinder / Piston

## Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard</th>
<th>Limit</th>
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<tbody>
<tr>
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<td>92.100</td>
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<tr>
<td>Out of round</td>
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<td>0.050</td>
</tr>
<tr>
<td>Taper</td>
<td>-</td>
<td>0.050</td>
</tr>
<tr>
<td>Warpage</td>
<td>-</td>
<td>0.050</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cylinder</th>
<th>Clearances between Piston Ring and Ring Groove</th>
<th>Top</th>
<th>0.015~0.050</th>
<th>0.090</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2nd</td>
<td></td>
<td>0.150~0.300</td>
<td>0.500</td>
</tr>
<tr>
<td>Piston</td>
<td>Clearances between Piston Ring and Cylinder</td>
<td></td>
<td>0.010~0.040</td>
<td>0.100</td>
</tr>
<tr>
<td>Piston/</td>
<td>ID of Piston Pin Boss</td>
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<td>22.002~22.008</td>
<td>22.020</td>
</tr>
<tr>
<td>Piston Pin Ring</td>
<td>91.430~91.480</td>
<td>91.350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piston</td>
<td>Clearance between Piston and Piston Pin</td>
<td></td>
<td>0.002~0.014</td>
<td>0.020</td>
</tr>
<tr>
<td>Piston O.D.</td>
<td>21.997~22.000</td>
<td>21.960</td>
<td></td>
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</tr>
<tr>
<td>Piston O.D.</td>
<td>22.020~22.041</td>
<td>22.071</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Troubleshooting

### Low or Unstable Compression Pressure
- Cylinder or piston ring worn out

### Knock or Noise
- Cylinder or piston ring worn out
- Carbon deposits on cylinder head top-side
- Piston pin hole and piston pin wear out

### Smoking in Exhaust Pipe
- Piston or piston ring worn out
- Piston ring installation improperly
- Cylinder or piston damage

### Engine Overheat
- Carbon deposits on cylinder head top side
- Cooling pipe clogged or not enough in coolant flow
7. Cylinder / Piston

Cylinder / Piston Removal
Remove cylinder head (refer to chapter 6). Remove coolant hose from cylinder. Remove cylinder.

Cover the holes of crankcase and cam chain with a piece of cloth. Remove piston pin clip, and then remove piston pin and piston.

Remove cylinder gasket and dowel pin. Clean up all residues or foreign materials from the two matching surfaces of cylinder and crankcase.

**Caution**
- Soap the residues into solvent so that the residues can be removed more easily.

**Inspection**
Check if the inner diameter of cylinder is wear out or damaged. In the 3 positions, top, center and bottom, of cylinder, measure the X and Y values respective in the cylinder.

- **Service limit (LX40A)**: 83.100 mm
- **Service limit (LX60A)**: 92.100 mm
Measure the cylinder upper surface for warpage.
**Service limit:** 0.050 mm

Measure the clearance between piston rings and ring grooves.
**Service Limit:**
- Top ring: 0.090 mm
- 2nd ring: 0.090 mm

**Remove piston rings**
Check if the piston rings are damaged or its grooves are worn.

© Caution
- Pay attention to remove piston rings because they are fragile.

Place piston rings respective into cylinder below 20 mm of cylinder top. In order to keep the piston rings in horizontal level in cylinder, push the rings with piston.

Measure the piston ring end gap.
**Service Limit:**
- Top ring: 0.500 mm
- 2nd ring: 0.650 mm
7. Cylinder / Piston

Measure the outer diameter of piston pin.

Service Limit (LX40A) : 19.960 mm
Service Limit (LX60A) : 21.960 mm

Measure the inner diameter of connecting rod small end.

Service Limit (LX40A) : 20.064 mm
Service Limit (LX60A) : 22.071 mm

Measure the inner diameter of piston pin hole.

Service Limit (LX40A) : 20.020 mm
Service Limit (LX60A) : 22.020 mm

Calculate clearance between piston pin and its hole.

Service Limit: 0.020 mm

Measure the piston outer diameter.

⚠️ Caution

- The measurement position is 10 mm distance from piston bottom side, and 90° to piston pin.

Service limit (LX40A) : 82.400 mm
Service limit (LX60A) : 91.350 mm

Compare measured value with service limit to calculate the clearance between piston and cylinder.
Piston Ring Installation

Clean up piston top, ring groove, and piston surface.
Install the piston ring onto piston carefully.
Place the openings of piston ring as diagram shown.

⚠️ Caution
- Do not damage piston and piston rings as installation.
- All marks on the piston rings must be forwarded to up side.
- Make sure that all piston rings can be rotated freely after installed.
**Piston Installation**

Install piston and piston pin, and place the IN marks on the piston top side forward to inlet valve.

Install new piston pin clip.

⚠️ **Caution**

- Do not let the opening of piston pin clip align with the piston cutout.
- Place a piece of cloth between piston and crankcase in order to prevent snap ring from falling into crankcase as operation.

**Cylinder Installation**

Clean up all residues and foreign materials on the matching surface of crankcase. Pay attention to not let these residues and foreign materials fall into crankcase.

⚠️ **Caution**

- Soap the residues into solvent so that the residues can be removed more easily.

Install dowel pins and new cylinder gasket.
Coat some engine oil to inside of cylinder, piston and piston rings. Care to be taken when installing piston into cylinder. Press piston rings in one by one as installation.

⚠️ **Caution**

- Do not push piston into cylinder forcefully because piston and piston rings will be damaged.

Install coolant hose onto cylinder. Install cylinder head (refer to Chapter 6).
NOTE:
# 8. V-Belt Drive System

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<td>8-2</td>
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<td>Troubleshooting</td>
<td>8-2</td>
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<tr>
<td>Left Crankcase Cover</td>
<td>8-3</td>
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<tr>
<td>Drive Belt</td>
<td>8-5</td>
</tr>
<tr>
<td>Drive Face</td>
<td>8-7</td>
</tr>
<tr>
<td>Clutch Outer / Driven Pulley</td>
<td>8-10</td>
</tr>
</tbody>
</table>

## Mechanism Diagram

![Mechanism Diagram](image_url)

- **0.7~1.1 kgf-m**
- **6.0~7.0 kgf-m**
- **8.5~10.5 kgf-m**

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8. V-Belt Drive System

Precautions in Operation

General Information
- Drive face, clutch outer, and driven pulley can be serviced on the motorcycle.
- Drive belt and drive pulley must be free of grease.

Specification - LX40

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard value</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive belt width</td>
<td>24.000 mm</td>
<td>22.500 mm</td>
</tr>
<tr>
<td>OD of movable drive face boss</td>
<td>29.946~29.980 mm</td>
<td>29.926 mm</td>
</tr>
<tr>
<td>ID of movable drive face</td>
<td>30.000~30.040 mm</td>
<td>30.060 mm</td>
</tr>
<tr>
<td>OD of weight roller</td>
<td>19.500~20.000 mm</td>
<td>19.000 mm</td>
</tr>
<tr>
<td>ID of clutch outer</td>
<td>144.850~145.150 mm</td>
<td>145.450 mm</td>
</tr>
<tr>
<td>Thickness of clutch weight</td>
<td>5.000 mm</td>
<td>2.700 mm</td>
</tr>
<tr>
<td>Free length of driven pulley spring</td>
<td>102.400 mm</td>
<td>97.400 mm</td>
</tr>
<tr>
<td>OD of driven pulley boss</td>
<td>40.950~40.990 mm</td>
<td>40.930 mm</td>
</tr>
<tr>
<td>ID of driven face</td>
<td>41.000~41.050 mm</td>
<td>41.070 mm</td>
</tr>
<tr>
<td>Weight of weight roller</td>
<td>17.700~18.300 g</td>
<td>17.200 g</td>
</tr>
</tbody>
</table>
8. V-Belt Drive System

Specification – LX60

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard value</th>
<th>Limit</th>
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</thead>
<tbody>
<tr>
<td>Drive belt width</td>
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<tr>
<td>OD of movable drive face boss</td>
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<td>29.926 mm</td>
</tr>
<tr>
<td>ID of movable drive face</td>
<td>30.000~30.040 mm</td>
<td>30.060 mm</td>
</tr>
<tr>
<td>OD of weight roller</td>
<td>19.500~20.000 mm</td>
<td>19.000 mm</td>
</tr>
<tr>
<td>ID of clutch outer</td>
<td>159.850~160.150 mm</td>
<td>160.450 mm</td>
</tr>
<tr>
<td>Thickness of clutch weight</td>
<td>5.000 mm</td>
<td>2.700 mm</td>
</tr>
<tr>
<td>Free length of driven pulley spring</td>
<td>102.400 mm</td>
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<tr>
<td>OD of driven pulley boss</td>
<td>40.950~40.990 mm</td>
<td>40.930 mm</td>
</tr>
<tr>
<td>ID of driven face</td>
<td>41.000~41.050 mm</td>
<td>41.070 mm</td>
</tr>
<tr>
<td>Weight of weight roller</td>
<td>17.700~18.300 g</td>
<td>17.200 g</td>
</tr>
</tbody>
</table>

Torque value
- Drive face nut: 8.5~10.5kgf·m
- Clutch outer nut: 5.0~6.0kgf·m
- Drive plate nut: 5.0~6.0kgf·m

Special Service Tools
- Clutch spring compressor: SYM-2301000
- Inner bearing puller: SYM-6204002
- Clutch nut wrench 39 x 41 mm: SYM-9020200
- Universal holder: SYM-2210100
- Bearing driver: SYM-9100100

Troubleshooting

Engine can be started but motorcycle cannot be moved
1. Worn drive belt
2. Worn drive face
3. Worn or damaged clutch weight
4. Broken driven pulley

Insufficient horsepower or poor high speed performance
1. Worn drive belt
2. Insufficient spring force of driven pulley
3. Worn roller
4. Driven pulley operation un-smoothly

Shudder or misfire when driving
1. Broken clutch weight
2. Worn clutch weight
8. V-Belt Drive System

Left Crankcase Cover

Left crankcase cover removal
Loosen 4 bolts from left side crank out cover & remove it. Remove left crankcase cover. (8 bolts) Remove 2 dowel pin and gasket.

Left crankcase cover install
Install left crankcase cover in the reverse procedures of removal.

Bearing setting plate
Drive shaft holder bearing
Left crankcase cover inspection
Remove 2 bolts to remove left crankcase cover bearing setting plate.

Check bearing on left crankcase cover.
Rotate bearing’s inner ring with fingers.
Check if bearings can be turned in smooth and silent, and also check if bearing outer ring is mounted on cover tightly.
If bearing rotation is uneven, noising, or loose bearing mounted, then replace it.

Bearing replacement
Remove bearing with special service tools
Special tools:
Inner bearing puller       SYM-6204022

Install bearing with special service tools.
Special tools:
Right crank case bearing 6201 assembles tool
SYM-9614000-HMA 6201
8. V-Belt Drive System

**Drive Belt**

**Removal**
Remove left crankcase cover. Hold drive face with universal holder, and remove nut and drive face.

*Special Tool : Universal holder*

Hold clutch outer with universal holder, and remove nut, bearing stay collar and clutch outer.

<table>
<thead>
<tr>
<th>Caution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Using special service tools for tightening or loosening the nut.</td>
</tr>
<tr>
<td>• Fixed rear wheel or rear brake will damage reduction gear system.</td>
</tr>
</tbody>
</table>

Push the drive belt into belt groove as diagram shown so that the belt can be loosened, and then remove the driven pulley.

Remove driven pulley. Do not remove drive belt. Remove the drive belt from the groove of driven pulley.

**Inspection**

Check the drive belt for crack or wear. Replace it if necessary.
Measure the width of drive belt as diagram shown.

*Service Limit: 22.5 mm*
Replace the belt if exceeds the service limit.

<table>
<thead>
<tr>
<th>Caution</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Using the genuine parts for replacement.</td>
</tr>
<tr>
<td>• The surfaces of drive belt or pulley must be free of grease.</td>
</tr>
<tr>
<td>• Clean up all grease or dirt before installation.</td>
</tr>
</tbody>
</table>
Installation

⚠️ Caution

- Pull out driven face to avoid it closing.
- Cannot oppress friction plate comp in order to avoid creates the distortion or the damage.

Install drive belt onto driven pulley.

Install the driven pulley that has installed the belt onto drive shaft.
On the drive belt another end to the movable drive face.

Install the clutch outer and bearing stay collar.
Hold the clutch outer whit universal holder, and then tighten nut to specified torque value.
**Torque value: 5.0~6.0kgf-m**

Install the drive face, washer and drive face nut.
Hold drive face with universal holder, and then tighten nut to specified torque value.
**Torque value: 8.5~10.5kgf-m**
8. V-Belt Drive System

**Drive Face**

**Removal**
Remove left crankcase cover.
Hold drive face with universal holder, and then remove drive face nut.
Remove drive face and drive belt.

Remove movable drive face comp and drive face boss from crankshaft.

Remove ramp plate.

Remove weight rollers from movable drive face.
8. V-Belt Drive System

**Inspection**
The weight rollers are to press movable drive face by means of centrifuge force. Thus, if weight rollers are worn out or damaged, the centrifuge force will be affected. Check if rollers are worn or damaged. Replace it if necessary. Measure each roller's outer diameter. Replace it if exceed the service limit.

**Service limit:** 19.0 mm  
**Weight:** 17.2g

Check if drive face boss is worn or damaged and replace it if necessary. Measure the outer diameter of movable drive face boss, and replace it if it exceed service limit.

**Service limit:** 29.962 mm

Measure the inner diameter of movable drive face, and replace it if it exceed service limit.

**Service limit:** 30.060 mm

**Reassembly/installation**  
Install weight rollers.

**Caution**
- The weight roller two end surfaces are not certainly same. In order to lengthen the roller life and prevented exceptionally wears the occurrence, Please end surface of the closure surface counter clockwise assembles onto movable drive face.

Install ramp plate.
8. V-Belt Drive System

With 4~5g grease spreads wipes drives in the movable drive face axis hole.
Install drive face boss.

**Caution**

- The movable drive face surface has to be free of grease. Clean it with cleaning solvent.

Install movable drive face comp. onto crankshaft.

**Driven pulley installation**
Press drive belt into pulley groove, and then pull the belt onto drive shaft.

Install drive face, washer and nut.

**Caution**

- Make sure that two sides of pulley surfaces have to be free of grease. Clean it with cleaning solvent.

Hold drives face with universal holder. Tighten nut to specified torque.
**Torque value: 8.5~10.5kgf-m**
Install left crankcase cover.
Clutch Outer / Driven Pulley

Disassembly
Remove drive belt, clutch outer and driven pulley. Install clutch spring compressor onto the pulley assembly, and operate the compressor to let the wrench be installed more easily.

⚠️ Caution
- Do not press the compressor too much.

Hold the clutch spring compressor onto bench vise, and then remove mounting nut with special service tool. Release the clutch spring compressor and remove friction plate, clutch weight and spring from driven pulley.

Remove seal collar from driven pulley.

Remove guide pin, guide pin roller, and movable driven face, and then remove O-ring & oil seal seat from movable driven face.

Inspection
Clutch outer
Measure the inner diameter of clutch outer. Replace the clutch outer if exceed service limit.

Service limit: 145.450 mm
8. V-Belt Drive System

Clutch weight
Measure each clutch weight thickness. Replace it if exceeds service limit.
**Service limit: 3.0 mm**

Driven pulley spring
Measure the length of driven pulley spring. Replace it if exceeds service limit.
**Service limit: 97.400 mm**

Driven pulley
Check following items:
- If both surfaces are damaged or worn.
- If guide pin groove is damaged or worn.
Replace damaged or worn components.
Measure the outer diameter of driven face and the inner diameter of movable driven face. Replace it if exceeds service limit.
**Service limit:**
- **Outer diameter:** 40.93 mm
- **Inner diameter:** 41.07 mm

Driven Pulley Bearing Inspection
Check if the inner bearing oil seal is damage. Replace it if necessary.
Check if needle bearing is damage or too big clearance. Replace it if necessary.
Rotate the inside of inner bearing with fingers to check if the bearing rotation is in smooth and silent. Check if the bearing outer parts are closed and fixed. Replace it if necessary.
Clutch weight Replacement
Remove snap ring and washer, and then remove clutch weight and spring from driving plate.

⚠️ Caution
- Some of models are equipped with one mounting plate instead of 3 snap rings.

Check if spring is damage or insufficient elasticity.

Check if shock absorption rubber is damage or deformation. Replace it if necessary.
Apply with grease onto setting pins.

Install new clutch weight onto setting pin and then push to the specified location.
Apply with grease onto setting pins.
But, the clutch block should not be greased. If so, replace it.

⚠️ Caution
- Grease or lubricant will damage the clutch weight and affect the block’s connection capacity.

Install the spring into groove with pliers.
8. V-Belt Drive System

Install snap ring and mounting plate onto setting pin.

Replacement of Driven Pulley Bearing
Remove inner bearing.

⚠️ Caution

- If the inner bearing equipped with oil seal on side in the driven pulley, then remove the oil seal firstly.
- If the pulley equipped with ball bearing, it has to remove snap ring and then the bearing.

Remove snap ring and then push bearing forward to other side of inner bearing.
Place new bearing onto proper position and its sealing end should be forwarded to outside.
Apply with specified oil.

Install new inner bearing.

⚠️ Caution

- Its sealing end should be forwarded to outside as bearing installation.
- Install needle bearing with hydraulic presser.
  Install ball bearing by means of hydraulic presser.

Install snap ring into the groove of drive face.
Align oil seal lip with bearing, and then install the new oil seal (if necessary).
Installation of Clutch Outer/Driven Pulley Assembly

Install new oil seal and O-ring onto movable driven face.
Apply with specified grease to lubricate the inside of movable driven face.

Install the movable driven face onto driven face.
Install the guide pin and guide pin roller.

Install the collar.

Install friction plate, spring and clutch weight into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut that can be installed.
Hold the compressor by bench vise and tighten the mounting nut to specified torque with clutch nut wrench.
Remove the clutch spring compressor.
**Torque value: 5.0~6.0kgf-m**
Install clutch outer/driven pulley and drive belt onto drive shaft.
## 9. Final Drive Mechanism

<table>
<thead>
<tr>
<th>Mechanism Diagram .......................... 9-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precautions in Operation .................... 9-3</td>
</tr>
<tr>
<td>Troubleshooting ................................ 9-3</td>
</tr>
<tr>
<td>Final Drive Mechanism Disassembly .......... 9-4</td>
</tr>
<tr>
<td>Final Drive Mechanism Inspection .......... 9-4</td>
</tr>
<tr>
<td>Bearing Replacement .......................... 9-5</td>
</tr>
<tr>
<td>Final Drive Mechanism Reassembly .......... 9-7</td>
</tr>
</tbody>
</table>

### Mechanism Diagram – LX40A

- **Radial ball bearing 6204**
- **Oil seal 25°40‘7**
- **Needle bearing NK18/20R**
- **Oil seal 45°65°10**
- **Radial ball bearing 6206 UU**
- **Radial ball bearing CSB305C**
- **Needle bearing HKS 25°33°18**
- **Final shaft**
- **Counter shaft**
- **Final gear**
- **Counter gear**
- **Drive shaft**
- **2.4~3.0 kgf-m**
9. Final Drive Mechanism

Mechanism Diagram – LX60A

- Final shaft
- Oil seal 45*65*10
- Radial ball bearing 6206 UU
- Final gear

- Counter gear
- Oil seal 25*40*7
- Needle bearing NK22/20R
- Counter shaft

- Drive shaft
- Needle bearing NK22/20R

- Radial ball bearing CSB305C

- Final shaft
- Needle bearing HKS 25*33*18

- 2.4~3.0 kgf-m

Drive shaft specifications:
- 2.4~3.0 kgf-m
Precautions in Operation

Specification
Application oil: scooter gear oil
Recommended oil: KING MATE serial gear oils
Oil quantity: 110 c.c. (100 c.c. when replacing)

Torque value
Gear box cover 1.0~1.4 kg-m

Tools
Special tools
Bearing (6203/6004UZ) driver
Bearing (6204) driver
Bearing (6301) driver
Oil seal (27*42*7) driver
Oil seal (20*32*6) driver
Inner bearing puller
Outer bearing puller

Troubleshooting

Engine can be started but motorcycle can not be moved.
● Damaged driving gear
● Burnt out driving gear

Noise
● Worn or burnt gear
● Worn gear

Gear oil leaks
● Excessive gear oil.
● Worn or damage oil seal
9. Final Drive Mechanism

Final Drive Mechanism
Disassembly

Remove driven pulley.
Drain gear oil out from gear box.
Remove gear box cover bolts and then remove the cover.
Remove gasket and dowel pin.

Remove drive shaft.
Remove final driving gear and shaft.
Remove countershaft and gear.

Final Drive Mechanism Inspection

Check if the countershaft is wear or damage.

Check if the final shaft and gear are burn, wear or damage.
Check bearings on gear box. Rotate each bearing’s inner ring with fingers. Check if bearings can be turned in smooth and silent, and also check if bearing outer ring is mounted on gear tightly. If bearing rotation is uneven, noising, or loose bearing mounted, then replace it. Check oil seal for wear or damage, and replace it if necessary. Check gear box cover bearing as the same way above, and replace it if necessary.

**Caution**

- If remove the drive shaft from the cover upper side, then its bearing has to be replaced.

Check drive shaft and gear for wear or damage.

**Bearing Replacement**

**Caution**

- Never install used bearings. Once bearing removed, it has to be replaced with new one.

Remove driving shaft bearing from left crankcase using following tools: **Inner bearing puller**

Install new driving shaft bearing into left crankcase.

**Tool:**
**Bearing (6301) driver**
Press the bearing into cover with hydraulic presser.
Remove oil seal, and then remove final shaft bearing from left crankcase.
Install new final shaft bearing.  
Press the bearing in with hydraulic presser.  
**Tool:**  
**Bearing (6203/6004UZ) driver**  
**Oil seal (27*42*7) driver**  

Press out the driving shaft from gear box cover.  
Using bearing protector as operation.  
Remove oil seal from gear box cover and discard the seal.  
Use bearing puller to remove the final shaft bearing from the cover.  

If the driving shaft is pulled out with its bearing, then remove the bearing with bearing puller and bearing protector.  
**Tool:**  
**Bearing (6204) driver** or  
Multi-functional bearing puller  
Bearing protector  

Install a new driving shaft bearing onto gear box cover.  
**Tool:**  
**Bearing (6204) driver**  
Press the bearing in with hydraulic presser.
Install a new final shaft bearing onto gear box cover.

**Tool:**
Bearing (6203/6004UZ) driver
Press the bearing in with hydraulic presser.

Install the driving shaft onto gear box cover and then place it to proper position.

Apply with grease onto new oil seal lip, and then install the oil seal.

**Tool:**
Oil seal (20*32*6) driver

---

**Final Drive Mechanism Reassembly**

Apply with grease onto the oil seal lip of final driving shaft.

Install countershaft, final shaft and final driving gear.
Install dowel pin and new gasket.

Install gear box cover and bolts, and tighten. **Torque value: 1.0~1.4 kgf-m**
Install driven pulley/clutch outer/belt.
Install movable drive face, drive face and left crankcase.
Install rear wheel.
Add gear oil.
10. AC Generator / Starting Clutch

Mechanism Diagram

Mechanism Diagram

- 0.7~1.1 kgf-m
- 8.5~10.5 kgf-m
- 2.8~3.2 kgf-m
- 0.7~1.1 kgf-m
Precautions in Operation

- Refer to chapter 5: Engine removal and installation
- Refer to chapter 16: The troubleshooting and inspection of alternator
- Refer to chapter 16: The service procedures and precaution items of starter motor

Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard value (mm)</th>
<th>Limit (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID of starting clutch gear</td>
<td>20.026~20.045</td>
<td>20.100</td>
</tr>
<tr>
<td>OD of starting clutch gear</td>
<td>42.175~42.200</td>
<td>42.100</td>
</tr>
</tbody>
</table>

Torque value

- Flywheel nut: 8.5~10.5 kgf-m
- Starting clutch hexagon bolt: 1.0~1.4 kgf-m with adhesive
- 8 mm bolts: 0.8~1.2 kgf-m
- 12 mm bolts: 1.0~1.4 kgf-m

Tools

Special tools
- A.C.G. flywheel puller
- Universal holder
Right Crankcase Cover Removal
Remove 12 bolts from the right crankcase cover. Remove the right crankcase cover. Remove dowel pin and gasket.

A.C.G. Set Removal
Remove 2 screws from pulse generator and then remove it. Remove 3 bolts from right crankcase cover and A.C.G. set.

Flywheel Removal
Remove the flywheel nut. Install the shaft protector to the crankshaft.

Pull out flywheel with A.C.G. flywheel puller.
Tool: A.C.G. Flywheel puller
10. AC Generator / Starting Clutch

**Flywheel Installation**

Insert the pin onto crankshaft. Align the key on crankshaft with the flywheel groove, and then install the flywheel. Hold the flywheel with flywheel holder, and tighten its nut.

**Torque value:** 8.5~10.5 kg-m  
**Tool:**  
Flywheel holder

**A.C.G. Set Installation**

Install the A.C.G. set onto right crankcase cover (3 bolts). Install pulse generator (2 screws). Tie the wire harness securely onto the indent of crankcase.

⚠️ **Caution**

Make sure that the wire harness is placed under pulse generator.

**Right Crankcase Cover Installation**

Install dowel pin and new gasket. Install right crankcase cover onto the crankcase. Note that align the water pump shaft indent with the oil pump shaft. Install right crankcase cover (12 bolts).

Connect water hose to the right crankcase cover. Install the water pump cover onto crankcase cover.
Mechanism Diagram – LX40A

- Radial ball bearing CSB304
- Radial ball bearing 6301
- Oil seal 35*55*7.5

Torque Specifications:
- 0.7~1.1 kgf-m
- 2.0~2.4 kgf-m
- 1.0~2.0 kgf-m
- 1.0~1.4 kgf-m
- 1.1~1.5 kgf-m
- 1.0~1.4 kgf-m
- 3.5~4.5 kgf-m
- 0.7~1.1 kgf-m

Contents

11. Crankshaft / Crankcase

- Mechanism Diagram ..................... 11-1
- Precautions in Operation ............. 11-2
- Troubleshooting .......................... 11-2
- Crankcase Disassembly ............... 11-3
- Crankshaft bearing replacement .... 11-5
- Crankshaft bearing installation .... 11-5
- Crankcase Assembly .................... 11-6
Precautions in Operation

- This Section concerns disassembly of the crankcase for repair purpose.
- Remove the following components before disassembling crankcase.
  - Engine (Section 5)
  - Cylinder head (Section 6)
  - Cylinder and piston (Section 7)
  - Drive pulley and driven pulley (Section 8)
  - AC generator/Start driven gear (Section 10)
  - Starting motor (Section 16)

- In case it requires replacing the crankshaft bearing, the driving chain of engine oil pump or the timing chain, it is preferably to replace crankshaft as a unit.

Service data

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecting rod side clearance of the big end</td>
<td>0.100~0.400</td>
<td>0.600</td>
</tr>
<tr>
<td>Vertical clearance of the big end of the connecting rod</td>
<td>0~0.008</td>
<td>0.050</td>
</tr>
<tr>
<td>Run-out</td>
<td>-</td>
<td>0.100</td>
</tr>
</tbody>
</table>

Torque value

- Bolts for crankcase: 0.8~1.2kgf-m
- Bolts for cam chain adjuster: 1.2~1.6kgf-m

Tools

Special tools
- R/L. crank disassemble/ install tool
- L. crank shaft bearing driver
- Crank shaft bearing fixing socket
- Crank shaft puller
- Outer bearing puller
- Inner bearing puller

Troubleshooting

Engine noise
- Loose crankshaft bearing
- Loose crankshaft pin bearing
- Worn out piston pin and pin hole
Crankcase Disassembly

Remove the cam chain.
Loosen the bolt and remove the tensioner.
Remove the water pump shaft locknut.

Remove the oil separator (bolt x 2).

Remove the oil pump drive sprocket, driven sprocket and drive chain.

Remove the right crankcase bolts (bolt x 3).
Remove the left crankcase bolts (bolt x 11).

Remove the right crankcase from the left crankcase.

Remove the crankshaft and balancer shaft from the left crankcase. Check the main bearing on the crankcase for any wear. Replace the main bearing with special tool if necessary.
**Crankshaft bearing replacement**
Align the main bearing remover with the main bearing.

Fix the remover with the universal holder and press out the main bearing.

**Crankshaft bearing installation**
Use the crankshaft main bearing holder to fasten the upper and lower main bearing.

Align the oil path on the main bearing and the crankcase.
Press the main bearing into the crankcase.
*Special tool: main bearing installer / remover*
SYM-9100310-L4A
Crankcase assembly

Install the crankshaft and balancer shaft to the left crankcase.

The marks on the crankshaft and balancer shaft must be aligned.

Assemble the right crankcase to the left crankcase.
Tighten the bolts on the right crankcase.

Install the oil pump drive sprocket, driven sprocket and drive chain.
Install the oil separator (bolt x2).

Tighten the bolts on the left crankcase (bolt x 11).

Tighten the water pump shaft locknut.
Install the cam chain and tensioner.
NOTE:
12. Cooling System

Mechanism Diagram

- Radiator filler cap
- Reserve tank
- Reserve tank inlet pipe
- Radiator
- Thermo switch (fan)
- Cooling fan
- Engine coolant outlet pipe
- Thermostat
- Water pump
- Thermo unit (temp meter)
- Engine coolant inlet pipe

Mechanism Diagram
12. Cooling System

Precautions in Operation

⚠️ Warning:

- While the engine is running, never attempt to open the radiator filler cap, the pressurized hot coolant may shoot out and cause serious scalding injury. No maintenance work is allowed to perform unless the engine is completely cooled down.

- Refill the radiator with distilled water or specified additives.
- Add coolant to the reservoir.
- The cooling system can be serviced on the motorcycle.
- Avoiding spilling the coolant on the painted surface.
- Test the cooling system for any leakage after the repair.
- Please refer to Section 17 for inspection of the temperature sensor switch for the fan motor and the water thermometer.

Technical Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure to open filler cap</td>
<td>0.9±0.15 Kg/cm²</td>
</tr>
<tr>
<td>Capacity of coolant: Engine + radiator</td>
<td></td>
</tr>
<tr>
<td>Reservoir upper</td>
<td>1500c.c.</td>
</tr>
<tr>
<td></td>
<td>350c.c.</td>
</tr>
<tr>
<td>Thermostat</td>
<td>Begins to activate at : 82~92ºC</td>
</tr>
<tr>
<td></td>
<td>Stroke : 0.05~3.0mm/80ºC</td>
</tr>
<tr>
<td>Boiling point</td>
<td>Not-pressured : 107.7ºC</td>
</tr>
<tr>
<td></td>
<td>Pressurized: 125.6ºC</td>
</tr>
</tbody>
</table>

Torque Value

For water pump rotor 1.0~1.4kgf-m

Tools Requirement

Special tools
- Water pump bearing driver (6901)
- Water pump oil seal driver (Inner)
- Water pump mechanical seal driver
- Inner bearing puller

---

12-2
12. Cooling System

Troubleshooting

The engine temperature is too high
- The water thermometer and the temperature sensor do not work properly.
- The thermostat is stuck to close.
- Insufficient coolant.
- The water hose and jacket are clogged.
- Fan motor malfunction.
- The malfunction of the radiator filler cap.

The engine temperature is too low
- The malfunction of the water thermometer and the temperature sensor.
- The thermostat is stuck to open.

Coolant is leaking
- The water pump mechanical seal does not function properly.
- The O ring is deteriorated.
- The water hose is broken or aged.
12. Cooling System

System Test

⚠️ Warning

- Never attempt to carry out service work on the cooling system unless the engine is completely cooled down, otherwise, you may get scalded.

Remove the reserve tank cap cover, and then remove tank cap.

Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.

Reinstall the drain bolt.

Refilling system with coolant and bleeding the air bubbles.
- Run the engine, and remove by-pass pipe.
- Check by-pass hole for any bubble come out.
- If there is no bubble emitted but only coolant flow out, then joint on backflow pipe, and turn off the engine.
- Remove radiator filler cap.
- Starts the engine, check if there is any bubbles come out from the radiator, and the coolant is stable.
- Stop the engine, and add coolant to proper level if necessary.
- Tighten the radiator filler cap.

⚠️ Caution

- In order to avoid the radiator rusting, please do not use the uncertified coolant.

Coolant recommended: SYM Bramax radiator agent.
Concentration: 50%
Check reserve tank
- Open the inner box lid.
- Check the liquid level in the tank.
- Add coolant to proper level if necessary.

⚠️ Caution
- Add too much coolant in the reserve tank might cause overflow when the temperature increased.

Radiator
Check
Check for any leakage from weld seam.
Blow radiator clean using compressed air. If the radiator is blocked by dirt, use low pressure water jet to clean it.
Care shall be taken when straightening the sink fan.

Remove
Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.

Remove the front cover and under spoiler (refer chapter 13).
Loosen the radiator mounting bolts (4 bolts).
12. Cooling System

Disconnect the couplers for the thermo switch and fan motor.
Remove engine coolant inlet pipe, reserve tank inlet pipe and radiator inlet pipe.

Remove reserve tank coolant inlet pipe.
Remove the radiator and the cooling fun.

Loosen the cooling fun mounting bolts (3 bolts).
Remove thermo switch.

Installation
Install the removed parts in the reverse order of removal.
Install radiator in the reverse order of removal.
Upon completion, check for any leakage.

Caution

- Liquid packing must be applied to the thermo switch before installation in order to avoid damaging the radiator.
12. Cooling System

Technical Data

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve begins to open</td>
<td>71 ~ 80 °C</td>
</tr>
<tr>
<td>Valve stroke</td>
<td>3.5 ~ 4.5 mm at 80 °C</td>
</tr>
</tbody>
</table>

Installation

Install in reverse order of removal.

⚠️ Caution

Always use a new oil ring and apply a coat of grease on it before installation.

Refill the specified coolant as necessary.

Steps to fill coolant after engine service

1:
Open the radiator cap.

2:
Remove the hose from engine, and drain out the coolant.

3:
Pump in high pressure air from the water hole in order to vent out the water from the pipe.
4: Remove the engine circulation pipe, and pump in high pressure air to the pipe.

5: Based on the above steps, coolant could be drained out.

Steps to fill coolant:

1: Remove the tube connecting to thermostat(19320) cover.
2: Close the fuel tube (95001-08550) loop.

3: Fill up the coolant from filler neck (19039) without interruption.
12. Cooling System

4:  Check the air exhausted through the thermostat tube head until coolant come out.

5:  Check the air exhausted through the thermostat cover joint until coolant come out.

6:  Reconnect thermostat tube(19320) to thermostat cover joint(19315)

7:  Loosen flange bolt (8X12) on the water pump cover(19221) for exhausting air until coolant come out.
    Tighten the flange bolt when finish.
8: Open the radiator cap, and turn on the engine. Overflow is normal. Continue adding water to radiator until equilibrant if the amount of water diminished.

9: Maintain the liquid level in reserve tank between upper and lower limit.
NOTE:
### Mechanism Diagram

<table>
<thead>
<tr>
<th>Component</th>
<th>Page</th>
</tr>
</thead>
<tbody>
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<td>13-1</td>
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<tr>
<td>Maintenance</td>
<td>13-4</td>
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<tr>
<td>Handle Cover</td>
<td>13-5</td>
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<tr>
<td>Front Cover</td>
<td>13-6</td>
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<tr>
<td>Meter Panel</td>
<td>13-8</td>
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<tr>
<td>Inner Box</td>
<td>13-9</td>
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<tr>
<td>Side Cover</td>
<td>13-11</td>
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<tr>
<td>Rear Carrier</td>
<td>13-12</td>
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<tr>
<td>Luggage Box</td>
<td>13-13</td>
</tr>
<tr>
<td>Rear Body Cover</td>
<td>13-14</td>
</tr>
<tr>
<td>Floor Panel</td>
<td>13-15</td>
</tr>
<tr>
<td>Front Fender</td>
<td>13-15</td>
</tr>
</tbody>
</table>

![Mechanism Diagram Image]

- **Wind screen**
- **Wind screen garnish**
- **FR. upper cover**
- **Front under spoiler**
- **Radiator cover**
- **Front fender**
- **Meter visor**
- **Meter panel**
- **FR. inner box**
- **Wind screen cover**
13. Body Cover

Mechanism Diagram

- Upper handle cover
- Left lower handle cover
- Right lower handle cover
- Right floor panel
- Right side cover
- Inner box lid stiffener
- Inner box lid
- Right body cover
- Double seat
- Rear back seat
- RH. RR. grip
- LH. RR. grip
Mechanism Diagram

- Maintenance cover
- Left floor panel
- Left side cover
- FR. luggage box
- RR. luggage box
- Left body cover
- Under cover
- Rear cover
- Rear fender
Body covers disassemble sequence:

- Be careful not to damage various covers in assembly or disassembly operation.
- Never injure hooks molded on the body covers.
- Align the buckles on the guards with slot on the covers.
- Make sure that each hook is properly installed during the assembly.
- Never compact forcefully or hammer the guard and the covers during assembly.
Handle Cover

Remove
Loosen the 2 screws from handle upper cover front end.

Loosen the 2 screws from handle upper cover rear end.
Remove right and left handle side cover.

Installation
Install in reverse order of removal procedures.
13. Body Cover

Front Cover

Remove
Loosen 4 screws from the wind screen garnish and remove the wind screen garnish.

Loosen 6 screws from the wind screen and remove the wind screen.

Loosen 4 screws from the meter visor and remove the meter visor.

Loosen 4 screws (2 screws on each side) from the inner box.
Loosen 2 bolts from the front cover under side.

Loosen 2 screws and 2 bolts from the front cover upper side.

Disconnect the headlight, foggy light and winker light couplers.
Remove the front cover.

**Installation**
Install in reverse order of removal procedures.
13. Body Cover

**Meter Panel**

**Remove**
Remove wind screen garnish, wind screen, meter visor and front cover.
Remove reserve tank cap.
Loosen 4 screws from right & left side of the meter panel.

Loosen 2 screws from in side of meter panel.

Loosen the meter cord coupler.

Remove the meter panel.

**Installation**
Install in reverse order of removal procedures.
**Inner Box**

**Remove**
Remove wind screen garnish, wind screen, meter visor, front cover, meter panel, R/L side cover and front under spoiler.
Loosen 1 screw from reserve tank stay.

Loosen 1 screw from fuse box and remove it.
Loosen 1 screw from main switch cap and remove the cap.
Loosen DC power output mounting nut, and remove DC power output.

Loosen 1 screw from battery cover and remove it.

Remove the battery negative (-) cable.
Remove the battery positive (+) cable.
Remove the battery.
Loosen 2 bolts from inner box under side.

Loosen 2 bolts from inside of the inner box. Disconnect the hazard light and foggy light switch couplers. Remove inner box.

**Installation**

Install in reverse order of removal procedures.
Side Cover

Remove
Loosen 2 screws from the side cover side end.

Loosen 2 screws from the side cover upper end.

Remove the side cover.

Installation
Install in reverse order of removal procedures.
Rear Carrier

Remove
Loosen 4 bolts from the rear carrier and remove it.

Installation
Install in reverse order of removal procedures.
Luggage Box

Remove
Open the seat.
Loosen 3 screws from the luggage box rear cover.
Disconnect the luggage box light and switch coupler.
Remove the luggage box rear cover.

Loosen 2 bolts from luggage box front side.

Loosen 4 bolts from luggage box rear side.

Remove the luggage box.

Installation
Install in reverse order of removal procedures.
13. Body Cover

Rear Body Cover

Remove
Loosen right and left side screws from rear end of floor panel.

Loosen right, left side and middle screws from rear side of the body cover.

Disconnect the tail light coupler.

Remove the body cover.

Installation
Install in reverse order of removal procedures.
Floor Panel

Remove
Remove wind screen garnish, wind screen, meter visor, front cover, R/L side cover, front under spoiler, inner box, luggage box and body cover. Loosen 4 bolts and 2 screws from floor panel.

Remove floor panel.

Installation
Install in reverse order of removal procedures.

Front Fender

Remove
Loosen 4 screws from front cushion.

Remove the front fender.

Installation
Install in reverse order of removal procedures.
14. Brake System

Precautions in Operation

**Caution**

Inhaling asbestos may cause disorders of respiration system or lung cancer; therefore, never use compressed air or dry brush to clean brake parts. Use vacuum cleaner or other authorized tool instead.

- The brake caliper can be removed without removing the hydraulic system.
- Air should be bled from the hydraulic system when remove it or the brake system is slack.
- While refilling brake fluid, avoid mixing any other substances.
- Do not spill brake fluid on the painted surfaces, because plastic or rubber parts might be damaged.
- Check the operation of the brake system before riding.

### Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>The thickness of the front brake disk</td>
<td>5.000</td>
<td>4.500</td>
</tr>
<tr>
<td>The thickness of the rear brake disk</td>
<td>6.000</td>
<td>4.500</td>
</tr>
<tr>
<td>Front and rear brake disk eccentricity</td>
<td>0.100 以下</td>
<td>0.300</td>
</tr>
<tr>
<td>Front brake master cylinder inner diameter</td>
<td>12.700~12.743</td>
<td>12.755</td>
</tr>
<tr>
<td>Front brake master cylinder piston outer diameter</td>
<td>12.657~12.684</td>
<td>12.645</td>
</tr>
<tr>
<td>Rear brake master cylinder inner diameter</td>
<td>12.700~12.743</td>
<td>12.755</td>
</tr>
<tr>
<td>Rear brake master cylinder piston outer diameter</td>
<td>12.657~12.684</td>
<td>12.645</td>
</tr>
<tr>
<td>Diameter of front disk</td>
<td>275.000</td>
<td>—</td>
</tr>
<tr>
<td>Diameter of rear disk</td>
<td>275.000</td>
<td>—</td>
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<tr>
<td>Thickness of the front brake lining</td>
<td>4.800</td>
<td>1.800</td>
</tr>
<tr>
<td>Thickness of the rear brake lining</td>
<td>8.000</td>
<td>2.000</td>
</tr>
</tbody>
</table>

**Torque values:**

- Brake hose bolts: 3.0~4.0kgf-m
- Bolt for front brake caliper: 3.5~4.5kgf-m
- Brake lever nut: 0.8~1.0kgf-m
- Air-bleed valve: 0.8~1.0kgf-m
Troubleshooting

Slack brake lever
1. Air inside the hydraulic system
2. Hydraulic system leaking
3. Worn master piston
4. Worn brake pad
5. Poor brake caliper
6. Worn brake lining/disk
7. Low brake fluid
8. Blocked brake hose
9. Deformed/ bent brake disk
10. Bent brake lever

Malfunction of the brake lever
1. Blocked brake system
2. Poor brake caliper
3. Blocked brake pipe
4. Seized/ worn master cylinder piston
5. Bent brake lever

Uneven brake
1. Dirty brake lining/ disk
2. Poor wheel alignment
3. Clogged brake hose
4. Deformed or bent brake disk

Tight brake
1. Dirty brake lining/disk
2. Poor wheel alignment
3. Deformed or bent brake disk

Brake abnormal noise
1. Dirty lining
2. Deformed brake disk
3. Poor brake caliper installation
4. Imbalance of brake disk or wheel
14. Brake System

**Disk Brake System Inspection**

**Inspection**
Examine for leaking or damage visually. Inspect brake tube seam with spanner to check if it becomes loose. Checking if there is any interference, contacts between protected pipeline and other parts by turning the handlebar right or left, pressing the cushion up and down.

Remove the front brake pad cap.
**Check the brake wear from the brake caliper.**

The brake pad must be replaced with new lining when it reaches the wear limit.

Park the motorcycle on an even ground, and check if fluid level is under the “LOWER” mark. Recommended Brake Fluid: WELL RUN BRAKE OIL (DOT 3).

**Caution**
- Inclined or just stopped vehicles could not be measured oil level accurately. For accuracy, vehicles should stay in still position for 3-to minutes.
- In order to prevent chemical change, please do not use counterfeiting or other uncertified brake fluid.
- Please use the same brand of brake fluid consistently for brake efficiency.
Adding Brake Fluid
Before the brake fluid reservoir is removed, turn the handle so that the brake fluid reservoir becomes horizontal, and then remove the brake fluid reservoir.
When maintain the brake system, it is supposed to cover the surface of rubber parts by rags.

⚠️ Caution

Please do not refill the brake fluid over upper limit. Overflow may result in damages on painted surface such as rubber or plastic parts.

Remove the master cylinder cap and diaphragm. Fill high quality brake fluid with same brand into master cylinder. Clean the dirty brake disk.

⚠️ Caution

- Dirty brake lining or disk will reduce the brake performance.
- Mix incompatible brake fluid will reduce brake performance.
- Other substance will block the brake fluid system, and lead to reduce the brake performance or lose brake ability completely.
Brake Fluid Replacement / Air-bleed

Connect drain hose to air-bleed valve.
Open the drain valve on the calipers and delay valve, hold and release the brake lever until the old brake fluid is entirely drained out.
Close the drain valve and add specified brake fluid into the brake master cylinder.

**Recommended brake fluid: WELLRUN DOT 3 brake fluid**

Connect one end of transparent hose to the drain valve, and put the other end into a container.
Open the drain valve around 1/4 turn, and at the same time hold the brake lever until there is no air bubble in the drain hose and also feeling resistance on the brake lever.

Close the drain valve when finish the brake system refilling fluid procedure, and operate the brake lever to check whether air bubble is in brake system or not.
If brake is still loose, please bleed the system as described below:
1. Tightly hold the brake lever and open the drain valve around 1/4 turn, and then close the valve.

![Air-bleed valve](image1)

![Air-bleed valve](image2)

**Caution**

- Do not release the brake lever before the drain valve is closed.
- Always check the brake fluid level when carrying out the air bleeding procedure to avoid air enters into the system.

2. Slowly release the brake lever, and wait for a few seconds until it reaches its top position.
3. Repeat the steps 1 and 2 until there is no air bubble at the end of the hose.
4. Tightly close the drain valve.
5. Make sure the brake fluid is in the UPPER level of the master cylinder, and refill the fluid if necessary.
6. Cover the cap

![Transparent hose](image3)

**Caution**

- Divulges the air to have to pump by the minute first divulges, then to caliper.
- May use fluid the replacement machine, the replacement fluid, the time is quicker, the air bubble also Compared with cannot remain
Front Brake Caliper

Removal
Place a container under the brake caliper, and loosen the brake hose bolts and finally remove the brake hoses.

⚠️ Caution
Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

Installation
Install the brake caliper and tighten the mounting bolts.

Torque: 3.5~4.5kgf-m

⚠️ Caution
- Use M8 x 35 mm flange bolt only.
- Long bolt will impair the operation of brake disk.

Use two seal washers and hose bolts to lock the hoses and brake caliper in place.

Torque: 3.0~4.0kgf-m

Refill up the brake fluid to the reservoir and make necessary air bleeding.

Brake pad replacement
Remove brake caliper.
Remove brake pad caps.
Remove the brake pad guidance shafts cotter pins.

Install the new brake pads onto brake caliper.
Install the brake pad guidance shafts and locking springs.
Install the brake pad guidance shafts cotter pins.
Install the brake caliper and tighten the mounting bolts.
14. Brake System

Rear Brake Caliper

Removal
Place a container under the brake caliper, and loosen the brake hose bolt and finally remove the brake hose.

⚠️ Caution
Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

Installation
Install the brake caliper and tighten the mounting bolts.

Torque: 3.5~4.5kgf-m

⚠️ Caution
- Use M8 x 35 mm flange bolt only.
- Long bolt will impair the operation of brake disk.

Use two seal washers and hose bolts to lock the hoses and brake caliper in place.

Torque: 3.0~4.0kgf-m
Refill the brake fluid to the reservoir and bleed the air if necessary.

Brake pad replacement
Remove the brake caliper upper parts (2 socket bolts).

Take out the brake pads.

Install the new brake pads onto brake caliper bracket.
Install the brake caliper upper parts and tighten the socket bolts.
Brake Disk

Inspection
Visually check the brake disk for wear or break. Measure the thickness of the disk at several places. Replace the disk if it has exceeded the service limit.

Allowable limit:
- Front brake disk: **4.5 mm**
- Rear brake disk: **4.5 mm**

Remove the brake disk from wheel.

Check the disk for deformation and bend.

Allowable limit: **0.30 mm**

⚠️ Caution
- The dirty brake lining or disk will reduce the brake performance.
- Brake lining includes the asbestos ingredient, cannot use the air-gun to clean it. The operator should wear a mask and glove, and use vacuum cleaner clean it.

Master Cylinder

Removal

⚠️ Caution
- Do not let other substance enter into the cylinder.

⚠️ Caution
- The whole set of master cylinder, piston, spring, diaphragm and circlip should be replaced as a set.

Remove the handlebar covers.
Remove the leads of brake light switch.
Drain out the brake fluid.
Remove the brake lever from the brake master cylinder.
Remove the brake hose.
Remove the master cylinder bolts and the master cylinder.
14. Brake System

Remove the rubber pad.
Remove the circlip.
Remove the piston and the spring.
Clean the master cylinder with recommended brake fluid.

Master Cylinder Inspection
Check the master cylinder for damage or scratch. Replace it if necessary.
Measure the cylinder inner diameter at several points along both X and Y directions. Replace the cylinder if the measured values exceed allowable limit.

Allowable limit:

Front brake: 12.755 mm
Rear brake: 12.755 mm

Measure the outer diameter of the piston. Replace the piston if the measured value exceeds allowable limit.

Allowable limit:

Front brake: 12.645 mm
Rear brake: 12.645 mm

Assembly

⚠️ Caution

- It is necessary to replace the whole set comprising piston, spring, piston cup, and cir clip.
- Make sure there is no dust on all components before assembling.

Apply clean brake fluid to the piston cup, and then install the cup onto the piston.
Install the larger end of the spring onto the master cylinder.
The master cup’s cavity should be faced inside of master cylinder while installing the master cup. Install the cir clip.

⚠️ Caution

- Never install cup lip in the opposite direction.
- Make sure the cir clip is seated securely in the groove.

Install the rubber pad into groove properly.
Master Cylinder Install
Install the rubber pad into the groove correctly. Place the master cylinder onto handlebar, and install the bolts. Install the brake lever, and connect leads to brake light switch.

Connect brake hoses with 2 new washers. Tighten the brake hose bolt to the specified torque value. Make sure the hose is installed correctly. Install all wires, hoses, and components carefully to avoid twisting them together.

⚠️ Caution
Improper routing may damage leads, hoses or pipes.

⚠️ Caution
Kink of brake leads, hose or pipe may reduce brake performance.

Add specified brake fluid and bleed the system.
ABS (Anti-lock Brake System)

ABS is designed to help prevent the wheel from locking up when hard brakes are applied while running straight. The ABS automatically regulates the brake force. Intermittently gaining gripping force and braking force helps prevent wheel lock-up and allows stable steering control while stopping. Brake control function is identical to that of a conventional scooter. The right brake lever is used for the front brake and the left brake lever for the rear brake.

Use of non-recommended tires may cause malfunctioning of ABS and can lead to extended braking distance. The rider could have an accident as a result. Always use recommended standard tires for this scooter.

When the ABS is functioning, rider may feel a pulsing in the brake lever. This is normal.

ABS does not function at the speed of approx. 5 km/h or below.

ABS does not function if the battery is discharged.
ABS indicator light:
The ABS indicator light goes on when the ignition switch is turned on and goes off shortly after the scooter speed is over 5km/hr.
If the indicator light is on, ABS may be out of function. However, the brake system can still work properly. You should have the ABS checked.
14. Brake System

ABS control unit (front view)

ABS control unit (left rear view)

ABS control unit (right rear view)
Caution

Do not remove the ABS control unit coupler when the main switch is ON, or the ABS control unit will be damaged.
14. Brake System

ABS components location

- ABS / EFI system diagnostic tool coupler
- ABS indicator
- ABS control unit
- Rear wheel speed sensor
- Rear wheel detective disk
- Front wheel speed sensor
- Front wheel detective disk
ABS description

Normal brake

When the brake is applied, speed sensors detect the front and rear wheel speed. When there is no wheel slip, EV (inlet valve for maintaining pressure) keeps open and AV (outlet valve for pressure reduction) is closed. Brake calipers receive pressure for master cylinders and brake normally.

Initial wheel slip

When the initial wheel slip is detected by the wheel speed sensors, EV and AV are both closed. Brake caliper keeps the pressure and brake continues.
When the wheel speed sensors detect continuous wheel slip, EV keeps closed and AV is open. Brake pressure is reduced (pulsing in the brake lever). Brake caliper lowers the pressure and braking force.

When the pressure reduction continues, the wheel speed sensors detect no wheel slip. EV keeps open and AV is closed. Brake caliper receives pressure from master cylinder and normal brake is applied.
## ABS trouble code

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>C1021</td>
<td>Abnormal ABS control unit</td>
</tr>
<tr>
<td>C1014</td>
<td>Abnormal EV / AV relay</td>
</tr>
<tr>
<td>C1054</td>
<td>Abnormal front EV</td>
</tr>
<tr>
<td>C1052</td>
<td>Abnormal rear EV</td>
</tr>
<tr>
<td>C1049</td>
<td>Abnormal front AV</td>
</tr>
<tr>
<td>C1048</td>
<td>Abnormal rear AV</td>
</tr>
<tr>
<td>C1059</td>
<td>Abnormal battery voltage (over)</td>
</tr>
<tr>
<td>C1058</td>
<td>Abnormal battery voltage (too low)</td>
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<tr>
<td>C1015</td>
<td>Abnormal oil pump</td>
</tr>
<tr>
<td>C1033</td>
<td>Abnormal front wheel speed sensor (hardware)</td>
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<tr>
<td>C1031</td>
<td>Abnormal rear wheel speed sensor (hardware)</td>
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<tr>
<td>C1034</td>
<td>Abnormal front wheel speed sensor (software)</td>
</tr>
<tr>
<td>C1032</td>
<td>Abnormal rear wheel speed sensor (software)</td>
</tr>
<tr>
<td>C1024</td>
<td>Abnormal wheel speed sensor (common)</td>
</tr>
</tbody>
</table>
14. Brake System

NOTE:
Mechanism Diagram

Front brake Master cylinder

Rear brake Master cylinder

Delay valve

3.0~4.0 kgf-m

0.8~1.0 kgf-m

3.0~4.0 kgf-m

3.5~4.5 kgf-m

Right front brake caliper

Left front brake caliper

Rear brake caliper

3.5~4.5 kgf-m

2.4~3.0 kgf-m

Front brake caliper

Rear brake caliper

Brake Disk

Master Cylinder

Brake Fluid Replacement / Air-bleed

Front Brake Caliper

Rear Brake Caliper

Brake Disc

Disk Brake System Inspection

Troubleshooting

Precautions in Operation

Mechanism Diagram

Page dimensions: 595.3x841.9

[Image 40x782 to 106x805]

[Image 90x79 to 505x621]

[Image 191x805 to 290x826]

[Image 306x805 to 405x826]
14. Brake System

Precautions in Operation

⚠️ Caution

Inhaling asbestos may cause disorders of respiration system or lung cancer; therefore, never use compressed air or dry brush to clean brake parts. Use vacuum cleaner or other authorized tool instead.

- The brake caliper can be removed without removing the hydraulic system.
- Air should be bled from the hydraulic system when remove it or the brake system is slack.
- While refilling brake fluid, avoid mixing any other substances.
- Do not spill brake fluid on the painted surfaces, because plastic or rubber parts might be damaged.
- Check the operation of the brake system before riding.

Specifications

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<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>The thickness of the front brake disk</td>
<td>4.000</td>
<td>2.500</td>
</tr>
<tr>
<td>The thickness of the rear brake disk</td>
<td>5.000</td>
<td>3.500</td>
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<tr>
<td>Front and rear brake disk eccentricity</td>
<td>&lt; 0.100</td>
<td>0.300</td>
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<tr>
<td>Front brake master cylinder inner diameter</td>
<td>11.000~11.043</td>
<td>11.055</td>
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<tr>
<td>Front brake master cylinder piston outer diameter</td>
<td>10.957~10.984</td>
<td>10.945</td>
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<tr>
<td>Rear brake master cylinder inner diameter</td>
<td>14.000~14.043</td>
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<td>Rear brake master cylinder piston outer diameter</td>
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<td>Diameter of front disk</td>
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<td>Diameter of rear disk</td>
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<tr>
<td>Thickness of the front brake lining</td>
<td>5.000</td>
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</tr>
<tr>
<td>Thickness of the rear brake lining</td>
<td>6.000</td>
<td>2.000</td>
</tr>
</tbody>
</table>

Torque values:

- Brake hose bolts: 3.0~4.0kgf-m
- Bolt for front brake caliper: 2.9~3.5kgf-m
- Brake lever nut: 0.8~1.0kgf-m
- Air-bleed valve: 0.8~1.0kgf-m
Troubleshooting

Slack brake lever
1. Air inside the hydraulic system
2. Hydraulic system leaking
3. Worn master piston
4. Worn brake pad
5. Poor brake caliper
6. Worn brake lining/disk
7. Low brake fluid
8. Blocked brake hose
9. Deformed/bent brake disk
10. Bent brake lever

Malfunction of the brake lever
1. Blocked brake system
2. Poor brake caliper
3. Blocked brake pipe
4. Seized/worn master cylinder piston
5. Bent brake lever

Uneven brake
1. Dirty brake lining/disk
2. Poor wheel alignment
3. Clogged brake hose
4. Deformed or bent brake disk

Tight brake
1. Dirty brake lining/disk
2. Poor wheel alignment
3. Deformed or bent brake disk

Brake abnormal noise
1. Dirty lining
2. Deformed brake disk
3. Poor brake caliper installation
4. Imbalance of brake disk or wheel
14. Brake System

Disk Brake System Inspection

Inspection
Examine for leaking or damage visually. Inspect brake tube seam with spanner to check if it becomes loose. Checking if there is any interferes, contacts between protected pipeline and other parts by turning the handle bar right or left, pressing the cushion up and down.

Remove the front brake pad cap. Check the brake wear from the brake caliper.

The brake pad must be replaced with new lining when it reaches the wear limit.

Park the motorcycle on an even ground, and check if fluid level is under the “LOWER” mark. Recommended Brake Fluid: WELL RUN BRAKE OIL (DOT 3).

Caution
- Inclined or just stopped vehicles could not be measured oil level accurately. For accuracy, vehicles should stay in still position for 3-to minutes.
- In order to prevent chemical change, please do not use counterfeiting or other uncertified brake fluid.
- Please use the same brand of brake fluid consistently for brake efficiency.
Adding Brake Fluid
Before the brake fluid reservoir is removed, turn the handle so that the brake fluid reservoir becomes horizontal, and then remove the brake fluid reservoir. When maintain the brake system, it is supposed to cover the surface of rubber parts by rags.

⚠️ Caution

Please do not refill the brake fluid over upper limit. Overflow may result in damages on painted surface such as rubber or plastic parts.

Remove the master cylinder cap and diaphragm. Fill high quality brake fluid with same brand into master cylinder. Clean the dirty brake disk.

⚠️ Caution

- Dirty brake lining or disk will reduce the brake performance.
- Mix incompatible brake fluid will reduce brake performance.
- Other substance will block the brake fluid system, and lead to reduce the brake performance or lose brake ability completely.
14. Brake System

**Brake Fluid Replacement / Air-bleed**

Connect drain hose to air-bleed valve.
Open the drain valve on the calipers and delay valve, hold and release the brake lever until the old brake fluid is entirely drained out.
Close the drain valve and add specified brake fluid into the brake master cylinder.

*Recommended brake fluid: WELLRUN DOT 3 brake fluid*

Connect one end of transparent hose to the drain valve, and put the other end into a container.
Open the drain valve around 1/4 turn, and at the same time hold the brake lever until there is no air bubble in the drain hose and also feeling resistance on the brake lever.

Close the drain valve when finish the brake system refilling fluid procedure, and operate the brake lever to check whether air bubble is in brake system or not.

If brake is still loose, please bleed the system as described below:

1. Tightly hold the brake lever and open the drain valve around 1/4 turn, and then close the valve.

**Caution**

- Do not release the brake lever before the drain valve is closed.
- Always check the brake fluid level when carrying out the air bleeding procedure to avoid air enters into the system.

2. Slowly release the brake lever, and wait for a few seconds until it reaches its top position.
3. Repeat the steps 1 and 2 until there is no air bubble at the end of the hose.
4. Tightly close the drain valve.
5. Make sure the brake fluid is in the UPPER level of the master cylinder, and refill the fluid if necessary.
6. Cover the cap

**Caution**

Divulges the air to have to pump by the minute first divulges, then to caliper.
May use fluid the replacement machine, the replacement fluid, the time is quicker, the air bubble also Compared with cannot remain
Front Brake Caliper

Removal
Place a container under the brake caliper, and loosen the brake hose bolts and finally remove the brake hoses.

⚠️ Caution
Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

Installation
Install the brake caliper and tighten the mounting bolts.

Torque: 2.9~3.5kgf-m

⚠️ Caution
- Use M8 x 35 mm flange bolt only.
- Long bolt will impair the operation of brake disk.

Use two seal washers and hose bolts to lock the hoses and brake caliper in place.

Torque: 3.0~4.0kgf-m
Refill up the brake fluid to the reservoir and make necessary air bleeding.

Brake pad replacement
Remove brake caliper.
Remove brake pad caps.
Remove the brake pad guidance shafts cotter pins.

Remove the brake pad guidance shafts and locking spring, and then remove brake pads.

Install the new brake pads onto brake caliper.
Install the brake pad guidance shafts and locking springs.
Install the brake pad guidance shafts cotter pins.
Install the brake caliper and tighten the mounting bolts.
Rear Brake Caliper

Removal
Place a container under the brake caliper, and loosen the brake hose bolt and finally remove the brake hose.

⚠️ Caution
Do not spill brake fluid on painted surfaces.

Remove two caliper mounting bolts and the caliper.

Installation
Install the brake caliper and tighten the mounting bolts.

Torque: 2.9~3.5kgf-m

⚠️ Caution
- Use M8 x 35 mm flange bolt only.
- Long bolt will impair the operation of brake disk.

Use two seal washers and hose bolts to lock the hoses and brake caliper in place.

Torque: 3.0~4.0kgf-m
Refill the brake fluid to the reservoir and bleed the air if necessary.

Brake pad replacement
Remove the brake caliper upper parts (2 socket bolts).

Take out the brake pads.

Install the new brake pads onto brake caliper bracket.
Install the brake caliper upper parts and tighten the socket bolts.
Brake Disk

Inspection
Visually check the brake disk for wear or break. Measure the thickness of the disk at several places. Replace the disk if it has exceeded the service limit.

Allowable limit:
Front brake disk  2.5 mm
Rear brake disk  3.5 mm

Remove the brake disk from wheel. Check the disk for deformation and bend.

Allowable limit: 0.30 mm

Caution
- The dirty brake lining or disk will reduce the brake performance.
- Brake lining includes the asbestos ingredient, cannot use the air-gun to clean it. The operator should wear a mask and glove, and use vacuum cleaner clean it.

Master Cylinder

Master Cylinder Removal

Caution
Do not let other substance enter into the cylinder.

Caution
The whole set of master cylinder, piston, spring, diaphragm and circlip should be replaced as a set.

Remove the handlebar covers.
Remove the leads of brake light switch.
Drain out the brake fluid.
Remove the brake lever from the brake master cylinder.
Remove the brake hose.
Remove the master cylinder bolts and the master cylinder.
14. Brake System

Remove the rubber pad.
Remove the circlip.
Remove the piston and the spring.
Clean the master cylinder with recommended brake fluid.

Master Cylinder Inspection
Check the master cylinder for damage or scratch. Replace it if necessary.
Measure the cylinder inner diameter at several points along both X and Y directions.
Replace the cylinder if the measured values exceed allowable limit.
Allowable limit:
Front brake: 11.055 mm
Rear brake: 14.055 mm

Measure the outer diameter of the piston.
Replace the piston if the measured value exceeds allowable limit.
Allowable limit:
Front brake: 10.945 mm
Rear brake: 13.945 mm

Master Cylinder Assembly

Caution
- It is necessary to replace the whole set comprising piston, spring, piston cup, and cir clip.
- Make sure there is no dust on all components before assembling.

Apply clean brake fluid to the piston cup, and then install the cup onto the piston.
Install the larger end of the spring onto the master cylinder.
The master cup’s cavity should be faced inside of master cylinder while installing the master cup.
Install the cir clip.

Caution
- Never install cup lip in the opposite direction.
- Make sure the cir clip is seated securely in the groove.

Install the rubber pad into groove properly.
Master Cylinder Install
Install the rubber pad into the groove correctly. Place the master cylinder onto handlebar, and install the bolts. Install the brake lever, and connect leads to brake light switch.

Connect brake hoses with 2 new washers. Tighten the brake hose bolt to the specified torque value. Make sure the hose is installed correctly. Install all wires, hoses, and components carefully to avoid twisting them together.

⚠️ Caution
Improper routing may damage leads, hoses or pipes.

⚠️ Caution
Kink of brake leads, hose or pipe may reduce brake performance.

Add specified brake fluid and bleed the system.
NOTE:
Mechanism Diagram

Front Wheel
Front Cushion
Steering Stem

Precautions in Operation
Troubleshooting
Steering Handle
Precautions in Operation

General
Please refer to the Maintenance Manual of tubeless tire in respect to the removal, repair and installation of the tire.

Torque Values

<table>
<thead>
<tr>
<th>Description</th>
<th>Torque Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nut for the front wheel axle</td>
<td>5.0 ~ 7.0kgf-m</td>
</tr>
<tr>
<td>Nut for the steering handle</td>
<td>4.0 ~ 5.0kgf-m</td>
</tr>
<tr>
<td>Lock nut for the steering handle stem</td>
<td>1.0 ~ 2.0kgf-m</td>
</tr>
<tr>
<td>Top crown for the steering handle stem</td>
<td>0.2 ~ 0.3kgf-m</td>
</tr>
<tr>
<td>Locating screw for the speedometer cable</td>
<td>0.15 ~0.3kgf-m</td>
</tr>
<tr>
<td>Front cushion upper lock bolt</td>
<td>2.4 ~ 3.0kgf-m</td>
</tr>
<tr>
<td>Front brake disk</td>
<td>4.0~4.5kgf-m</td>
</tr>
</tbody>
</table>

Special Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering handle top thread wrench</td>
<td>SYM-5320000</td>
</tr>
<tr>
<td>Inner bearing puller</td>
<td>SYM-6204020</td>
</tr>
<tr>
<td>Steering nut wrench</td>
<td>SYM-6204010</td>
</tr>
<tr>
<td>Driver 32*35mm</td>
<td></td>
</tr>
<tr>
<td>Driver 42*47mm</td>
<td></td>
</tr>
</tbody>
</table>

Troubleshooting

Hard to steer
- The steering handle stem nut is too tight.
- The ball and the top crown of the steering handle stem are damaged.
- Insufficient tire pressure.

The front wheel rim run-out
- The rim is bent.
- The wheel axle nut is not tightened enough.
- Side-worn or poor tire.
- The bearing clearance of the wheel axle is too large.

The steering handlebar is tilted
- Uneven arrangement of the front cushion.
- The front fork is bent.
- The front wheel axle is bent

Soft front cushion
- The front cushion spring is worn out.
- The oil seal of the front cushion is leaking.

Noise in front cushion
- Front cushion rod is bent.
- The joint of the front cushion gets loose.
**Steering Handle**

**Remove**
Remove the right and left handle side cover, handle upper cover and front cover. (Refer to chapter 13)
Loosen the lock bolts for the master cylinder of the front brake.

Loosen the deceleration throttle cable fixing nut. Loosen 1 screw from the acceleration throttle fixing plate.

Loosen 2 screws from the throttle holder.

Remove throttle holder, handle switch, cables and grip.
Loosen 2 bolts from the master cylinder of the rear brake. Remove holder and master cylinder.

Loosen left handle switch connector. Loosen 2 screws from left side handle switch holder. Remove the right handle switch.

Loosen handle mounting nut. Remove handle mounting bolt, and then remove the handle.

**Installation**
Install handle and align with bolt hole. Install bolt and nut and then tighten it. **Torque value: 4.0~5.0kgf-m**

Apply grease to throttle cable and the sliding surface of handle. Align the lock pin with the hole on the handle. After the installation completes, carry on the following inspection and adjustment:
- Throttle grip operation.
- All electric appliances, the meter function
**Front Wheel**

Loosen 2 bolts from the front brake caliper and remove it

⚠ **Caution**

- Care shall be taken not to push the brake lever to avoid the brake pad being squeezed out. In case that the brake pad is accidentally squeezed out, use a screwdriver to force it back to the place.

Loosen screw & remove speedometer cable. Turn loose the axle nut.

Pull out the front wheel axle. Remove the front wheel and both side collar.
Inspection

Wheel axle
Place the wheel axle on a V block, measure its displacement.
Service limit: 0.2 mm

Bearing
Use finger to move the inner ring of each bearing, it shall move smoothly and quietly. Check the outer ring is securely attached on the wheel hub. If the motion of the inner ring of the bearing is not smooth, or noisy and loose when being moved, replace with a new one.

⚠️ Caution
- The bearing shall be replaced in pair.

Wheel
Place the wheel on to a rotation seat to check its rim wobbling.
Turn the wheel with hand and measure its rim wobbling value with a dial gauge.
Service limit:
Radial: 2.0 mm (0.08 in)
Axial: 2.0 mm (0.08 in)

Disassembly
Remove brake disk (5 bolts).
Remove dust seal, bearing and dist collar from left side.
Remove dust seal and bearing from right side.
Special tools:
Inner bearing puller SYM-6204020
Assembly
Fill out the block of bearing by grease. Drive the left bearing, dust seal and install the dist collar. Install the right side bearing.

⚠️ Caution
- Carefully install the bearing in correct and evenly.
- Bearing outer face should be faced up as bearing installation.

Install the brake disk and then tighten the bolts.
**Torque value:** 4.0~4.5kgf-m
Front Cushion

Remove
Remove front cover, front under spoiler and front fender.
Remove three bolts at both sides.
Remove front wheel.
Remove front brake caliper.
Remove speedometer cable.
Steering Stem

Remove
Remove handle, front wheel and front cushion.
Remove the steering stem mounting nut.

Remove top cone race and steering stem.

⚠️ Caution
- Place the steel ball onto a parts container to prevent from missing.

Special tools:
Steering stem top thread wrench SYM-5320010
Handle stand nut wrench SYM-5321100

Slightly tap the top and bottom ball bearing seats with a plastic hammer to remove the seats.
Remove bottom cone race body with a punch.

⚠️ Caution
- Do not damage the steering stem.

Installation
Install a new bottom cone race onto the steering stem.
Push the cone race until to mounted position.

⚠️ Caution
- Do not tilt the ball bearing seats as installation.

Apply with grease onto the ball bearing seats, and install steel balls onto the seats. (Top: 26 balls, bottom: 29 balls)
Lubricate the top cone race seat with grease. Screw the cone race into top ball bearing seat till touching, and then screw out the cone race 1/4~3/8 turn.

**Torque value:** 0.25kgf-m

⚠️ **Caution**

- Check the steering stem that should be rotated freely, and no clearance in vertical direction.

Install the steering stem mounting nut and tighten the nut by means of holding the top cone race body.

**Torque value:** 1.0~2.0kgf-m

Install in reverse order of removal procedures.
**NOTE:**

**Steering stem adjustment:** When the steering stem is too tight.

**Steps:** please refer to figure 1

1. Stay front wheel on the ground, and make sure that the component ①,②,③,④ are connected all together appropriately.
2. Lock the component 53220-HMA-00 (STRG. HEAD TOP THREAD COMP.) with the torque of 350±50Kgf-cm.
3. Turn the steering stem right to left for 5-6 times in order to make the bearing fit in.
4. Keep the front wheel on the ground, loosen the component 53220-HMA-00 over 1/4 turn, and make the lock torque to zero.
5. Start second lock procedure. To begin with the component 53220-HMA-00. Make sure that the lock torque is between 100~130 Kgf-cm.
   Turn the steering stem, and adjust it to appropriate position.
6. Lock the component 50306-M9Q-00 with the torque of 300~350 Kgf-cm. Please be aware that component 53220-HMA-00 is not allowed to rotate along with the component 50306-M9Q-00 during this lock procedure.
7. Lock torque for the component 90304-L4A-00 is between 650~700 Kgf-cm.

![Fig.1 Steering system components.](image-url)
Mechanism Diagram

1. Mechanism Diagram
2. Operational Precautions
3. Troubleshooting
4. Muffler
5. Rear Wheel
6. Rear Fork
7. Rear Cushion

Mechanism Diagram
16. Rear Wheel / Rear Fork / Rear Cushion

Operational Precautions

General
Please refer to the Maintenance Manual for tubeless tire in respect to the removal, repair and installation of the tires.

Service data

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard</th>
<th>Allowable Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run-out of rear rim</td>
<td>Radial</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Axial</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Torque Value

<table>
<thead>
<tr>
<th>Item</th>
<th>Torque Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear wheel axle nut</td>
<td>11.0~13.0kgf-m</td>
</tr>
<tr>
<td>Rear cushion upper bolt</td>
<td>3.5~4.5kgf-m</td>
</tr>
<tr>
<td>Rear cushion under bolt</td>
<td>2.4~3.0kgf-m</td>
</tr>
<tr>
<td>Rear fork mounting bolt</td>
<td>4.0~5.0kgf-m</td>
</tr>
<tr>
<td>Exhaust muffler mounting nut</td>
<td>1.0~1.2kgf-m</td>
</tr>
<tr>
<td>Exhaust muffler mounting bolt</td>
<td>3.2~3.8kgf-m</td>
</tr>
<tr>
<td>Brake clipper mounting bolts</td>
<td>2.9~3.5kgf-m</td>
</tr>
<tr>
<td>Brake disc mounting bolt</td>
<td>4.0~5.0kgf-m</td>
</tr>
</tbody>
</table>

Troubleshooting

Run-out of rear wheel
- Deformed or bent wheel hub.
- Improper tires.
- Loose wheel shaft.

Soft Cushion
- The spring is too weak.

Noisy Brake
- Worn brake lining.
- Offset brake disc.
- Improper assembly of brake caliper.
- Brake disc or wheel imbalance.

Poor Performance of Brake
- Improperly adjusted brake.
- Contaminated brake disc.
- Worn brake lining.
- Air inside brake fluid pipe.
- Grease on brake disc.
- The brake fluid piping is clogged.
- The brake fluid pipe is deformed or bent.
- The brake fluid pipe is deformed or bent.
- Insufficient amount of brake fluid in the reservoir.
Muffler

Removal
Loosen the 2 nuts from exhaust muffler front side.

Loosen the 3 mounting bolts by exhaust muffler right side.
Remove exhaust muffler.

Installation
Install in reverse order of removal procedures.

⚠️ Caution
- Replace the front side muffler pipe gasket if worn or deformed.

Torque Value:
Muffler mounting bolt  3.2 ~ 3.8kgf-m
Muffler mounting nut  1.0 ~ 1.2kgf-m

Rear Wheel

Removal
Remove the exhaust muffler.
Remove the rear brake caliper (2 bolts) and brake hose clamp (1 bolt).

⚠️ Caution
- Care shall be taken not to push the brake lever to avoid the brake pad being squeezed out. In case that the brake pad is accidentally squeezed out, use a screwdriver to force it back to the place.

Remove the lower bolt of the right side rear cushion.
Remove 2 bolts of the rear fork.
16. Rear Wheel / Rear Fork / Rear Cushion

Remove rear wheel axle nut.

Remove rear fork and both side collars.
Remove the rear wheel.

Inspection rear wheel rim
Place the wheel rim on a rotational support.
Rotate it by hand and measure the run-out with a
dial indicator.
Run-out limit: 2.0 mm

Installation
Install in reverse order of removal procedures.

<table>
<thead>
<tr>
<th>Torque Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear wheel axle nut</td>
</tr>
<tr>
<td>Rear cushion under bolt</td>
</tr>
<tr>
<td>Rear fork mounting bolt</td>
</tr>
<tr>
<td>Brake clipper mounting bolts</td>
</tr>
</tbody>
</table>
Rear Fork

Inspection rear fork bearing
Rotate the inner ring of the bearing with a finger. The bearing should move smoothly and quietly. Check the fit of the bearing and rim. Replace the bearing if its motion is not smooth or noisy.

Replacement of rear fork bearing
Remove the bearing lock cir clip.

Uses the bearing driver; drive out the bearing.
Special tool: Bearing driver

Install new rear fork bearing and bearing puller (6303) onto rear fork.
Install assembly directs puller bearing puller.
Special Service Tools:
Rear fork bearing 6303 bearing puller  SYM-6303000-HMA H9A 6303
Assembly directs puller SYM-2341110

Use screw driver hold bearing puller lower part, and turn the bearing puller upper part to install the rear fork bearing.
Install the bearing lock cir clip.

Rear Cushion
Removal
Remove the luggage box, rear carrier and body covers.
Loosen the mounting bolts of the air cleaner (2 bolts).
Remove the exhaust muffler (3 bolts, 2 nuts).
Remove the under bolts by left and right rear cushions.
Remove the upper bolts by left and right rear cushions, and then remove the cushion.

Installation
Install in reverse order of removal procedures.

⚠️ Caution
- The rear cushion must be replaced as a unit. Never disassemble the rear cushion as that would damage the structure.

Torque Value
- Rear cushion upper bolt: 3.5~4.5kgf-m
- Rear cushion under bolt: 2.4~3.0kgf-m
Mechanism Diagram

17-1

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Starting System 17-11
Meter 17-13
Light / Bulb 17-15
Switch / Horn 17-17
Fuel Unit 17-19
Cooling Fan Thermo Switch 17-20
Thermo Unit 17-21
Water Temperature Meter 17-21

Mechanism Diagram

- Speed sensor
- Rollover sensor
- Winker & Hazard control unit
- Headlight hi-beam relay
- Thermo switch (Cooling fan)
- Battery
- Start relay
- Passing / Beam / Winker / Horn / Seat open switch
- AISV
- Side stand switch
- Spark plug
- Fuel injector
- MAP Sensor
- ISC
- TPS
- TA Sensor
- Seat open linear motor
- Horn
- Headlight lo-beam relay
- Power relay
- Key relay
- Engine stop relay
- Fuse box
- Main switch
- Start / Headlight / Engine stop switch
- Fuel pump / fuel unit
- O2 Sensor
- Ignition coil
- Thermo unit
- TW Sensor
- CPS
- A.C. Generator
- ECU
- Reg. Rec.
17. Electrical System

Precautions in Operation

- When removing the battery, the disconnection sequence of cable terminals shall be strictly observed. (First disconnect the negative cable terminal, next, the positive cable terminal.)
- The model of the spark plug and the tightening torque.
- The ignition timing.
- Adjustment of headlight.
- Removal and installation of AC generator.
- The maintenance-free battery requires no inspection of electrolyte level and refilling of distilled water.
- To recharge the battery, remove the battery from rack without removing ventilation caps.
- Unless in emergency, never rapid-charge the battery.
- The voltage must be checked with the voltmeter while charging the battery.
- As ECU assembly does not require an ignition timing check. In case ignition timing is incorrect, check ECU and AC generator. Verify with an ignition timing light after replacement if necessary.

Specification

Charging system

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>Capacity</td>
</tr>
<tr>
<td></td>
<td>12V10Ah</td>
</tr>
<tr>
<td></td>
<td>Charging rate</td>
</tr>
<tr>
<td></td>
<td>1.2A / 5~10hr (standard) 5A / 1hr (rapid charging)</td>
</tr>
<tr>
<td>Leak current</td>
<td>Below 10mA</td>
</tr>
<tr>
<td>Charging current</td>
<td>1.2A / 1500 rpm</td>
</tr>
<tr>
<td>Control voltage in charging</td>
<td>14.5±0.5 V / 2,000 rpm</td>
</tr>
</tbody>
</table>

Ignition system

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spark plug</td>
<td>Model NGK CR8E (Recommended)</td>
</tr>
<tr>
<td></td>
<td>Gap 0.6~0.7 mm</td>
</tr>
<tr>
<td>Ignition coil and resistance</td>
<td>Primary winding 2.8Ω±15%</td>
</tr>
<tr>
<td></td>
<td>Secondary winding Without cap:9 KΩ± 20%</td>
</tr>
<tr>
<td></td>
<td>With cap:14.1 KΩ± 20%</td>
</tr>
<tr>
<td>Crankshaft position sensor resistance (20°C)</td>
<td>80~160 Ω</td>
</tr>
<tr>
<td>Ignition timing advance</td>
<td>At idle speed BTDC 10° / 1650 rpm</td>
</tr>
<tr>
<td></td>
<td>Full advanced BTDC 30°</td>
</tr>
</tbody>
</table>
17. Electrical System

**Troubleshooting**

No voltage
- Battery over discharged
- The cable disconnected
- The fuse is blown
- Improper operation of the main switch
- Low voltage
- The battery is not fully charged
- Poor connection.
- Poor charging system
- Poor voltage regulator

No spark produced by spark plug
- The spark plug is out of work
- The cable is poorly connected, open or short-circuited
- Poor connection between ECU and ignition coil
- Poor connection between ECU and main switch
- Poor main switch
- Poor ECU.
- A.C.G. is out of work

Starter motor does not work
- The fuse is blown
- The battery is not fully charged
- Poor main switch
- Poor starter switch
- The front and rear brake switches do not operate correctly
- Starter relay is out of work
- The ignition coil is poorly connected, open or short-circuited
- The starter motor is out of work

Intermittent power supply
- The connector of the charging system becomes loose
- Poor connection of the battery cable
- Poor connection or short-circuit of the discharging system
- Poor connection or short-circuit of the power generation system

Charging system does not operate properly
- Burnt fuse
- Poor contact, open or short circuit
- Poor regulator rectifier
- Poor ACG

Engine does not crank smoothly
- Primary winding circuit
  - Poor ignition coil
  - Poor connection of cable and connectors
  - Poor main switch
- Secondary winding circuit
  - Poor ignition coil
  - Poor spark plug
  - Poor ignition coil cable
  - Current leakage in the spark plug
- Incorrect ignition timing
  - Poor ACG
  - Improper installation of CPS
  - Poor ECU

Weak starter motor
- Poor charging system
- The battery is not fully charged
- Poor connection in the windings
- The motor gear is jammed by foreign material

Starter motor is working, but engine does not crank
- Poor starter motor pinion
- The starter motor runs in reverse direction
- Poor battery
17. Electrical System

Battery

Removal
Loosen 1 screw and remove the battery cover. Disconnect the negative cable terminal first, then the positive cable terminal.

Remove the battery.

Voltage Check
Use the digital voltmeter to check the voltage of the battery.

Voltage:
- **Fully charged:** 12.8V ↑ at 20°C
- **Undercharged:** Below 12.0 V at 20°C

⚠️ Warning
- Keep flames away while recharging.
- Charging is completely controlled by the ON/OFF switch on the charger, not by battery cables.

Charging
Connect the positive terminal (+) of the charger to the battery positive terminal (+). Connect the negative terminal (−) of the charger to the battery negative terminal (−).

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charging current</td>
<td>1.2A</td>
<td>5A</td>
</tr>
<tr>
<td>Charging time</td>
<td>10 hr</td>
<td>1 hr</td>
</tr>
</tbody>
</table>

⚠️ Warning
- Keep flames away while recharging.
- Charging is completely controlled by the ON/OFF switch on the charger, not by battery cables.

⚠️ Caution
- Never rapid charge the battery unless in emergency.
- Verify the battery is recharged with current and duration prescribed above.
- Large current and fast time to charge will render damage to the battery.

When installing the battery, coat the cable terminal with grease.
Fuse

Fuse circuit diagram

1. Electrical System

To this chapter contents
Charging System

Regulator rectifier Inspection

<table>
<thead>
<tr>
<th>Item</th>
<th>Check Points</th>
<th>Standard Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main switch connection</td>
<td>R– B</td>
<td>Battery voltage (ON)</td>
</tr>
<tr>
<td>Battery connection</td>
<td>R– G</td>
<td>Battery voltage</td>
</tr>
<tr>
<td>Charging coil</td>
<td>Y– Y</td>
<td>0.2~0.4 Ω</td>
</tr>
</tbody>
</table>

If the readings measured are not normal, check parts in the circuit.

If the parts are normal, then trouble is in the wiring. If there is nothing wrong with parts and wiring, replace the regulator rectifier.
Inspection on AC. Generator coil
Remove the luggage box, rear carrier and body covers.
Disconnect 3 pin couplers of the generator coil.
Connect an ohmmeter to the each terminal end.
Check the continuity of the each terminal end, and engine ground with short circuit.
If there is no continuity or short circuit, replace the AC. Generator.

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th>Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1</td>
<td>70~80</td>
<td>0.2~0.4</td>
</tr>
<tr>
<td>Y2</td>
<td>70~80</td>
<td>0.2~0.4</td>
</tr>
<tr>
<td>Y3</td>
<td>70~80</td>
<td>0.2~0.4</td>
</tr>
</tbody>
</table>

And you can check voltage when engine is running.

Current Leakage Inspection
Turn the main switch OFF, and remove the negative cable terminal (-) from the battery.
Connect an ammeter between the negative cable terminal and the battery negative terminal.
Disconnect each cable one by one and take measurement of the current of each cable to locate the short circuit.
**Allowable current leakage: Less than 10mA**

⚠️ Caution

- In the current leakage test, set the current range at the largest scale, then gradually decrease to the lower scale as the test process goes to avoid possible damage to the ammeter and the fuse.
- Do not turn the main switch to ON position during test.

If the leaked current exceeds the specified value, it may indicate a short circuit.
Inspection on Charging Voltage

Caution
- Before conducting the inspection, be sure that the battery is fully charged. If undercharged, the current changes dramatically.
- Use a fully charged battery having a voltage larger than 13.0 V to prevent the current fluctuation.
- While starting the engine, the starter motor draws large amount of current from the battery.

After the engine is warmed up, replace the original battery with a fully charged one.
Connect a digital voltmeter to the battery terminals.
Connect an ammeter between both ends of the main fuse.

Caution
- When the probe is reversibly connected, use a voltmeter having an indication that the current flows from the positive or the negative direction and the measurement should be at zero, ammeter at one direction only.

Caution
- Do not use any short-circuit cable.
- It is possible to measure the current by connecting an ammeter between the battery positive terminal and the cable positive terminal; however, while the starter motor is activated, the surge current draws from the battery may damage the ammeter. Use the kick starter to start the engine to prevent this happen.
- The main switch shall be turned to OFF position during the process of inspection. Never tamper with the ammeter and the cable while there is current flowing through. It may damage the ammeter.

Connect a tachometer.
Turn on the headlight to high beam and start the engine.
Accelerate the engine to the specified revolution per minute and measure the charging voltage.

Specified Charging Current:
1.2 A / 6000 rpm
Control Charging Voltage:
14.5 V / 1650 rpm

Caution
- When it comes to replacement, make sure that the current and voltage of the new battery are the same as the old one.

The following problems are related to the charging system; follow the instructions provided in the checking list to correct it if any one of the problems occurs.
1. The charging voltage can not exceed the voltage between two battery terminals and the charging current is in the discharging direction.
2. The charging voltage and current are too much higher than the standard values.

The following problems are not related to the charging systems; correct it if any by following steps indicated in the checking list.
(1) The standard charging voltage and current can only reach when the revolution of the engine exceeds the specified rpm.
   - Light bulbs used exceed their rate and consume too much power.
   - The replaced battery is aged and does not have enough capacity.

(2) The charging voltage is normal, while the current is not.
   - The replaced battery is aged and does not have enough capacity.
   - Battery used does not have enough electricity or is over charged.
   - The fuse of the ammeter is blown.
   - The ammeter is improperly connected.

(3) The charging current is normal, but the voltage is not.
   - The fuse of the voltmeter is blown.
ECU coupler (ECU side)

01 pin (R/Y): Drive components Power.
03 pin (L/O): Crankshaft position sensor positive
09 pin (G): Crankshaft position sensor negative
18 pin (Y/G): Ignition coil
Inspection on ignition coil
Remove the right floor garnish.
Disengage the connector of the ignition coil.
Measure the resistance between the terminals of the primary winding.
**Standard resistance: 2.8Ω±15% (20°C)**

Replacement of ignition coil
Remove the cap from the spark plug.

Loosen 2 bolts and replace the ignition coil if necessary.

Inspection of crank position sensor
Remove luggage box (bolt×6).
Disconnect the coupler of the crank position sensor and measure the resistance between the terminals of green/white and blue/yellow.
**Standard resistance: 80~160Ω**

⚠️ Caution
It is not necessary to remove the coil from the engine during this process.

Please refer to the section 11 for disassembly of coil.
Starting System

Inspection of starter relay
Open the main switch.
Press the brake.
Push the starter switch.
If a sound of “Looh Looh” is heard, it indicates the relay is working properly.

Open the inner box lid, and remove battery cover.
Disconnect the negative cable terminal of the battery.

Remove the luggage box.
Disconnect the cable positive terminal from the start relay.
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Disconnect the positive cable of the starter motor.
Disconnect the coupler of the relay.
Connect an ohmmeter to the large terminal end.
Connect the yellow/red cable to the battery positive terminal and the green/yellow cable to the battery negative terminal.
Check the continuity of the large terminal end.
If there is no continuity, replace the relay.

Removal of Starter motor
Turns off the main switch
Remove the luggage box.
Disconnect the coupler of the start relay.
Disconnect the cable negative terminal of the battery.
Disconnect the starter motor power cable.
Loosen 2 bolts & remove starter motor.

Installation of starter motor
Install in reverse order of removal procedures.
17. Electrical System

Meter circuit diagram

Meter coupler

Wire harness coupler

<table>
<thead>
<tr>
<th>Red</th>
<th>Yellow / Green</th>
<th>Black</th>
<th>Green</th>
<th>Green / Pink</th>
<th>Green</th>
<th>Red / Green</th>
<th>Yellow / White</th>
<th>Gray / White</th>
<th>Orange / black</th>
</tr>
</thead>
<tbody>
<tr>
<td>BATT+</td>
<td>EFI</td>
<td>IGN+</td>
<td>BATT-</td>
<td>SP-</td>
<td>BATT-</td>
<td>RPM</td>
<td>Fuel+</td>
<td>SP+</td>
<td>SP</td>
</tr>
<tr>
<td>Green</td>
<td>Blue / White</td>
<td>Blue</td>
<td>Yellow / Blue</td>
<td>Brown</td>
<td>Sky Blue</td>
<td>Orange</td>
<td>White / Black</td>
<td>Green / Blue</td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>Side stand</td>
<td>Hi-beam</td>
<td>Charge</td>
<td>ILLUMI.</td>
<td>Turn-R</td>
<td>Turn-L</td>
<td>Foggy</td>
<td>TEMP</td>
<td></td>
</tr>
</tbody>
</table>
17. Electrical System

Removal of meter
Remove wind screen garnish, wind screen, meter visor, front cover, meter visor.
(Refer chapter 14)

Disconnect the coupler of the speedometer, and take off the meter panel and meter.

Loosen 4 screws from meter panel.
Remove the speedometer.

Installation of meter
Install in reverse order of removal procedures
Light / Bulb

Headlight and foggy light circuit diagram

Winker light circuit diagram
17. Electrical System

Headlight bulb replacement

Pull out the rubber socket, and press the 2 springs, then remove light bulb.

**Specification:**
- Lo-beam bulb 12V 55W (H11)
- Hi-beam bulb 12V 55W (H11)

⚠️ **Caution**
- It would be much easier to replace the light bulb if dismounting the front cover.
- Never touch the bulb with bare fingers, which may create a heat point and lead to premature bulb failure.
- Clean the fingerprint left on the bulb with alcohol.

**Installation**
Install the bulb of the headlight in reverse order of removal.

Front winker bulb replacement
Hold the winker bulb socket. Rotate the winker bulb and remove it. Replace with new bulb if necessary.

**Specification:**
- Winker light bulb 12V 21W

**Installation**
Install the bulb of the headlight in reverse order of removal.
Switch / Horn

Main switch

Inspection
Remove the front cover.
Disconnect the main switch coupler.
Check the continuity between two points as indicated below.

<table>
<thead>
<tr>
<th>Position</th>
<th>Pin</th>
<th>BAT</th>
<th>BAT1</th>
<th>BAT2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wire Color
- Red
- Black
- Blake

Replacement of main switch
Remove main switch cap.
Disconnect the coupler of the main switch and loosen the mounting bolts (3 bolts).
Remove the main switch.
Install the new main switch and tighten the mounting bolts.
Install the main switch coupler and cap.

Right handle switch
Remove the handle cover and front cover.
Disconnect the coupler of right handle switch.
Check the continuity between two points as indicated in the table below.

Headlight switch

<table>
<thead>
<tr>
<th>Position</th>
<th>Pin</th>
<th>TL</th>
<th>CI</th>
<th>HL</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wire Color
- Brown
- Black
- Black
- Blue/White

Engine start and stop switch

<table>
<thead>
<tr>
<th>Position</th>
<th>Pin</th>
<th>ST</th>
<th>E</th>
<th>ST</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wire Color
- Black
- Black/Green
- Yellow/Red
- Sky blue/Orange
Left handle switch
Remove the handle cover and front cover.
Disconnect the coupler of left handle switch.
Check the continuity between two points as indicated in the table below

### High and low beam switch
<table>
<thead>
<tr>
<th>Position</th>
<th>LO</th>
<th>HL</th>
<th>HI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Wire color</td>
<td>White</td>
<td>Blue / White</td>
<td>Blue</td>
</tr>
</tbody>
</table>

### Winker switch
<table>
<thead>
<tr>
<th>Position</th>
<th>R</th>
<th>WR</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>FROM R</td>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /></td>
</tr>
<tr>
<td>PUSH OFF</td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /></td>
<td><img src="image9.png" alt="Image" /></td>
</tr>
<tr>
<td>FROM L</td>
<td><img src="image10.png" alt="Image" /></td>
<td><img src="image11.png" alt="Image" /></td>
<td><img src="image12.png" alt="Image" /></td>
</tr>
<tr>
<td>Wire color</td>
<td>Sky blue</td>
<td>Gray</td>
<td>Orange</td>
</tr>
</tbody>
</table>

### Brake Switch
While grasp the brake lever firmly, the terminals of white/green and green/yellow of the brake should have continuity.
Replace the switch if damaged.

### Horn
Remove the front cover and front under spoiler.
Apply 12 V power source to two terminals of the horn, the horn should work.
Replace the horn if necessary.
Fuel Unit
Open the seat.
Remove the luggage box.
Remove the rear carrier.
Remove right & left side cover.
Remove the body cover
Remove the floor panel.
Disconnect the coupler of the fuel unit.
Loosen 4 bolts from fuel unit and remove it.

⚠️ Caution
• Great care shall be taken not to damage or bend the float arm of the gauge.

When the float arm shifts to the F position or the E position, the resistance measured shall be as follows:

<table>
<thead>
<tr>
<th>Position</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>E (Empty)</td>
<td>90~100 Ω</td>
</tr>
<tr>
<td>F (Full)</td>
<td>4~8 Ω</td>
</tr>
</tbody>
</table>

Connect the wiring to the fuel unit and the ohmmeter as shown.
Connect the fuel unit coupler to the wire harness.
Turn on the main switch.
Move the float arm to verify the proper position of the fuel gauge needle indicates.

<table>
<thead>
<tr>
<th>Arm Position</th>
<th>Needle Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up (Full)</td>
<td>F (Full)</td>
</tr>
<tr>
<td>Down (Empty)</td>
<td>E (Empty)</td>
</tr>
</tbody>
</table>

⚠️ Caution
• While conducting the test, turn on the direction indicator lamp to make sure that the battery is in serviceable condition.
Cooling Fan Thermo Switch
The thermo switch mounted on the radiator controls the operation of the cooling fan motor. In case that the fan motor fails working, disconnect the green and black/blue leads, and connect jump wires to the terminals, then turn on the main switch. The fan motor should operate afterwards. If the fan motor still fails running, measure the battery voltage between the green and black / blue leads.
If there is no voltage, check for blown fuse, loose connection or short-circuit.
If the fan motor runs, check the thermo switch in the manner as described below:
Hang the thermo switch on the bowl filled with coolant to check the switch’s opening and closing temperatures. To confirm the switch is close-circuited at room temperature. Increase the coolant temperature gradually, and the switch should have a continuity at 95-101°C.

⚠️ Caution
- Keep the coolant at a constant temperature at least for three minutes. Suddenly increase the coolant temperature will give rise to wrong readings of thermometer and the tester to indicate wrong readings.
- Never let the thermometer and the thermo switch contact the wall of the bowl, which may result in wrong readings.
- The thermo switch shall be placed in the coolant until the teeth are completely submerged.
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**Thermo Unit**
Remove the thermo unit. Hang the thermo unit in an oil heater, heat the oil and measure the resistance at each temperature.

<table>
<thead>
<tr>
<th>Temperature</th>
<th>50°C</th>
<th>80°C</th>
<th>100°C</th>
<th>120°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard (Ω)</td>
<td>134~149</td>
<td>47.5~57.0</td>
<td>26~29</td>
<td>14.8~17.2</td>
</tr>
</tbody>
</table>

⚠️ Caution
- Wear gloves and goggles when performing this test.

⚠️ Caution
- Engine oil should be used as a heating medium and the test temperature must be higher than 100°C.
- Contacting the container wall by the thermometer and the thermo unit may result in wrong readings.

**Water Temperature Meter**
Disconnect the thermo sensor coupler and connect it to engine ground. Turn on the main switch. The needle of the water temperature meter should move to other end, H position.

⚠️ Caution
- Do not ground the sensor more than 5 seconds, or the meter will be damaged.
17. Electrical System

NOTE:
NOTE: