Kawasaki

JET SKI® watercraft

STX-15F

JET SKI® Watercraft Service Manual

Quick Reference Guide

This quick reference guide will assist you in locating a desired topic or procedure.

- Bend the pages back to match the black tab of the desired chapter number with the black tab on the edge at each table of contents page.
- Refer to the sectional table of contents for the exact pages to locate the specific topic required.

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Second Edition (1):Oct. 15, 2004 (K)

LIST OF ABBREVIATIONS

A	ampere(s)	lb	pound(s)
ABDC	after bottom dead center	m	meter(s)
AC	alternating current	min	minute(s)
ATDC	after top dead center	N	newton(s)
BBDC	before bottom dead center	Pa	pascal(s)
BDC	bottom dead center	PS	horsepower
BTDC	before top dead center	psi	pound(s) per square inch
°C	degree(s) Celsius	r	revolution
DC	direct current	rpm	revolution(s) perminute
F	farad(s)	TDC	top dead center
°F	degree(s) Fahrenheit	TIR	total indicator reading
ft	foot, feet	V	volt(s)
g	gram(s)	W	watt(s)
h	hour(s)	Ω	ohm(s)
L	liter(s)		

Read OWNER’S MANUAL before operating.

MAINTENANCE AND ADJUSTMENTS

Maintenance, replacement, or repair of the emission control devices and systems may be performed by any marine SI engine repair establishment or individual.

EMISSION CONTROL INFORMATION

Fuel Information

THIS ENGINE IS CERTIFIED TO OPERATE ON UNLEADED REGULAR GRADE GASOLINE ONLY.

A minimum of 87 octane of the antiknock index is recommended. The antiknock index is posted on service station pumps.

Emission Control Information

To protect the environment in which we all live, Kawasaki has incorporated an exhaust emission control system in compliance with applicable regulations of the United States Environmental Protection Agency.

Exhaust Emission Control System

This system reduces the amount of pollutants discharged into the atmosphere by the exhaust of this engine. The fuel, ignition and exhaust systems of this engine have been carefully designed and constructed to ensure an efficient engine with low exhaust pollutant levels.

Maintenance

Proper maintenance and repair are necessary to ensure that watercraft will continue to have low emission levels. This Service Manual contains those maintenance and repair recommendations for this engine. Those items identified by the Periodic Maintenance Chart are necessary to ensure compliance with the applicable standards.

Tampering with Emission Control System Prohibited

Federal law prohibits the following acts or the causing thereof: (1) the removal or rendering inoperative by any person other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any new engine for the purposes of emission control prior to its sale or delivery to the ultimate purchaser or while it is in use, or (2) the use of the engine after such device or element of design has been removed or rendered inoperative by any person.

Among those acts presumed to constitute tampering are the acts listed below:

Do not tamper with the original emission related parts.

* Digital Transistor Ignition System
* Fuel Pump
* Spark Plugs
* Throttle Body and Internal Parts
* Fuel Injectors
* ECU

Foreword

This manual is designed primarily for use by trained mechanics in a properly equipped shop. However, it contains enough detail and basic information to make it useful to the owner who desires to perform his own basic maintenance and repair work. A basic knowledge of mechanics, the proper use of tools, and workshop procedures must be understood in order to carry out maintenance and repair satisfactorily. Whenever the owner has insufficient experience or doubts his ability to do the work, all adjustments, maintenance, and repair should be carried out only by qualified mechanics.

In order to perform the work efficiently and to avoid costly mistakes, read the text, thoroughly familiarize yourself with the procedures before starting work, and then do the work carefully in a clean area. Whenever special tools or equipment are specified, do not use makeshift tools or equipment. Precision measurements can only be made if the proper instruments are used, and the use of substitute tools may adversely affect safe operation.

For the duration of the warranty period, we recommend that all repairs and scheduled maintenance be performed in accordance with this service manual. Any owner maintenance or repair procedure not performed in accordance with this manual may void the warranty.

To get the longest life out of your JET SKI® watercraft:

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki JET SKI® watercraft parts. Special tools, gauges, and testers that are necessary when servicing Kawasaki JET SKI® watercraft are introduced by the Special Tool Manual. Genuine parts provided as spare parts are listed in the Parts Catalog.
- Follow the procedures in this manual carefully. Don't take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any new parts installed.

How to Use This Manual

In this manual, the product is divided into its major systems and these systems make up the manual's chapters. The Quick Reference Guide shows you all of the product's system and assists in locating their chapters. Each chapter in turn has its own comprehensive Table of Contents.

For example, if you want ignition coil information, use the Quick Reference Guide to locate the Electrical System chapter. Then, use the Table of Contents on the first page of the chapter to find the Ignition Coil section.

Whenever you see these WARNING and CAUTION symbols, heed their instructions! Always follow safe operating and maintenance practices.

⚠ WARNING

This warning symbol identifies special instructions or procedures which, if not correctly followed, could result in personal injury, or loss of life.

CAUTION

This caution symbol identifies special instructions or procedures which, if not strictly observed, could result in damage to or destruction of equipment.

This manual contains four more symbols (in addition to WARNING and CAUTION) which will help you distinguish different types of information.

NOTE

○ *This note symbol indicates points of particular interest for more efficient and convenient operation.*

● Indicates a procedural step or work to be done.

○ Indicates a procedural sub-step or how to do the work of the procedural step it follows. It also precedes the text of a NOTE.

★ Indicates a conditional step or what action to take based on the results of the test or inspection in the procedural step or sub-step it follows.

In most chapters an exploded view illustration of the system components follows the Table of Contents. In these illustrations you will find the instructions indicating which parts require specified tightening torque, oil, grease or a locking agent during assembly.

This model, JT1500A, is mounted with a four -stroke engine.

When the JET SKI® watercraft is submerged and swamped, the four-stroke engine needs special care and systematic procedure for recovery compared with the two-stroke engine. Therefore in this manual, such procedures, which are not shown in SMs for two-stroke engines, are explained thoroughly to cope with the cases.

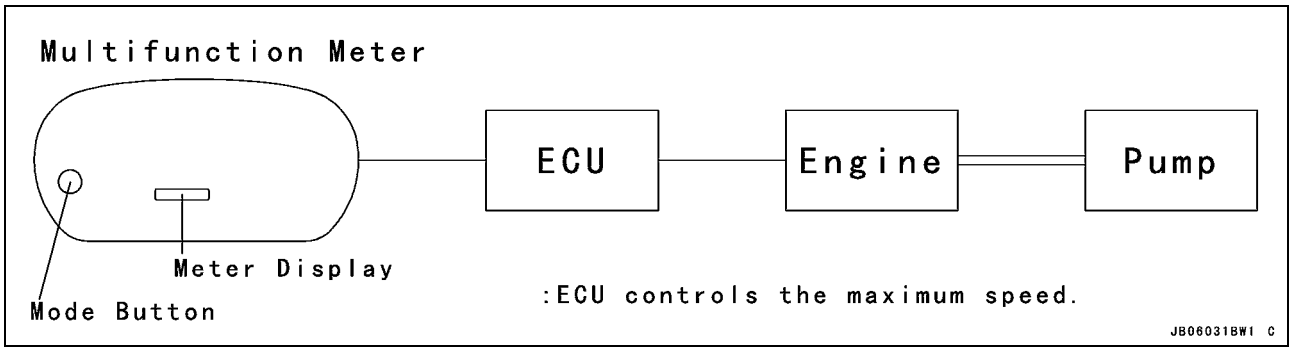
Refer to the section, After submerging in Chapter 9, Cooling and Bilge Systems for the summary and detailed procedures.

General Information

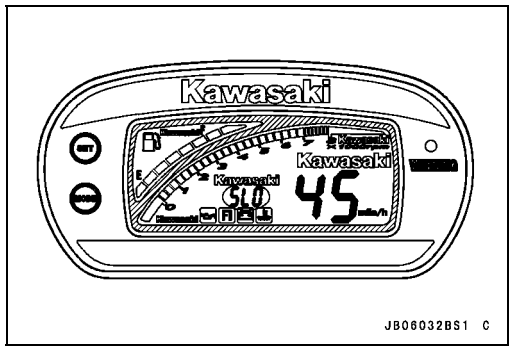
Table of Contents

Smart Learning Operation mode (SLO) (JT1500-A2 model ~)

This watercraft is equipped with the Smart Learning Operation mode (SLO) and normal operation mode (Full Power Operation, FPO). The SLO mode reduces the maximum watercraft speed by approximately 30 percent for a use by unskilled operators. To change the SLO mode to FPO mode, and back again, push the “MODE” button for 7 seconds or more.



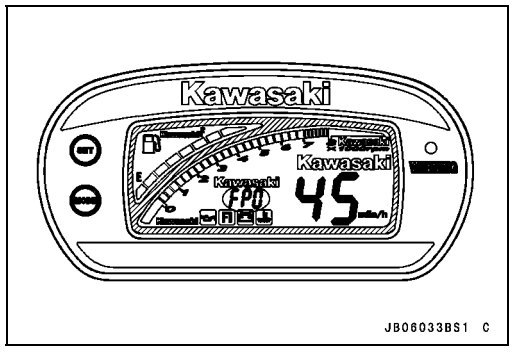
SLO mode is displayed on the meter as SLO.



NOTE

- *When shifted to the SLO mode, the initial display, as shown when the ignition switch is turned on, is shown together with a buzzer sound.*
- *Then, “SLO” is shown blinking at every three seconds.*
- *Under the SLO mode, all the meter displays and other functions work in the same manner as the normal operation (Full Power Operation, FPO) mode.*

Normal operation mode (Full Power Operation mode, FPO) is shown by FPO display.



NOTE

- *When shifted to the normal operation mode (Full Power Operation mode, FPO), the same initial display is first shown and followed by “FPO” for two seconds. However, “FPO” is shown only once when shifted and is not displayed thereafter.*
- *When the ignition switch is turned off and on again, the same mode when turned off is displayed again.*

Before Servicing

Before starting to perform an inspection service or carry out a disassembly and reassembly operation on watercraft, read the precautions given below. To facilitate actual operations, notes, illustrations, photographs, cautions, and detailed descriptions have been included in each chapter wherever necessary. This section explains the items that require particular attention during the removal and reinstallation or disassembly and reassembly of general parts.

Especially note the following:

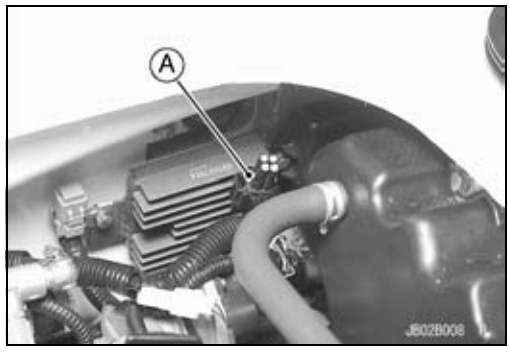
Kawasaki Diagnostic System (KDS) Software

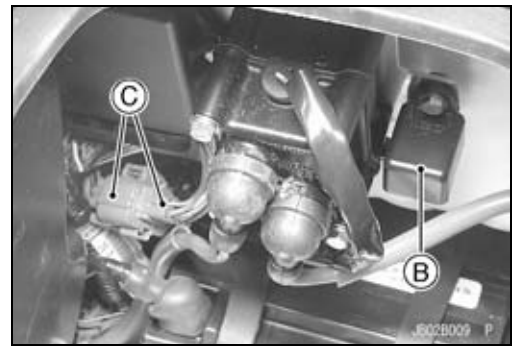
KDS software version 2.2 that runs on Windows personal computer (PC) will be available as a diagnostic tool for watercraft with Kawasaki DFI system.

You need the following items to use the KDS.

Item	P/No.
KDS Software Version 2.2 (CD-ROM)	57001-1503
Signal Converter	57001-1504
Communication Cable and Cable Adapter	57001-1470
Relay Cable	57001-1535

The connectors for the communication cable and relay cable are located in the front of the battery. Connect the communication cable to the KDS connector (4-pin) [A] and the relay cable between the relay assembly [B] connectors (8-pin) [C].





Adjustments

Adjustments shall be made in accordance with the Periodic Maintenance Chart or whenever troubleshooting or presence of symptoms indicate that adjustments may be required. Whenever running of the engine is required during maintenance it is best to have the watercraft in water.

CAUTION

Do not run the engine without cooling water supply for more than 15 seconds, especially in high revolutionary speed or severe engine and exhaust system damage will occur.

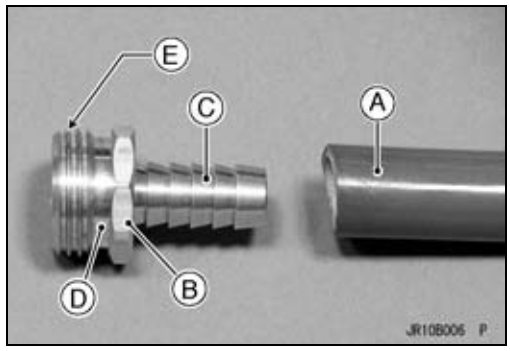
Auxiliary Cooling

An auxiliary cooling supply may be used if the watercraft cannot be operated in water during adjustments. If possible, always operate the watercraft in water rather than use an auxiliary cooling supply.

Before Servicing

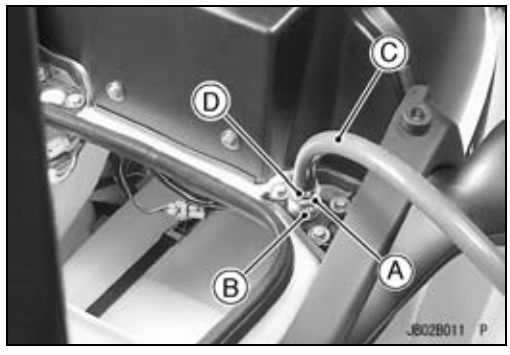
- Obtain a standard garden hose [A] and a garden hose adapter [B] as shown.
  C: Garden Hose Fitting of Adapter
  D: Flushing Fitting of Adapter
  E: Thread: Rp 3/4

○Optional part (P/No. 92005-3746) is available as a garden hose adapter.



- Open the front storage compartment cover.
- Remove the flushing cap [A] on the brim of the storage compartment.

- Screw a garden hose adapter [A] onto the flushing fitting [B].
- Attach a garden hose [C] to a garden hose adapter and secure the hose clamp [D].



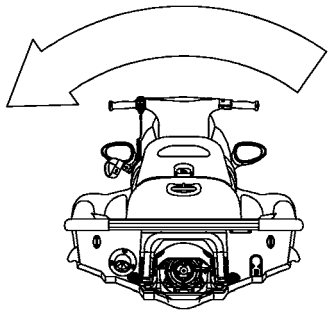
- Attach the garden hose to a faucet. Do not turn on the water until the engine is running and turn it off immediately when the engine stops. The engine requires 2.4 L/min (2.5 qts/min) at 1 800 rpm and 7.0 L/min (7.4 qts/min) at 6 000 rpm.

CAUTION

Insufficient cooling supply will cause the engine and/or exhaust system to overheat and severe damage will occur. Excessive cooling supply may kill the engine and flood the cylinders, causing hydraulic lock. Hydraulic lock will cause severe damage to the engine. If the engine dies while using an auxiliary cooling supply, the water must be shut off immediately.

CAUTION

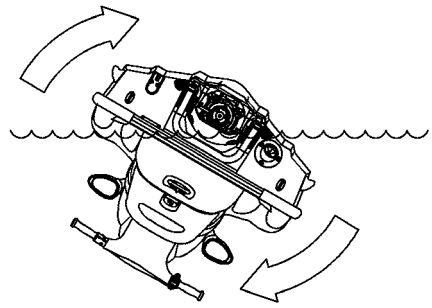
Always turn the boat on its left side. Rolling to the right side can cause water in the exhaust system to run into the engine, with possible engine damage.



Before Servicing

CAUTION

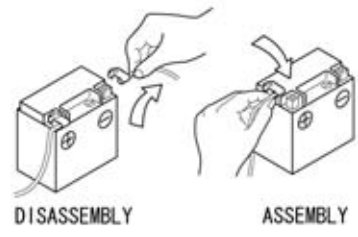
Turn the capsized boat clockwise so that the port side always faces downward. Turning counterclockwise can cause water in the exhaust system to run into the engine, with possible engine damage.



JB02007BW1 C

Battery Ground

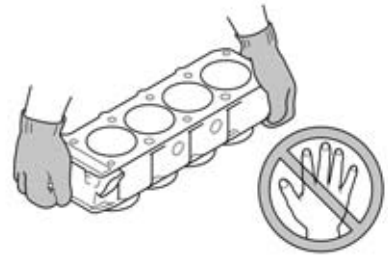
Before completing any service on the watercraft, disconnect the battery wires from the battery to prevent the engine from accidentally turning over. Disconnect the ground wire (–) first and then the positive (+). When completed with the service, first connect the positive (+) wire to the positive (+) terminal of the battery then the negative (–) wire to the negative terminal.



GB02024B S

Edges of Parts

Lift large or heavy parts wearing gloves to prevent injury from possible sharp edges on the parts.



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Solvent

Use a high flush point solvent when cleaning parts. High flush point solvent should be used according to directions of the solvent manufacturer.

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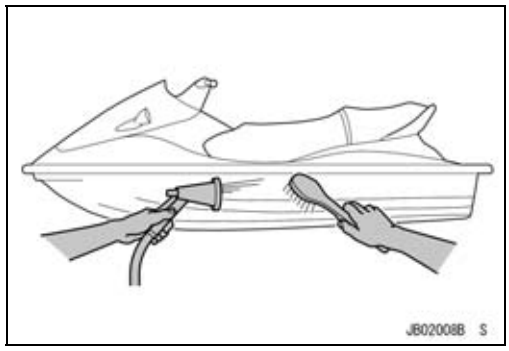
Before Servicing

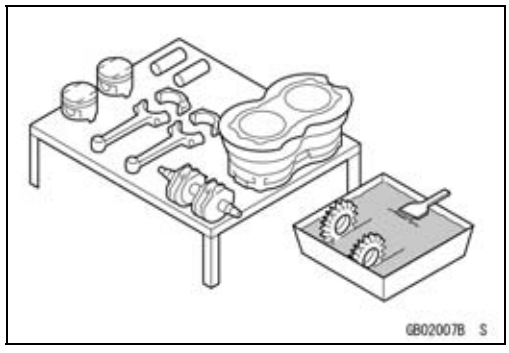
Cleaning Watercraft before Disassembly

Clean the watercraft thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during watercraft disassembly can cause excessive wear and decrease performance of the watercraft.



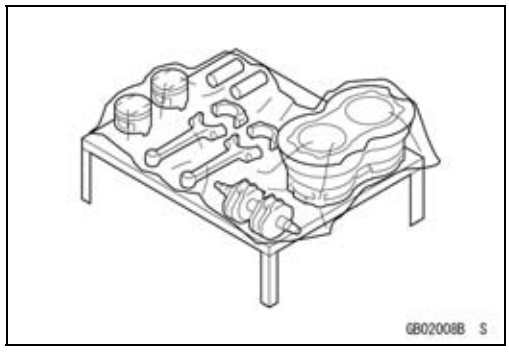
Arrangement and Cleaning of Removed Parts

Disassembled parts are easy to confuse. Arrange the parts according to the order the parts were disassembled and clean the parts in order prior to assembly.



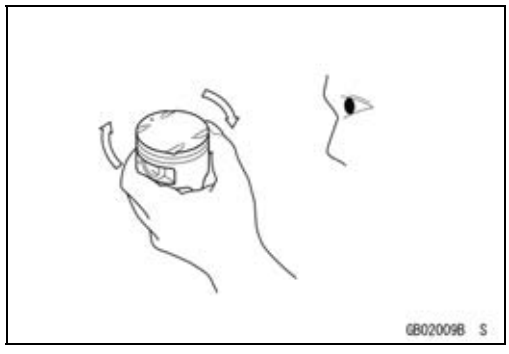
Storage of Removed Parts

After all the parts including subassembly parts have been cleaned, store the parts in a clean area. Put a clean cloth or plastic sheet over the parts to protect from any foreign materials that may collect before re-assembly.



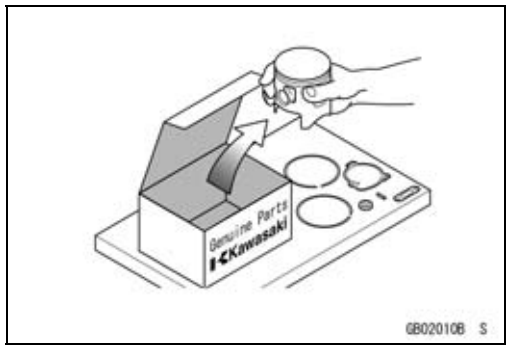
Inspection

Reuse of worn or damaged parts may lead to serious accident. Visually inspect removed parts for corrosion, discoloration, or other damage. Refer to the appropriate sections of this manual for service limits on individual parts. Replace the parts if any damage has been found or if the part is beyond its service limit.



Replacement Parts

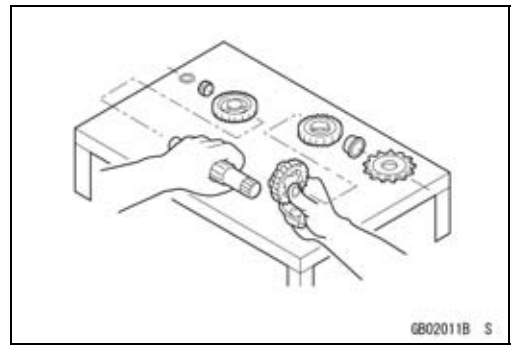
Replacement Parts must be KAWASAKI genuine or recommended by KAWASAKI. Gaskets, O-rings, Oil seals, Grease seals, circlips or cotter pins must be replaced with new ones whenever disassembled.



Before Servicing

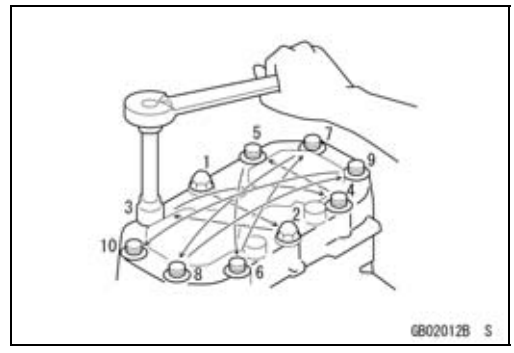
Assembly Order

In most cases assembly order is the reverse of disassembly, however, if assembly order is provided in this Service Manual, follow the procedures given.



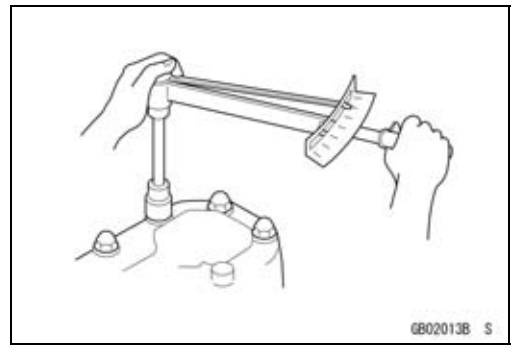
Tightening Sequence

Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them according to the specified sequence to prevent case warpage or deformation which can lead to malfunction. Conversely when loosening the bolts, nuts, or screws, first loosen all of them by about a quarter turn and then remove them. If the specified tightening sequence is not indicated, tighten the fasteners alternating diagonally.



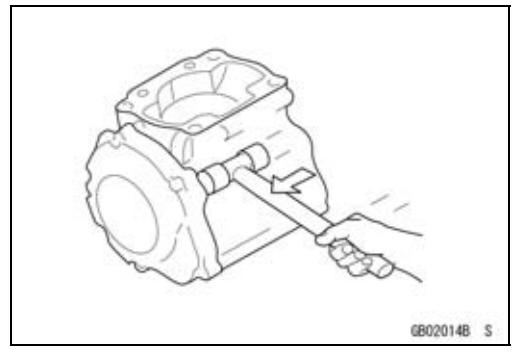
Tightening Torque

Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.



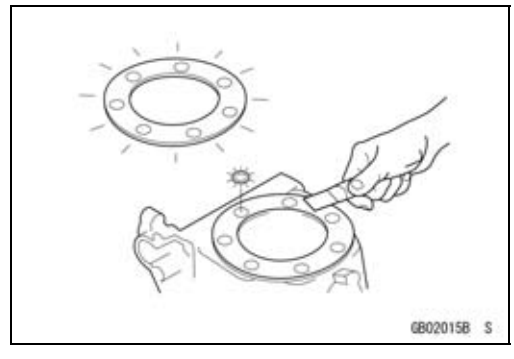
Force

Use common sense during disassembly and assembly, excessive force can cause expensive or hard to repair damage. When necessary, remove screws that have a non -permanent locking agent applied using an impact driver. Use a plastic-faced mallet whenever tapping is necessary.



Gasket, O-ring

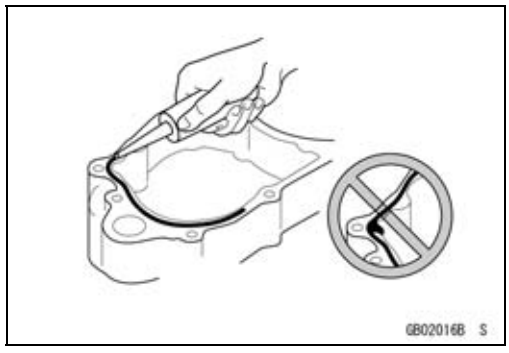
Hardening, shrinkage, or damage of both gaskets and O-rings after disassembly can reduce sealing performance. Remove old gaskets and clean the sealing surfaces thoroughly so that no gasket material or other material remains. Install new gaskets and replace used O-rings when re-assembling



Before Servicing

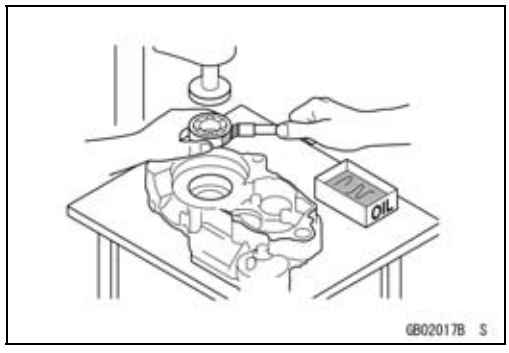
Liquid Gasket, Locking Agent

For applications that require Liquid Gasket or a Locking agent, clean the surfaces so that no oil residue remains before applying liquid gasket or locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



Press

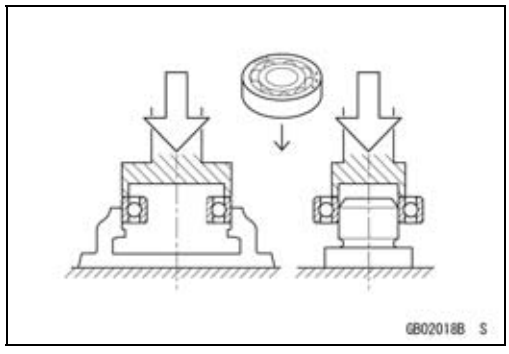
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



Ball Bearing

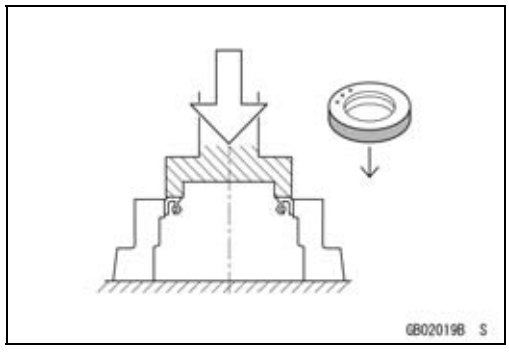
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

Pressing the incorrect race can cause pressure between the inner and outer race and result in bearing damage.

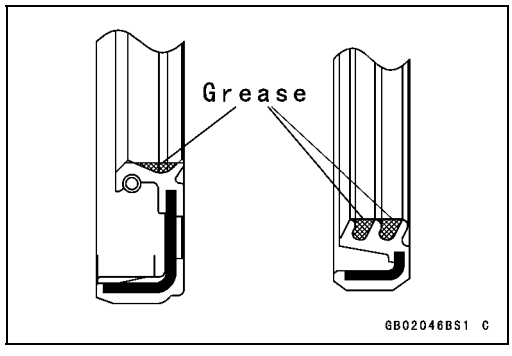


Oil Seal, Grease Seal

Do not remove pressed oil or grease seals unless removal is necessary. Replace with new ones whenever removed. Press new oil seals with manufacture and size marks facing out. Make sure the seal is aligned properly when installing.



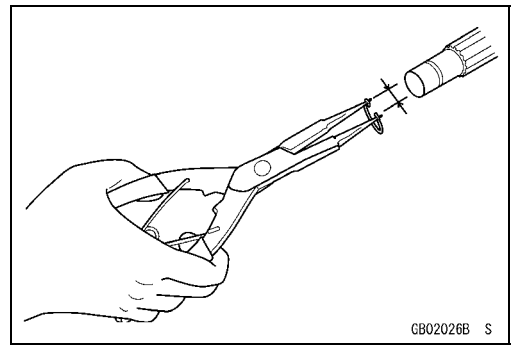
Apply specified grease to the lip of seal before installing the seal.



Before Servicing

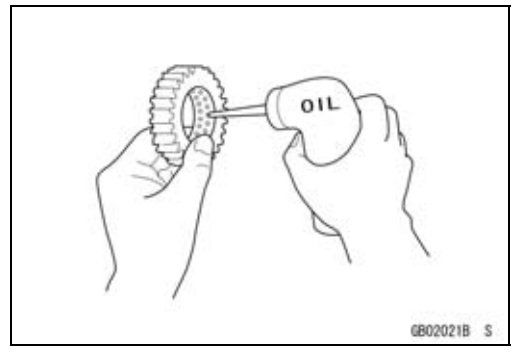
Circlips, Cotter Pins

Replace circlips or cotter pins that were removed with new ones. Take care not to open the clip excessively when installing to prevent deformation.



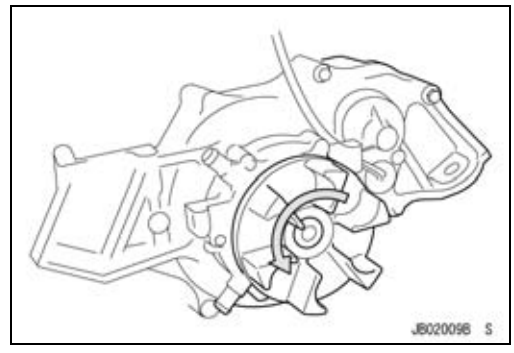
Lubrication

It is important to lubricate rotating or sliding parts during assembly to minimize wear during initial operation. Lubrication points are called out throughout this manual, apply the specific oil or grease as specified.



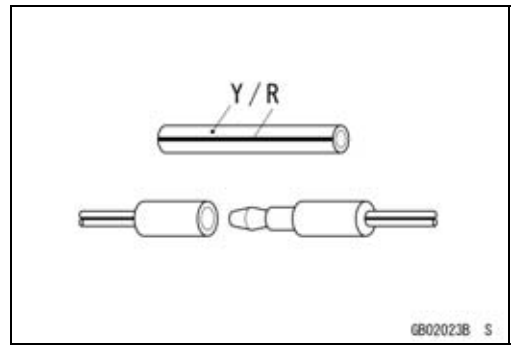
Direction of Engine Rotation

When rotating the crankshaft, by hand, the free play amount of rotating direction will affect the adjustment. Rotate the crankshaft to positive direction (counter-clockwise viewed from stern sinde).



Electrical Wires

A two-color wire is identified first by the primary color and then the stripe color. Unless instructed otherwise, electrical wires must be connected to those of the same color.



Model Identification

JT1500-A1 Left Side View

JT1500-A1 Right Side View

General Specifications

Items	JT1500-A1 ~ A2
Engine	
Type	4-stroke, DOHC, 4-cylinder, water cooled
Displacement	1 498 mL (91.4 cu in.)
Bore and Stroke	83 × 69.2 mm (3.27 × 2.72 in.)
Compression Ratio	10.6 : 1
Maximum Horsepower	118 kW (160 PS) @7 500 r/min (rpm)
Maximum Torque	152 N·m (15.5 kgf·m, 112.1 ft·lb) @7 250 r/min (rpm)
Ignition System	Digital transistor
Lubrication System	Forced lubrication (semi-dry sump)
Carburetion System	FI (fuel injection) MIKUNI AC 60 × 1
Starting System	Electric starter
Cylinder Numbering Method	Front (bow) to rear (stern), 1-2-3-4
Firing Order	1-2-4-3
Valve Timing:	
Inlet:	
Open	22.5° BTDC
Close	67.5° ABDC
Duration	270°
Exhaust:	
Open	74.5° BBDC
Close	9.5° ATDC
Duration	264°
Tuning Specifications	
Spark plug:	
Type	NGK CR9EK
Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)
Ignition Timing	3° ATDC @1 300 r/min ~ 32° BTDC @3 000 r/min (rpm)
Idle Speed	1 300 ±100 r/min (rpm) -in water 1 300 ±100 r/min (rpm) -out of water
Compression Pressure	1 190 ~ 1 799 kPa (12.1 ~ 18.3 kgf/cm², 173 ~ 261 psi) @430 r/min (rpm)
Drive System	
Coupling	Direct drive from engine
Jet Pump:	
Type	Axial flow single stage
Thrust	4 250 N (434 kgf, 955 lb)
Steering	Steerable nozzle
Braking	Water drag
Performance	
†Minimum Turning Radius	4.0 m (13.1 ft)
†Fuel Consumption	43 L/h (11.4 US gal/h) @full throttle
†Cruising Range	134 km (87 mile) @full throttle 1 hour and 26 minutes (3 person)
Dimensions	
Overall Length	3 120 mm (122.8 in.)

General Specifications

Items	JT1500-A1 ~ A2
Overall Width	1 180 mm (46.5 in.)
Overall Height	1 050 mm (41.3 in.)
Dry Weight	338 kg (745 lb)
Fuel Tank Capacity	62 L (16.4 US gal)
Engine Oil	
Type	API SE, SF or SG API SH or SJ with JASO MA
Viscosity	SAE 10W-40
Capacity	5.0 L (5.3 US qt)
Electrical Equipment	
Battery	12 V 18 Ah
Maximum Generator Output	16 A @14 V

†: This information shown here represents results under controlled conditions, and the information may not be correct under other conditions.

Specifications subject to change without notice, and may not apply to every country.

Unit Conversion Table

Prefixes for Units

Prefix	Symbol	Power
mega	M	× 1 000 000
kilo	k	× 1 000
centi	c	× 0.01
milli	m	× 0.001
micro	μ	× 0.000001

Units of Mass

kg	×	2.205	=	lb
g	×	0.03527	=	oz

Units of Volume

L	×	0.2642	=	gal (US)
L	×	0.2200	=	gal (imp)
L	×	1.057	=	qt (US)
L	×	0.8799	=	qt (imp)
L	×	2.113	=	pint (US)
L	×	1.816	=	pint (imp)
mL	×	0.03381	=	oz (US)
mL	×	0.02816	=	oz (imp)
mL	×	0.06102	=	cu in

Units of Force

N	×	0.1020	=	kg
N	×	0.2248	=	lb
kg	×	9.807	=	N
kg	×	2.205	=	lb

Units of Length

km	×	0.6214	=	mile
m	×	3.281	=	ft
mm	×	0.03937	=	in.

Units of Torque

N·m	×	0.1020	=	kgf·m
N·m	×	0.7376	=	ft·lb
N·m	×	8.851	=	in·lb
kgf·m	×	9.807	=	N·m
kgf·m	×	7.233	=	ft·lb
kgf·m	×	86.80	=	in·lb

Units of Pressure

kPa	×	0.01020	=	kgf/cm²
kPa	×	0.1450	=	psi
kPa	×	0.7501	=	cmHg
kgf/cm²	×	98.07	=	kPa
kgf/cm²	×	14.22	=	psi
cmHg	×	1.333	=	kPa

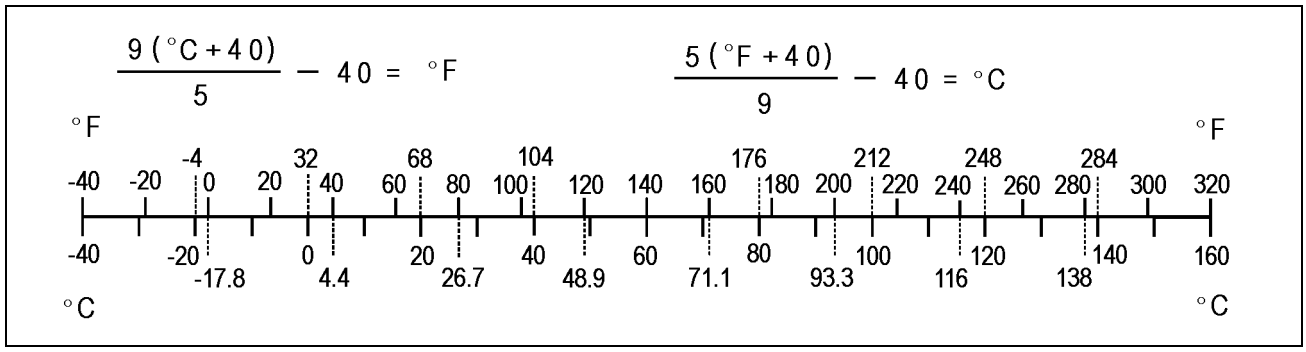
Units of Speed

km/h	×	0.6214	=	mph

Units of Power

kW	×	1.360	=	PS
kW	×	1.341	=	HP
PS	×	0.7355	=	kW
PS	×	0.9863	=	HP

Units of Temperature



Periodic Maintenance

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2-2 PERIODIC MAINTENANCE

Periodic Maintenance Chart

The scheduled maintenance must be done in accordance with this chart to keep the watercraft in good running condition. **The initial maintenance is vitally important and must not be neglected.**

Frequency / Description	Initial 10 Hours	Every 25 Hours	Every 50 Hours	Every 100 Hours	Reference
Inspect throttle control system (e)		●			2-10
Inspect/clean air filter drain caps		●			2-10
Inspect/clean air filter			● (or every year)		2-11
Inspect fuel vent check valve		●			2-11
Clean fuel pump screen (e)		●			2-12
Inspect throttle shaft spring (replace throttle body if necessary) (e)				●	2-12
Replace engine oil			● (or every year)		2-12
Replace engine oil filter				●	2-14
Check air suction valve				●	2-15
Inspect/adjust valve clearance (e)				●	2-15
Inspect/tighten engine mounting bolts			● (or every year)		2-19
Inspect/replace coupling damper				●	2-19
Flush cooling system (after each use in salt water)		●			2-19
Flush bilge line and filter		●			2-21
Inspect impeller blades for damage (remove)				●	2-22
Inspect steering cable/shift cable				●	2-22
Lubricate handlebar pivot (disassemble)		●			2-22
Inspect hull drain screws (replace if necessary)			●		2-23
Inspect battery charging condition		●			2-23
Inspect battery terminals		●			2-23
Clean and gap spark plugs (replace if necessary) (e)		●			2-24
Lubricate throttle cable fitting at throttle body		●			2-24
Lubricate throttle cable and throttle fitting at throttle case		●			2-24
Lubricate steering cable/shift cable ball joints and steering nozzle/reverse bucket pivots		●			2-24
Check all hoses, hose clamps, nuts, bolts, and fasteners	●	●			2-27

(e): Emission Related Items

Torque and Locking Agent

The following table list the tightening torque for the major fasteners, and the parts requiring use of a non-permanent locking agent or silicone sealant.
Letters used in the “Remarks” column mean:
EO: Apply oil to the threads and seating surface.
L: Apply a non-permanent locking agent to the threads.
MO: Apply molybdenum disulfide grease oil solution.
R: Replacement Part
S: Tighten the fasteners following the specified sequence.
SS: Apply silicone sealant to the threads.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System				
Vehicle-down Sensor Mounting Screws	1.5	0.15	13 in·lb	
Bracket Mounting Bolts	–	–	–	L
Inlet Manifold Mounting Bolts	25	2.5	18	L
Inlet Manifold Mounting Nuts	20	2.0	14	
Delivery Pipe Mounting Bolts	7.8	0.80	69 in·lb	
Inlet Air Pressure Sensor Bolts	7.8	0.80	69 in·lb	
Throttle Cable Holder Bolts	8.8	0.90	78 in·lb	L
Inlet Air Temperature Sensor	20	2.0	14	
Throttle Body Assy Mounting Bolts	20	2.0	14	
Inlet Manifold Drain Plug	20	2.0	14	
Inlet Manifold Plate Bolts	7.8	0.80	69 in·lb	
Crankshaft Sensor Screws	4.4	0.45	39 in·lb	L
Camshaft Position Sensor Bolt	7.8	0.80	69 in·lb	L
Oil Temperature Sensor	15	1.5	11	see text
Water Temperature Sensor	15	1.5	11	see text
Regulator/Rectifier Bolts	7.8	0.80	69 in·lb	
ECU Mounting Bolts	8.8	0.90	78 in·lb	L
Throttle Sensor Mounting Screws	2.0	0.20	18 in·lb	
ISC Actuator Mounting Bolts	4.9	0.50	43 in·lb	
Oil Pressure Switch	15	1.5	11	SS
Fuel Filler Tube Clamp Screws	2.9	0.30	26 in·lb	
Fuel Level Sensor Clamp Screw	2.9	0.30	26 in·lb	
Fuel Filter Mounting Bolts	8.8	0.90	78 in·lb	L
Air Filter Mounting Bolts	9.8	1.0	87 in·lb	
Air Filter Bracket Mounting Bolts	7.8	0.80	69 in·lb	L
Throttle Cable Locknut	7.8	0.80	69 in·lb	
Throttle Case Mounting Screws	3.9	0.40	35 in·lb	
Engine Lubrication System				
Breather Plate Bolts	7.8	0.80	69 in·lb	
Oil Filler Cap	1.0	0.10	8.7 in·lb	
Oil Passage Plugs	20	2.0	14	L
Oil Separator Tank Mounting Screws	4.9	0.50	43 in·lb	L
Breather Case Mounting Bolts	7.8	0.80	69 in·lb	
Breather Pipe Bolts	8.8	0.90	78 in·lb	

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Oil Passage Joints	11	1.1	95 in·lb	L
Oil Cooler Assembly Bolts	7.8	0.80	69 in·lb	
Oil Pressure Switch	15	1.5	11	SS
Oil Passage Bolt	78	8.0	58	S
Oil Filter	18	1.8	13	EO
Oil Cooler Positioning Bolt	20	2.0	14	S
Oil Pan Bolts	7.8	0.80	69 in·lb	S
Dipstick Tube Bolts	7.8	0.80	69 in·lb	L, S
Oil Pump Sprocket Bolt	15	1.5	11	L
Oil Pump Cover Bolts	7.8	0.80	69 in·lb	
Oil Pressure Relief Valve	15	1.5	11	L
Oil Pipe Bolts	7.8	0.80	69 in·lb	
Chain Guide Spring Plate Bolt	7.8	0.80	69 in·lb	
Oil Pump Body Plug	20	2.0	14	L
Oil Pump Body Bolts	7.8	0.80	69 in·lb	
Oil Screen Bolts	7.8	0.80	69 in·lb	
Water Pipe Joints	20	2.0	14	L
Exhaust System				
Exhaust Manifold Mounting Nuts	25	2.5	18	S
Exhaust Manifold Mounting Bolts	25	2.5	18	L, S
Bypass Nozzle	–	–	–	L
Flushing Hose Joint	11	1.1	95 in·lb	SS
Water Hose Joint	11	1.1	95 in·lb	SS
Water Temperature Sensor	15	1.5	11	see chapter 3
Exhaust Pipe Mounting Plate Bolts	30	3.0	22	L
Exhaust Pipe Mounting Bolts	30	3.0	22	
Engine Top End				
Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	
Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	
Upper Camshaft Chain Guide Bolts	12	1.2	104 in·lb	S
Camshaft Cap Bolts	12	1.2	104 in·lb	S
Cylinder Head Bolts (M7)	20	2.0	14	S
Cylinder Head Bolts (M11)	23	2.3	17	First, MO, S
Cylinder Head Bolts (M11)	59	6.0	43	Final, MO, S
Water Jacket Plugs	20	2.0	14	L
Cylinder Head Bolts (M6)	12	1.2	104 in·lb	S
Engine Hook Bolts	20	2.0	14	
Camshaft Position Sensor Bolt	9.8	1.0	87 in·lb	L
Exhaust Side Camshaft Chain Guide Bolts (Upper)	25	2.5	18	
Exhaust Side Camshaft Chain Guide Bolts (Lower)	12	1.2	104 in·lb	
Upper Camshaft Chain Guide Bolts	12	1.2	104 in·lb	S

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Inlet Side Camshaft Chain Guide Bolts	12	1.2	104 in·lb	L
Camshaft Chain Tensioner Mounting Bolts	9.8	1.0	87 in·lb	L
Camshaft Chain Tensioner Cap Bolt	20	2.0	14	
Camshaft Position Sensor Rotor Bolt	12	1.2	104 in·lb	L
Water Hose Joint	11	1.1	95 in·lb	SS
Oil Passage Joint	11	1.1	95 in·lb	L
Engine Removal/Installation				
Engine Mounting Bolts	36	3.7	27	L
Engine Damper Mounting Bolts	16	1.6	12	L
Engine Bottom End				
Crankshaft Sensor Cover Bolts	7.8	0.80	69 in·lb	
Engine Bracket Mounting Bolts	29	3.0	22	L
Timing Rotor Bolt	29	3.0	22	L
Connecting Rod Nuts	–	–	–	MO, see text
Oil Passage Plugs	20	2.0	14	L
Stator Mounting Bolts	12	1.2	104 in·lb	L
Grommet Cover Bolts	9.8	1.0	87 in·lb	L
Magneto Cover Bolts	20	2.0	14	
Output Cover Bolts	7.8	0.80	69 in·lb	
Output Shaft	245	25	180	MO
Coupling	98	10	72	
Crankcase Bolts (M10)	50	5.0	36	MO, S
Crankcase Bolts (M8)	29	3.0	22	MO, S
Crankcase Bolts (M8)	29	3.0	22	S
Crankcase Bolts (M6)	12	1.2	104 in·lb	S
Cooling and Bilge Systems				
Breather Mounting Bolt	–	–	–	L
Water Hose Joint (L Shape Type)	11	1.1	95 in·lb	SS
Water Hose Joint (Straight Shape Type)	20	2.0	14	SS
Water Hose Joint (Straight Shape Type)	11	1.1	95 in·lb	SS, see text
Drive System				
Coupling	39	4.0	29	L
Drive Shaft Holder Mounting Bolts	22	2.2	16	L
Coupling Cover Bolts	8.8	0.90	78 in·lb	L
Pump and Impeller				
Steering Nozzle Pivot Bolts	19	1.9	14	L
Pump Mounting Bolts	36	3.7	27	L
Pump Outlet Mounting Bolts	19	1.9	14	L
Pump Cap Bolts	9.8	1.0	87 in·lb	L
Pump Cap Plug	3.9	0.40	35 in·lb	
Impeller	98	10	72	
Pump Bracket Mounting Bolts (2)	19	1.9	14	L, SS
Pump Bracket Mounting Bolts (4)	9.8	1.0	87 in·lb	L

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Pump Cover Mounting Bolts	7.9	0.80	69 in·lb	L
Grate Mounting Bolts	9.8	1.0	87 in·lb	L
Filter Cover Mounting Bolts	9.8	1.0	87 in·lb	L
Steering				
Handlebar Clamp Bolts	16	1.6	12	L
Start/stop Switch Case Mounting Screws	3.9	0.40	35 in·lb	
Throttle Case Mounting Screws	3.9	0.40	35 in·lb	
Steering Shaft Locknut	49 ~ 59	5.0 ~ 6.0	36 ~ 43	
Steering Shaft Nut	–	–	–	Hand-Tight
Steering Holder Mounting Bolts	20	2.0	14.5	L
Steering Neck Mounting Bolts	16	1.6	12	L
Steering Cable Joint Bolt	9.8	1.0	87 in·lb	L
Ball Joint	9.8	1.0	87 in·lb	L
Shift Cable End Nut	9.8	1.0	87 in·lb	
Reverse Bucket Pivot Bolts	19	1.9	14	L
Shift Cable Nut	39	4.0	29	
Steering Cable Nut	39	4.0	29	
Shift Lever Locknut	20	2.0	14.5	
Hull/Engine Hood				
Crossmember Bolts	7.8	0.80	69 in·lb	L
Handrail Bolts	9.8	1.0	87 in·lb	L
Lock Assembly Nut	4.9	0.50	43 in·lb	
Front Duct Bolts	–	–	–	L
Damper Bolts	–	–	–	L
Damper Bracket Bolts	–	–	–	L
Front Storage Compartment Cover Bolts	–	–	–	L
Hinge Bolts	–	–	–	L
Front Storage Compartment Hook Bolts	–	–	–	L
Steering Cover Bolts	–	–	–	L
Meter Screen Bolts	–	–	–	L
Seat Hook Bolts	–	–	–	L
Seat Locknut	–	–	–	L
Reboarding Step Bolts	–	–	–	L
Mirror Stay Bolts	–	–	–	L
Stabilizer Bolts	9.8	1.0	87 in·lb	L
Air inlet Duct Bolts	–	–	–	L
Exhaust Outlet Bolts	–	–	–	L
Electrical System				
Vehicle-Down Sensor Mounting Screws	1.5	0.15	13 in·lb	
Electrical Parts Bracket Screws	4.9	0.50	43 in·lb	L
Starter Relay Case Bolts	7.8	0.80	69 in·lb	
Ignition Coil Mounting Bolts	8.8	0.90	78 in·lb	L
Water Temperature Sensor	15	1.5	11	see text