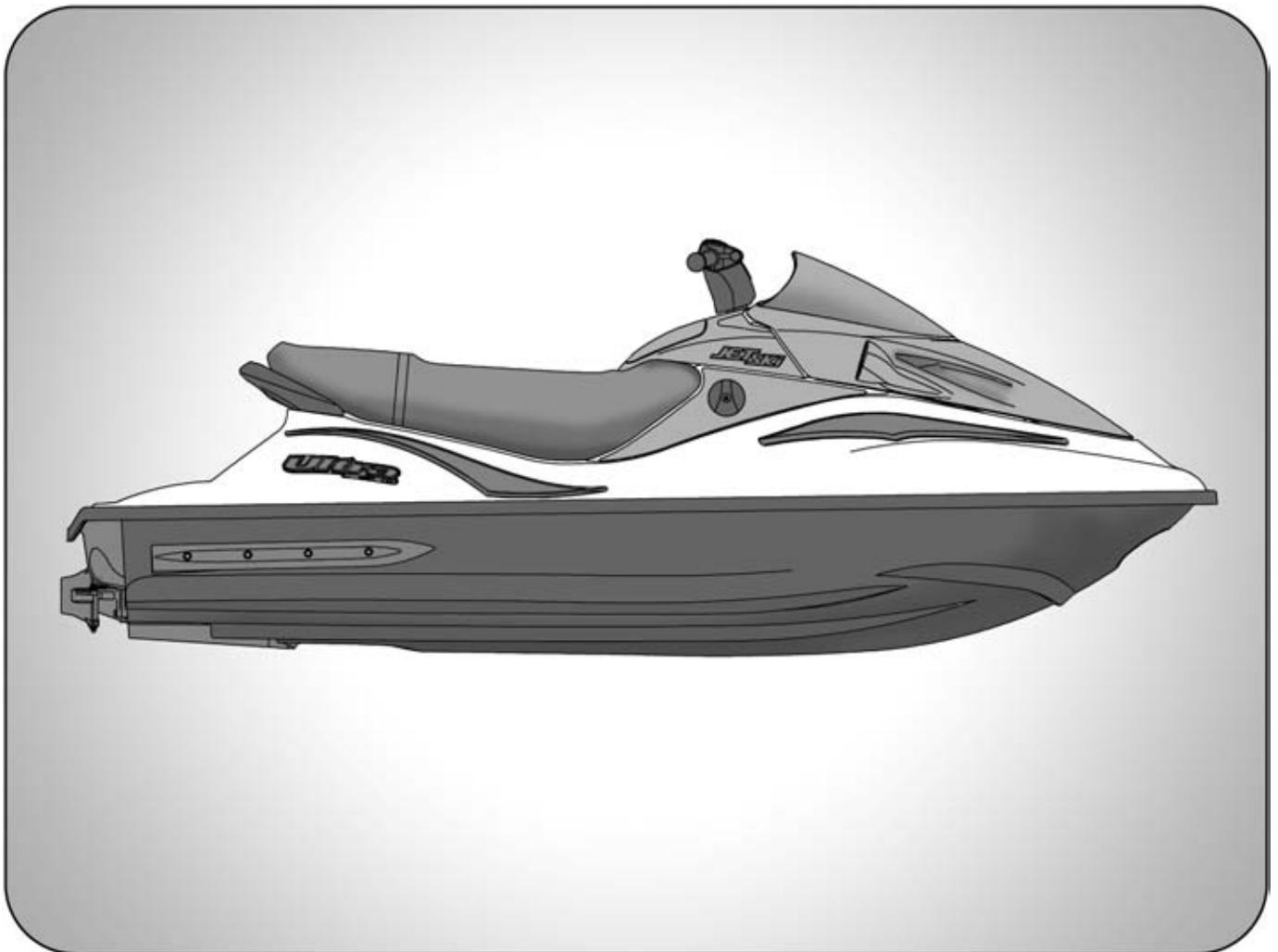


Kawasaki

JETSKI
watercraft®

ULTRA150



JET SKI® Watercraft Service Manual

Quick Reference Guide

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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.

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.

- * CDI Ignition System
- * Flame Arrester
- * Fuel Filter Screen
- * Spark Plugs
- * Carburetor and internal parts

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.

General Information

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1-2 GENERAL INFORMATION

Before Servicing

Before starting to service a watercraft, careful reading of the applicable section is recommended to eliminate unnecessary work. Photographs, diagrams, notes, cautions, warnings, and detailed descriptions have been included wherever necessary. Nevertheless, even a detailed account has limitations, a certain amount of basic knowledge is also required for successful work.

Especially note the following:

(1) Adjustments

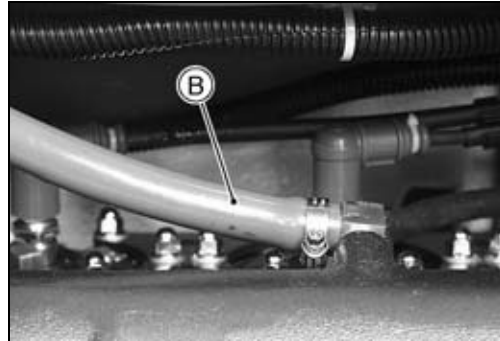
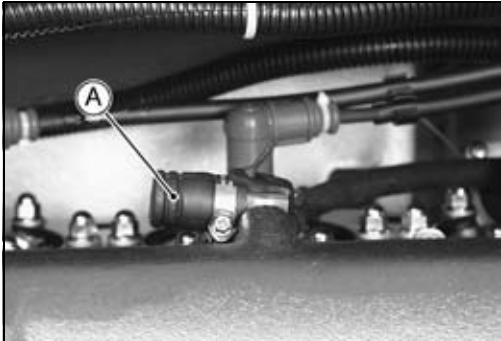
Adjustments shall be made in accordance with the Periodic Maintenance Chart or whenever troubleshooting or presence of symptoms indicate that adjustments may be required. Whenever running of the engine is required during maintenance it is best to have the watercraft in water.

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.

(2) Auxiliary Cooling

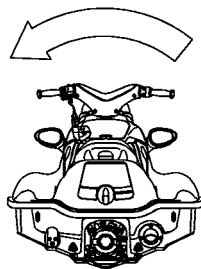
An auxiliary cooling supply may be used if the watercraft cannot be operated in water during adjustments. If possible, always operate the watercraft in water rather than use an auxiliary cooling supply.



- Loosen the clamp and remove the cap [A].
- Connect the garden hose [B] to the hose fitting (see above).
- 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 r/min (rpm) and 7.0 L/min (7.4 qts/min) at 6 000 r/min (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. 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

(3) Dirt

Before removal and disassembly, clean the “Jet Ski” watercraft. Any sand entering the engine will shorten the life of the watercraft. For the same reason, before installing a new part, clean off any dust or metal filings.

(4) Battery Ground

Disconnect the ground (–) wire from the battery before performing any disassembly operations on the “Jet Ski” watercraft. This prevents the engine from accidentally turning over while work is being carried out, sparks from being generated while disconnecting the wires from electrical parts, as well as damage to the electrical parts themselves. For reinstallation, first connect the positive wire to the positive (+) terminal of the battery

(5) Installation, Assembly

Generally, installation or assembly is the reverse of removal or disassembly. However, if installation or assembly sequence is given in this Service Manual, follow it. Note parts locations and cable, wire, and hose routing during removal or disassembly so they can be installed or assembled in the same way. It is preferable to mark and record the locations and routing whenever possible.

(6) Tightening Sequence

When installing bolts, nuts, or screws for which a tightening sequence is given in this Service Manual, make sure to follow the sequence. When installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit, thus ensuring that the part has been installed in its proper location. Then, tighten them to the specified torque in the tightening sequence and method indicated. If tightening sequence instructions are not given, tighten them evenly in a cross pattern. Conversely, to remove a part, first loosen all the bolts, nuts, or screws that are retaining the part a 1/4-turn before removing them.

(7) Torque

When torque values are given in this Service Manual, use them. Either too little or too much torque may lead to serious damage. Use a good quality, reliable torque wrench.

(8) Force

Common sense should dictate how much force is necessary in assembly and disassembly. If a part seems especially difficult to remove or install, stop and examine what may be causing the problem. Whenever tapping is necessary, tap lightly using a wooden or plastic-faced mallet. Use an impact driver for screws (particularly for the removing screws held by non-permanent locking agent) in order to avoid damaging the screw heads.

(9) Edges

Watch for sharp edges, as they could cause injury through careless handling, especially during major engine disassembly and assembly. Use a clean piece of thick cloth when lifting the engine or turning it over.

(10) High-Flash Point Solvent

A high-flash point solvent is recommended to reduce fire danger. A commercial solvent commonly available in North America is standard solvent (generic name). Always follow manufacturer and container directions regarding the use of any solvent.

(11) Gasket, O-ring

Replace a gasket or an O-ring with a new part when disassembling. Remove any foreign matter from the mating surface of the gasket or O-ring to ensure a perfectly smooth surface to prevent oil or compression leaks.

(12) Liquid Gasket, Locking Agent

Clean and prepare surfaces where liquid gasket or non-permanent locking agent will be used. Apply them sparingly. Excessive amount may block engine oil passages and cause serious damage.

(13) Press

When using a press or driver to install a part such as a drive shaft holder bearing, apply a small amount of oil to the area where the two parts come in contact to ensure a smooth fit.

(14) Ball Bearing and Needle Bearing

Do not remove a ball bearing or a needle bearing unless it is absolutely necessary. Replace any ball or needle bearings that were removed with new ones. Install bearings with the manufacturer and size marks facing out, applying pressure evenly with a suitable driver. Apply force only to the end of the race that contacts the press fit portion, and press it evenly over the base component.

1-4 GENERAL INFORMATION

Before Servicing

(15) Oil Seal and Grease Seal

Replace any oil or grease seals that were removed with new ones, as removal generally damages seals. Oil or grease seals should be pressed into place using a suitable driver, applying a force uniformly to the end of seal until the face of the seal is even with the end of the hole, unless instructed otherwise. When pressing in an oil or grease seal which has manufacturer's marks, press it in with the marks facing out.

(16) Circlip, Retaining Ring, and Cotter Pin

When installing circlips and retaining rings, take care to compress or expand them only enough to install them and no more. Install the circlip with its chamfered side facing load side as well.

Replace any circlips, retaining rings, and cotter pins that were removed with new ones, as removal weakens and deforms them. If old ones are reused, they could become detached while the "Jet Ski" watercraft is driven, leading to a major problem.

(17) Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the sliding surfaces have an adequate lubricative film. During assembly, make sure to apply oil to any sliding surface or bearing that has been cleaned. Old grease or dirty oil could have lost its lubricative quality and may contain foreign particles that act as abrasives; therefore, make sure to wipe it off and apply fresh grease or oil. Some oils and greases in particular should be used only in certain applications and may be harmful if used in an application for which they are not intended.

(18) Replacement Parts

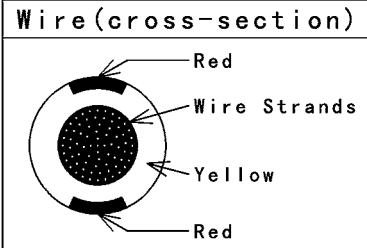

When there is a replacement instruction, replace these parts with new ones every time they are removed.

Replacement parts will be damaged or lose their original function once they are removed. Therefore, always replace these parts with new ones every time they are removed. Although the previously mentioned gasket, O-ring, ball bearing, needle bearing, grease seal, oil seal, circlip, and cotter pin have not been so designated in their respective text, they are replacement parts.

(19) Electrical Wires

All the electrical wires are either one-color or two-color. A two-color wire is identified first by the primary color and then the stripe color. For example, a yellow wire with thin red stripes is referred to as a "yellow/red" wire; it would be a "red/yellow" wire if the colors were reversed. Unless instructed otherwise, electrical wires must be connected to wires of the same color.

Two-Color Electrical

Wire (cross-section)	Color Indicated on the Wire	Color Indicated on the Wiring Diagram
	Yellow/Red	

68020601W1 C

(20) Inspection

When parts have been disassembled, visually inspect these parts for the following conditions or other damage. If there is any doubt as to the condition of them, replace them with new ones.

Abrasion	Crack	Hardening	Warp
Bent	Dent	Scratch	Wear
Color change	Deterioration	Seizure	

(21) Specifications

Specification terms are defined as follows:

"Standards" show dimensions or performances which brand-new parts or systems have.

"Service Limits" indicate the usable limits. If the measurement shows excessive wear or deteriorated performance, replace the damaged parts.

Model Identification

JH1200-B1 Left Side View



JH1200-B1 Right Side View



1-6 GENERAL INFORMATION

General Specifications

Items	JH1200-B1 ~ B3
Engine Type Displacement Bore and Stroke Compression Ratio Maximum Horsepower Maximum Torque Ignition System Lubrication System Carburetion System Starting System	2-stroke, 3-cylinder, crankcase reed valve, water cooled 1 176 mL (71.8 cu in.) 80 × 78 mm (3.15 × 3.07 in.) 5.8 : 1 106.6 kW (145 PS) @6 750 r/min (rpm) 153.5 N·m (15.6 kgf·m, 112.8 ft·lb) @6 000 r/min (rpm) DC-CDI (Digital) Superlube Oil injection (break-in period: Oil injection and fuel mixture 50 : 1) Keihin CDCV 40-35 × 3 Electric starter
Tuning Specifications Spark Plug: Type Gap Terminal Ignition Timing Carburetor: Idle Speed Compression Pressure	NGK BR9ES 0.7 ~ 0.8 mm (0.028 ~ 0.031 in.) Solid post 15° BTDC @1 250 r/min ~ 22° BTDC @3 500 r/min (rpm) 1 250 ±100 r/min (rpm)-in water 1 800 ±100 r/min (rpm)-out of water 675 ~ 1 070 kPa (6.9 ~ 10.9 kgf/cm ² , 98 ~ 155 psi) @ 440 r/min (rpm)
Drive System Coupling Jet Pump: Type Thrust Steering Braking	Direct drive from engine Mixed flow single stage 4 020 N (410 kgf, 904 lb) Steerable nozzle Water drag
Performance †Minimum Turning Radius †Fuel Consumption †Cruising Range	4.0 m (13.1 ft) 50.5 L/h (13.3 US gal/h) @ full throttle 119 km (75 mile) @ full throttle 1 hour and 9 minutes
Dimensions Overall Length Overall Width Overall Height Dry Weight Fuel Tank Capacity	2 890 mm (113.8 in.) 1 129 mm (44.4 in.) 1 028 mm (40.5 in.) 284 kg (626 lb) 58 L (15.3 US gal) including 7 L (1.8 US gal) reserve
Engine Oil Type Oil Tank Capacity	2-stroke, N.M.M.A. Certified for Service TC-W3 4.7 L (1.2 US gal)

General Specifications

Items	JH1200-B1 ~ B3
Electrical Equipment	
Battery	12 V 18 Ah
Maximum Generator Out Put	5.0 A/14V @6 000 r/min (rpm)

†: 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.

1-8 GENERAL INFORMATION

Technical Information-Kawasaki Smart Steering System (Carburetor Type)

Outline

The Kawasaki Smart Steering system provides turning action under certain conditions when the throttle is released. There must be thrust at the jet nozzle to initiate and complete turns. This is supplemental steering system which assists operators in learning to negotiate turns and maneuver.

The Kawasaki Smart Steering system continuously detects the operator's steering input as well as the boat's speed. When the throttle is released while boat speed is high and a turn is initiated, the smart steering system automatically increases engine speed to provide additional thrust. The system does not work when the engine is off or the boat speed is low.

The Kawasaki Smart Steering system functions when all of these conditions are met.

- engine speed averages more than 3 000 RPM for a specified time
- the throttle is released completely
- and the handlebars are held fully to the left or right.

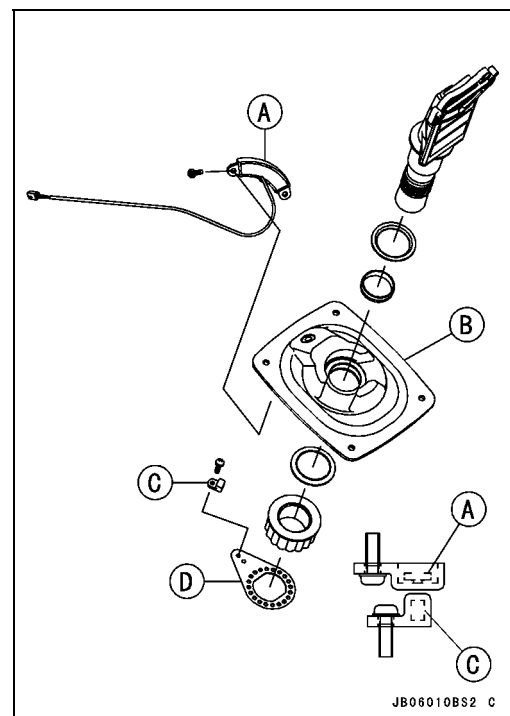
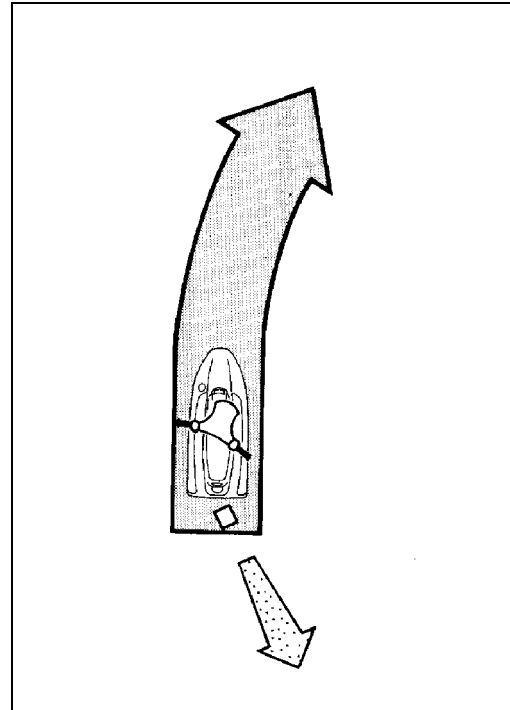
Construction and Operation

The main component parts for the Kawasaki Smart Steering system are the following.

1. Steering Position Sensor and Magnet
2. Throttle Sensor
3. Crankshaft Sensor
4. IC Igniter
5. Smart Steering Actuator

The steering position sensor [A] is installed on the bottom side of the steering holder [B]. Left and right sensors are built into the steering position sensor [A]. The magnet [C] is installed on the mount plate [D].

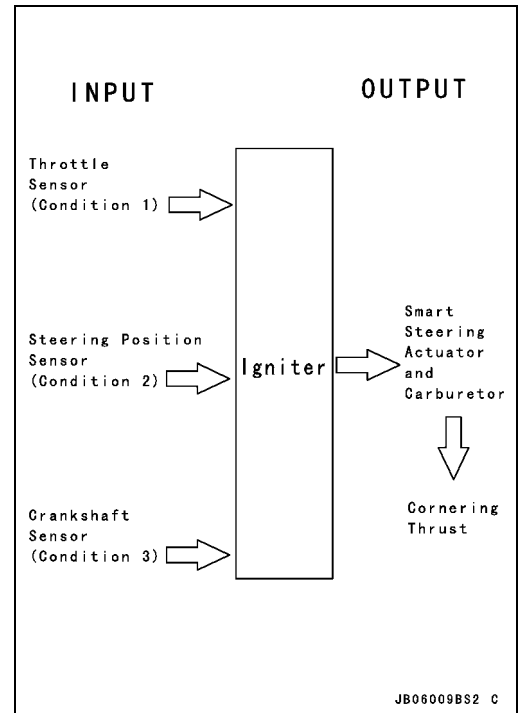
When the handlebar is fully turned in either direction, the magnet [C] under the steering position sensor [A] signals the steering position sensor [A] to switch ON.



Technical Information-Kawasaki Smart Steering System (Carburetor Type)

Kawasaki Smart Steering system provides thrust (approx. 2 800 rpm-in water) when the these three conditions are met.

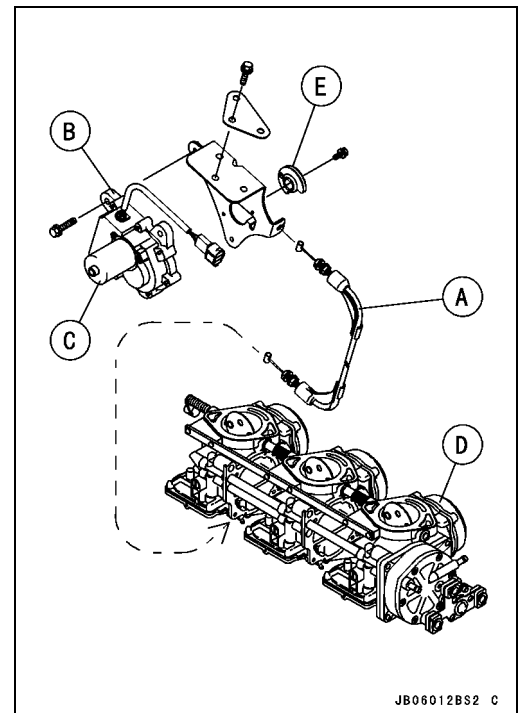
- Condition 1: Throttle is release-The throttle opening angle of throttle sensor at idle.
- Condition 2: The handlebar is fully turned in either direction-The steering position sensor switches ON.
- Condition 3: The average engine speed for a period of time before the system operates is 3 000 rpm or more-The igniter calculates the average engine speed based on the data sent from the crankshaft sensor.



The IC igniter will send digital signals for the most adequate actions to the Kawasaki Smart Steering actuator if three conditions mentioned above are completed.

The Smart Steering cable [A] will be pulled if the actuator [B] with a built-in servo motor [C] receives signals. Engine speed will be increased (up to approximately 2 800 rpm) by opening the throttle valves. This will provide enough thrusts to allow your personal watercraft to turn.

- Carburetor [D]
- Pulley [E]



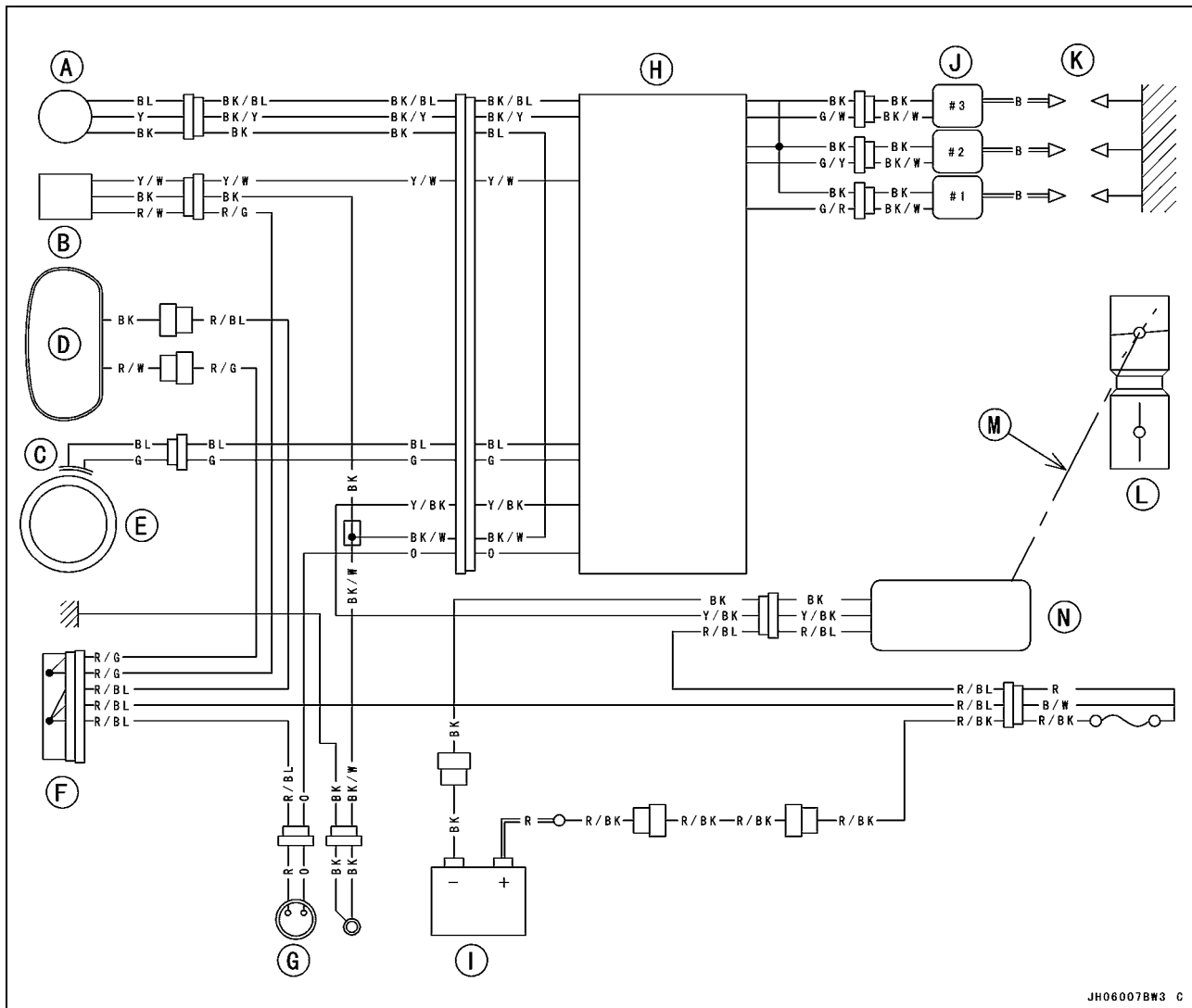
How To Release Kawasaki Smart Steering System

	IN WATER	OUT OF WATER
Engine Speed (When the Kawasaki Smart Steering system operates)	approx. 2 800 rpm	approx. 6 500 rpm
How To Release Kawasaki Smart Steering System	Keep the handlebar in the straight-ahead position, or pull the throttle lever in a third or more.	Keep the handlebar in the straight-ahead position, or pull the throttle lever in a third or more.

1-10 GENERAL INFORMATION

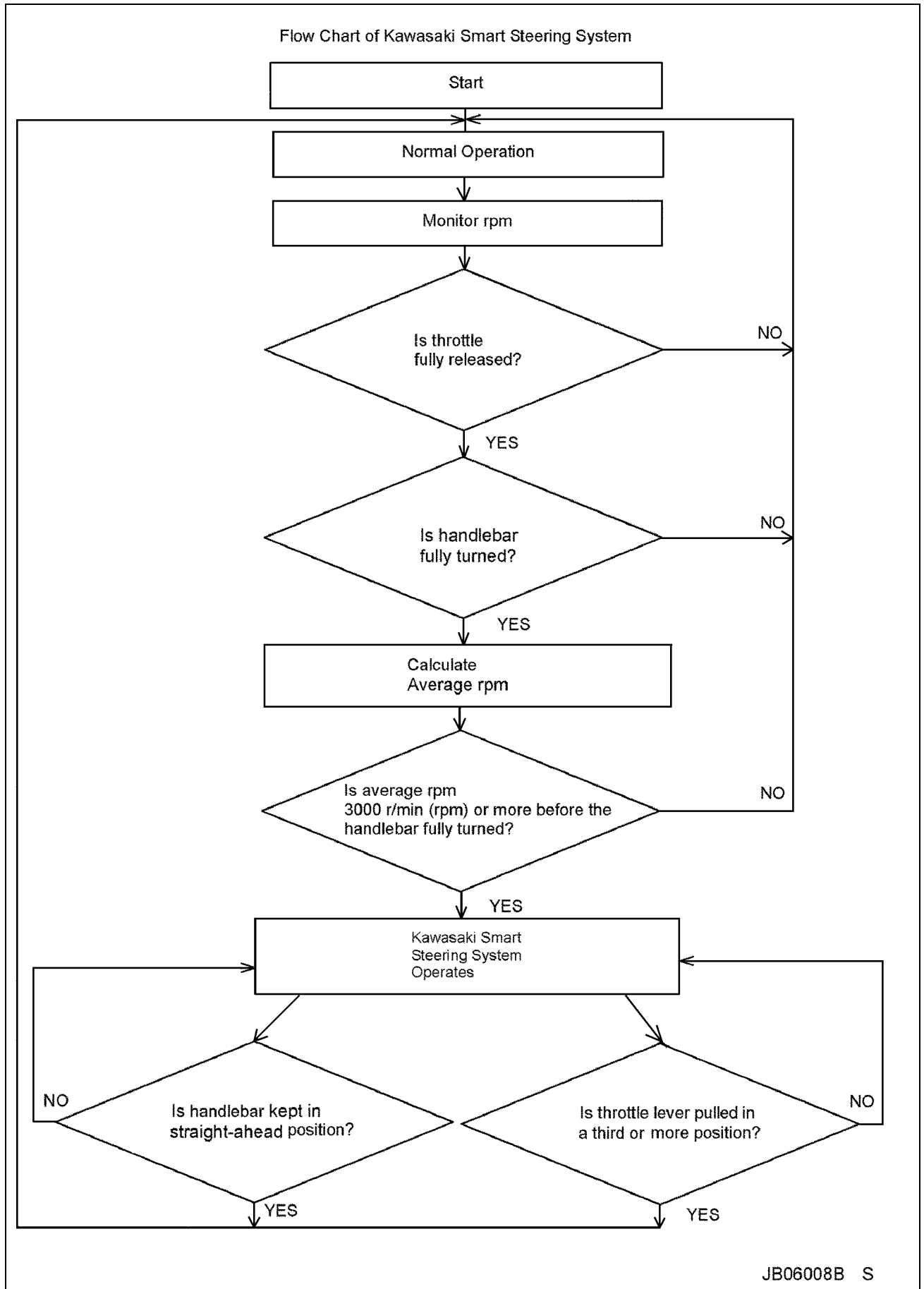
Technical Information-Kawasaki Smart Steering System (Carburetor Type)

Kawasaki Smart Steering System Circuit



- A. Throttle Sensor
- B. Steering Position Switch (Steering Position Sensor and Magnet)
- C. Crankshaft Sensor
- D. Multifunction Meter
- E. Magneto
- F. Joint Connector
- G. Main Switch
- H. IC Igniter
- I. Battery
- J. Ignition Coils
- K. Spark Plugs
- L. Carburetor
- M. Cable
- N. Smart Steering Actuator

Technical Information-Kawasaki Smart Steering System (Carburetor Type)



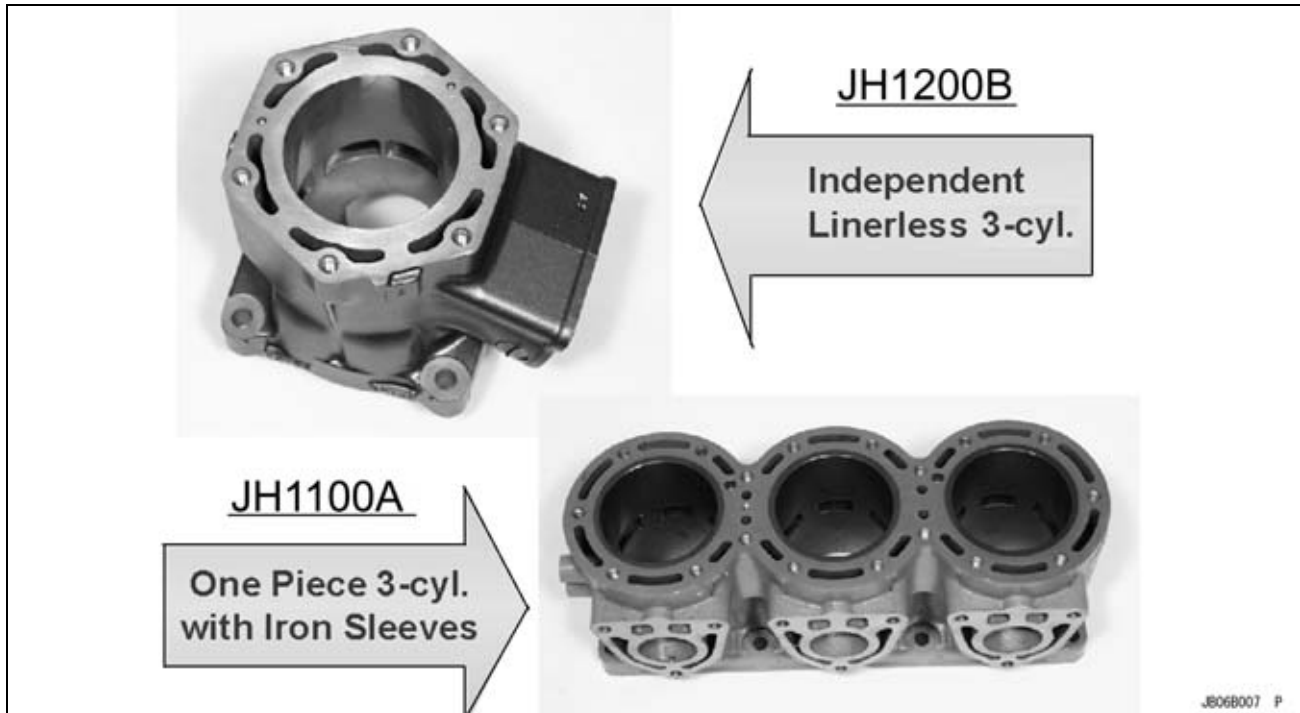
1-12 GENERAL INFORMATION

Technical Information-Engine

1. Cylinder

This large-displacement engine features independent, Nikasil plated aluminium cylinders for light weight, long wear and superb heat dispersion characteristics.

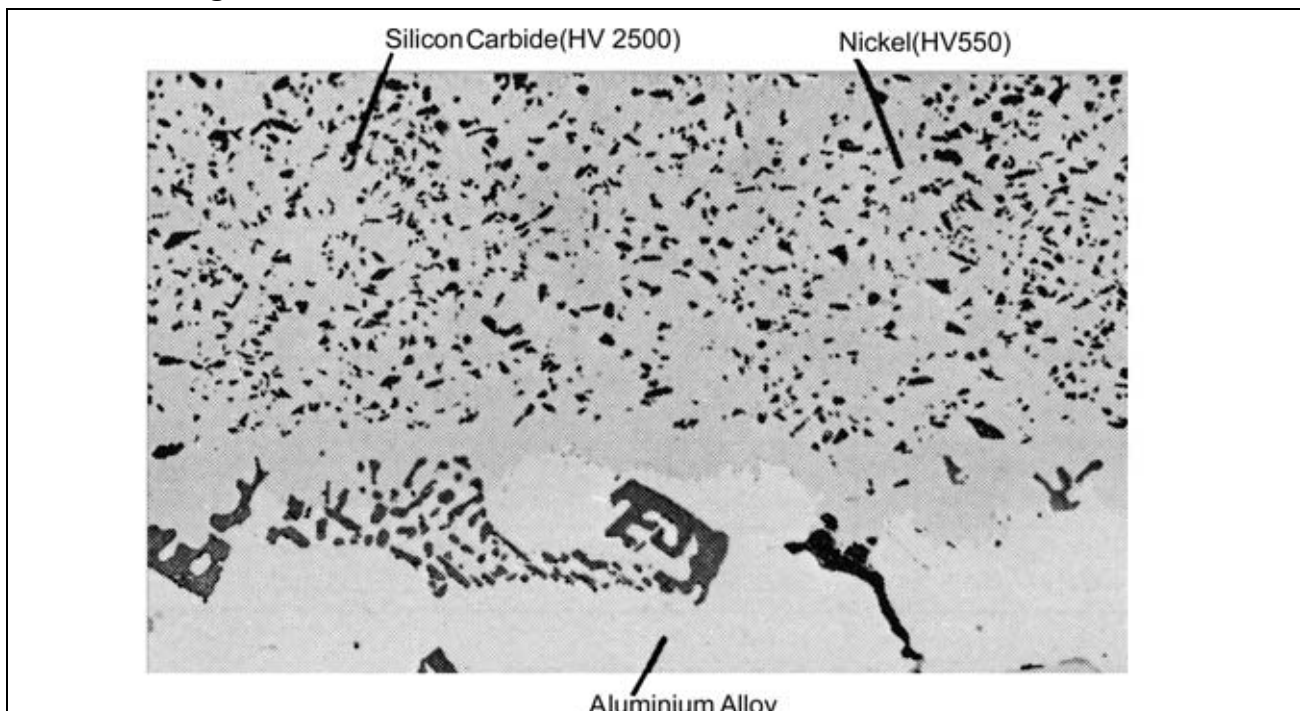
Comparison of Cylinders



Nikasil Plating: A film in which silicon carbide (SiC) is combined with nickel (Ni).

The cylinders are made from aluminium alloy for excellent heat transmission. This keeps the surface temperature of the cylinder-bore lower than is possible with a conventional aluminium cylinder with a cast-iron sleeve. Assembly and maintenance are improved with independent cylinders.

Nikasil Plating



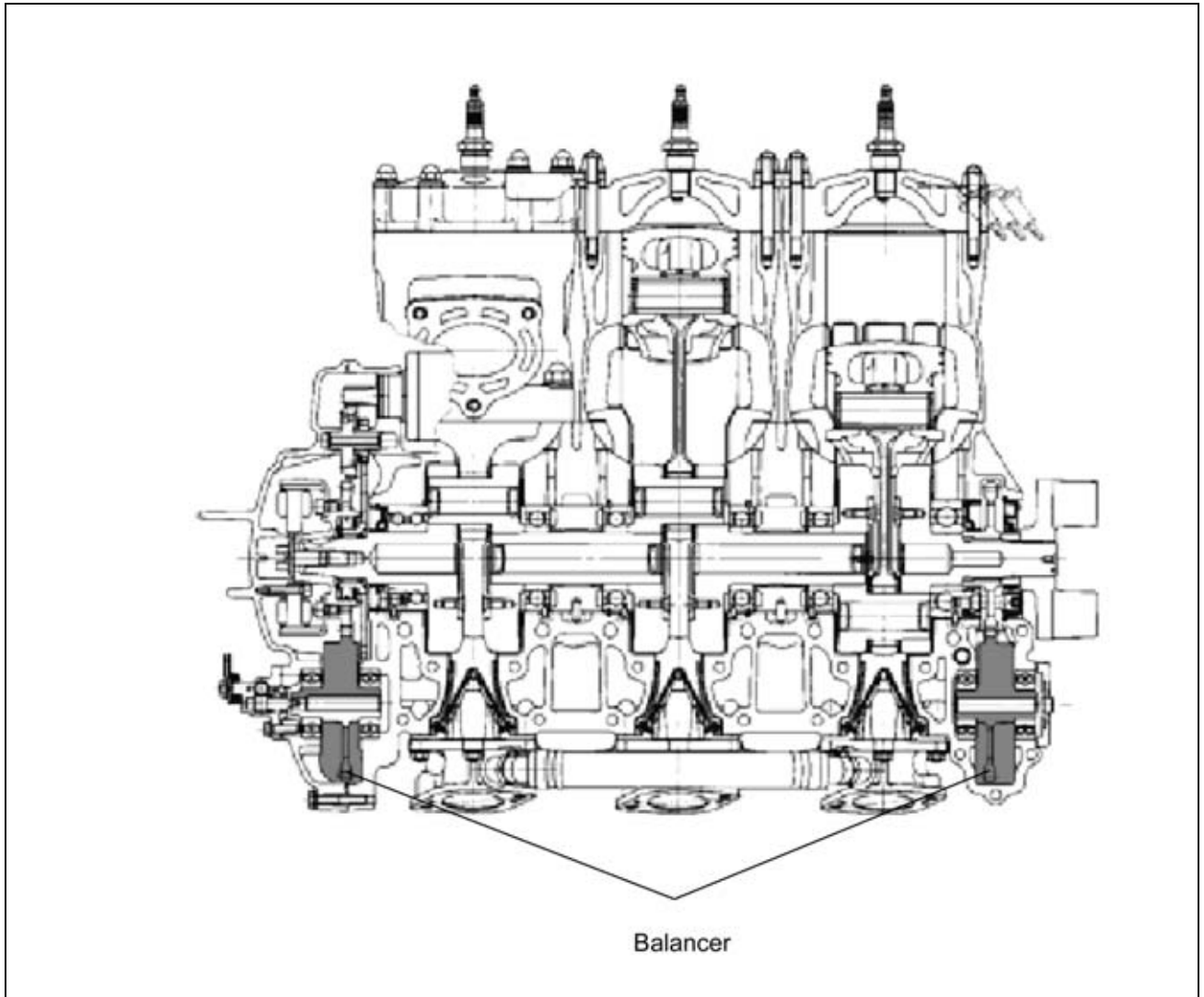
Technical Information-Engine

2. Balancer

New counter balancers, one at each end of the crankshaft, decrease vibrations and make this the smoothest running Kawasaki triple ever produced. When reassembling, it is necessary to match the marks on the balancer gear and the balancer drive gear. After engine reassembly, the front and rear balancer oil chambers must be refilled with engine oil for lubricating the bearings and teeth, since these chambers are isolated from crankcase chambers.

Front end: 200 mL (12.2 cu in.)

Rear end: 20 mL (1.2 cu in.)

Balancer

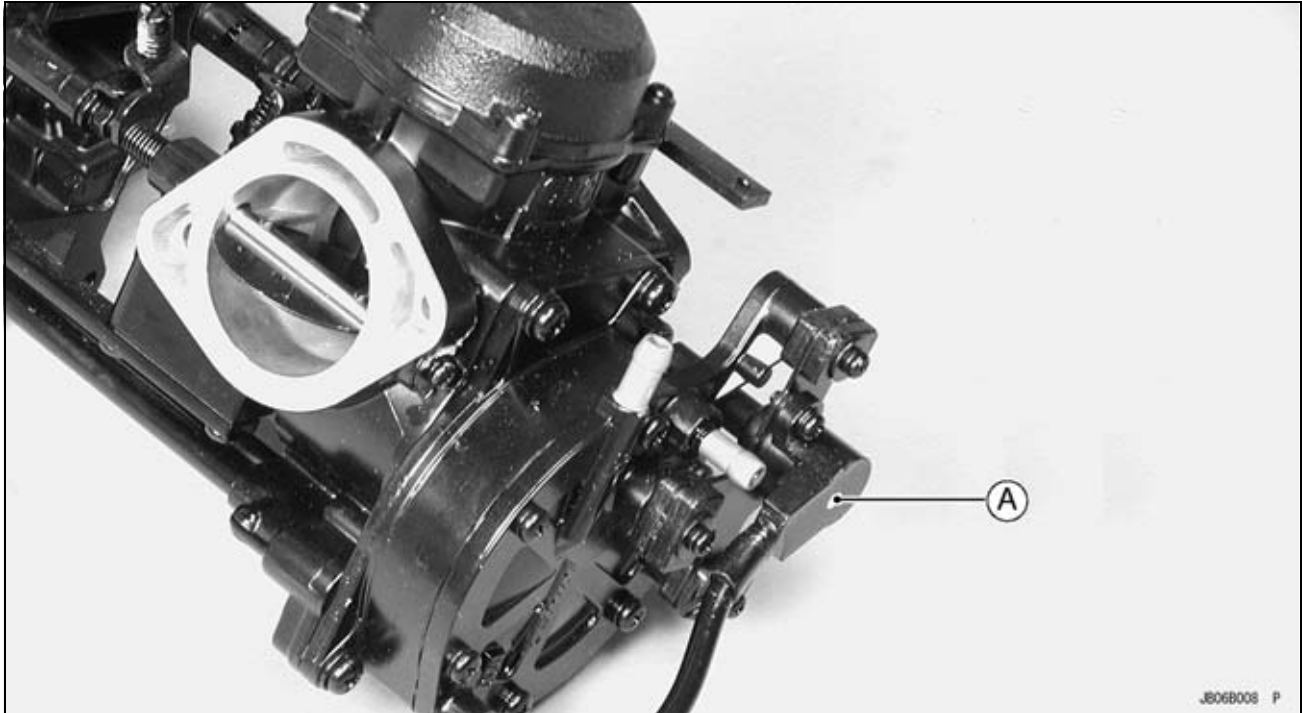
1-14 GENERAL INFORMATION

Technical Information-Engine

3. Carburetor and Throttle Sensor

The JH1200-B1 has CDCV 40 carburetors with a Throttle Sensor [A]. The CDCV 40 carburetors deliver sharp throttle response and smooth acceleration. Throttle sensor ensures ideal ignition timing at all throttle openings, delivering improved response, harder acceleration and improved power feel at all rpm. The throttle sensor signal goes to the igniter. The igniter computes the optimum ignition timing. (K-TRIC system)

Throttle Sensor



The Kawasaki JET SKI Watercraft Constant Velocity Carburetor

(1) Development Goals

- 1) The carburetor must allow high performance with high flexibility to match the engine's capabilities.
- 2) The carburetor must have high driveability from low to high engine speeds, responding closely to the operator's input.
- 3) The carburetor must lower exhaust emissions for less harm to the environment.

(2) Features

- 1) The watercraft CV carburetor has a variable venturi for smoother driveability through the entire speed range of the engine. It has a vacuum diaphragm which moves a slide in the venturi, and a needle jet and jet needle. The slide changes the venturi area according to the pressure in the venturi, and the needle and jet vary the amount of fuel allowed into the venturi.
- 2) The watercraft CV carburetor is a diaphragm-type carburetor (as opposed to a float bowl-type), and has all the performance features of the traditional watercraft carburetor: It can operate efficiently at any angle, it is durable, corrosion resistant, and salt water proof.

(3) Construction and Function

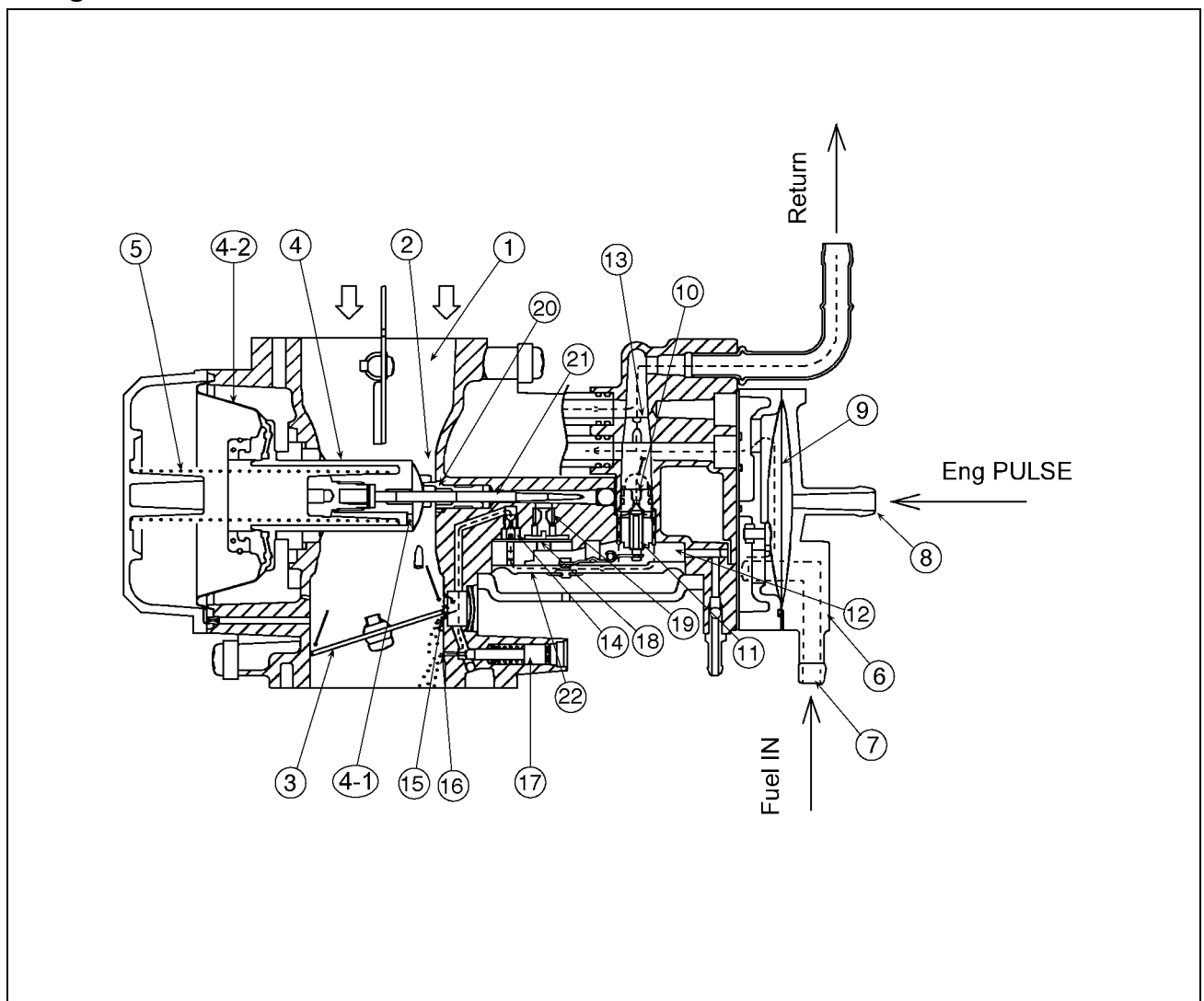
- 1) In operation, air is drawn through the intake [1], venturi opening [2], and the throttle valve [3], and into the engine's crankcase. The vacuum-actuated slide [4] projects into the venturi, and is pushed to narrow the venturi opening by the vacuum slide spring [5]. When the engine is running slowly and the amount of air down into the engine is very small, the slide [4] moves to minimize the venturi cross sectional area. This maintains the air velocity in the venturi. The bottom of the slide [4] has a hole [4-1] that goes through into the space above the diaphragm [4-2]. This hole allows the low pressure in the venturi to draw the slide, against the pressure of the spring [5], out of the venturi, enlarging the venturi area [2]. The wider the throttle opens, the lower the pressure in the venturi and the farther the slide moves, opening the venturi so that the engine can speed up. This mechanism maintains the air speed through the venturi at an even level.
- 2) The carburetor assembly has a built-in pulse-type fuel pump [6]. Fuel flows from the fuel tank to the joint [7] on the carburetor assembly and into the fuel pump. As the engine turns, pressure

Technical Information-Engine

pulses from the crankcase travel through the pulse joint [8] and push the diaphragm [9] in the fuel pump back and forth, drawing fuel through the check valve in the joint [7] and pushing it past the needle valve [11], and into the regulator chamber [12]. The needle valve [11] serves the same purpose as the float valve in a float bowl-type carburetor. If the pump supplies more fuel than the engine can use, the excess fuel escapes back to the fuel tank through the leak jet [13].

- 3) The carburetor slow system provides fuel to the engine at low speeds. The slow system consists of a slow jet [14], various bypass outlets [15], the pilot outlet [16], and the pilot screw [17]. As the throttle valve opens, fuel flows through the pilot outlet [16] and then the bypass outlets [15], one by one.
- 4) The main system consists of the check valve [18], the main jet [19], the needle jet [20], and the jet needle [21]. The jet needle [21] is fixed to the slide and moves with it. As the slide moves, powered by the diaphragm [4-2], the tapered jet needle [21] moves in and out of the needle jet [20] varying the clearance between them and thus the fuel flow out of the needle jet.
- 5) When the engine is idling, the throttle valve [3] is almost closed. The low pressure in the inlet tract downstream of the throttle valve draws fuel through the pilot outlet [16] and the bypass outlets [15] from the regulator chamber [12]. Even though the pressure in the venturi [2] is higher on the upstream side of the throttle valve, almost no fuel flows through the needle jet [20] and into the regulator chamber [12], because of the check valve [18].

Idling



- 6) As the fuel in the regulator chamber [12] flows out, the pressure in the chamber drops and draws the regulator diaphragm [22] into contact with the collar [24] of the float arm [23], which in turn pulls the needle float valve [11] away from the valve seat [10]. Fuel can now flow into the regulator chamber [12] and press the diaphragm [22] away from the float arm [23]. This allows the float arm

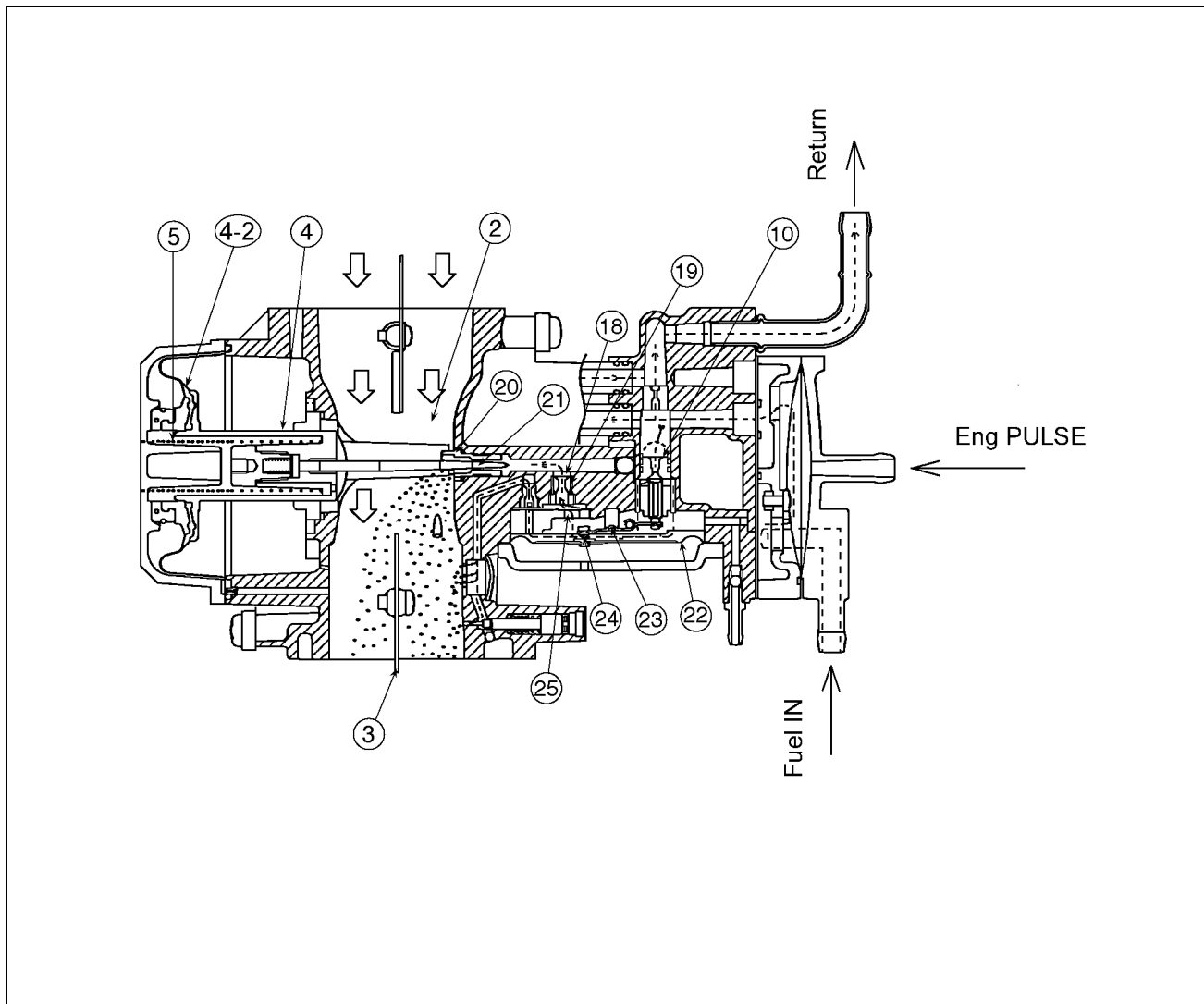
1-16 GENERAL INFORMATION

Technical Information-Engine

spring [25] to push the arm toward the float valve needle [11] pressing it into the seat [10], shutting off the fuel flow.

- 7) When the throttle valve [3] opens, the engine runs at mid-range or higher speeds. The pressure in the venturi [2] drops as the air flow speed through it rises. This pressure drop allows the check valve [18] to open and fuel flows through the main jet [19], the needle jet [20], past the jet needle [21], and into the venturi [2] on its way into the engine. The low pressure in the venturi [2] also acts on the diaphragm [4-2], which pulls the slide [4] increasing the area of the venturi. The diaphragm [4-2] moves the slide until the pressure of the vacuum slide spring [5] is high enough to overcome the force of the diaphragm. As the slide moves, it pulls the jet needle [21] out of the needle jet [20], increasing the clearance between the two and allowing more fuel to join the air going to the engine. The parts on the carburetor are designed to balance the air to fuel ratio for the best fuel economy, power, driveability, and lowest exhaust emissions.

Full-Open

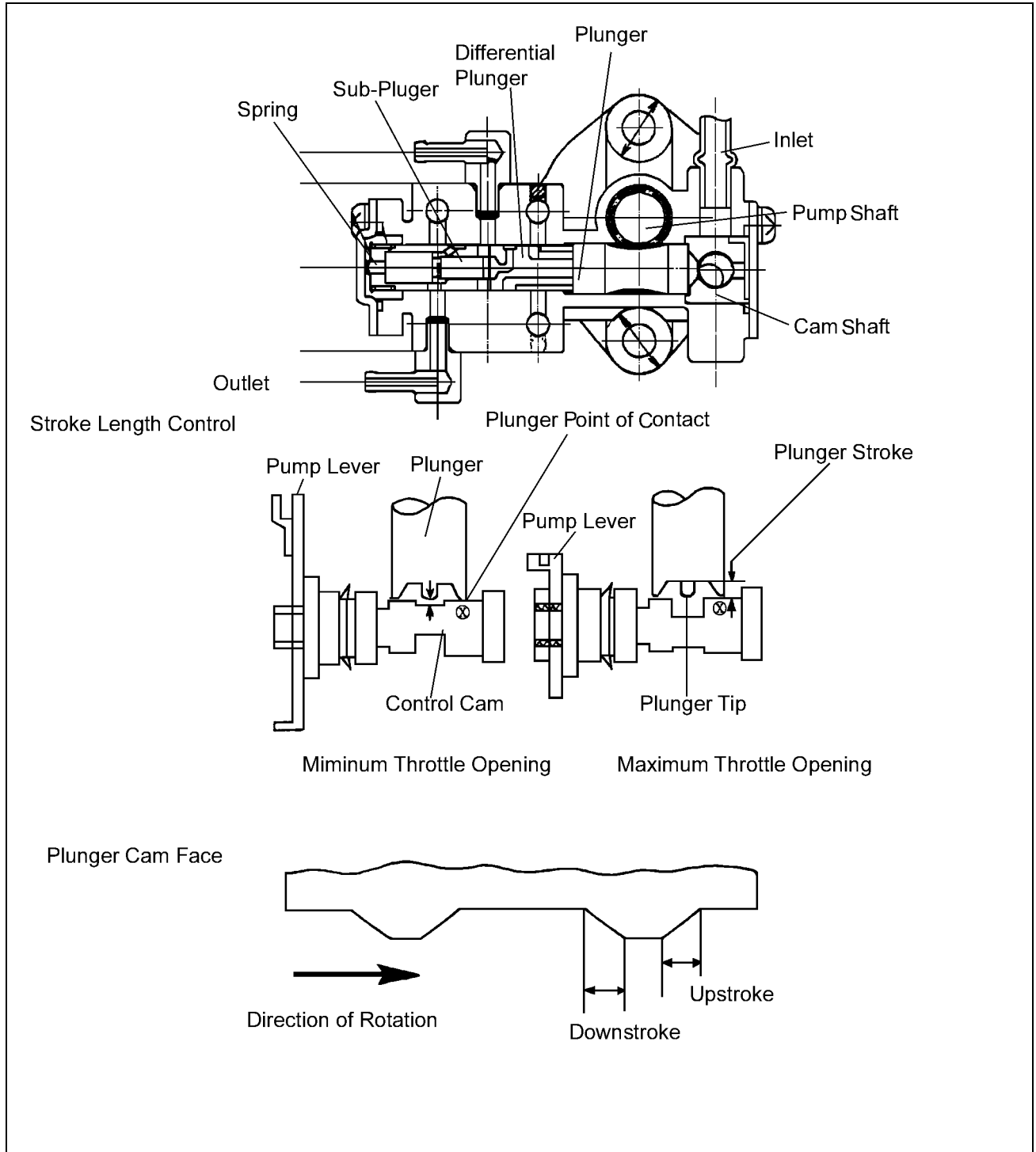


Technical Information-Engine

4. Oil Pump

The oil pump output is determined by both engine speed and throttle opening, reducing both oil consumption and exhaust smoke. This type of pump is often used on 2-stroke motorcycles. The oil pump has 5 outlet ports. The oil is supplied to each carburetor through 3 outlet ports and to the balancers through 2 ports for optimum lubrication.

Oil Pump



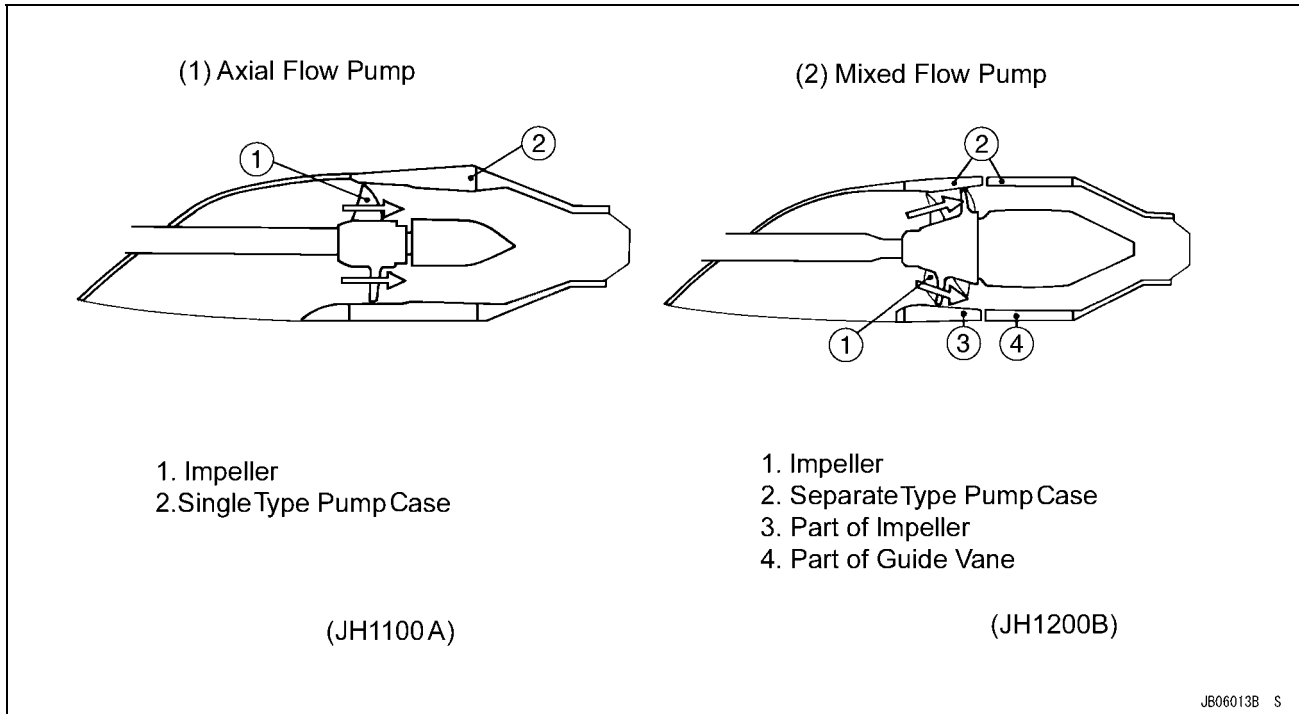
1-18 GENERAL INFORMATION

Technical Information-Propulsion System

1. Pump

Two kinds of pump are used in PWC for propulsion. The JH1200-B1 has a mixed flow pump. The mixed-flow pump is compact with high-capacity, and it delivers more efficient propulsion for improved acceleration and performance.

Pump

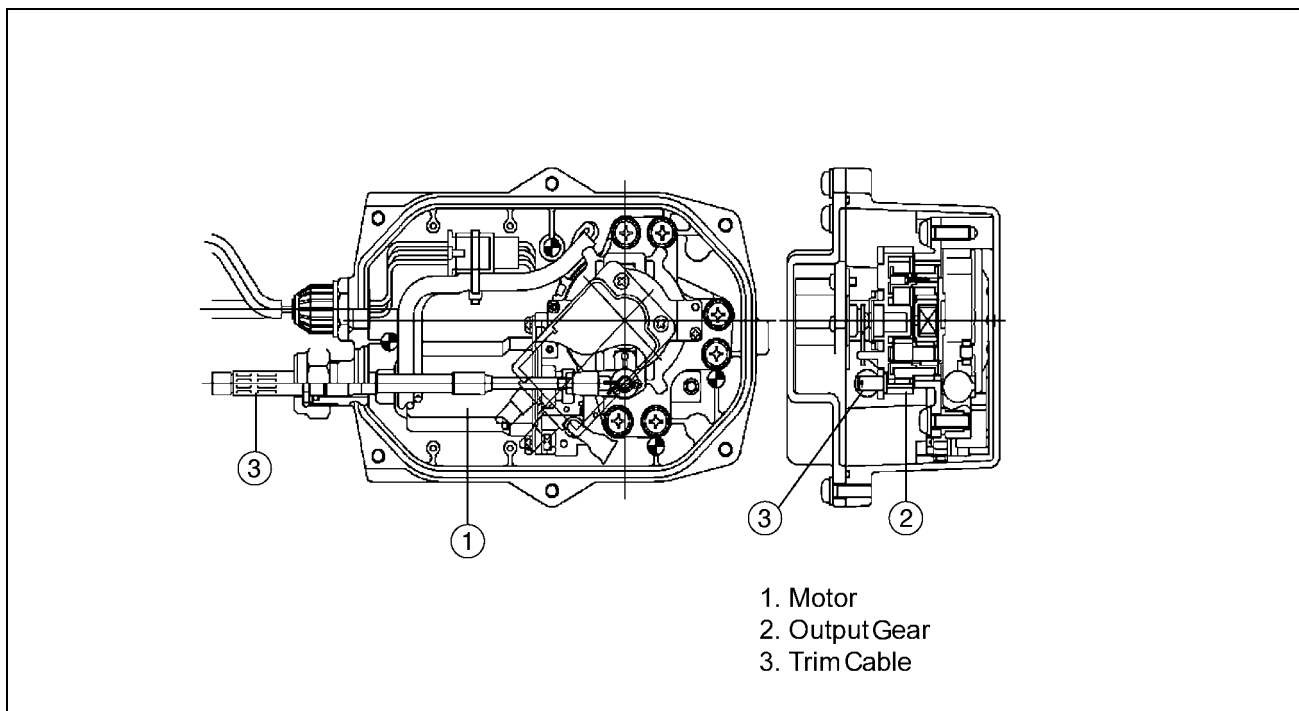


Impeller/Pump Case Clearance: STD 0.2-0.3 mm (0.008 ~ 0.012 in.)

2. Trim Actuator

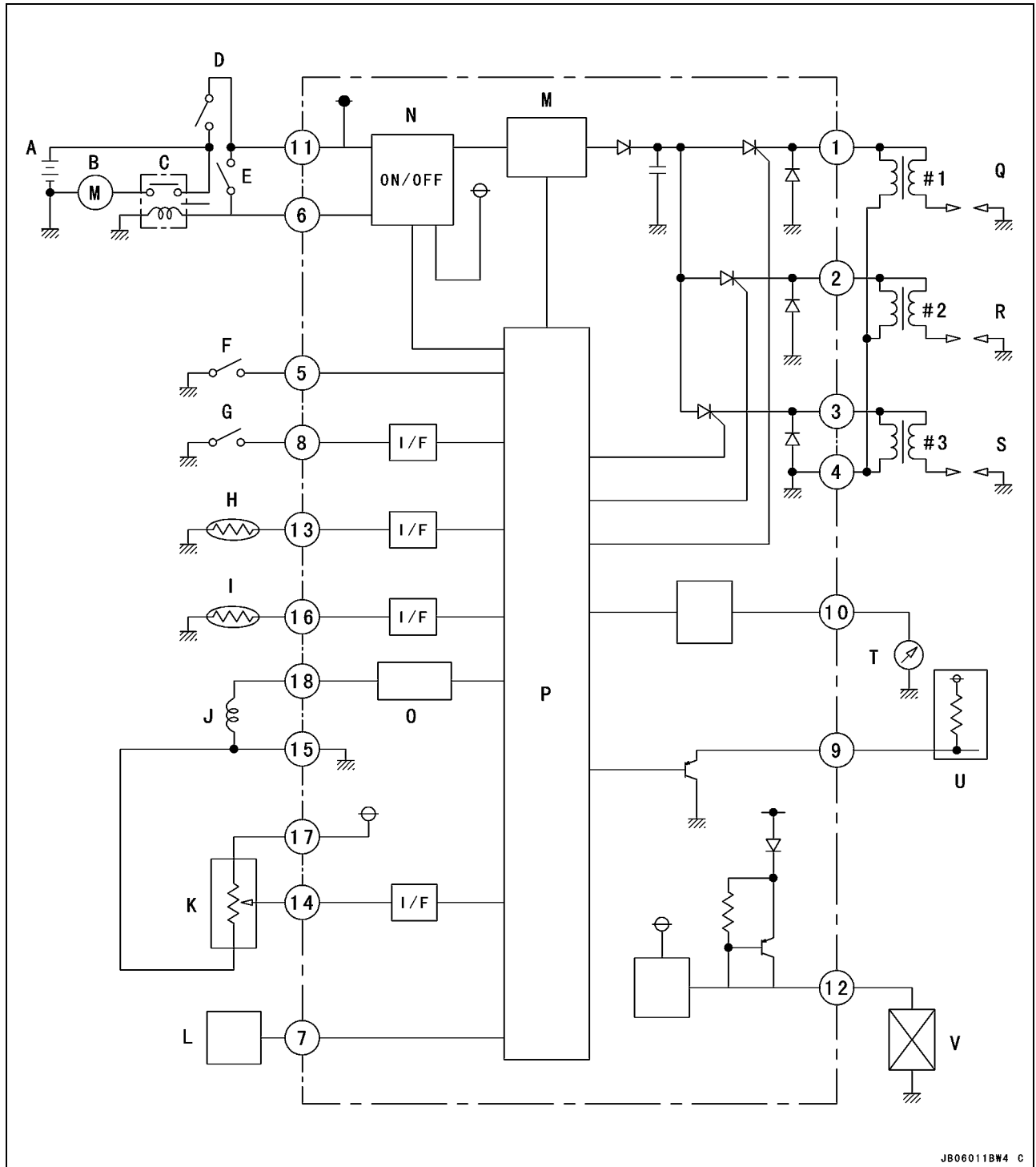
The JH1200-B1 has a trim, cable driven by the gear system shown below. An input signal revolves the motor which revolves the sun-gear through a worm gear, and the output gear pulls and pushes the trim cable. This trim system has a quicker response time than the conventional system.

Trim Actuator



Technical Information-Igniter

1. Block Diagram of Digital Igniter



- | | |
|---------------------------------|--------------------------------|
| A. Battery | L. Warning Monitor |
| B. Starter | M. Power-Source ON/OFF Circuit |
| C. Starter Relay | N. Wave Shape Circuit |
| D. Ignition Switch | O. DC-DC Converter |
| E. Starter Switch | P. Control Unit |
| F. Stop Switch | Q. Ignition Coil #1 |
| G. Steering Position Sensor | R. Ignition Coil #2 |
| H. Water Temperature Sensor | S. Ignition Coil #3 |
| I. Inlet Air Temperature Sensor | T. Tachometer |
| J. Crankshaft Sensor | U. Smart Steering Actuator |
| K. Throttle Sensor | V. Outer Load |
| | I/F Interface |

1-20 GENERAL INFORMATION

Technical Information-Igniter

2. Functions of Digital Igniter

(1) K-TRIC

The throttle sensor is installed on the throttle body. The output signal is sent to the igniter, which determines the optimum igniter timing. The K-TRIC system controls the independent timing maps for each cylinder based on engine speed and throttle opening for quick throttle response.

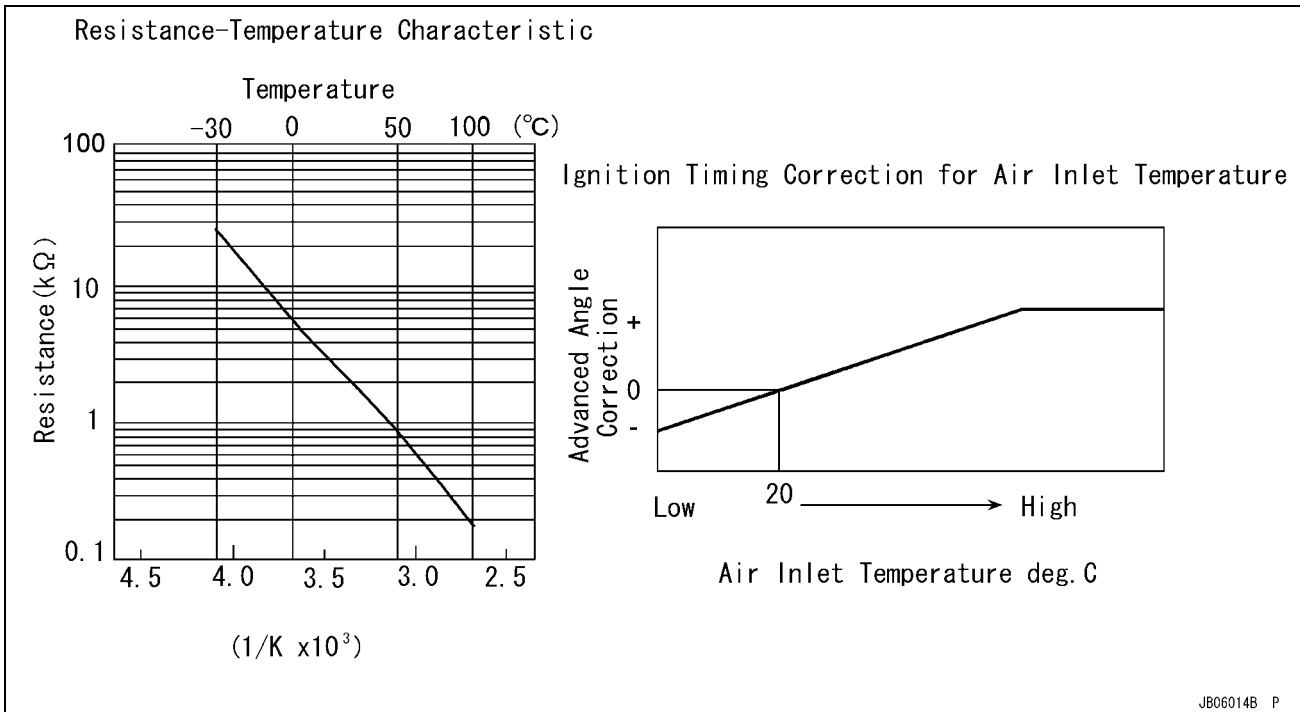
(2) Correction of Engine Acceleration

The igniter features an acceleration function which advances the timing during rapid acceleration for improved throttle response. When revs stabilise, timing returns to "normal".

(3) Inlet Air Temperature Correction

The inlet air temperature sensor is installed in the engine room. As the air temperature inside the hull rises, the igniter compensates by advancing ignition timing to avoid power fade.

Inlet Air Temperature Correction

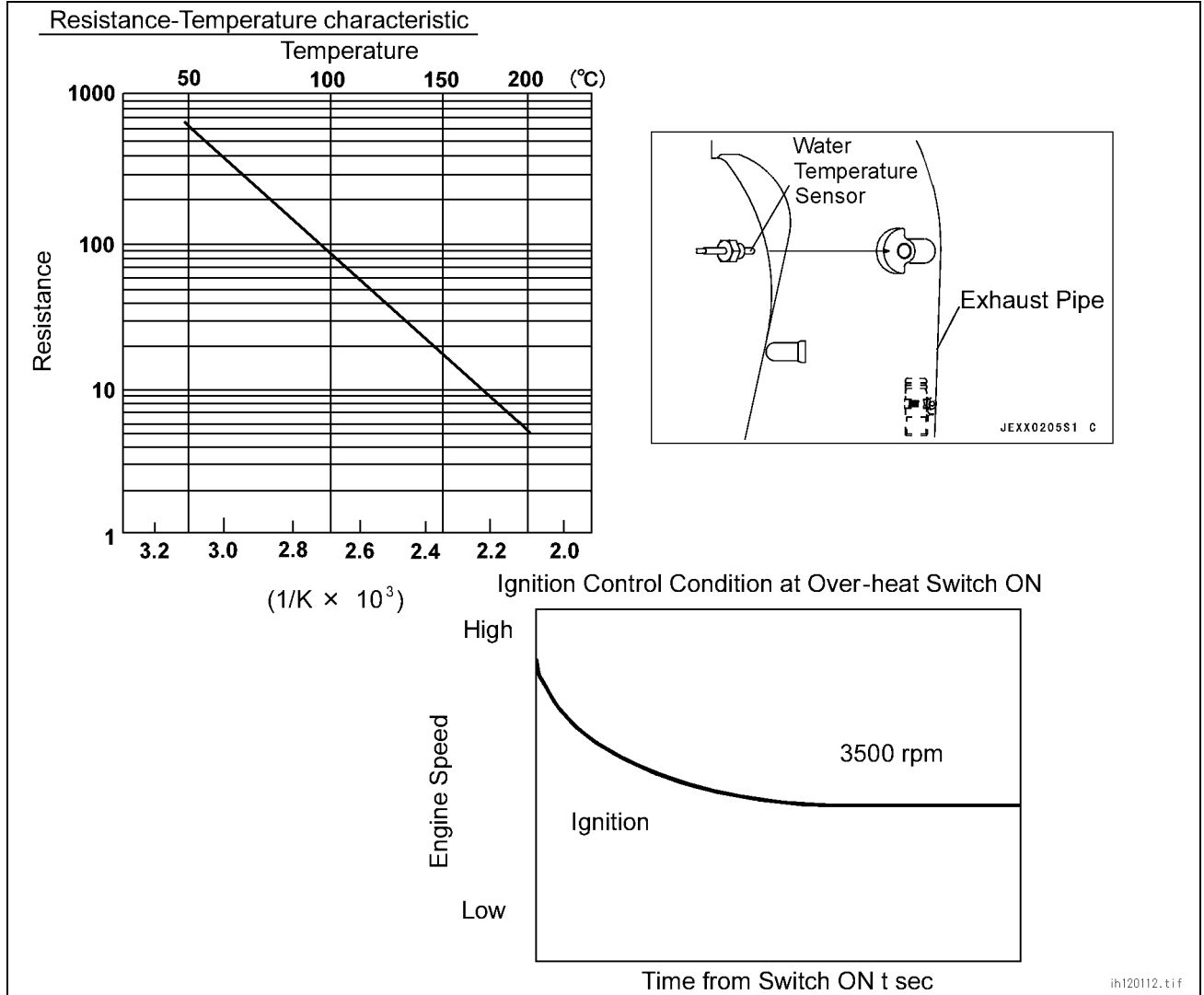


Technical Information-Igniter

(4) Overheat Control

To protect the engine against overheating, a new, more sensitive heat-sensor constantly monitors exhaust pipe temperature. When temperature exceeds 90 degrees C or more, the igniter gradually cuts engine speed to 3 500 rpm where it stays until the temperature is lowered.

Overheat Control



(5) Engine Over-Rev Cut-Off

The igniter stops ignition when engine speed exceeds 7 500 rpm, to protect the engine from damage. The ignition starts again when the engine speed drops below 7 500 rpm.

(6) Engine Tachometer Drive

The electric tachometer is driven by the pulsing signals from the igniter.

(7) Power Source OFF Function

Three minutes after the engine stops, the igniter shuts off the power source automatically. The power source turns on again when the starter switch turns on.

(8) Output for Outer Load Function

When the power source of unit turns on, the igniter puts out a voltage equivalent to the battery voltage on the terminal. This terminal is connected to Trim Switch and Multifunction meter.

1-22 GENERAL INFORMATION

Technical Information-Electrical Parts

1. Engine Starter

The more compact starter features a 1-way clutch with back-torque limiter to prevent starter damage caused by "kick-back" during starting.

2. Magneto

The exciter coil is eliminated by adopting DC-CDI. Rare earth metal magnets lighten the magneto and decrease the flywheel effect, improving acceleration response.

	JH1200B	JH1100A
Diameter (mm)	106 (4.17 in.)	131 (5.16 in.)
Weight (kg)	1.44 (3.18 lb)	2.54 (5.60 lb)
Flywheel effect (kgf·cm ²)	16.1	43.0

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/cm ²
kPa	×	0.1450	=	psi
kPa	×	0.7501	=	cmHg
kgf/cm ²	×	98.07	=	kPa
kgf/cm ²	×	14.22	=	psi
cm Hg	×	1.333	=	kPa

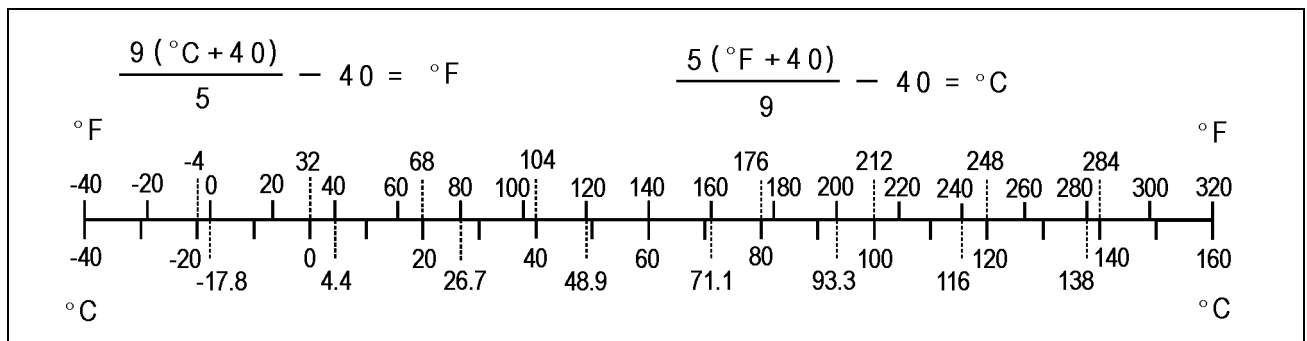
Units of Speed:

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

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:

L: Apply a non-permanent locking agent to the threads.

SS: Apply silicone sealant to the threads.

S: Tighten the fasteners following the specified sequence.

*: Initial Torque for Temporal Tightening

Fastener	Torque			Re- marks
	N·m	kgf·m	ft·lb	
Fuel System				
Flame Arrester Bracket Bolts	–	–	–	L
Fuel Filler Nut	4.9	0.5	43 in·lb	
Carburetor Mounting Bolts	8.8	0.9	78 in·lb	L
Choke Knob Set Screw	–	–	–	L
Fuel Tap Set Screw	–	–	–	L
Oil Pump Cable Mounting Bolt	7.8	0.8	69 in·lb	
Fuel Filler Tube Clamps	2.9	0.3	26 in·lb	
Inlet Manifold Mounting Nuts	9.8	1.0	87 in·lb	
Air Inlet Cover Mounting Bolts	7.8	0.8	69 in·lb	L
Fuel Level Sensor Clamps	2.9	0.3	26 in·lb	
Cable Holder Mounting Bolts	8.8	0.9	78 in·lb	L
Carburetor Cable Adjuster Locknuts	7.8	0.8	69 in·lb	
Choke Cable Adjuster Locknuts	7.8	0.8	69 in·lb	
Throttle Case Mounting Screws	3.9	0.4	35 in·lb	
Air Inlet Connecting Elbows	7.8 ~ 14	0.8 ~ 1.4	69 ~ 121 in·lb	L
Engine Lubrication System				
Oil Filler Nut	4.9	0.5	43 in·lb	
Air Bleeder Screw	1.0 ~ 1.5	0.1 ~ 0.15	9 ~ 13 in·lb	
Oil Filler Tube Clamps	2.9	0.3	26 in·lb	
Oil Pump Mounting Bolts	8.8	0.9	78 in·lb	L
Oil Pump Cable Locknuts	7.8	0.8	69 in·lb	
Oil Pump Cable End Mounting Bolt	4.9	0.5	43 in·lb	L
Exhaust System				
Exhaust Pipe Mounting Bolts-8 mm dia	29	3.0	22	L
Exhaust Pipe Mounting Bolts-10 mm dia	49	5.0	36	L
Cable Holder Mounting Bolts	8.8	0.9	78 in·lb	L
Exhaust Manifold Mounting Nuts	34	3.5	25	S
Expansion Chamber Mounting Bolts	29	3.0	22	L
Water Pipe Joints	7.8 ~ 14	0.8 ~ 1.4	69 ~ 122 in·lb	SS
Water Temperature Sensor	14.7	1.5	11	see text
Engine Top End				
Cylinder Head Nuts	29 (7.8*)	3.0 (0.8*)	22 (69 in·lb*)	S
Water Pipe Joint	7.8 ~ 14	0.8 ~ 1.4	69 ~ 122 in·lb	SS
Cylinder Base Nuts	49 (7.8*)	5.0 (0.8*)	36 (69 in·lb*)	S
Water Pipe Mounting Nuts	9.8	1.0	87 in·lb	S

PERIODIC MAINTENANCE 2-3

Torque and Locking Agent

Fastener	Torque			Re- marks
	N·m	kgf·m	ft·lb	
Engine Removal/Installation				
Engine Mounting Bolts	36	3.7	27	L
Engine Damper Mounting Bolts	16	1.6	12	
Engine Mount Bolts	34	3.5	25	L
Engine Bottom End				
Flywheel Bolt	123 ~ 127	12.5 ~ 13.0	90 ~ 94	L
Stator Mounting Bolts	7.8	0.8	69 in·lb	L
Balancer Drive Gear Mounting Bolts	12	1.2	8.7	L
Grommet Mounting Screws	3.5	0.36	31 in·lb	L
Crankshaft Sensor Mounting Screws	3.5	0.36	31 in·lb	L
Coupling	123 ~ 127	12.5 ~ 13.0	90 ~ 94	L
Magneto Cover Mounting Bolts	12	1.2	8.7	L
Grommet Cover Mounting Bolts	8.8	0.9	78 in·lb	L
Oil Level Gauge Bolt	3.9	0.4	35 in·lb	L
Crankcase Bolts-6 mm dia	8.8	0.9	78 in·lb	L, S
Crankcase Bolts-8 mm dia	29	3.0	22	L, S
Cooling And Bilge Systems				
Water Pipe Joint	7.8 or above	0.8 or above	69 in·lb or above	SS
Bypass Outlet Screws	–	–	–	L
Breather Mounting Bolt	–	–	–	L
Drive System				
Coupling	39	4.0	29	L
Drive Shaft Holder Mounting Bolts	22	2.2	16	L
Coupling Cover Mounting Bolts	–	–	–	L
Pump And Impeller				
Steering Nozzle Pivot Nuts	19	1.9	14	
Tilt Ring Pivot Bolts	19	1.9	14	L
Cable Joint Bolts	9.8	1.0	87 in·lb	L
Pump Case Mounting Bolts	9.8	1.0	87 in·lb	L
Pump Outlet Mounting Bolts	19	1.9	14	L
Pump Cap Bolts	9.8	1.0	87 in·lb	L
Impeller	98	10	72	
Pump Mounting Nuts	36	3.7	27	
Pump Bracket Mounting Nuts	36	3.7	27	
Pump Cover Mounting Bolts	7.8	0.8	69 in·lb	L
Grate Mounting Bolts	9.8	1.0	87 in·lb	L
Cable Joint	39	4.0	29	L
Tilt Ring Mounting Bolts (L=35 mm, 1.38 in.)	–	–	–	L
Tilt Ring Mounting Bolts (L=32 mm, 1.26 in.)	–	–	–	L
Stop Screws	3.2	0.33	29 in·lb	L
Pump Mounting Bolts	36	3.7	27	L
Pump Bracket Mounting Bolts	36	3.7	27	L

2-4 PERIODIC MAINTENANCE

Torque and Locking Agent

Fastener	Torque			Re- marks
	N·m	kgf·m	ft·lb	
Plug	12	1.2	104 in·lb	L
Steering				
Handlebar Clamp Bolts	16	1.6	11.5	L
Smart Steering Actuator Bracket Mounting Bolts	8.8	0.9	78 in·lb	L
Steering Holder Mounting Bolts	16	1.6	11.5	L
Steering Cable Joint	9.8	1.0	87 in·lb	
Steering Cable Nut	39	4.0	29	
Trim Cable Nut	39	4.0	29	
Throttle Case Mounting Screws	3.9	0.4	35 in·lb	
Switch Case Mounting Screws	3.9	0.4	35 in·lb	
Cable Joint Bolts	9.8	1.0	87 in·lb	L
Cable Joint	9.8	1.0	87 in·lb	
Hull/Engine Hood				
Stabilizer Mounting Bolts	9.8	1.0	87 in·lb	L
Crossmember Mounting Bolts	7.8	0.8	69 in·lb	
Grip Mounting Bolts	9.8	1.0	87 in·lb	L
Rear Mounting Plate Nuts	25	2.5	18	L
Electrical System				
Actuator Pulley Mounting Bolt	3.5	0.36	31 in·lb	L
Actuator Mounting Bolt	8.8	0.9	78 in·lb	L
Actuator Bracket Mounting Bolts	8.8	0.9	78 in·lb	L
Meter Bracket Mounting Bolts	3.9	0.4	35 in·lb	L
Switch Case Mounting Screws	3.9	0.4	35 in·lb	
Spark Plugs	25 ~ 29	2.5 ~ 3.0	18 ~ 20	
Speed Sensor Mounting Bolts	3.9	0.4	35 in·lb	L
Water Temperature Sensor	15	1.5	11	
Starter Motor Mounting Bolts	8.8	0.9	78 in·lb	L
Starter Relay Mounting Nuts	3.4 ~ 4.4	0.35 ~ 0.45	30 ~ 39 in·lb	
Starter Motor Cable Nut	7.8	0.8	69 in·lb	
Fuse Case Mounting Bolts	7.8	0.8	69 in·lb	L
Fuse Bracket Mounting Screws	4.4	0.45	39 in·lb	L

The table below, relating tightening torque to thread diameter, lists the basic torque for the bolts and nuts. Use this table for only the bolts and nuts which do not require a specific torque value. All of the values are for use with dry solvent-cleaned threads.

General Fasteners (stainless bolt and nut)

Threads dia. (mm)	Torque		
	N·m	kgf·m	ft·lb
6	5.9 ~ 8.8	0.60 ~ 0.90	52 ~ 78 in·lb
8	16 ~ 22	1.6 ~ 2.2	11.6 ~ 15.9
10	30 ~ 41	3.1 ~ 4.2	22 ~ 30

PERIODIC MAINTENANCE 2-5

Periodic Maintenance Chart

Frequency	Initial 10 Hours	Every 25 Hours	Every 100 Hours
Description			
Adjust carburetor		●	
Clean fuel filter screen		●	
Inspect/replace fuel filter			●
Inspect fuel vent check valve		●	
Inspect throttle valve return springs (replace carburetor if necessary)			●
Inspect/clean flame arrester		●	
Inspect/replace coupling damper			●
Flush cooling system (after each use in salt water)		●	
Flush bilge line and filter		●	
Inspect impeller blade for damage (remove)			●
Inspect steering cable, and trim cable			●
Lubricate handlebar pivot (disassemble)		●	
Inspect battery		●	
Clean and gap spark plugs (replace if necessary)		●	
Lubricate steering cable joint at steering shaft and steering nozzle/trim nozzle pivots		●	
Lubricate carburetor cable fitting, smart steering cable fitting and choke cable fitting at carburetor		●	
Lubricate smart steering cable, choke cable and smart steering cable fitting, throttle control cable and throttle cable fitting at throttle case		●	
Check all hoses, hose clamps, nuts, bolt, and fasteners	●	●	
Torque rear mounting plate nuts	●		

2-6 PERIODIC MAINTENANCE

Specifications

Item	Standard	Service Limit
Fuel System		
Idle Speed:		
in Water	1 250 ±100 r/min (rpm)	- - -
out of Water	1 800 ±100 r/min (rpm)	- - -
Main Jet:		
Front	#165 (#155-for high altitude)	- - -
Middle	#165 (#155-for high altitude)	- - -
Rear	#165 (#155-for high altitude)	- - -
Pilot Jet:		
Front	#48 (#45-for high altitude)	- - -
Middle	#48 (#45-for high altitude)	- - -
Rear	#48 (#45-for high altitude)	- - -
Electrical System		
Battery Terminal Voltage	12.6 V or more	- - -
Spark Plug Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)	- - -

Periodic Maintenance Procedure

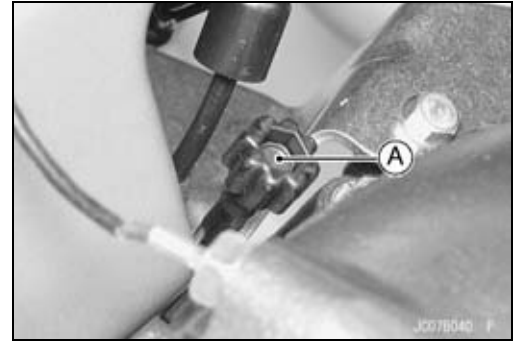
Fuel System

Idle Speed Adjustment

The normal idle speed is the lowest stable speed.

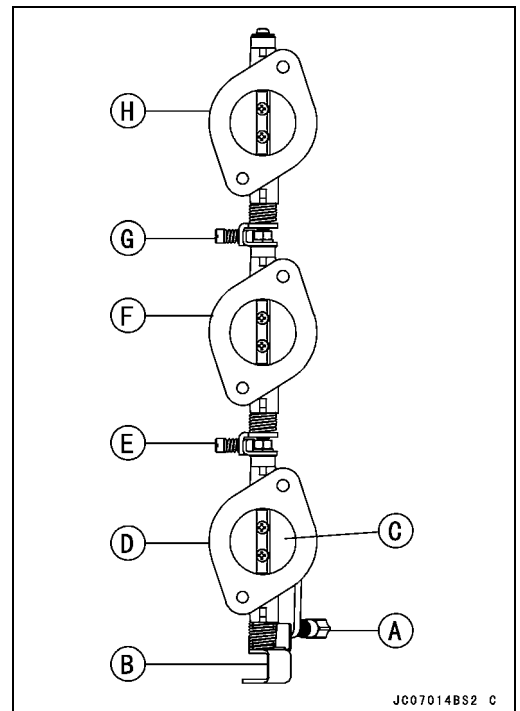
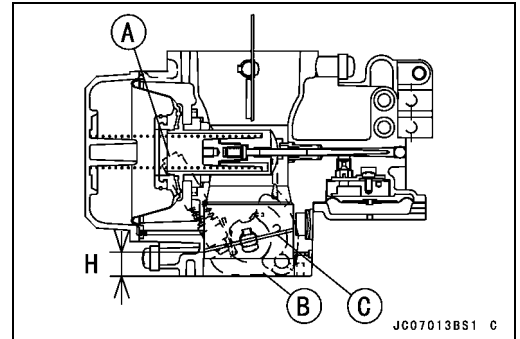
- Turn the idle adjusting screw [A] as required to reach this setting.

Idle Speed	1 250 ±100 rpm (in water)
	1 800 ±100 rpm (out of water)



Carburetor Synchronization

- Remove the carburetor (see Fuel System chapter).
- Turn out the idle adjusting screw [A] until there is a clearance between the adjusting screw end and throttle shaft lever [B].
- Turn in the idle adjusting screw until the adjusting screw end just touches the throttle shaft lever.
- Turn in the adjusting screw 3/4 turn from the point to keep the specified throttle valve [C] opening in the front carburetor [D].
- Measure the distance from the bottom of the carburetor bore lower end to the valve edge shown as "H".
- Turn the synchronizing screw [E] so that the valve edge in the middle carburetor [F] keeps the same distance within ±0.2 mm (0.008 in.) tolerance as that in the front carburetor.
- Turn the synchronizing screw [G] so that the valve edge in the rear carburetor [H] keeps the same distance within ±0.2 mm (0.008 in.) tolerance as in the front carburetor.
- Install the carburetor.
- Adjust the throttle control and choke cables.
- Adjust the idle adjusting screw.



2-8 PERIODIC MAINTENANCE

Periodic Maintenance Procedure

High Altitude Performance Adjustment

The normal carburetor settings are best for sea level. If the watercraft is used at the higher elevations, the lower atmospheric pressure makes the carburetions richer. To obtain the proper carburetor setting at higher elevations, change the main and slow jets according to the table.

Altitude	Sea Level ~ 1 000 m (0 ~ 3 300 ft) STD	1 000 ~ 2 000 m (3 300 ~ 6 600 ft STD)	2 000 ~ 3 000 m (6 000 ~ 9 800 ft STD)
Main jet #	#165	#165	#155
P/No.	92063-3720	92063-3720	92063-3723
Pilot jet # (slow jet)	#48	#48	#45
P/No.	16158-3724	16158-3724	16158-3725

Carburetor Cable Adjustment

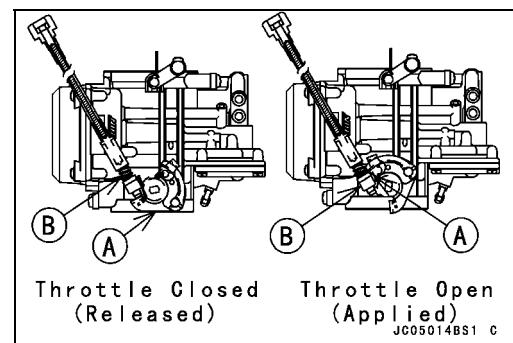
The throttle control cable is actually an assembly of three cables: the throttle cable, the carburetor cable, and the oil pump cable. The throttle cable runs from the throttle lever to the cable assembly junction where it connects to both the carburetor cable which leads to the carburetor, and the oil pump cable which leads to the oil pump.

Since the throttle lever controls both the carburetor and the oil pump simultaneously, it is important that each cable be adjusted to its designed base position so that the oil and fuel/air mixture reach the engine in the correct proportion at all throttle openings. Cable stretch creates excess play at the throttle lever and alters the base positions of the cables at the carburetor and the oil pump, necessitating periodic adjustment.

NOTE

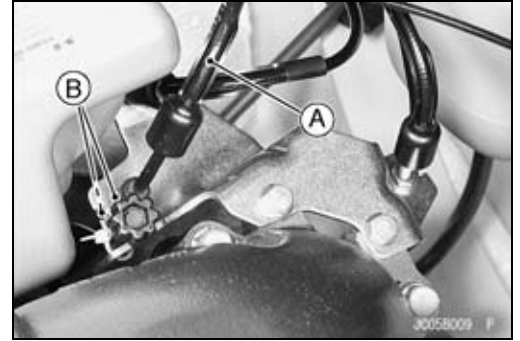
○Be sure to inspect the remaining cable if whichever cable the carburetor the oil pump is adjusted.

- Check carburetor cable adjustment.
- With the throttle lever released, the lower stop on the throttle pivot arm [A] should rest against the idle adjust screw [B], and there should be slight slack in the throttle cable.
- When the throttle lever is fully applied (pulled), the upper stop on the pivot arm should be all the way up against the stop on the carburetor.



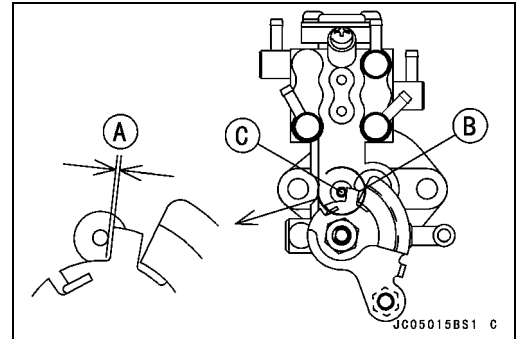
Periodic Maintenance Procedure

- If necessary, adjust the carburetor cable [A].
- Loosen and turn the locknuts [B] at the cable holder until the lower stop on the pivot arm hits against the idle adjust screw with slight cable slack.
- Tighten the locknuts securely.
- Check the oil pump cable adjustment (see Fuel System chapter).
- ★ If necessary, adjust the oil pump cable.

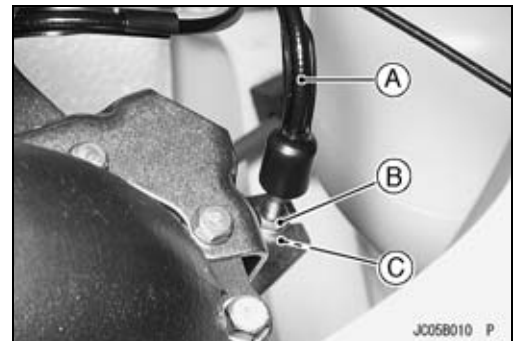


Oil Pump Cable Adjustment

- Check carburetor cable adjustment.
- If necessary, adjust the carburetor cable.
- Check oil pump cable adjustment.
- When the throttle lever is fully applied (pulled), check to see that there is a clearance [A] (approx. 0.6 mm (0.024 in.)) between stop [B] on the oil pump pulley and the stopper pin [C] on the oil pump body. At this time, the oil pump pulley is fully opened.

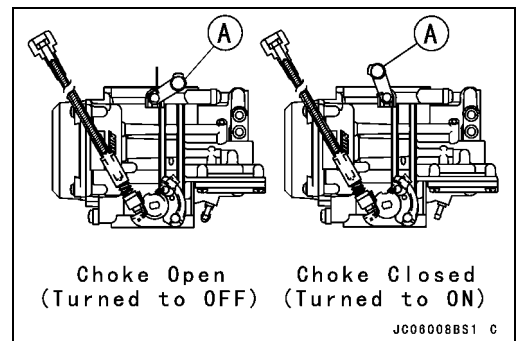


- ★ If necessary, adjust the oil pump cable [A].
- Hold the throttle lever fully applied (pulled).
- Turn the oil pump pulley till the stop on the pulley contacts to the stopper pin on the oil pump body. At this time, the oil pump pulley is fully open. And then give the oil pump cable tension by turning the upper adjusting nut clockwise.
- Loosen the upper adjusting nut [B] by turning counter-clockwise 1/2 turn and then fix the oil pump cable by tightening the lower adjusting nut [C] securely.

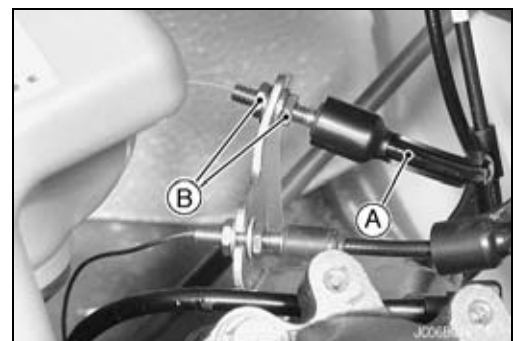


Choke Cable Adjustment

- Check choke cable adjustment.
- When the choke knob is turned to the OFF position, the choke butterfly valve in the carburetor should be completely open. The choke pivot arm [A] should stand all the way toward the port side of the boat with cable slack.
- When the choke knob is turned to the ON position, the choke butterfly valve in the carburetor should be completely closed. Check that the choke pivot arm stands all the way toward the starboard side of the boat without cable slack.



- ★ If necessary, adjust the choke cable [A].
- Loosen the locknuts [B] at the cable holder and turn the choke knob to the OFF position.
- Check that the choke pivot arm stands all the way toward the port side of the boat with cable slack, and tighten the locknuts.
- Turn the choke knob to the ON position.
- Check that the choke pivot arm stands all the way toward the starboard side of the boat without cable slack.



2-10 PERIODIC MAINTENANCE

Periodic Maintenance Procedure

Fuel Filter Screen Cleaning

- Remove:
 - Filler Tubes of Fuel and Oil
 - Oil Tank
 - Fuel Tank Strap
 - Crossmember
 - Cable Holder with Control Cables
- Lift the front portion of the fuel tank.
- Disconnect:
 - Fuel Level Sensor Lead Connector
 - Fuel Hoses
 - Air Vent Hose
- Pull out the fuel level sensor assembly [A].
- Wash the fuel filter screens in non-flammable or high flash-point solvent. Use a brush to remove any contaminants trapped in the screens.

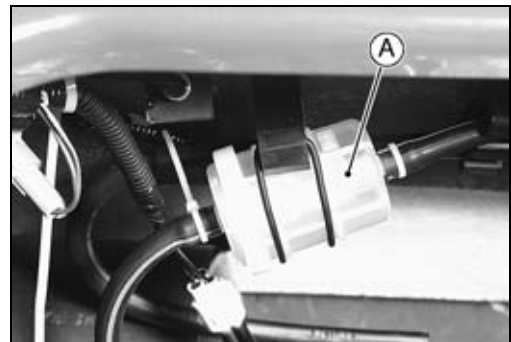


WARNING

Clean the fuel screens in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent. A fire or explosion could result.

Fuel Filter Inspection

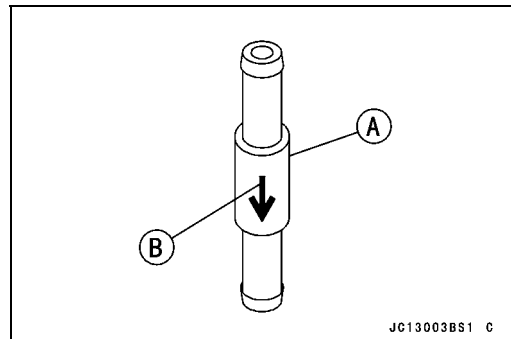
- Inspect and replace the fuel filter [A] in accordance with the Periodic Maintenance Chart, or whenever you find from outside any foreign material or water trapped in the fuel filter.



Fuel Vent Check Valve Mounting

The fuel vent check valve is mounted in the fuel tank vent hose to prevent fuel from spilling during riding. Air can flow into the tank to allow fuel to be drawn out by the fuel pump, but fuel cannot flow out the check valve.

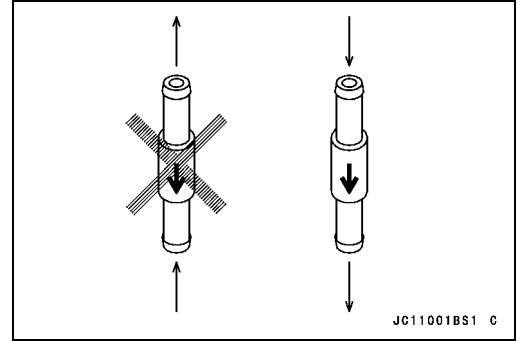
- The fuel vent check valve [A] must be mounted so that the arrow [B] on its body is pointing toward the fuel tank.



Periodic Maintenance Procedure

Fuel Vent Check Valve Inspection

- Remove the check valve and blow through it from each end.
- ★ If the check valve will allow air to flow as shown, it is OK.
- ★ If air will flow through the check valve in both direction or in neither direction, the check valve must be replaced.



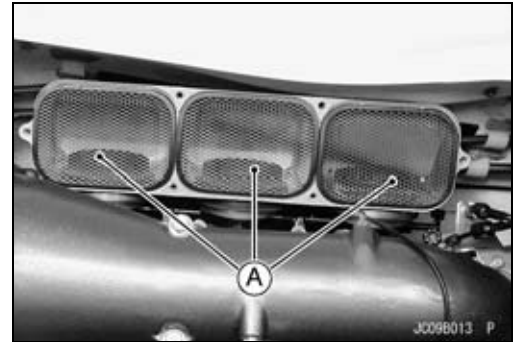
Flame Arrester Cleaning

- Remove the flame arrester [A] (see Fuel System chapter).
- Blow the flame arrester clean with compressed air.

WARNING

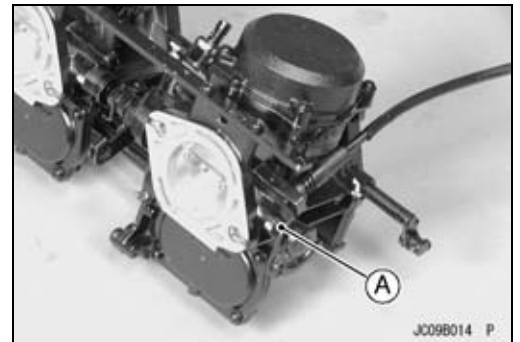
Eye protection should be worn when compressed air is used to dry parts. Do not direct air toward anyone. Use 172 kPa (1.75 kgf/cm², 25 psi) maximum nozzle pressure.

- Install the flame arrester (see Fuel System chapter).



Throttle Shaft Spring Inspection

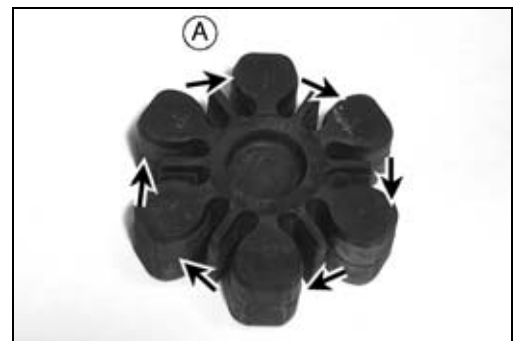
- Check the throttle shaft springs [A] by pulling the throttle lever.
- ★ If the springs are damaged or weak, replace the carburetors.



Engine Bottom End

Coupling Damper Inspection

- With the engine removed, remove the coupling damper and inspect it for wear [A] and deterioration.
- ★ If it is grooved or misshapen, replaced it with a new damper.
- ★ If there is any doubt as to coupler condition, replace it.



2-12 PERIODIC MAINTENANCE

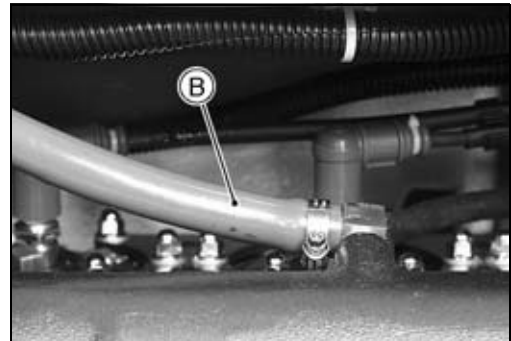
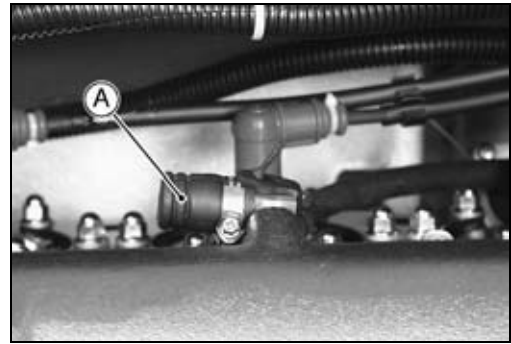
Periodic Maintenance Procedure

Cooling and Bilge System

Cooling System Flushing

To prevent sand or salt deposits from accumulating in the cooling system, it must be flushed occasionally. Flush the system according to the Periodic Maintenance Chart, after each use in salt water, or whenever there is reduced water flow from the bypass outlet on the left side of the hull.

- Remove the fitting cap [A] on the cylinder head.
- Connect a garden hose [B] to the fitting.



- Start the engine and allow it to idle before turning on the water.

CAUTION

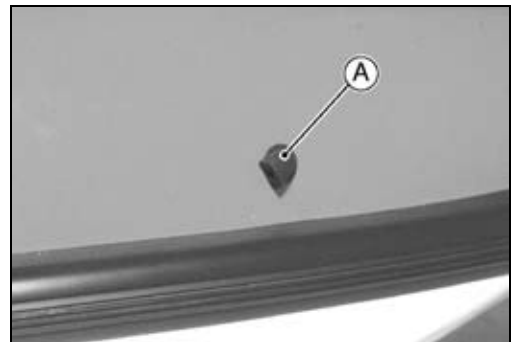
The engine must be running before the water is turned on or water may flow back through the exhaust pipe into the engine, resulting in the possibility of severe internal damage.

- Immediately turn on the water and adjust the flow so that a little trickle of water comes out of the bypass outlet [A] on the right side of the hull.
- Left the engine idle for several minutes with the water running.
- Turn off the water. Leave the engine idling.
- Rev the engine a few times to clear the water out of the exhaust system.

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.

- Switch off the engine, remove the garden hose, install the fitting cap.



Periodic Maintenance Procedure

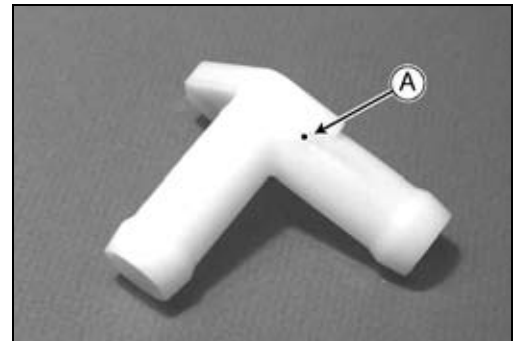
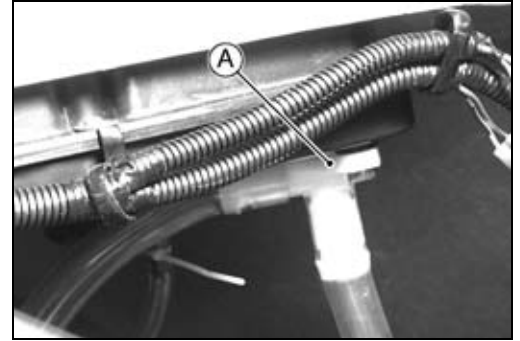
Bilge System Flushing

To prevent clogging, the bilge system should be flushed out according to the Periodic Maintenance Chart, or whenever you suspect it is blocked.

- Disconnect both bilge hoses at the plastic breather fitting [A].

- Connect the bilge filter hoses (from the hull bottom) to the garden hoses, turn the water on, and flush it out for about a minute. During this procedure, water will flow into the engine compartment. Do not allow a large amount of water to accumulate in the engine compartment.
- Connect the other hoses (from the hull bulkhead) to the garden hose, turn the water on, and flush it out for several minutes.

- Before reconnecting the hoses to the plastic breather fitting make sure the small hole [A], on top of the breather fitting is clear.
- Reconnect the bilge hoses.



Pump and Impeller

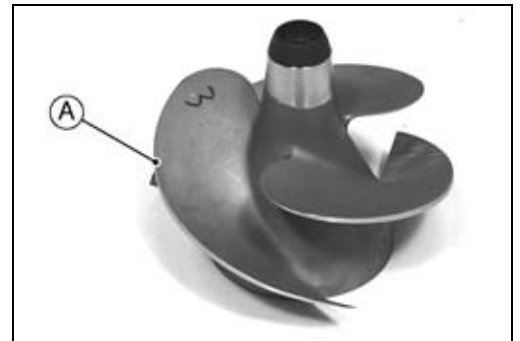
Pump and Impeller Inspection

- Examine the impeller. [A]
- ★ If there is pitting, deep scratches, nicks or other damage, replace the impeller.

NOTE

○ *Minor nicks and gouges in the impeller blades can be removed with abrasive paper or careful filing. Smooth leading edges are especially important to avoid cavitation.*

- Examine the pump case [A].
- ★ If there are deep scratches inside the pump case, replace it.



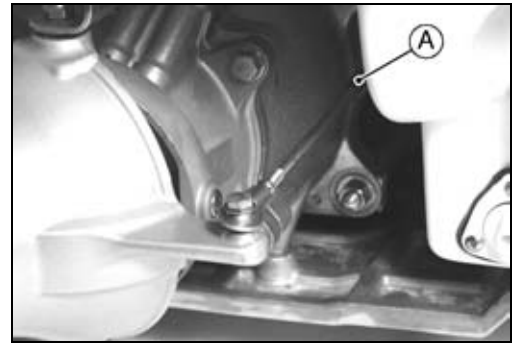
2-14 PERIODIC MAINTENANCE

Periodic Maintenance Procedure

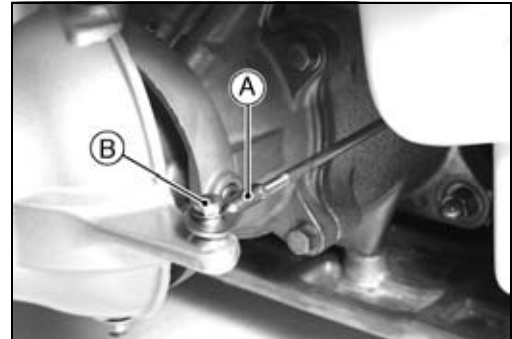
Steering

Steering Cable Inspection

- Examine the steering cable.
- ★ If the cable or cable housing is kinked or frayed, replace the cable.
- ★ If the seal [A] at either end of the cable is damaged in any way, replace the cable.



- Be certain that the cable moves freely in both directions.
- Disconnect the cable joint [A] at each end of the cable.
- Take out the cable joint bolt [B] and disconnect the cable joint.



CAUTION

Never lay the watercraft on the right side. Water in the exhaust system may drain back into the engine causing serious damage.

- Slide the inner cable back and forth in the cable housing.
- ★ If the cable does not move freely, replace it.

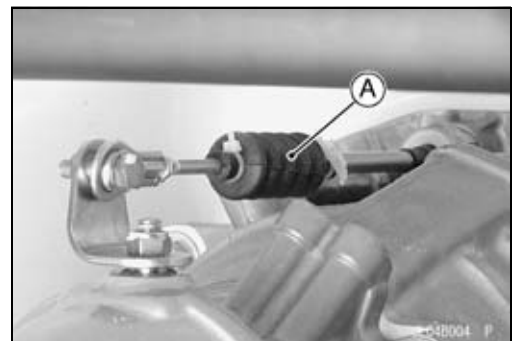
Steering Cable Lubrication

NOTE

- *The steering cable is sealed at each end and do not require lubrication. If the seal is damaged, the cable must be replaced.*

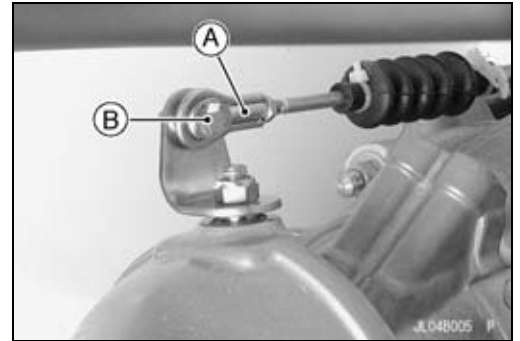
Trim Cable Inspection

- Examine the trim cable.
- ★ If the cable or cable housing is kinked or frayed, replace the cable with the motor box.
- ★ If the seal at either end of the cable is damaged in any way, replace the cable with the trim actuator.
- Check the boot [A] on the trim cable for hardening, cracking, checking, cuts, abrasions, and breaks.
- ★ If boot is damaged in any way, replace it.



Periodic Maintenance Procedure

- Be certain that the cable moves freely in both directions.
- Disconnect the cable joint [A] at each end of the cable.
- Take out the cable joint bolt [B] and disconnect the cable joint.



CAUTION

Never lay the watercraft on the right side. Water in the exhaust system may drain back into the engine causing serious damage.

- Slide the inner cable back and forth in the cable housing.
- ★ If the cable does not move freely, replace the cable with the motor box.

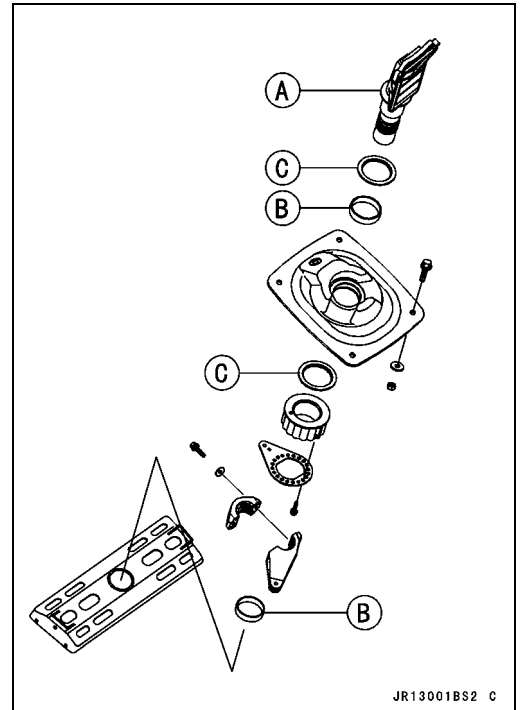
Trim Cable Lubrication

NOTE

- The trim cable is sealed at each end and do not require lubrication. If the seal is damaged, the cable must be replaced.

Handlebar Pivot Lubrication

- Remove the steering shaft [A] (see Steering chapter).
- Check the bushings [B] for damage and wear.
- ★ If the bushings are damaged or worn, replace them.
- Grease:
 - Bushings
 - Washers [C]



2-16 PERIODIC MAINTENANCE

Periodic Maintenance Procedure

Electrical System

Battery Charging Condition Inspection

Battery charging condition can be checked by measuring battery terminal voltage.

- Disconnect the battery terminal cables (see Battery Removal in the Electrical System chapter).

CAUTION

Be sure to disconnect the negative terminal lead first.

- Measure the battery terminal voltage.

NOTE

○ Measure with a digital voltmeter [A] which can be read one decimal place voltage.

- ★ If the reading is below the specified, refreshing charge is required (see Refreshing Charge in the Electrical System chapter).

Battery Terminal Voltage

Standard: 12.6 V or more

- Connect the battery leads, positive first.

Spark Plug Inspection

- Remove the spark plugs (see Spark Plug Removal in the Electrical System).
- Examine the ceramic insulator [C] and electrodes [A] [B].
- ★ If the insulator appears glazed or very white, or if there are gray metallic deposits on the electrodes, combustion chamber temperatures are too high (see Troubleshooting in the Appendix chapter).
- ★ If the insulator appears dry and sooty the fuel/air mixture is overly rich (see Troubleshooting in the Appendix chapter).
- If the insulator and electrodes are wet and oily, an improper oil type or an excess oil output may be the cause.
- ★ If the ceramic insulator is cracked, replace the plug.
- ★ If the electrodes are badly worn or burned, replace the plug.
- Examine the spark plug threads.
- ★ If the threads are damaged, replace the plug.

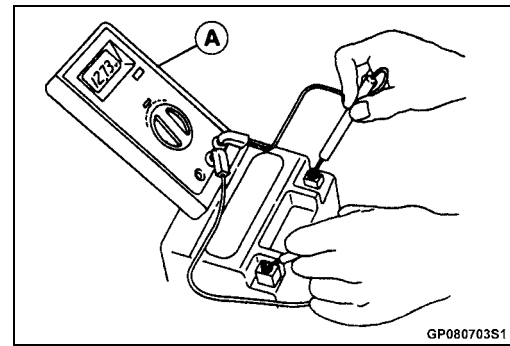
Spark Plug Adjustment

- Measure the spark plug gap [D].
- Check the distance between the electrodes with a feeler gauge or a wire gauge.

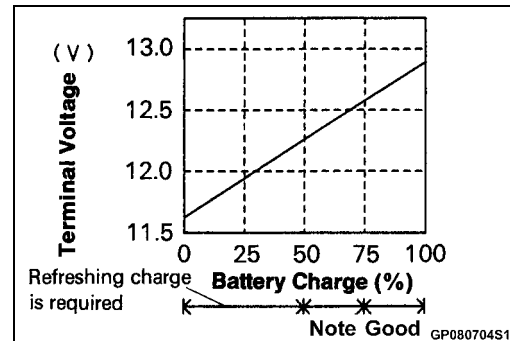
Spark Plug Gap

Standard: 0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)

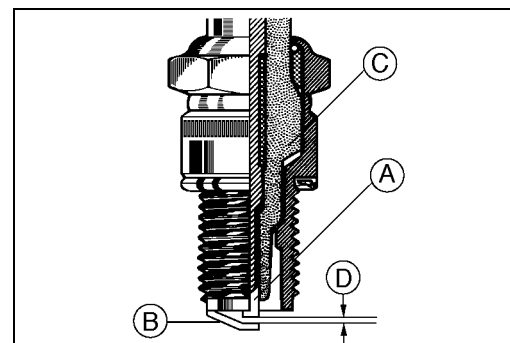
- ★ If the gap is not within specifications, adjust it.
- Adjust the gap by carefully bending the side electrode with a tool designed for this purpose.



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Periodic Maintenance Procedure

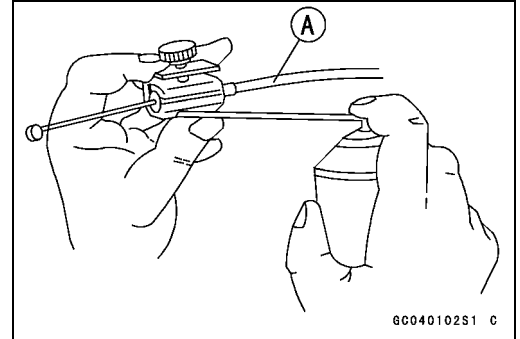
Spark Plug Cleaning

- Clean the electrodes and the ceramic insulator around the center electrode with an abrasive blasting device.
- Be certain that all abrasive particles are removed from the plug.
- Clean the entire plug in a high flash point solvent.

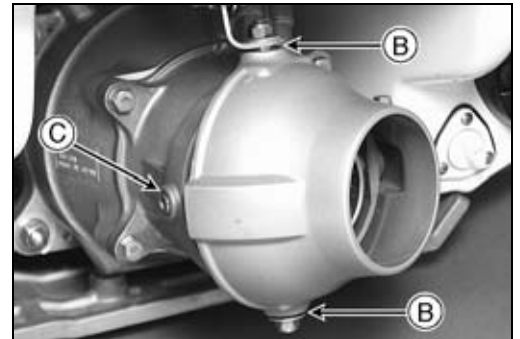
Lubrication

As in all marine craft, adequate lubrication and corrosion protection is an absolute necessity to provide long, reliable service. Refer to the Periodic Maintenance Chart for the frequency of the following items:

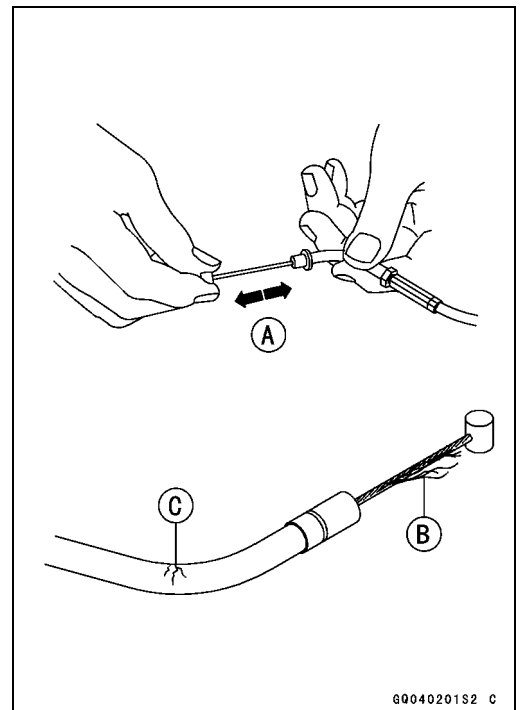
- Lubricate the following with a penetrating rust inhibitor.
 - Throttle Control Cable [A]**
 - Choke Cable [A]**
 - Smart Steering Cable [A]**



- Steering Nozzle Pivots [B]**
- Tilt Ring Pivots [C]**



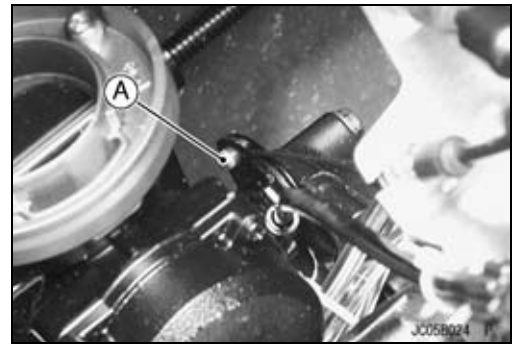
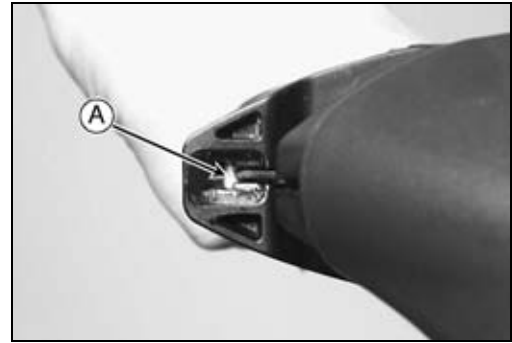
- With the cable disconnected at both ends, the cable should move freely [A] within the cable housing.
- ★ If cable movement is not free after lubricating, if the cable is frayed [B], or if the cable housing is kinked [C], replace the cable.



2-18 PERIODIC MAINTENANCE

Periodic Maintenance Procedure

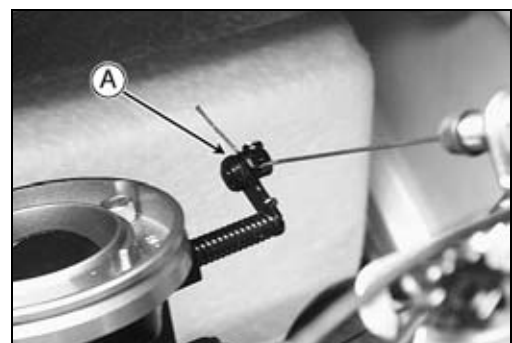
- Lubricate the following with grease.
Throttle Cable Ends [A]



Kawasaki Smart Steering Cable Ends [A]

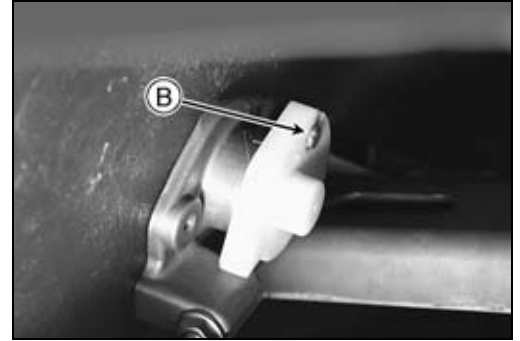


Choke Pivot Arm [A]



Periodic Maintenance Procedure

Choke Cable End [B]



All Hoses, Hose Clamp, Nuts, Bolts and Fasteners Check

Nuts, Bolts, and Fasteners Tightness Inspection

- Check the tightness of the bolts and nuts listed here. Also, check to see that each cotter pin is in place and in good condition.

NOTE

○ *For the engine fasteners, check the tightness of them when the engine is cold (at room temperature).*

- ★ If there are loose fasteners, retighten them to the specified torque following the specified tightening sequence. Refer to the appropriate chapter for torque specifications. If torque specifications are not in the appropriate chapter, see the Standard Torque Table. For each fastener, first loosen it by 1/2 turn, then tighten it.
- ★ If cotter pins are damaged, replace them with new ones.

Nut, Bolt, and Fastener to be checked

Engine:

Engine Bed Mounting Bolts
 Engine Mounting Bolts
 Engine Mount Bolts
 Air Inlet Cover Bolts
 Carburetor Mounting Bolts
 Inlet and Exhaust Manifold Nuts
 Exhaust Pipe Mounting Bolts
 Exhaust Chamber Mounting Bolts
 Cylinder Head Nuts
 Cylinder Base Nuts

Drive Shaft, Pump, and Impeller:

Drive Shaft Coupling
 Drive Shaft Holder Mounting Bolts
 Pump Mounting Bolts
 Pump Cover Mounting Bolts
 Pump Grate Mounting Bolts
 Impeller
 Steering Nozzle Pivot Bolts

2-20 PERIODIC MAINTENANCE

Periodic Maintenance Procedure

Steering:

- Handlebar Clamp Bolts
- Throttle Case Screws
- Switch Case Screws
- Steering Neck Mounting Bolts
- Steering Cover Mounting Bolts
- Handlebar Cover and Bracket Mounting Bolts

Hull and Engine Hood:

- Towing Eyes
- Bumper Nut or Rivets
- All Cable Joint Balls (Threads) and Joint Bolts

Electrical System:

- Spark Plug Caps
- Starter Motor Mounting Bolts
- Battery Terminal
- Ground Cable Mounting Nut

Hose and Hose Connect Inspection

- Check the following hoses for leakage [A] hardening, cracking [B], checking, cuts, abrasions, breaks and bulges [C]. And make sure the hoses are not kinked or pinched.

- Fuel Hoses
- Fuel Vent Hose
- Oil Hoses
- Cooling Hoses
- Bilge Hoses

- ★ If a hose is damaged in any way, replace it immediately and check all the others for damage.

- Make sure the above hoses are routed properly and secured with the clamps away from any moving parts and sharp edged portions.

- [A] Plastic Clamp
- [B] Hose
- [C] Hose Fitting

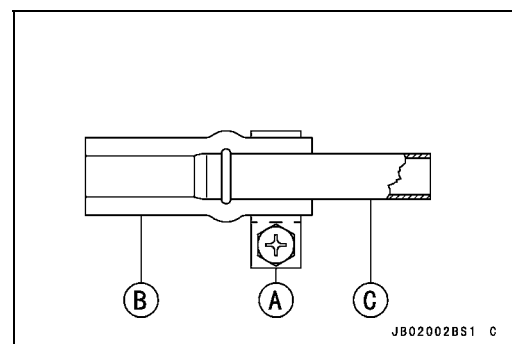
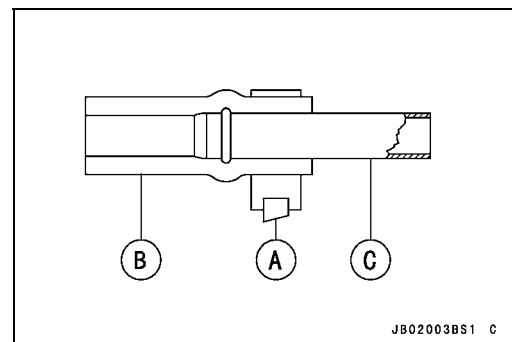
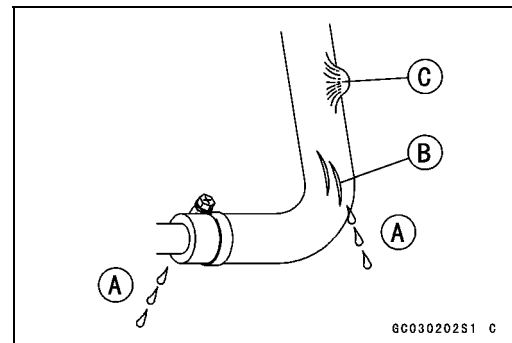
NOTE

- The majority of bilge hoses have no clamps at the hose ends.

- [A] Metal Clamp
- [B] Hose
- [C] Hose Fitting

NOTE

- Check the fuel and oil filler tubes and exhaust tubes for signs of wear, deterioration, damage or leakage. Replace if necessary.
- Make sure the above tubes are secured with the metal gear clamps away from any parts.



Periodic Maintenance Procedure

Rubber Strap Inspection

- Check the following rubber straps for any deterioration or damage. Pull on squeeze the straps and look for cracks.
 - Battery Straps [A]
 - Fuel and Oil Tanks Straps
 - Water Box Muffler Straps
- ★ If a strap is damaged in any way, replace it.



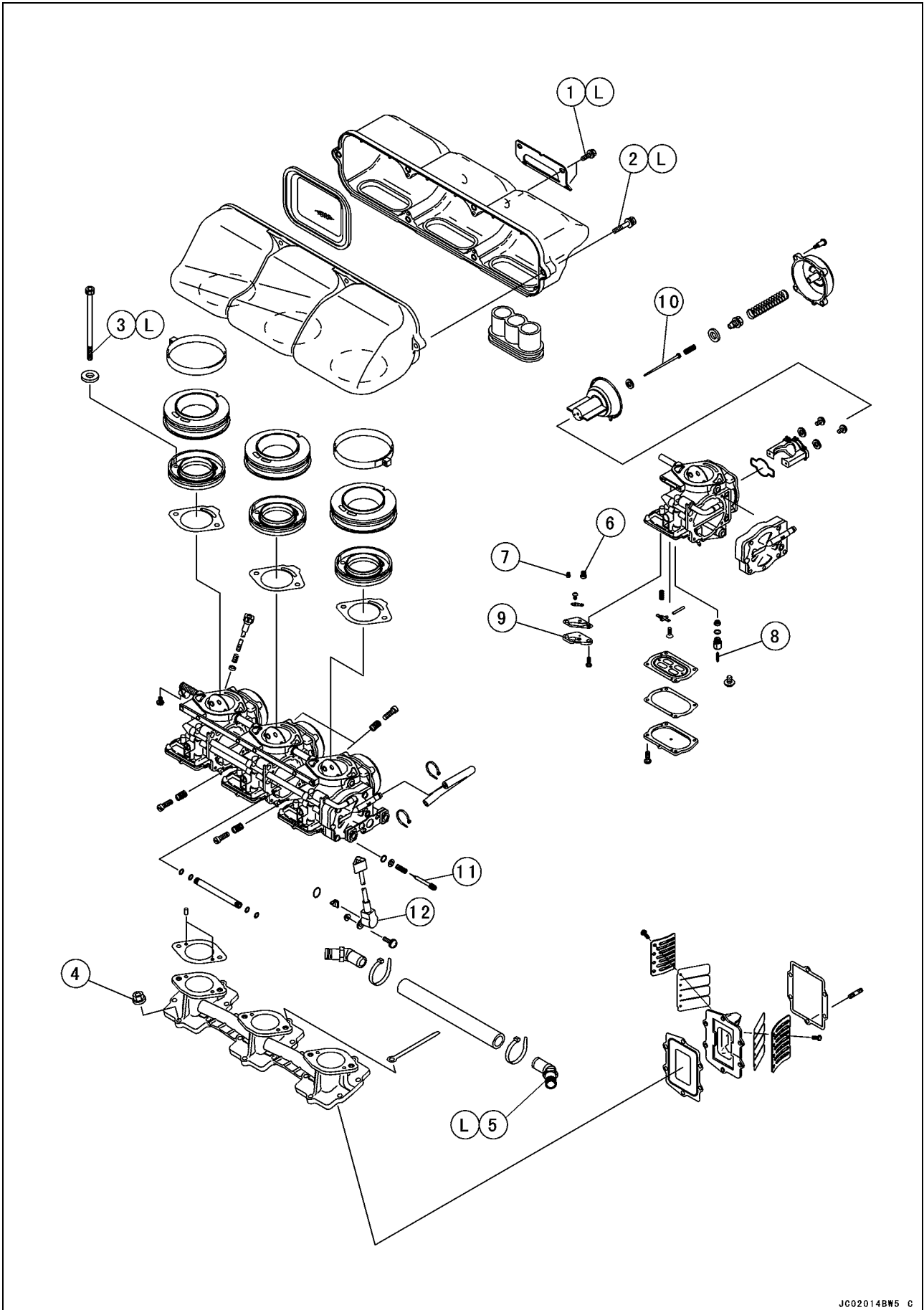
Fuel System

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3-2 FUEL SYSTEM

Exploded View



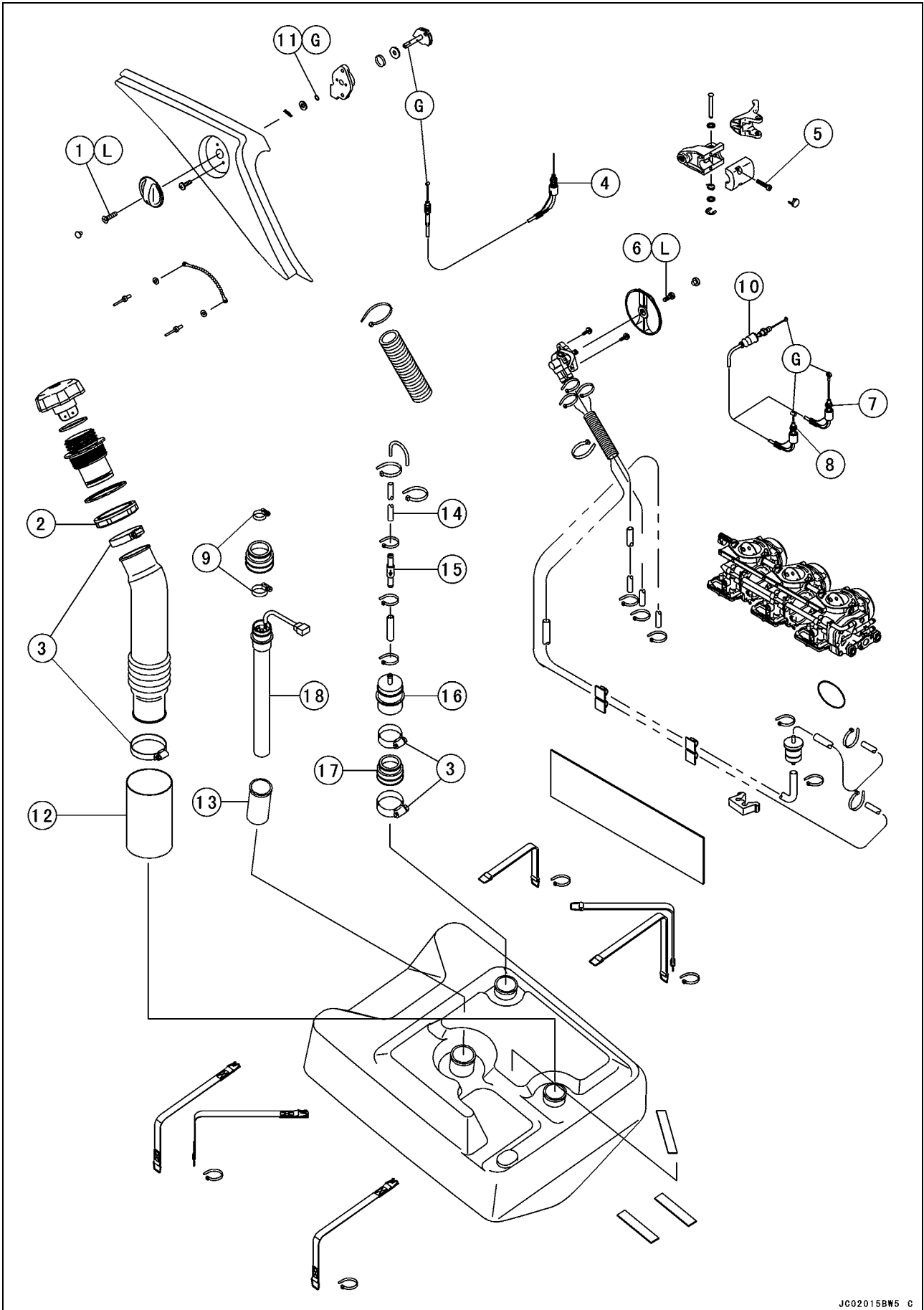
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Flame Arrester Bracket Bolts	–	–	–	L
2	Air Inlet Cover Mounting Bolts	7.8	0.8	69 in·lb	L
3	Carburetor Mounting Bolts	8.8	0.9	78 in·lb	L
4	Inlet Manifold Mounting Nuts	9.8	1.0	87 in·lb	
5	Air Inlet Connecting Elbows	7.8 ~ 14	0.8 ~ 1.4	69 ~ 121 in·lb	L

- 6. Main Jet
 - 7. Pilot Jet
 - 8. Inlet Valve
 - 9. Check Valve
 - 10. Jet Needle
 - 11. Pilot Screw
 - 12. Throttle Sensor
- L: Apply a non-permanent locking agent.

3-4 FUEL SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Choke Knob Set Screw	–	–	–	L
2	Fuel Filler Nut	4.9	0.5	43 in·lb	
3	Fuel Filler Tube Clamps	2.9	0.3	26 in·lb	
4	Choke Cable Adjuster Locknuts	7.8	0.8	69 in·lb	
5	Throttle Case Mounting Screws	3.9	0.4	35 in·lb	
6	Fuel Tap Set Screw	–	–	–	L
7	Oil Pump Cable Mounting Bolt	7.8	0.8	69 in·lb	
8	Carburetor Cable Adjuster Locknuts	7.8	0.8	69 in·lb	
9	Fuel Level Sensor Clamps	2.9	0.3	26 in·lb	

- 10. Throttle Cable
 - 11. Choke Knob Shaft O-ring
 - 12. Fuel Tube
 - 13. Buffer Pipe
 - 14. Fuel Vent Hose
 - 15. Fuel Vent Check Valve
 - 16. Fuel Vent Pipe
 - 17. Rubber Holder
 - 18. Fuel Level Sensor Assembly
- G: Apply grease.
 L: Apply a non-permanent locking agent.

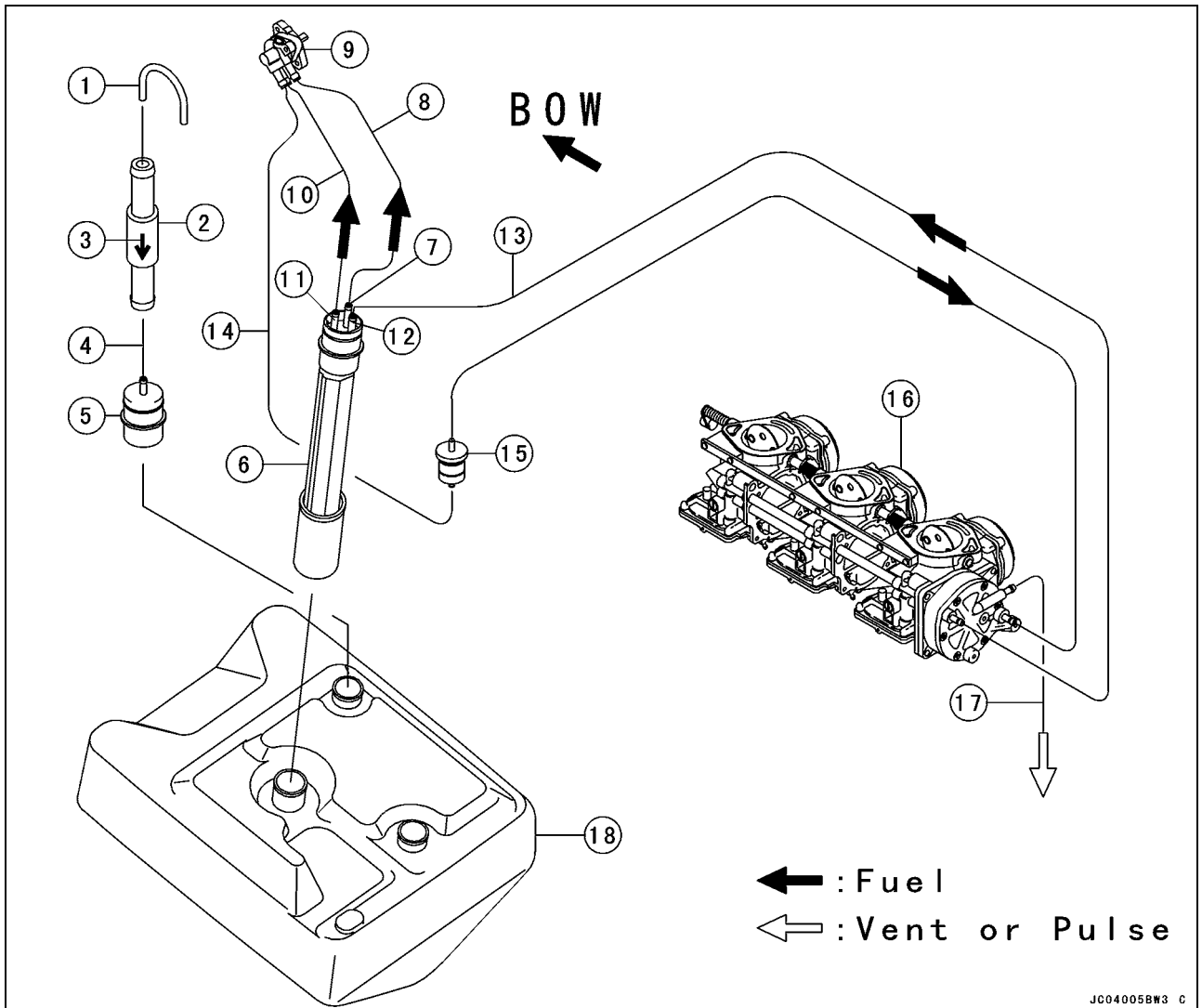
3-6 FUEL SYSTEM

Specifications

Item	Standard	Service Limit
Carburetor		
Make, Type	Keihin, CDCV 40-35 × 3	---
Size	35 mm (1.378 in.) Venturi	---
Main Jet:		
Front	#165 (#155-for high altitude)	---
Middle	#165 (#155-for high altitude)	---
Rear	#165 (#155-for high altitude)	---
Pilot Jet:		
Front	#48 (#45-for high altitude)	---
Middle	#48 (#45-for high altitude)	---
Rear	#48 (#45-for high altitude)	---
Pilot Screw	1 1/4 ±1/2 turn open	---
Jet Needle Mark	N8DC	---
Inlet Valve System:		
Valve Seat Size	1.6 mm (0.063 in.)	---
Arm Spring Load	0.18 N (18 g)	---
Pop-Off Pressure	108 kPa (1.10 kgf/cm ² , 15.6 psi)	---
Idle Speed:		
In Water	1 250 ±100 r/min (rpm)	---
Out Of Water	1 800 ±100 r/min (rpm)	---
Reed Valve		
Reed Warp	---	0.2 mm (0.008 in.)
Fuel Tank		
Capacity	58 L (15.3 US gal) including 7 L (1.85 US gal) reserve	---

Sealant - Kawasaki Bond (Silicone Sealant): 56019-120

Fuel System Diagram



1. Fuel Vent Pipe
2. Fuel Vent Check Valve: The fuel vent check valve must be mounted so that the arrow is pointing toward the fuel tank.
3. Arrow Mark
4. Fuel Vent Line
5. Fuel Vent Pipe
6. Fuel Filter/Pipe
7. ON
8. Main Line
9. Fuel Tap
10. Reserve Line
11. RESERVE
12. RETURN
13. Return Line
14. Supply Line
15. Fuel Filter
16. Carburetor
17. Pulse Line
18. Fuel Tank

3-8 FUEL SYSTEM

Throttle Control Cable

Carburetor Cable Adjustment

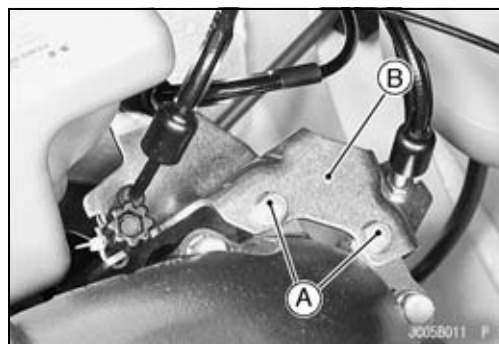
- Refer to Carburetor Cable Adjustment in the Periodic Maintenance chapter.

Oil Pump Cable Adjustment

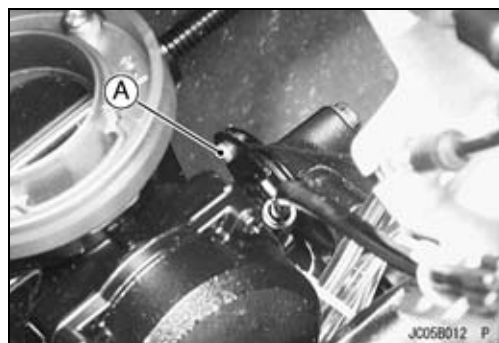
- Refer to Oil Pump Cable Adjustment in the Periodic Maintenance chapter.

Throttle Case and Throttle Control Cable Removal

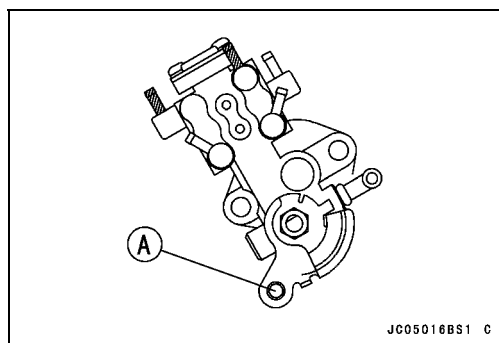
- Loosen the adjuster locknuts of the carburetor and oil pump cables.
- Take out the bolt [A] of the cable holder [B] and move the holder with the control cables to port side to make the service easier.



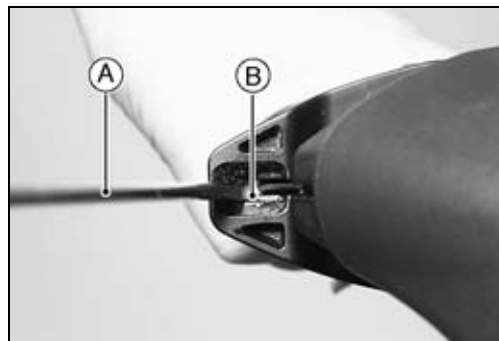
- Disconnect the carburetor cable from the carburetor.
- Unscrew the adjuster locknuts and slide the cable from the cable holder.
- Slide the cable tip [A] from the throttle shaft lever.



- Disconnect the oil pump cable from the oil pump cable.
- Unscrew the adjuster locknuts and slide the cable from the cable holder.
- Take out the bolt [A] and disconnect the oil pump cable end.



- Remove the handlebar with the throttle case and the start/stop switch case (see Handlebar Removal in the Steering chapter).
- Disconnect the throttle cable from case.
- Use a screw driver [A] to separate the tip of the cable end [B] from the case body.
- Slide the rubber boot out of the place.
- Unscrew the throttle cable fitting nut.
- Pull down the throttle control cable.



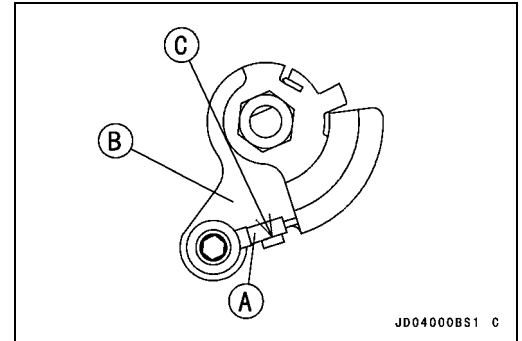
Throttle Control Cable

Throttle Case and Throttle Control Cable Installation

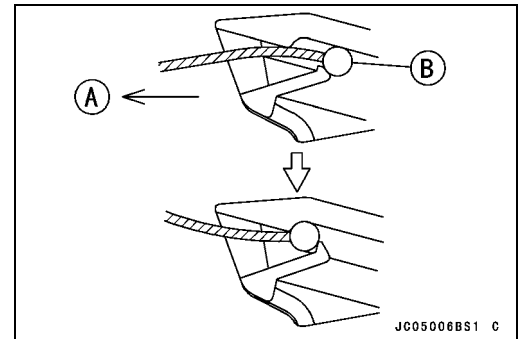
- Install the oil pump cable [A] on the pulley [B].
- Apply a non-permanent locking agent to the oil pump cable mounting bolt and torque it.

Torque - Oil Pump Cable End Mounting Bolt: 4.9 N·m (0.5 kgf·m, 43 in·lb)

- Be sure the cable portion indicated in the illustration is in contact [C] with the pulley portion indicated in the illustration.



- Pulling the throttle cable [A], position the tips of the cable end [B] as shown.



- Route the following correctly (see Appendix chapter).

Throttle Cable
 Carburetor Cable
 Oil Pump Cable
 Choke Cable

- Adjust the following.

Throttle Cable
 Carburetor Cable
 Oil Pump Cable
 Choke Cable (if necessary)

Torque - Carburetor Cable Adjuster Locknuts: 7.8 N·m (0.8 kgf·m, 69 in·lb)

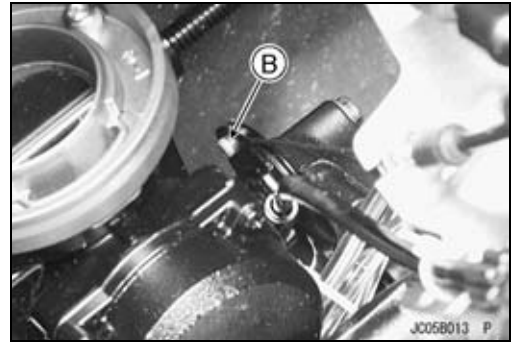
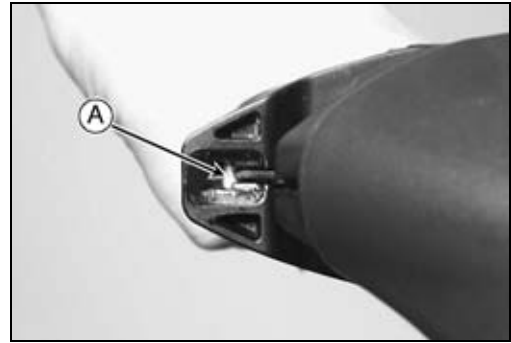
Carburetor Cable Adjuster Locknuts: 7.8 N·m (0.8 kgf·m, 69 in·lb)

3-10 FUEL SYSTEM

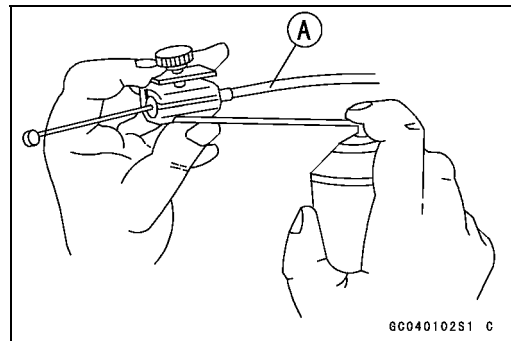
Throttle Control Cable

Throttle Control Cable Lubrication

- Apply grease to the tips of the throttle [A]/carburetor [B] cable ends.

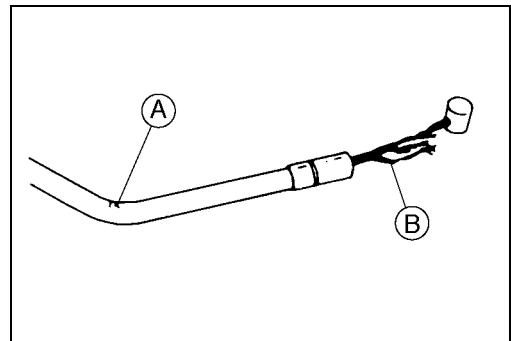


- Lubricate the cable [A] by seeping oil between the cable and cable housing.



Throttle Control Cable Inspection

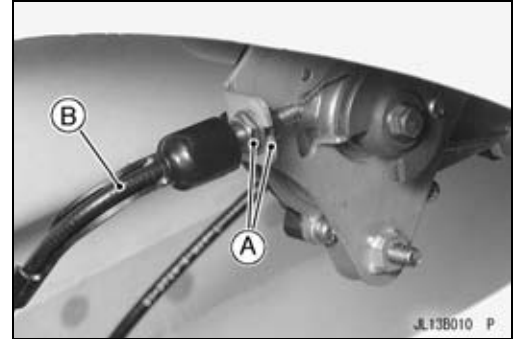
- Examine the cable.
- ★ If the cable or cable housing is kinked [A] or frayed [B], replace the cable.
- Be certain that the throttle control cable moves freely in both directions.
- Loosen the adjuster locknuts, and slide the cable from the pulley.
- Slide the inner cable back and forth in the cable housing.
- ★ If the cable does not move freely, replace it.



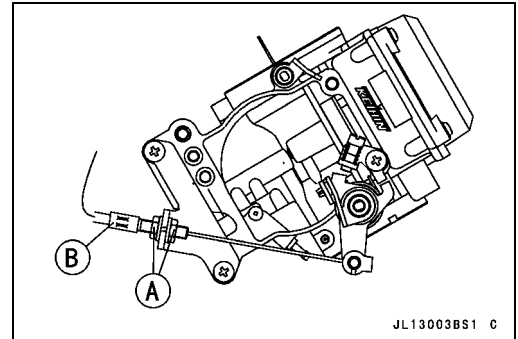
Smart Steering Cable

Cable Removal

- Remove the flame arrester (see this chapter).
- Unscrew the adjuster locknuts [A] and slide the cable [B] from the cable holder (pulley side).

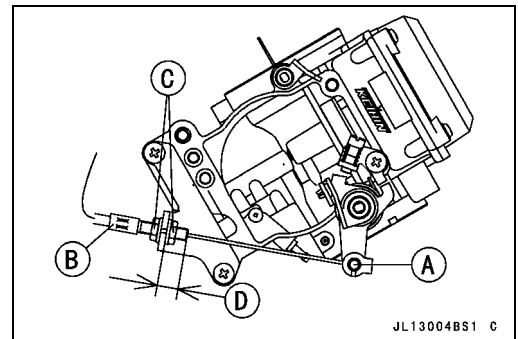


- Unscrew the adjuster locknuts [A] and slide the cable [B] from the cable holder (carburetor side).

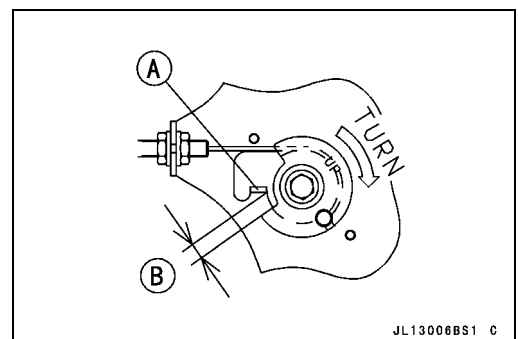


Cable Installation

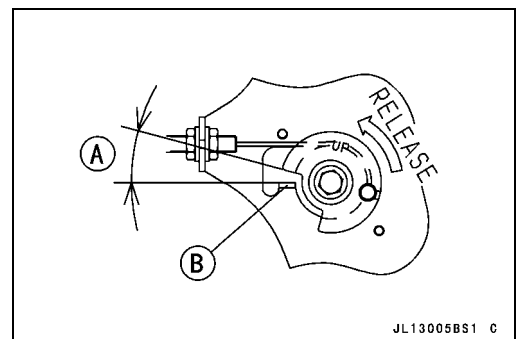
- Fit the actuator cable end [A] into the carburetor lever.
- Slide the cable [B] and screw the adjuster locknuts [C] into the holder as shown.
[D] 10 ±1 mm (0.40 ±0.04 in.)



- Check the following after setting the cable end to the pulley.
 - The pulley must not come into contact with one side of stopper when turning the pulley completely clockwise.
 - [A] Projection
 - [B] Maintain clearance



- The pulley must not come into contact with the other side of stopper when releasing the pulley completely.
 - [A] Maintain clearance
 - [B] Projection
- If the pulley contacts the projection, check the cable adjustment and adjust as necessary.



3-12 FUEL SYSTEM

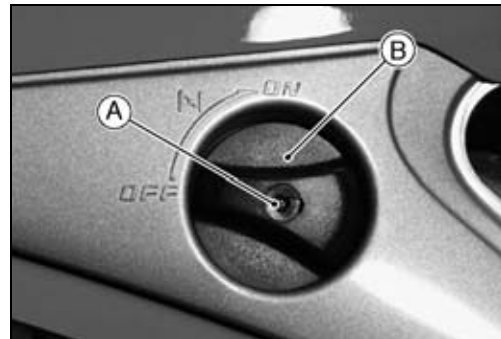
Choke Cable

Choke Cable Adjustment

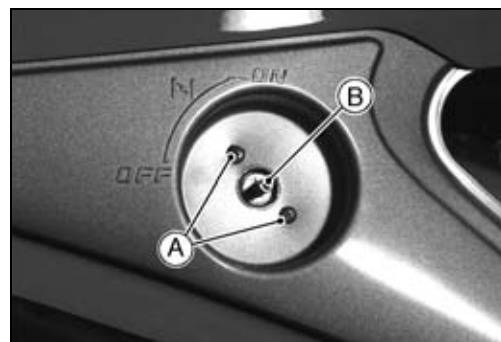
- Refer to Choke Cable Adjustment in the Periodic Maintenance chapter.

Choke Knob and Cable Removal

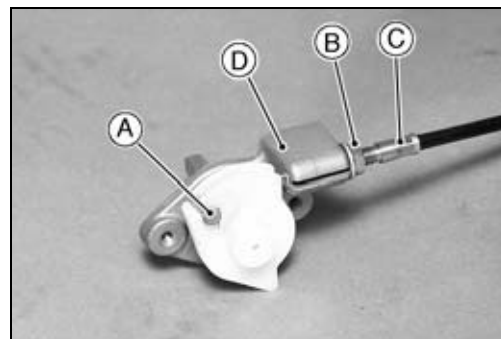
- Disconnect the choke cable from the carburetor.
- Remove the plug.
- Remove the set screw [A] and take out the choke knob [B].



- Remove the cable holder mounting screws [A].
- Pull the choke knob shaft [B] with cable holder out of the hull.

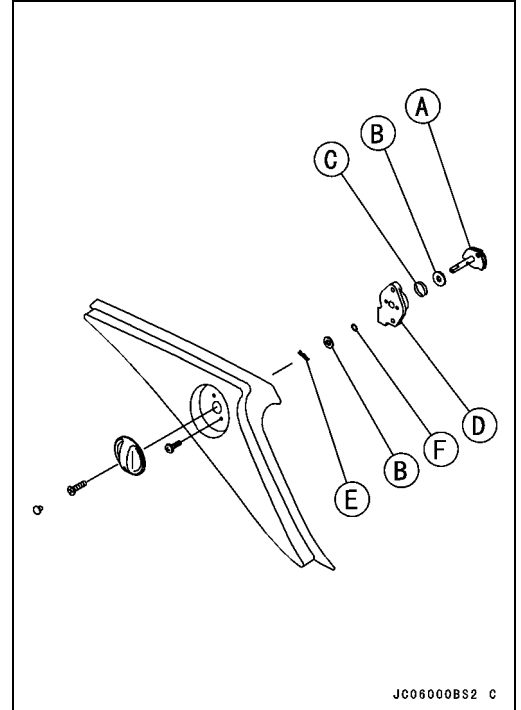


- Slide the tip [A] of the choke inner cable out of the pulley on the choke knob shaft.
- Loosen the locknut [B] and unscrew the cable housing [C] from the holder [D].



Choke Cable

- Remove the pin and washer, and pull out the choke knob shaft from the cable holder.
 - A. Choke Knob Shaft
 - B. Washer
 - C. Spring
 - D. Cable Holder
 - E. Pin
 - F. O-ring

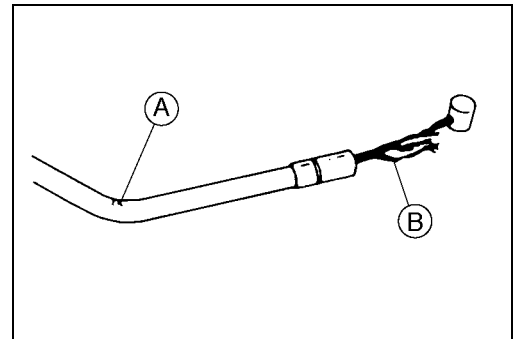


Choke Knob and Cable Installation

- Route the choke cable according to the Cable Routing section in the Appendix chapter.
- Adjust the choke cable (see Choke Cable Adjustment in the Periodic Maintenance chapter).

Inspection

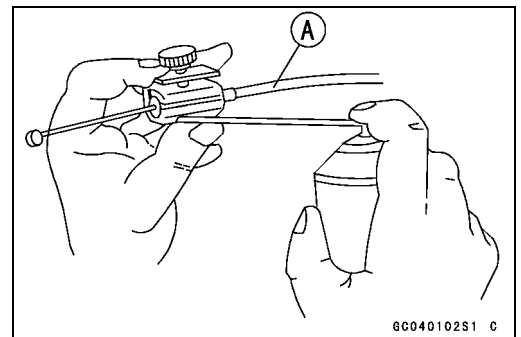
- Examine the cable.
- ★ If the cable or cable housing is kinked [A] or frayed [B], replace the cable.
- With the choke cable disconnected at the both ends, the cable should move freely within the cable housing.
- ★ If the cable does not move freely, replace it.



Lubrication

Whenever the choke cable removed, lubricate the choke cable as follows.

- Apply grease to the tip of the choke cable end.
- Lubricate the choke cable [A] by seeping oil between the cable and cable housing.
- Attached the choke cable to the carburetor and adjust the choke cable (see Choke Cable Adjustment in the Periodic Maintenance chapter).



3-14 FUEL SYSTEM

Carburetor/Fuel Pump

Idle Speed Adjustment

- Refer to Idle Speed Adjustment in the Periodic Maintenance chapter.

Carburetor Synchronization

- Refer to Carburetor Synchronization in the Periodic Maintenance chapter.

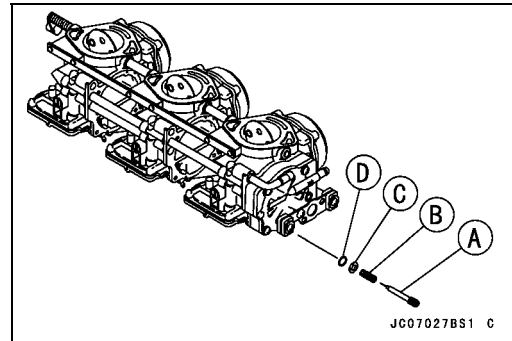
Pilot Screw Removal/Installation

- Turn in the pilot screw [A] and count the amount of turns until it seats thoroughly and then remove the screw. The purpose is to set the screw to its original position when installing.

Spring [B]

Washer [C]

O-ring [D]

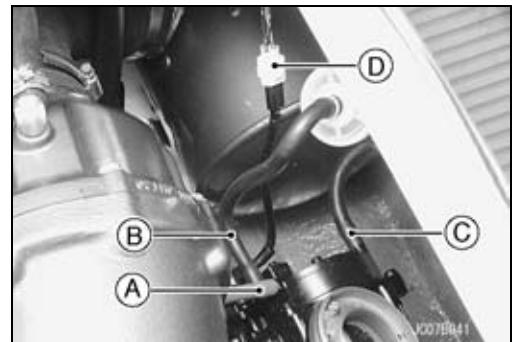


- ★ If the carburetor is tampered with or counting the amount of turns is not performed, set the pilot screw to the specified amount of turns.

Pilot Screw 1 1/4 ±1/2 turn open

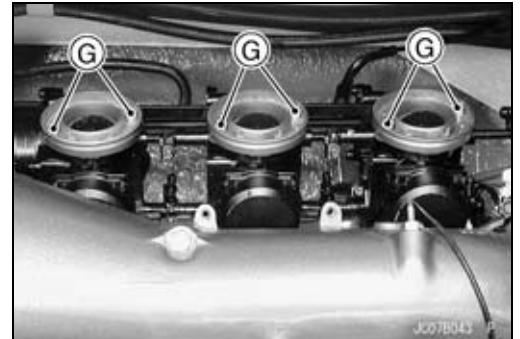
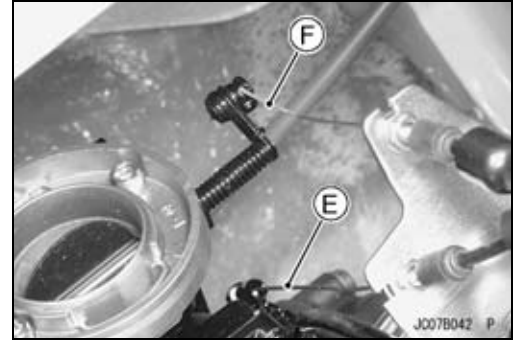
Carburetor Removal

- Remove or Disconnect:
 - Air Inlet Cover
 - Arrester Case
 - Pulse Hose [A]
 - Fuel (Supply) Hose [B]
 - Fuel (Return) Hose [C]
 - Throttle Sensor Lead Connector [D]

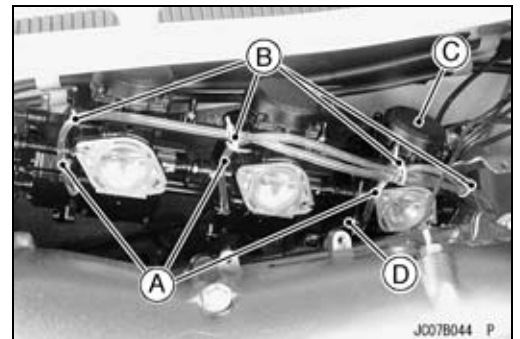


Carburetor/Fuel Pump

- Carburetor Cable [E]
- Choke Cable [F]
- Carburetor Mounting Bolts [G]

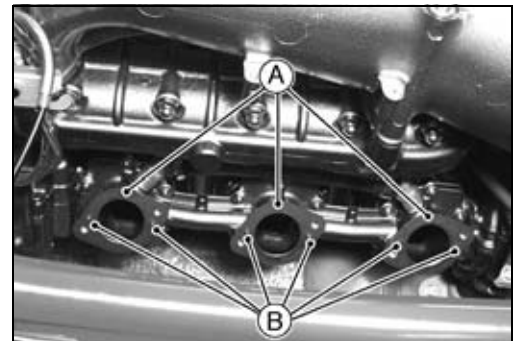


- Remove the clamps on the stay.
- Disconnect the inlet oil hoses [A] and clamps [B] which lead to the carburetors, lifting the carburetor assembly [C].
- Remove the smart steering cable [D] from the carburetor.
- Lift the carburetor assembly off the inlet manifold.



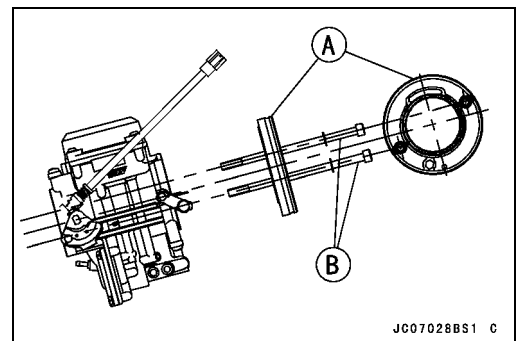
Carburetor Installation

- Install new gaskets [A] under the carburetors.
- Be sure the dowel pins [B] are in place.
- Installation either obverse or reverse side is available.



- Connect the oil inlet hose (see Appendix chapter).
- Install the cases [A] on the carburetors noting the direction (indicated in the figure).
- Apply a non-permanent locking agent to the carburetor mounting bolts [B] and torque.

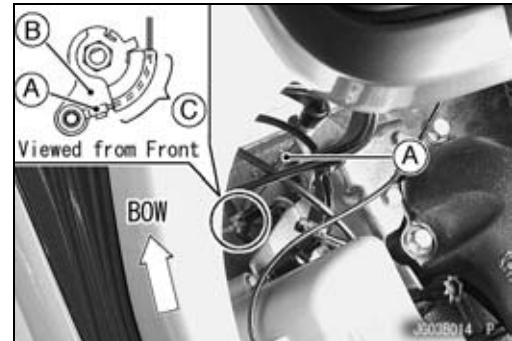
Torque - Carburetor Mounting Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)



3-16 FUEL SYSTEM

Carburetor/Fuel Pump

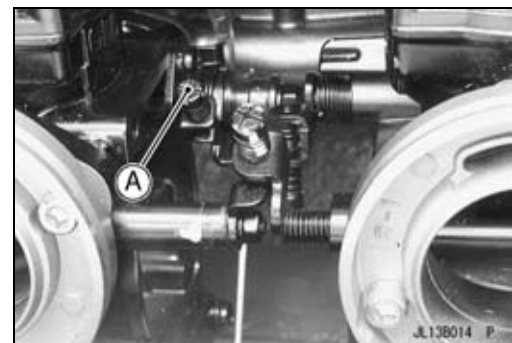
- Connect the fuel and pulse hoses correctly (see Appendix chapter).
- Adjust the throttle control and choke cables (see Throttle Control and Choke Cable Adjustment in the Periodic Maintenance chapter).
- Check the oil pump cable installation as follows.
 - Pull the throttle lever to ensure if the oil pump cable [A] makes the oil pump pulley [B] turn.
 - Make sure the lower part [C] of the oil pump cable is installed the oil pump pulley securely.
 - ★ If necessary, reinstall the oil pump cable to the pulley and adjust it (see Oil Pump Cable Adjustment in the Fuel System chapter).



Carburetor Disassembly

NOTE

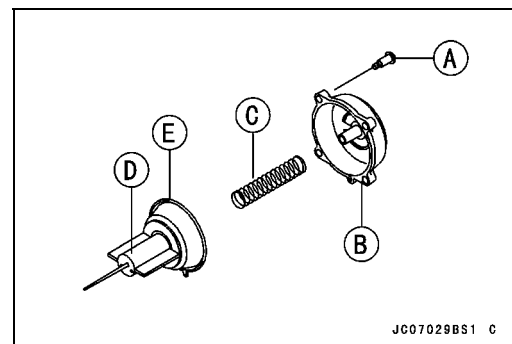
- Do not adjust the stop screw [A].
- The stop screw has been adjusted at the factory, it is not necessary to adjust.
- ★ If the stop screw is turned, it will cause engine trouble.



WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Pull the lanyard key off the stop button. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

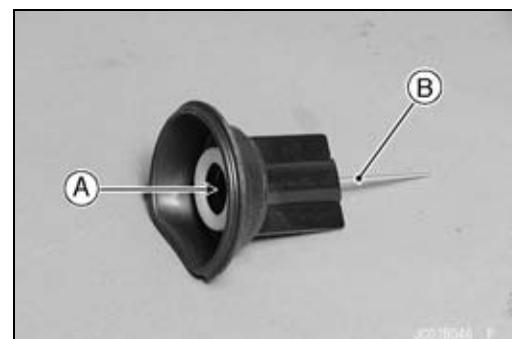
- Remove the carburetor (see Carburetor Removal).
- Unscrew the carburetor cap screws [A] and take off the carburetor cap [B].
- Remove:
 - Cap Spring [C]
 - Vacuum Piston [D] and Diaphragm [E]



CAUTION

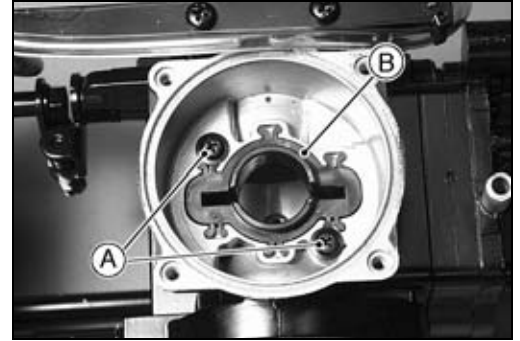
During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove the diaphragm.

- Unscrew the jet needle holder bolt [A] and take off the holder spring and jet needle [B].

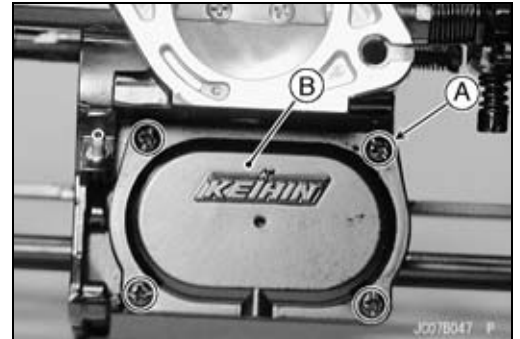


Carburetor/Fuel Pump

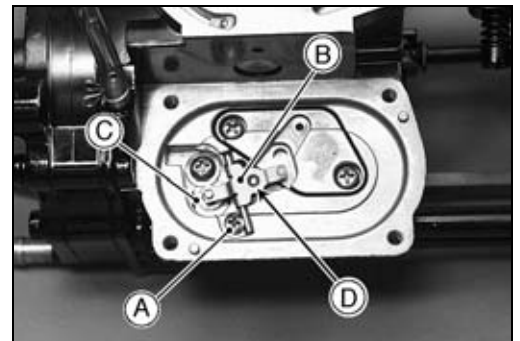
- Unscrew the vacuum piston holder screws [A] and take off the vacuum piston holder [B].



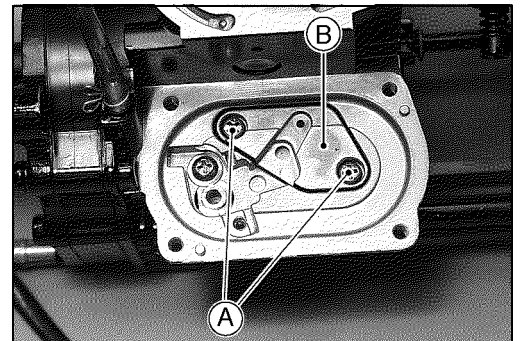
- Unscrew the carburetor cover screws [A] and take off the carburetor cover [B].



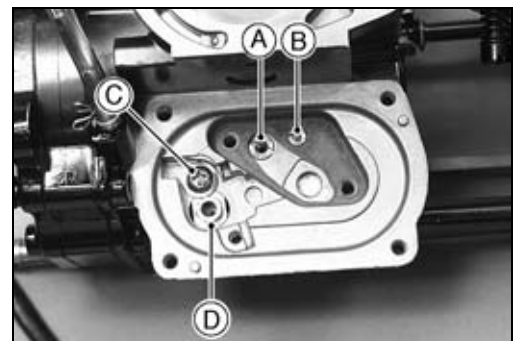
- Unscrew the float arm set screw [A].
- Remove:
 - Float Arm [B] and Pin
 - Inlet Valve [C]
 - Spring [D]



- Unscrew the check valve body screws [A] and take off the check valve body [B].



- Remove:
 - Main Jet [A]
 - Pilot Jet [B]
 - Screw [C]
 - Valve Seat [D]

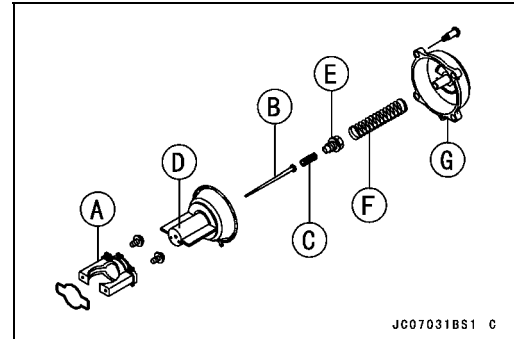
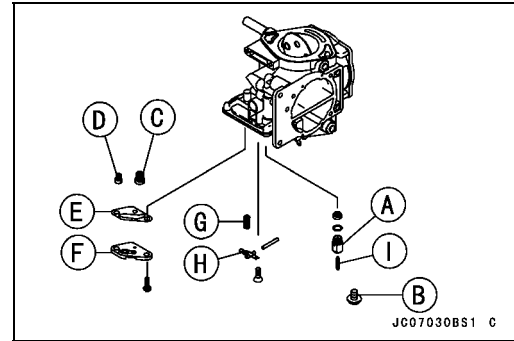


3-18 FUEL SYSTEM

Carburetor/Fuel Pump

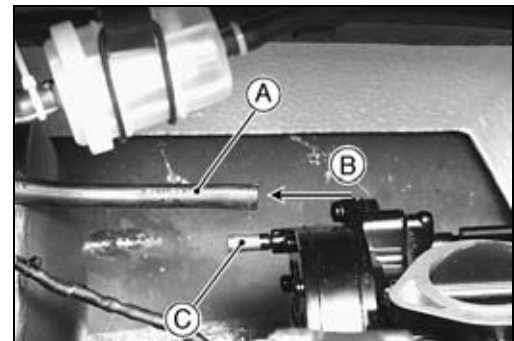
Carburetor Assembly

- Install:
 - Valve Seat [A] and Screw [B]
 - Main Jet [C]
 - Pilot Jet [D]
 - Gasket [E]
- Apply a non-permanent locking agent to the check valve body screws.
 - Check Valve Body [F] and Screws
 - Spring [G]
 - Float Arm [H] and Inlet Valve [I]
- Install the vacuum piston holder [A].
- Install the jet needle [B] and holder spring [C] in the vacuum piston [D], and tighten the jet needle holder bolt [E].
- Install:
 - Cap Spring [F]
 - Carburetor Cap [G]



NOTE

○After the carburetor has been disassembled and cleaned, it should be primed before starting the engine to save the battery. Pull off the fuel return hose [A] at the carburetor, and blow [B] through it until fuel appears at the fuel return fitting [C] on the carburetor. The fuel system is now full of fuel.



Carburetor Cleaning and Inspection

- Disassemble the carburetor (see Carburetor Disassembly).

WARNING

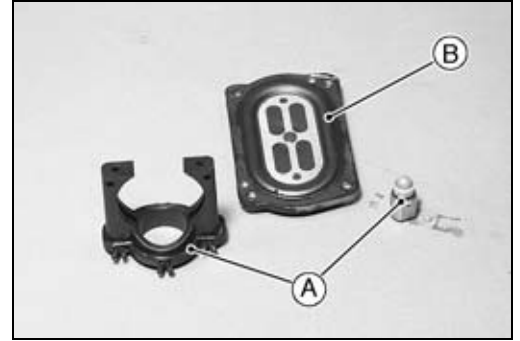
Solvent is toxic and flammable. Avoid prolonged contact with skin and keep away from open flame. Use only in a well-ventilated area. Eye protection should be worn when compressed air is used to dry parts. Do not direct air toward anyone. Use 172 kPa (1.75 kgf/cm², 25 psi) maximum nozzle pressure.

- Immerse all the metal parts in a carburetor cleaning solution.
- Rinse the parts in water.
- When the parts are clean, dry them with compressed air.
- Blow out the air and fuel passages with compressed air.
- Inspect the check valve [A] for damage or deterioration, and replace it if necessary.
- ★ If the gasket [B] under the check valve appears damaged, it may leak and must be replaced.

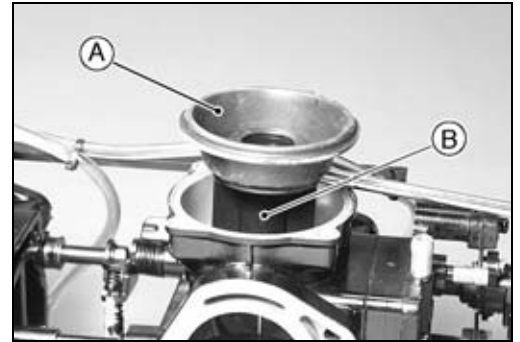


Carburetor/Fuel Pump

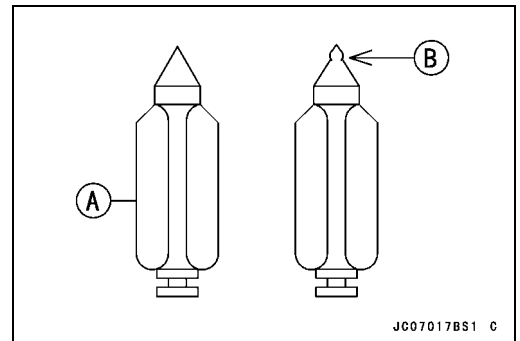
- Check these rubber parts for damage.
 - O-ring [A]
 - Diaphragm [B]
- ★ If any of these parts are not in good condition, replace them.



- Check the vacuum piston diaphragm [A] for damage.
 - ★ If it is not in good condition, replace it.
- Check that the vacuum piston [B] moves smoothly in the carburetor body. The surface of the piston must not be excessively worn.
- ★ If the vacuum piston does not move smoothly, or if it is very loose in vacuum piston holder, replace the piston and/or the holder.



- Check the plastic tip on the inlet valve. It should be smooth, without any grooves, scratches, or tears.
 - Inlet Valve [A]
 - Inlet Valve Wear [B]
- ★ If the plastic tip is damaged, replace inlet valve.



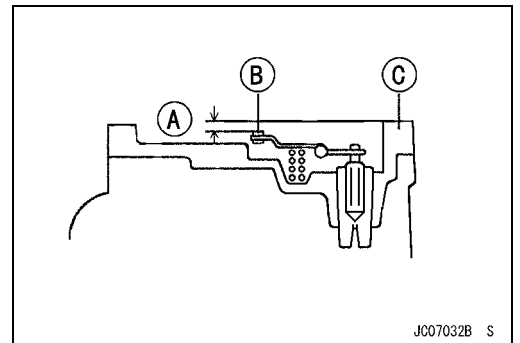
JC07017BS1 C

Float Arm Level Inspection and Adjustment

- Check the float arm level [A].
 - Measure from the plastic tip [B] on the float arm to the carburetor case [C].

Float Arm Level: 1.0 ~ 2.0 mm (0.04 ~ 0.08 in.)

- ★ If the float arm level is incorrect, bend the float arm very slightly to changed the float arm level.



JC07032B S

3-20 FUEL SYSTEM

Carburetor/Fuel Pump

Pop-off Pressure Inspection

- Pull the fuel inlet and return hoses out of their fittings on the carburetor.
- Connect the hose of the air-pump gauge tester [A] to the fuel inlet fitting [B].
- Press down the fuel return fitting [C] securely with a finger.
- Pump the tester until the inlet release pressure is reached (seen by a sudden pressure drop).

Pop-off Pressure

Standard: 108 kPa (1.10 kgf/cm², 15.6 psi)

NOTE

○ Pressure inspection should be performed three times to obtain a correct reading.

- ★ If the pop-off pressure valve is not specified inspect the float arm level (see this chapter).

CAUTION

Do not stretch or cut the float arm spring.

Fuel Pump Removal/Installation

- Remove the carburetor.
- Remove the fuel pump body screws [A], and take the fuel pump unit [B] off the carburetor.

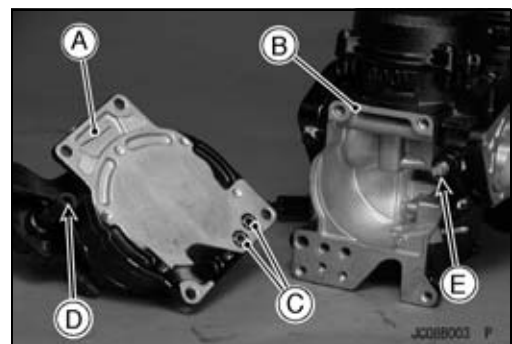
CAUTION

The fuel pump should not be disassembled. If leakage is evident or internal damage is suspected, replace the fuel pump unit [B].

- Note the following when installing the pump unit [A] to the carburetor assembly [B].
- Check the O-rings [C] for damage and if necessary, replace them.
- Align the slot [D] on the pump body with the shaft [E] on the carburetor assembly.

High Altitude Performance Adjustment

- Refer to High Altitude Performance Adjustment in the Periodic Maintenance chapter.



Flame Arrester

Removal

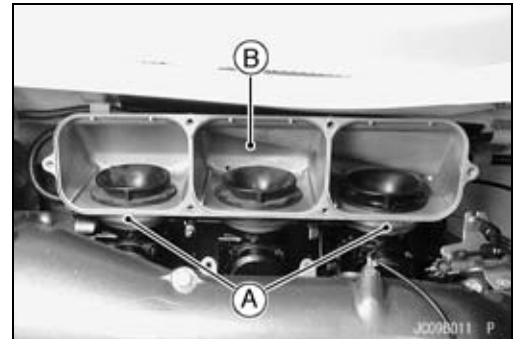
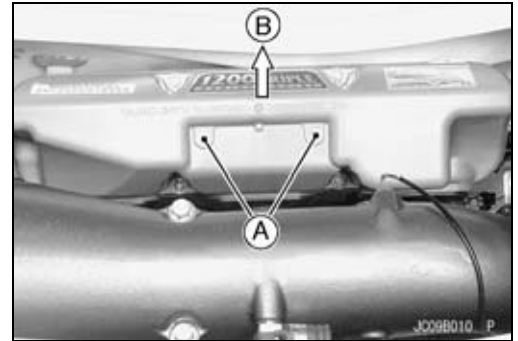
- Remove the bracket holding the air inlet cover.
- Unscrew the air inlet cover mounting bolts [A] indicated in the figure, pushing the air inlet cover [B] to the port side by hand.

NOTE

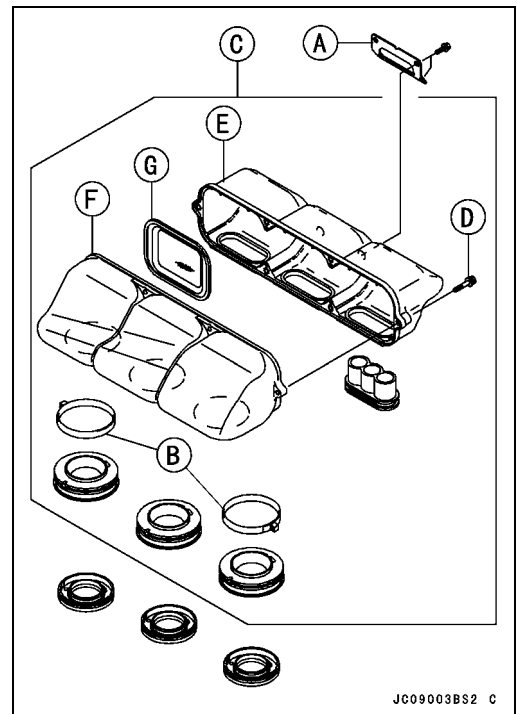
○Be careful not to drop the removed bolts into the hull bottom when removing.

- Unscrew the remained mounting bolts and remove the air inlet cover.

- Remove the flame arresters.
- Loosen the clamps [A] and take out the arrester case [B].



- Another way to remove the flame arresters is the following procedures.
 - Remove the bracket [A] holding the air inlet cover.
 - Loosen the clamps [B] and pull out the air inlet cover assembly [C].
 - Take out the air inlet cover mounting bolts [D] and separate the air inlet cover [E] from the arrester case [F].
 - Take out the flame arresters [G].

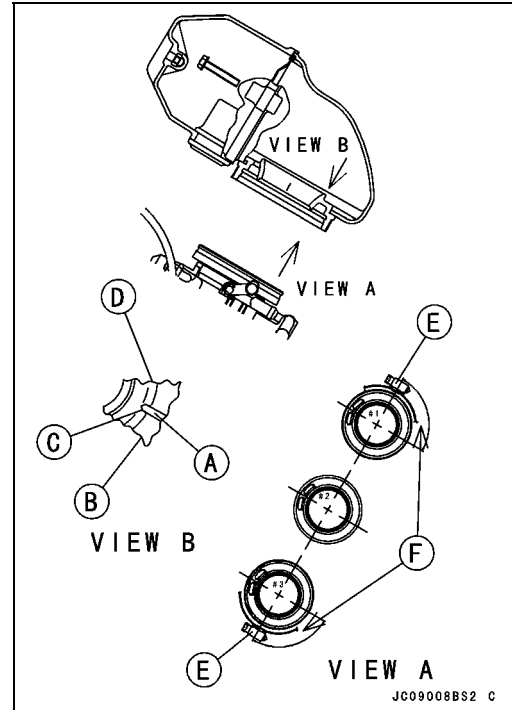


3-22 FUEL SYSTEM

Flame Arrester

Installation

- Be sure the ribs [A] on the arrester case [B] fit the grooves [C] on the duct [D].
- Tighten the clamp screws [E] within the range [F] indicated in the figure.
- The #2 duct has no clamp.



- Apply a non-permanent locking agent to the air inlet cover mounting bolts and torque them.

Torque - Air Inlet Cover Mounting Bolts: 7.8 N·m (0.8 kgf·m, 69 in·lb)

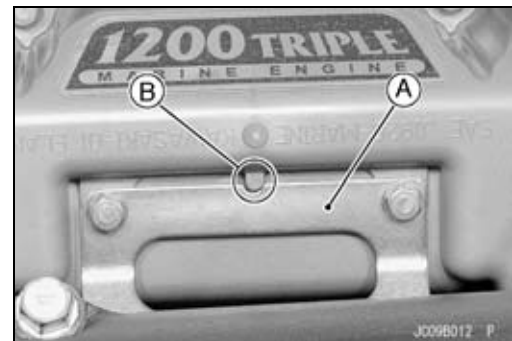
NOTE

○ Be careful not to drop the bolts into the hull bottom when installing.

- Install the bracket [A] aligning the groove on the bracket with the project on the air inlet cover [B].

Flame Arrester Cleaning

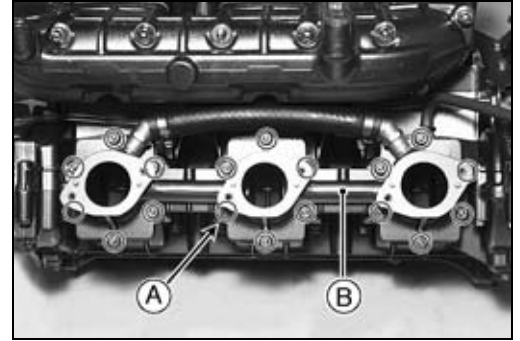
- Refer to Flame Arrester Cleaning in the Periodic Maintenance chapter.



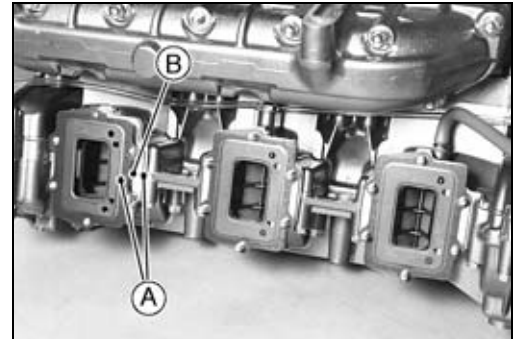
Inlet Manifold, Reed Valves

Inlet Manifold Removal

- Remove:
 - Air Inlet Cover
 - Arrester Case
 - Carburetor
- Remove the inlet manifold mounting nut [A] and remove the inlet manifold [B].

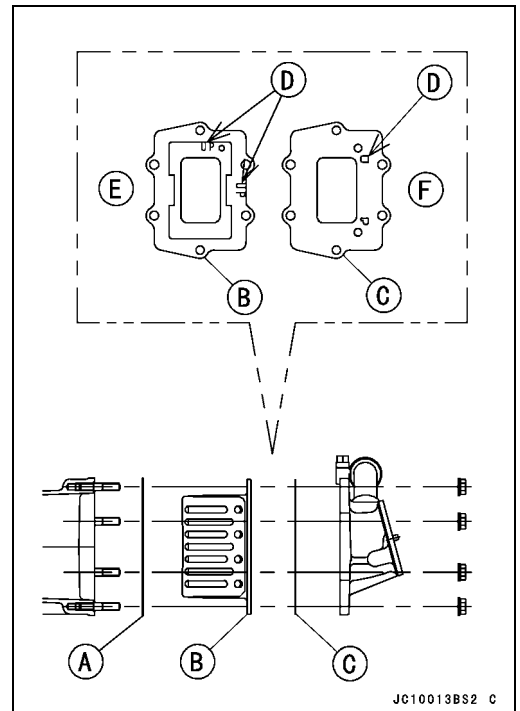


- Pull out the gaskets [A] and the reed valves [B].



Inlet Manifold Installation

- Replace the gaskets with new ones.
 - As for the base gaskets [A], installation either obverse or reverse side is available.
 - As for the reed valve assemblies [B] and the gasket [C], install them noting the direction of "UP" [D] letters.

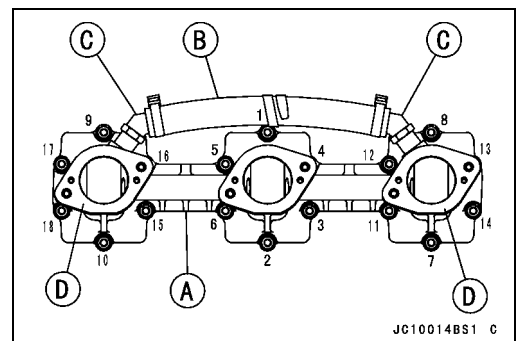


- Install the intake manifold [A].
 - Torque the mounting nuts, following the sequence indicated in the figure.

Torque - Inlet Manifold Mounting Nuts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

- When the balance tube [B] and air inlet connecting elbows [C] were removed, noting the following.
 - Apply a non-permanent locking agent to the threads of the elbows and torque the elbows, and then turn them inside so that they are parallel to the flange portion [D] of the inlet manifold.

Torque - Air Inlet Connecting Elbows: 7.8 ~ 14 N·m (0.8 ~ 1.4 kgf·m, 69 ~ 121 in·lb)



3-24 FUEL SYSTEM

Inlet Manifold, Reed Valves

Reed Valve Inspection

- Check reed warp by measuring the clearance [A] between each reed [B] and the valve holder [C].
- ★ If any one of the clearance measurements exceeds the service limits, replace the reed with a new one.
- ★ Check reed warp after installing a new reed.
- ★ If the clearance is correct, tight the mounting screws securely.

Reed Warp

Service Limit: 0.2 mm (0.008 in.)

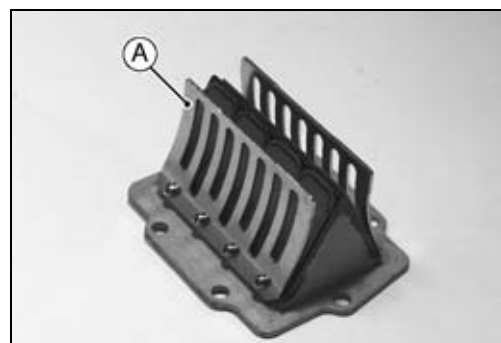
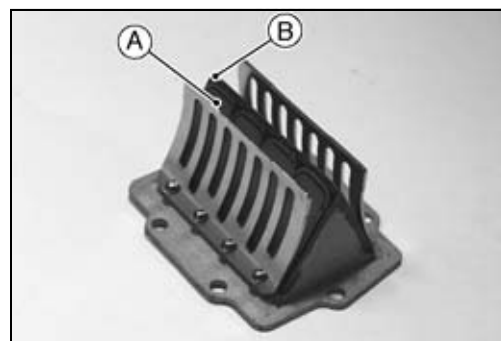
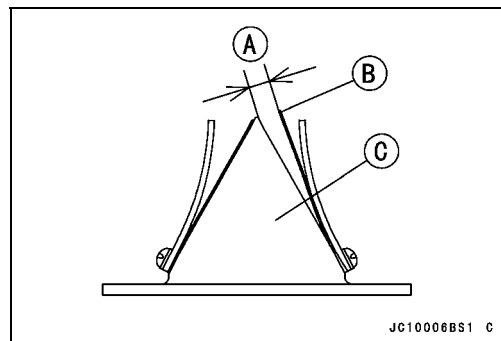
- Check the mounting screw tightness.
- Visually inspect the reeds for cracks, folds, or other damage.
- ★ If there is any doubt as to the condition of a reed, replace the reed.
- ★ If a reed becomes wavy, replace the reed with a new one even if reed warp is less than the service limit.
- Install the reed and stop onto the reed valve holder, aligning the chamfered corner of the reed with that of the reed stop.

Valve Holder Inspection

- Check the reed [A] contact areas of the valve holder for grooves, scratches, or other damage.
- Check that the rubber coating [B] on the valve holder does not show any signs of separation from the holder.
- ★ If there is any doubt as to the condition of the rubber coating, replace the reed valve holder with a new one.

Valve Stop Inspection

- Check the valve stops [A] for deformation, cracks, or other damage.
- ★ If there is any doubt as to the condition of a stop, replace the reed valve assembly with a new one.



Fuel Vent Check Valve

Fuel Vent Check Valve Mounting

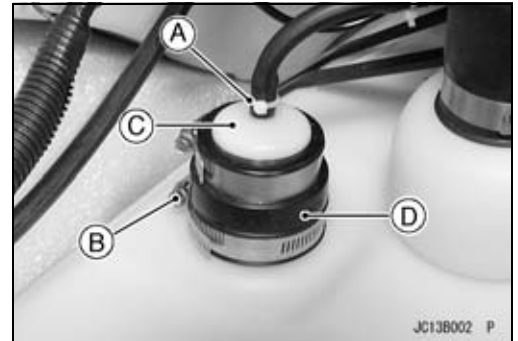
- Refer to Fuel Vent Check Valve Mounting in the Periodic Maintenance chapter.

Fuel Vent Check Valve Inspection

- Refer to Fuel Vent Check Valve Inspection in the Periodic Maintenance chapter.

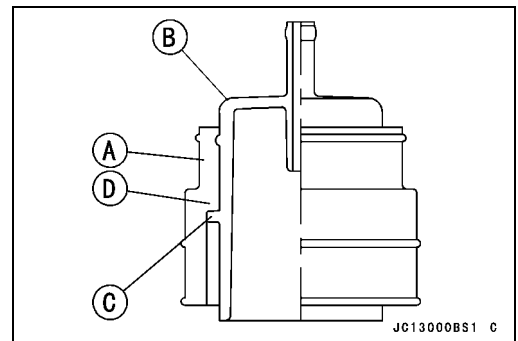
Fuel Vent Pipe Removal

- Cut off the clamp [A] at lower end of the fuel vent hose.
- Unscrew the lower side clamp [B] and pull the fuel vent pipe [C] with the rubber holder [D].



Fuel Vent Pipe Installation

- Install the rubber holder [A] on the fuel vent pipe [B] so the flanged part [C] of the pipe completely contacts the stepped part [D] of the holder.

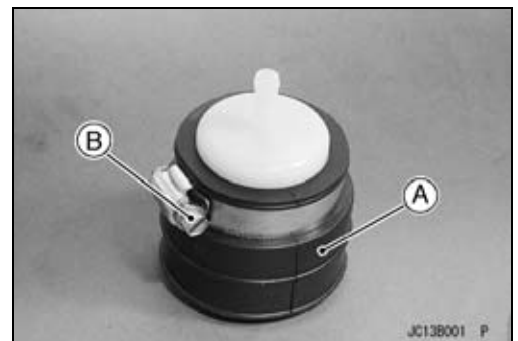


- Pressing down the rubber holder [A], tighten the small diameter clamp [B].

Torque - Small Diameter Clamp: 2.9 N·m (0.3 kgf·m, 26 in·lb)

- Insert the fuel vent pipe with rubber holder on the fuel tank and tighten the large diameter clamp.

Torque - Large Diameter Clamp: 2.9 N·m (0.3 kgf·m, 26 in·lb)



- Set the two clamp screws [A] so they do not hit the oil tank [B].



3-26 FUEL SYSTEM

Fuel Tank

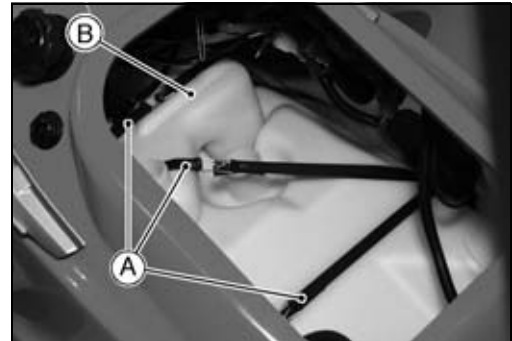
Fuel Tank Removal

- If the level of the fuel is above the filler neck, siphon some fuel out to prevent spilling it.

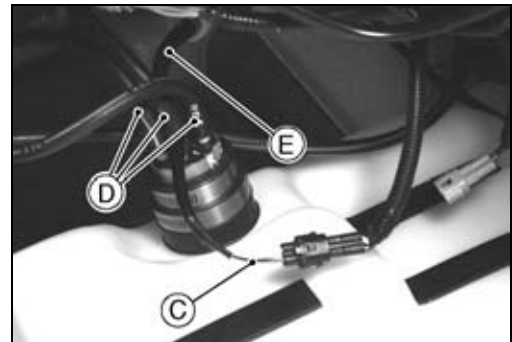
WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Pull the lanyard key off the stop button. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

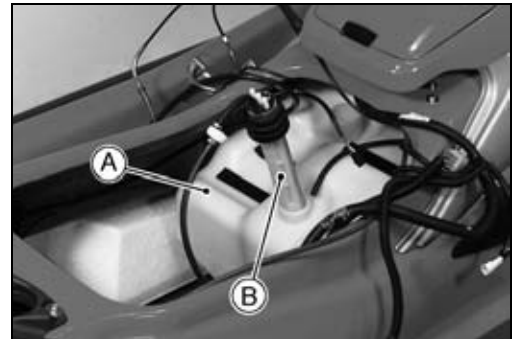
- Remove the engine.
- Remove the oil and fuel inlet tubes.
- Remove or disconnect:
 - Straps [A] of Fuel and Oil Tanks
 - Oil Tank [B]



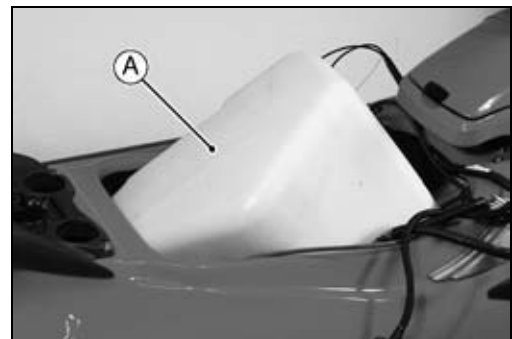
Crossmember
Fuel Level Sensor Lead Connector [C]
Fuel Hoses [D]
Air Vent Hose [E]



- Move the fuel tank [A] backward, and pull out the fuel level sensor assembly [B].



- Remove the fuel tank [A] out of the engine compartment.



Fuel Tank

Fuel Tank Installation

- Connect them correctly (see Cable, Wire and Hose Routing in the Appendix chapter).
 - Fuel Hoses
 - Air Vent Hose
 - Fuel Level Sensor Lead Connector
 - Other Wire and Harness.

Fuel Tank Cleaning

- Remove the fuel tank (see Fuel Tank Removal).
- Drain the tank into a suitable container.

WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Pull the lanyard key off the stop button. Do not smoke. Make sure the area is well ventilated and free from any source of flame or spark; this includes any appliance with a pilot light.

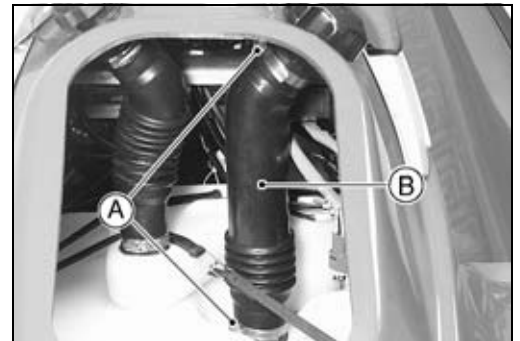
- Flush the tank repeatedly with high flash-point solvent until it is clean. It may be necessary to put a few marbles or pieces of clean gravel into the tank and shake it, to knock loose any foreign matter in the bottom.

WARNING

Clean the tank in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean the tank. A fire or explosion could result.

Fuel Filler and Tube Removal

- Loosen the tube clamps [A] and remove the fuel tube [B].



- Unscrew the fuel filler [A] and pull off it.

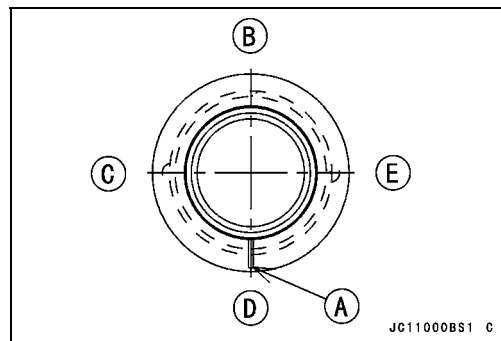


3-28 FUEL SYSTEM

Fuel Tank

Fuel Filler and Tube Installation

- Install the fuel filler so that its rib faces downward.
 - Rib [A]
 - Up [B]
 - Front [C]
 - Down [D]
 - Rear [E]



Fuel Filter Screen Cleaning

- Refer to Fuel Filter Screen Cleaning in the Periodic Maintenance chapter.

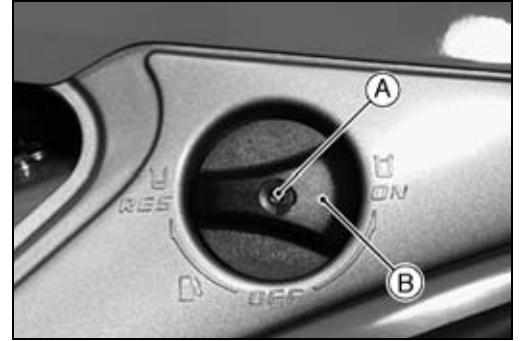
Fuel Filter Inspection

- Refer to Fuel Filter Inspection in the Periodic Maintenance chapter.

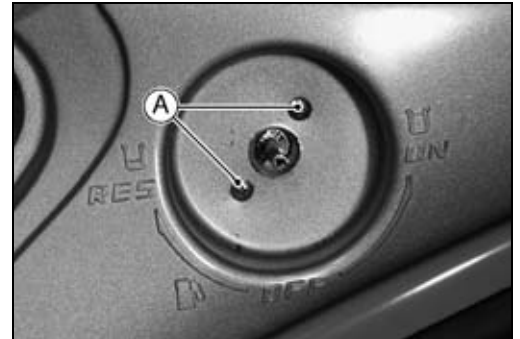
Fuel Tap

Removal

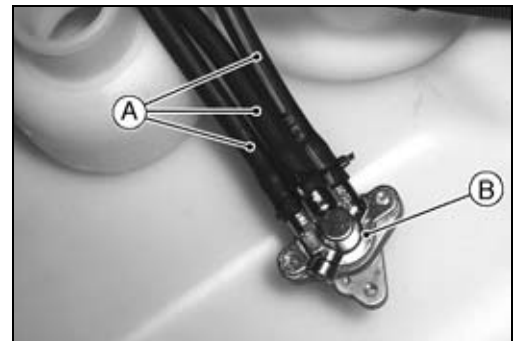
- Take out the plug.
- Unscrew the set screw [A] and take out the fuel tap knob [B]



- Unscrew the mounting screws [A] and take out the fuel tap.



- Pull the fuel hoses [A] off the fuel tap [B].



Installation

- Connect the fuel hoses to the fuel tap correctly (see Cable, Wire and Hose Routing section in the Appendix chapter).
- Apply a non-permanent locking agent to the fuel tap mounting screws and tighten them securely.

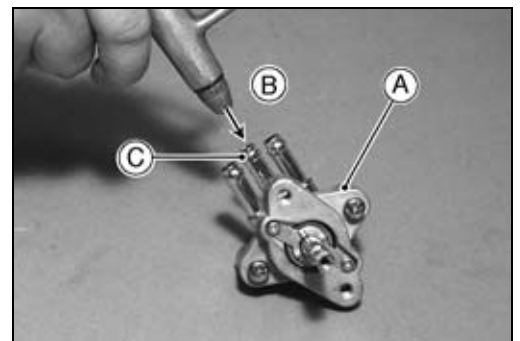
Cleaning

If the fuel tap becomes clogged with foreign matter, it must be cleaned.

- Remove the fuel tap [A].
- Use compressed air to blow [B] through the supply fuel hose fitting [C], while switching the fuel tap right and left between the "ON" and "RES" positions. Do this until only blockage is forced out.

NOTE

- Do not use too high air pressure (172 kPa, 1.8 kgf/cm², 25 psi max.).



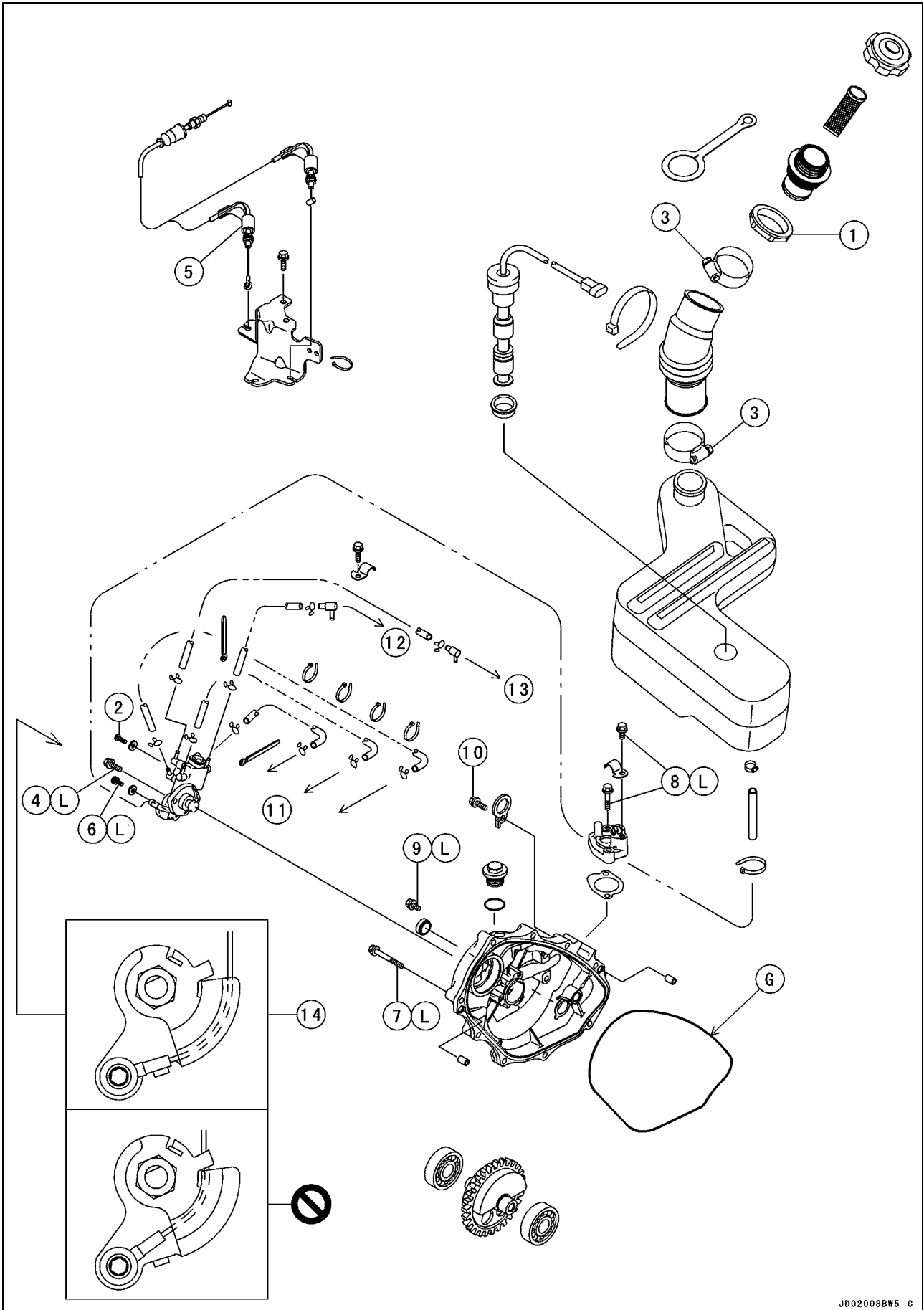
Engine Lubrication System

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4-2 ENGINE LUBRICATION SYSTEM

Exploded View



ENGINE LUBRICATION SYSTEM 4-3

Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Filler Nut	4.9	0.5	43 in·lb	
2	Air Bleeder Screw	1.0 ~ 1.5	0.1 ~ 0.15	9 ~ 13 in·lb	
3	Oil Filler Tube Clamps	2.9	0.3	26 in·lb	
4	Oil Pump Mounting Bolts	8.8	0.9	78 in·lb	L
5	Oil Pump Cable Locknuts	7.8	0.8	69 in·lb	
6	Oil Pump Cable End Mounting Bolt	4.9	0.5	43 in·lb	L
7	Magneto Cover Mounting Bolts	12	1.2	8.7	L
8	Grommet Cover Mounting Bolts	8.8	0.9	78 in·lb	L
9	Oil Level Gauge Bolt	3.9	0.4	35 in·lb	L
10	Plate Bolt	8.8	0.9	78 in·lb	L

11. To carburetor check valves

12. To front check valve on upper crankcase half

13. To rear check valve on upper crankcase half

14. Correct

L: Apply a non-permanent locking agent.

G: Apply grease.

4-4 ENGINE LUBRICATION SYSTEM

Specifications

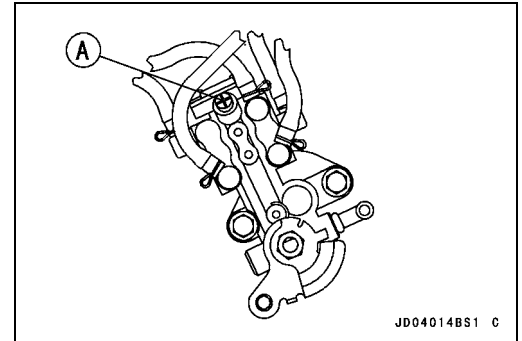
Item	Standard
Engine Oil Type Oil Tank Capacity	2-stroke, N.M.M.A. Certified for Service TC-W3 4.7 L (1.24 US gal)
Engine Oil Pump Oil pump output when oil pump pulley is fully opened @3 000 r/min (rpm), 2 min per one line: Output for #1 Carburetor Output for #2 Carburetor Output for #3 Carburetor Output for Front Balancer Output for Rear Balancer	3.83 mL (0.234 cu in.) ±10% 4.00 mL (0.244 cu in.) ±10% 3.83 mL (0.234 cu in.) ±10% 1.33 mL (0.081 cu in.) ±10% 1.33 mL (0.081 cu in.) ±10%

Oil Pump

Oil Pump Bleeding

- Make sure that there is plenty of engine oil in the oil tank and that oil flow is not restricted.
- Place a container under the oil pump.
- Loosen the air bleeder screw [A] on the oil pump a couple of turns, wait until oil flows out, and then tighten the bleeder screw securely.

Torque - Air Bleeder Screw: 1.0 ~ 1.5 N·m (0.1 ~ 0.15 kgf·m, 9 ~ 13 in·lb)



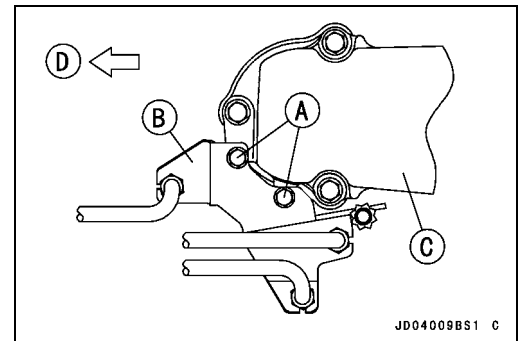
CAUTION

**Use a 50: 1 mixture of gasoline to oil in the fuel tank in place of the gasoline normally used.
Do not turn on the water until the engine is running and turn it off immediately when the engine stops.**

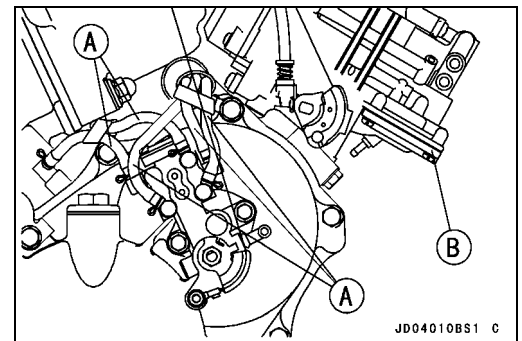
- Supply the cooling system with water (see Auxiliary Cooling in the General Information chapter).
- Start the engine, keep it at idling speed and check the oil flow through the transparent outlet hoses.
- Keep the engine running until any air bubbles in the outlet hoses disappear.

Oil Pump Performance Test

- ★ If a drop in oil pump performance is suspected, check the pump output at which the oil is being pumped.
- Take out the bolts [A] of the cable holder [B] and move the holder with the control cables to port side to make the service easier.
Exhaust Pipe [C]
Bow [D]



- Disconnect the oil pump outlet hoses [A] at the pump body.
Carburetors [B]
- Plug the ends of the oil pump outlet hoses.
- Reserve suitable transparent hoses and connect them with the oil pump outlets.
- Inject oil into the transparent hoses.
- Run each hose into a measuring glass.
- Reinstall the cable holder. If necessary, adjust control cables.



CAUTION

For this test, use a 50:1 mixture of gasoline to oil instead the gasoline normally used.

4-6 ENGINE LUBRICATION SYSTEM

Oil Pump

- Supply the cooling system with water (see Auxiliary Cooling in the General Information chapter).
- Hold the oil pump pulley fully opened.
- Start the engine, and run it at a steady 3000 rpm.
- Collect the oil that is being pumped for 2 minutes. If the quantity of oil collected is within the specification, the oil pump is operating properly.

Oil Pump Output (pump pulley fully opened, engine: 3000 rpm for 2 min)

Standard:

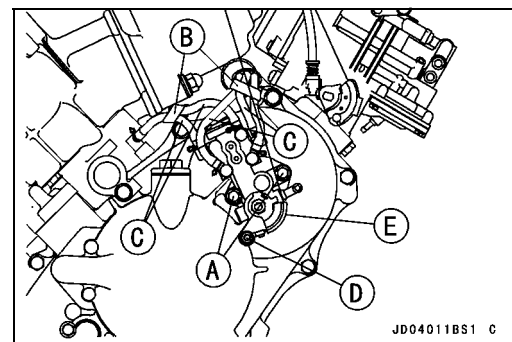
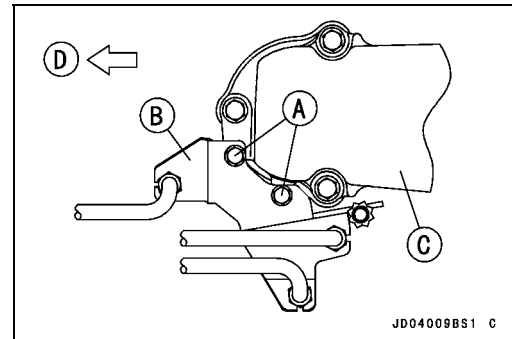
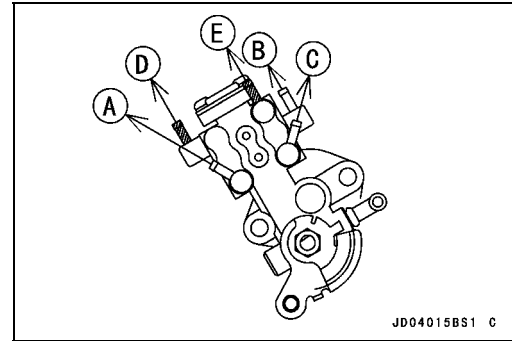
Output for #1 Carburetor [A]	3.83 mL (0.234 cu in.) ±10%
Output for #2 Carburetor [B]	4.00 mL (0.244 cu in.) ±10%
Output for #3 Carburetor [C]	3.83 mL (0.234 cu in.) ±10%
Output for Front Balancer [D]	1.33 mL (0.081 cu in.) ±10%
Output for Rear Balancer [E]	1.33 mL (0.081 cu in.) ±10%

- ★ If the oil pump output is subnormal, inspect the oil pump, and the inlet and output hoses for oil leaks.
- ★ If oil leaks are not found, replace the oil pump.

Oil Pump Removal

- Take out the bolts [A] of the cable holder [B] and move the holder with the control cables to port side to make the service easier.
Exhaust Pipe [C]
Bow [D]

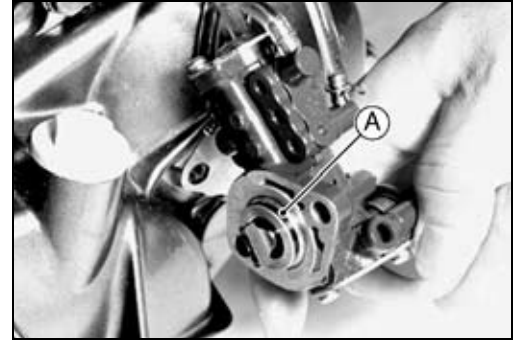
- Disconnect the oil inlet hose at the oil pump body.
- Unscrew the oil pump mounting bolts [A].
- Loosen the clamps [B] to let the oil outlet hoses [C] move freely.
- Pull up the oil pump body remaining connected with the hoses and cable.
- Disconnect the oil hoses [C].
- Take out the bolt [D] and disconnect the oil pump cable from the oil pump body.
- Remove the oil pump [E].



Oil Pump

Oil Pump Installation

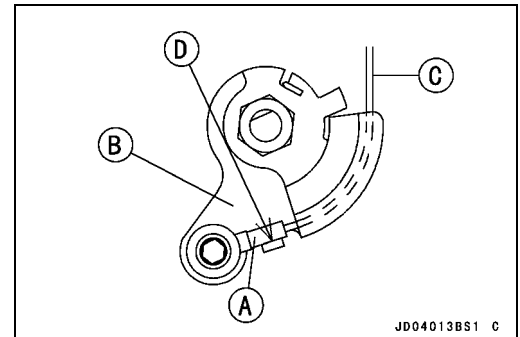
- Be sure the O-ring [A] is in place.



- Install the oil pump cable [A] on the pulley [B].
- Apply a non-permanent locking agent to the oil pump cable mounting bolt and torque it.

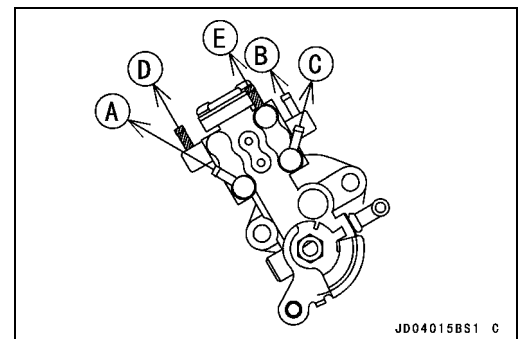
Torque - Oil Pump Cable End Mounting Bolt: 4.9 N·m (0.5 kgf·m, 43 in·lb)

- Be sure to run the cable [C] so that the cable end is in contact [D] with the guide of the pulley and the cable is along the groove of the pulley as shown.



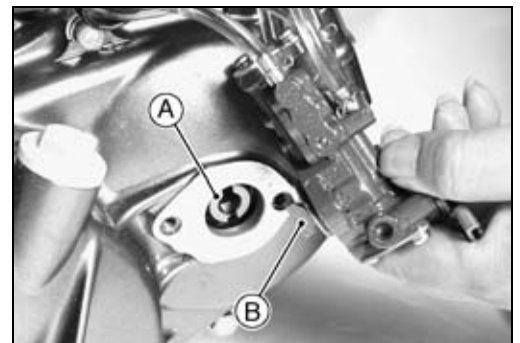
- Initially inject oil into the oil pump body and the hoses, and connect the hoses with the oil pump as shown.

- To #1 Carburetor [A]
- To #2 Carburetor [B]
- To #3 Carburetor [C]
- To Front Check Valve for Balancer Lubrication [D]
- To Rear Check Valve for Balancer Lubrication [E]

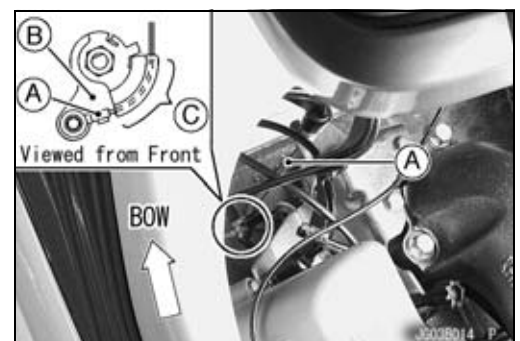


- Install the oil pump on the magneto cover.
- When mounting the oil pump, note the position of the slot [A] in the front balancer shaft, and then turn oil pump shaft [B] so that it will fit into the slot.
- Apply a non-permanent locking agent to the oil pump mounting bolts and torque them.

Torque - Oil Pump Mounting Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)



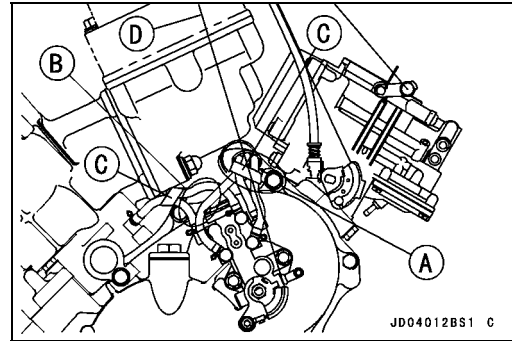
- Check the oil pump cable installation as follows:
 - Pull the throttle lever to ensure if the oil pump cable [A] makes the oil pump pulley [B] turn.
 - Make sure the lower part [C] of the oil pump cable is installed on the oil pump pulley securely.
- ★ If necessary, reinstall the oil pump cable on the pulley and adjust it (see Oil Pump Cable Adjustment in the Periodic Maintenance chapter).



4-8 ENGINE LUBRICATION SYSTEM

Oil Pump

- Route the oil hoses correctly (see Cable, Wire and Hose Routing in the Appendix chapter).
 - To Carburetors [A]
 - To Check Valves for Balancer Lubrication [B]
 - Clamps [C]
- Bleed the air from the system (see Oil Pump Bleeding).
- Adjust the oil pump cable [D] (see Oil Pump Cable Adjustment in the Periodic Maintenance chapter).

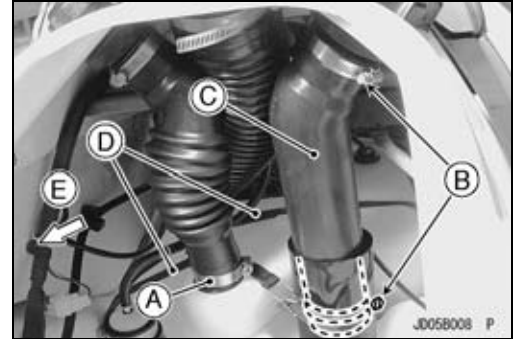


Oil Tank

Oil Tank Removal

- Tilt up the hatch cover and remove the storage case.
- Loosen the lower clamp [A] and pull off the oil hose.
- Loosen the clamps [B] and remove the fuel tube [C].
- Plug the fuel tank opening at once.
- Unhook the rubber straps [D].

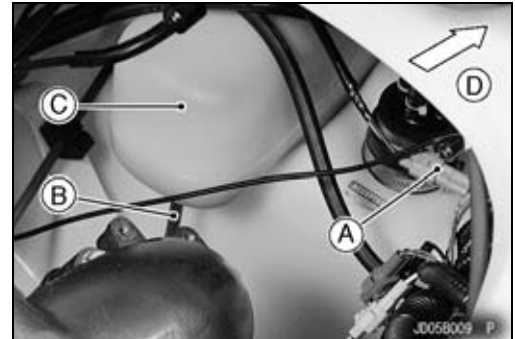
Bow [E]



- Remove the seat.
 - Disconnect the oil level sensor connector (green) [A].
 - Disconnect the oil pump inlet hose [B] from the oil tank.
 - Plug the tank nipple and hose immediately.
- In the photo, the cable holder has been removed for clarity.

- Remove the oil tank [C] from the front hatch.
- Remove the oil level sensor from the oil tank.

Bow [D]



Oil Tank Installation

- Initially inject oil into the oil inlet hose.

Oil Tank Cleaning

- Remove the oil tank.
- Flush the tank repeatedly with a high flash-point solvent until it is clean.

WARNING

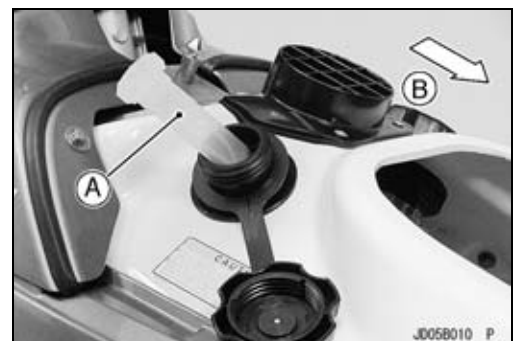
Clean the tank in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean the tank. A fire or explosion could result.

Oil Filter Cleaning

- Tilt up the hatch cover.
 - Take out the oil filter [A].
- Bow [B]
- Wash the oil filter in a non-flammable or high flash-point solvent. Use a brush to remove any contaminants trapped in the filter.

WARNING

Clean the oil filter in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean the filter. A fire or explosion could result.



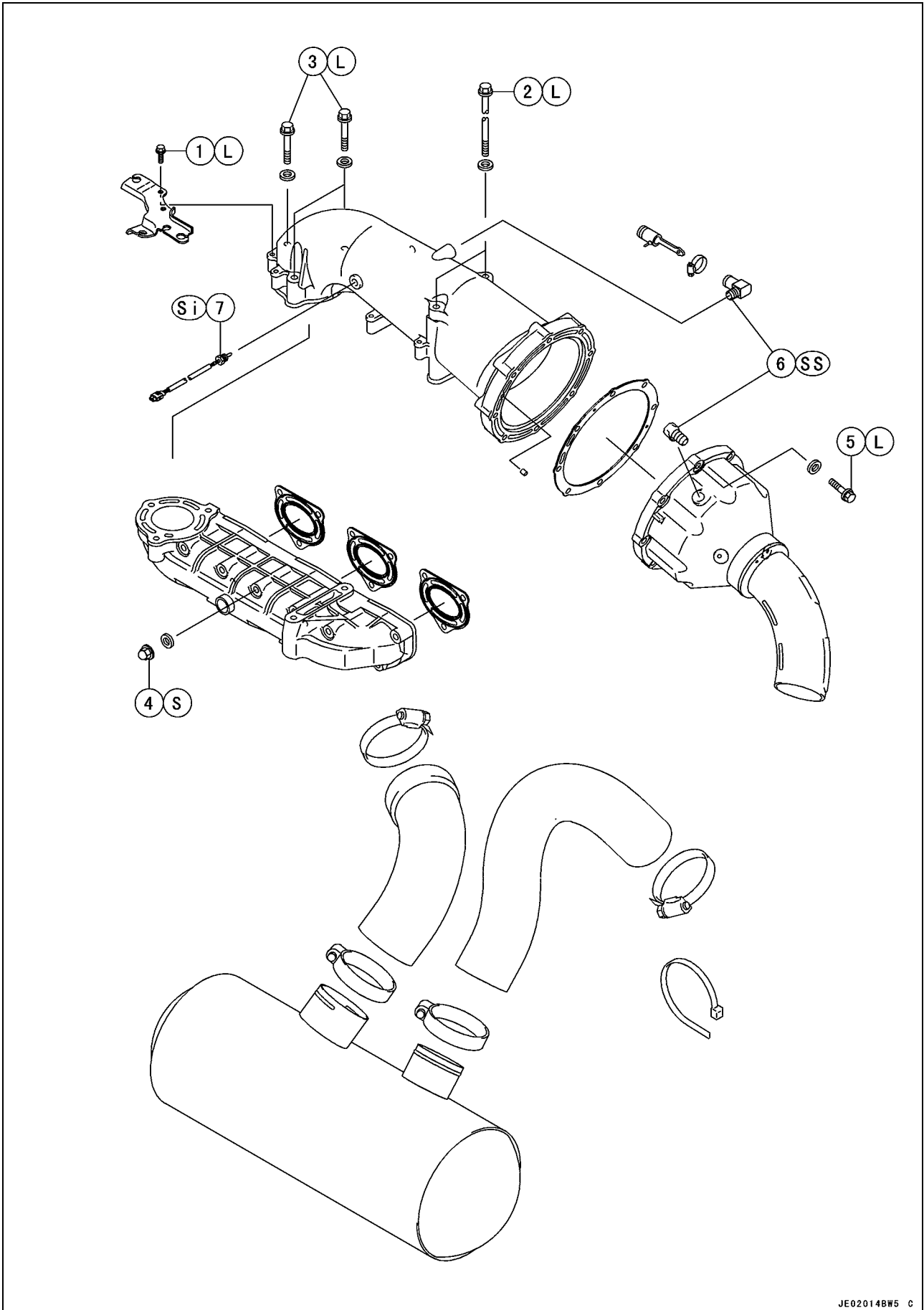
Exhaust System

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5-2 EXHAUST SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Cable Holder Mounting Bolts	8.8	0.9	78 in·lb	L
2	Exhaust Pipe Mounting Bolts (M10)	49	5.0	36	L
3	Exhaust Pipe Mounting Bolts (M8)	29	3.0	22	L
4	Exhaust Manifold Mounting Nuts	34	3.5	25	S
5	Expansion Chamber Mounting Bolts	29	3.0	22	L
6	Water Hose Joints	7.8 ~ 14	0.8 ~ 1.4	69 ~ 122 in·lb	SS
7	Water Temperature Sensor	14.7	1.5	11	Si

L: Apply a non-permanent locking agent.

S: Follow the specific tightening sequence.

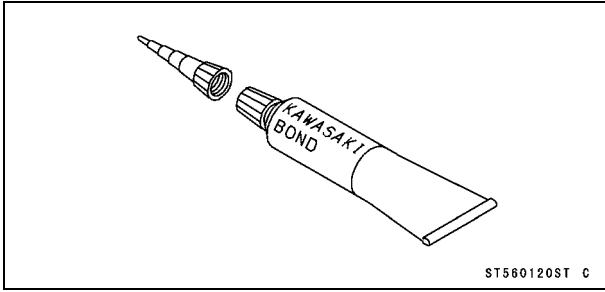
Si: Fill the hollow with the specified silicone grease (92137-1002)

SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

5-4 EXHAUST SYSTEM

Special Tool

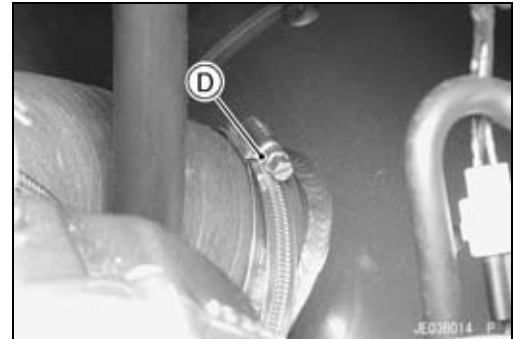
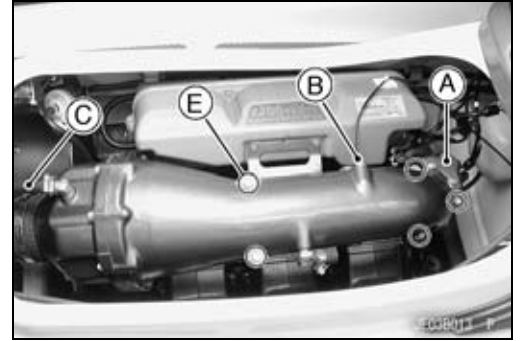
Kawasaki Bond (Silicone Sealant):
56019-120



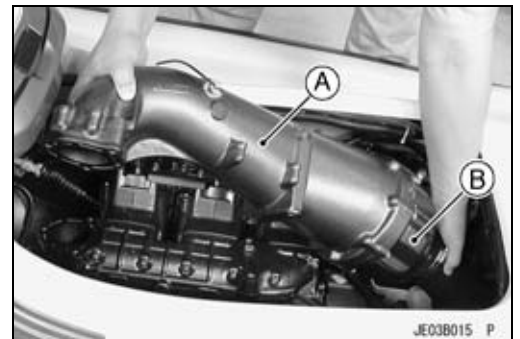
Expansion Chamber

Removal

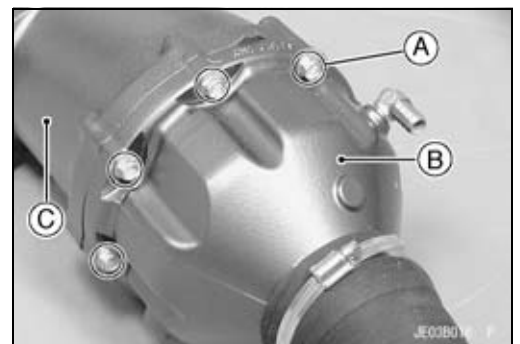
- Remove or disconnect:
 - Cable Holder [A]
 - Lead Connector of Heat Sensor [B]
 - Cooling Hose [C]
 - Tube Clamp at Water Box Muffler [D]
 - Exhaust Pipe Mounting Bolts [E]



- Remove the exhaust pipe [A] and expansion chamber [B] as a set.



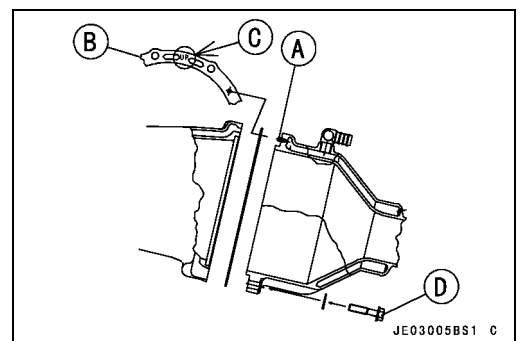
- Unscrew the mounting bolts [A] and separate the expansion chamber [B] from the exhaust pipe [C].



Installation

- Install the expansion chamber on the exhaust pipe.
 - Be sure the dowel pin [A] is in place.
 - Install the new gasket [B] on the expansion chamber so that its "UP" letter [C] faces upward.
 - Apply a non-permanent locking agent to the expansion chamber mounting bolts [D] and torque them.

Torque - Expansion Chamber Mounting Bolts: 29 N·m (3.0 kgf·m, 22 ft·lb)



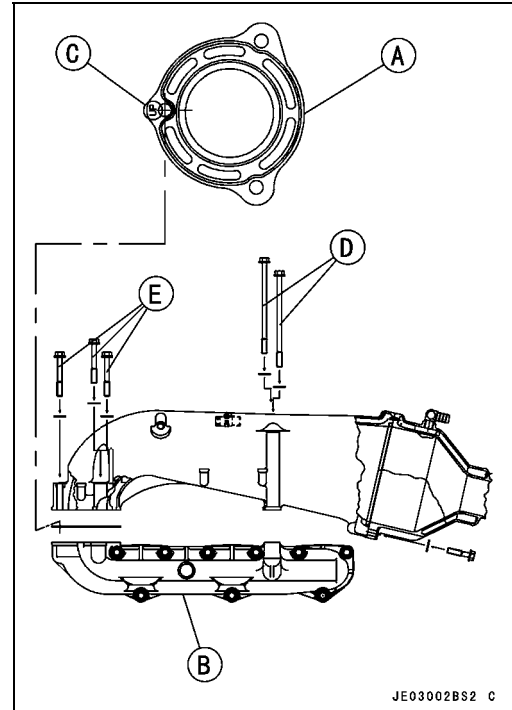
5-6 EXHAUST SYSTEM

Expansion Chamber

- Install the pipe and the chamber as a set on the manifold.
- Install the new gasket [A] on the exhaust manifold [B] so that its "UP" letter [C] faces upward.
- Apply a non-permanent locking agent to the exhaust pipe mounting bolts and torque them.

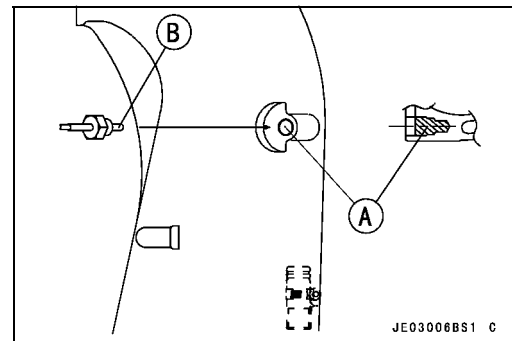
Torque - Exhaust Pipe Mounting Bolts (M10) [D]: 49 N·m (5.0 kgf·m, 36 ft·lb)

Exhaust Pipe Mounting Bolts (M8) [E]: 29 N·m (3.0 kgf·m, 22 ft·lb)



- Fill the hollow of the exhaust pipe with the specified silicone grease [A], if the water temperature sensor [B] is removed.
- Tighten:

Torque - Water Temperature Sensor: 14.7 N·m (1.5 kgf·m, 11 ft·lb)



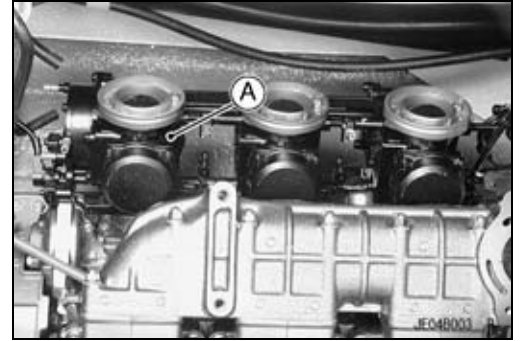
Exhaust Pipe/Exhaust Chamber Cleaning and Inspection

- Remove the exhaust pipe and chamber.
- Clean the carbon deposits out of the exhaust passages with a blunt, rounded tool.
- Flush foreign matter out of the water passages with fresh water.
- Check the insides of the water passages for corrosion. Check the gasket surfaces for nicks or other damage.
- ★ If there is excessive corrosion or if the gasket surfaces are so badly damaged that they will not seal properly, replace the part.

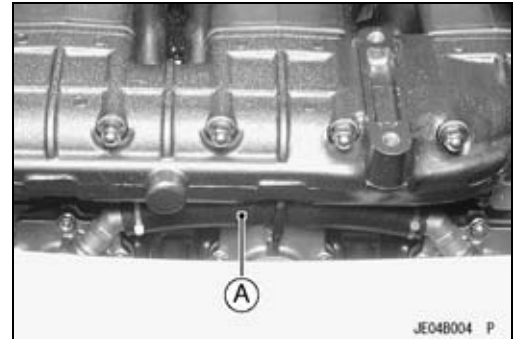
Exhaust Manifold

Removal

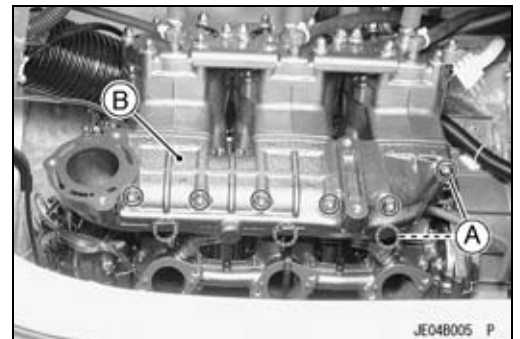
- Remove the exhaust pipe and the exhaust chamber as a set.
- Remove the carburetor assembly [A] remaining connected the fuel hoses, oil hoses and control cables, and place it on the hull bottom as shown.



- Remove the balance tube [A] to make the service easier.



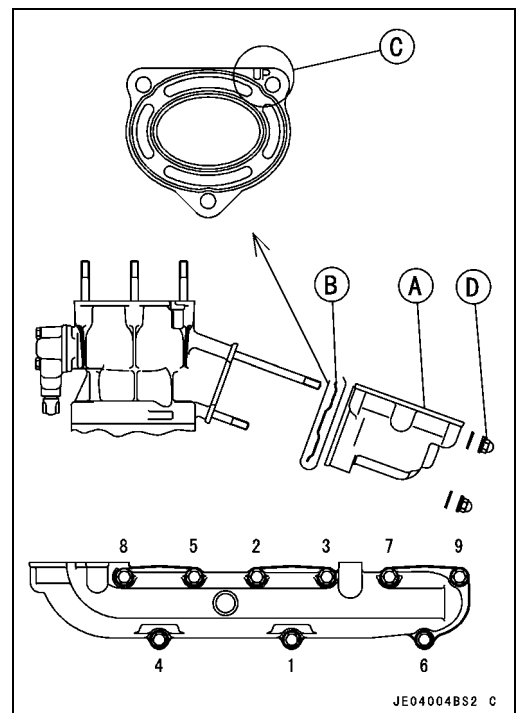
- Unscrew the mounting nuts [A] and remove the exhaust manifold [B].



Installation

- Install the exhaust manifold [A] on the cylinder.
- Place the new gaskets [B] on the cylinders so that "UP" letter [C] faces upward as shown.
- Tighten the exhaust manifold mounting nuts [D] following the sequence shown.

Torque - Exhaust Manifold Mounting Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)



5-8 EXHAUST SYSTEM

Exhaust Manifold

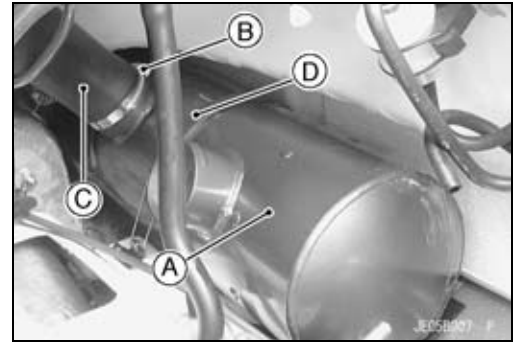
Cleaning and Inspection

- Remove the exhaust manifold parts.
- Clean the carbon deposits out of the exhaust passages with a blunt, rounded tool.
- Flush foreign matter out of the water passages with fresh water.
- Check the insides of the water passages for corrosion. Check the gasket surfaces for nicks or other damage.
- ★ If there is excessive corrosion or if the gasket surfaces are so badly damaged that they will not seal properly, replace the part.

Water Box Muffler

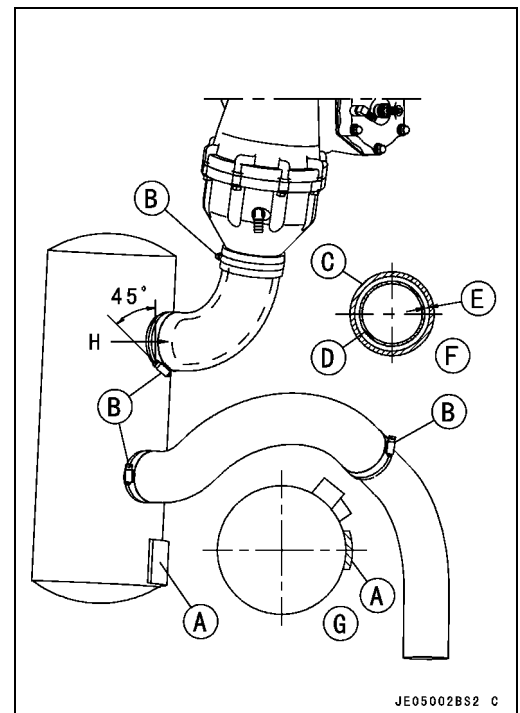
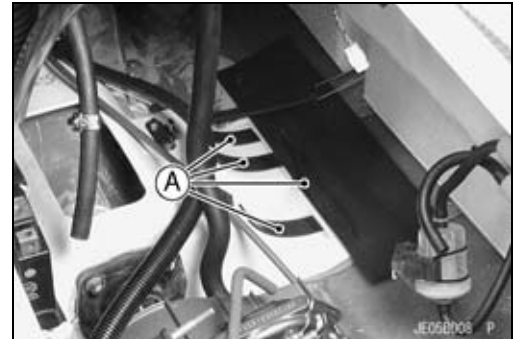
Removal

- Remove the engine (see Engine Removal/Installation chapter).
- Remove the water box muffler [A] out of the hull.
- Loosen the clamp [B] and pull out the exhaust tube [C].
- Unhook the rubber strap [D].



Installation

- Be sure the dampers [A] on the hull bottom and muffler body are in place.
- Install the clamps [B] of the exhaust tubes, noting their screw positions.
- The center lines of tube [C] and pipe [D] to be on the same line.
- [E] 5 mm (0.2 in.)
- [F] View H
- [G] Rear View



Inspection

- Remove the water box muffler.
- Empty water out of the water box.
- Check the inlet spigot for damage caused by excessive heat.
- ★ If there is heat damage to the inlet spigot, check the cooling system for blockage (see Cooling System Cleaning and Inspection) and the carburetor for proper adjustment (see Fuel System chapter).

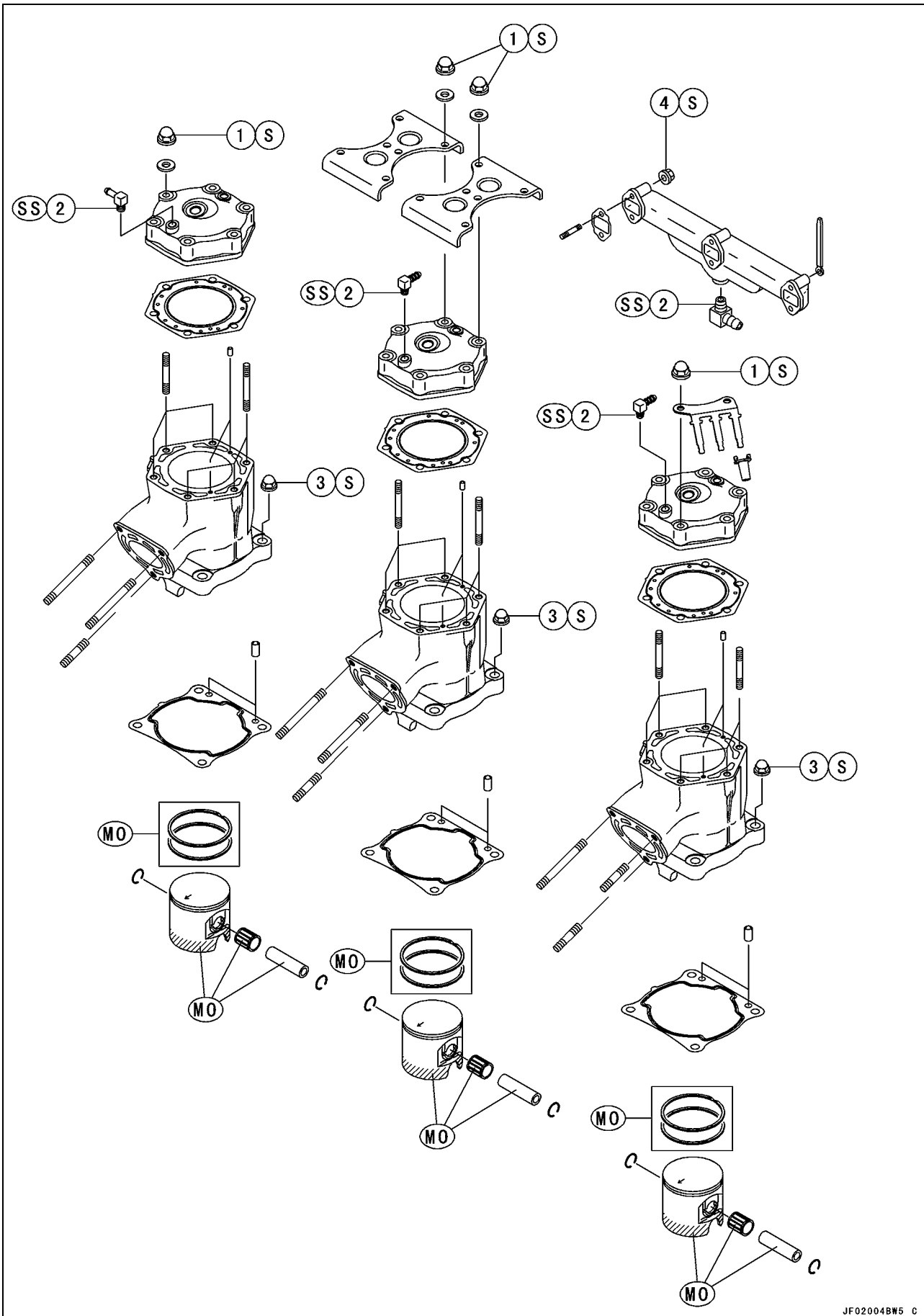
Engine Top End

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6-2 ENGINE TOP END

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Cylinder Head Nuts	29 (7.8*)	3.0 (0.8*)	22 (69 in·lb*)	S
2	Water Hose Joints	7.8 ~ 14	0.8 ~ 1.4	69 ~ 122 in·lb	SS
3	Cylinder Base Nuts	49 (7.8*)	5.0 (0.8*)	36 (69 in·lb*)	S
4	Water Hose Mounting Nuts	9.8	1.0	87 in·lb	S

*: Initial torque for temporal tightening

MO: Apply molybdenum disulfide oil. (Mixture of the engine oil and molybdenum grease in a weight ratio 10 : 1)

S: Tighten the fasteners, following the specified sequence.

SS: Apply silicone sealant. (Kawasaki Bond: 56019-120)

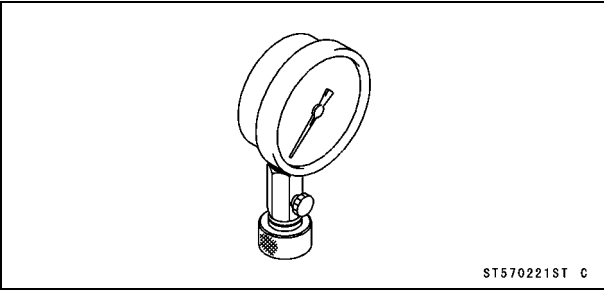
6-4 ENGINE TOP END

Specifications

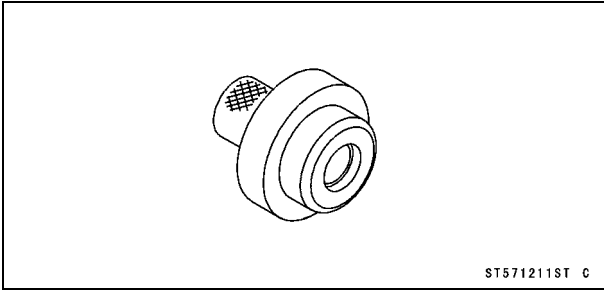
Item	Standard	Service Limit
Cylinder Head		
Cylinder Compression	(Usable range) 675 ~ 1 070 kPa (6.9 ~ 10.9 kgf/cm ² , 98 ~ 155 psi)	— — —
Cylinder Head Warp	(Open throttle) — — —	0.05 mm (0.0020 in.)
Cylinder, Piston		
Cylinder Inside Diameter	80.000 ~ 80.015 mm (3.14961 ~ 3.15019 in.)	80.10 mm (3.1535 in.)
Piston Diameter (26.9 mm (1.06 in.) up from bottom of skirt)	79.865 ~ 79.880 mm (3.14429 ~ 3.14488 in.)	79.72 mm (3.1386 in.)
Piston/Cylinder Clearance	0.130 ~ 0.140 mm (0.005118 ~ 0.005512 in.)	— — —
Piston Ring/Groove Clearance:		— — —
Top (keystone)	— — —	
Second (keystone)	— — —	— — —
Piston Ring Groove Width:		— — —
Top (keystone)	— — —	
Second (keystone)	— — —	— — —
Piston Ring Thickness:		— — —
Top (keystone)	— — —	
Second (keystone)	— — —	— — —
Piston Ring End Gap:		
Top	0.25 ~ 0.40 mm (0.00984 ~ 0.0157 in.)	0.7 mm (0.028 in.)
Second	0.25 ~ 0.40 mm (0.00984 ~ 0.0157 in.)	0.7 mm (0.028 in.)

Special Tools

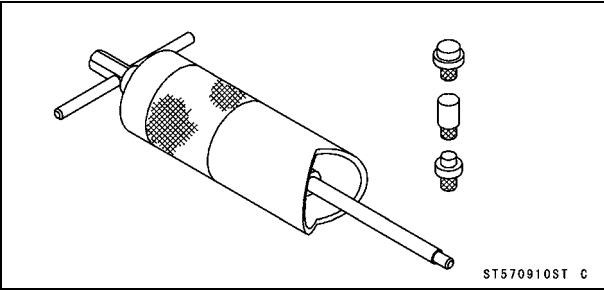
**Compression Gauge, 20 kgf/cm²:
57001-221**



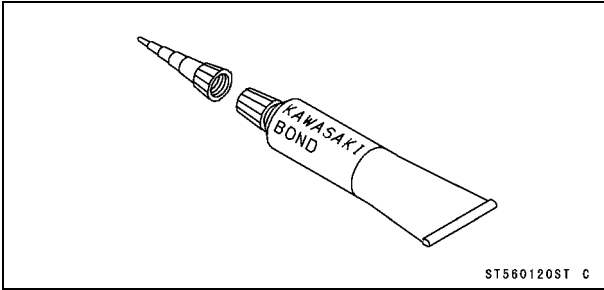
**Piston Pin Puller Adapter, ϕ 14:
57001-1211**



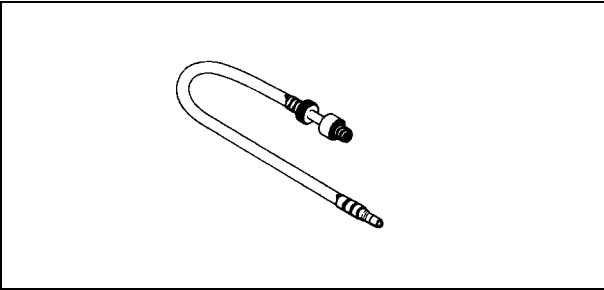
**Piston Pin Puller Assembly:
57001-910**



**Kawasaki Bond (Silicone Sealant):
56019-120**



**Compression Gauge Adapter, M14 \times 1.25:
57001-1159**



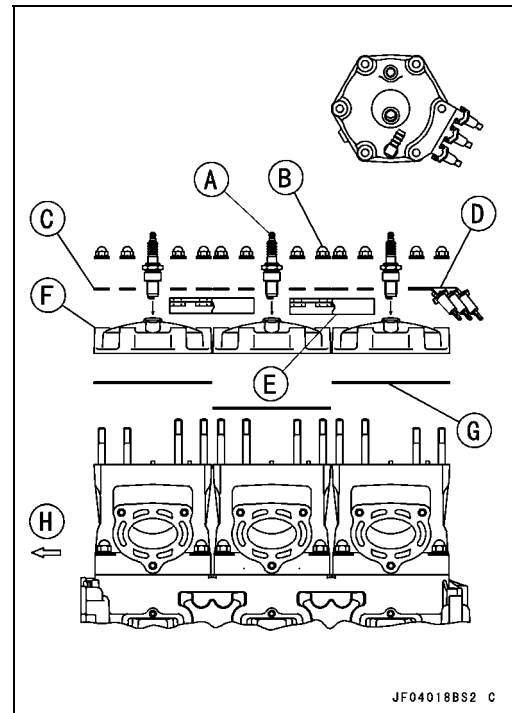
6-6 ENGINE TOP END

Engine Top End

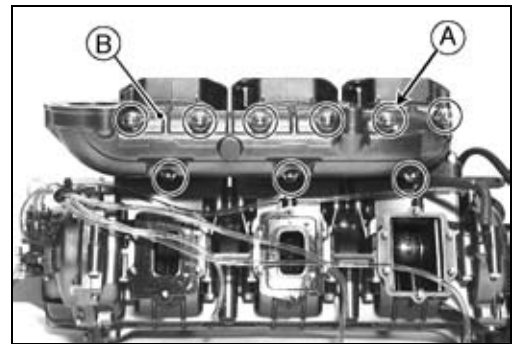
Disassembly and Assembly

Disassembly

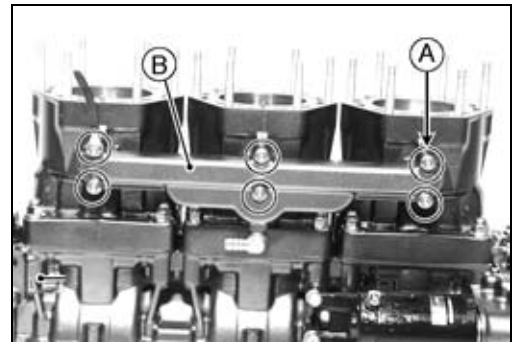
- Remove the engine (see Engine Removal/Installation chapter).
- Remove:
 - Spark Plugs [A]
 - Cylinder Head Nuts [B] and Washers [C]
 - Spark Plug Holder [D]
 - Reinforce [E]
 - Cylinder Head [F]
 - Cylinder Head Gasket [G]
 - Bow [H]



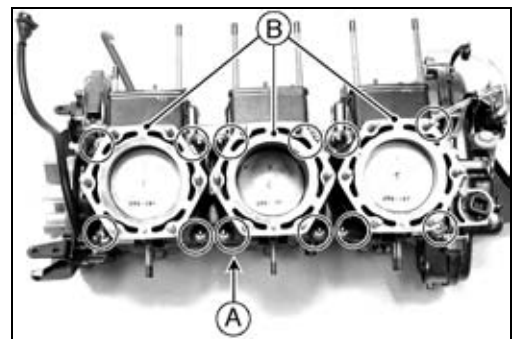
- Remove:
 - Exhaust Manifold Mounting Nuts [A]
 - Exhaust Manifold [B]



- Remove:
 - Water Pipe Mounting Nuts [A]
 - Water Pipe [B]



- Remove the cylinder base nuts [A], and lift off the cylinders [B].



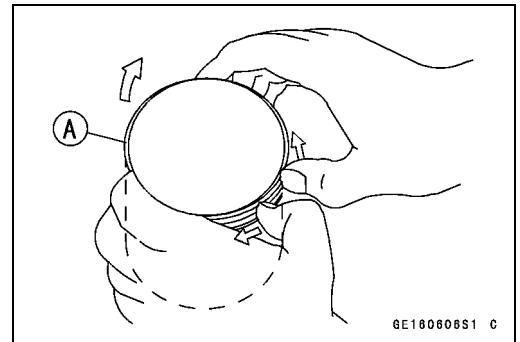
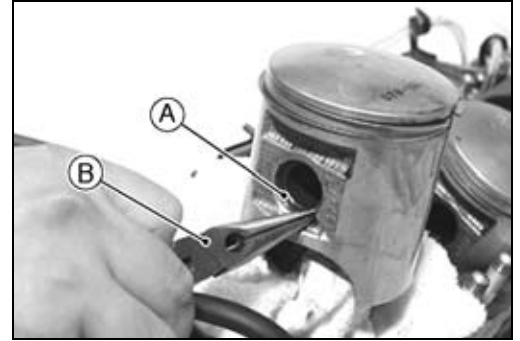
Engine Top End

- Stuff clean rags into the crankcase opening to prevent dirt or foreign objects from falling into the crankcase.
- Remove the piston pin snap ring [A] with pliers [B].
- Remove the piston by pushing its pin out the side that the circlip was removed. Use a piston pin puller assembly, if the pin is tight.

Special Tools - Piston Pin Puller Assembly: 57001-910

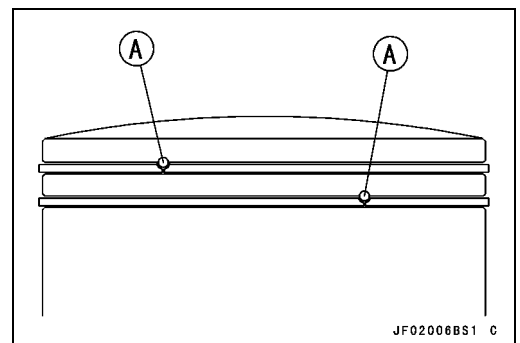
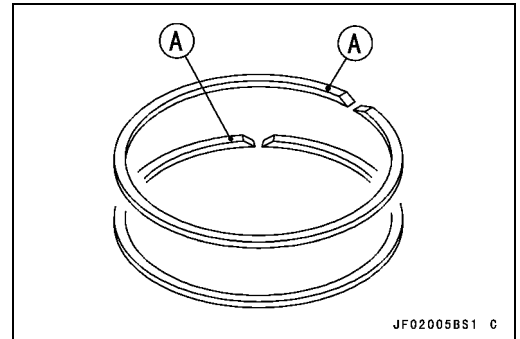
Piston Pin Puller Adapter: 57001-1211

- Do not confuse these pistons since each should be installed in the original cylinder to maintain the correct clearance.
- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.



Assembly

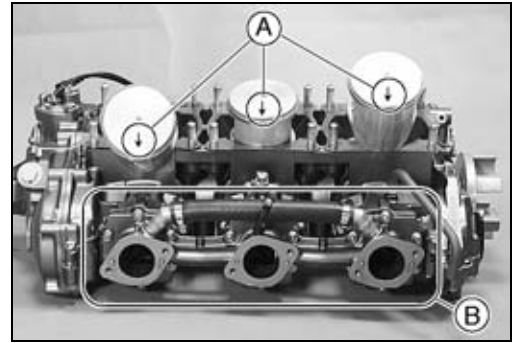
- If any parts in the piston assemblies require replacement, or if the cylinder is replaced, be sure to check the critical clearances of the new parts against the values given in Specifications.
 - Install the piston rings so that the “R” mark [A] faces upward as shown.
- When the piston rings are reinstalled to the piston ring grooves, reinstall them as follows for fitting.
- Second Piston Ring → Second Piston Ring Groove
 Top Piston Ring → Top Piston Ring Groove
- When installing the piston rings by hand, first fit one end of the piston ring against the pin in the ring groove, spread the ring opening with the other hand and then slip the ring into the groove.
 - Check to see that the pin [A] in each piston ring groove is between the ends of the piston ring.
 - Using molybdenum disulfide oil, lubricate the small end bearing and insert into the connecting rod eye.
 - Using molybdenum disulfide oil, lubricate the piston pin and the pin holes.



6-8 ENGINE TOP END

Engine Top End

- Install each piston in the original cylinder to maintain the correct clearance.
- Mount the pistons on the connecting rods with the arrows [A] on their crown pointing to the reed valves side [B] of engine.

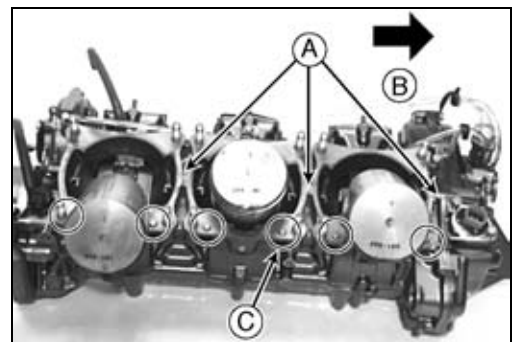
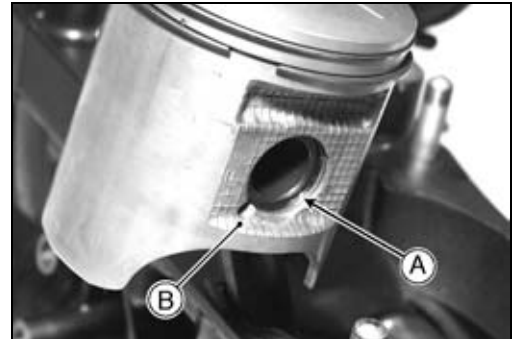


- When installing a piston pin snap ring, compress it only enough to install it and no more.

CAUTION

Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.

- Fit a new piston pin snap ring into the side of each piston so that the snap ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- Set the new cylinder base gasket in place on the crankcase.
- The tab [A] of gasket must face forward [B] and align the dowel pin hole [C] of gasket with the dowel pin on the cylinder.



- Apply molybdenum disulfide oil:
 - Small End Bearings
 - Piston Pins and Piston Pin Holes
 - Pistons and Cylinder Bores
- Slide the cylinder block down over the crankcase studs onto the crankcase compressing the piston rings.

CAUTION

Do not force the cylinder block. Make sure the rings are in place.

- Install the cylinder base nuts.
- Temporarily torque the cylinder base nuts in a cross pattern and torque them in the same order.

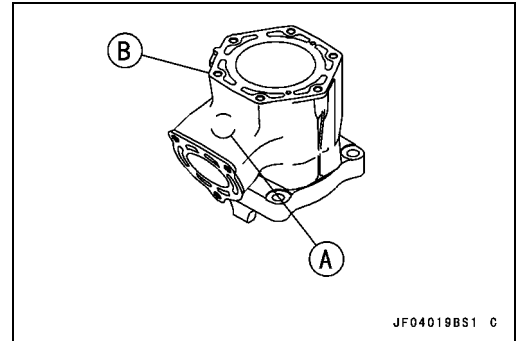
Initial Torque for Temporal Tightening-

Cylinder Base Nuts: 7.8 N·m (0.8 kgf·m, 69 in·lb)

Torque - Cylinder Base Nuts: 49 N·m (5.0 kgf·m, 36 ft·lb)

Engine Top End

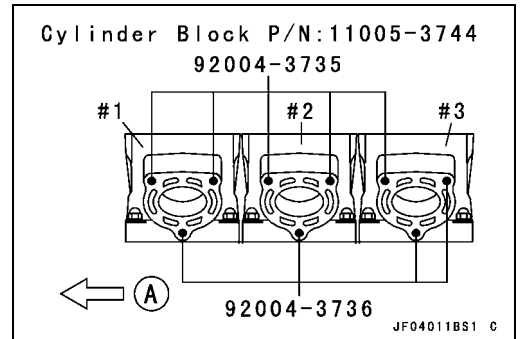
- If the cylinder blocks and studs are replaced, first confirm the following.
- Be sure that there is no punch mark [A] on the cylinder block [B].



- The cylinder blocks and studs should be assembled and installed, following the next combination.

Bow [A]

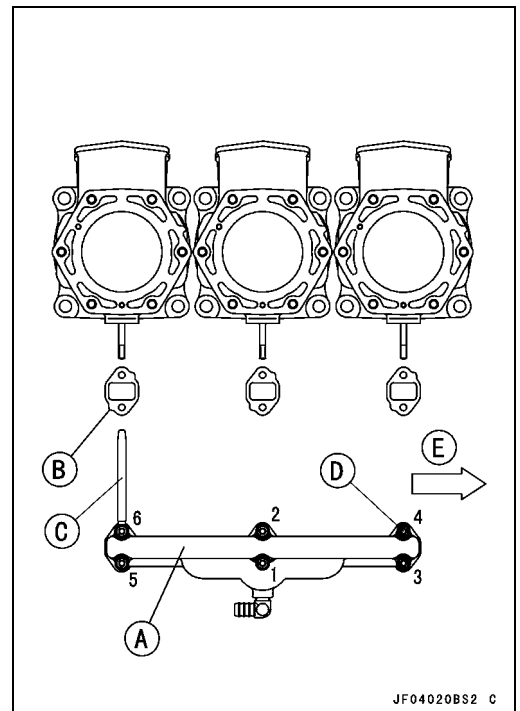
Cylinder Block: P/N 11005-3744
Studs: P/N 92004-3736
 (Length: 56 mm, 2.20 in.)
 P/N 92004-3735



- Install the water pipe [A] on the cylinder.
- Place new water pipe gaskets [B] on each cylinder as shown.
- Set the clamp [C] on the water pipe as shown.
- Tighten the water pipe nuts [D], following the sequence shown.

Bow [E]

Torque - Water Pipe Mounting Nuts: 9.8 N·m (1.0 kgf·m, 87 in·lb)

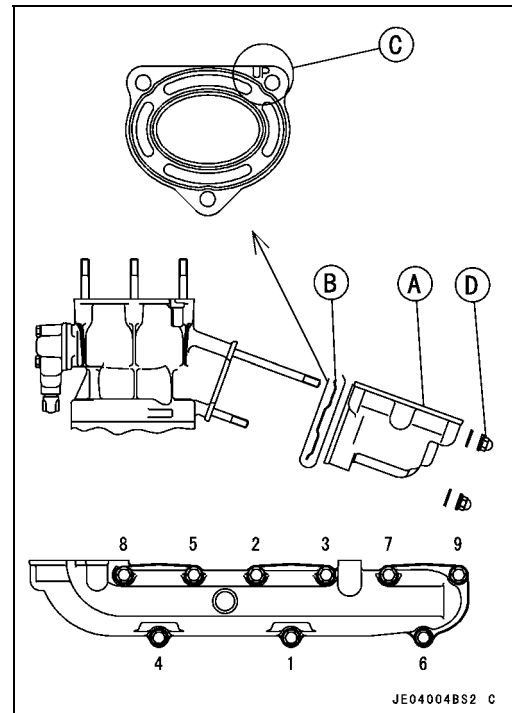


6-10 ENGINE TOP END

Engine Top End

- Install the exhaust manifold [A] on the cylinder.
- Place new gaskets [B] on the cylinders so that “UP” letter [C] faces upward as shown.
- Tighten the exhaust manifold nuts [D], following the sequence shown.

Torque - Exhaust Manifold Mounting Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)

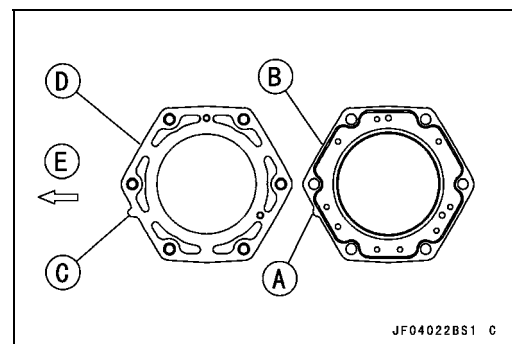


- Place a new cylinder head gasket on the cylinder head.
- Align the tab [A] of head gasket [B] with that [C] of the cylinder block [D].
- Align the dowel pins on the cylinder block with the holes of the head gaskets.
Bow [E]
- Install the cylinder head in this order.
#2 → #3 → #1 (middle → rear → front)
- Temporarily torque the cylinder head nuts in a cross pattern and torque them in the same order.

**Initial Torque for Temporal Tightening-
Cylinder Head Nut: 7.8 N·m (0.8 kgf·m, 69 in·lb)**

Torque - Cylinder Head Nut: 29 N·m (3.0 kgf·m, 22 ft·lb)

- Start the engine to check for fuel and oil leaks, exhaust leaks, and excessive vibration.



WARNING

Do not run the engine in a closed area. Exhaust gases contain carbon monoxide, a colorless, odorless, poisonous gas which can be lethal.

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.

Engine Top End

Maintenance and Inspection

Compression Measurement

- Thoroughly warm up the engine, while checking that there is no compression leakage from around the spark plugs or the cylinder head gasket.

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 damaged will occur.

- Stop the engine.
- Remove the spark plugs and screw a compression gauge firmly into the spark plug hole (left side view).

Special Tools - Compression Gauge: 57001-221 [A]

**Compression Gauge Adapter, M14 × 1.25:
57001-1159 [B]**

- Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.
- Repeat the measurement for the other two cylinders.

Cylinder Compression (Usable Range)

675 ~ 1 070 kPa (6.9 ~ 10.9 kgf/cm², 98 ~ 155 psi) (open throttle)

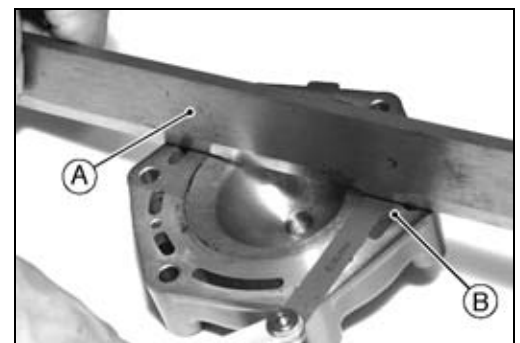
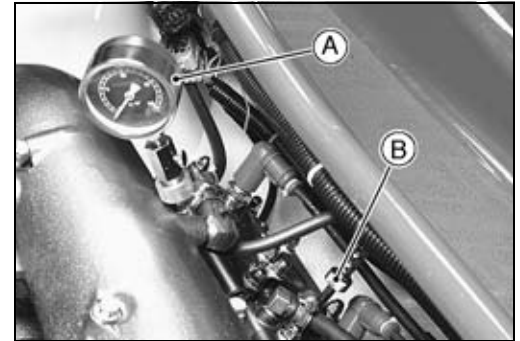
- ★ If the cylinder compression is higher than the usable range, check the following.
 - Carbon buildup on the piston head and cylinder head -clean off any carbon on the piston head and cylinder head.
 - Cylinder head gasket, cylinder base gaskets-use only the proper gaskets. The use of a gasket of incorrect thickness will change the compression.
- ★ If cylinder compression is lower than the usable range, check the following:
 - Gas leakage around the cylinder head-replace the damaged gasket and check the cylinder head for warp.
 - Piston/cylinder clearance, piston seizure.
 - Piston rings, piston ring grooves wear.

Cylinder Head Warp Inspection

- Lay a straightedge [A] across the lower surface of the head [B] at several different points, and measure warp by inserting a thickness gauge between the straightedge and the head.
- ★ If warp exceeds the service limit, repair the mating surface. Replace the cylinder head if the mating surface is badly damaged.

Cylinder Head Warp

Service Limit: 0.05 mm (0.0020 in.)



6-12 ENGINE TOP END

Engine Top End

Cylinder Wear Inspection

- Inspect the inside of the cylinder for scratches and abnormal wear.
- ★ If the cylinder is damaged or badly worn, replace it with a new one.
- Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the 3 locations (total of 6 measurements) shown in the figure.
 - 10 mm (0.4 in.) [A]
 - 90 mm (3.5 in.) [B]
 - 60 mm (2.4 in.) [C]

- ★ If any of the cylinder inside diameter measurements exceeds the service limit, the cylinder will have to be replaced with a new one.

Cylinder Inside Diameter

- Standard:** 80.000 ~ 80.015 mm (3.14961 ~ 3.15019 in.) and less than 0.01 mm difference between any two measurements
- Service Limit:** 80.10 mm (3.1535 in.), or more than 0.05 mm (0.0020 in.) difference between any two measurements

Piston Diameter Measurement

- Measure the outside diameter [A] of the piston 26.9 mm (1.059 in.) up [B] from the bottom of the piston at a right angle to the direction of the piston pin.

Piston Diameter

- Standard:** 79.865 ~ 79.880 mm (3.14429 ~ 3.14488 in.)
- Service Limit:** 79.72 mm (3.1386 in.)

- If the measurement is less than the service limit, replace the piston.

NOTE

- Abnormal wear such as a marked diagonal pattern across the piston skirt may mean a bent connecting rod or a misaligned crankshaft.

Piston/Cylinder Clearance

The piston-to-cylinder clearance must be checked, and the standard value maintained anytime a piston or the cylinder block are replaced with new parts.

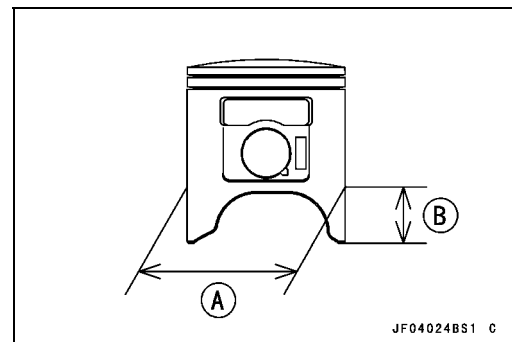
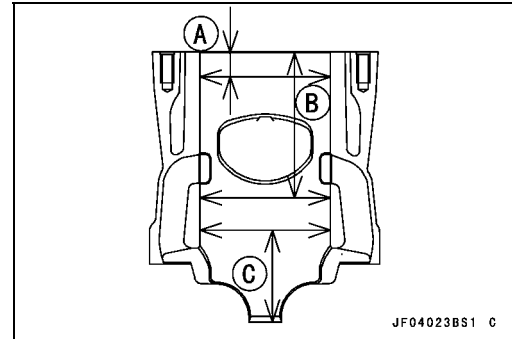
- Measure the piston diameter as just described, and subtract this value from the cylinder inside diameter measurement. The difference is the piston clearance.

Piston/Cylinder Clearance

- 0.130 ~ 0.140 mm (0.005118 ~ 0.005512 in.)**

Piston Ring, Piston Ring Groove Inspection

- Visually inspect the piston rings and the piston ring grooves.
- ★ If the rings are worn unevenly or damaged, they must be replaced.
- ★ If any piston ring groove is worn unevenly or damaged, the piston must be replaced and fitted with new rings.



Engine Top End

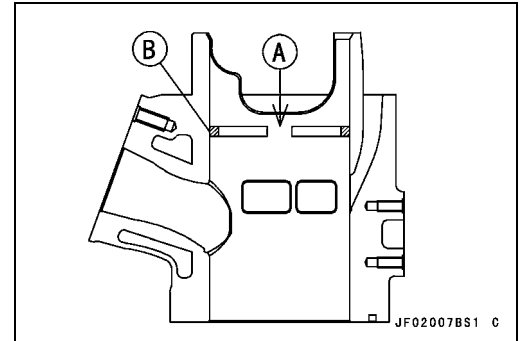
Piston Ring End Gap

- Put the cylinder upside-down.
- Place the piston ring inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.
- Measure the gap [A] between the ends of the ring [B] with a thickness gauge.
- ★ If the gap is wider than the service limit, the ring is worn excessively and must be replaced.

Top & Second Piston Ring End Gap

Standard: 0.25 ~ 0.40 mm (0.00984 ~ 0.0157 in.)

Service Limit: 0.70 mm (0.028 in.)



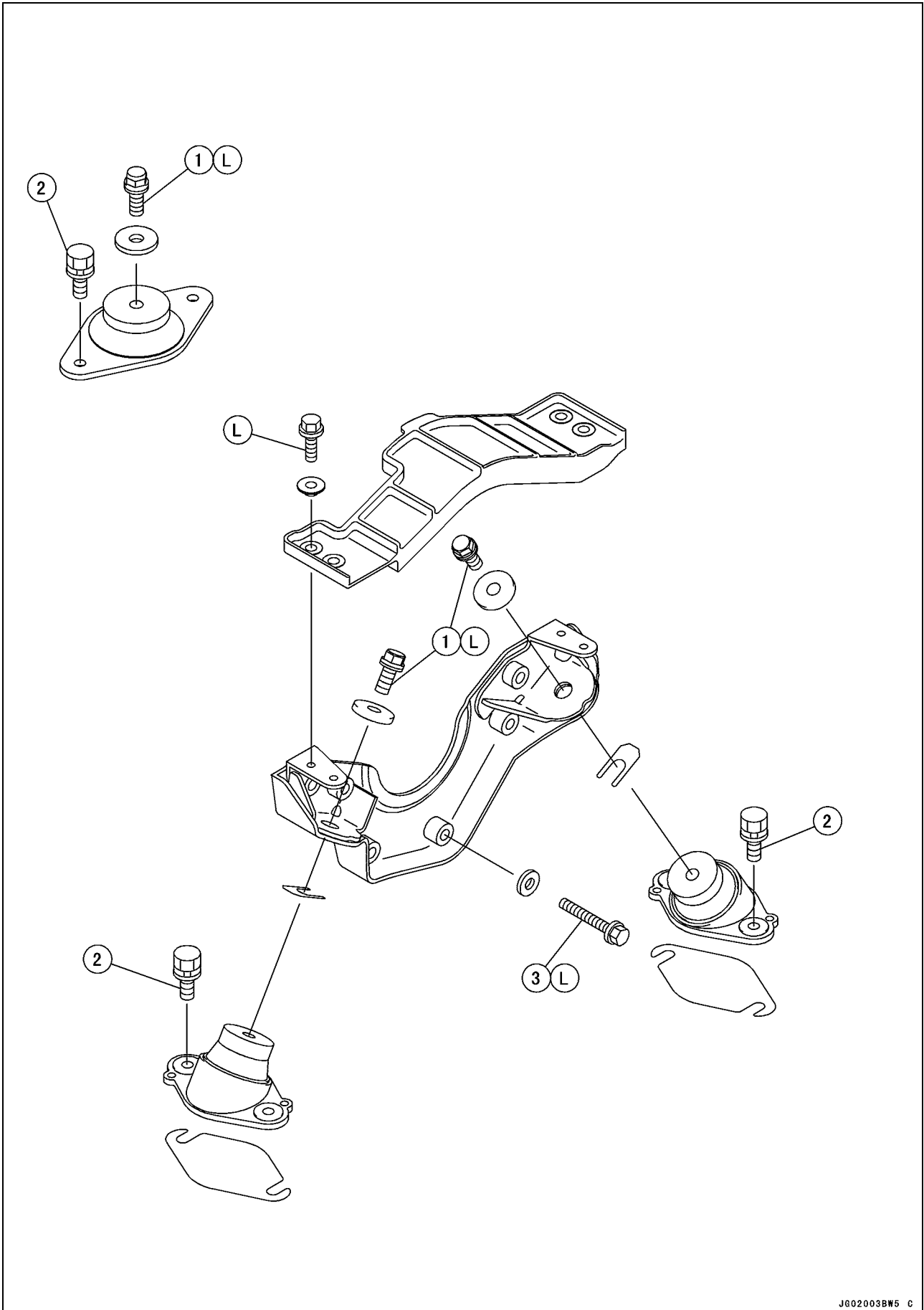
Engine Removal/Installation

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7-2 ENGINE REMOVAL/INSTALLATION

Exploded View



ENGINE REMOVAL/INSTALLATION 7-3

Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Mounting Bolts	36	3.7	27	L
2	Engine Damper Mounting Bolts	16	1.6	12	
3	Engine Mount Bolts	34	3.5	25	L

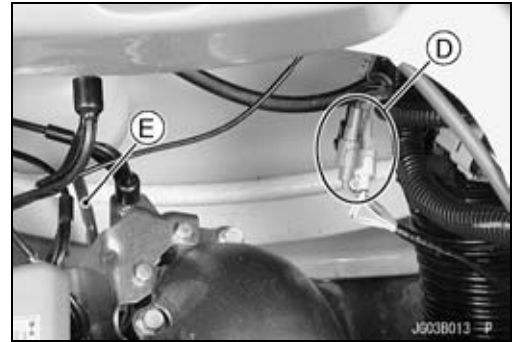
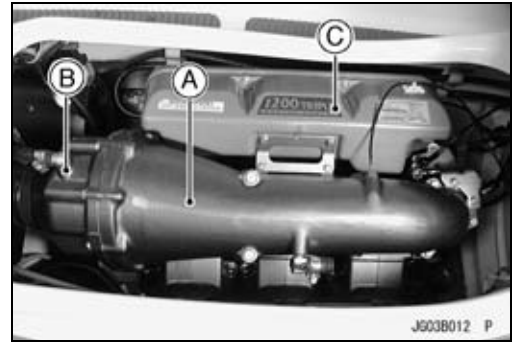
L: Apply a non-permanent locking agent.

7-4 ENGINE REMOVAL/INSTALLATION

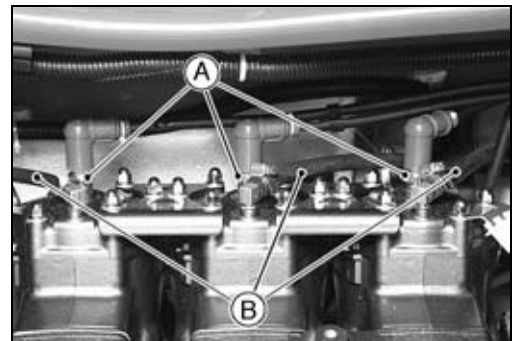
Engine Removal/Installation

Removal

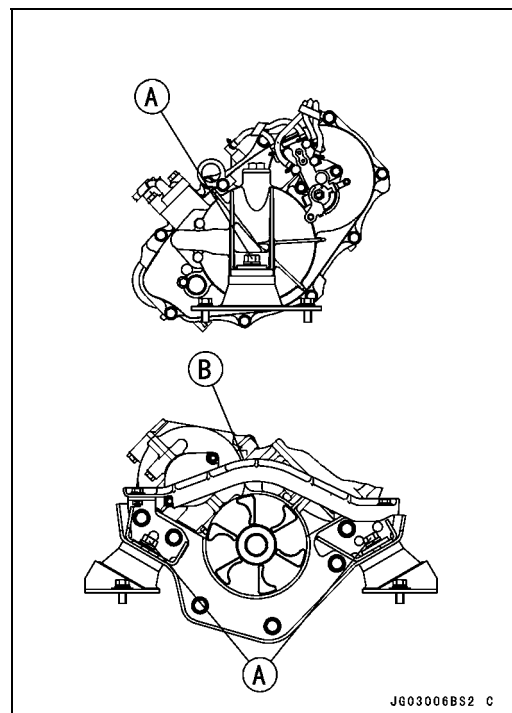
- Remove or disconnect:
 - Exhaust Pipe [A] and Chamber [B] as a set (see Exhaust System chapter.)
 - Air Inlet Cover [C] (see Fuel System chapter.)
 - Carburetors (see Fuel System chapter.)
 - Magneto Lead Connectors [D] (Disconnect)
 - Oil Inlet Hose [E] (Disconnect)



- Remove:
 - Spark Plugs [A]
 - Cooling Hoses on Cylinder Heads [B]

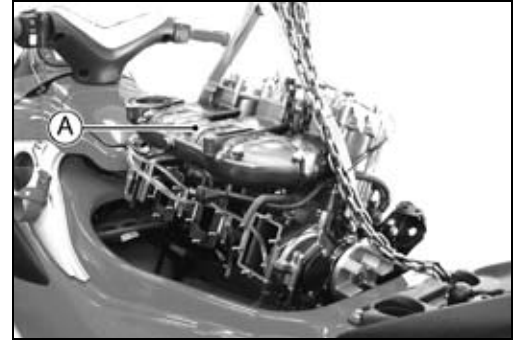


- Coupling Cover [B]
- Engine Mounting Bolts [A]



Engine Removal/Installation

- Slide the engine toward the front to disengage the couplings, and then lift the engine [A] out of the hull.



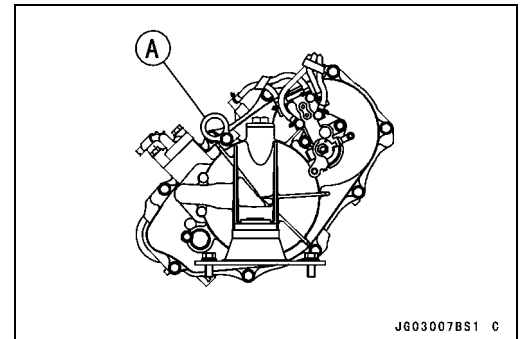
- Lift the engine by using the plates [A].

NOTE

- Perform the following services while the engine is lifted to make them easier.

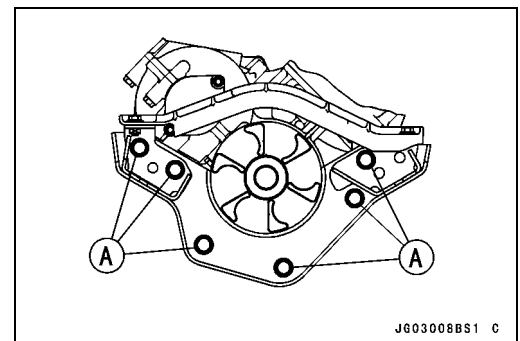
Oil Pump Cable Disconnection
 Inlet Cooling Hose Disconnection
 Starter Motor Cable Disconnection

- Remove the engine mount.



Installation

- Be sure there are no foreign objects and parts inside of the hull.
- Clean the bilge filter (see Filter Cleaning and Inspection in the Cooling and Bilge Systems chapter).
- Check the coupling damper for wear and damage (see Coupling Damper Inspection in the Engine Bottom End chapter).
- Apply a non-permanent locking agent to the engine mount bolts [A] and torque them.



Torque - Engine Mount Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)

- Check the gap between the engine mount and the dampers by rocking the engine.
- If there is a gap, insert a suitable shim between the engine mount and the damper to achieve a good fit.

Shim Selection

Shim No.	Thickness
92025-3705	t 0.3 mm
92025-3706	t 0.5 mm
92025-3707	t 1.0 mm
92025-3708	t 1.5 mm

- Apply a non-permanent locking agent to the engine mounting bolts and torque them.

Torque - Engine Mounting Bolts: 36 N·m (3.7 kgf·m, 27 ft·lb)

- After installing the engine in the hull, check the following.
 - Throttle Control Cable
 - Choke Cable
 - Oil Pump Bleeding
 - Fuel and Exhaust Leaks

7-6 ENGINE REMOVAL/INSTALLATION

Engine Removal/Installation

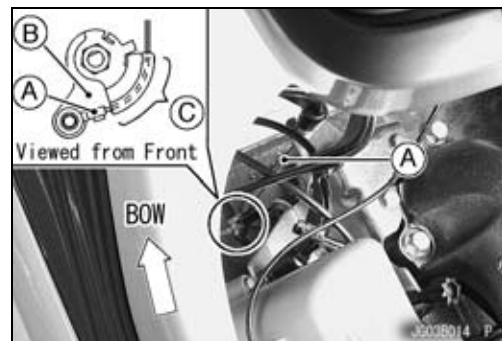
- Check the oil pump cable installation as follows.
- Pull the throttle lever to ensure if the oil pump cable [A] makes the oil pump pulley [B] turn.
- Make sure the lower part [C] of the oil pump cable is installed the oil pump pulley securely.
- ★ If necessary, reinstall the oil pump cable to the pulley and adjust it (see Oil Pump Cable Adjustment in the Periodic Maintenance chapter).

WARNING

Do not run the engine in a closed area. Exhaust gases contain carbon monoxide, a colorless, odorless, poisonous gas which can be lethal.

CAUTION

Operate the engine only for short periods without cooling water.



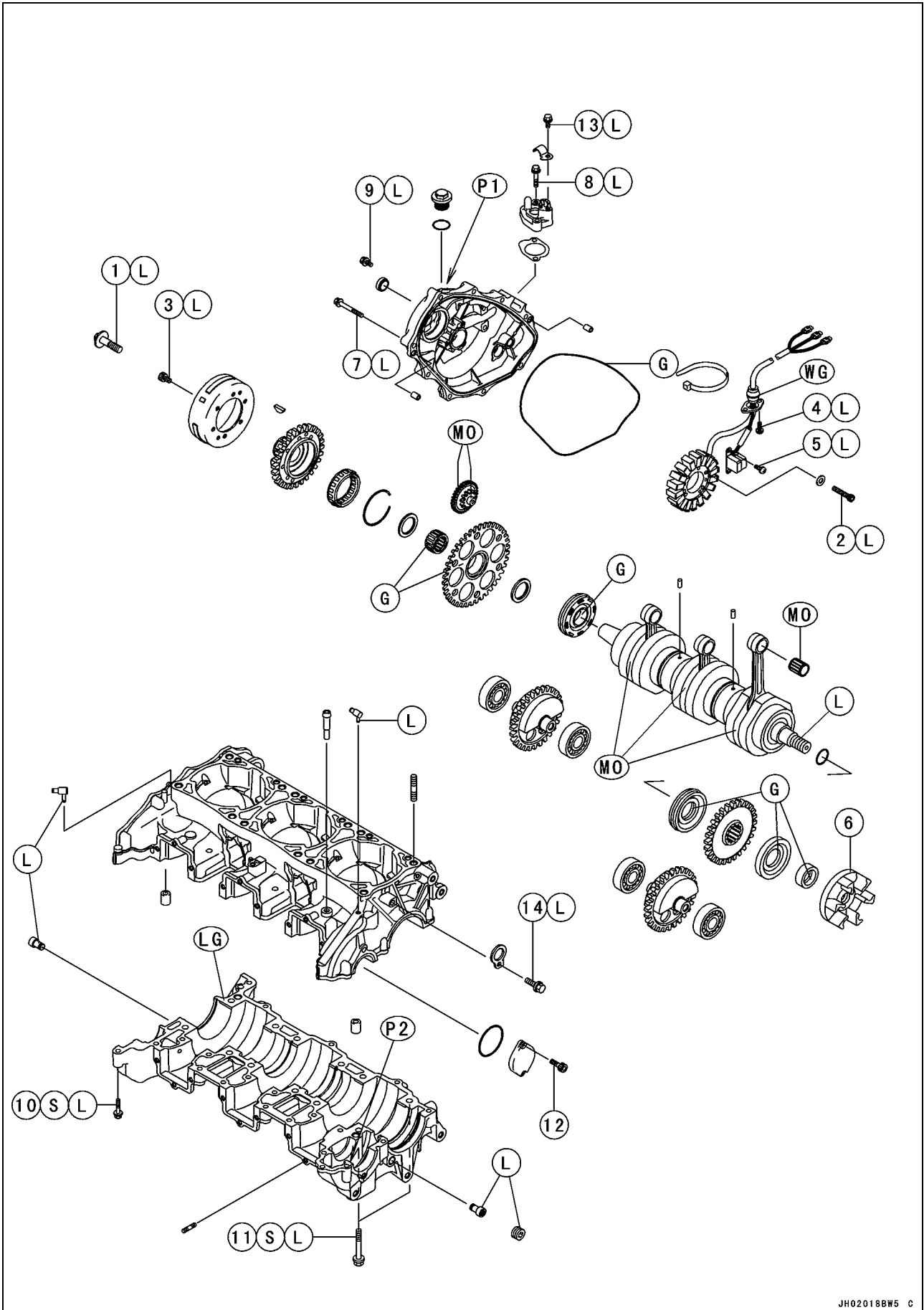
Engine Bottom End

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8-2 ENGINE BOTTOM END

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Flywheel Bolt	123 ~ 127	12.5 ~ 13.0	90 ~ 94	L
2	Stator Mounting Bolts	7.8	0.8	69 in·lb	L
3	Balancer Drive Gear Mounting Bolts	12	1.2	8.7	L
4	Grommet Mounting Screws	3.5	0.36	31 in·lb	L
5	Pickup Coil Mounting Screws	3.5	0.36	31 in·lb	L
6	Coupling	123 ~ 127	12.5 ~ 13.0	90 ~ 94	L
7	Magneto Cover Mounting Bolts	12	1.2	8.7	L
8	Grommet Cover Mounting Bolts	8.8	0.9	78 in·lb	L
9	Oil Level Gauge Bolt	3.9	0.4	35 in·lb	L
10	Crankcase Bolts-6 mm dia	8.8	0.9	78 in·lb	L, S
11	Crankcase Bolts-8 mm dia	29	3.0	22	L, S
12	Bearing Cap Bolts	7.8	0.8	69 in·lb	
13	Clamp Mounting Bolt	8.8	0.9	78 in·lb	L
14	Plate Bolt	8.8	0.9	78 in·lb	L

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

MO: Apply molybdenum disulfide oil to the flanged portion. (Mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)

S: Tighten the fasteners, following the specified sequence.

P1: Pour 200 mL (12.2 cu in.) of 2-stroke oil.

P2: Pour 20 mL (1.2 cu in.) of 2-stroke oil.

WG: Apply water-resistance grease.

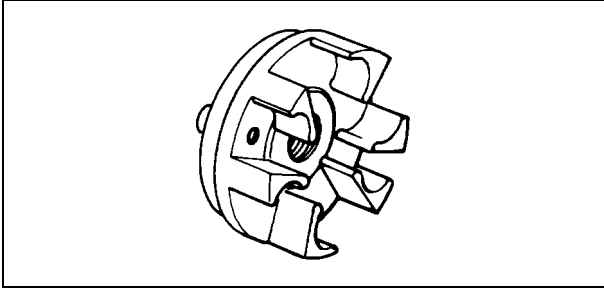
8-4 ENGINE BOTTOM END

Specifications

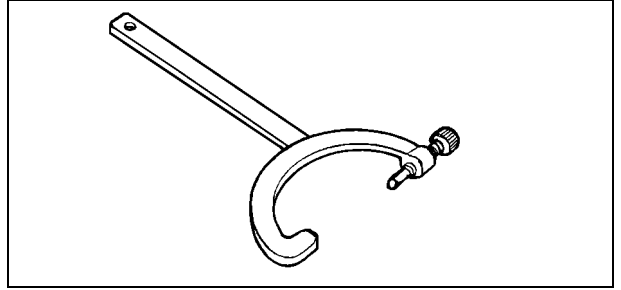
Item	Standard	Service Limit
Crankshaft, Connecting Rods		
Crankshaft Runout		
Runout [B]	TIR under 0.04 mm (0.00157 in.)	TIR 0.10 mm (0.00394 in.)
Runout [C]	TIR under 0.10 mm (0.00394 in.)	TIR 0.25 mm (0.00984 in.)
Connecting Rod Side Clearance	0.45 ~ 0.55 mm (0.01772 ~ 0.02165 in.)	0.8 mm (0.031 in.)
Connecting Rod Radial Clearance	0.025 ~ 0.037 mm (0.000984 ~ 0.001457 in.)	0.087 mm (0.00343 in.)
Connecting Rod Bent	0.05 mm/100 mm (0.00197/3.934 in.)	0.2 mm/100 mm (0.0079/3.934 in.)
Connecting Rod Twist	0.15 mm/100 mm (0.00591/3.934 in.)	0.2 mm/100 mm (0.0079/3.934 in.)

Special Tool

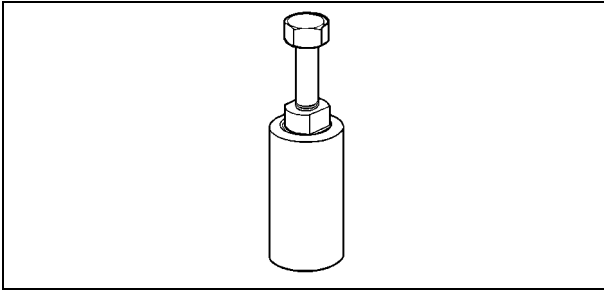
**Coupling Holder #2:
57001-1423**



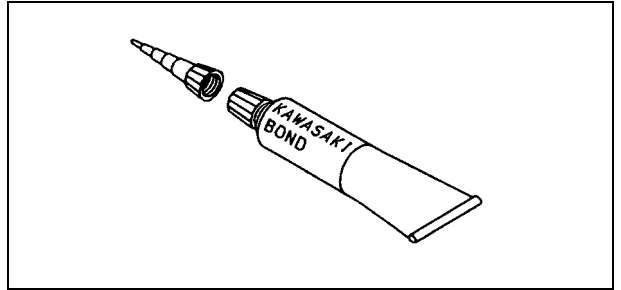
**Rotor Holder:
57001-1428**



**Flywheel Puller Assembly, M30 × 1.5, M33 × 1.5:
57001-1426**



**Kawasaki Bond (Liquid Gasket - Black) :
92104-1062**



8-6 ENGINE BOTTOM END

Oil Filling

Oil Filling

- Take out the plug [A] on the magneto cover and fill 200 mL (12.2 cu in.) of 2-stroke oil [B] into the front balancer room (inside the magneto cover) after the following service procedures.

Coupling Removal

Magneto Flywheel Removal

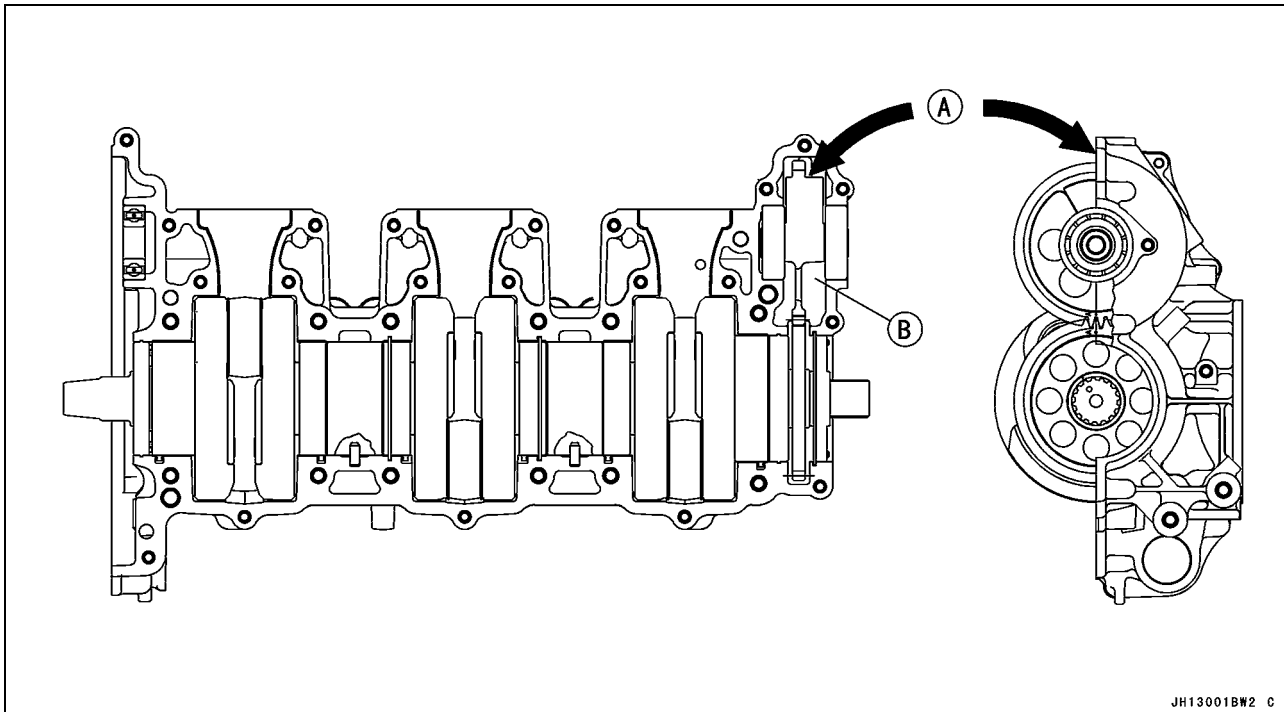
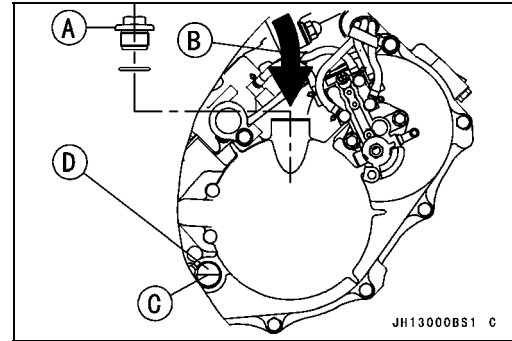
Starter Clutch Gear and Starter Idle Gear Removal

Stator Removal

NOTE

○ Oil level should be approx in the middle line [C] of the oil level gauge [D] under the state that the engine is mounted on the hull after pouring 200 mL (12.2 cu in.).

- Fill 20 mL (1.2 cu in.) of 2-stroke oil [A] into the rear balancer room [B] after splitting the crankcase.



Coupling

Removal

- Remove:
 - Engine (see Engine Removal/Installation chapter)
 - Coupling Damper
 - Magneto Cover
 - Starter Idle Gear
- Holding the boss of the front balancer gear, unscrew the coupling.

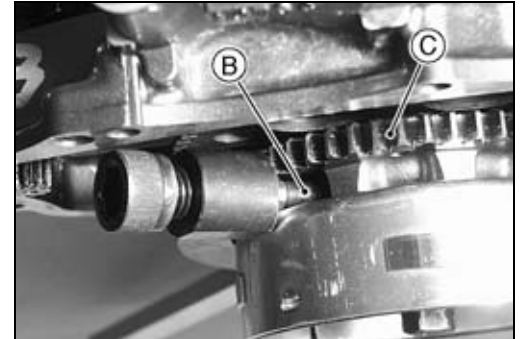
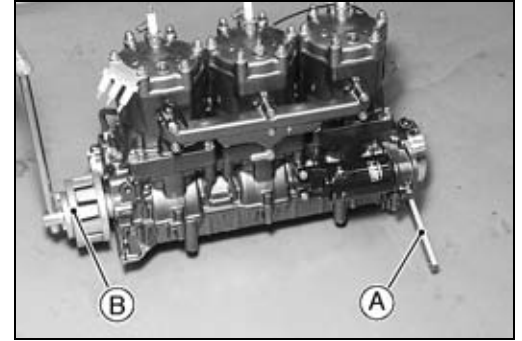
**Special Tools - Rotor Holder: 57001-1428 [A]
Coupling Holder: 57001-1423 [B]**

NOTE

○Be sure to hold the boss [B] of the front balancer gear [C] with the rotor holder [A].

CAUTION

Do not hold the teeth of the front balancer drive gear or magneto flywheel with the rotor holder. The gear teeth or the flywheel could be damaged.



Installation

- Apply a non-permanent locking agent.
 - Screw the coupling onto the crankshaft and tighten it.
- Torque - Coupling: 123 ~ 127 N·m (12.5 ~ 13.0 kgf·m, 90 ~ 94 ft·lb)**

Coupling Damper Inspection

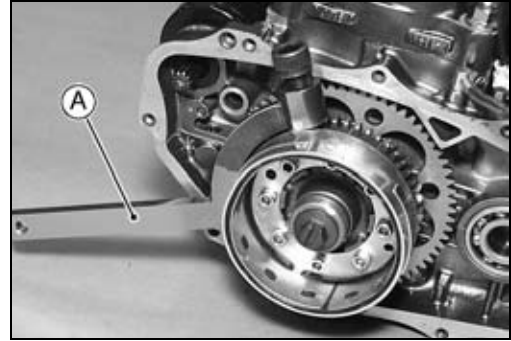
- Refer to Coupling Damper Inspection in the Periodic Maintenance chapter.

8-8 ENGINE BOTTOM END

Magneto Flywheel

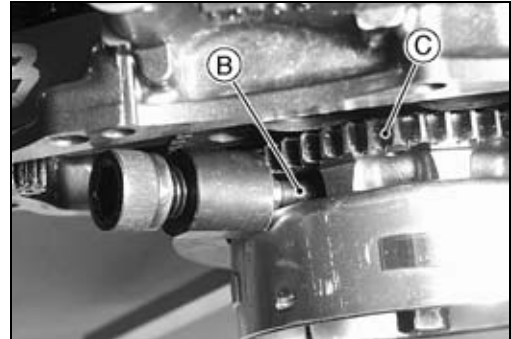
Magneto Flywheel Removal

- Remove:
 - Engine (see Engine Removal/Installation chapter.)
 - Magneto Cover
 - Starter Idle Gear
 - Holding the boss [B] of the front balancer gear [C] with the rotor holder [A], remove the flywheel bolt.
- Special Tool - Rotor Holder: 57001-1428 [A]**



CAUTION

Do not hold the teeth of the front balancer drive gear or magneto flywheel with the rotor holder. The gear teeth or the flywheel could be damaged.



- Using the special tool, pull off the flywheel.

Special Tool - Flywheel Puller Assembly, M30 × 1.5, M33 × 1.5: 57001-1426 [A]

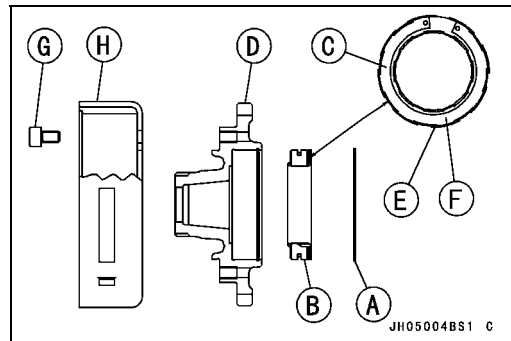
CAUTION

Do not hit the head of the flywheel puller assy. A loss in rotor magnetism may be caused.



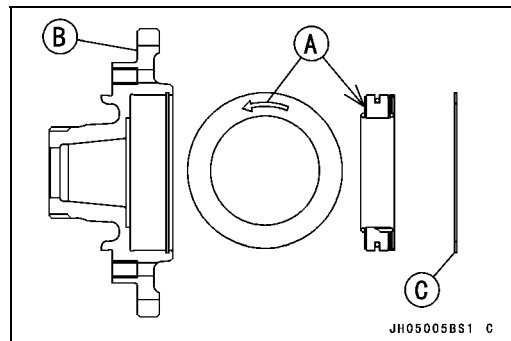
Magneto Flywheel Disassembly

- Remove the snap ring [A].
 - Compressing the friction ring [C], remove the oneway clutch [B] from the balancer drive gear [D].
- When compressing the friction ring, be careful that its projections [E] does not get out of the side plate [F].
- Remove the balancer drive gear mounting bolts [G] and take out the magneto flywheel [H].



Magneto Flywheel Assembly

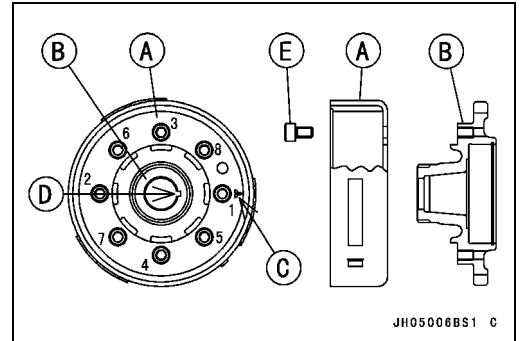
- Install the oneway clutch, compressing the friction ring on the balancer drive gear.
- When installing the oneway clutch, be careful that its rotating mark [A] faces toward the balancer gear [B] side.
- When compressing the friction ring, be careful that its projections does not get out of the side plate.
- Replace the snap ring [C] with new one and install it.



Magneto Flywheel

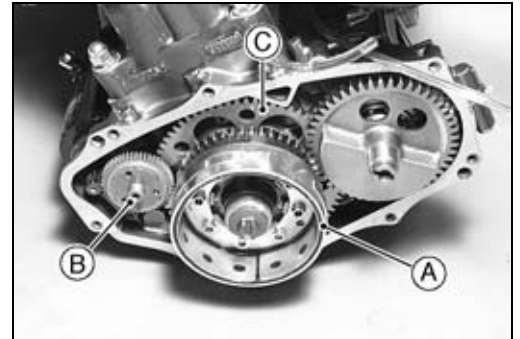
- Install the magneto flywheel [A] on the balancer drive gear [B].
- Align the maker mark [C] on the magneto flywheel with the key groove [D] on the gear [B].
- Apply a non-permanent locking agent to the balancer drive gear mounting bolts [E] and tighten them, following the sequence shown.

Torque - Balancer Drive Gear Mounting Bolts: 12 N·m (1.2 kgf·m, 8.7 ft·lb)



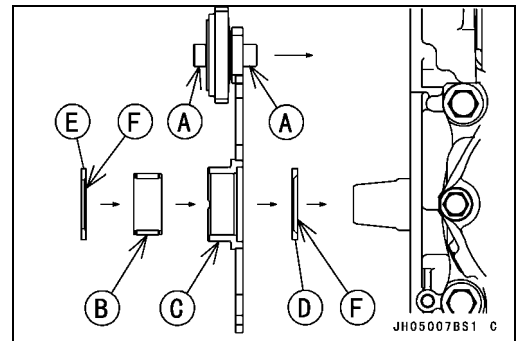
Stater Clutch Gear and Starter Idle Gear Removal

- Remove:
 - Magneto Cover
 - Magneto Flywheel [A]
 - Starter Idle Gear [B]
 - Starter Clutch Gear [C]



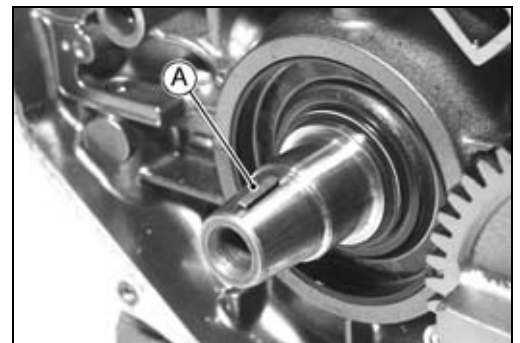
Starter Clutch Gear and Starter Idle Gear Installation

- Apply molybdenum disulfide oil to the starter idle gear shaft [A].
- Grease slightly the needle bearing [B] and the inside of the starter clutch gear [C] as shown.
- Install the 3 mm (0.118 in.) thick spacer [D] on the cylinder side and the 2.5 mm (0.0984 in.) thick spacer [E] on the magneto side with each chamfer side facing the cylinder side.



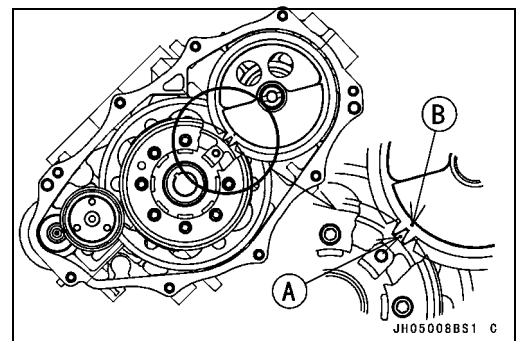
Magneto Flywheel Installation

- Using a high flash-points solvents, clean off any oil or dirt that may be on the flywheel bolt, the crankshaft taper, or in the tapered hole in the flywheel.
- Fit the woodruff key [A] securely in the crankshaft before installing the magneto flywheel.



- Install the magneto flywheel, aligning a mark [A] on the balancer drive gear with a mark [B] on the balancer driven gear.

Torque - Flywheel Bolt: 123 ~ 127 N·m (12.5 ~ 13.0 kgf·m, 90 ~ 94 ft·lb)



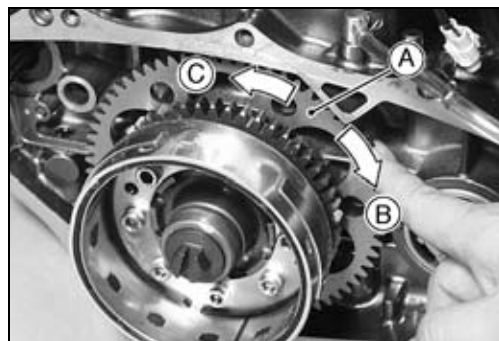
8-10 ENGINE BOTTOM END

Magneto Flywheel

- Inspect the starter clutch.
- Turn the starter clutch gear [A] by hand. The starter clutch gear should turn counterclockwise [C] freely, but should not turn clockwise [B].
- ★ If the clutch does not operate as it should or if it makes noise, disassemble the starter clutch, examine each part visually, and replace any worn or damaged parts.

NOTE

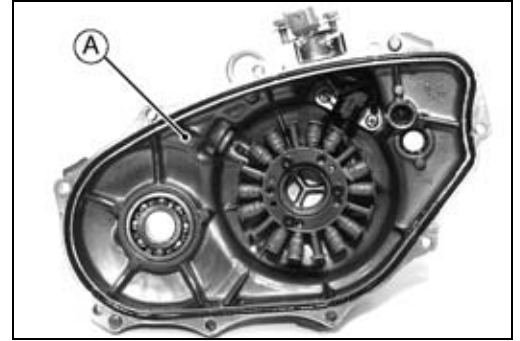
○ *Leave the starter idle gear removed when inspecting.*



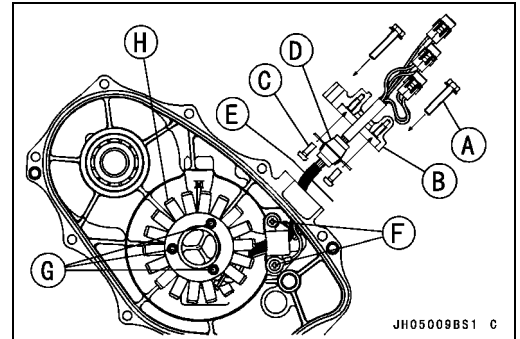
Stator

Removal

- Remove:
 - Engine Magneto Cover [A]



- Remove:
 - Grommet Cover Mounting bolts [A]
 - Grommet Cover [B]
 - Stator Grommet Mounting Screws [C]
 - Grommet [D]
 - Gasket [E]
 - Crankshaft Sensor Mounting Screws [F]
 - Stator Mounting Bolts with Washers [G]
 - Stator Assembly [H]



Installation

NOTE

○ Install the grommet and grommet cover before installing the stator assembly.

- Run the gasket through the stator lead.
- Install the grommet [A] on the grommet cover [B].
- Apply water resistant grease to the grommet
- Apply a non-permanent locking agent to the grommet mounting screws [C]

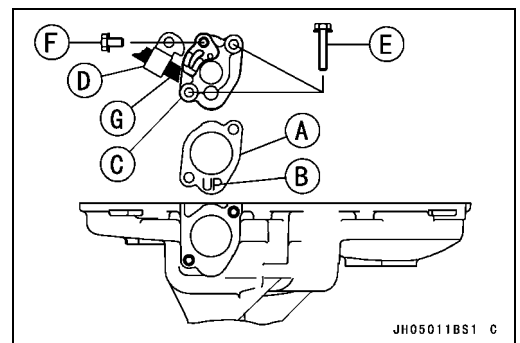
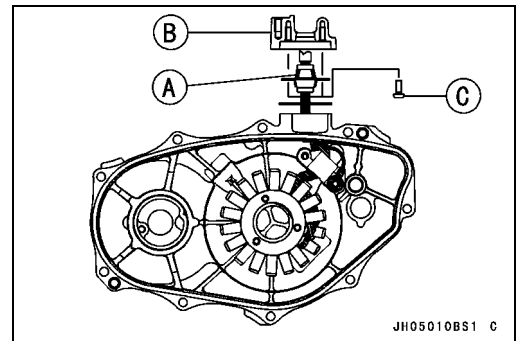
Torque - Grommet Mounting Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)

- Install the grommet cover on the magneto cover.
- Install the new gasket [A] so that its "UP" letter [B] faces upward.
- Note the install direction for the cover [C] and clamp [D].
- Apply a non-permanent locking agent to the grommet cover mounting bolts [E] and clamp mounting bolt [F].

Torque - Grommet Cover Mounting Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)

Clamp Mounting Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)

- Keep the magneto lead [G] loose when tightening the clamp mounting bolt [E].

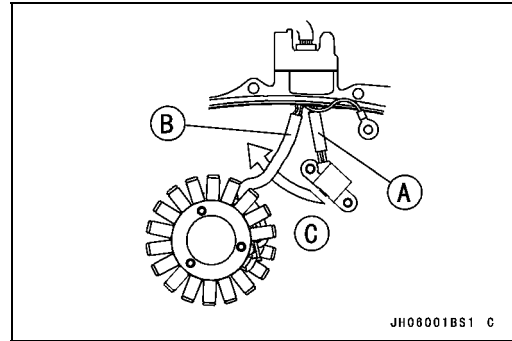


8-12 ENGINE BOTTOM END

Stator

- Install the stator and crankshaft sensor on the magneto cover.
- Run the pickup coil leads [A] to the left [C] under the stator leads [B] as shown.
- Apply a non-permanent locking agent to the stator mounting bolts and put the washers.

Torque - Stator Mounting Bolts: 7.8 N·m (0.8 kgf·m, 69 in·lb)

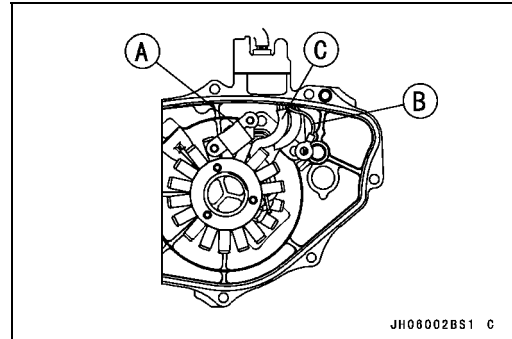


- Apply a non-permanent locking agent to the crankshaft sensor mounting screws and install the crankshaft sensor [A] together with the ground lead [B] so that the stator leads [C] have to be pressed by the crankshaft sensor.

Torque - Crankshaft Sensor Mounting Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)

NOTE

- While pressing the crankshaft sensor outward, torque the crankshaft sensor mounting screws.

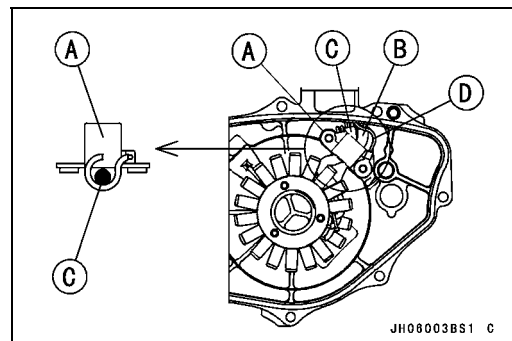


Crankshaft Sensor Air Gap (Clearance between the rotor projection and pickup core)

Standard: 0.75 ~ 0.95 mm (0.030 ~ 0.037 in.)

NOTE

- When installing the crankshaft sensor [A], fix the crankshaft sensor leads [B] between the stator leads [C] and the inside wall [D] of the magneto cover.
- Be sure the stator and crankshaft sensor leads have no slack and bite.



Crankcase

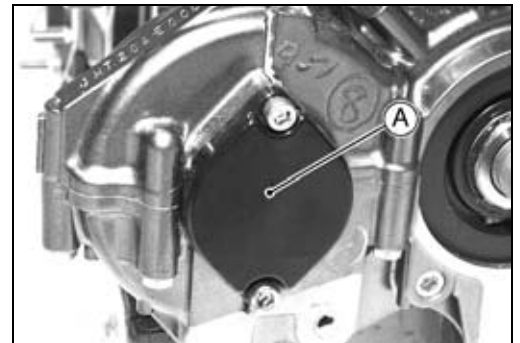
Splitting

- Remove the engine (see Engine Removal/Installation chapter).
- Remove the following from the engine.
 - Starter Motor
 - Inlet Manifold, Cylinder Head, Cylinder Block, and Pistons
 - Oil Pump
 - Coupling
 - Magneto Flywheel, Balancer Gear, Starter Idle Gear, and Starter Clutch Gear

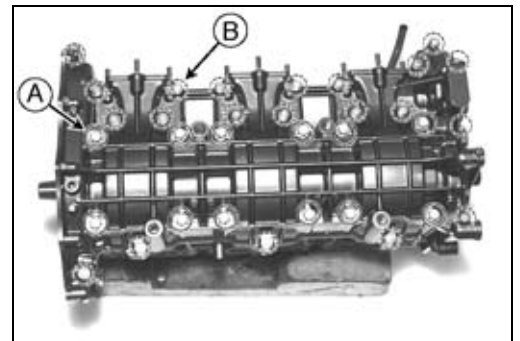
NOTE

○ Always remove the coupling before removing the magneto flywheel or there won't be any way to hold the crankshaft while unscrewing the coupling.

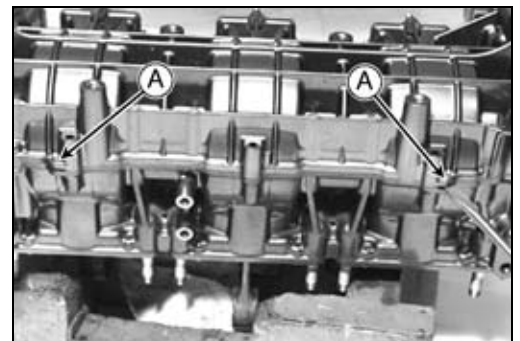
- Remove the bearing cap [A].



- Remove the 6 mm crankcase bolts [A] first and the 8 mm bolts [B].



- Pry the point [A] indicated in the figure to split the crankcase halves apart, and then remove the lower crankcase half.
- Lift the crankshaft assembly out of the upper crankcase half.

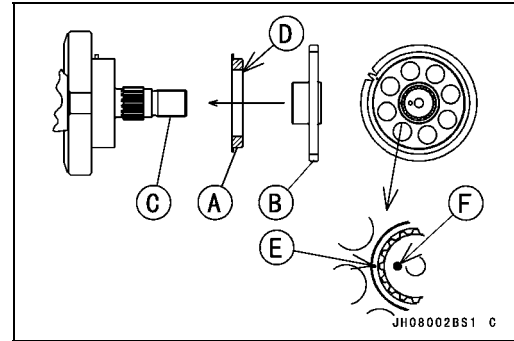


8-14 ENGINE BOTTOM END

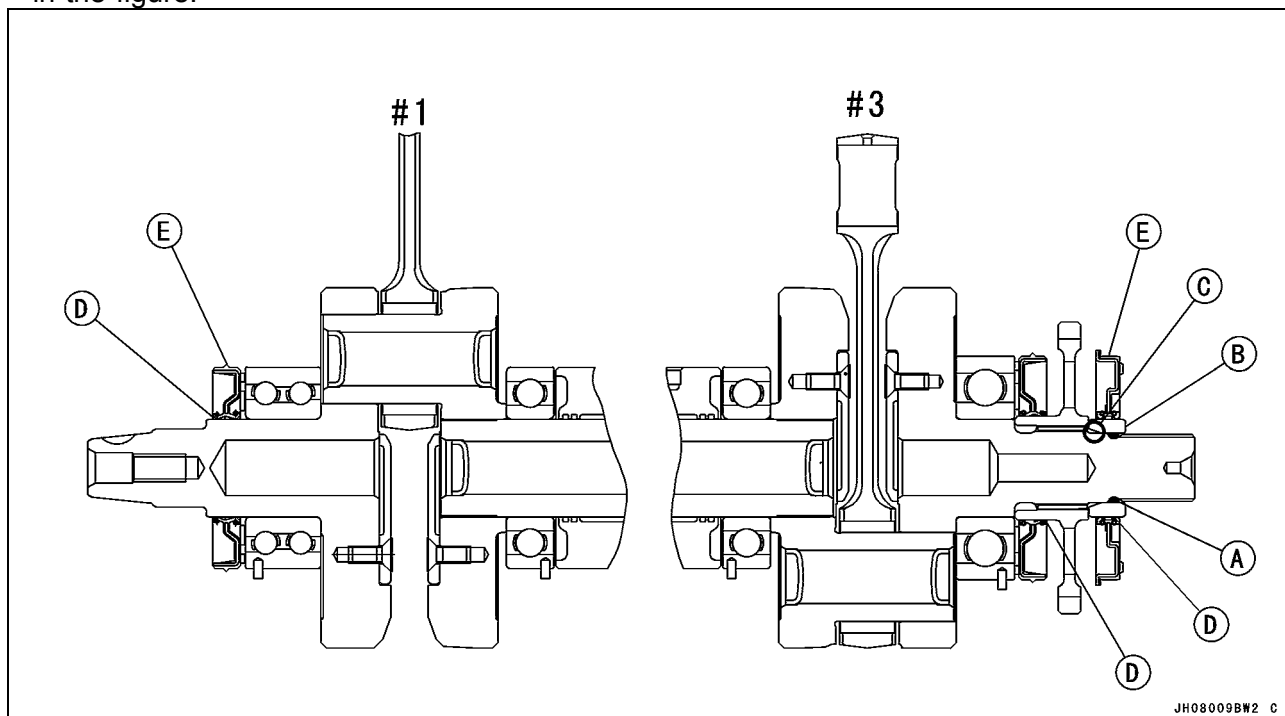
Crankcase

Assembly

- Install the oil seal [A] and the balancer drive gear [B] on the crankshaft [C].
- Slightly apply grease [D] to the lip of the oil seal and install it, noting the install direction indicated in the figure.
- Align a mark [E] on the balancer drive gear with a mark [F] on the crankshaft.

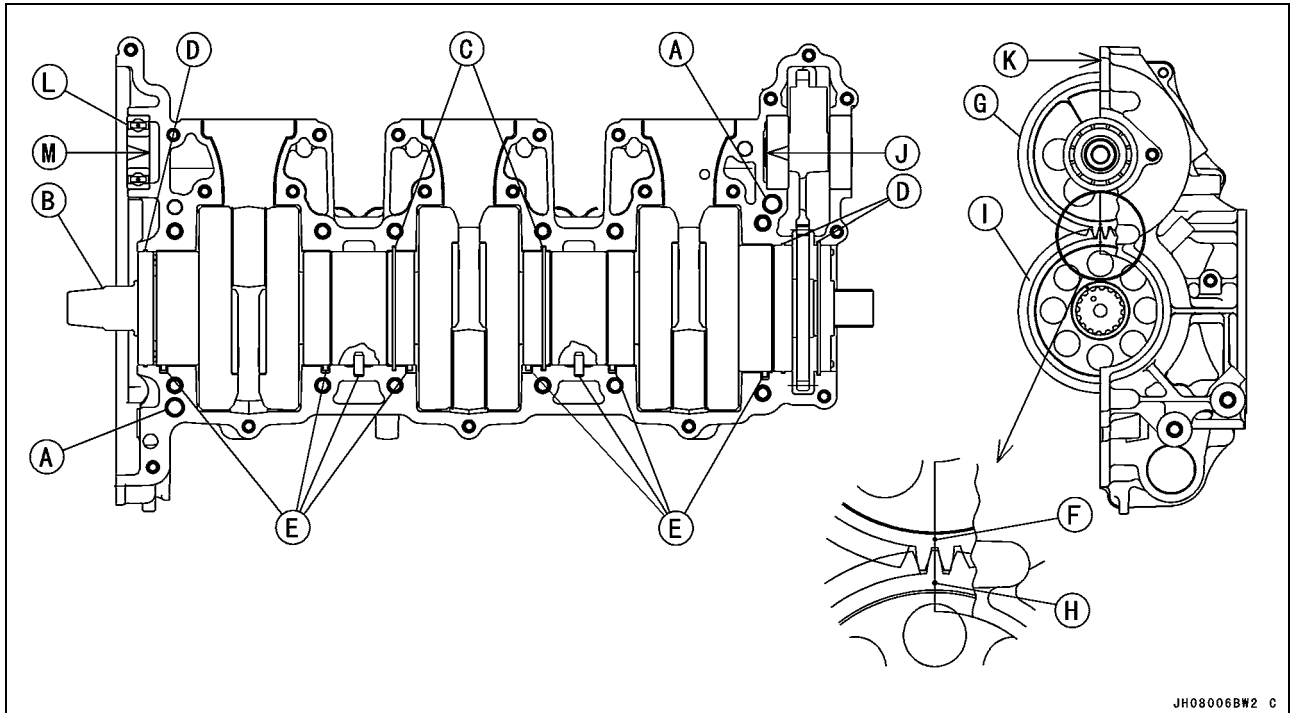


- Visually inspect the crankshaft O-ring [A] and replace it if necessary.
- Grease the inner surface of the collar [B] and install it so that its chamfer side [C] faces toward the balancer drive gear.
- Slightly grease [D] the lips of the oil seals [E] and install them, noting the install directions indicated in the figure.



- Apply molybdenum disulfide oil to the connecting rod big end bearings and the side washers.
- With a high flash-point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.
- Check that the dowel pins [A] are in place.
- Place the crankshaft assembly [B] in the upper crankcase half.
- Fit each position ring [C] of the bearings and each raised rib [D] of the oil seals into the grooves in the crankcase.
- Fit the pins [E] of the bearing and labyrinth packing into the holes of the crankcase.
- Install the rear balancer gear [G], aligning a mark [F] on the balancer gear [G] with a mark [H] on the balancer drive gear [I]. At this time, push the bearing toward bow side [J].
- **Pour 20 mL (1.2 cu in.) of 2-stroke oil into rear balancer room [K].**
- Set the bearing [L] for the front balancer gear, pushing it toward stern side [M].

Crankcase

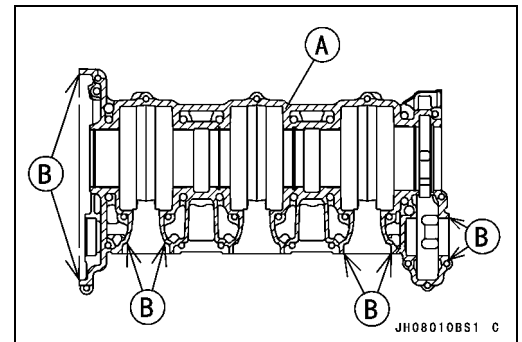


JH08006BW2 C

- Apply liquid gasket to the mating surface [A] of the lower crankcase half.
- Wipe off any excess liquid gasket at the portions [B] indicated in the figure.

NOTE

- Finish the application of the liquid gasket within 30 minutes.
- Tighten the case bolts just after finishing the application of the liquid gasket.



JH08010BS1 C

**Special Tool - Kawasaki Bond (Liquid Gasket-Black):
92104-1062**

- Install the lower crankcase half on the upper half.
- Apply a non-permanent locking agent to the crankcase bolts, and tighten them in the order numbered on the lower crankcase.

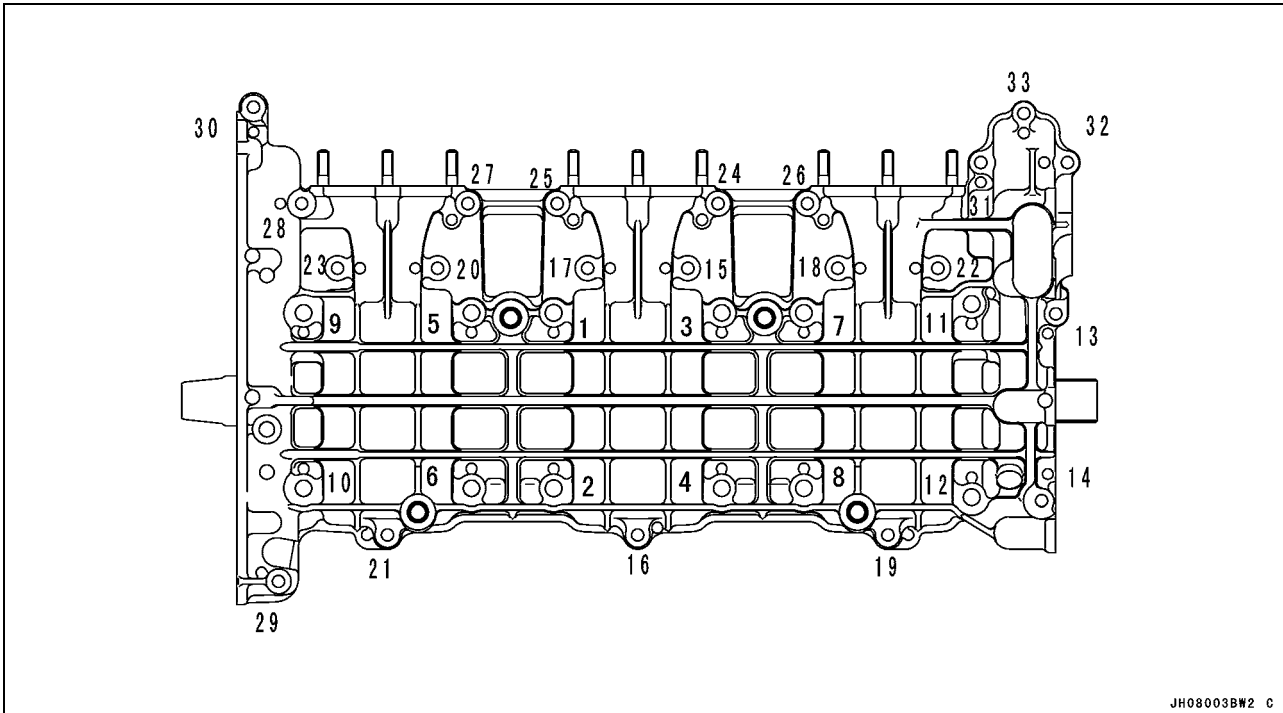
Torque - Crankcase M8 Bolts: 29 N·m (3.0 kgf·m, 22 ft·lb)

Crankcase M6 Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)

- The tightening sequence numbers are marked on the lower crankcase half.

8-16 ENGINE BOTTOM END

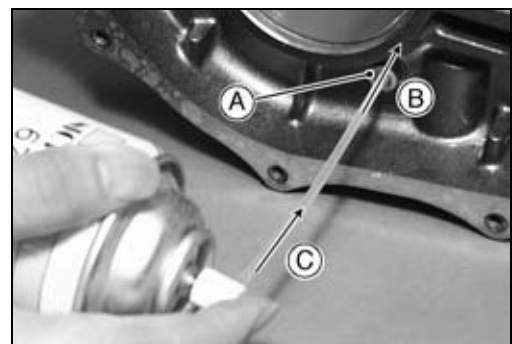
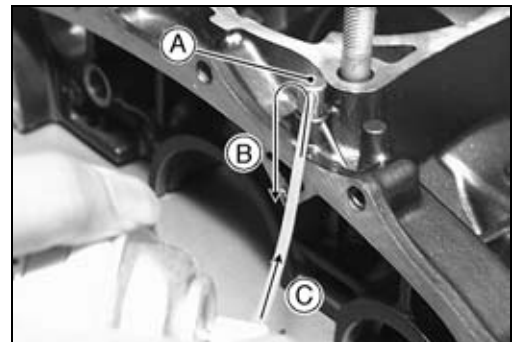
Crankcase



JH08003BW2 C

Crankcase Check Valves Inspection

- Split the crankcase.
 - Inspect the check valves.
- The check valve [A] allows oil flow in the direction of the arrow [B].
- Inspect the normal oil flow by injecting [C] a high flash -point solvent in a squirt can or syringe.
- ★ In the following case, replace the check valve.
1. Oil will not pass through the check valve in the normal direction.
 2. Oil will pass through the check valve in both direction.



CAUTION

Do not use compressed air on the valve since doing so would damage the valve spring

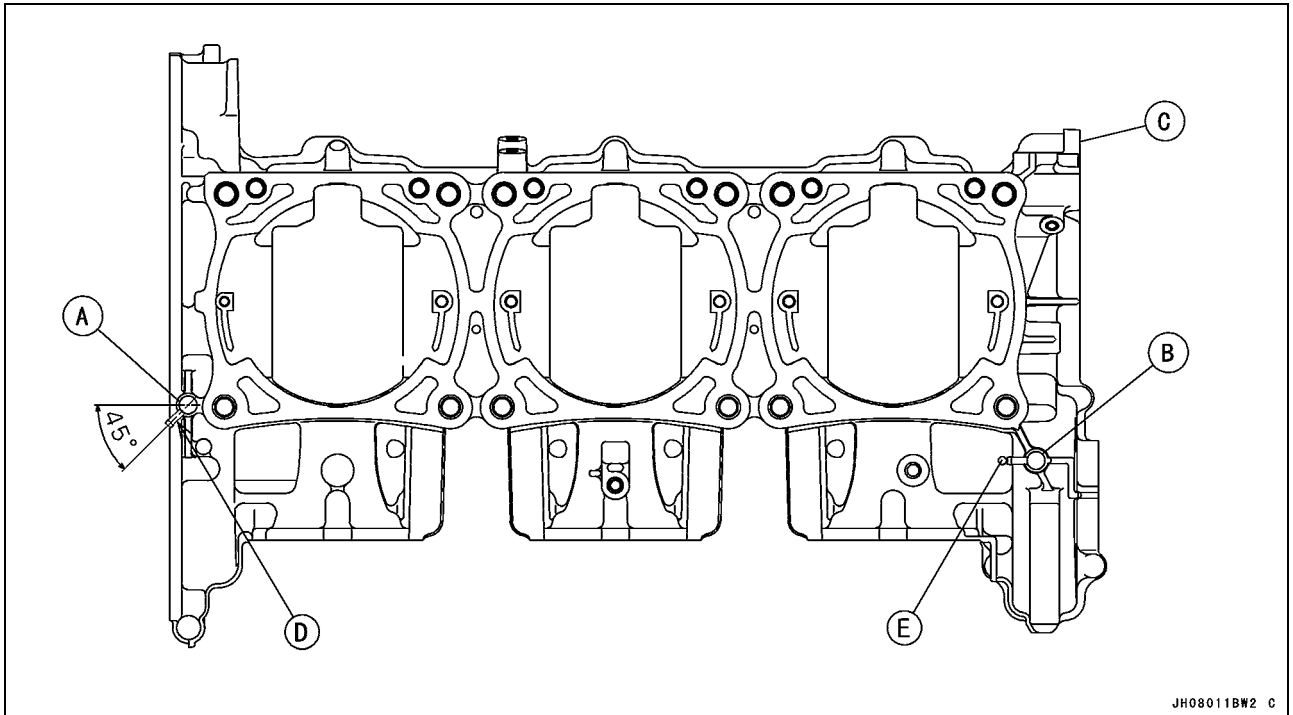
Upper Crankcase Check Valve Removal/Installation

- Remove the front [A] and rear [B] check valves on the upper crankcase [C] with pliers.
 - Note the following when installing.
- Apply a non-permanent locking agent to the check valves.
- Press the check valves until they are bottomed. At this time, do not plug up the holes of the check valves with a non-permanent locking agent.
- Install the check valves [A] [B] as shown.

NOTE

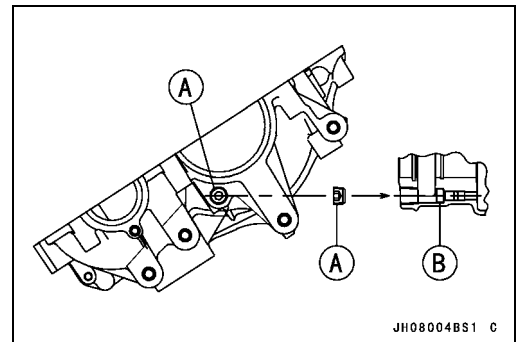
- Align the oil hose fitting of the front check valve [A] with a rib [D] on the upper crankcase half.
- Align the oil hose fitting of the rear check valve [B] with a mark [E] on the upper crankcase half.

Crankcase

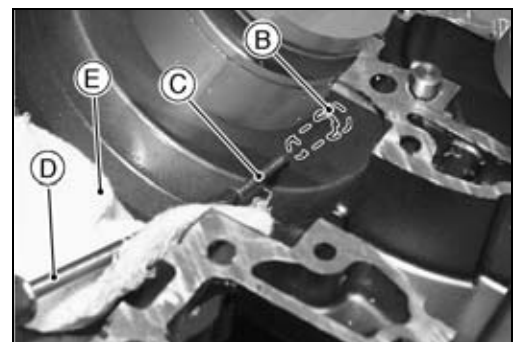
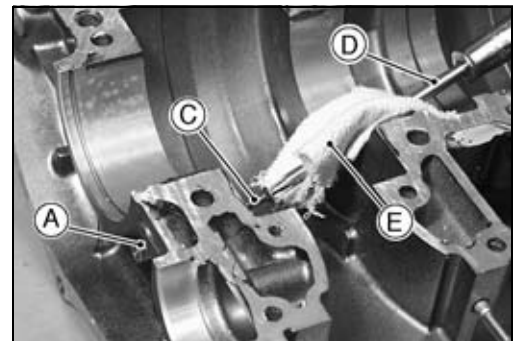


Lower Crankcase Check Valve Removal/Installation

- Split the crankcase.
- Take out the plug [A] to remove the rear check valve [B] from the lower crankcase.



- Tap the front [A] and rear [B] check valves out of the lower crankcase with a suitable screw [C] and driver [D].
- Place a rug [E] on the crankcase half to prevent it from damage.



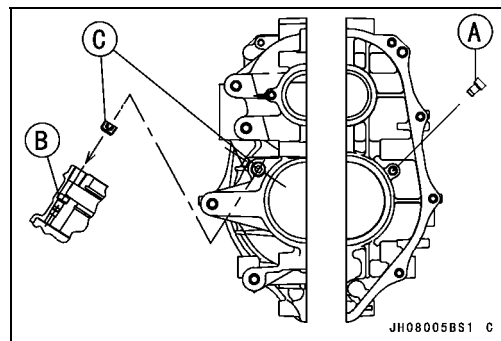
8-18 ENGINE BOTTOM END

Crankcase

- Apply a non-permanent locking agent to the front check valve [A] and rear check valve [B].
- Press the check valves until their flanges portions are bottomed. At this time, do not plug up the holes of check valves with a locking agent.
- Apply a non-permanent locking agent to the plug [C] for the rear check valve and install it.

CAUTION

In case that the check valves were installed aslant, replace the check valves.



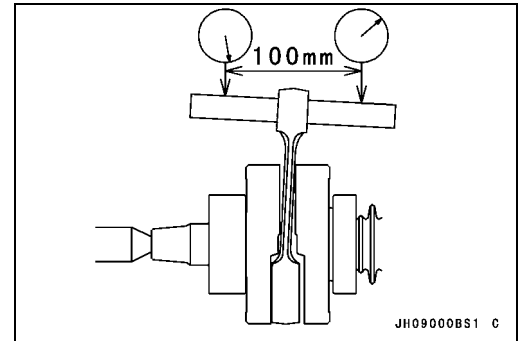
Crankshaft Maintenance

The crankshaft changes reciprocating motion of the piston into rotating motion to drive the jet pump. Crankshaft trouble, such as excessive play or runout, will multiply the stress caused by the intermittent force on the piston and will result in not only rapid crankshaft bearing wear, but also noise, power loss, vibration, and shortened engine life. A defective crankshaft should be always detected at an early stage and repaired immediately.

The following explanation concerns the most common crankshaft problems and the method for measuring play, runout and con-rod alignment. It does not cover crankshaft disassembly because of the highly specialized equipment that is required. If crankshaft components become damaged or worn, the entire crankshaft should be replaced as an assembly, or rebuilt by a properly equipped shop.

Connecting Rod Bend/Twist

- Set the crankshaft in an alignment jig or in V blocks on a surface plate.
- Select an arbor of the same diameter as the connecting rod small end and at least 100 mm (3.9 in.) long, and insert the arbor through the connecting rod small end.
- With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.9 in.) length to determine the amount of connecting rod bend.
- ★ If connecting rod bend exceeds the service limit, the connecting rod or crankshaft must be replaced.

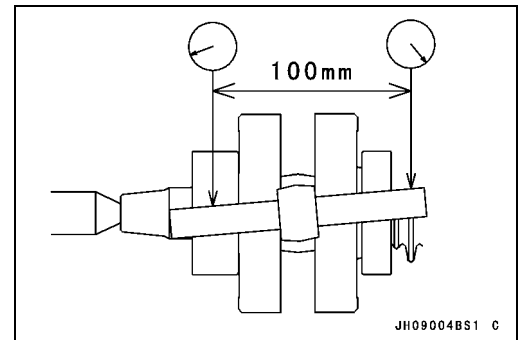


Connecting Rod Bend

Standard: Under 0.05/100 mm (0.00197/3.934 in.)

Service Limit: 0.2/100 mm (0.0079/3.934 in.)

- With the crankshaft still in the alignment jig, measure connecting rod twist.
- Hold the connecting rod horizontally and measure the amount that the arbor varies from being parallel with the crankshaft over a 100 mm (3.9 in.) length of the arbor to determine the amount of connecting rod twist.
- ★ If connecting rod twist exceeds the service limit, the connecting rod or crankshaft must be replaced.



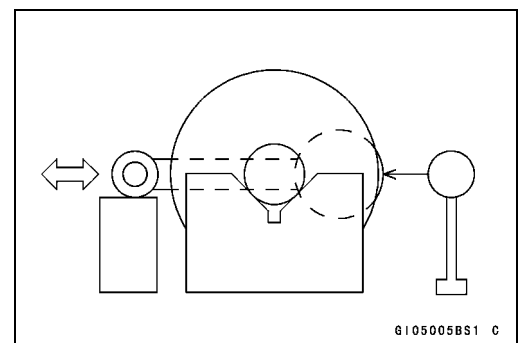
Connecting Rod Twist

Standard: Under 0.15/100 mm (0.00591/3.934 in.)

Service Limit: 0.2/100 mm (0.0079/3.934 in.)

Connecting Rod Big End Radial Clearance

- Check big end radial clearance.
- Set the crankshaft in an alignment jig or on V blocks, and place a dial gauge against the connecting rod big end.
- Push the connecting rod first towards the gauge and then in the opposite direction. The difference between the two gauge readings is the radial clearance.
- ★ If the radial clearance exceeds the service limit, replace or disassemble the crankshaft assy and examine the crankpin, needle bearing, and con-rod big end for wear.



Connecting Rod Big End Radial Clearance

Standard: 0.025 ~ 0.037 mm
(0.000984 ~ 0.001457 in.)

Service limit: 0.087 mm (0.00343 in.)

8-20 ENGINE BOTTOM END

Crankshaft Maintenance

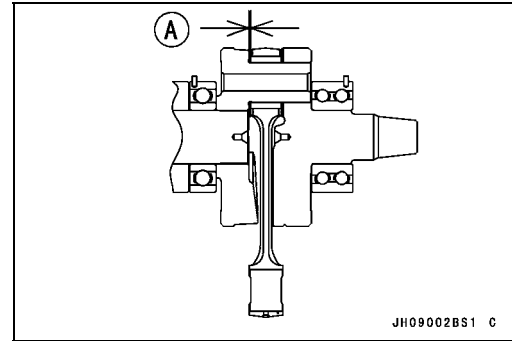
Connecting Rod Big End Side Clearance

- Measure big end side clearance [A].
- Insert a feeler gauge between the big end and either crank half to determine clearance.
- ★ If the measured value exceeds the service limit, the crankshaft should be either replaced or rebuilt.

Connecting Rod Big End Side Clearance

Standard: 0.45 ~ 0.55 mm (0.01772 ~ 0.02165 in.)

Service limit: 0.8 mm (0.031 in.)



Crankshaft Main Bearing Wear

- Wash the bearings in a high flash-point solvent, blow them dry (DO NOT SPIN THEM), and lubricate them with engine oil.

CAUTION

Solvent is toxic and flammable. Avoid prolonged contact with skin and keep away from open flame. Use only in a well ventilated area. Eye protection should be worn when compressed air is used to dry parts. Do not direct air towards anyone. Use 172 kPa (1.75 kgf/cm², 25 psi) maximum nozzle pressure.

- Turn each bearing over by hand and see that it makes no noise, turns smoothly, and has no rough spots.
- ★ If any of the bearings are defective, replace them.

Crankshaft Runout

- Check crankshaft alignment by measuring runout.
- With the crankshaft on V blocks [A], rotate the crankshaft slowly and measure runout at each of the locations shown.
- ★ If the runout at any point exceeds the service limit, the crankshaft must be either replaced or rebuilt.

Crankshaft Runout [B]

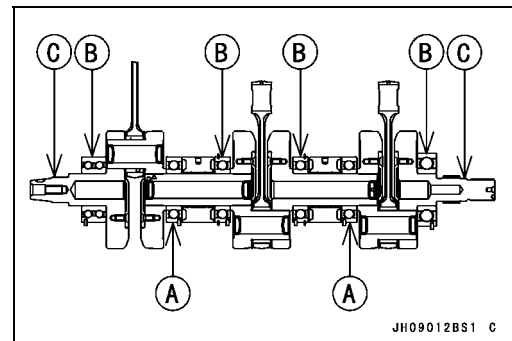
Standard: TIR under 0.04 mm (0.00157 in.)

Service Limit: TIR 0.10 mm (0.00394 in.)

Crankshaft Runout [C]

Standard: TIR under 0.10 mm (0.00394 in.)

Service Limit: TIR 0.25 mm (0.00984 in.)



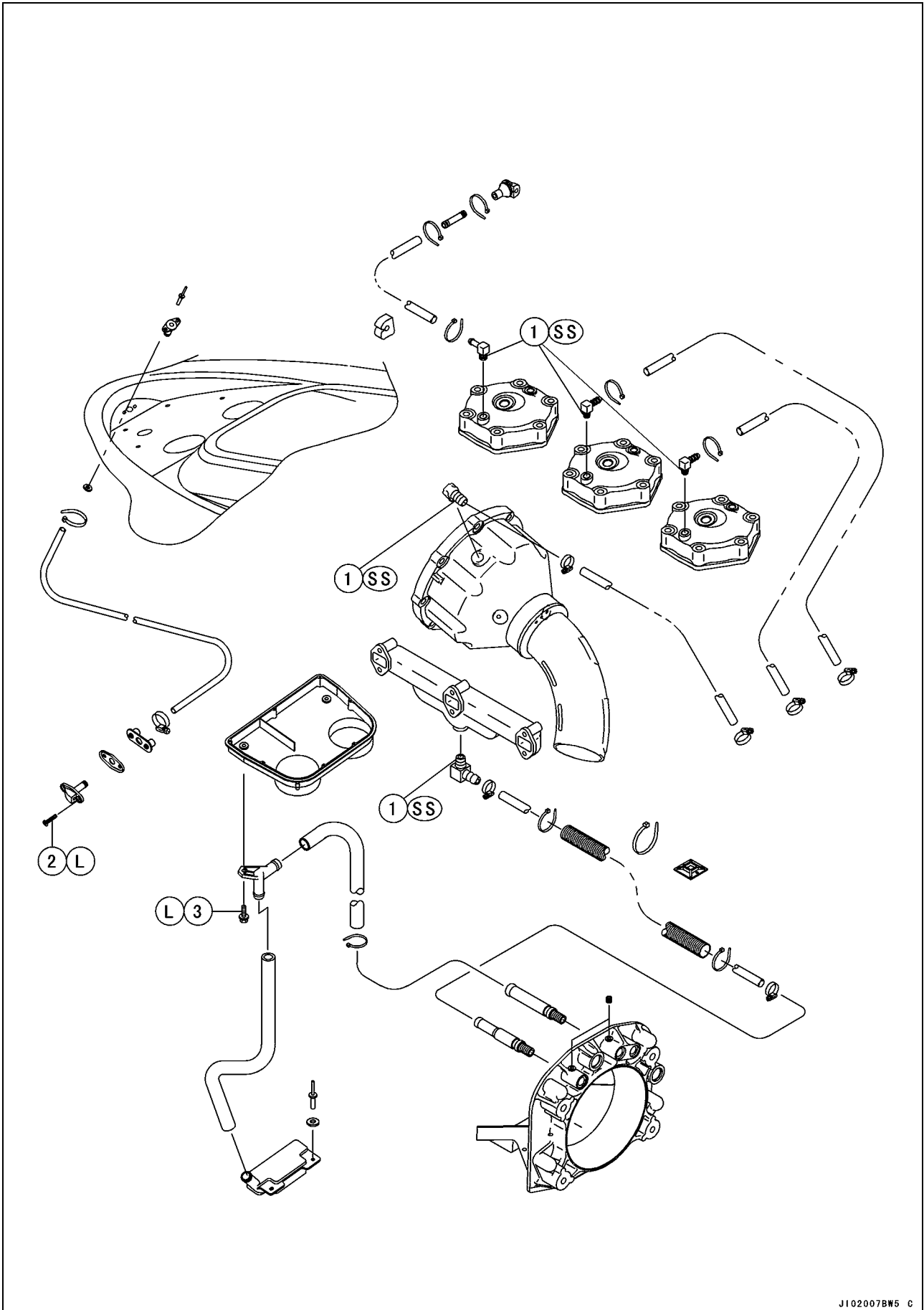
Cooling and Bilge System

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9-2 COOLING AND BILGE SYSTEM

Exploded View



COOLING AND BILGE SYSTEM 9-3

Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Water Pipe Joints	7.8 or above	0.8 or above	69 in·lb or above	SS
2	Bypass Outlet Screws	–	–	–	L
3	Breather Mounting Bolt	–	–	–	L

L: Apply a non-permanent locking agent.

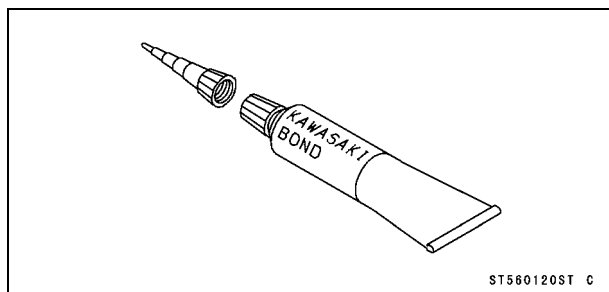
SS: Apply silicone sealant. (Kawasaki Bond: 56019-120)

9-4 COOLING AND BILGE SYSTEM

Special Tool

Kawasaki Bond (Silicone Sealant):

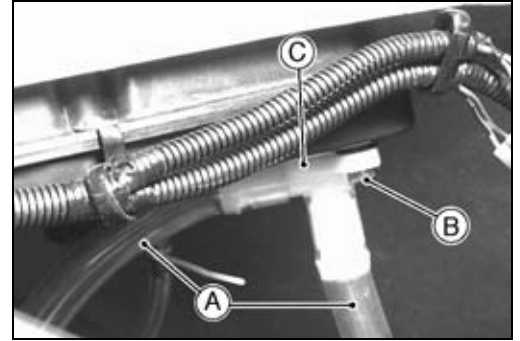
56019-120



Bilge System

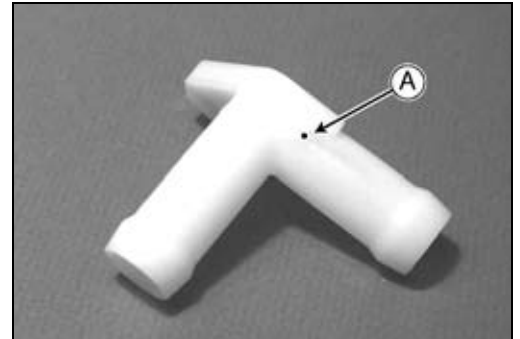
Breather Removal

- Pull the hoses [A] off the breather.
- Unscrew the mounting bolt [B], and remove the breather [C].



Breather Installation

- Be sure the small hole [A] in the breather is open before installing it.
- Apply a non-permanent locking agent to the breather mounting bolt and tighten it.



Breather Cleaning and Inspection

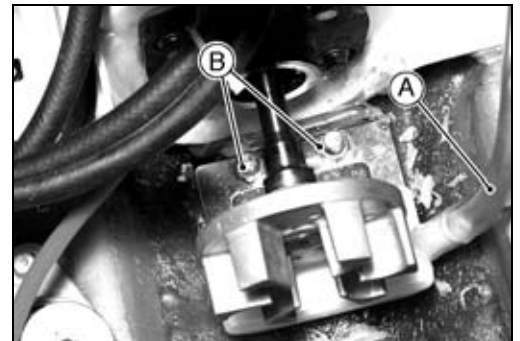
- Check that the small hole in the top of the breather is open by blowing in one end of the breather and plugging the other.
- ★ If the hole is plugged, clean it with compressed air. Do not open it with a pointed object (like a needle or a piece of wire), because the hole may be enlarged. If the hole is too large, the bilge system may not suck water out of the hull as it should.

Filter Removal/Installation

- Pull the hose [A] off the filter.
- Unscrew the mounting nuts [B], and remove the filter assembly.
- Drill out the pop rivets holding the filter with a drill.

Pop Rivet Removal Drill Bit Size: 5.0 mm (0.20 in.)

- Installation is the reverse of removal. Note the following.
- Apply silicone sealant to the outer circumference of the plate mounting nuts.



Filter Cleaning and Inspection

- Flush the filter thoroughly with fresh water and shake it dry.
- Water must flow freely through the filter, but large debris must not.
- ★ If the filter cannot be cleaned, or if it is broken and allows debris to pass through, replace it.

9-6 COOLING AND BILGE SYSTEM

Cooling and Bilge System Hoses

Hose Removal

- None of the bilge system hoses has a clamp. To remove this hose, remove the filter (see Filter Removal). The bilge system hoses may be simply pulled off their fittings.
- All the cooling system hoses are clamped at both ends. Loosen the clamps and pull the hoses off.

Hose Installation

- To install the bilge filter hose, push the hose over the end of the filter.
- When installing the cooling system hoses, be sure to use the same kind of clamp as the original. Some of the clamps are metal +for tighter clamping ability (required when smooth fittings are used). Plastic clamps are used where tight clamping is not required.

Hose Inspection

- Check the hoses for hardening, cracking, checking, cuts, abrasions, and breaks.
- ★ If a hose is damaged in any way, replace it immediately and check all the others for damage.

Cooling and Bilge System Flushing

Cooling System Flushing

- Refer to Cooling System Flushing in the Periodic Maintenance chapter.

Bilge System Flushing

- Refer to Bilge System Flushing in the Periodic Maintenance chapter.

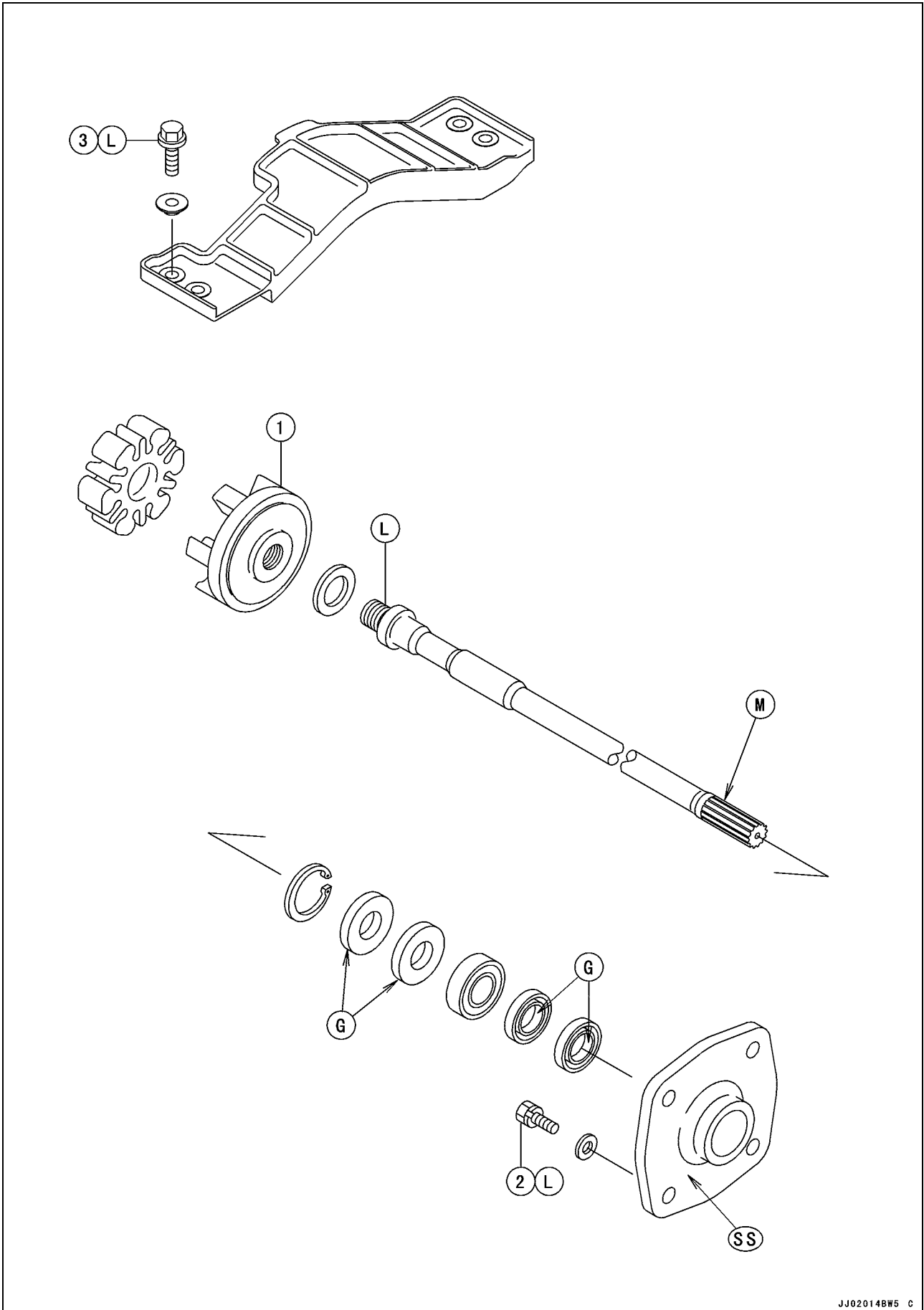
Drive System

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10-2 DRIVE SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Coupling	39	4.0	29	
2	Drive Shaft Holder Mounting Bolts	22	2.2	16	L
3	Coupling Cover Mounting Bolts	–	–	–	L

G: Apply grease.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

SS: Apply silicone sealant (Kawasaki Bond: 56109-120).

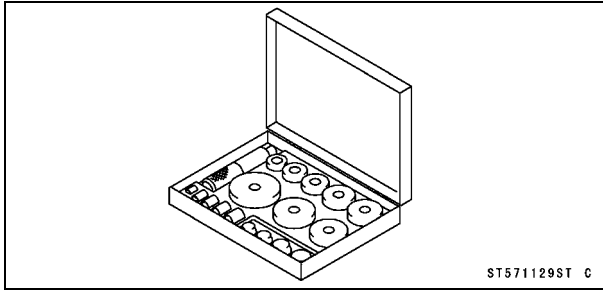
10-4 DRIVE SYSTEM

Specifications

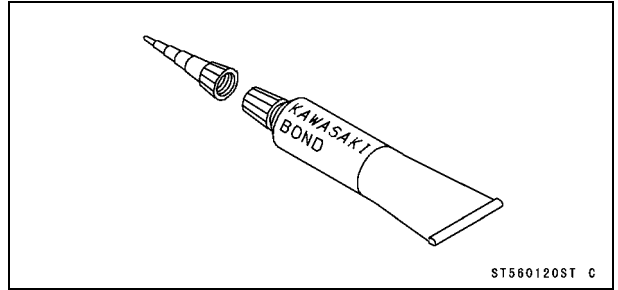
Item	Standard	Service Limit
Drive Shaft Runout (See Page 10-8)	[A] less than 0.1 mm (0.004 in.) [B] less than 0.2 mm (0.008 in.)	0.2 mm (0.008 in.) 0.6 mm (0.024 in.)

Special Tools

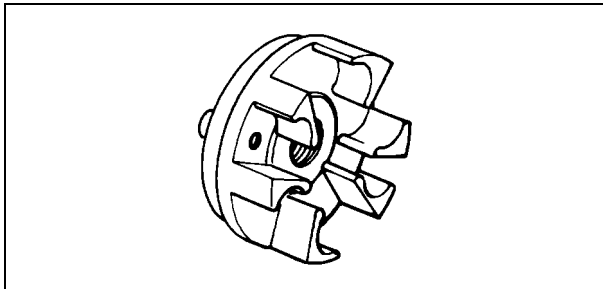
**Bearing Driver Set:
57001-1129**



**Kawasaki Bond (Silicone Sealant):
56019-120**



**Coupling Holder #2:
57001-1423**

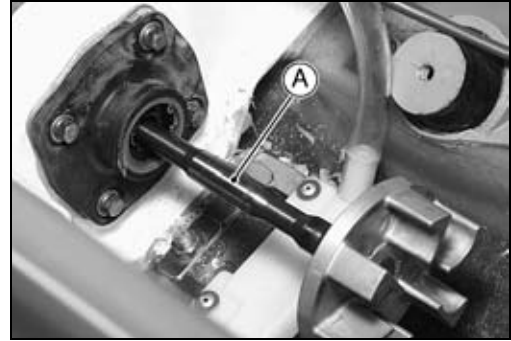


10-6 DRIVE SYSTEM

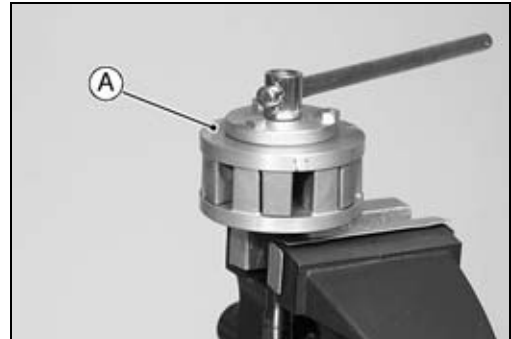
Drive Shaft/Drive Shaft Holder

Drive Shaft Removal/Installation

- Remove the engine (see Engine Removal/Installation chapter).
- Pull the drive shaft [A] out of the hull.



- Hold the drive shaft in a vice, and unscrew the coupling.
Special Tool - Coupling Holder [A]: 57001-1423



- When installing the drive shaft, be careful of the following items.

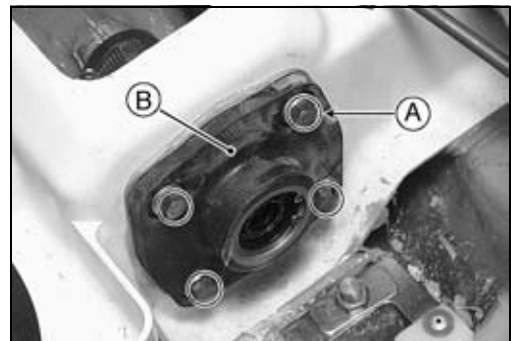
- Apply a non-permanent locking agent to the coupling threads and tighten it.

Torque - Coupling: 39 N·m (4.0 kgf·m, 29 ft·lb)

- Apply grease to the grease seal lips and the drive shaft spline.

Drive Shaft Holder Removal/Disassembly

- Remove the drive shaft.
- Unscrew the mounting bolts [A] and remove the drive shaft holder [B] from the bulkhead.

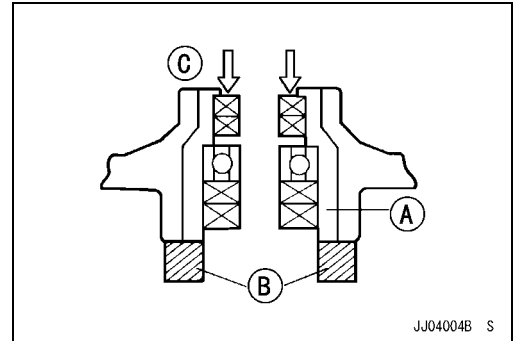


- Disassemble the drive shaft holder.
 - Remove the circlip [A].



Drive Shaft/Drive Shaft Holder

- Press the small grease seal, and the large grease seals, bearing, and small grease seals come out of the holder.
 - [A] Sleeve
 - [B] Blocks
 - [C] Press

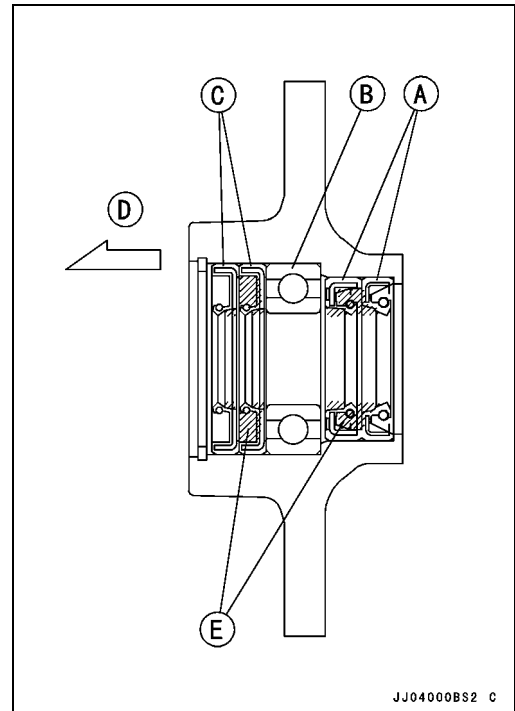


Drive Shaft Holder Assembly/Installation

- Replace the grease seals with new ones.
- Press the bearing and grease seals into the drive shaft holder, noting the following.
- Install the parts in this order.
 - Two Small Grease Seals [A]
 - One Bearing [B]
 - Two Large Grease Seals [C]
 - Front [D]

Special Tool - Bearing Driver Set: 57001-1129

- Install the seals so that the sides with the spring face outward.
- Fill the gaps between the seals with grease [E].
- Install the circlip.
- Grease to the bearing inner surface and grease seal lips.



- Install the drive shaft holder on the bulkhead so that the circlip side face toward the front.
- Apply a non-permanent locking agent to the drive shaft holder mounting bolts, tighten them loosely.
- Install the drive shaft.
- After installing the engine, tighten the drive shaft holder mounting bolts to the specified torque to give proper coupling alignment.

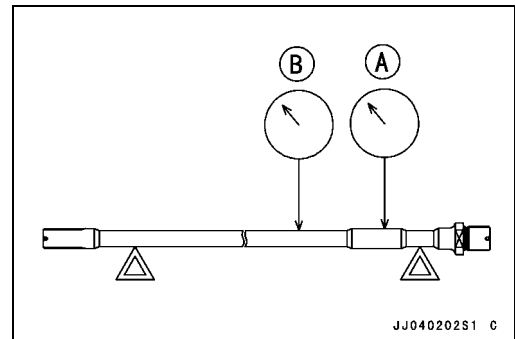
Torque - Drive Shaft Holder Mounting Bolts: 22 N·m (2.2 kgf·m, 16 ft·lb)

Drive Shaft Runout

- Measure drive shaft runout by supporting the shaft on V blocks and setting a dial gauge against the shaft at each point shown.
- Turn the drive shaft slowly. The difference between the highest and lowest dial gauge reading is the runout.
- ★ If any measurement exceeds the service limit, replace the shaft.

Drive Shaft Runout

- Standard:**
 - [A] Less than 0.1 mm (0.004 in.)
 - [B] Less than 0.2 mm (0.008 in.)
- Service Limit:**
 - [A] 0.2 mm (0.008 in.)
 - [B] 0.6 mm (0.024 in.)



Pump and Impeller

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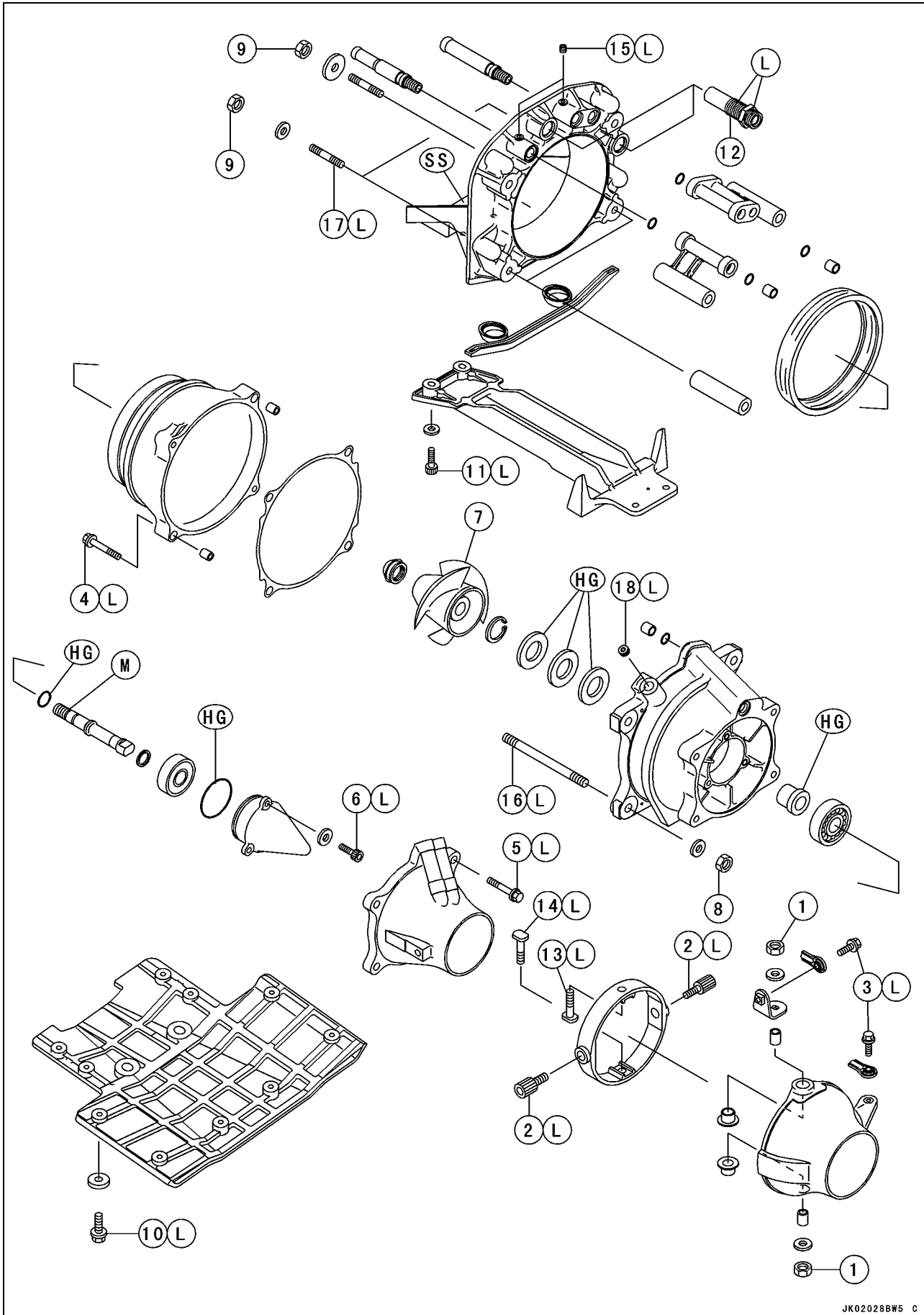
 Pump Assembly 11-10

 Pump and Impeller Inspection 11-14

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11-2 PUMP AND IMPELLER

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Steering Nozzle Pivot Nuts	19	1.9	14	
2	Tilt Ring Pivot Bolts	19	1.9	14	L
3	Cable Joint Bolts	9.8	1.0	87 in·lb	L
4	Pump Case Mounting Bolts	9.8	1.0	87 in·lb	L
5	Pump Outlet Mounting Bolts	19	1.9	14	L
6	Pump Cap Bolts	9.8	1.0	87 in·lb	L
7	Impeller	98	10	72	
8	Pump Mounting Nuts	36	3.7	27	
9	Pump Bracket Mounting Nuts	36	3.7	27	
10	Pump Cover Mounting Bolts	7.8	0.8	69 in·lb	L
11	Grate Mounting Bolts	9.8	1.0	87 in·lb	L
12	Cable Joint	39	4.0	29	L
13	Tilt Ring Mounting Bolts (L = 35 mm, 1.38 in.)	–	–	–	L
14	Tilt Ring Mounting Bolts (L = 32 mm, 1.26 in.)	–	–	–	L
15	Stop Screws	3.2	0.33	29 in·lb	L
16	Pump Mounting Bolts	36	3.7	27	L
17	Pump Bracket Mounting Bolts	36	3.7	27	L
18	Plug	12	1.2	104 in·lb	L

- HG: Apply high grade water-resistance grease.
(Chevron: Black Pearl Grease EP NLG12 or equivalent)
- L: Apply a non-permanent locking agent.
- M: Apply molybdenum disulfide grease.
- SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

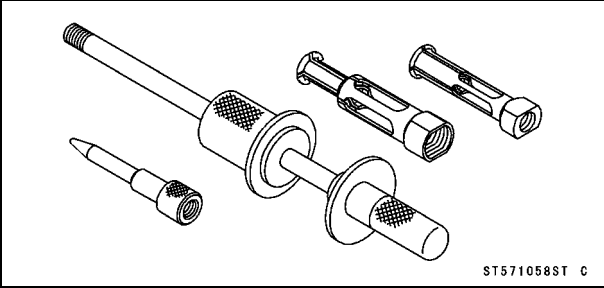
11-4 PUMP AND IMPELLER

Specifications

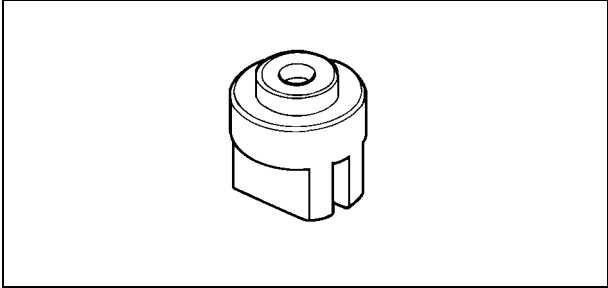
Item	Standard	Service Limit
Jet Pump Impeller Clearance	0.2 ~ 0.3 mm (0.008 ~ 0.012 in.)	0.6 mm (0.024 in.)

Special Tools

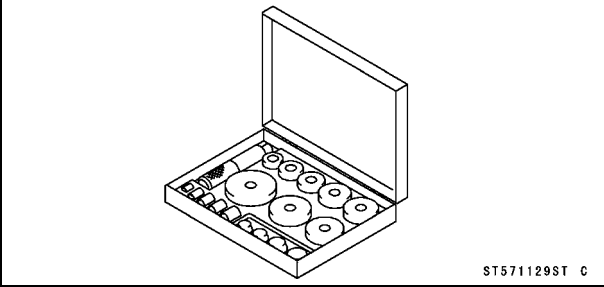
Oil Seal & Bearing Remover:
57001-1058



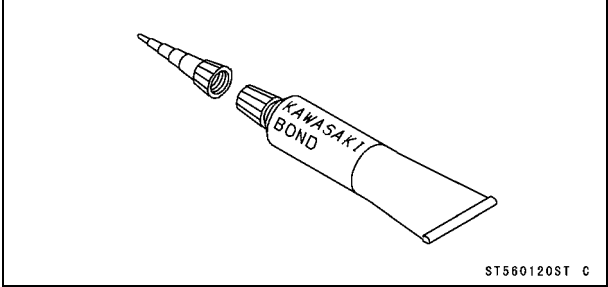
Impeller Holder #2 :
57001-1425



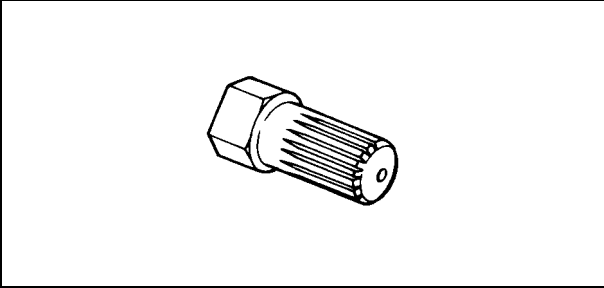
Bearing Driver Set:
57001-1129



Kawasaki Bond (Silicone Sealant):
56019-120



Impeller Wrench:
57001-1228

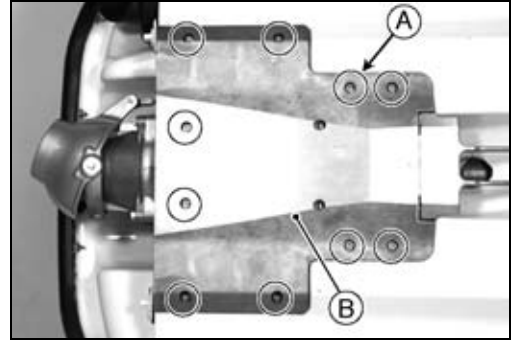


11-6 PUMP AND IMPELLER

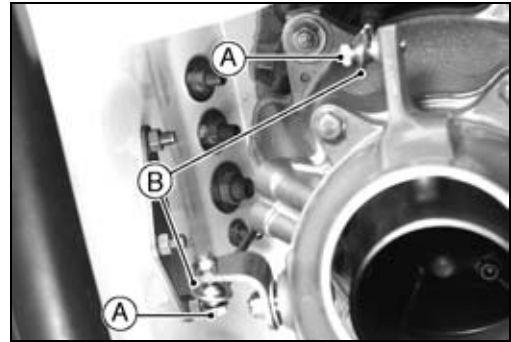
Pump and Impeller

Pump Removal

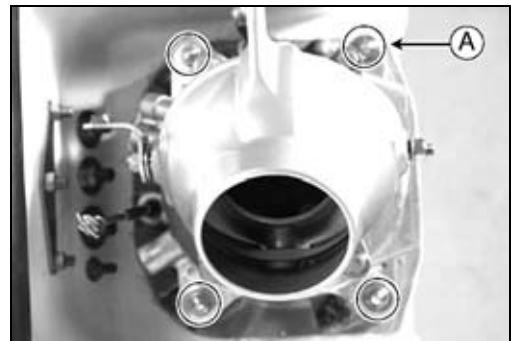
- Turn the craft on its left side.
- Unscrew the mounting bolts [A], and remove the pump cover [B].



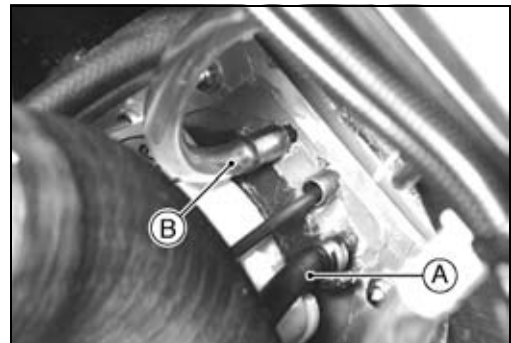
- Remove the bolts [A] and take off the cable joints [B].



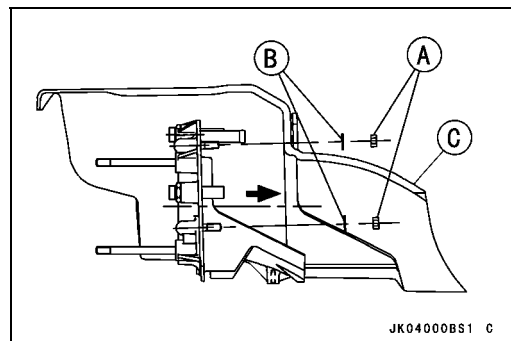
- Unscrew the pump mounting bolts [A].
- Slide the pump to the rear to disengage the drive shaft, and remove it from the hull.



- To remove the pump bracket, remove the following.
- Pull out the inlet cooling hose [A] and the bilge hose [B] from each fitting in the hull.

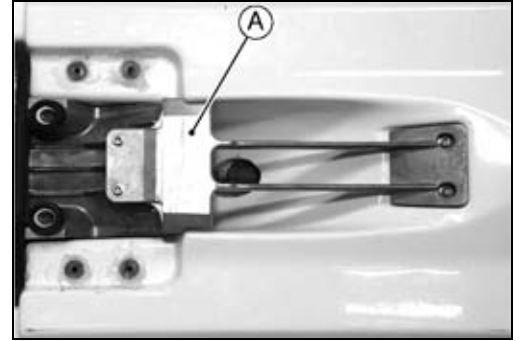


- Take out the pump bracket mounting nuts [A] and washers [B] in the hull [C].

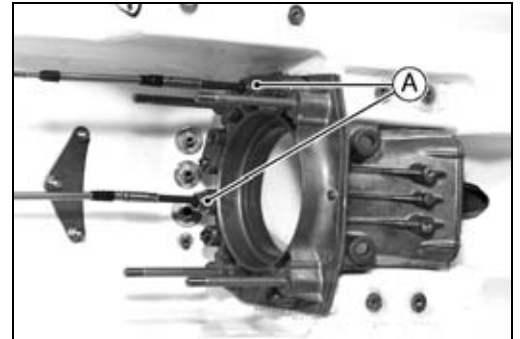


Pump and Impeller

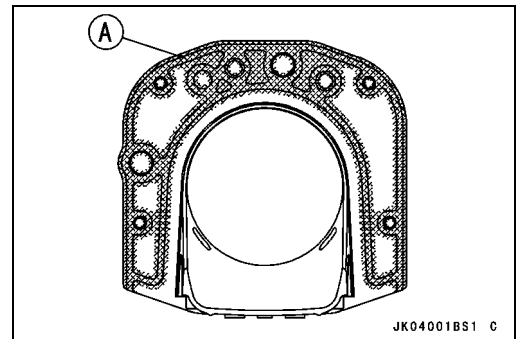
- Remove the grate [A] from the hull.



- Remove:
Steering and Trim Cable Joints
Steering and Trim Cable Nuts [A]
E-rings, Washers and O-rings of Steering and Trim Cable



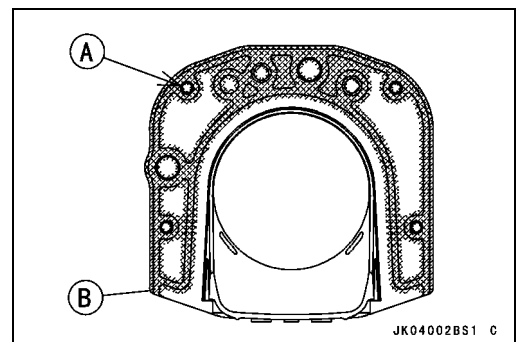
- Cut the sealant at the indicated area [A] in the figure and remove the pump bracket from the hull.



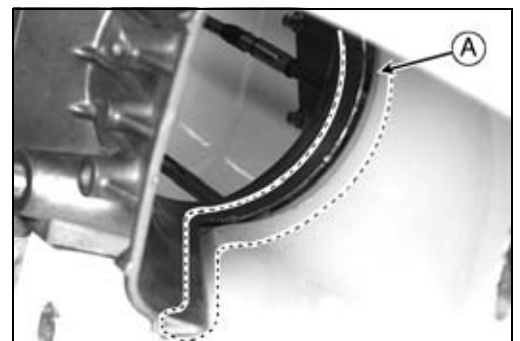
Pump Installation

- Strip off all the old sealant around the pump intake.
- Apply silicone sealant on the groove [A] for the pump bracket [B] to form a seal between the bracket and the hull.
- Install the pump bracket, and wipe off any excess sealant and smooth the joint.

Torque - Pump Bracket Mounting Nuts: 36 N·m (3.7 kgf·m, 27 ft·lb)



- Fill the gap [A] between the bracket and the hull with silicone sealant and wipe off any excess sealant and smooth the joint.

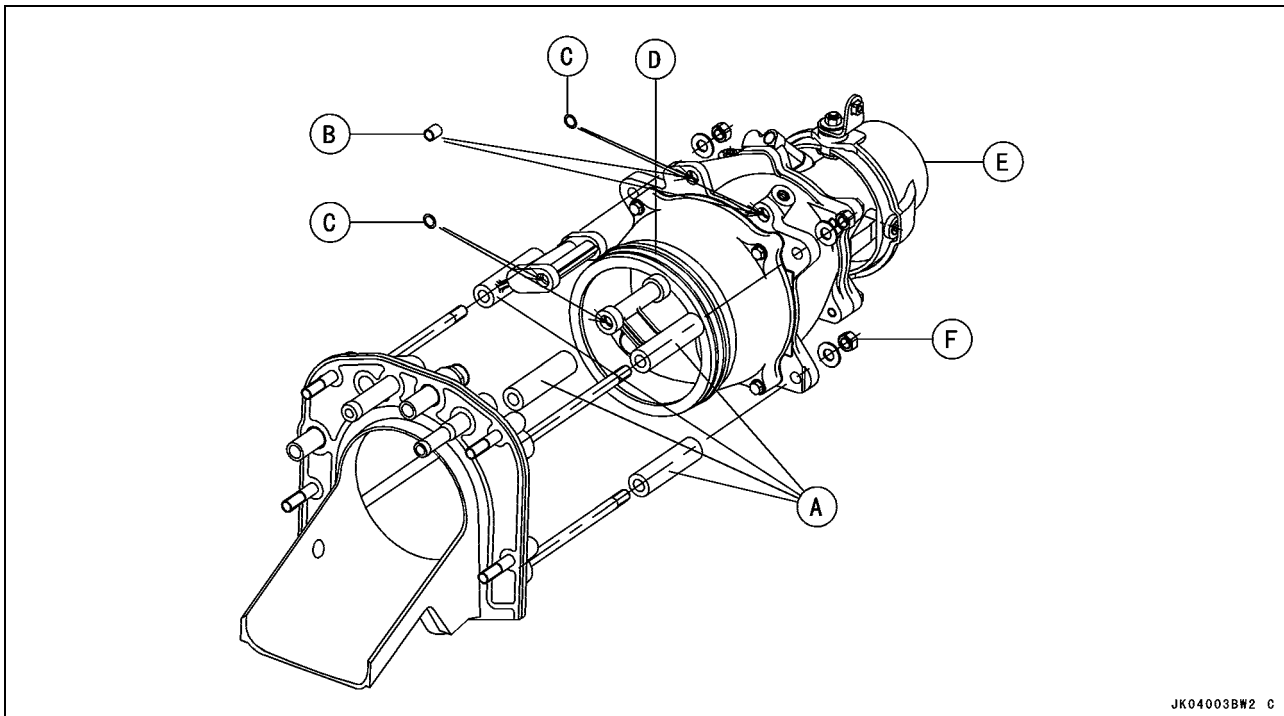


- Run the steering and trim cables through the pump bracket.

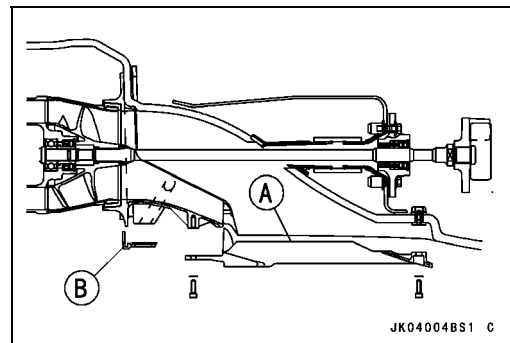
11-8 PUMP AND IMPELLER

Pump and Impeller

- Install the following on the pump bracket and the pump case.
 - Pipes [A]
 - Pins [B]
 - O-rings [C]
- Be sure trim seal [D] is in place.
- Grease the splines on the drive shaft with water resistant grease.
- Install the pump case [E].
 - Torque - Pump Mounting Nuts [F]: 36 N·m (3.7 kgf·m, 27 ft·lb)**

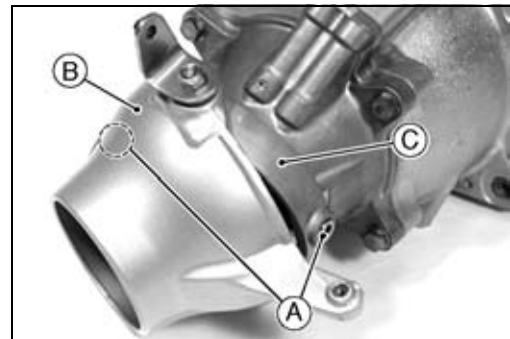


- Apply a non-permanent locking agent to the grate mounting bolts and install the grate [A].
 - Torque - Grate Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Be sure the trim seal [B] is in place.
- Apply a non-permanent locking agent to the pump cover mounting bolts and install the pump cover.
 - Torque - Pump Cover Mounting Bolts: 7.8 N·m (0.8 kgf·m, 69 in·lb)**



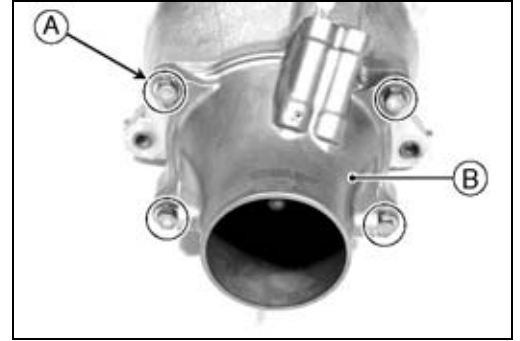
Pump Disassembly

- Unscrew the mounting bolts [A], and remove the steering nozzle [B] and tilt ring [C].

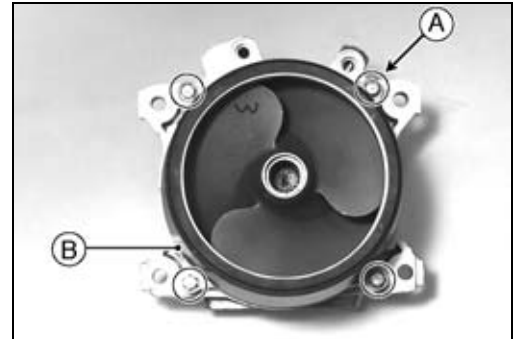


Pump and Impeller

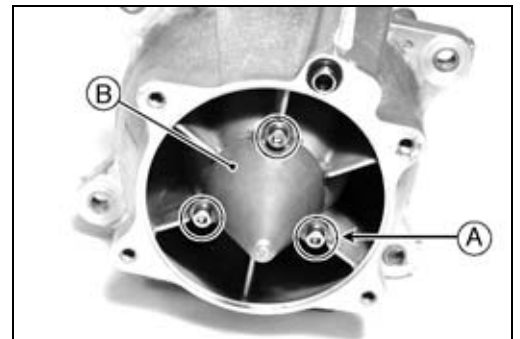
- Unscrew the mounting bolts [A], and remove the pump outlet [B].



- Unscrew the guide vane mounting bolts [A] and remove the guide vane [B].

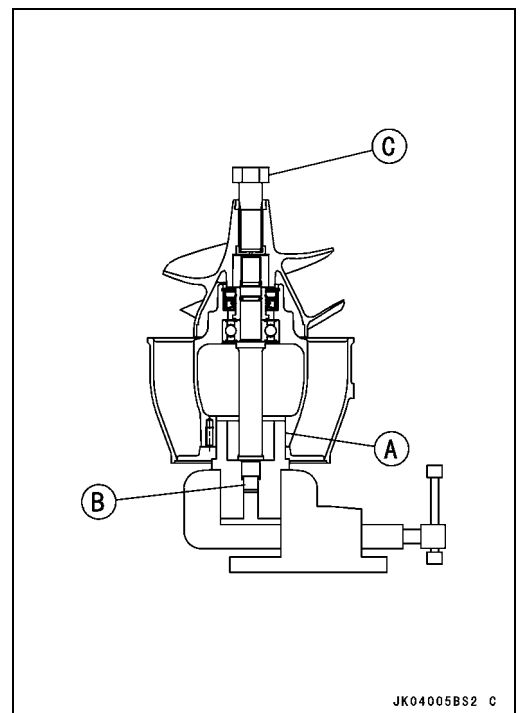


- Unscrew the cap bolts [A], and remove the pump cap [B].



- Forcefully put the impeller holder [A] into the pump shaft [B] in the pump case to hold sufficiently the shaft in the impeller holder.
- Remove the impeller from the pump shaft and then pull out the pump shaft, the bushing and the ball bearing.

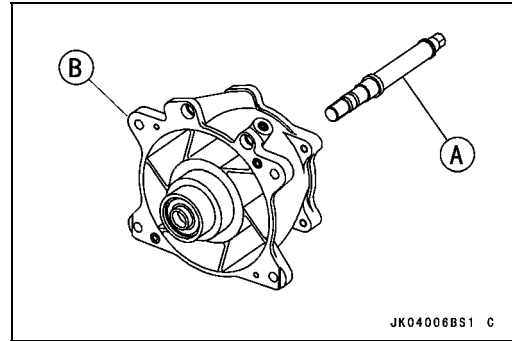
Special Tools - Impeller Holder [A]: 57001-1425
Impeller Wrench [C]: 57001-1228



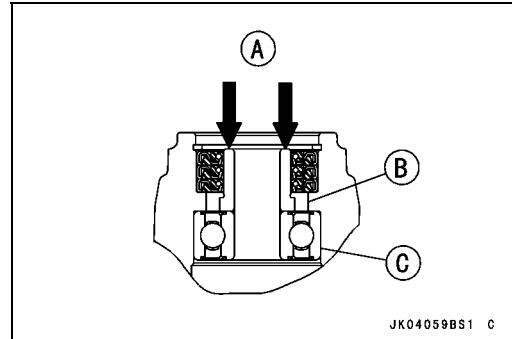
11-10 PUMP AND IMPELLER

Pump and Impeller

- Pull out the pump shaft [A] from the vane guide [B].



- Press [A] the collar [B] and the ball bearing [C]. They come out of the vane guide.

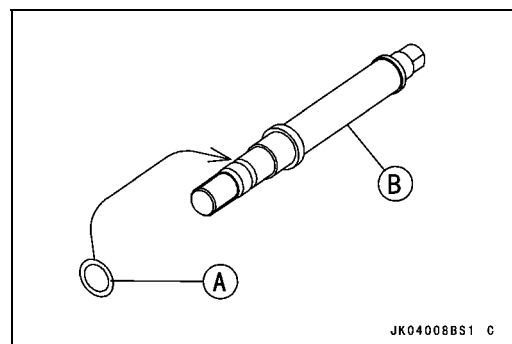


- Remove the circlip and the grease seals.
Special Tool - Oil Seal & Bearing Remover [A]: 57001-1058



Pump Assembly

- Install the O-ring [A] over the pump shaft [B].



Pump and Impeller

- Press the new oil seals [A] into the guide vane [B] and install the circlip [C] as shown.
- Be sure there are no foreign objects inside the vane guide and over the grease seals.

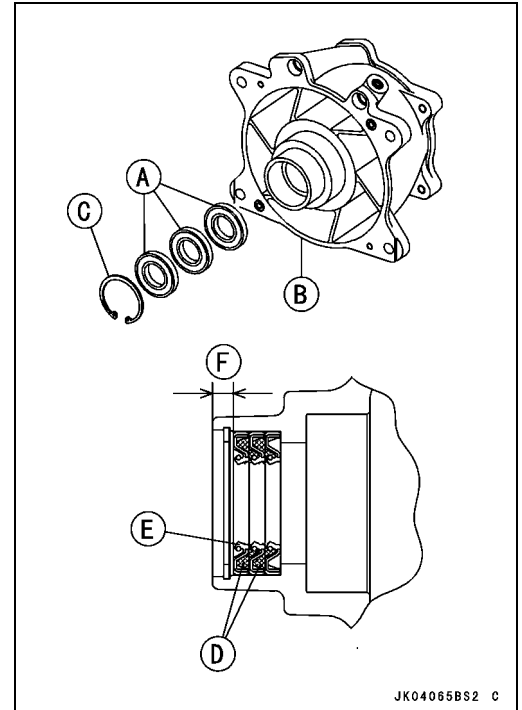
Oil seal outside surface between the vane guide surface distance [F]

6.5 ~ 6.7 mm (0.256 ~ 0.264 in.): JH1200-B1 ~ B2

5.5 ~ 6.5 mm (0.217 ~ 0.254 in.): JH1200-B3

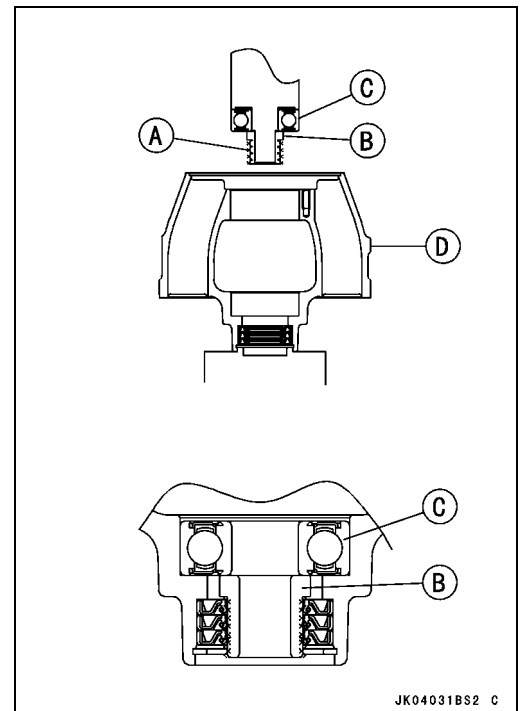
- Fill the bearing side oil seal with high grade water-resistance grease [D] and install it so that the sides with the spring face outward.
- High grade water-resistance grease the grease seal lips [E].

Special Tool - Bearing Driver Set: 57001-1129

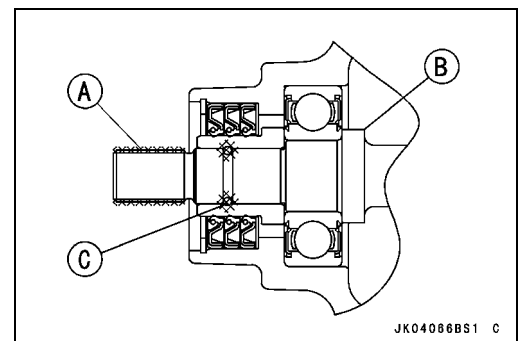


- Before installing the pump bearing, blow any dirt or foreign particles out of the guide vane with compressed air.
- High grad water-resistance grease [A] the collar [B].
- Insert the collar [B] and press the new ball bearing [C] into the vane guide [D].

Special Tool - Bearing Driver Set: 57001-1129



- Molybdenum disulfide grease [A] the pump shaft [B] and high grade water-resistance grease the O-ring [C].
- Push the pump shaft into the guide vane.



11-12 PUMP AND IMPELLER

Pump and Impeller

- Grease the pump shaft threads and screw on impeller.

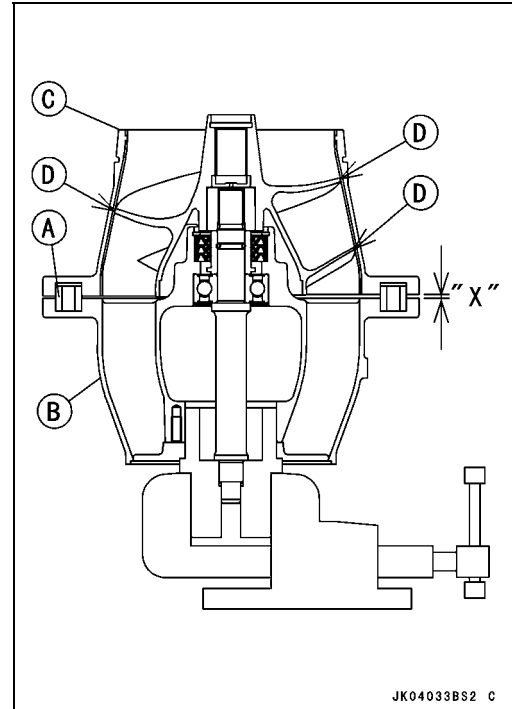
Special Tools - Impeller Holder: 57001-1425

Impeller Wrench: 57001-1228

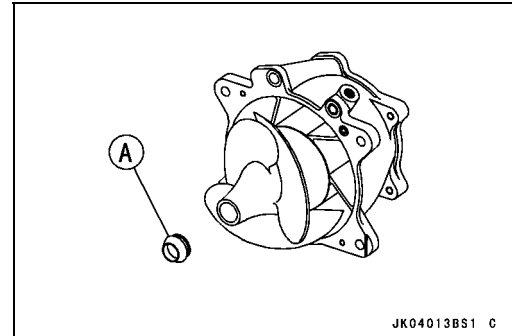
Torque - Impeller: 98 N·m (10 kgf·m, 72 ft·lb)

- Install the dowel pins [A] on the guide vane [B].
- Position the pump case [C] on the guide vane and bring the impeller blades so that it will contact [D] with the inside of the pump case.
- Measure the space "X" between the pump case and the guide vane at three places of 120 degree intervals.
- The maximum value measured at three places is assumed to be "X max".
- Compare the "X max" value with that in the chart, and choose the amount of shims.

X max (mm)	Amount of Shims
From 0 ~ Less than 0.5	3
From 0.5 ~ Less than 1.0	4
From 1.0 ~ Less than 1.5	5

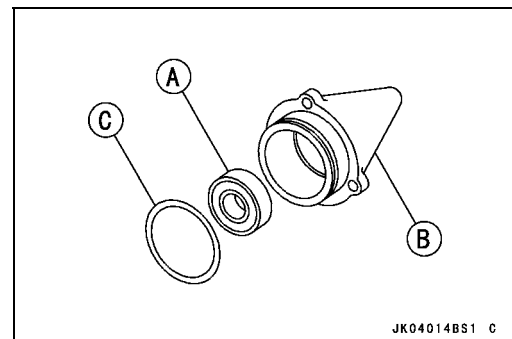


- Visually inspect the impeller seal [A], and replace if necessary.
- Install the seal [A] on the impeller.



★ If the pump cap bearing [A] was removed, replace it with a new one.

- Press the bearing into the cap [B] until it is bottomed.
- Be sure the O-ring [C] is in place on the pump cap.
- High grade water-resistance grease the O-ring.

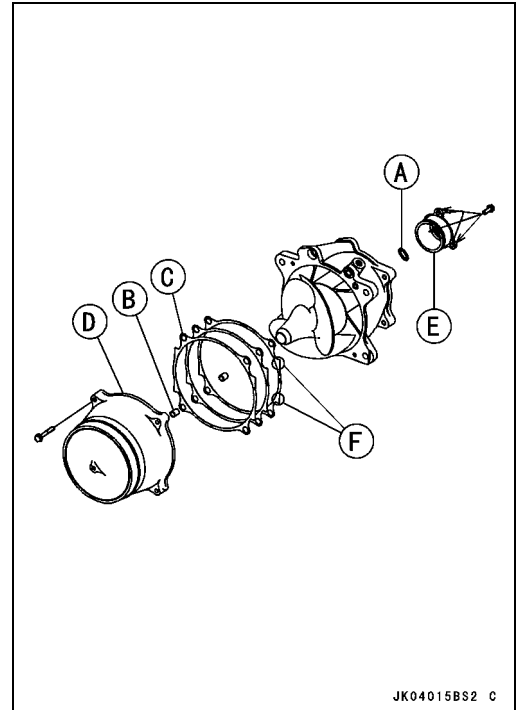


Pump and Impeller

- Install the damper [A] over the pump shaft.
- Instal the following on the guide vane.
 - Dowel Pins [B]
 - Shims [C]
 - Pump Case [D]
 - Pump Cap [E]
- Install the shim(s) noting its tab [F] position.
- Apply a non-permanent locking agent to the following.
 - Torque - Pump Case Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
 - Pump Cap Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

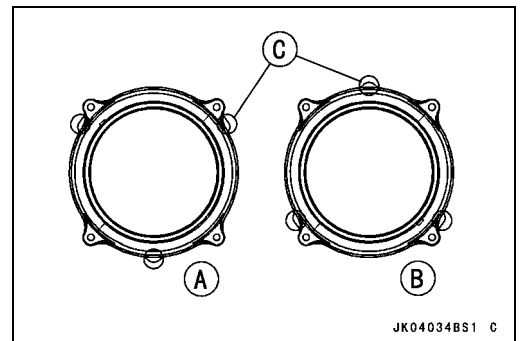
NOTE

○Be sure the impeller rotates by 2.9 N·m (0.3 kgf·m, 26 in·lb) or less after assembly.



JK04015BS2 C

- The pump case can be installed in either direction [A] or [B].
- Tabs [C]



JK04034BS1 C

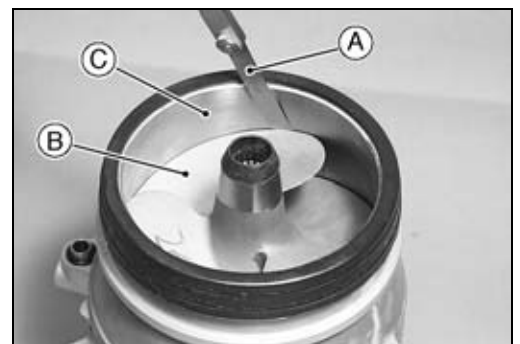
- Use a feeler gauge [A] to measure the impeller [B] -to -pump case [C] clearance.

Impeller Clearance

Standard: 0.2 ~ 0.3 mm (0.008 ~ 0.012 in.)

Service Limit: 0.6 mm (0.024 in.)

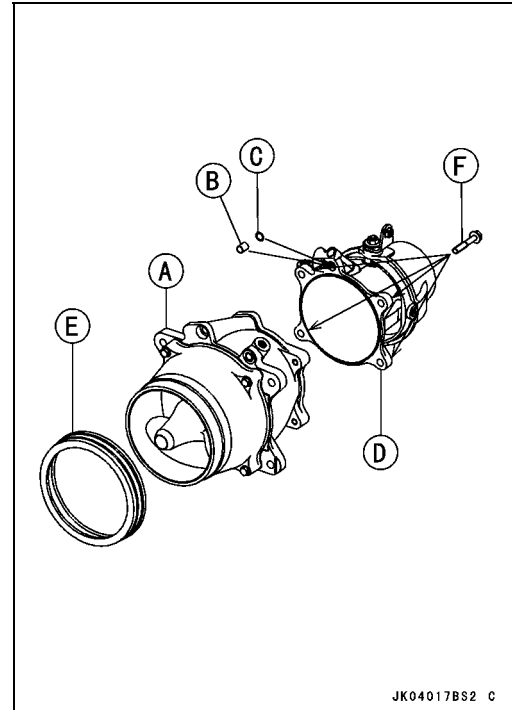
- ★If the clearance is outside the range given, remove the pump case and change the amount of shims.



11-14 PUMP AND IMPELLER

Pump and Impeller

- Install the following on the pump [A].
 - Pin [B]
 - O-ring [C]
 - Pump Outlet [D]
 - Trim Seal [E]
 - Apply a non-permanent locking agent to the pump outlet mounting bolts [F].
- Torque - Pump Outlet Mounting Bolts: 19 N·m (1.9 kgf·m, 14 ft·lb)**



Pump and Impeller Inspection

- Refer to Pump and Impeller Inspection in the Periodic Maintenance chapter.

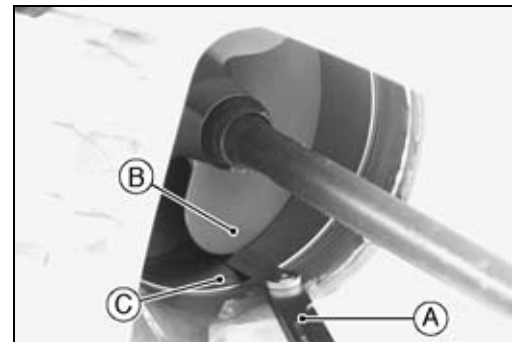
Impeller Clearance

- Impeller clearance is critical to proper performance. If the pump case and impeller are not visibly damaged, poor performance may be caused by too much impeller clearance.
- To check impeller clearance, remove the grate and insert a feeler gauge [A] between the tip of the impeller blade [B] and the pump case [C].

Impeller Clearance

Standard:	0.2 ~ 0.3 mm (0.008 ~ 0.012 in.)
Service Limit:	0.6 mm (0.024 in.)

- ★ If the clearance is less than the service limit, do not adjust it.
- ★ If the clearance is greater than the service limit, but the pump case has deep scratches, replace the pump case.
- ★ If the clearance is greater than the service limit, and the pump case is in good condition, adjust the impeller clearance.



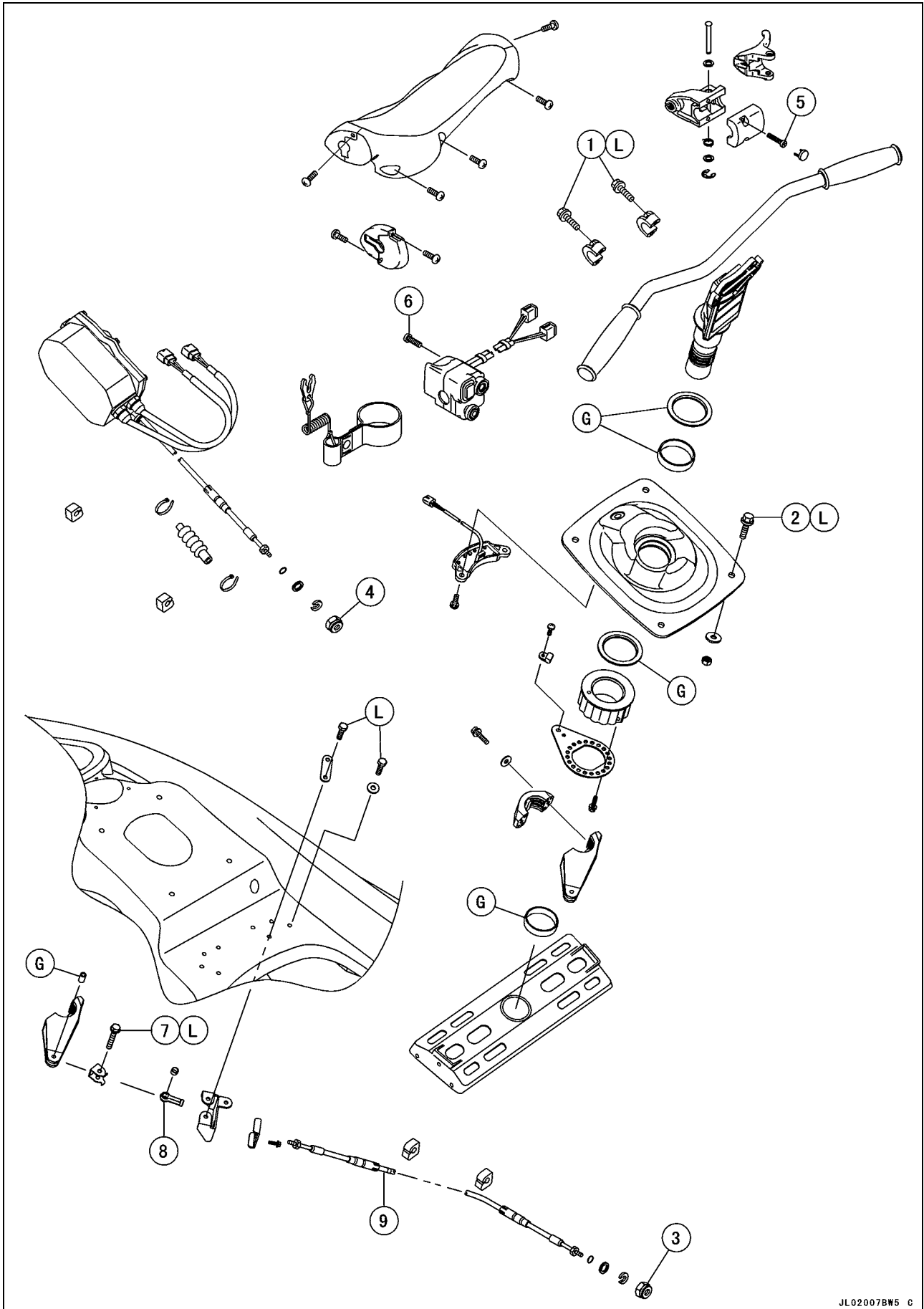
Steering

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12-2 STEERING

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Handlebar Clamp Bolts	16	1.6	11.5	L
2	Steering Holder Mounting Bolts	16	1.6	11.5	L
3	Steering Cable Nut	39	4.0	29	
4	Trim Cable Nut	39	4.0	29	
5	Throttle Case Mounting Screws	3.9	0.4	35 in·lb	
6	Switch Case Mounting Screws	3.9	0.4	35 in·lb	
7	Cable Joint Bolts	9.8	1.0	87 in·lb	L
8	Cable Joint	9.8	1.0	87 in·lb	

9: White mark (bow side)

G: Apply grease.

L: Apply a non-permanent locking agent.

12-4 STEERING

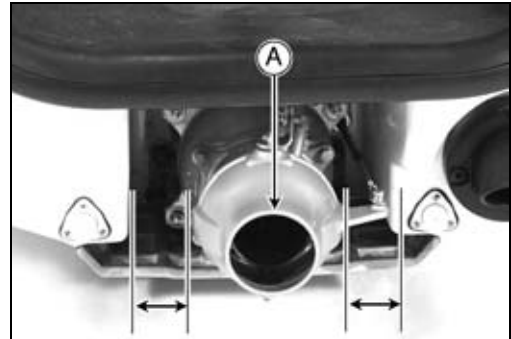
Steering Cable

Steering Cable Adjustment

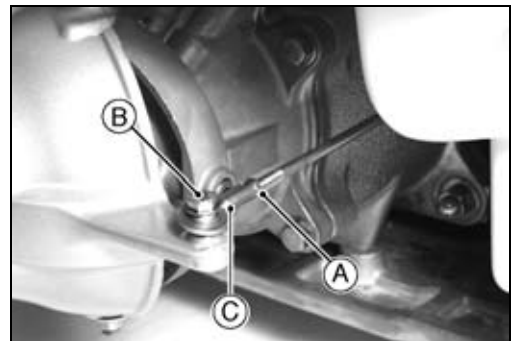
- Check steering cable adjustment.
- Center the handlebar in the straight-ahead position.



- Check that the steering nozzle is centered [A] in the pump cavity.



- ★ If necessary adjust the steering cable.
- Loosen the locknut [A] on the steering cable.
- Take out the cable joint bolt [B] and disconnect the cable joint [C] from the steering nozzle.
- Turn the joint on the cable to adjust the steering.
- Temporarily tightening the cable joint bolt, connect the joint with the nozzle and check cable adjustment again.
- When adjustment is correct, unscrew the cable joint bolt and apply a non-permanent locking agent to it. And tighten the cable joint bolt and the steering cable locknut securely.



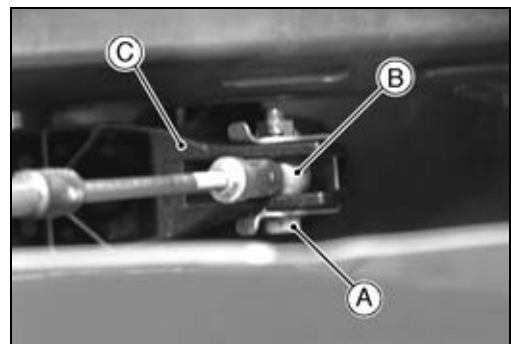
Torque - Cable Joint Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

Steering Cable Removal

- Disconnect the cable joint at each end of the steering cable.
- Take out the cable joint bolt [A] and disconnect the cable joint [B] from the lever [C].

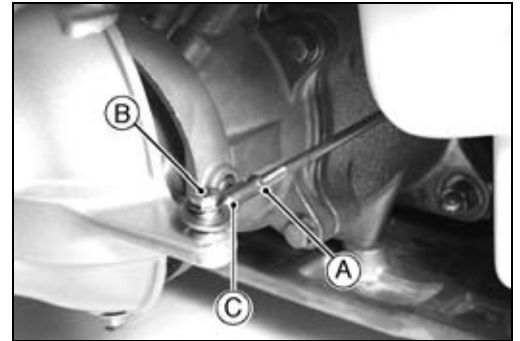
CAUTION

Never lay the watercraft on the right side. Water in the exhaust system may drain back into the engine, causing serious damage.

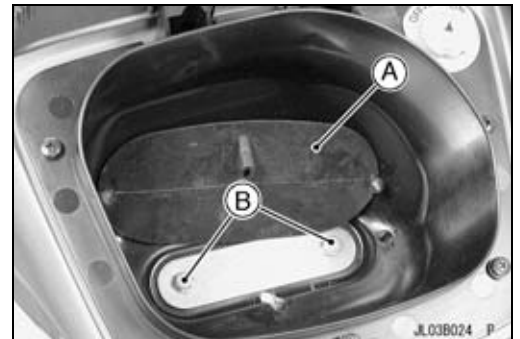


Steering Cable

- Loosen the locknut [A] on the steering cable.
- Take out the cable joint bolt [B] and disconnect the cable joint [C] from the steering nozzle.
- Remove the cable joint and the locknut on the cable.



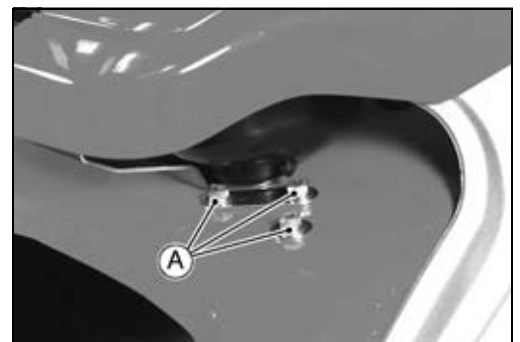
- Remove:
 - Rubber Cover [A]
- Loosen:
 - Steering Cover Bolts [B]



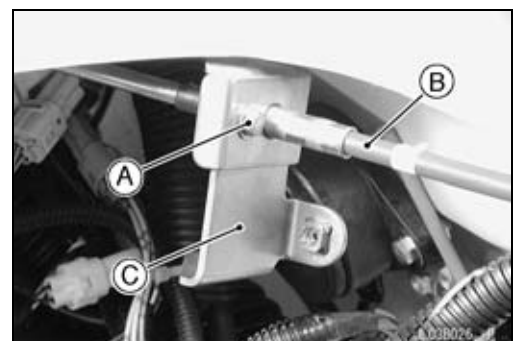
- Loosen:
 - Steering Cover Bolts [A]



- Disconnect the steering cable from the holder.
 - Unscrew the mounting bolts [A], and remove the holder.



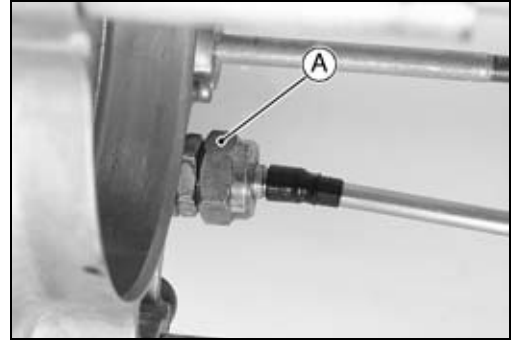
- Take out the bolt [A] and separate the cable [B] from the cable holder [C].



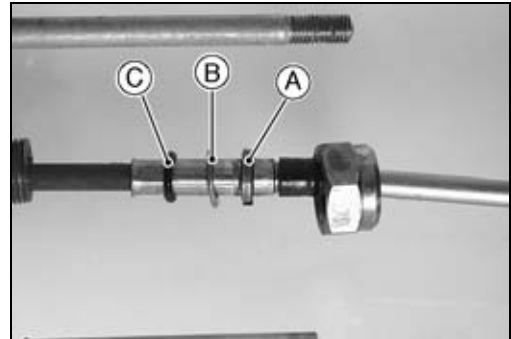
12-6 STEERING

Steering Cable

- Remove the pump (see Pump Removal in the Pump/Impeller chapter).
- Unscrew the large nut [A] in the hull with a wrench.



- Slide off the E-ring [A], washer [B], and O-ring [C].
- Pull the cable from the cable detent in the engine compartment.
- Pull out the steering cable toward the front.



Steering Cable Installation

- Slide a short piece of rubber or plastic tubing over the rear cable end to guide the cable through the hull.
- Lubricate the outside of the new cable to ease cable installation.
- Torque:
Torque - Steering Cable Nut: 39 N·m (4.0 kgf·m, 29 ft·lb)
- Apply a non-permanent locking agent to the cable joint bolts and torque them.
Torque - Cable Joint Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)
- Adjust the steering cable (see Steering Cable Adjustment).

Steering Cable Inspection

- Refer to Steering Cable Inspection in the Periodic Maintenance chapter.

Steering Cable Lubrication

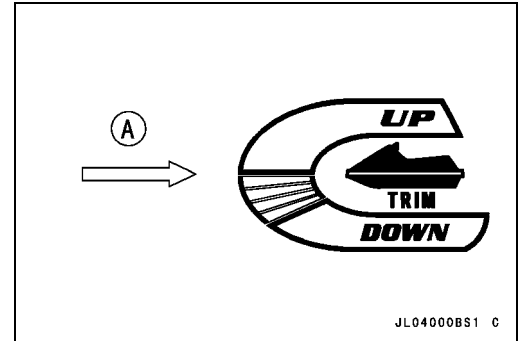
NOTE

- *The steering cable is sealed at each end and do not require lubrication. If the seal is damaged, the cable must be replaced.*

Trim Cable

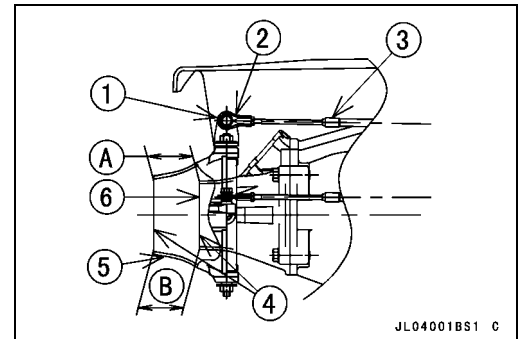
Trim Cable Adjustment

- Check trim cable adjustment.
- Turn the ignition switch ON.
- Push the trim switch as the trim indicator shows the level position [A].

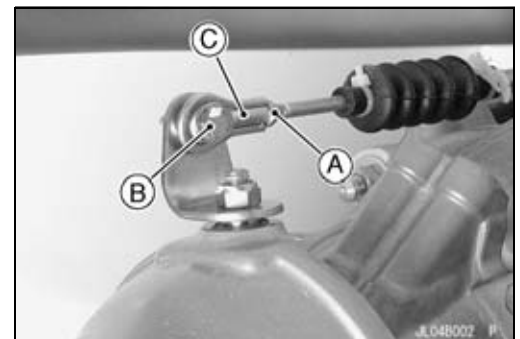


- Measure the distances from the pump outlet end to the steering nozzle end at the upper and lower locations as shown. Both distances should be approximately equal. The difference between the distance of [A] and [B] should be within 2 mm (0.08 in.).

- [1] Cable Joint Bolt
- [2] Joint
- [3] Trim Cable
- [4] Parallel
- [5] Steering Nozzle
- [6] Pump Outlet
- [A] Upper Distance
- [B] Lower Distance



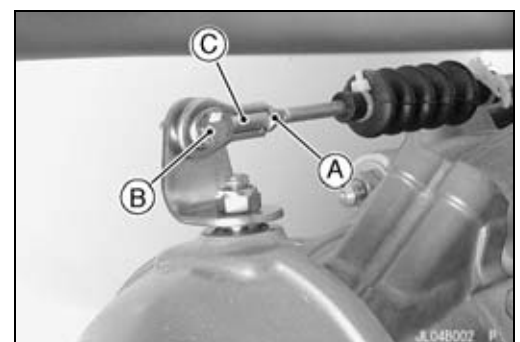
- ★ If necessary, adjust the trim cable.
- Be sure the trim indicator shows the level position.
- Loosen the locknut [A] on the trim cable.
- Take out the cable joint bolt [B] and disconnect the cable joint [C] from the trim ring.
- Turn the joint on the cable to adjust the trim angle.
- Temporarily tightening the cable joint bolt, connect the joint with the trim ring and check trim cable adjustment.
- When adjustment is connect, unscrew the cable joint bolt and apply a non-permanent locking agent to it. And tighten the cable joint bolt and steering cable nut securely.



Torque - Cable Joint Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)

Trim Cable with Trim Actuator Removal

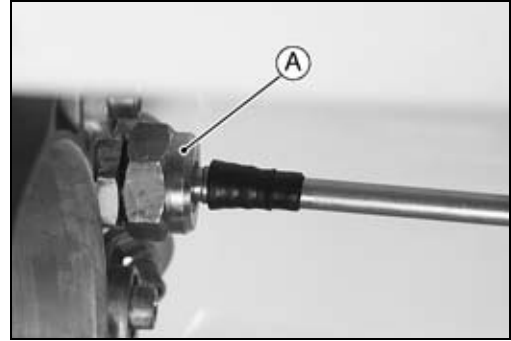
- Disconnect the cable joint at rear end of the trim cable.
- Loosen the locknut [A] on the trim cable.
- Take out the cable joint bolt [B] and disconnect the cable joint [C] from the trim ring.
- Remove the cable joint and locknut on the cable.



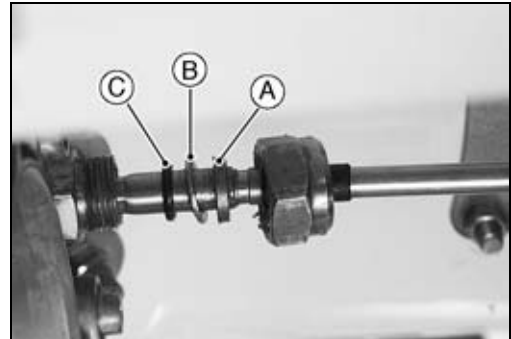
12-8 STEERING

Trim Cable

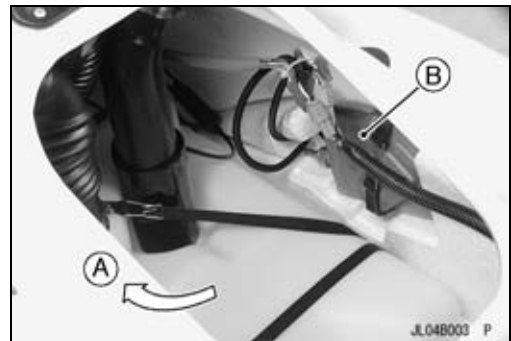
- Remove the pump (see Pump Removal in the Pump/Impeller chapter).
- Unscrew the large nut [A] in the hull with a wrench.



- Slide off the E-ring [A], washer [B], and O-ring [C].



- Slide the fuel tank toward the right [A] to remove the trim actuator [B] with the cable.
- Loosen the upper clamps on the fuel and oil inlet tube, and pull down the tubes.
- Unhook the straps for the fuel and oil tanks.



- Disconnect the connector of the trim actuator leads.
- Pull the cable from the cable detent in the engine compartment.
- Pull out the trim cable with the trim actuator.

Trim Cable Installation

- Torque:
Torque - Trim Cable Nut: 39 N·m (4.0 kgf·m, 29 ft·lb)

Trim Cable Inspection

- Refer to Trim Cable Inspection in the Periodic Maintenance chapter.

Trim Cable Lubrication

NOTE

- The trim cable is sealed at each end and do not require lubrication. If the seal is damaged, the cable must be replaced.

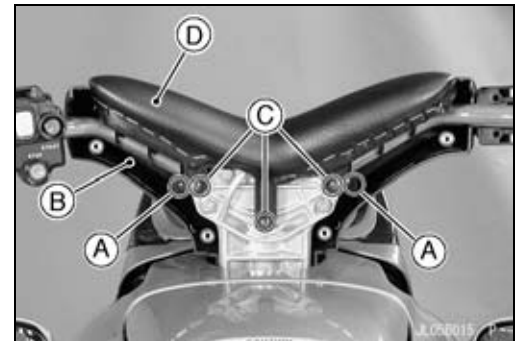
Handlebar

Removal

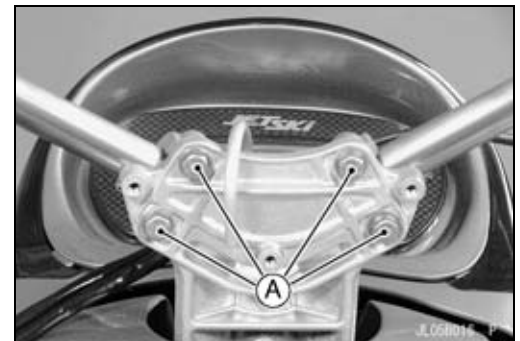
- Remove the clamp screws for the throttle case [A] and the switch case [B].
- Unscrew the mounting screws [C] and remove the rear handlebar cover [D].



- Unscrew the mounting screws [A] and remove the front handlebar cover [B].
- Unscrew the mounting screws [C] and remove the handlebar pad [D].

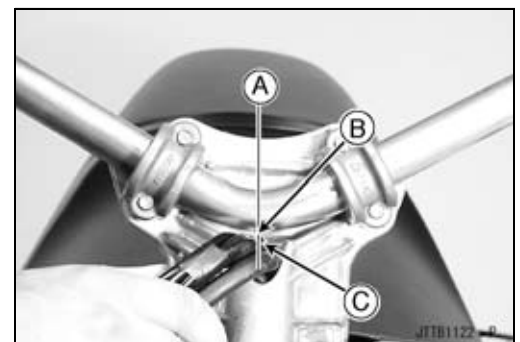


- Take out the handle clamp bolts [A] and remove the handlebar.



Installation

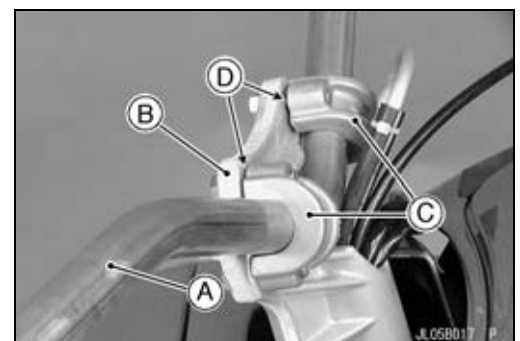
- Apply a non-permanent locking agent to the handlebar clamp bolts.
- Temporarily fix the handlebar with the clamps.
- Align [A] the hole [B] on the handlebar with the hole [C] on the steering shaft holder.



- Install the handlebar [A] on the steering shaft [B] with clamps [C].
- Mount the lower, V shaped part of the handlebar onto the holder of the steering shaft.
- Tighten the lower clamp bolts first, and then the upper clamp bolts to the specified torque. There will be a gap [D] at the upper part of the clamp after tightening.

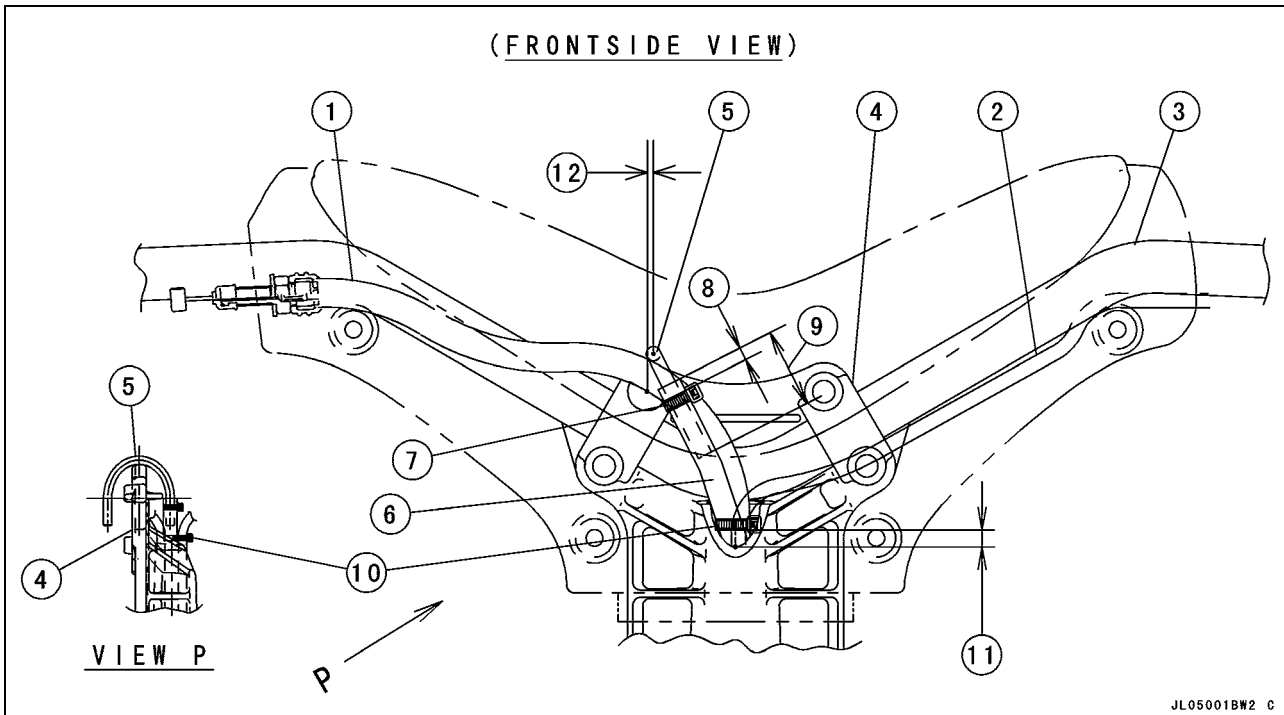
Torque - Handlebar Clamp Bolts: 16 N·m (1.6 kgf·m, 11.5 ft·lb)

- Route the cable, wire and hose as shown



12-10 STEERING

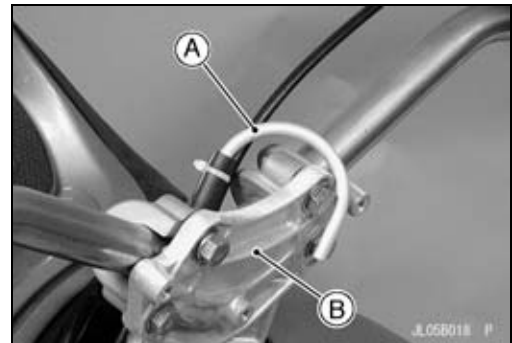
Handlebar



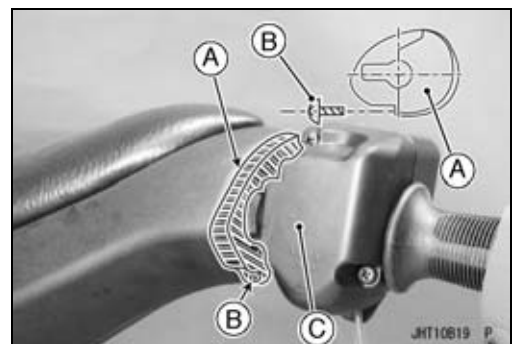
1. Throttle Cable
2. Start/Stop Switch Leads
3. Handlebar
4. Steering Shaft Holder
5. Fuel Vent Pipe
6. Fuel Vent Hose
7. Clamp: Fasten the fuel vent hose and pipe with the clamp.

8. Approx. 7 mm (0.28 in.)
9. Fuel Vent Hose Length: Approx. 30 mm (1.18 in.)
10. Clamp: Attaching the fuel vent pipe to the steering holder, fasten the throttle cable, fuel vent hose, start/stop switch leads with the clamp.
11. Approx. 7 mm (0.28 in.)
12. Approx. 2.5 mm (0.10 in.)

- Be sure the fuel vent pipe [A] is installed on the top end of the fuel vent hose.
- Position the fuel vent pipe on the right side of the steering shaft [B].



- Install the handlebar spacer [A] between the handlebar cover and the switch case [C] with the screw [B].

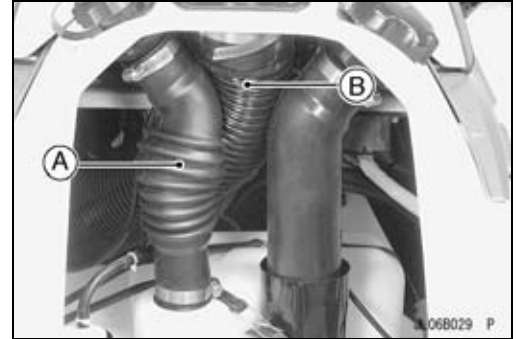


Steering

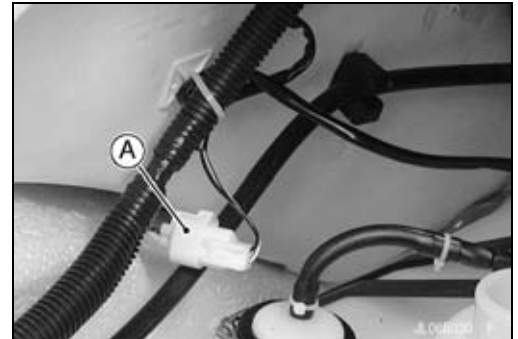
Remove

- Remove the handlebar (see Handlebar Removal).
- Remove the oil inlet tube [A] air inlet duct [B] to make services easier.

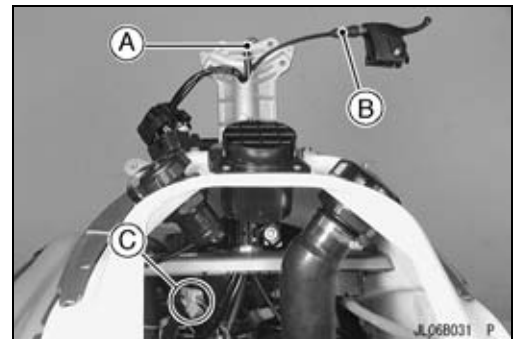
- Disconnect:
Switch Case Lead Connectors
Throttle Cable End at Throttle Case



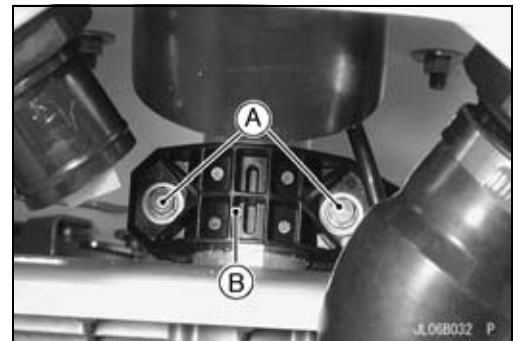
- Disconnect:
Steering Position Sensor Lead Connector [A]



- Remove:
Fuel Vent Pipe [A]
Throttle Cable Upper End [B]
Switch Case Lead Connectors [C]



- Unscrew the mounting bolts [A] and remove the lever [B].



- Remove the steering cover.
○ Unscrew the steering cover mounting bolts [A].

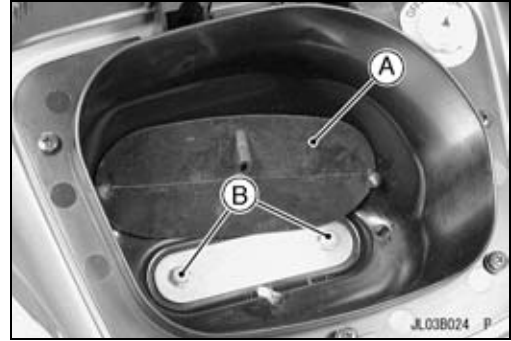


12-12 STEERING

Steering

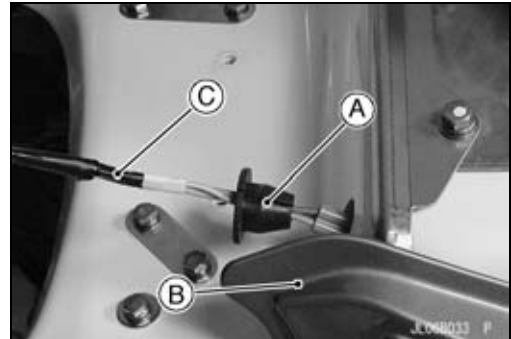
○ Remove:

- Rubber Cover [A]
- Steering Cover Mounting Bolts [B]

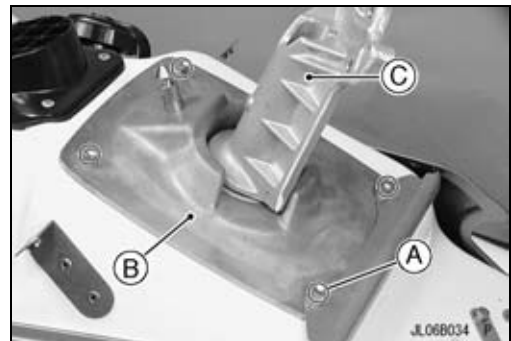


○ Disconnect the ignition switch lead connector and pull out the grommet [A].

○ Remove the steering cover [B] with the ignition switch lead [C].

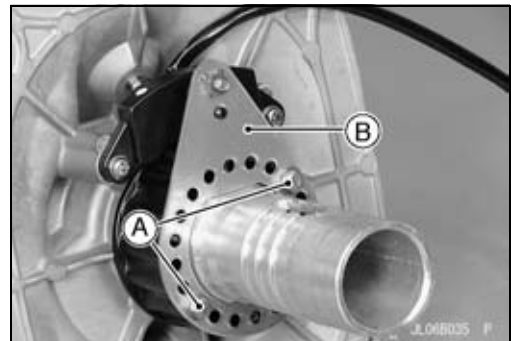


● Unscrew the mounting bolts [A] and remove the steering holder [B] with the steering shaft [C].



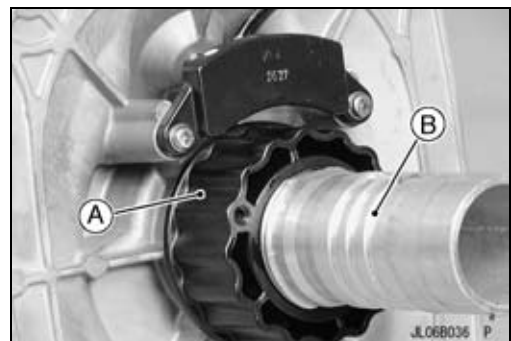
● Remove:

- Steering Shaft Mount Plate Bolts [A]
- Steering Shaft Mount Plate [B]



● Remove:

- Steering Nut [A]
- Steering Shaft [B]

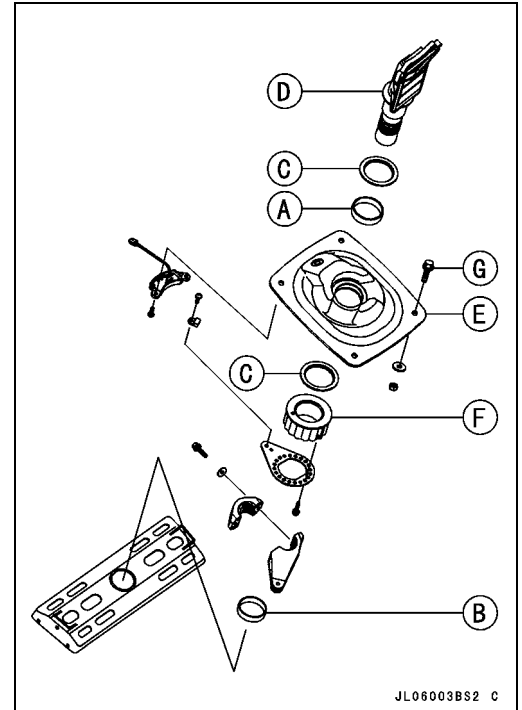


Steering

Installation

- Check the bushings for damage and wear.
- ★ If the bushings are damaged or worn, replace them.
- Grease:
 - Upper Bushing [A]
 - Lower Bushing [B]
 - Washers [C]
- Position the lower bushing on the member.
- Install the steering shaft [D] on the steering holder [E].
- Hand-tighten the steering nut [F] and check that the steering shaft turns smoothly but there is no looseness between the shaft and holder.
- Apply a non-permanent locking agent to the steering holder mounting bolts [G], and torque them.

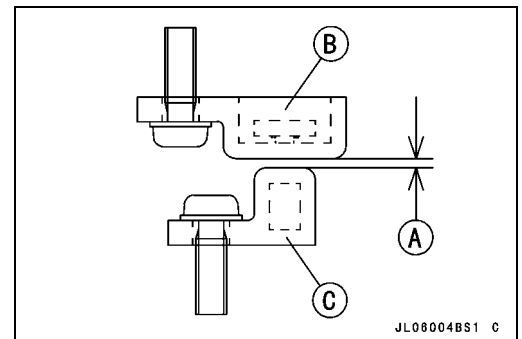
Torque - Steering Holder Mounting Bolts: 16 N·m (1.6 kgf·m, 11.5 ft·lb)



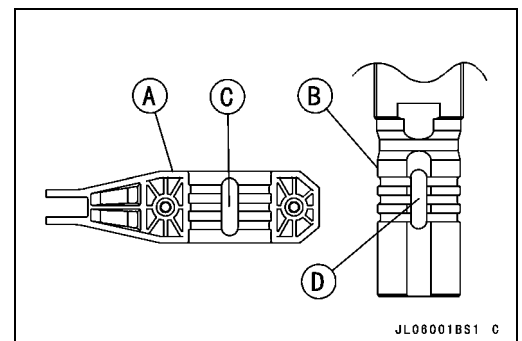
- Turning the steering shaft fully in left and right direction, check whether the steering position sensor comes in contact with the magnet.
- Check the clearance [A] between the steering position sensor [B] and the magnet [C] with feeler gauge.

Steering Position Sensor Clearance
Standard: 0.5 ~ 1.5 mm (0.02 ~ 0.06 in.)

- ★ If necessary, adjust the steering shaft nut.



- Install the lever [A] over the steering shaft [B].
- Align the project [C] on the lever with the groove [D] on the shaft.



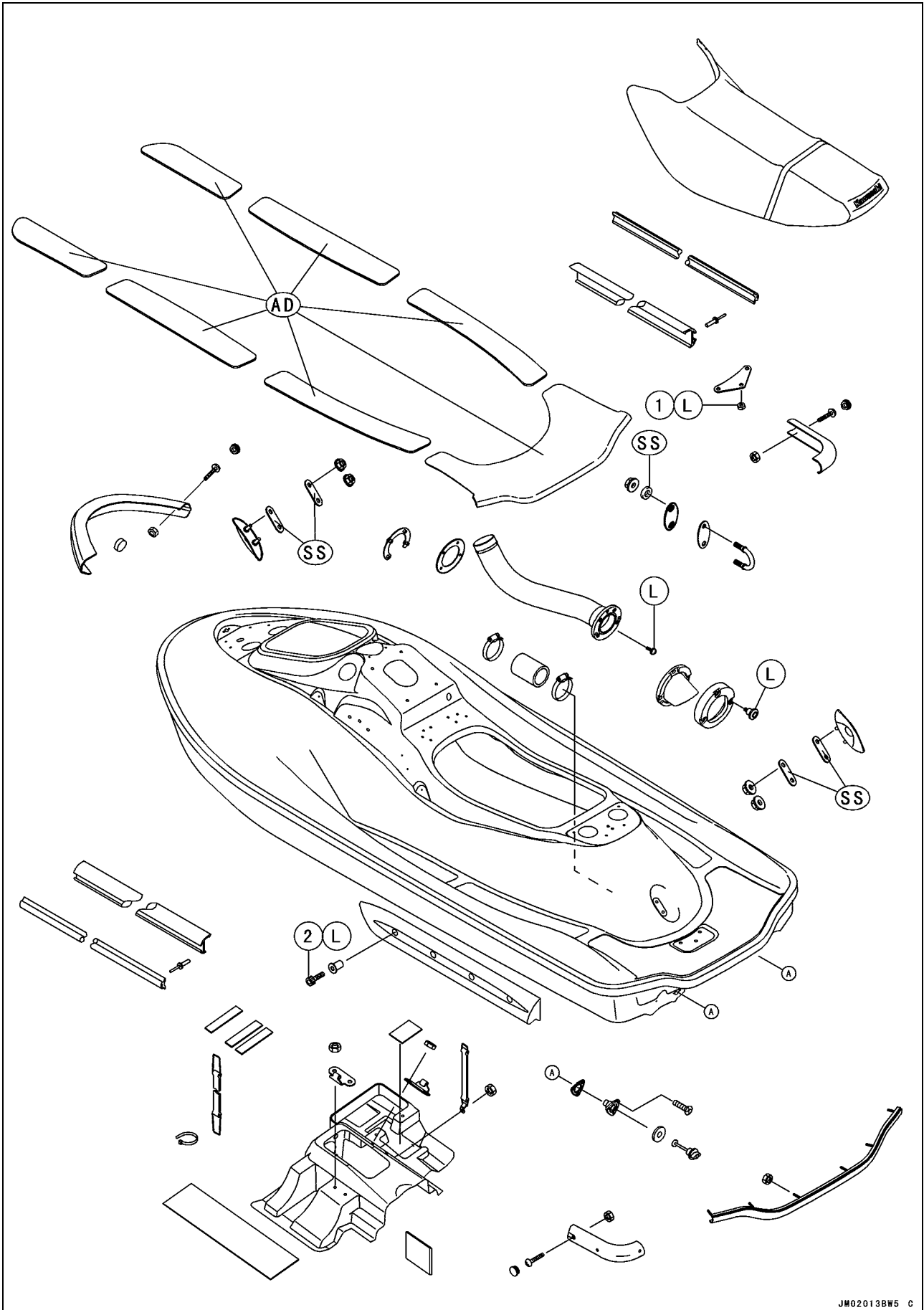
Hull/Engine Hood

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13-2 HULL/ENGINE HOOD

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Mounting Plate Nuts	25	2.5	18	L
2	Stabilizer Mounting Bolts	9.8	1.0	87 in·lb	L

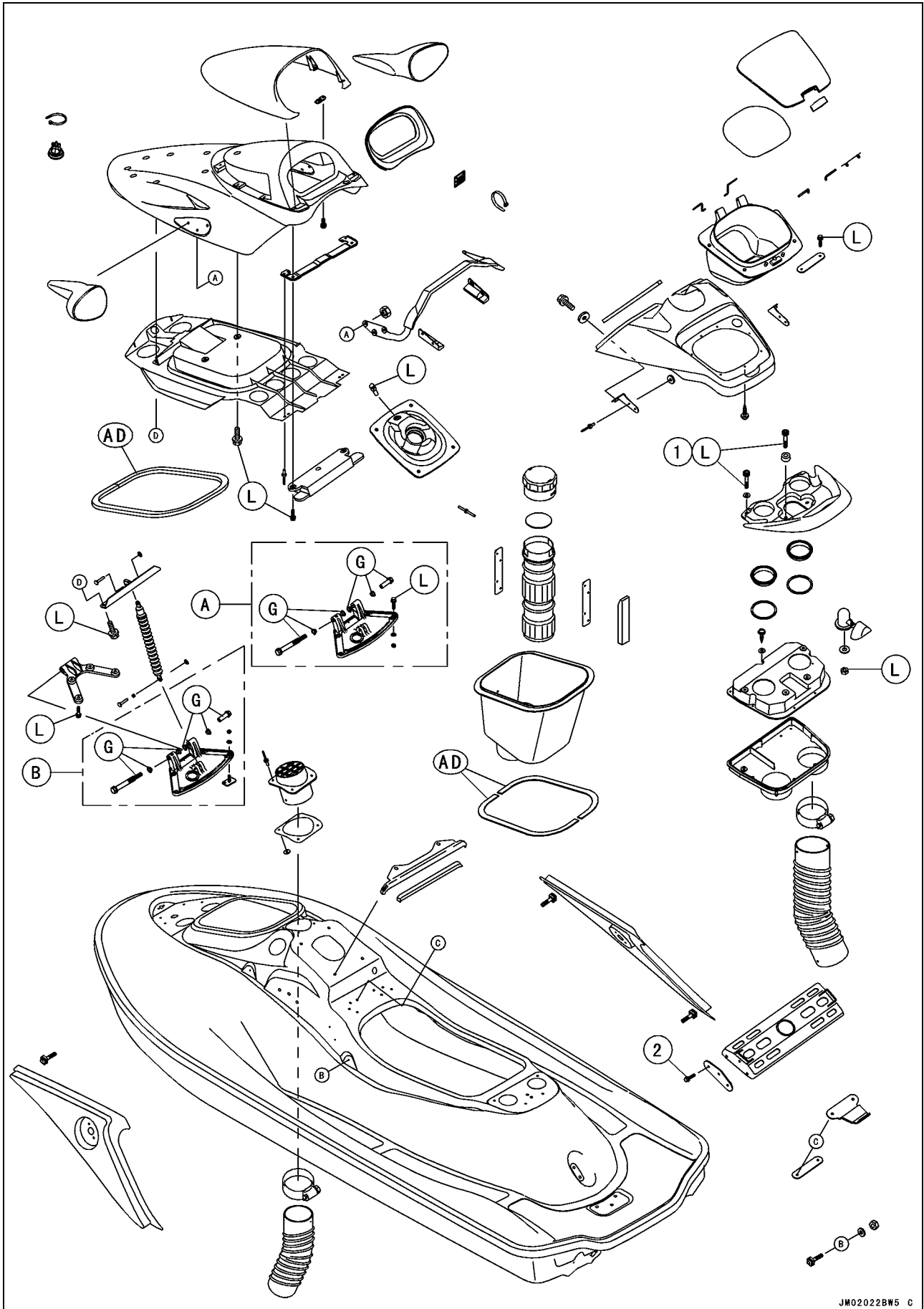
AD: Apply synthetic rubber adhesive.

L: Apply a non-permanent locking agent.

SS: Apply silicone sealant.

13-4 HULL/ENGINE HOOD

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Grip Mounting Bolts	9.8	1.0	87 in·lb	L
2	Crossmember Mounting Bolts	7.8	0.8	69 in·lb	

A: JH1200-B1 Model

B: JH1200-B2 ~ Model

AD: Apply synthetic rubber adhesive

L: Apply a non-permanent locking agent.

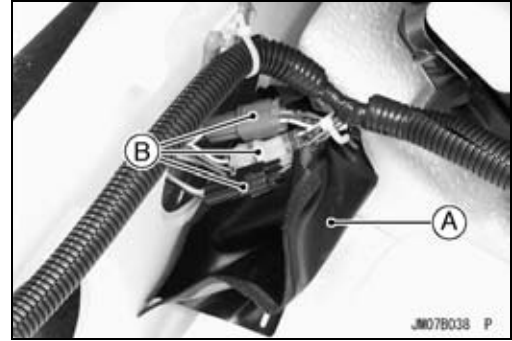
SS: Apply silicone sealant.

13-6 HULL/ENGINE HOOD

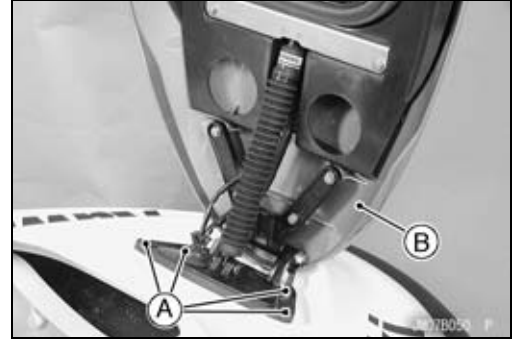
Fittings

Hatch Cover Removal/Installation

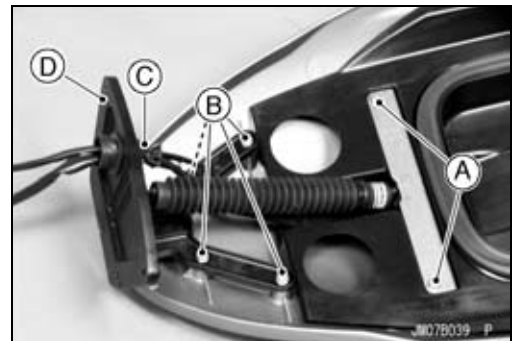
- Open the hatch cover.
- Open the connector cover [A].
- Disconnect the connectors [B] of the multifunction meter leads.



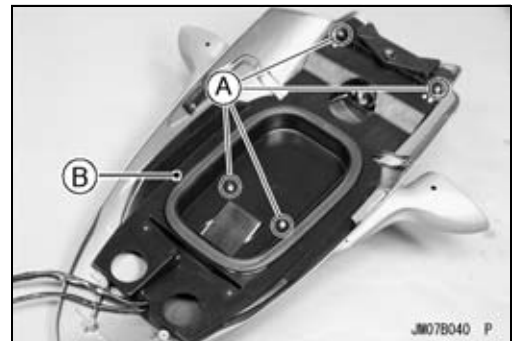
- Remove:
 - Lower Hatch Cover Bracket Mounting Bolts [A] and Nuts.
 - For JH1200-B1 model, the nuts on the inside of the hull will drop down when the mounting bolts are removed.
- Remove the hatch cover assembly [B] with the hatch cover bracket.



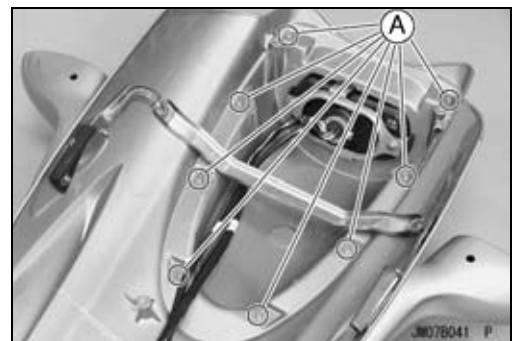
- Remove:
 - Damper Bracket Mounting Bolts [A]
 - Upper Hatch Cover Bracket Bolts [B]
- Pull out the rubber boot [C] with the multifunction meter leads.
- Remove the hatch cover bracket [D] from the hatch cover.



- To remove the duct cover [A], unscrew the mounting bolts [B].

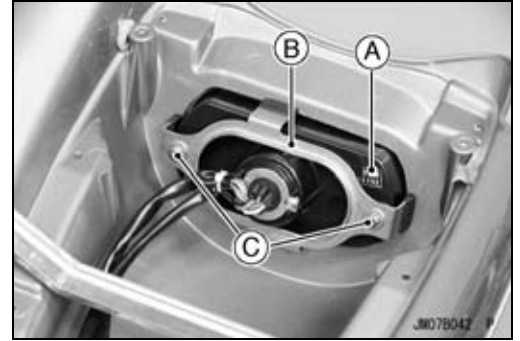


- To remove the windshield, unscrew the mounting screws [A].

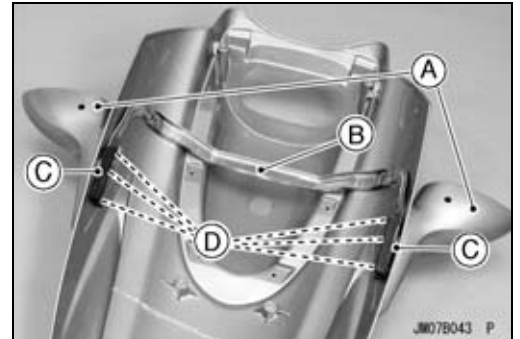


Fittings

- To remove the multifunction meter [A] and meter cover, take off the meter bracket [B].
- Unscrew the bolts [C].

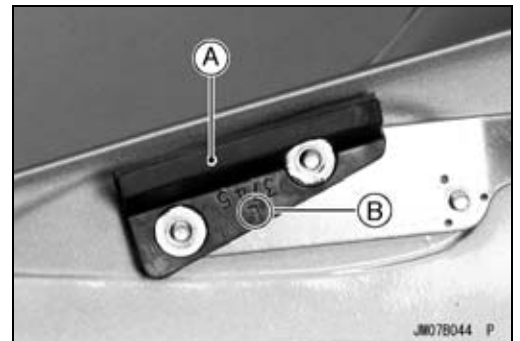


- To remove the rear view mirrors [A], mirror bracket [B] and rubber dampers [C], unscrew the mounting nuts [D].



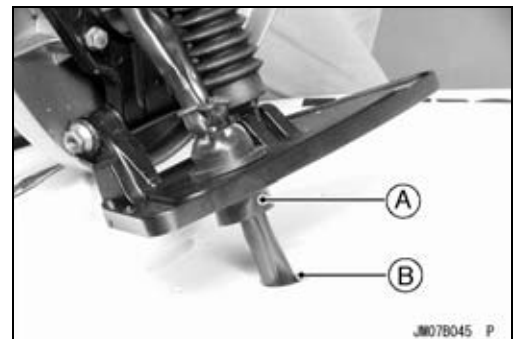
Hatch Cover Installation

- Install the hatch cover rubber dampers.
- The left damper [A] has a L mark [B] and the right damper has a R mark.



- Apply a non permanent locking agent to the following parts.
 - Duct Cover Mounting Bolts
 - Damper Bracket Mounting Bolts
 - Hatch Cover Bracket Bolts

- Insert the lower part [A] of the rubber boot into the hole [B] of the hull.

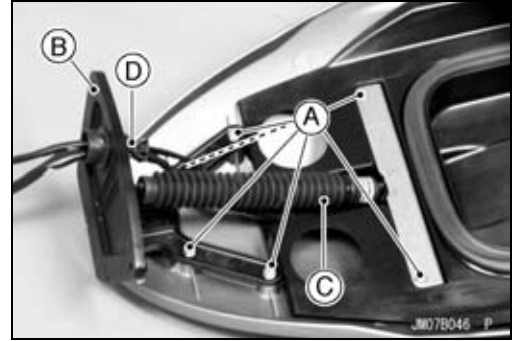


13-8 HULL/ENGINE HOOD

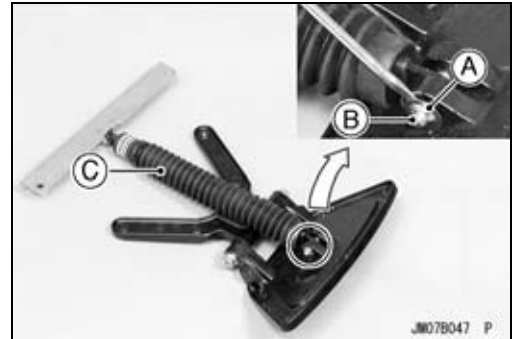
Fittings

Hatch Cover Bracket Removal

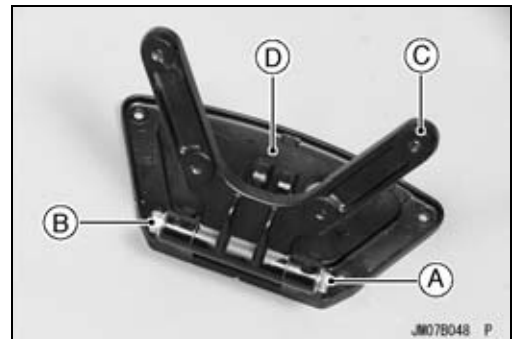
- Remove the hatch cover assembly (see Hatch Cover Removal/Installation).
- Take out the mounting bolts [A] and remove the hatch cover bracket [B] with damper [C].
- Pull out the rubber boot [D] with the multifunction meter leads.



- Remove:
 - Circlips [A] (Discard)
 - Pins [B]
 - Damper [C]

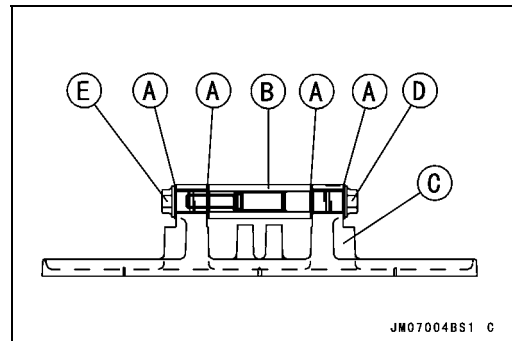


- Unscrew the shaft [A] and nut [B], and remove the upper bracket [C] from the lower bracket [D].



Hatch Cover Bracket Installation

- Grease:
 - Bushings
 - Shaft
 - Nut
 - Insert the bushings [A] into the bracket.
 - Set the upper bracket [B] and the lower bracket [C].
 - Tighten the shaft [D]
 - Tighten the nut [E]
-
- Apply a non permanent locking agent to the following.
 - Upper Bracket Mounting Bolts
 - Lower Bracket Mounting Bolts



Fittings

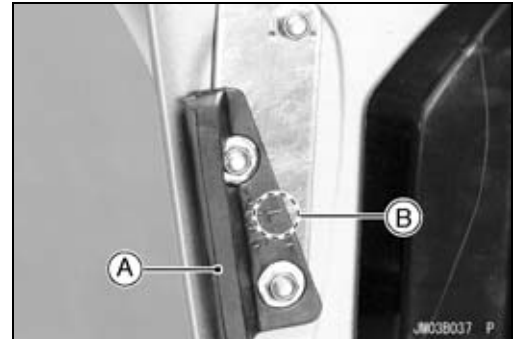
Rear View Mirror Removal

- Open the hatch cover.
- Take out the nuts [A] and remove the rear view mirror [B] and rubber damper.



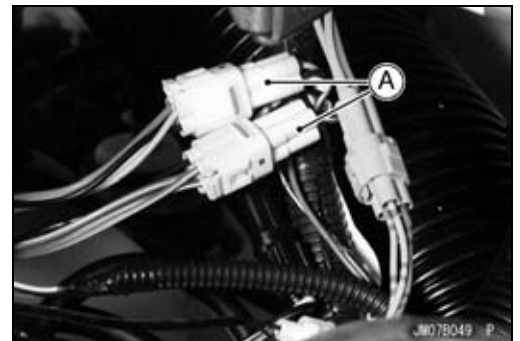
Rear View Mirror Installation

- Install the rear view mirror and rubber [A].
- The left rubber damper has a L mark [B] and the right rubber damper has a R mark.



Crossmember Removal

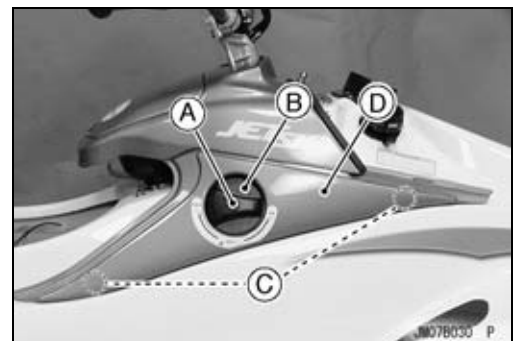
- Remove the seat.
- Disconnect the trim, tether and starter switch connectors [A].



- Remove:
 - Rear Handlebar Cover (see Steering chapter)
 - Front Handlebar Cover (see Steering chapter)
 - Handlebar Pad (see Steering chapter)
 - Throttle Control Cable Upper End (see Fuel System chapter)
- Pull down the throttle control cable [A].



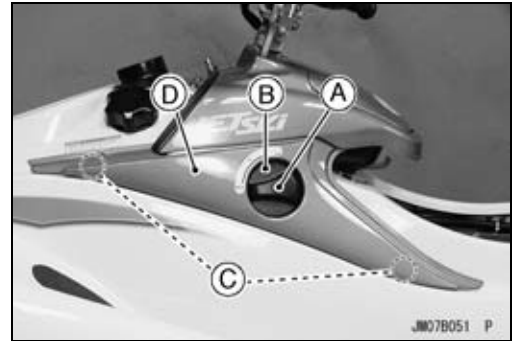
- Open the hatch cover.
- Remove:
 - Plug [A]
 - Screw
 - Fuel Tap Knob [B]
 - Nuts [C]
 - Right Side Cover [D]



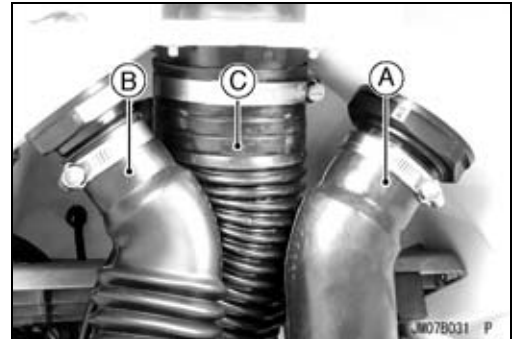
13-10 HULL/ENGINE HOOD

Fittings

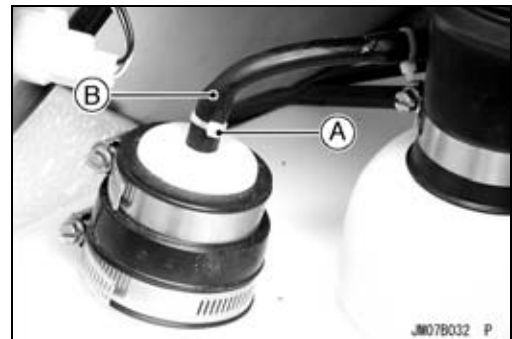
- Remove:
 - Plug [A]
 - Screw
 - Choke Knob [B]
 - Nuts [C]
 - Left Side Cover [D]



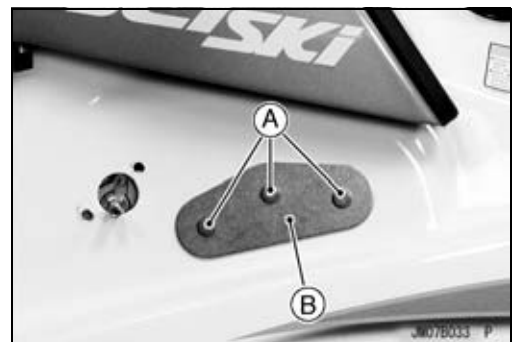
- Loosen the clamps.
- Remove:
 - Fuel Inlet Tube Upper End [A]
 - Oil Inlet Tube Upper End [B]
 - Front Air Vent Duct Upper End [C]



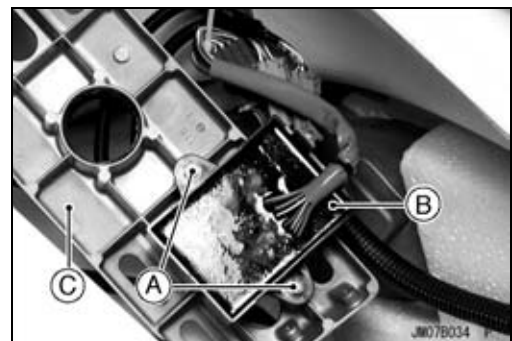
- Cut the band [A].
- Remove:
 - Fuel Tank Air Vent Hose Lower End [B].



- Take out the bolts [A] and plates [B].



- Unscrew the bolts [A], and remove the control unit [B].
- Remove the crossmember [C] from the hull.

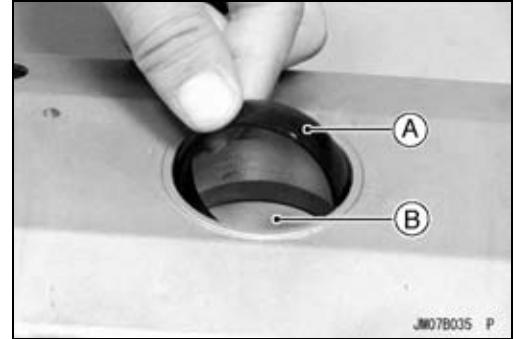


Fittings

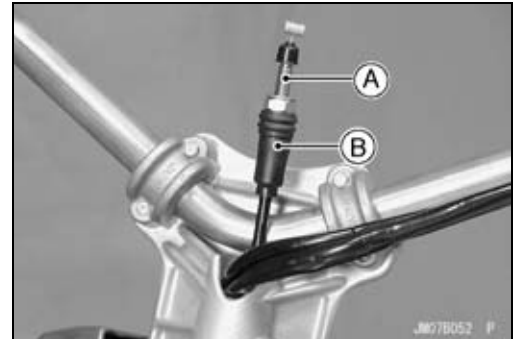
Crossmember Installation

- Apply grease to the busing.
- Install the busing [A] into the hole [B] of the crossmember.
- Apply a non-permanent locking agent to the crossmember mounting bolts and torque them.

Torque - Crossmember Mounting Bolts: 7.8 N·m (0.8 kgf·m, 69 in·lb)



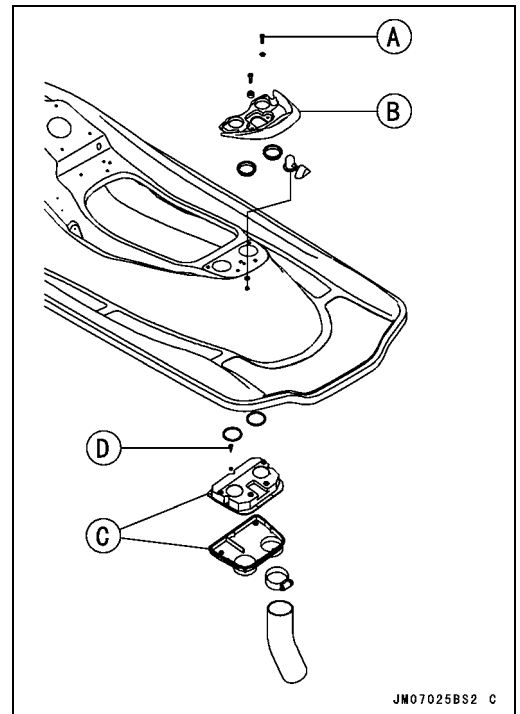
- Run the throttle cable [A] into the tube of the steering bracket.
- Be sure the rubber boot [B] on the cable.



Grip and Rear Duct Removal/Installation

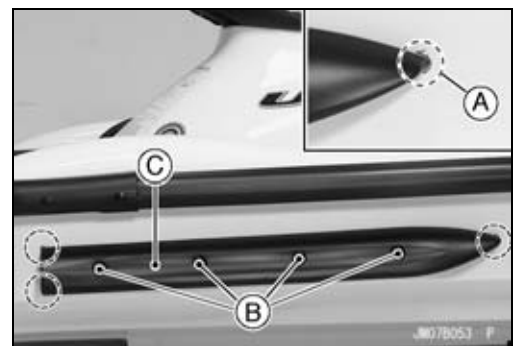
- Take out the bolts [A], and remove the grip [B] and rear duct [C].
- To split the upper duct and lower duct, remove the mounting screws [D].
- Installation is the reverse of removal.
- Apply a non-permanent locking agent to the grip mounting bolts.

Torque - Grip Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



Stabilizer Removal

- Before removing the stabilizer, mark [A] the position of the stabilizer on the hull.
- Unscrew the bolts [B] and remove the stabilizer [C].

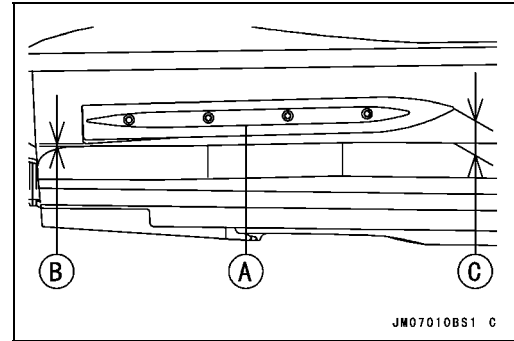


13-12 HULL/ENGINE HOOD

Fittings

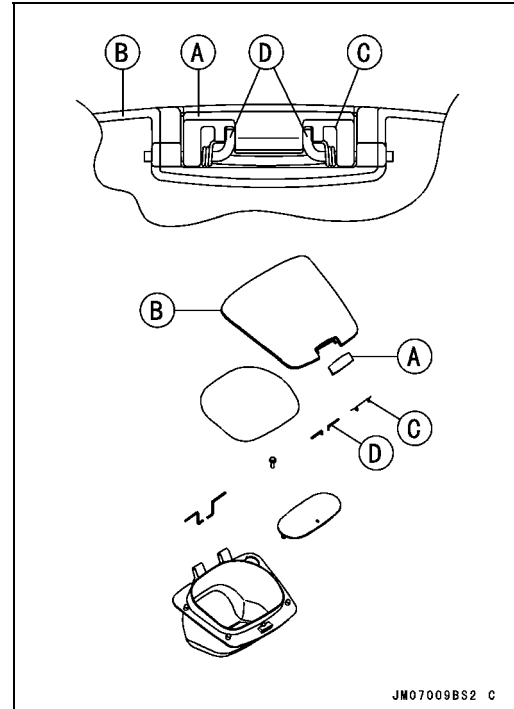
Stabilizer Installation

- Install the stabilizer [A] on its original position by setting it with the marks.
 - 5 ±2 mm (0.2 ±0.08 in.) [B]
 - 65 ±3 mm (2.6 ±0.1 in.) [C]
 - Apply a non-permanent locking agent to the stabilizer mounting bolts and tighten them.
- Torque - Stabilizer Mounting Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



Storage Cover Assembly

- When disassembling the lock [A] from the storage cover [B], assemble the storage cover, as shown.
 - Storage Cover [B]
 - Lock [A]
 - Spring [C]
 - Shaft [D]
- Push down the shaft [D] into the lock [A].



Hull Replacement

To replace the hull, remove the various parts in the following suggested order.

- Seat
- Battery and Pad
- Exhaust Pipe and Expansion Chamber
- Carburetor
- KSS Actuator
- Engine and Mounts
- Oil Tank and Filler
- Air Vent Ducts
- Electric Case (Front, Rear)
- Fuse Assy and Brackets
- Water Box Muffler
- Drive Shaft and Shaft Holder
- Steering Cover
- Fuel Tap
- Choke Assembly
- Pump and Hoses
- Handlebar and Steering
- Crossmember
- Fuel Tank and Filler
- Steering Cable
- Tilt Cable with Tilt Motor Box
- Bilge and Cooling System Hose
- Bypass Hose and Outlet
- Main Harness
- Bumpers
- Seat Latch
- Hatch Cover and Brackets

The following parts cannot be removed from the hull and must be replaced.

- Decals
- Labels
- Mats
- Registration Number (if any)

If the new hull is to be painted, do that first. Then install removed parts in the reverse order of their removal. Finally, install the labels, decals, mats and the registration numbers.

13-14 HULL/ENGINE HOOD

Rubber Parts

NOTE

○ The rubber parts on the watercraft are fastened in place with various adhesives. To replace a rubber part, use a cement in the following table, or an equivalent.

WARNING

Read all warnings and cautions on any solvents and adhesives used. Many of these products are flammable, may be harmful to the skin and eyes, and may give off harmful vapors. Use these solvents and adhesives only in a well-ventilated area and never near an open flame.

For this Application:	Type
Mats Engine Hood Gasket Hatch Cover Trim Seal	Synthetic Rubber Adhesive (P/N: 92104-3701)
Detents Handlebar Grips	Cyanoacrylate Cement

CAUTION

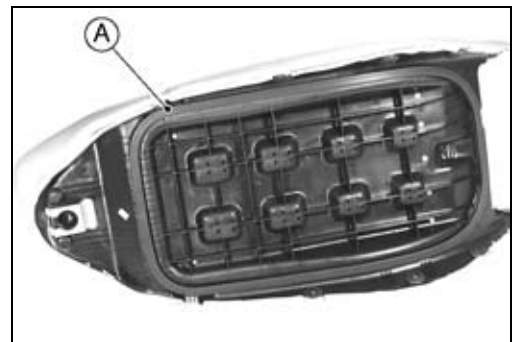
Be very careful that the part is positioned correctly when you apply the cement. It may be impossible to reposition the part.

WARNING

Do not get any cyanoacrylate cement in your eyes or on your skin. If you do get some in your eyes, do not try to wash it out. Contact a physician immediately! If you do get some on your fingers, do not touch any other part of your body; your fingers will stick to anything they touch. Allow the cement to cure and it will eventually wear off.

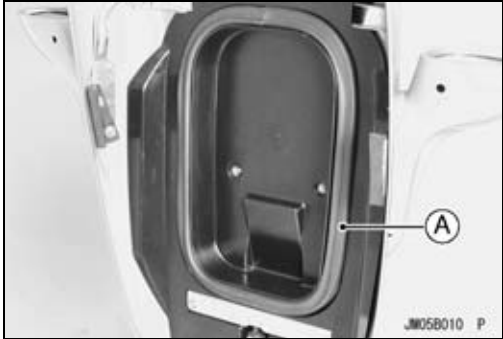
Rubber Parts Location

Engine Hood Gasket [A]

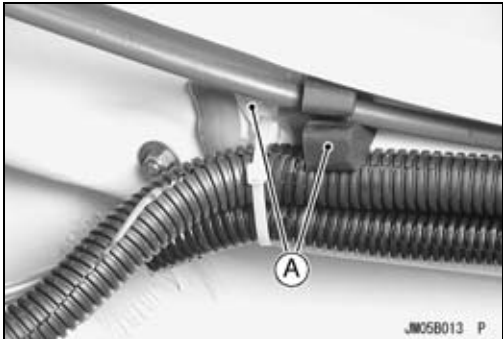


Rubber Parts

Trim Seal [A]



Detent [A]

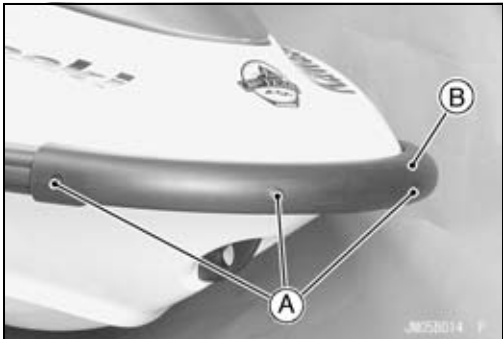


Mats [A]



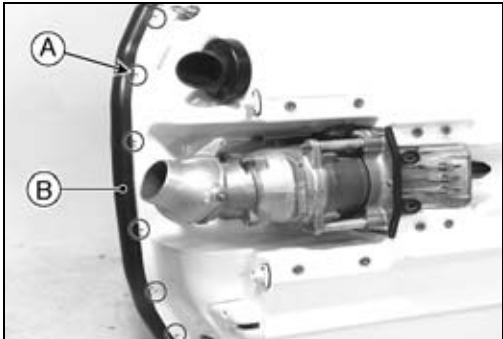
Front Bumper Removal/Installation

- Pull out the plugs [A].
- Unscrew the screws [A], and remove the front bumper [B].
- Installation is the reverse of removal.



Rear Bumper Removal/Installation

- Take out the rear bumper mounting nuts [A].
- Remove the rear bumper [B].
- Installation is the reverse of removal.

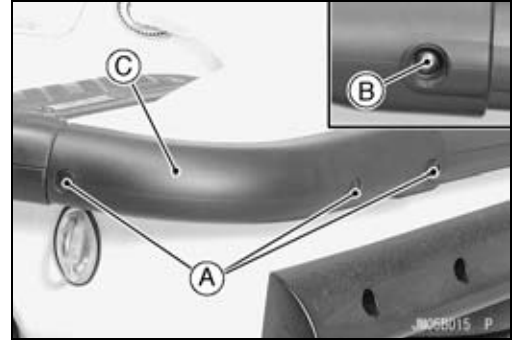


13-16 HULL/ENGINE HOOD

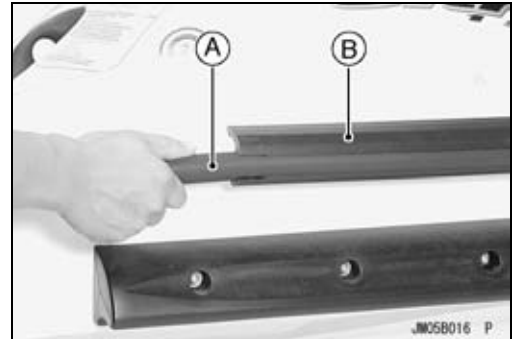
Rubber Parts

Side Bumper Removal

- Remove the front bumper (see Front Bumper Removal)
- Pull out the plugs [A], and unscrew the screws [B].
- Remove the corner bumper [C].



- Pull the trim strip [A] from the side bumper [B].

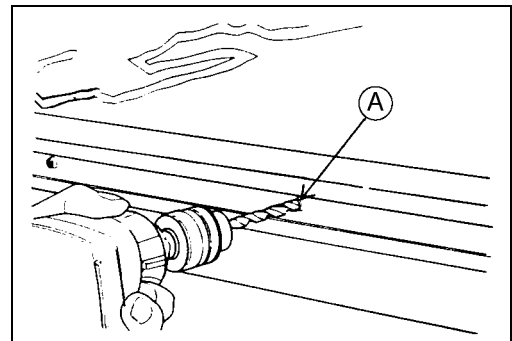


- Drill out the pop rivets with a drill bit of the correct size.

Pop Rivet Removal Drill Bit Size
5.0 mm (0.2 in.)

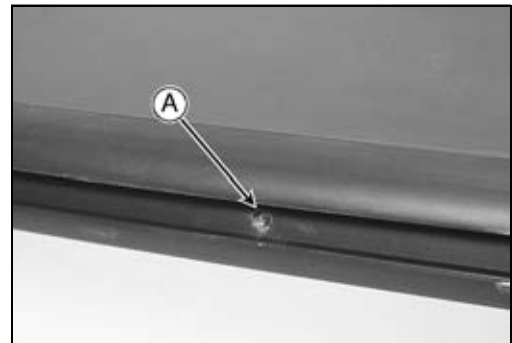
NOTE

- Stop drilling when the rivet head [A] starts to turn with drill bit.
- Tap the rivet out of the hull flange with a suitable punch and hammer.

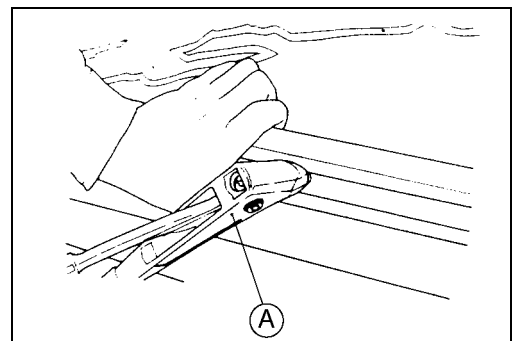


Side Bumper Installation

- Align [A] the hole on the bumper with the mounting hole on the hull.



- Secure the bumper to the hull flange with a pop rivet [A].
- Install the trim strip pushing on the both sides of the strip.



Electrical System

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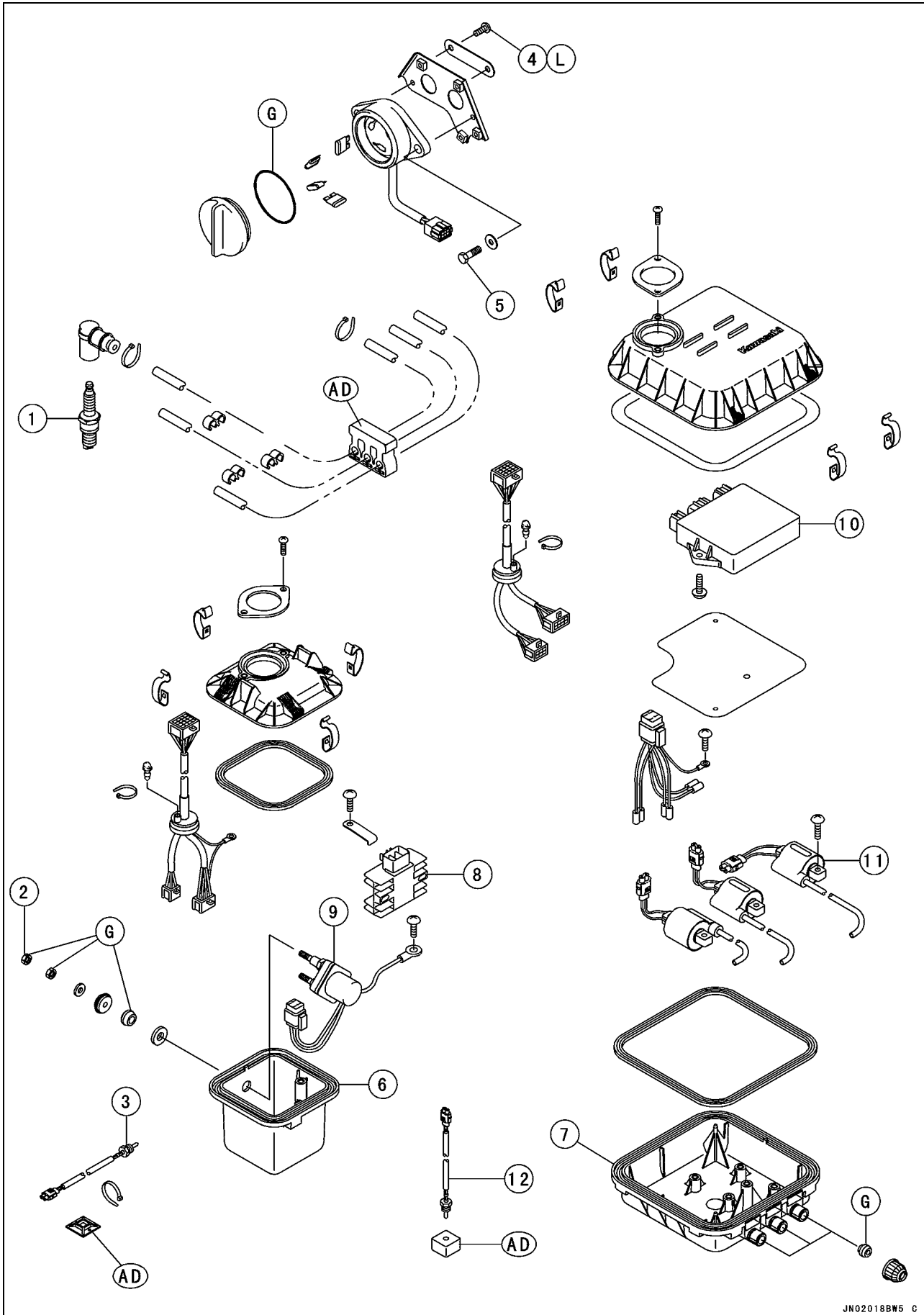
14-2 ELECTRICAL SYSTEM

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Dummy Page

14-4 ELECTRICAL SYSTEM

Exploded View



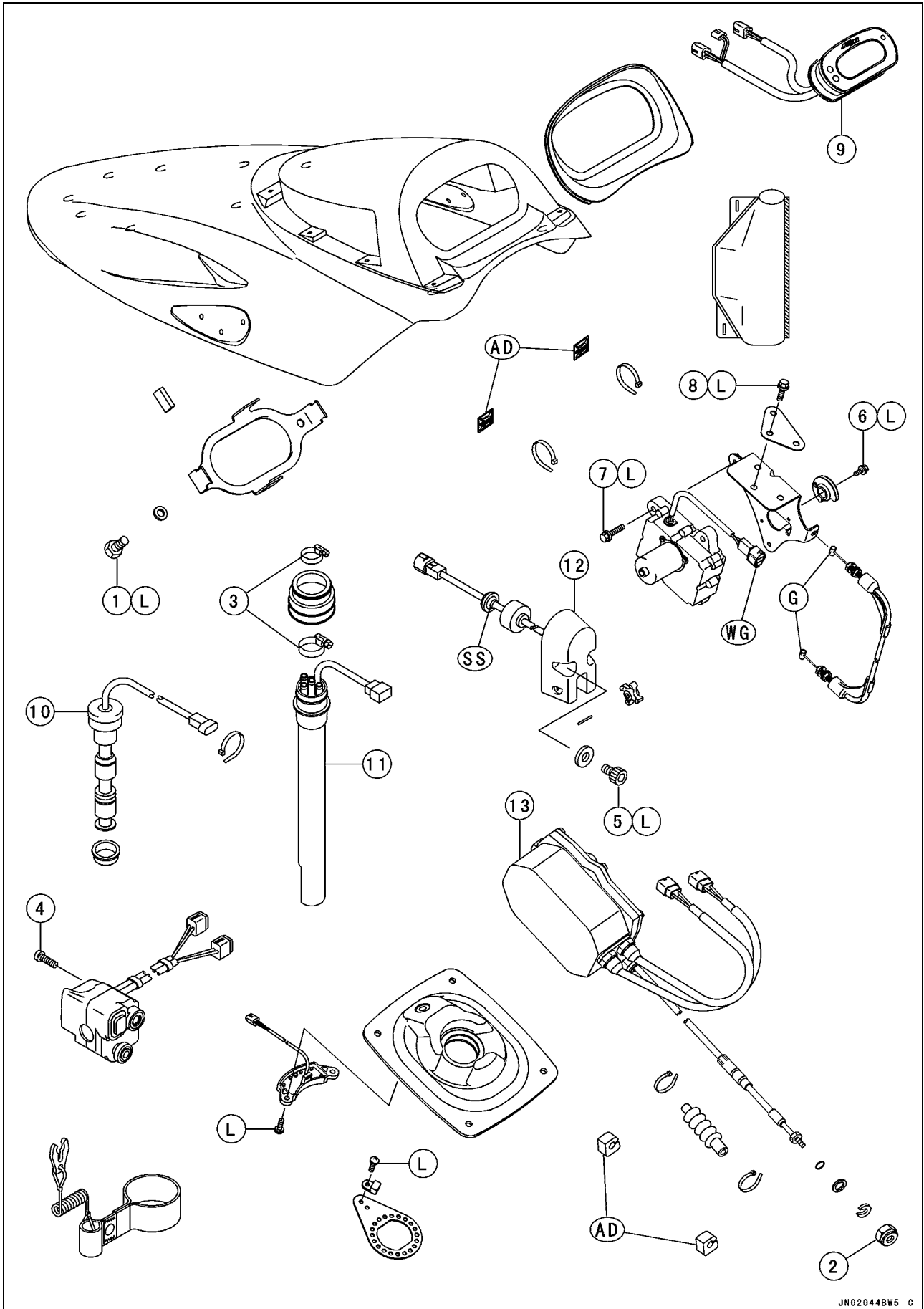
Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Spark Plug	25 ~ 29	2.5 ~ 3.0	18 ~ 22	
2	Starter Relay Mounting Nuts	3.4 ~ 4.4	0.35 ~ 0.45	30~ 39 in·lb	
3	Water Temperature Sensor	15	1.5	11	
4	Fuse Bracket Mounting Screws	4.4	0.4	39 in·lb	L
5	Fuse Case Mounting Bolts	7.8	0.8	69 in·lb	L

- 6. Rear Electric Case
 - 7. Front Electric Case
 - 8. Regulator/Rectifier
 - 9. Starter Relay
 - 10. Igniter
 - 11. Ignition Coil
 - 12. Inlet Air Temperature Sensor
- AD: Apply adhesive.
 G: Apply grease.
 L: Apply a non-permanent locking agent.

14-6 ELECTRICAL SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Meter Bracket Bolts	3.9	0.4	35 in·lb	L
2	Trim Cable Nut	39	4.0	29	
3	Fuel Level Sensor Assembly Clamps	2.9	0.3	26 in·lb	
4	Start/Stop Switch Case Mounting Screws	3.9	0.4	35 in·lb	
5	Speed Sensor Mounting Bolts	3.9	0.4	35 in·lb	L
6	Smart Steering Actuator Pulley Mounting Bolt	3.5	0.36	31 in·lb	L
7	Smart Steering Actuator Mounting Bolts	8.8	0.9	78 in·lb	L
8	Smart Steering Actuator Bracket Mounting Bolts	8.8	0.9	78 in·lb	L

9. Multifunction Meter

10. Oil Level Sensor

11. Fuel Level Sensor Assembly

12. Speed Sensor

13. Trim Actuator

AD: Apply adhesive.

G: Apply grease.

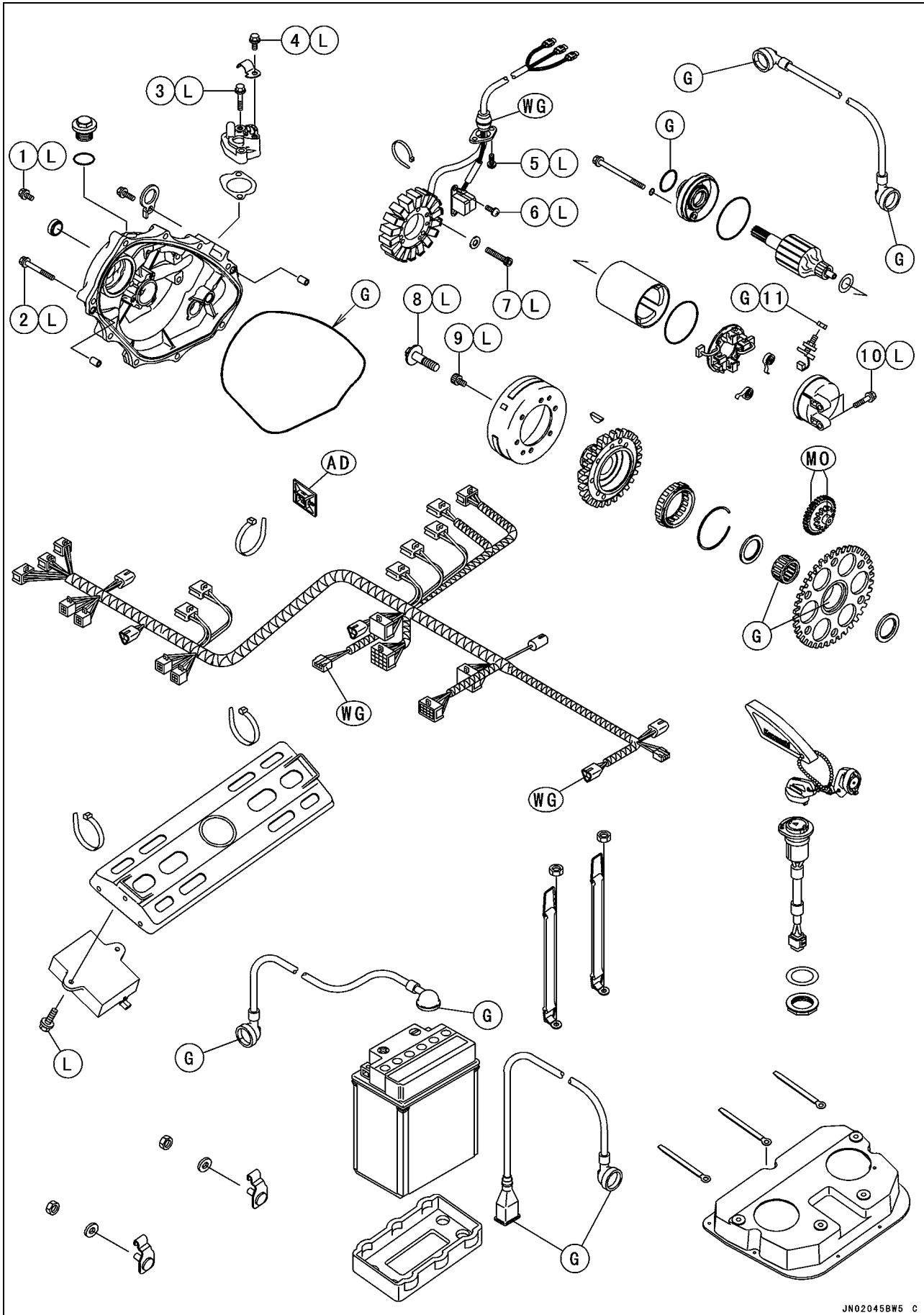
L: Apply a non-permanent locking agent.

SS: Apply silicone sealant.

WG: Apply water-resistance grease.

14-8 ELECTRICAL SYSTEM

Exploded View



Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Gauge Bolt	3.9	0.4	35 in·lb	L
2	Magneto Cover Mounting Bolts	12	1.2	8.7	L
3	Grommet Cover Mounting Bolts	8.8	0.9	78 in·lb	L
4	Grommet Clamp Mounting Bolt	8.8	0.9	78 in·lb	L
5	Grommet Mounting Screws	3.5	0.36	31 in·lb	L
6	Pickup Coil Mounting Screws	3.5	0.36	31 in·lb	L
7	Stator Mounting Bolts	7.8	0.8	69 in·lb	L
8	Flywheel Bolt	123 ~ 127	12.5 ~ 13.0	90 ~ 94	L
9	Balancer Drive Gear Mounting Bolt	12	1.2	8.7	L
10	Starter Motor Mounting Bolts	8.8	0.9	7.8 in·lb	L
11	Starter Motor Cable Nut	7.8	0.8	69 in·lb	G

AD: Apply adhesive.

G: Apply grease.

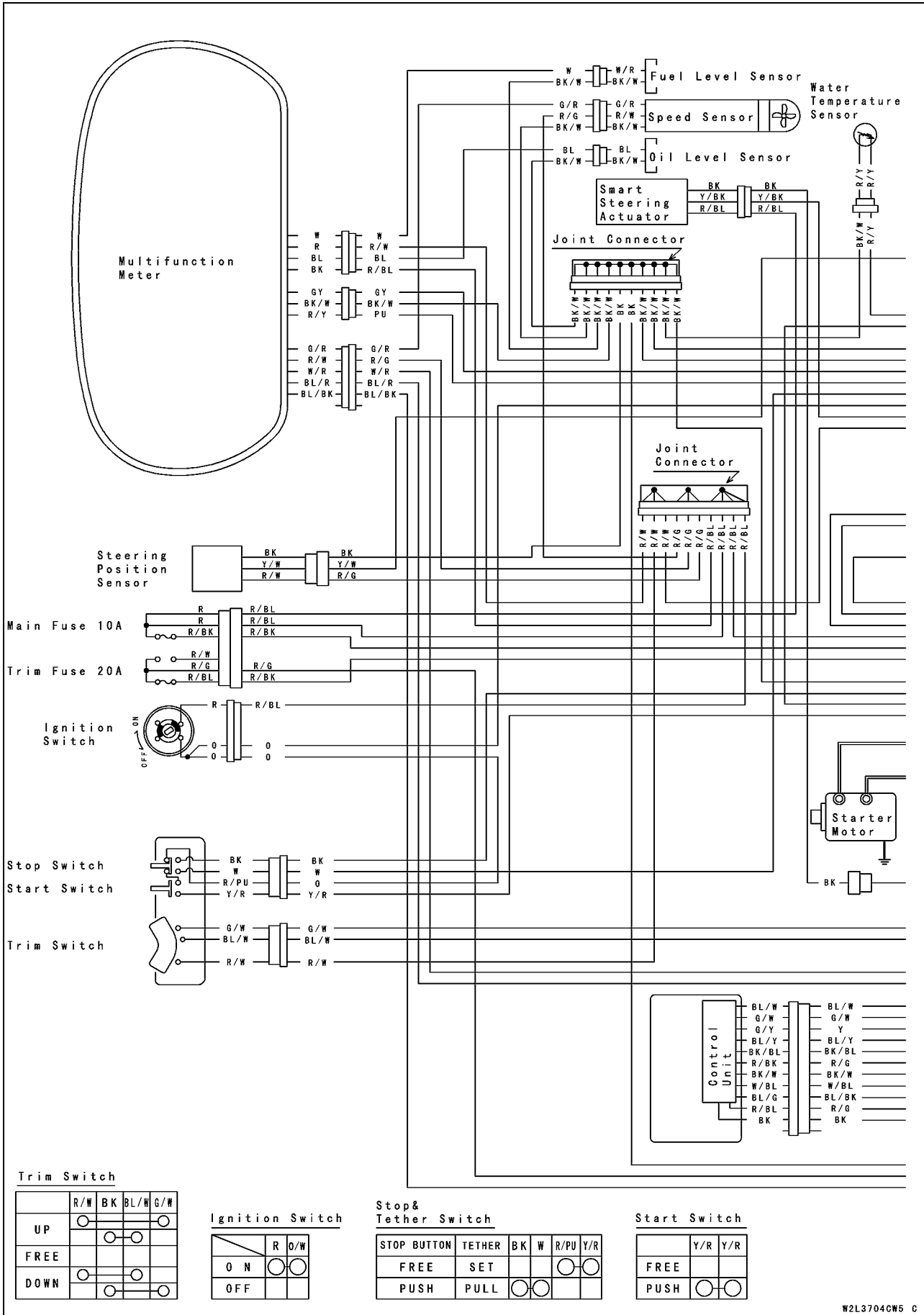
L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide grease oil. (Mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)

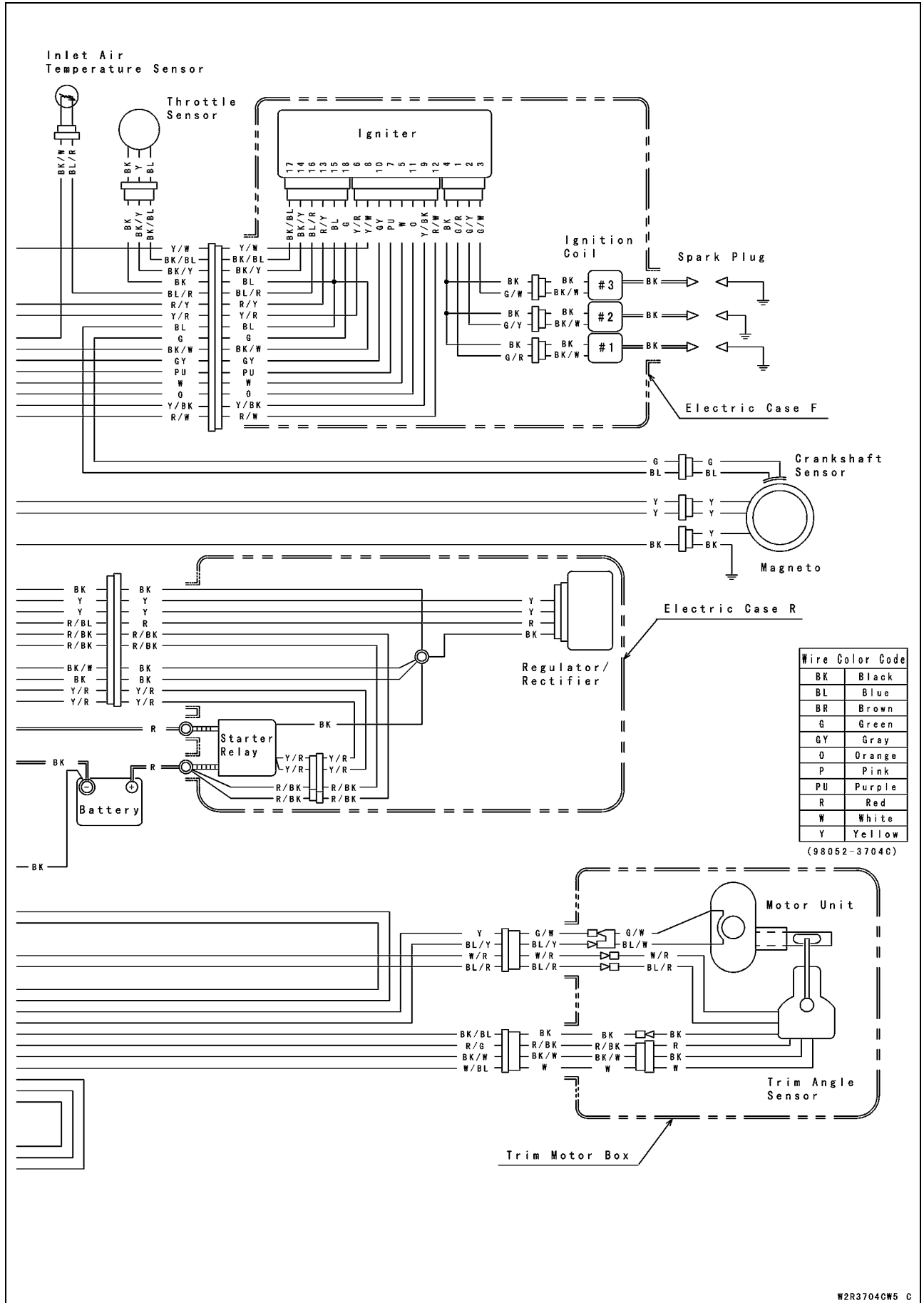
WG: Apply water-resistance grease.

14-10 ELECTRICAL SYSTEM

Wiring Diagram



Wiring Diagram



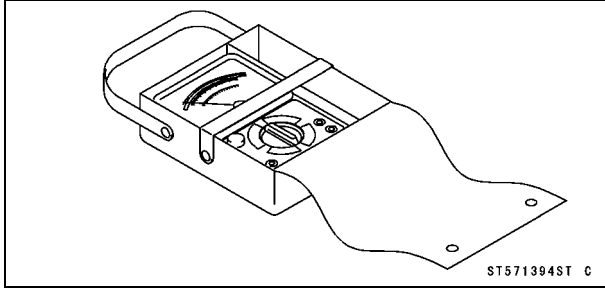
14-12 ELECTRICAL SYSTEM

Specifications

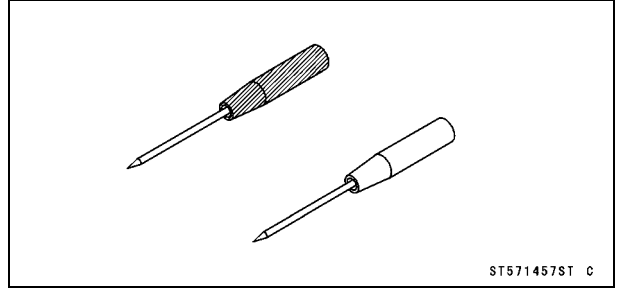
Item	Standard	Service Limit
Battery		
Type	12 V 18 Ah	— — —
Electric Starter System		
Starter Motor:		
Brush Length	12.0 mm (0.47 in.)	6.5 mm (0.26 in.)
Commutator Diameter	28 mm (1.10 in.)	27 mm (1.06 in.)
Charging System		
Regulator/Rectifier Output Voltage	Battery voltage -14.5 ±0.5 V	— — —
Charging Coil Output Voltage	32 ~ 48 V @3 000 r/min (rpm)	— — —
Charging Coil Resistance:		
Yellow ← → Yellow	0.64 ~ 0.96 Ω	— — —
Ignition System		
Ignition Timing	15° BTDC @1 250 r/min (rpm) ~ 22° BTDC @3 500 r/min (rpm)	— — —
Ignition Coil:		
Primary Winding Resistance	0.33 ~ 0.43 Ω	— — —
Secondary Winding Resistance	5.44 ~ 7.36 kΩ	— — —
Spark Plug:		
Type	NGK BR9ES	— — —
Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)	— — —
Terminal	Solid post	— — —
Crankshaft Sensor Resistance	396 ~ 594 Ω	— — —
Crankshaft Sensor Air Gap (Clearance Between The Rotor Projection and Crankshaft Sensor Core)	0.75 ~ 0.95 mm (0.030 ~ 0.037 in.)	— — —

Special Tools

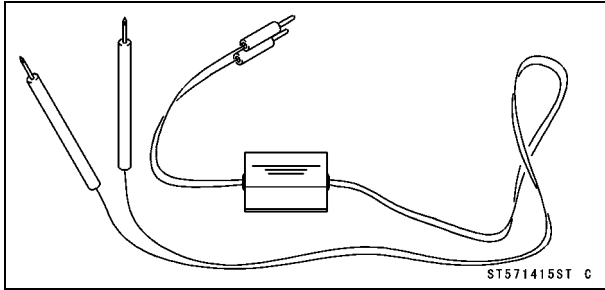
**Hand Tester:
57001-1394**



**Needle Adapter Set:
57001-1457**



**Peak Voltage Adapter:
57001-1415**



14-14 ELECTRICAL SYSTEM

Battery

Removal

- Disconnect the battery cables.

WARNING

To prevent possible personal injury and damage to electrical components, always disconnect the grounded cable first.

- Unhook the battery straps [A].
- Carefully lift the battery from the engine compartment.

Installation

- Be sure the battery damper [A] is in position in the battery compartment.
- Place the battery so that its terminals face to bow side.
- Hook the battery straps.
- Connect the battery cables, positive first.
- After attaching both cables, coat the terminals and cable ends with grease to prevent corrosion.
- Slide the protective boot over each terminal.

WARNING

Loose battery cables can create sparks which can cause a fire or explosion resulting in injury or death. Make sure the battery terminal screws are tightened securely and the covers are installed over the terminals.

CAUTION

Do not reverse the battery connections.

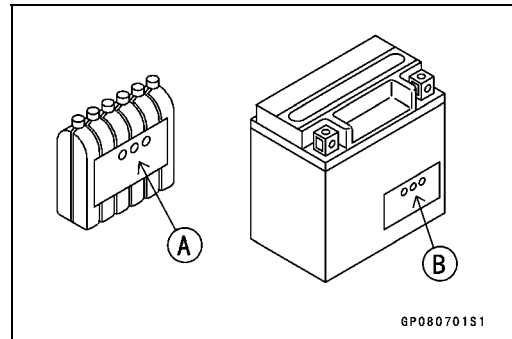
Electrolyte Filling

- Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.

Battery Model Name for JH1200-B1: YTX20L-BS

CAUTION

Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type. This is to prevent overfilling of the electrolyte, shorting the battery life, and deterioration of the battery performance.

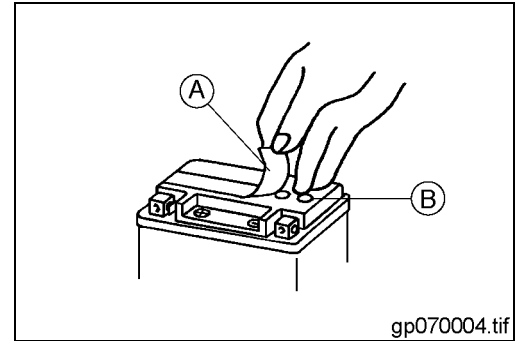


Battery

- Check to see that there is no peeling, tears or holes in the seal sheet on the top of the battery.
- Place the battery on a level surface.
- Remove the seal sheet [A].

CAUTION

Do not remove the seal sheet sealing the filler ports [B] until just before use.



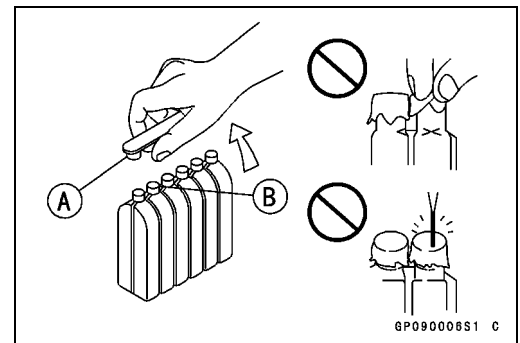
NOTE

○A battery whose seal sheet has any peeling, tears, or holes, requires a refreshing charge (initial charge).

- Take the electrolyte container out of the plastic bag.
- Detach the seal cap [A] from the container.

NOTE

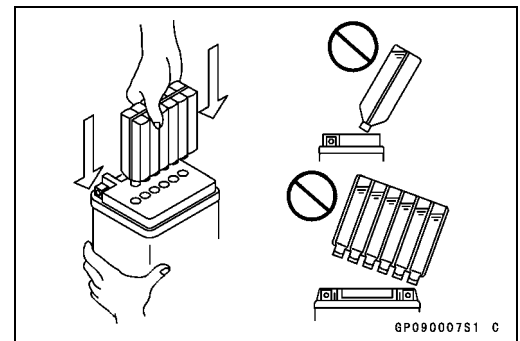
○Do not discard the seal cap because it is used as the battery plugs later.
 ○Do not peel back or pierce the seals [B] on the container.



- Place the electrolyte container upside down aligning the six seals with the six battery filler ports.
- Push the container down strongly enough to break the seals. Now the electrolyte should start to flow into the battery.

NOTE

○Do not tilt the container as the electrolyte flow may be interrupted.



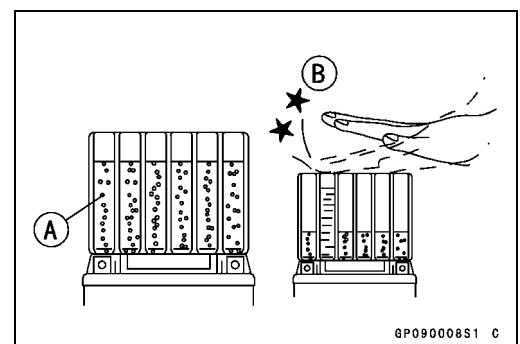
- Make sure air bubbles [A] are coming up from all six filler ports.
- Leave the container this way for 5 minutes or longer.

NOTE

○If no air bubbles are coming up from a filler port, tap [B] the bottom of the container two or three times. Never remove the container from the battery.

CAUTION

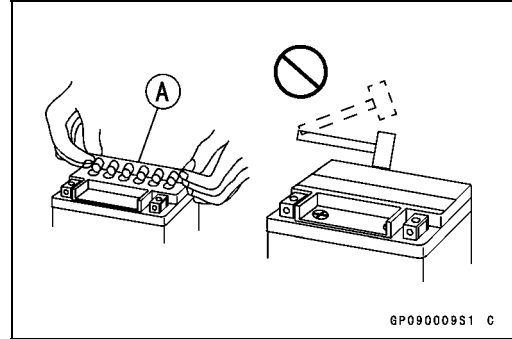
Fill the electrolyte into the battery until the container is completely emptied.



14-16 ELECTRICAL SYSTEM

Battery

- Be certain that all the electrolyte has flowed out.
- Tap the bottom the same way as above if there is any electrolyte left in the container.
- Now pull the container gently out of the battery.
- Let the battery sit for **20** minutes. During this time, the electrolyte permeates the special separators and the gas generated by chemical reaction is released.
- Fit the seal cap [A] tightly into the filler ports until the seal cap is at the same level as the top of the battery.



NOTE

○Do not hammer. Press down evenly with both hands.

WARNING

Once you installed the seal cap after filling the battery, never remove it, nor add any water or electrolyte.

Initial Charge

While a sealed battery can be used after only filling with electrolyte, a battery may not be able to sufficiently move a starter motor to start an engine in the cases shown in the table below, where an initial charge is required before use. However, if a battery shows a terminal voltage of 12.6 V or more, using a digital volt meter, after 10 minutes of filling, no initial charge is necessary.

NOTE

○To measure battery terminal voltage, use a digital voltmeter which can be read one decimal place voltage.

Condition requiring initial charge	Charging method
At low temperature (lower than 0°C)	1.8 A × 2 ~ 3 hours
Battery has been stored under high temperature and humidity.	1.8 A × 15 ~ 20 hours
Seal sheet has been removed, or broken-peeling, tear or hole.	
Battery two or more years old from date of manufacture. Battery manufacturing date is printed on battery top. Example) <u>R2</u> <u>08</u> <u>H</u> <u>V</u> Mfg. location Day Month Year	

Precautions

1) No need of topping-up

No topping-up is necessary in this battery until it ends its life under normal use. Forcibly prying off the seal cap to add water is very dangerous. Never do that.

2) Refreshing charge

If an engine will not start, it indicates the battery has been discharged. Give refresh charge for 5 to 10 hours with charge current shown in the specification (see this chapter).

When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

CAUTION

This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above. Never remove the seal cap during refresh charge.

If by chance an excessive amount of gas is generated due to overcharging, the relief valve releases the gas to keep the battery normal.

Battery

- 3) When you do not use the watercraft for months:
Give a refresh charge before you store the watercraft and store it with the negative lead removed. Give a refresh charge **once a month** during storage.
- 4) Battery life:
If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it (Provided, however, the watercraft's starting system has no problem).

WARNING

Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger.

This procedure prevents sparks at the battery terminals which could ignite any battery gases.

No fire should be drawn near the battery, or no terminals should have the tightening loosened.

The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water. Get medical attention if severe.

Interchange

A sealed battery can fully display its performance only when combined with a proper watercraft electric system. Therefore, replace a sealed battery only on watercraft which was originally equipped with a sealed battery.

Be careful, if a sealed battery is installed on watercraft which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

Charging Condition Inspection

○Refer to Battery Charging Condition Inspection in the Periodic Maintenance chapter.

Refreshing Charge

- Remove the battery [A] (see Battery Removal).
- Refresh-charge by following method according to the battery terminal voltage.

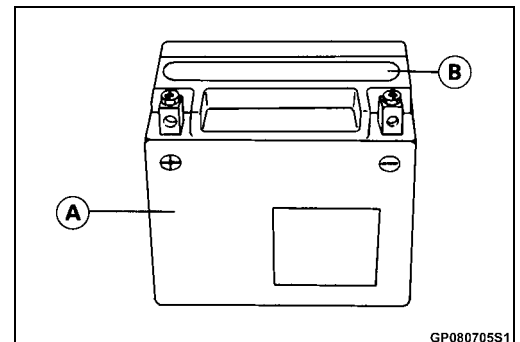
WARNING

This battery is sealed type. Never remove seal cap [B] even at charging. Never add water. Charge with current and time as stated below.

Terminal Voltage: 11.5 ~ less than 12.6 V

Standard Charge: 1.8 A × 5 ~ 10 h (see following chart)

Quick Charge: 9.0 A × 1.0 h



CAUTION

If possible, do not quick charge. If the quick charge is done due to unavoidable circumstances, do standard charge later on.

Terminal Voltage: less than 11.5 V

Charging Method: 1.8 A × 20 h

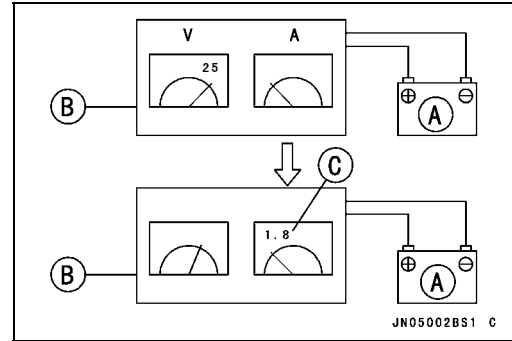
14-18 ELECTRICAL SYSTEM

Battery

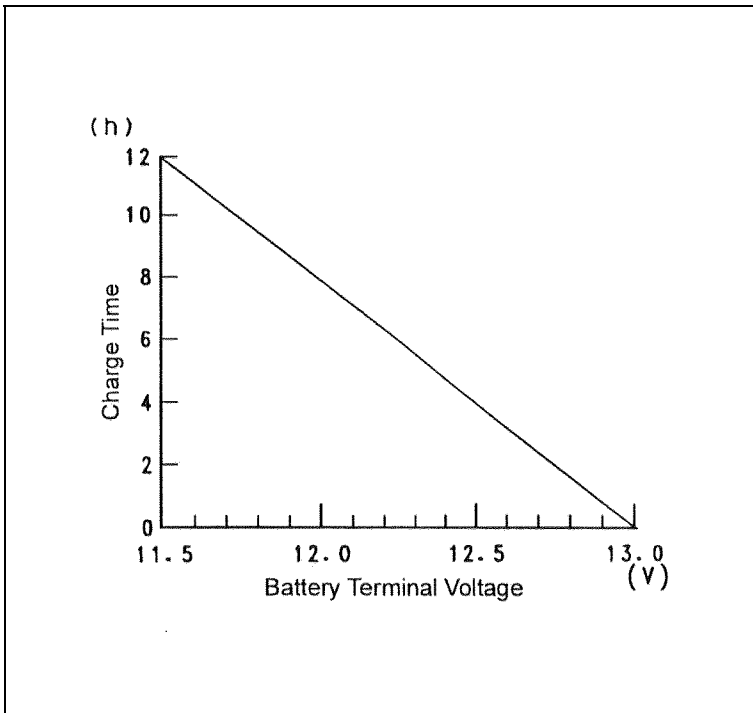
NOTE

- Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than five minutes at the increased voltage then check if the battery is drawing current.
- If the battery will accept current, decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 minutes, replace the battery.

Battery [A]
 Battery Charger [B]
 Standard Value [C]



Battery Standard Charge Time Chart



- Determine battery condition after refreshing charge.
- Determine the condition of the battery 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

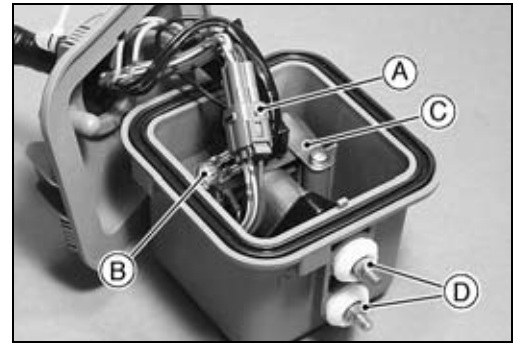
Criteria	Judgement
12.6 V or more	Good
12.0 ~ less than 12.6 V	Charge insufficient → Recharge
less than 12.0 V	Unserviceable → Replace

Electric Starter System

Starter Relay:

Removal

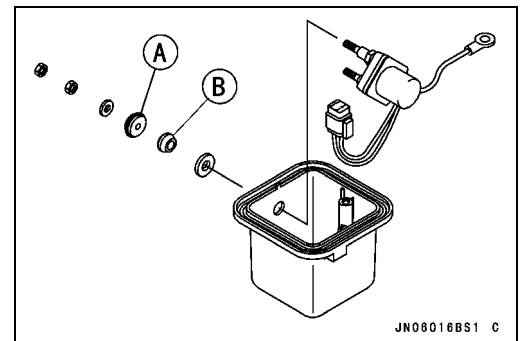
- Open the rear electric case (see Rear Electric Case Removal/Disassembly).
- Remove:
 - Starter Relay Connector [A]
 - Ground Lead Mounting Screw [B]
 - Regulator Mounting Plate [C]
- Remove the nuts [D] from the starter terminals on the starter relay switch.



- Slide the starter relay switch from the electric case being careful not to lose any of the insulating washers or grommets.
- Disconnect the wire connectors.

Installation

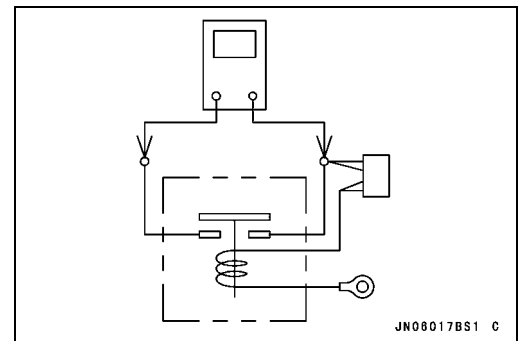
- Coat the insulating washers [A] and grommets [B] with waterproof grease.
- Be certain all insulating washers and grommets are in position.



- Connect the ground lead (black) to the ground mounting screw.
- Connect the battery cable to the relay (+) terminal having red lead.

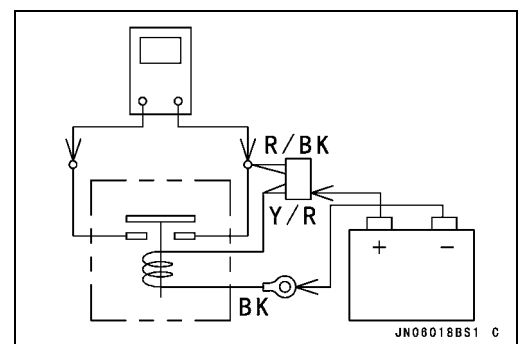
Inspection

- Set the hand tester to $R \times 1 \Omega$ scale.
- Connect meter leads to starter relay as shown.
- ★ If resistance is less than infinite, the starter relay switch is not returning and must be replaced.



- Set the hand tester to $R \times 1 \Omega$ scale.
- Connect meter leads to starter relay as shown.
- Activate starter relay switch by connecting a 12 V battery as shown.
- ★ If the starter relay switch clicks and the hand tester indicates zero resistance, the starter relay switch is good.
- ★ If the meter indicates high or infinite (∞) resistance, the starter relay switch is defective and must be replaced.

Special Tool - Hand Tester: 57001-1394



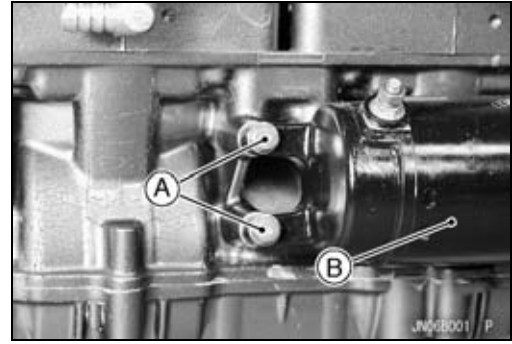
14-20 ELECTRICAL SYSTEM

Electric Starter System

Starter Motor:

Starter Motor Removal

- Remove the engine (see Engine Removal/Installation chapter).
- Remove the mounting bolts [A].
- Pull out the starter motor [B].

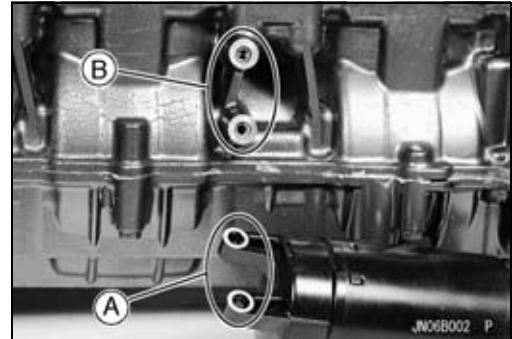


Starter Motor Installation

CAUTION

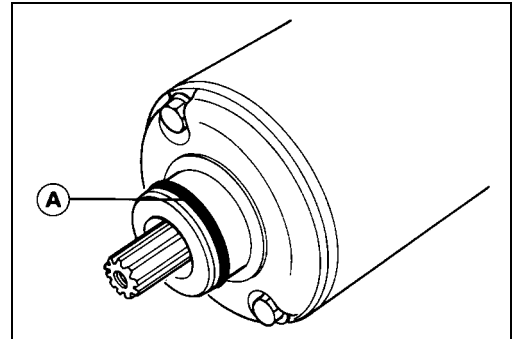
Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.

- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.



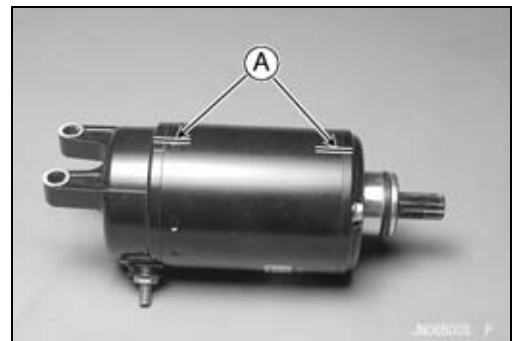
- Apply grease to the O-ring [A].
- Install the starter motor and tighten the mounting bolts.

Torque - Starter Motor Mounting Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)

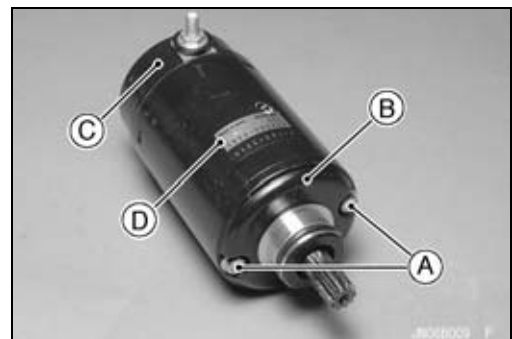


Starter Motor Disassembly

- Mark [A] the front cover, yoke, and rear cover to ease reassembly.

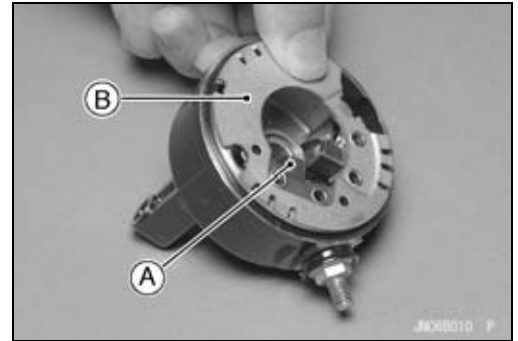


- Take off the starter motor through bolts [A] and remove the front [B] and rear [C] covers, and pull the armature out of the yoke [D].

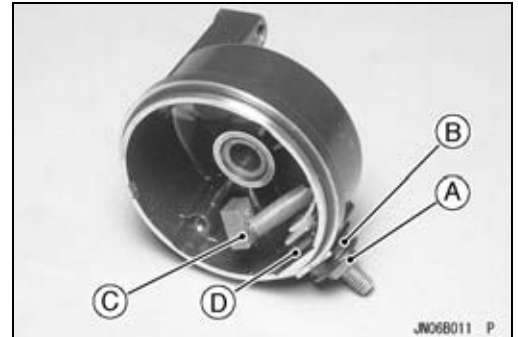


Electric Starter System

- Pull the positive brush [A] out of the brush holder plate [B].

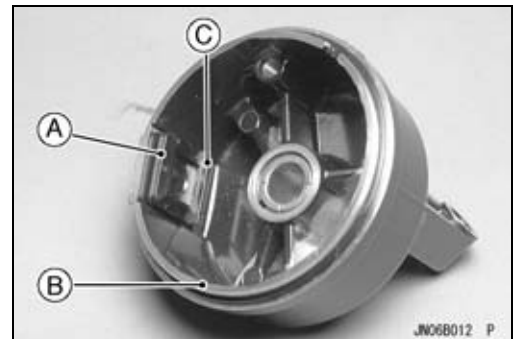


- Remove:
 - Nut [A]
 - Insulating Bushing [B]
 - Negative Brush Assembly [C]
 - Insulating Plate [D]

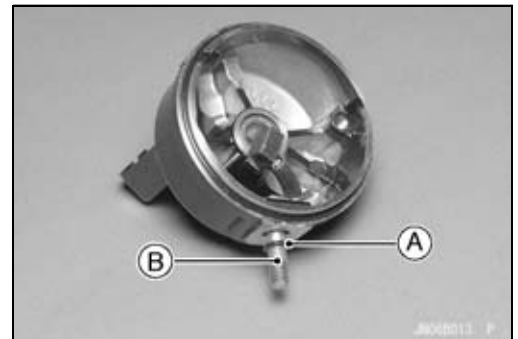


Starter Motor Assembly

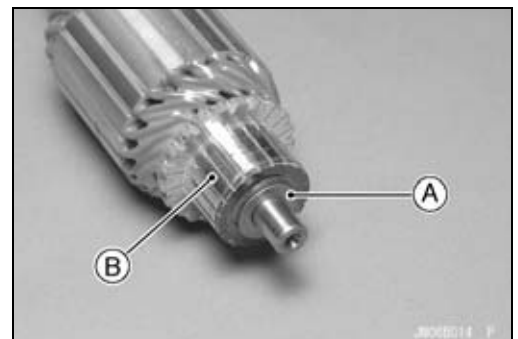
- Install the insulating plate [A] on the rear cover [B] so that its projection [C] faces the bottom side of the rear cover.



- Insert new O-ring [A] on the positive brush assembly [B].



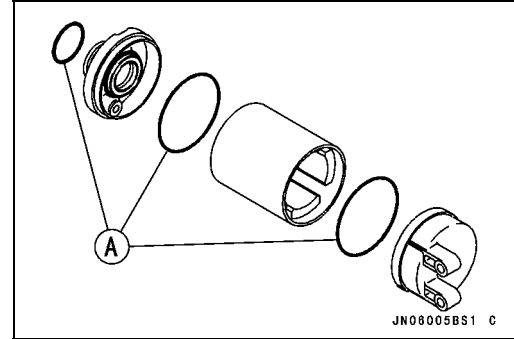
- Slide the washer [A] on the armature [B].



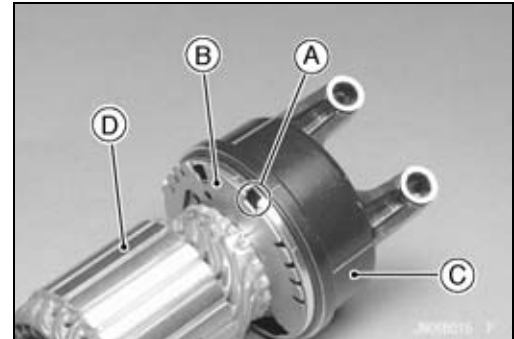
14-22 ELECTRICAL SYSTEM

Electric Starter System

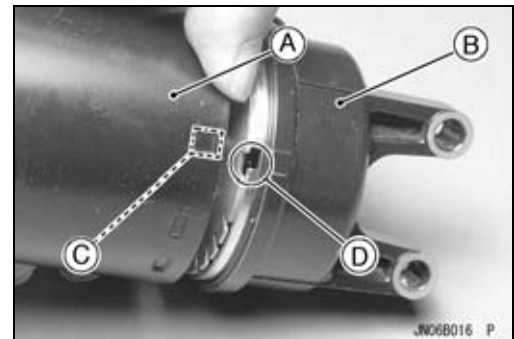
- Install the O-rings [A] as shown.



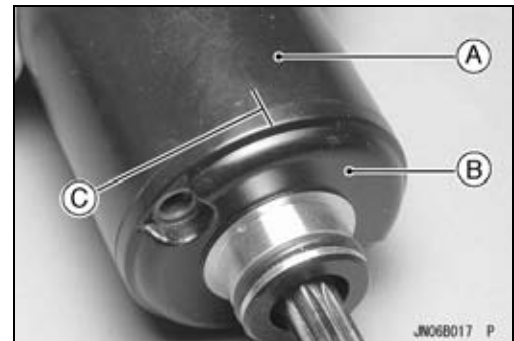
- Align [A] the recess on the brush holder plate [B] with the recess on the rear cover [C].
- Put the armature [D] among the brushes.



- Install the yoke [A] to the rear cover [B].
- Align the projection [C] inside yoke with the recesses [D] on the plate and cover.



- Position the yoke [A] and front cover [B].
- Align [C] the index mark made previously.

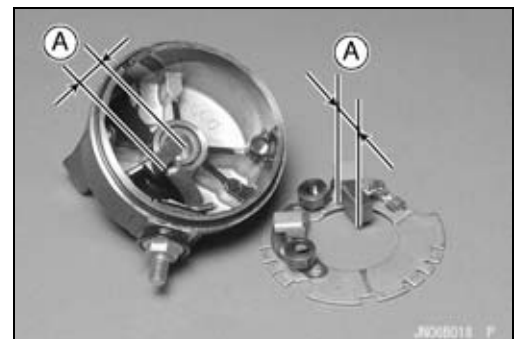


Brush Inspection

- Measure the length [A] of each brush.
- ★ If any is worn down to the service limit, replace the carbon brushes.

Starter Motor Brush Length

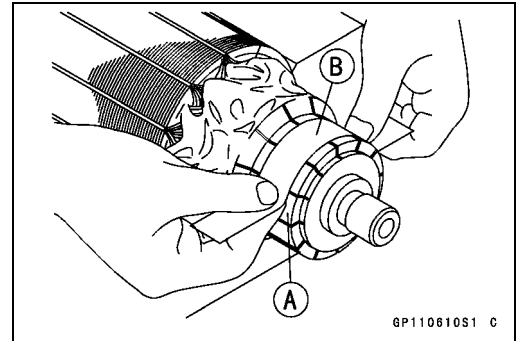
Standard:	12.0 mm (0.47 in.)
Service Limit:	6.5 mm (0.26 in.)



Electric Starter System

Commutator Cleaning and Inspection

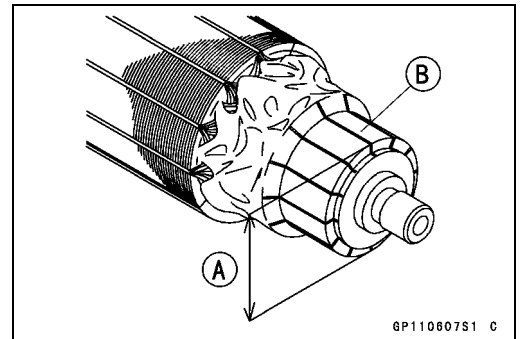
- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.



- Measure the diameter [A] of the commutator [B].
- ★ Replace the starter motor with a new one if the commutator diameter is less than the service limit.

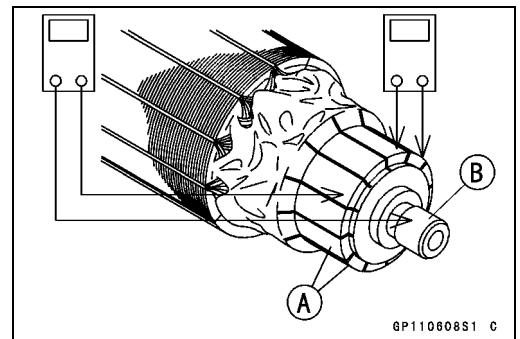
Commutator Diameter

Standard:	28 mm (1.10 in.)
Service Limit:	27 mm (1.06 in.)



Armature Inspection

- Using the $\times 1 \Omega$ hand tester range, measure the resistance between any two commutator segments [A].
- ★ If there is a high resistance or no reading (∞) between any two segments, a winding is open and the starter motor must be replaced.
- Using the highest hand tester range, measure the resistance between the segments and the shaft [B].
- ★ If there is any reading at all, the armature has a short and the starter motor must be replaced.



Special Tool - Hand Tester: 57001-1394

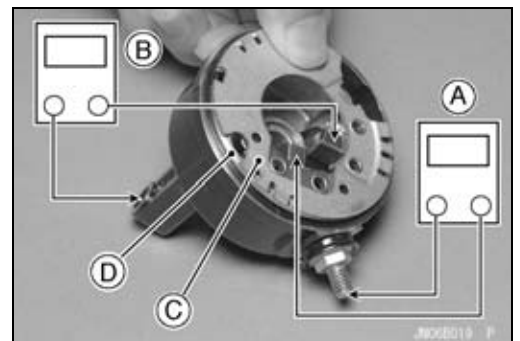
NOTE

- Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable within the hand tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.

Brush Assembly Inspection

- Using the $\times 1 \Omega$ hand tester range, measure the resistance as shown.
 - [A] Terminal and Positive Brush
 - [B] Rear Cover and Negative Brush
- Keep the brush holder plate [C] in contact with the rear cover [D] as shown.
- ★ If there is not close to zero ohms, the brush lead has an open. Replace the positive brush assembly and/or the negative brush subassembly.

Special Tool - Hand Tester: 57001-1394

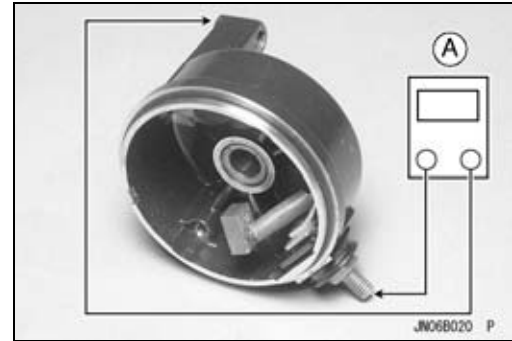


14-24 ELECTRICAL SYSTEM

Electric Starter System

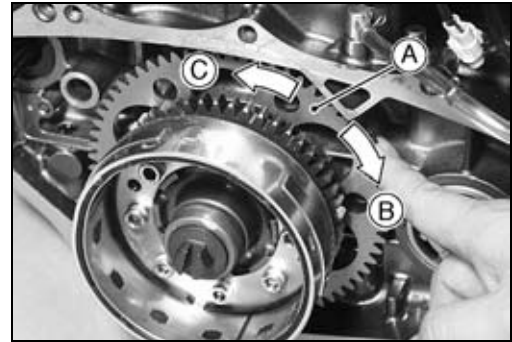
Rear Cover Assembly Inspection

- Using the highest hand tester range, measure the resistance as shown.
[A] Terminal and Rear Cover
- ★ If there is any reading, the rear cover assembly have a short. Replace the rear cover assembly.



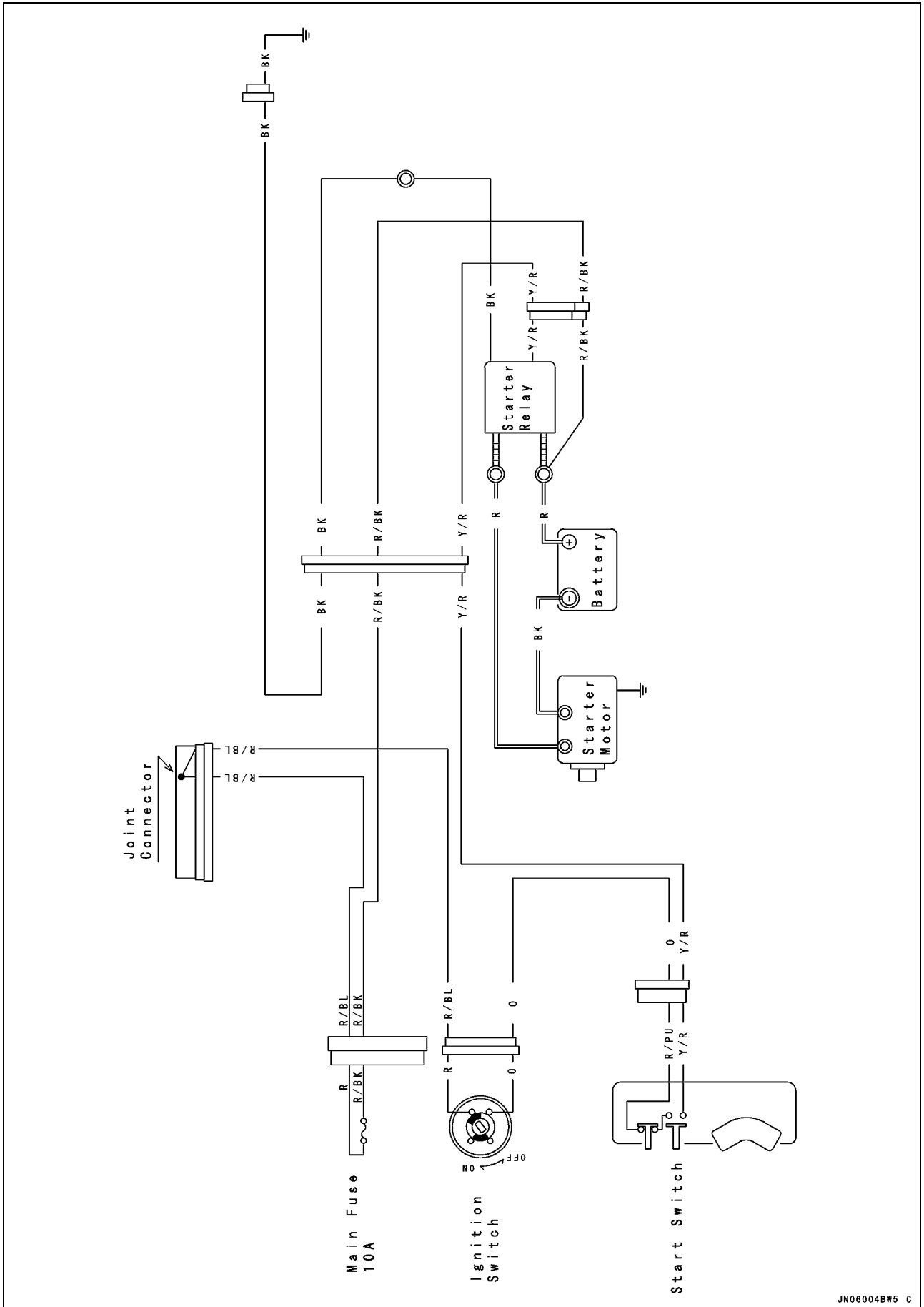
Starter Motor Clutch Inspection

- Remove:
 - Magneto Cover
 - Starter Idle Gear
- Turn the starter motor clutch gear [A] by hand. The starter motor clutch gear should turn counterclockwise [C] freely, but should not turn clockwise [B].
- ★ If the clutch does not operate as it should or if it makes noise, disassemble the starter motor clutch, examine each part visually, and replace any worn or damaged parts.



Electric Starter System

Electric Starter System Circuit

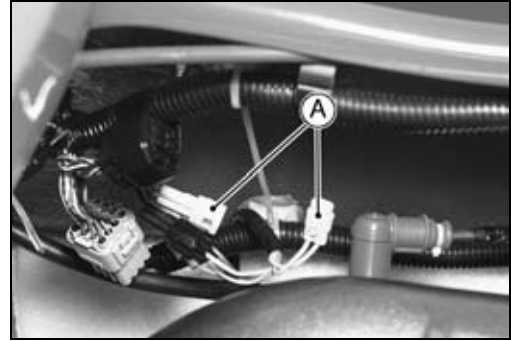


14-26 ELECTRICAL SYSTEM

Charging System

Charging Coil Testing

- Disconnect the 2-pin charging coil leads connector (Yellow) [A].



- With the hand tester, check the charging coil output (in circuit) according to the following table with the engine running at approximately 3,000 rpm.

WARNING

To avoid electrical shock, do not perform this test with the watercraft in the water.

CAUTION

Do not run the engine over 15 seconds without cooling water.

Charging Coil Output Test

Meter Setting	Connections		Standard Value
	Meter (+) to	Meter (-) to	
250 V AC	Yellow lead	Yellow lead	32 ~ 48 V

- ★ If the charging coil output voltage is correct, check the regulator according to the regulator test procedure.
- ★ If the charging coil output voltage is low, check the charging coil resistance with the hand tester according to the following table.

Charging Coil Resistance Test

Meter Setting	Connections		Standard Value
	Meter (+) to	Meter (-) to	
R × 1 Ω	Yellow lead	Yellow lead	0.64 ~ 0.96 Ω

- ★ If the coil has normal resistance, but the voltage check shows the charging system to be defective, then the permanent magnets in the flywheel have probably weakened, necessitating flywheel replacement.

Special Tool - Hand Tester: 57001-1394

Charging System

Regulator/Rectifier Removal/Installation

- Open the rear electric case (see Rear Electric Case Removal/Disassembly).
- Remove:
 - Regulator/Rectifier Mounting Screw [A]
 - Leads Connector [B]
 - Regulator/Rectifier [C]
- Installation is the reverse of removal.



Regulator/Rectifier Inspection

- With the hand tester set to the R × 1 kΩ range, test the regulator/rectifier according the following table.

Special Tool - Hand Tester: 57001-1394

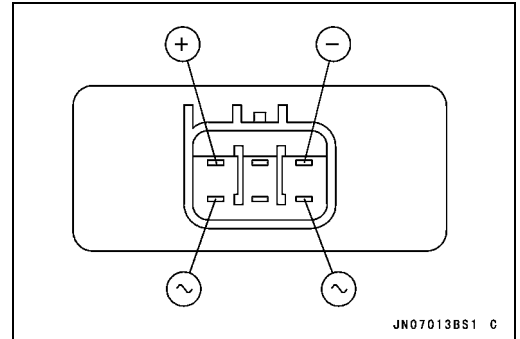
Regulator/Rectifier Inspection

Unit: kΩ

		Tester (+) Lead Connection			
Terminal		+	~	~	-
(-)*	+	-	∞	∞	∞
	~	2 ~ 20	-	∞	∞
	~	2 ~ 20	∞	-	∞
	-	3 ~ 30	2 ~ 20	2 ~ 20	-

(-)*: Tester (-) lead Connection

- ★ If any of the values obtained do not agree with the above table, the regulator/rectifier must be replaced.

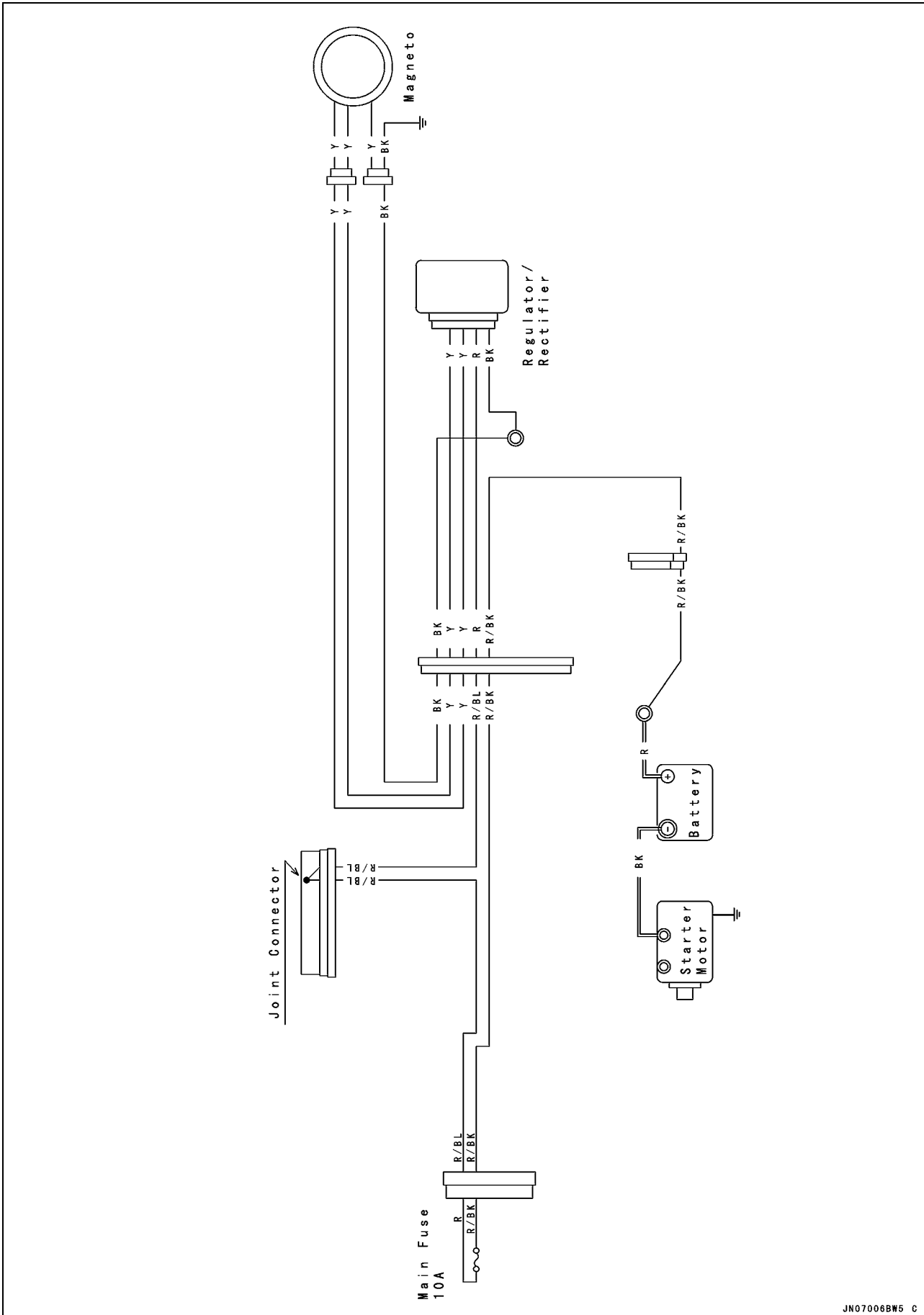


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14-28 ELECTRICAL SYSTEM

Charging System

Charging System Circuit



Ignition System

WARNING

The ignition system produces extremely high voltage. Do not touch the spark plugs, ignition coils, or spark plug leads while the engine is running, or you could receive a severe electrical shock.

Crankshaft Sensor Inspection

- Disconnect the 2-pin crankshaft sensor leads connector (Blue) [A].
- Set the hand tester to the $\times 100 \Omega$ range, zero it, and connect it to the crankshaft sensor lead terminals (G and BL) in the connector.
- ★ If there is more resistance than the specified value, the sensor has an open lead and must be replaced. Much less than this resistance means the sensor is shorted, and must be replaced.

Crankshaft Sensor Resistance

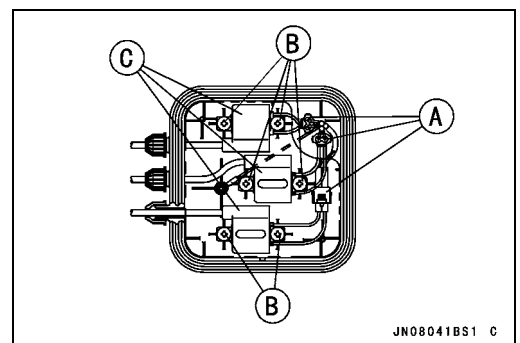
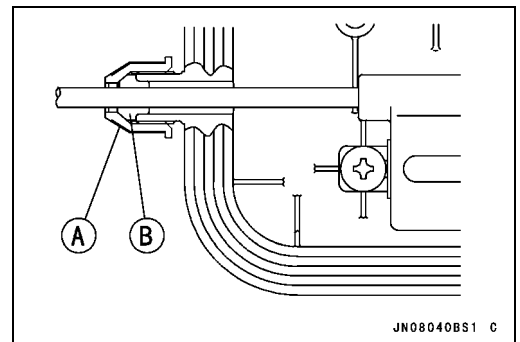
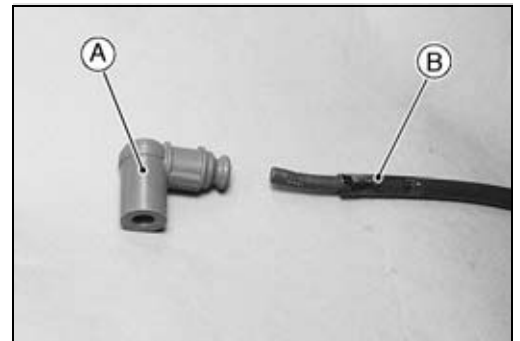
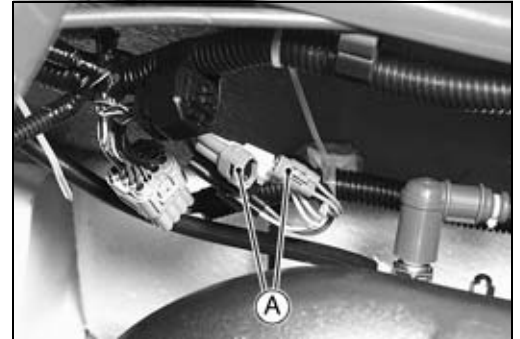
Standard: 396 ~ 594 Ω

Special Tool - Hand Tester: 57001-1394

Ignition Coil Removal

- Open the front electric case (see Front Electric Case Removal/Disassembly).
- Pull the spark plug caps [A], and slide off the protector tubes [B].
- Unscrew the grommet caps [A] and slide off the grommets [B]. Lubricate the leads with penetrating rust inhibitor.

- Disconnect the ignition coil primary lead connectors [A], and unscrew the ignition coil mounting screws [B].
- Remove the ignition coils [C].



14-30 ELECTRICAL SYSTEM

Ignition System

Ignition Coil Installation

- Fix the each coil and connect the primary lead connectors as follows.
 - #1 Coil → Black Connector
 - #2 Coil → Green Connector
 - #3 Coil → White Connector

Ignition Coil Inspection

Measuring arcing distance:

The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance.

- Remove the ignition coil.
- Connect the ignition coil [A] (with the spark plug cap left installed on the spark plug lead) to the tester [B], and measure the arcing distance.

WARNING

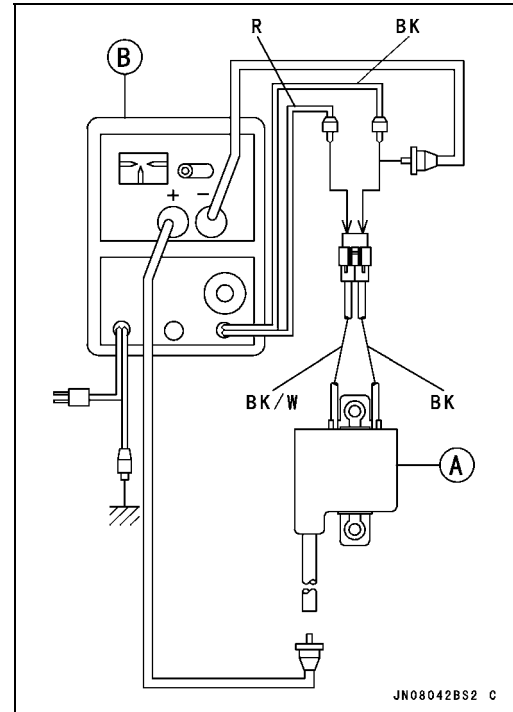
To avoid extremely high voltage shocks, do not touch the coil or lead.

- ★ If the distance reading is less than the specified value, the ignition coil or spark plug cap is defective.

3 Needle Arcing Distance

Standard: 7 mm (0.3 in.) or more

- To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil.
- ★ If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug caps.



Ignition System

Measuring coil resistance:

If the Coil Tester is not available, the coil can be checked for a broken or badly shorted winding with a hand tester. However, a hand tester can not detect layer shorts and shorts resulting from insulation breakdown under high voltage.

- Disconnect the primary leads from the coil terminals.
- Measure the primary winding resistance as follows [A].
- Connect the tester between the coil terminals.
- Set the tester to the $\times 1 \Omega$ range, and read the tester.
- Measure the secondary winding resistance as follows [B].
- Remove the plug caps by turning them counterclockwise.
- Connect the tester between the spark plug leads.
- Set the tester to the $\times 1 \text{ k}\Omega$, and read the tester.
- ★ If the hand tester does not read as specified, replace the coil.

Winding Resistance

Standard: Primary windings 0.33 ~ 0.43 Ω

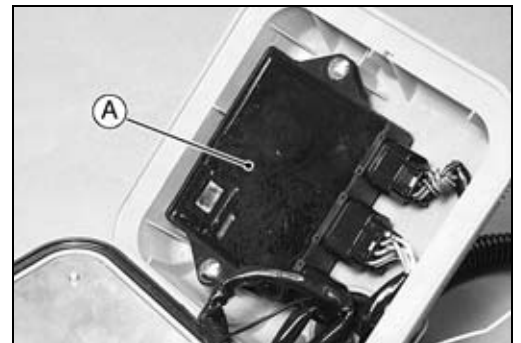
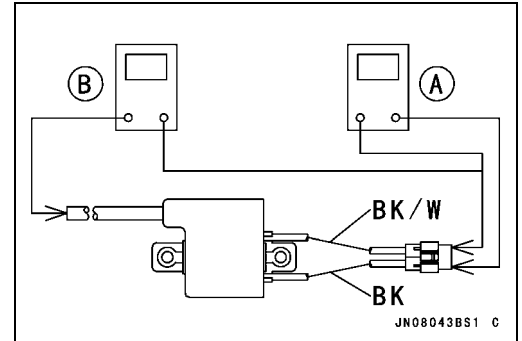
Secondary windings 5.44 ~ 7.36 k Ω

Special Tool - Hand Tester: 57001-1394

- ★ If the tester reads as specified, the ignition coil windings are probably good. However, if the ignition system still does not perform as it should after all other components have been checked, test replace the coil with one known to be good.
- Check the spark plug lead for visible damage.
- ★ If the spark plug lead is damaged, replace the coil.

Igniter Removal/Installation

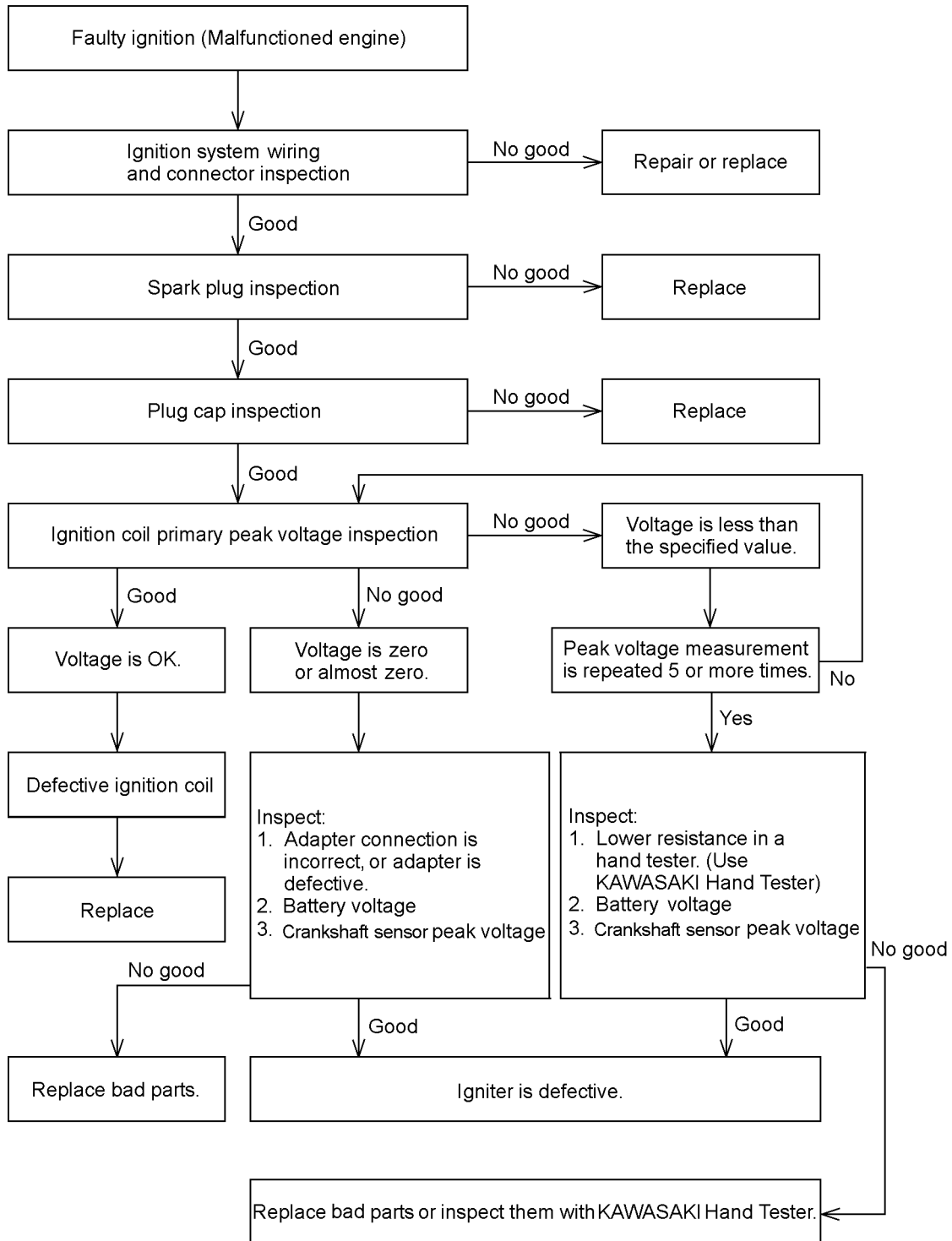
- Remove the front electric case and open it.
- Remove the igniter [A] and disconnect the connectors.
- Installation is the reverse of removal.



14-32 ELECTRICAL SYSTEM

Ignition System

Ignition System Troubleshooting

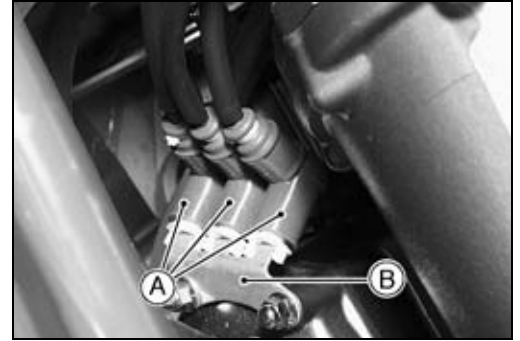


Ignition System

Igniter Inspection

CAUTION

Do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent igniter damage.



Ignition Coil Primary Peak Voltage Check

NOTE

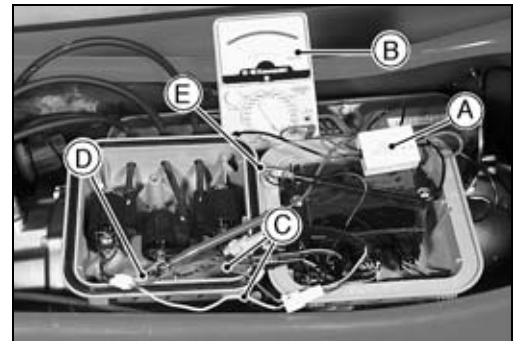
○ Be sure the battery is fully charged.

- Remove the front electric case and open it.
- Pull all the spark plug caps from the spark plugs and push the caps [A] fully onto the spark plug cap holder [B].

NOTE

○ Maintain the correct value of compression pressure for the cylinder (Be sure to measure the voltage with the spark plug installed to the cylinder head).

- Install a commercially available peak voltage adapter [A] into the hand tester [B].
- Disconnect the ignition coil primary lead connector. And the connector is reconnected mutually by using two auxiliary wires [C].
- Connect the adapter between the ignition coil primary lead terminal [D] and the black lead terminal (ground) [E] of the electric case with the primary lead left connected.



Special Tools - Peak Voltage Adapter: 57001-1415

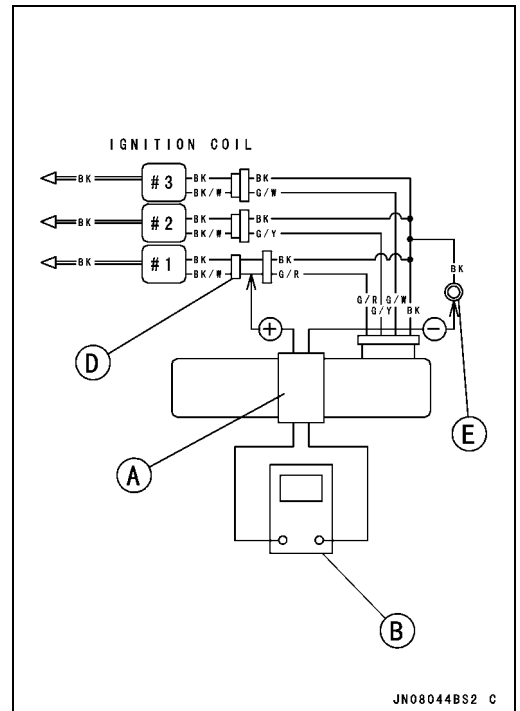
Type: KEK-54-9-B

Hand Tester: 57001-1394

Hand Tester Range: × DC 250 V

Primary Lead Connections:

	Adapter (R, +)		Adapter (BK, -)
#1 Coil:	G/R	↔	BK (Ground)
#2 Coil:	G/Y	↔	BK (Ground)
#3 Coil:	G/W	↔	BK (Ground)



14-34 ELECTRICAL SYSTEM

Ignition System

WARNING

To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.

- Turn the ignition switch on and push the lanyard key under the stop button.
- Pushing the starter button, crank the engine 4 ~ 5 seconds to measure the primary peak voltage.
- Do not operate the starter for longer than 5 seconds. Wait 15 seconds before using it again.
- Repeat the measurements 5 or more times for one ignition coil.

Ignition Coil Primary Peak Voltage

Standard: 140 V or more

- Repeat the test for the other ignition coil.
- ★ If the reading is less than the specified value, see "Igniter Unit Troubleshooting" table to determine whether Igniter is good or no good.

Crankshaft Sensor Peak Voltage Check

NOTE

○ Be sure the battery is fully charged.

- Disconnect the crankshaft sensor lead connector.
- Pull all the spark plug caps from the spark plugs and push the caps [A] fully onto the spark plug cap holder [B].

NOTE

○ Maintain the correct value of compression pressure for the cylinder (Be sure to measure the voltage with the spark plug installed to the cylinder head).

- Connect a commercially available peak voltage adapter [B] to the hand tester [A].

Special Tool - Peak Voltage Adapter: 57001-1415

Type: KEK-54-9-B

- Insert the adapter probes into the connector [C] of the magneto cover side for the crankshaft sensor as shown.

Special Tool - Hand Tester: 57001-1394

Connections

	Adapter (R, +)	Adapter (BK, -)
Crankshaft Sensor:	G	←→ BL

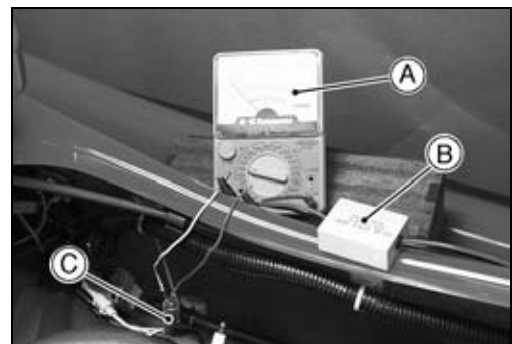
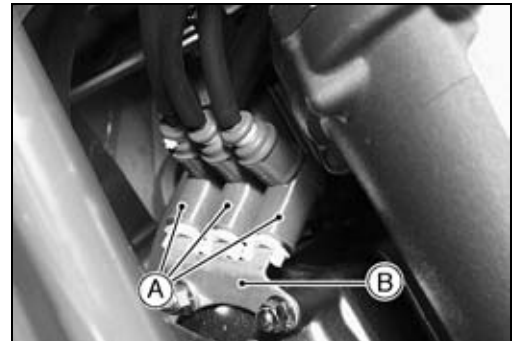
Hand Tester Range: × DC 10 V

- Turn the ignition switch on and push the lanyard key under the stop switch.
- Pushing the starter switch, crank the engine 4 ~ 5 seconds to measure the crankshaft sensor peak voltage.
- Do not operate the starter for longer than 5 seconds. Wait 15 seconds before using it again.
- Repeat the measurements 5 or more times.

Crankshaft Sensor Peak Voltage

Standard: 2 V or more

- ★ If the reading is less than the specified value, check the crankshaft sensor (see Crankshaft Sensor Inspection).



Ignition System

Throttle Sensor Input Voltage Check

- Remove the throttle sensor [A] lead connector.
- Set the tester [B] to the DC 10 V range, and connect it to the connector [C] of the main harness.

Special Tool - Hand Tester: 57001-1394

Hand Tester (+) → Black/Blue Lead

Hand Tester (-) → Black Lead

- Turn the ignition switch on.
- Check the throttle sensor input voltage.

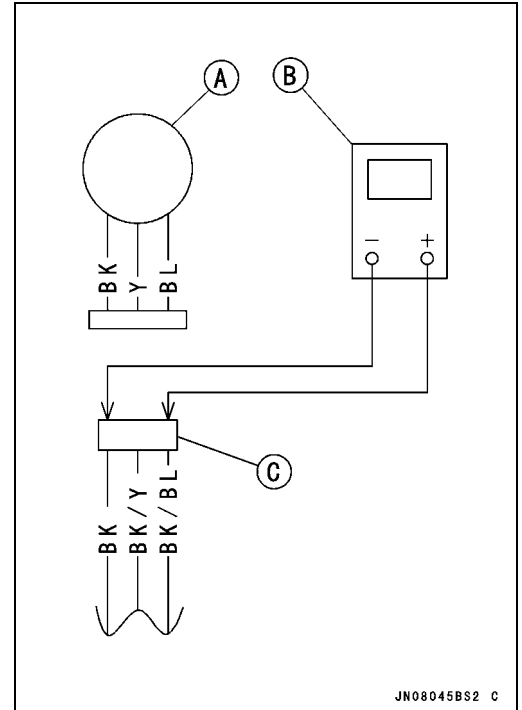
Throttle Sensor Input Voltage

Standard: around DC 5 V

NOTE

○ Check the above process within three minutes.

- ★ If it is not the specified voltage, check the igniter input voltage between Orange lead and Black/White lead.
- ★ If there is battery voltage between the leads, the igniter is defective.
- To check the throttle sensor output voltage, see throttle sensor Inspection.



Inlet Air Temperature Sensor Input Voltage Check

- Disconnect the inlet air temperature sensor [A] connector.
- Set the tester [B] to the DC 10 V range, and connect it to the sensor connector [C] of the main harness side.

Special Tool - Hand Tester: 57001-1394

Connections

Tester Positive → Blue/Red

Tester Negative → Black/White

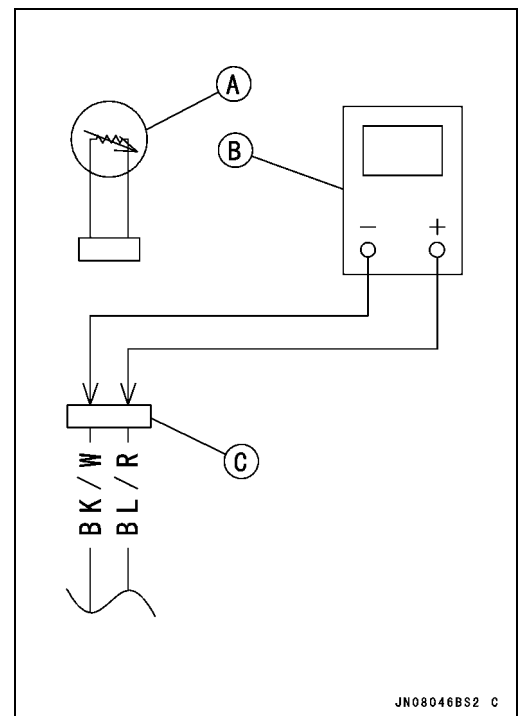
- Turn the ignition switch on.
- Check the tester reading.

Inlet Air Temperature Sensor Input Voltage: around DC 5 V

NOTE

○ Check the above process within three minutes.

- ★ If the tester reading does not show specified voltage, check the igniter input voltage between Orange lead and Black/White lead.
- ★ If there is battery voltage between the leads, igniter is defective.



14-36 ELECTRICAL SYSTEM

Ignition System

Water Temperature Sensor Input Voltage Check

- Disconnect the water temperature sensor [A] lead connector.
- Set the tester [B] to the DC 10 V range, and connect it to the sensor connector [C] of the main harness side.

Connections:

Tester Positive → Red/Yellow Lead

Tester Negative → Black/White Lead

- Turn the ignition switch on.
- Check the tester reading.

Water Temperature Sensor Input Voltage: around DC 5 V

NOTE

○ Check the above process within three minutes.

- ★ If the tester reading does not show specified voltage, check the igniter input voltage between Orange lead and Black/White lead.
- ★ If there is battery voltage between the leads, the igniter is defective.

Special Tool - Hand Tester: 57001-1394

Overheat Diagnosis Output Voltage Check

- Disconnect the 3-pin connector of the multifunction meter [A].
- Set the tester [B] to the DC 10 V range, connect it to the 3-pin connector [C] of the main harness side.

Hand Tester (+) → Purple Lead

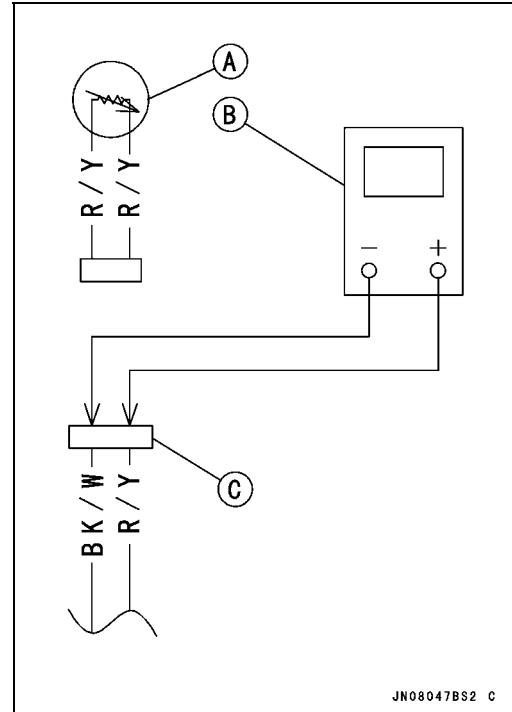
Hand Tester (-) → Black/White Lead

- Turn the ignition switch on.
- Check the tester reading.

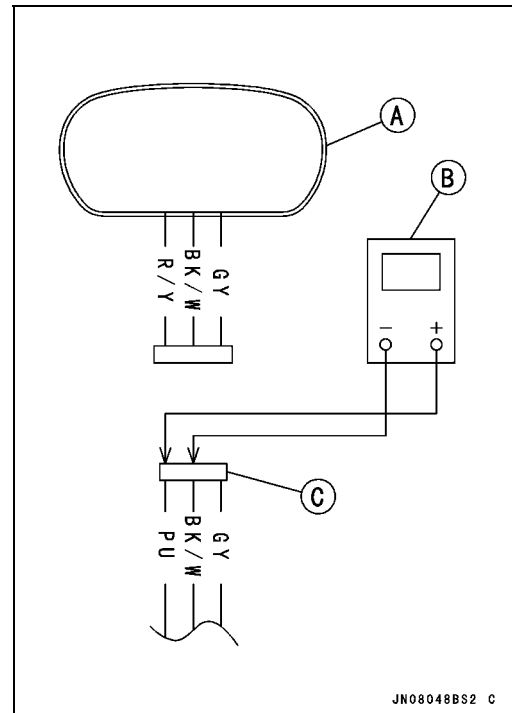
**Overheat Diagnosis Output Voltage: around DC 5 V
(When the engine is not in overheat mode)**

- ★ If the tester reading does not show specified voltage, replace the igniter is defective.

Special Tool - Hand Tester: 57001-1394



JN08047BS2 C



JN08048BS2 C

Spark Plug Removal

- Pull off the spark plug caps.
- Unscrew the spark plugs
- Be careful to avoid breaking the ceramic on the spark plugs.

Ignition System

Spark Plug Installation

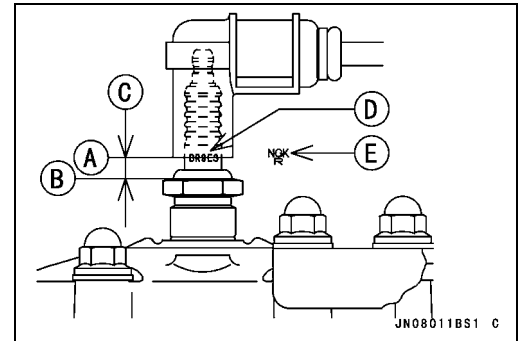
- Be sure the spark plug threads are clean and dry.
- Torque the spark plugs.

Torque - Spark Plugs: 25 ~ 29 N·m (2.5 ~ 3.0 kgf·m, 18 ~ 22 ft·lb)

- Be careful to avoid breaking the ceramic on the spark plugs.
- Install the spark plug cap onto the spark plug securely.
- Push the cap onto the plug so that the distance between the lower end [A] of the cap and upper surface [B] of the plug hexagonal nut is 6 mm (0.24 in.) [C].

NOTE

- For easier correct installation of the spark plug. Push the cap onto the plug until the figures "BR9ES" [D] printed on the plug are half covered with the cap or the figures "NGK" [E] of "KGR" are completely covered.



Spark Plug Inspection

- Refer to Spark Plug Inspection in the Periodic Maintenance chapter.

Spark Plug Adjustment

- Refer to Spark Plug Adjustment in the Periodic Maintenance chapter.

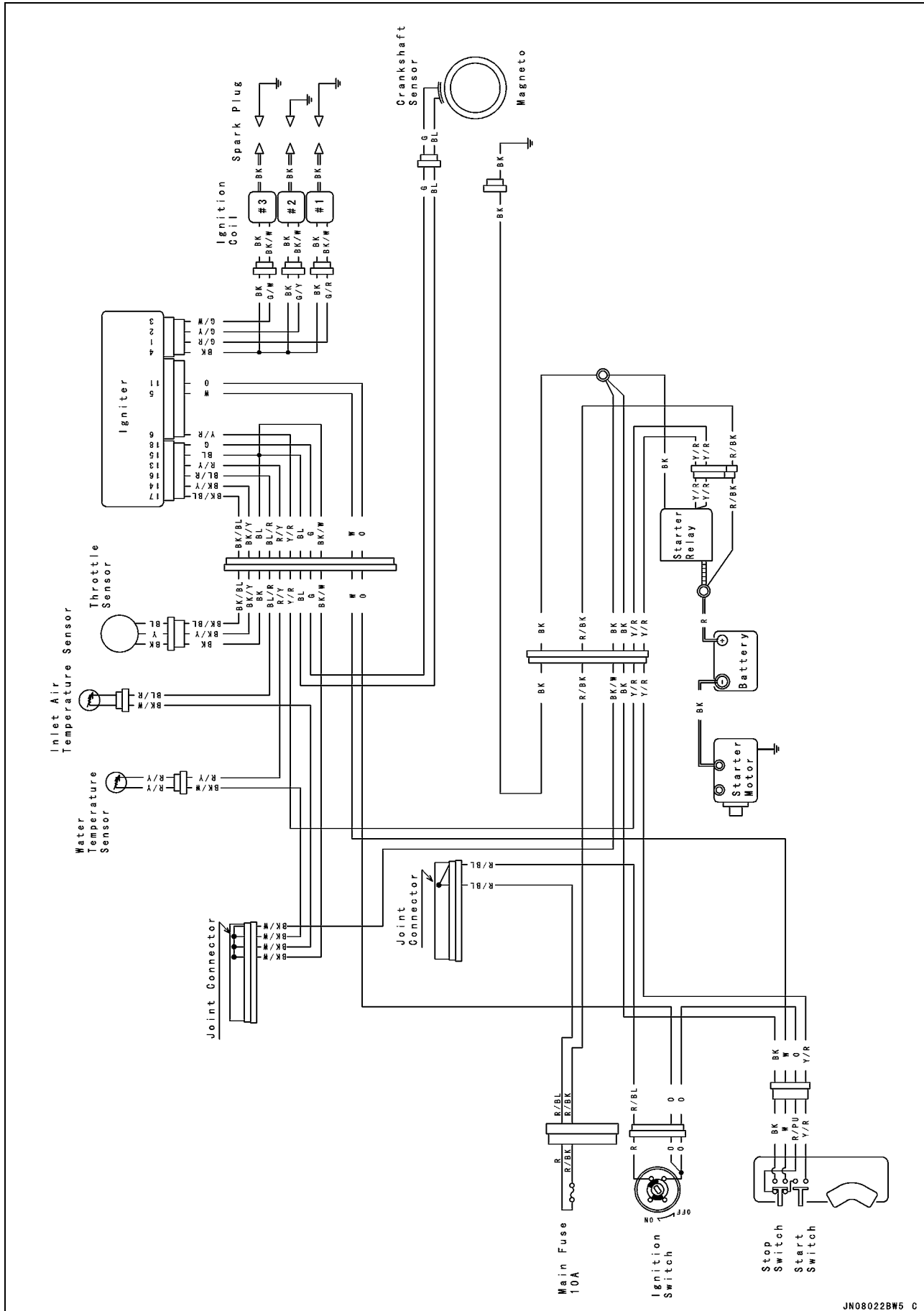
Spark Plug Cleaning

- Refer to Spark Plug Cleaning in the Periodic Maintenance chapter.

14-38 ELECTRICAL SYSTEM

Ignition System

Ignition System Circuit



Electric Trim System

Trim Actuator Inspection

- Inspect the internal resistance of the trim angle sensor [A].
- Disconnect the trim actuator connector [B].
- Using the hand tester, measure the resistance between the W/R terminal and the BL/R terminal.

Trim Angle Sensor Resistance: 479 ~ 718 Ω

- Disconnect the trim actuator connectors [A] [B].
- Using the auxiliary wires, connect the trim actuator terminals to the main harness terminals as shown.
- Connect the hand tester to the trim actuator terminal as shown.
- Move the nozzle by pushing the trim switch.
- Check that the meter readings are variable.
- ★ If the meter readings are not variable, the trim angle sensor defective.

- Inspect the limit switch function of the trim angle sensor.
- Set the nozzle full up position by pushing the trim switch.
- Disconnect the trim actuator connectors [A].
- Using the hand tester, check to see the following connection.

When the nozzle is full up position

R/BK-W: around 0 Ω [B]

R/BK-BK/W ∞ [C]

- Reconnect the trim actuator connectors [A].
- Set the nozzle full down position by pushing the trim switch.
- Disconnect the trim actuator connectors.

When the nozzle is full down position

R/BK-BK/ W: around 0 Ω [C]

R/BK-W: ∞ [B]

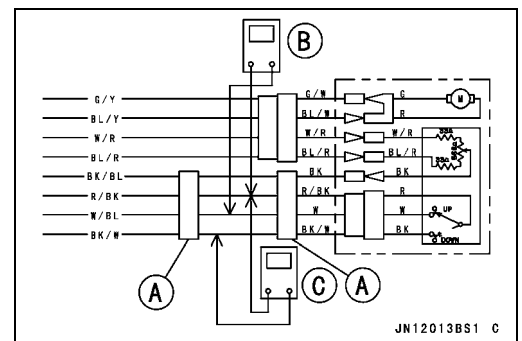
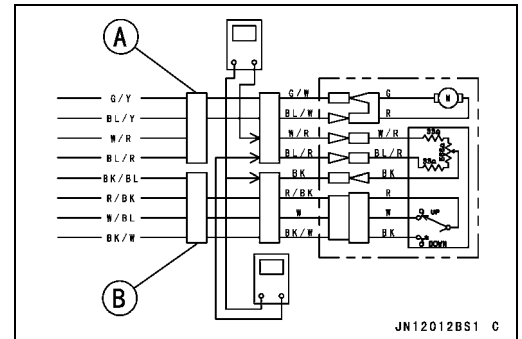
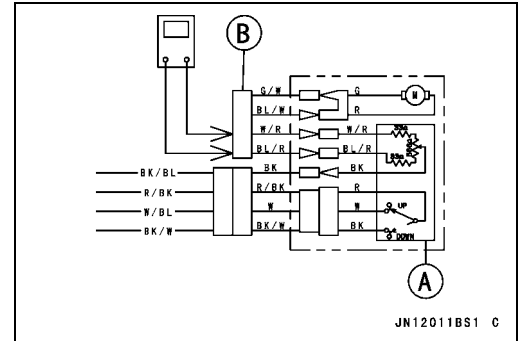
- ★ If the tester reading is not as specified, the trim angle sensor is defective.

Special Tool - Hand Tester: 57001-1394

- Inspect the amount of the trim cable stroke.
- Disconnect the trim cable end (see Steering chapter).
- Pushing the trim switch, measure the amount of the trim cable between full up and full down positions.

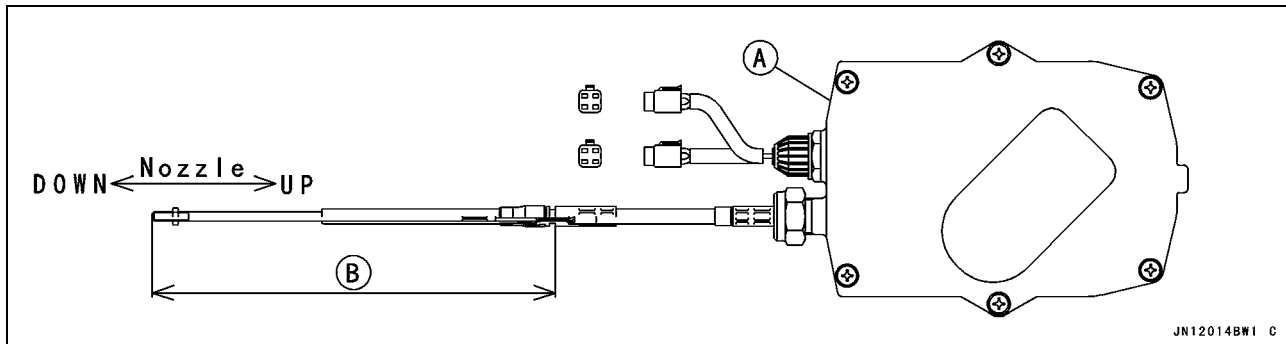
Trim Cable Stroke Amount: 16 mm (0.6 in.)

- ★ If the stroke amount is not specified, the trim actuator is defective.



14-40 ELECTRICAL SYSTEM

Electric Trim System



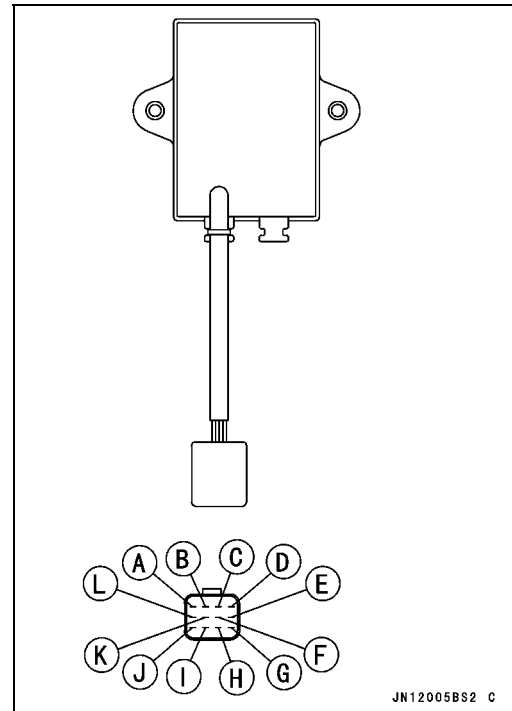
[A] Trim Actuator Assembly

[B] 222 ±3 mm (8.74 ±0.12 in.) (when the nozzle position is full up with limit switch ON)

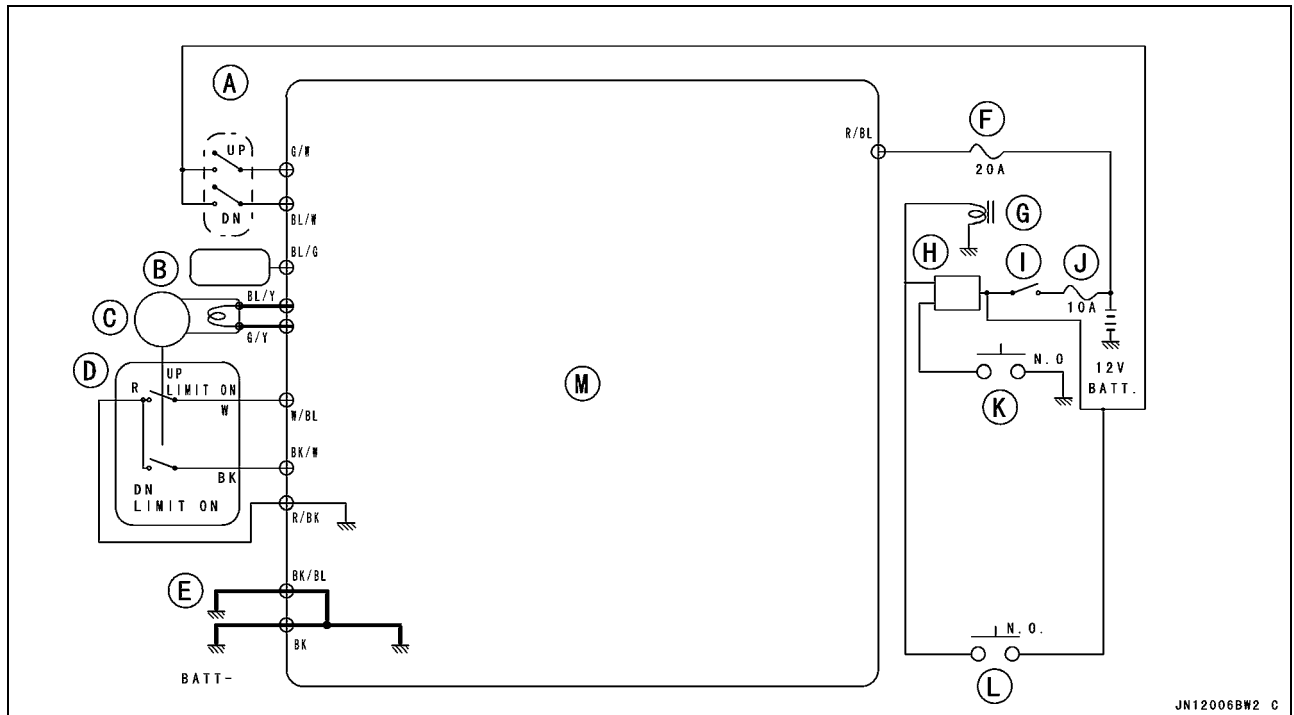
Electronic Control Unit Inspection

Electronic Control Unit has the following functions of controlling the trim motor.

- [A] G/W (Trim UP SW)
- [B] BL/W (Trim DN SW)
- [C] BL/G (Meter)
- [D] BL/Y (Trim Motor UP → +)
- [E] R/BK (Limit UP/DN)
- [F] BK/W (Limit DN)
- [G] Plug
- [H] R/BL (Batt +)
- [I] BK (Batt -)
- [J] BK/BL (Motor Box)
- [K] W/BL (Limit UP)
- [L] G/Y (Trim Motor UP → -)



Electric Trim System



JN12006BW2 C

- | | |
|-------------------------|-----------------------------|
| [A] Trim Switch | [H] Igniter |
| [B] Multifunction Meter | [I] Ignition Switch |
| [C] Motor Unit | [J] Main Fuse |
| [D] Trim Angle Sensor | [K] Stop Switch |
| [E] Trim Actuator | [L] Start Switch |
| [F] Trim Fuse | [M] Electronic Control Unit |
| [G] Starter Relay | |

Electronic Control Unit Inspection

- Unscrew the mounting bolts on the crossmember and disconnect the connectors of the electronic control unit.
- Using the auxiliary wires, reconnect the connectors of the control unit to the connector of the main harness.

14-42 ELECTRICAL SYSTEM

Electric Trim System

- Check the electronic control unit.
- Check the normal voltage and continuity according to the following table and see the causes for abnormal results.

(1) Normal Voltage and Continuity

Connection	Ignition SW OFF	Ignition SW ON
(1) R/BL-Ground (BK)	0 V	12 V

Connections	Unit OFF	Unit ON		
		Full Up ~ Full Down	Full Up	Full Down
(2) R/BK -BK/W	–	Discontinuity	Discontinuity	Continuity
(3) R/BK -W/BL	–	Discontinuity	Continuity	Discontinuity
(4) BL/Y-BK (A)	0 V	12 V	0 V	12 V
(5) G/Y-BK (B)	0 V	12 V	12 V	0 V

(A): When the trim switch (UP side) is pushed.

(B): When the trim switch (DOWN side) is pushed.

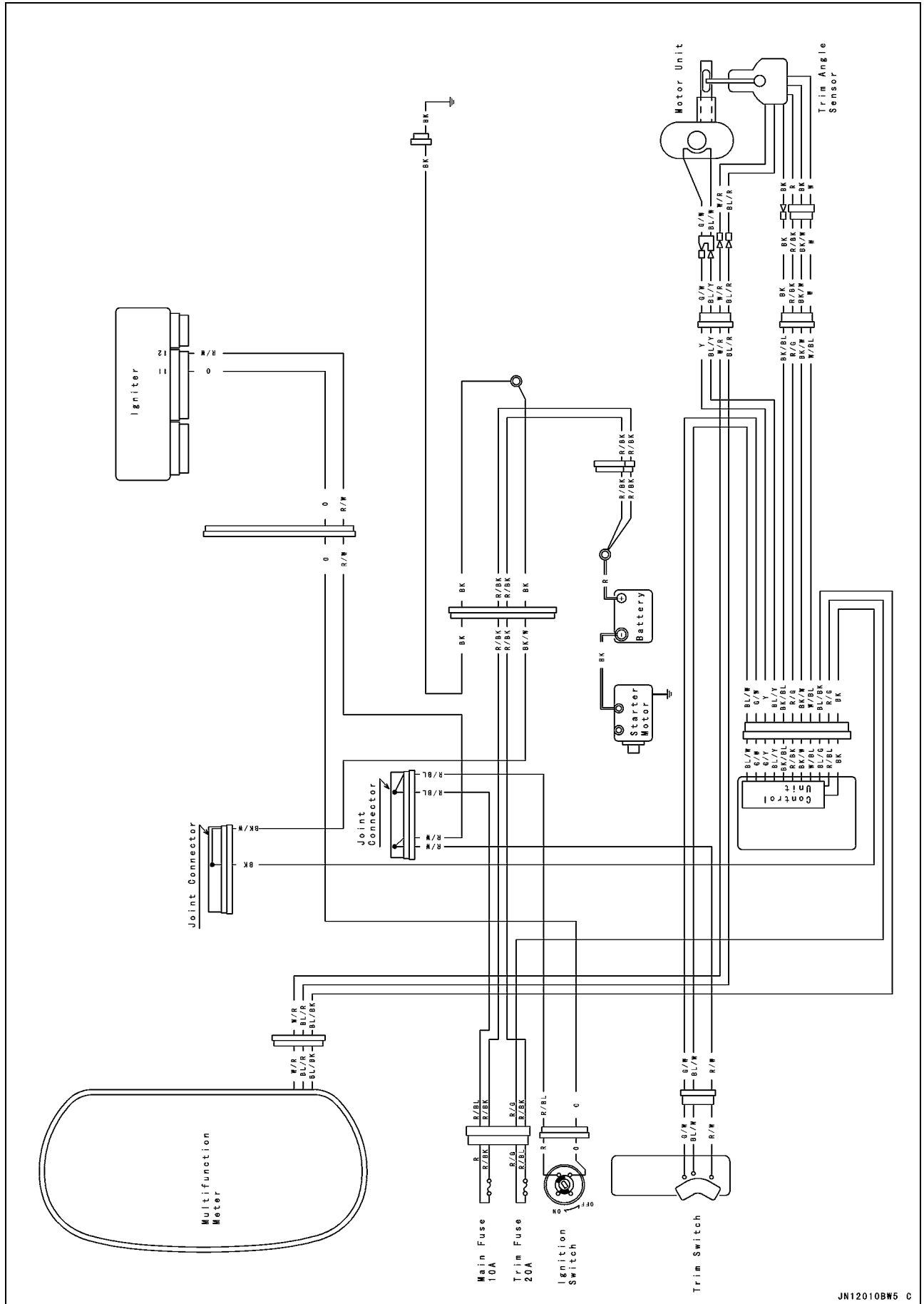
(2) Causes for Abnormal Results

	Faulty Parts			
	Control Unit	Harness	Igniter	Battery
(1)		●	●	●
(2)	●			
(3)	●			
(4)	●			
(5)	●			

	Faulty Parts		
	Fuse	Trim Angle Sensor	Trim Switch
(1)	●		
(2)		●	
(3)		●	
(4)		●	●
(5)		●	●

Electric Trim System

Electric Trim System Circuit



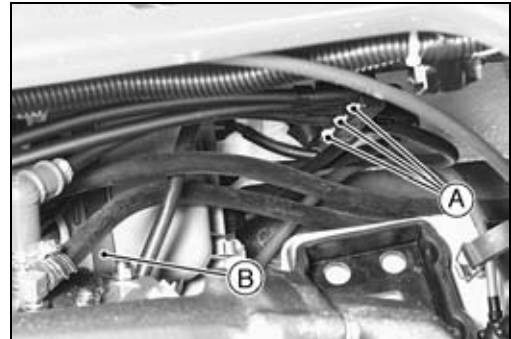
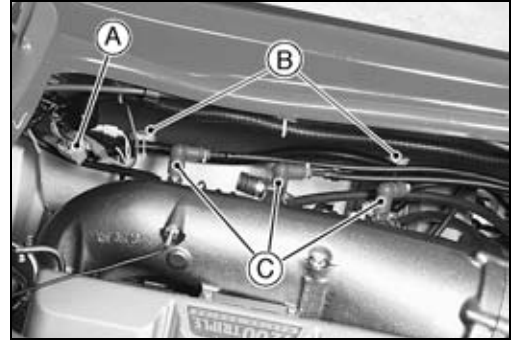
14-44 ELECTRICAL SYSTEM

Electric Case

Front Electric Case Removal/Disassembly

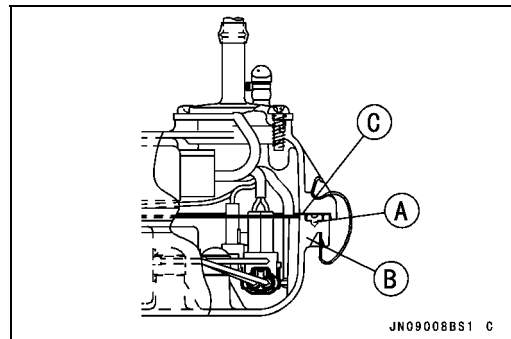
- Remove the battery.
- Remove or disconnect:
 - Lead Connector [A]
 - Clamps [B]
 - Spark Plug Caps [C]

- Remove or disconnect:
 - Clamps [A]
 - Straps [B]
- Remove the front electric case assembly out of the hull.
- Take out the clamps and open the case.
- Remove the electric components.
- Note wire routing and ground terminal location.

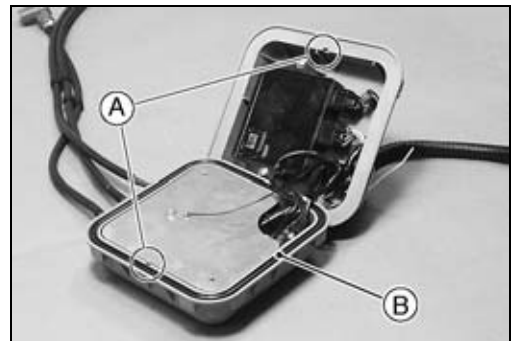


Front Electric Case Assembly/Installation

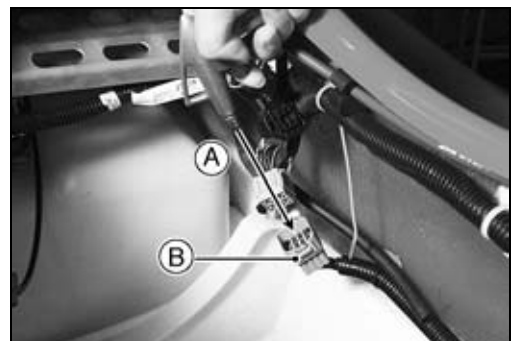
- Install the plate aligning the hole on the plate with the projection on the lower case (turn the two pages and see the illustration).
- Install the seal [A] on the lower case [B].
- **Install the gasket [C] on the seal aligning the recess in the gasket with the projection on the lower case.**



- Align [A] the projection on the lower case with the recess on the upper case.
 - Seal and Gasket [B]



- Use compressed air to blow [A] the male connector [B] of the front electric case lead when connecting.

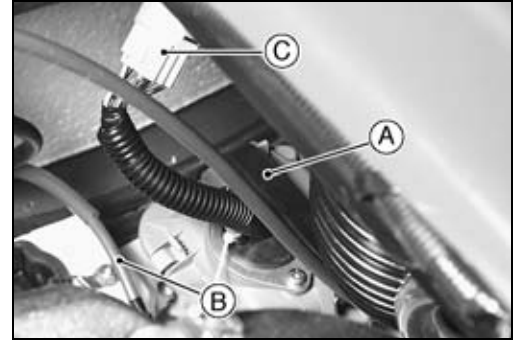


CAUTION

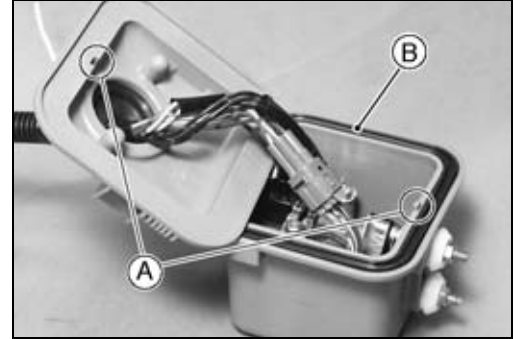
Water remained in the connector could cause the electrical leak.

Electric Case***Rear Electric Case Removal/Disassembly***

- Remove the battery.
- Remove or disconnect:
 - Strap [A]
 - Starter Motor Cable [B]
 - Lead Connector [C]
- Take out the clamps and open the case.
- Remove the electric components.
- Note wire routing and ground terminal location.

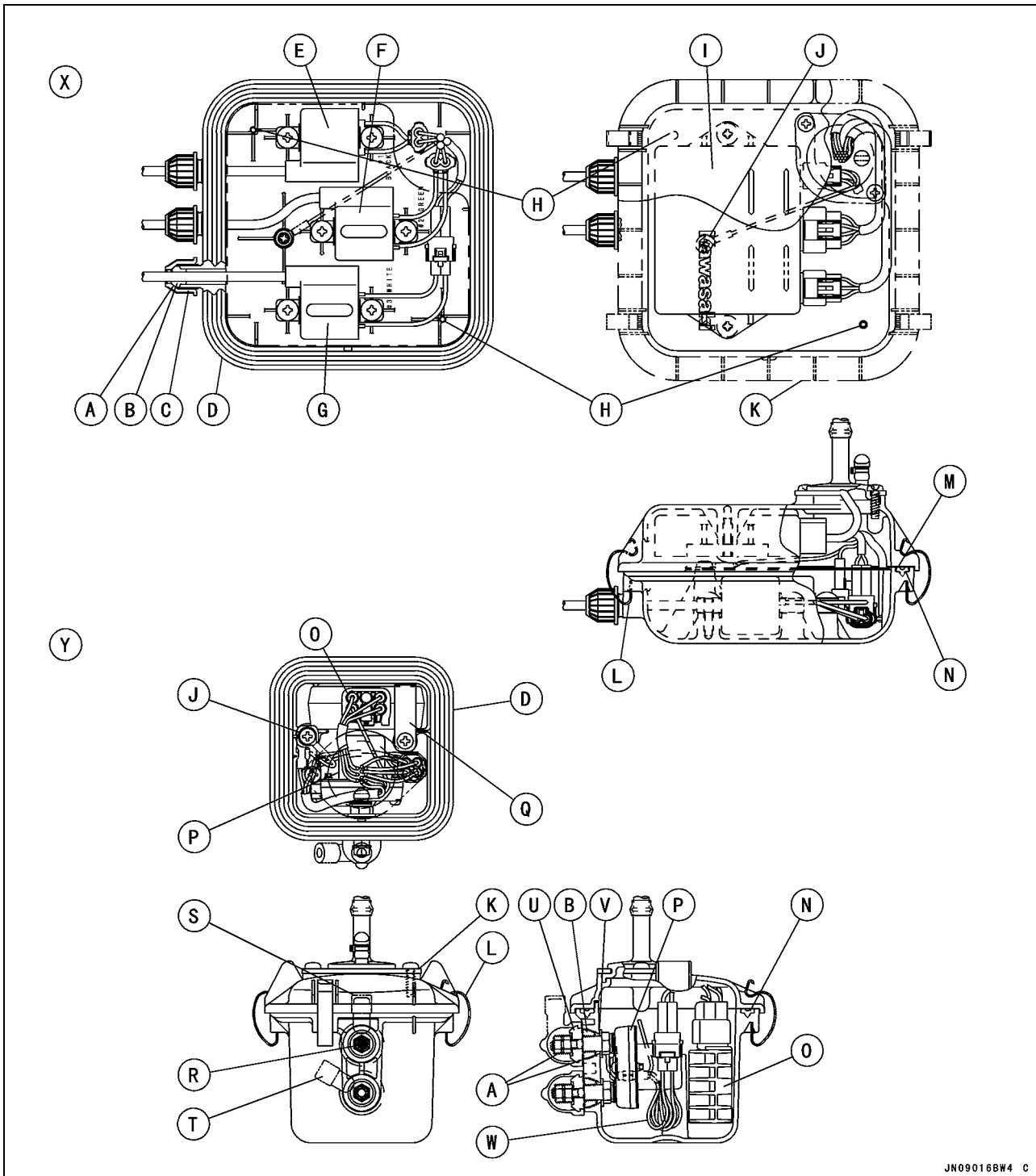
***Rear Electric Case Assembly/Installation***

- Be sure the seal [B] is in position.
- Align [A] the projection on the lower case with the recess on the upper case.
- Use compressed air to blow the male connector of the rear electric case lead.



14-46 ELECTRICAL SYSTEM

Electric Case



JN09016BW4 C

- [A] Apply grease.
- [B] Grommet
- [C] Grommet Cap
- [D] Lower Electric Case
- [E] #1 Ignition Coil
- [F] #2 Ignition Coil
- [G] #3 Ignition Coil
- [H] Align the projection with the hole.
- [I] Igniter
- [J] BK Lead
- [K] Upper Electric Case
- [L] Clamp
- [M] Gasket
- [N] Seal
- [O] Regulator/Rectifier
- [P] Starter Relay
- [Q] Regulator/Rectifier Mounting Plate
- [R] Red Mark
- [S] To Battery (+) Terminal
- [T] To Starter Motor Terminal
- [U] Spacer
- [V] Washer
- [W] Route the leads downward.
- [X] Front Electric Case
- [Y] Rear Electric Case

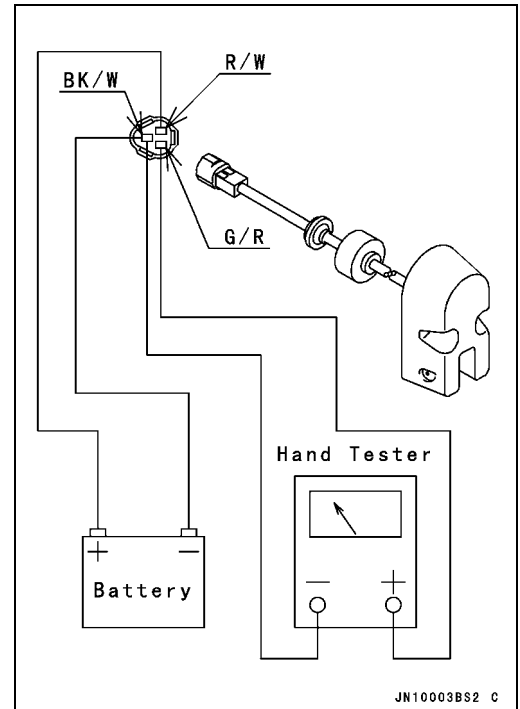
Sensors

Speed Sensor Inspection

- Disconnect the speed sensor connectors [A] (see Wiring Diagram).



- Connect the battery and tester leads to the sensor as shown.



- Rotate the waterwheel by hand slowly.
- Measure the output voltage of a speed sensor.

G/R (+), BK/W (-) → 0 ~ 10 V

twice a rotation (Rotate it slowly.)

- ★ If the voltage does not rise from zero to about 10 volts twice a rotation, replace the sensor.



- Measure the output voltage of the sensor at higher speeds.

○ Rotate the waterwheel in a fair speed by air.

G/R (+), BK/W (-) → approx. 5 V

- ★ If the sensor voltage does not reach 5 volts when spun with compressed air, replace the sensor.

Special Tool - Hand Tester: 57001-1394



14-48 ELECTRICAL SYSTEM

Sensors

Oil Level Sensor Inspection

- Disconnect the oil level sensor 2-pin connector.
- Remove the oil level sensor out of the oil tank.
- Set the hand tester (ohmmeter) to the $\times 1 \text{ k}\Omega$ range.

Special Tool - Hand Tester: 57001-1394

- Connect the tester leads to the BK/W and BL leads to check the switching operation of the float.

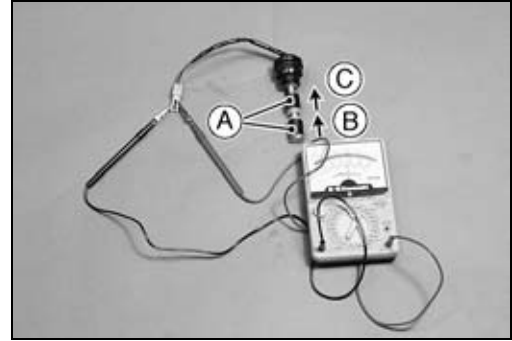
Meter Reading

When the two floats are held downward [A]: approx. $4 \text{ k}\Omega$

When one float is held upward [B]: approx. $2 \text{ k}\Omega$

When the two floats are held upward [C]: approx. 0Ω

- ★ The meter should read as specified. If it does not, replace the oil level sensor.



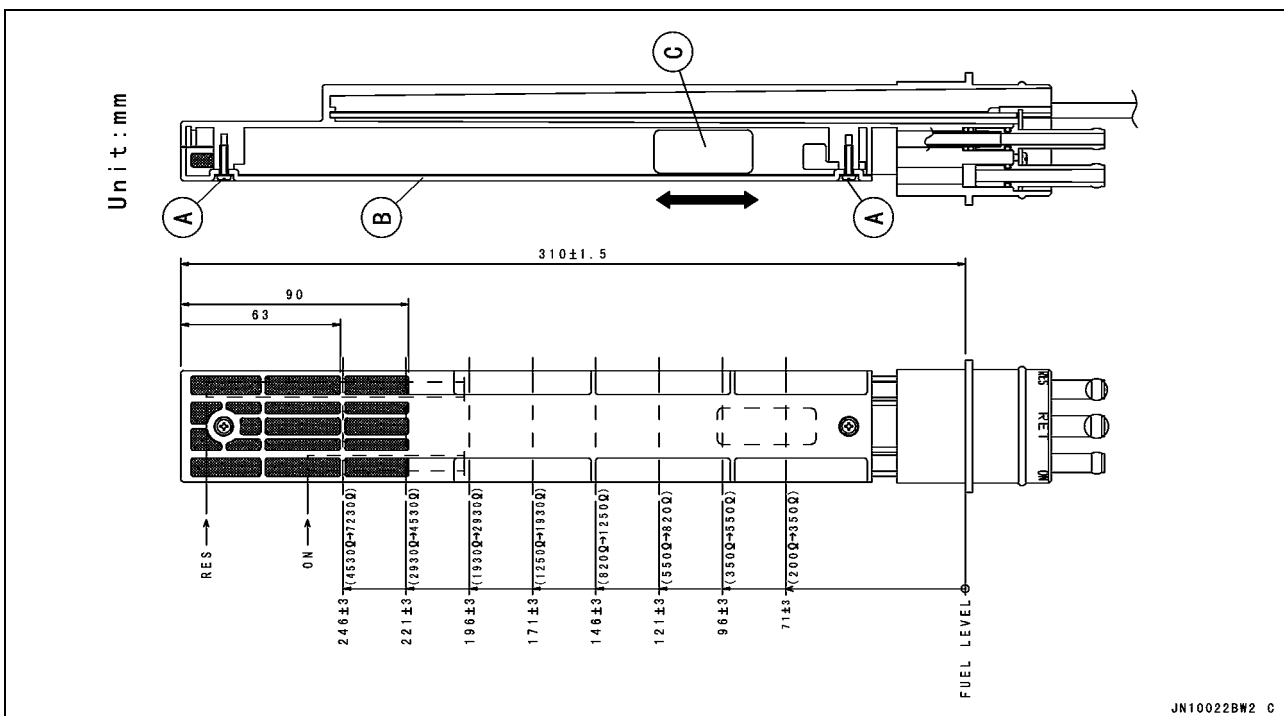
Fuel Level Sensor Inspection

- Remove the fuel level sensor out of the fuel tank.
- Set the hand tester (ohmmeter) to the $\times 100 \Omega$ range.

Special Tool - Hand Tester: 57001-1394

- Connect the tester leads to the W/R and BK/W leads.
- Take out the mounting screws [A] and remove the cover [B].
- According the next figure, test the fuel level sensor by sliding the float [C].

- ★ The meter should read as specified. If it does not, replace the fuel level sensor.



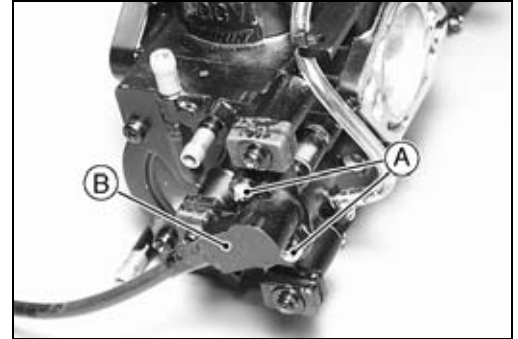
Sensors

Throttle Sensor Removal/Installation

CAUTION

Do not remove the throttle sensor [B] unnecessarily.

- Remove the carburetor (see Fuel System).
- Unscrew the mounting screws [A] and remove the throttle sensor [B].
- Be sure to adjust the throttle sensor when installing (see Throttle Sensor Adjustment).



Throttle Sensor Inspection

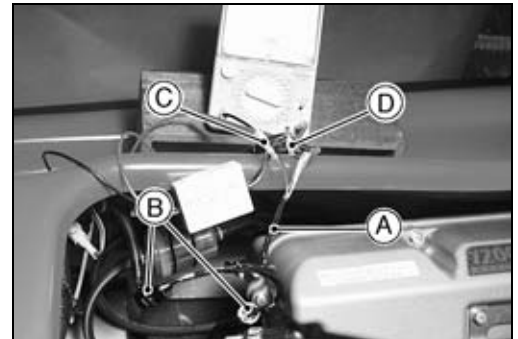
- Start the engine and warm it up thoroughly.

CAUTION

Do not run the engine without cooling water supply for more than 15 seconds or severe engine and exhaust system damage will occur.

- Check:
 - Idle Speed (see Periodic Maintenance chapter)
 - Battery Charging Condition (see this chapter)
- Turn the ignition switch off.
- Remove the throttle sensor lead connector.
- Connect the adapter [A] between the connectors [B].

Special Tool - Throttle Sensor Setting Adapter: 57001-1400
- Connect the hand tester to the adapter.
 - Hand Tester (+) → Y Lead [C] (Wire Color of TS)
 - Hand Tester (-) → BK Lead [D] (Wire Color of TS)
- Start the engine.



CAUTION

Do not run the engine without cooling water supply for more than 15 seconds or severe engine and exhaust system damage will occur.

- Check the sensor output voltage with the engine idling.

Throttle Sensor Output Voltage
Standard: 0.73 ~ 0.83 V (When engine is idling.)

★ If it is not within the specified voltage, adjust the throttle sensor position (see Throttle Sensor Adjustment).
★ If it is specified voltage, go to next test.

 - Stop the engine.
 - Turn on the ignition switch.
 - Check the sensor output voltage with the throttle fully open.

Throttle Sensor Output Voltage
Standard: 3.57 ~ 3.94 V
(When throttle is fully opened.)

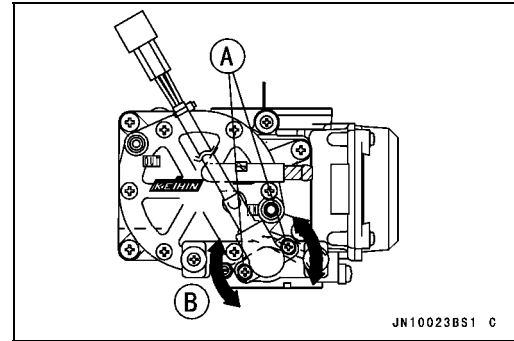
★ If it is not within the specified voltage, adjust the sensor (see Throttle Sensor Adjustment).
★ If the sensor cannot be adjusted, replace sensor.

14-50 ELECTRICAL SYSTEM

Sensors

Throttle Sensor Adjustment

- Check the throttle sensor output voltage (see Throttle Sensor Inspection).
- ★ If the output voltage is out of the range, adjust it as follows.
- Loosen the sensor mounting screws [A].
- Adjust [B] the position of the sensor until the output voltage is within the specified range.



Water Temperature Sensor Inspection

- Remove the water temperature sensor.
- Suspend the sensor [A] in a container of water so that the temperature-sensing projection is submerged.
- Suspend an accurate thermometer [B] in the water.

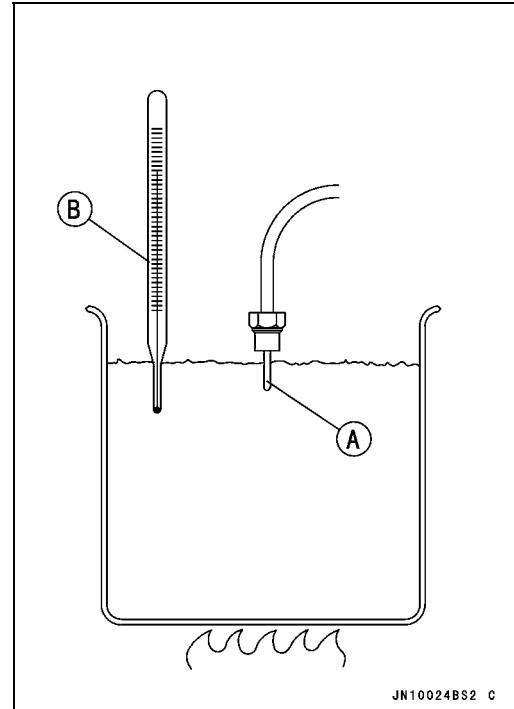
NOTE

○ The sensor and thermometer must not touch the container side or bottom.

- Place the container over a source of heat and gradually raise the temperature of the water while stirring the water gently.
- Using the hand tester, measure the internal resistance of the sensor at the temperatures shown in the table.
- ★ If the hand tester does not show the specified values, replace the sensor.

Water Temperature Sensor Resistance

Water Temperature	Sensor Resistance
20° C (68° F)	approx. 2 759 kΩ
50° C (122° F)	approx. 635 kΩ
90° C (194° F)	approx. 121.9 kΩ
100° C (212° F)	approx. 85.3 kΩ



Special Tool - Hand Tester: 57001-1394

Sensors

Inlet Air Temperature Sensor Inspection

- Remove the inlet air temperature sensor.
- Suspend the sensor [A] in a container of water.
- Suspend an accurate thermometer [B] in the water.

NOTE

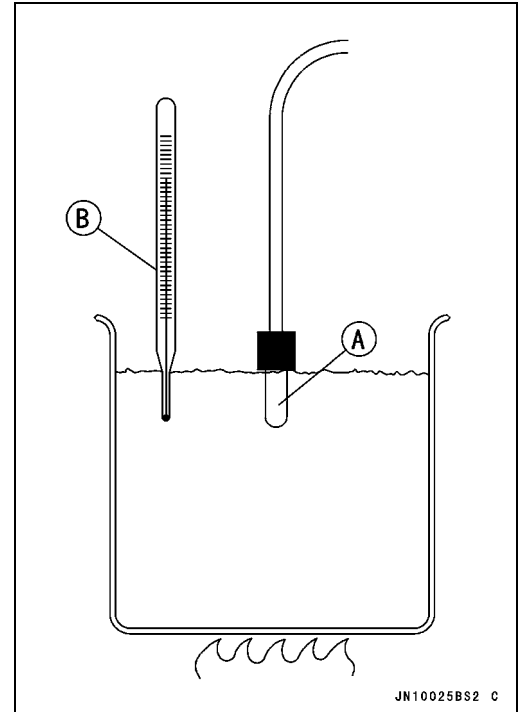
○ *The sensor and thermometer must not touch the container side or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the water while stirring the water gently.
- Using the hand tester, measure the internal resistance of the sensor at the temperatures shown in the table.
- ★ If the hand tester does not show the specified values, replace the sensor.

Inlet Air Temperature Sensor Resistance

Water Temperature	Sensor Resistance
10° C (50° F)	approx. 3.74 kΩ
20° C (68° F)	approx. 2.47 kΩ
50° C (122° F)	approx. 0.833 kΩ
70° C (158° F)	approx. 0.448 kΩ

Special Tool - Hand Tester: 57001-1394



14-52 ELECTRICAL SYSTEM

Multifunction Meter

Display Function Inspection

● Using the auxiliary wires, connect the 12 V battery [A] to the meter unit [B] connector as follows.

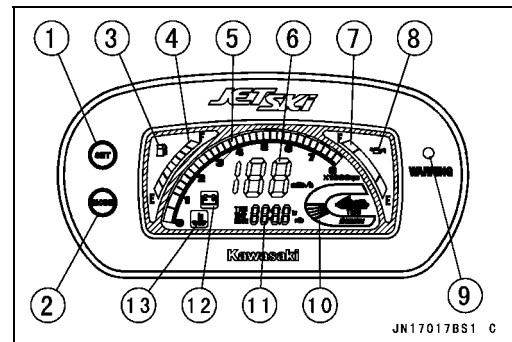
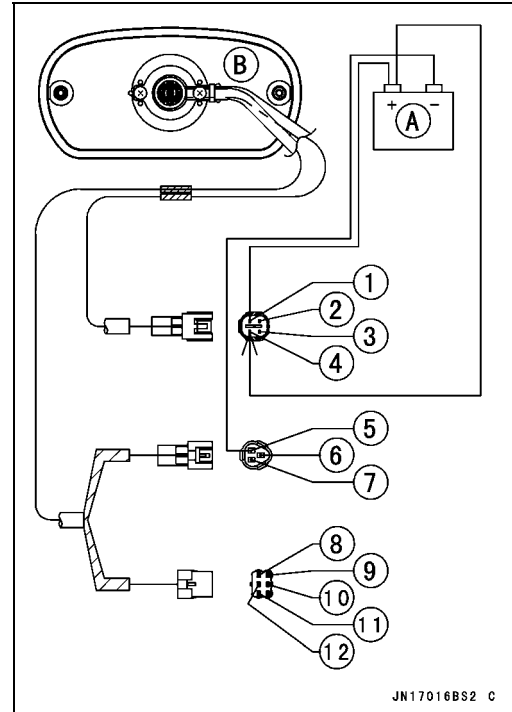
- Connect the battery positive terminal to the terminal [1].
- Connect the battery negative terminal to the terminal [5].

- [1] Battery (+)
- [2] Oil Level Sensor
- [3] Fuel Level Sensor
- [4] Ignition Switch (+)
- [5] Ground (-)
- [6] Diagnosis Signal
- [7] Tachometer Pulse
- [8] Trim Angle Sensor 1
- [9] Speed Sensor
- [10] Speed Sensor Power Source (+)
- [11] Trim Limit Switch
- [12] Trim Angle Sensor 2

Battery Voltage Range: 10 ~ 16 V

- Check that when the battery positive terminal [1] is connected to the terminal [4] using the auxiliary wire, all the LCD segments and LED warning light appear for seconds.
- Check that when the terminals are disconnected, all the LCD segments and LED warning light disappear.
- ★ If the LCD segments and LED warning light will not appear, replace the meter assembly.

- [1] SET Button
- [2] MODE Button
- [3] Fuel Symbol
- [4] Fuel Level Gauge
- [5] Tachometer
- [6] Speedometer
- [7] Oil Level Gauge
- [8] Engine Oil Symbol
- [9] LED Warning Light
- [10] Trim Indicator
- [11] Clock/Time/Trip/Hour Meter
- [12] Battery Symbol
- [13] Heat Symbol



CAUTION

Do not drop the meter unit. Do not short the terminals [9], [10] and [10], [5].

If the multifunction meter displays incorrectly while the engine is running, first disconnect the (-) battery terminal lead and reconnect it again to recover the meter display.

Then, check to see that the standard plugs and/or plug caps are installed. Install only the standard plugs and/or plug caps. The resistors are embedded in both parts.

Multifunction Meter

Fuel Level Gauge/Symbol/Warning Light Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Display Function Inspection”.
- Connect the variable rheostat [A] to the terminal [3] as shown.
- Check that the number of segments matches the resistance value of the variable rheostat.

Resistance Value (Ω)	Display Segments
7 230	0
4 530	1*
2 930	2
1 930	3
1 250	4
820	5
550	6
350	7

*: The LED warning light and fuel symbol flash at the same time.

- If any display function does not work, replace the meter assembly.

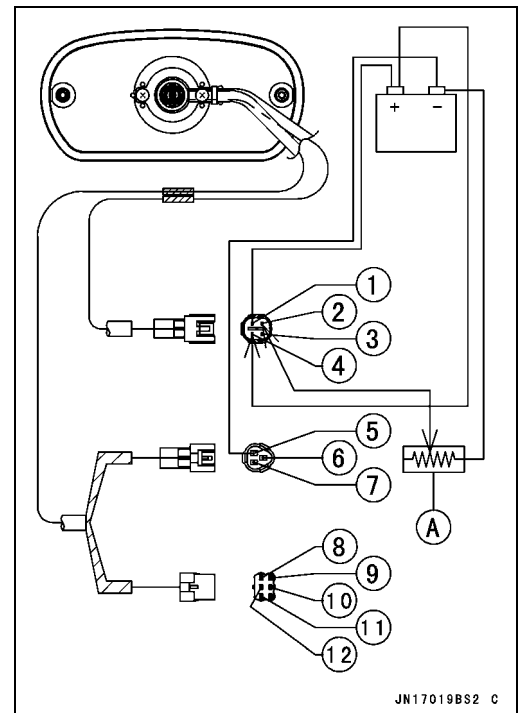
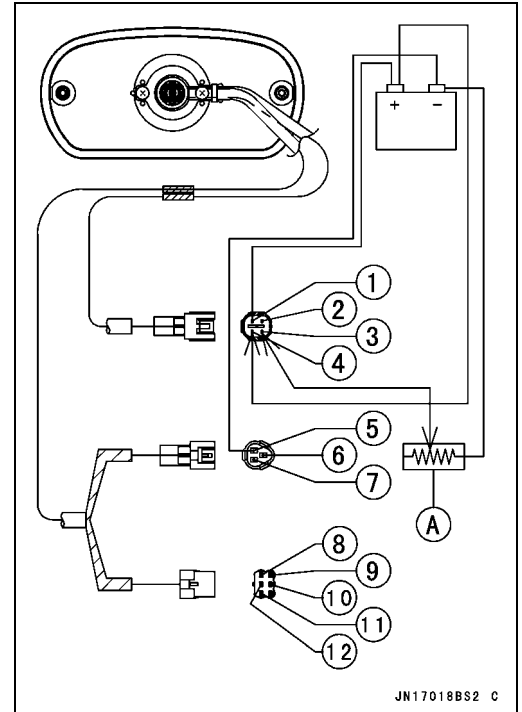
Oil Level Gauge/Symbol/Warning Light Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Display Function Inspection”.
- Connect the variable rheostat [A] to the terminal [2] as shown.
- Check that the number of segments matches the resistance value of the variable rheostat.

Resistance Value (Ω)	Display Segments
4 000	1*
2 000	2
0	3

*: The LED warning light and oil symbol flash at the same time.

- If any display function does not work, replace the meter assembly.



14-54 ELECTRICAL SYSTEM

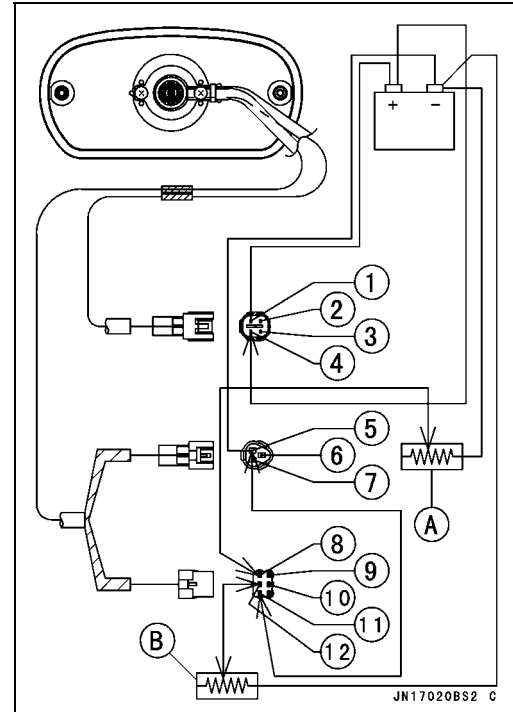
Multifunction Meter

Trim Indicator Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Display Function Inspection”.
- Connect the variable rheostat 1 [A] to the terminal [8] as shown.
- Connect the variable rheostat 2 [B] to the terminal [12] as shown.
- Check that the number of segments matches the resistance value of the variable rheostat.

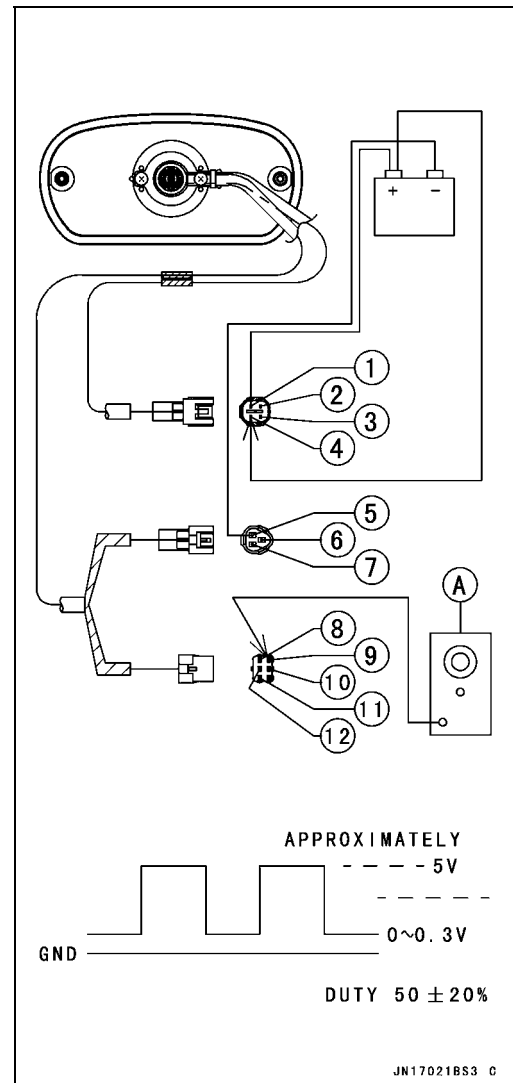
Variable Rheostat 1 Resistance Value (Ω)	Variable Rheostat 2 Resistance Value (Ω)	Display Segment
33	100	1
100	33	2
330	33	3
Connect the terminal [11] to the [5] terminal (GND).		

- If any display function does not work, replace the meter assembly.



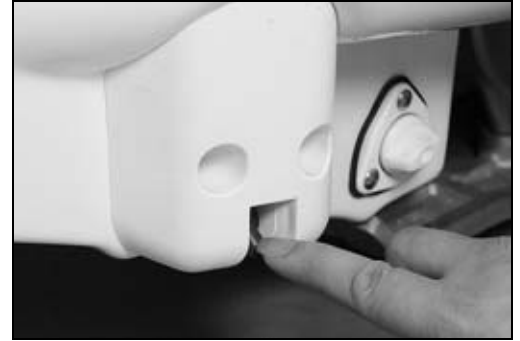
Speedometer Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Display Function Inspection”.
- The speed equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown) would be input into the terminal [9].
- Indicates approximately 60 mph in case the input frequency would be approximately 337 Hz.
- Indicates approximately 60 km/h in case the input frequency would be approximately 209 Hz.



Multifunction Meter

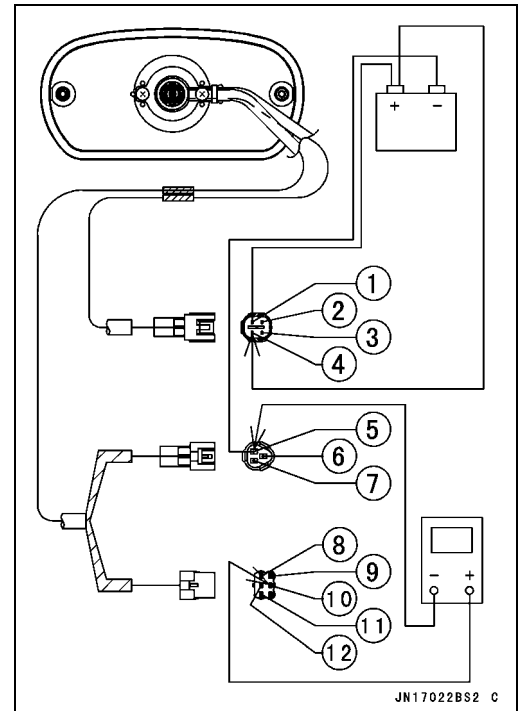
- If the oscillator is not available, the speedometer can be checked as follows.
 - Install the meter unit.
 - Turn on the ignition switch.
 - Rotate the waterwheel by hand.
 - Check that the speedometer shows the speed.
- ★ If the speedometer does not work, check the speed sensor electric source voltage and speed sensor.



Speed Sensor Electric Source Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Display Function Inspection”.
- Set the hand tester [A] to the DC25 V range and connect it to the terminals [5] and [10].
- ★ If the voltage is less than 7 V, replace the meter assembly.

Special Tool - Hand Tester: 57001-1394

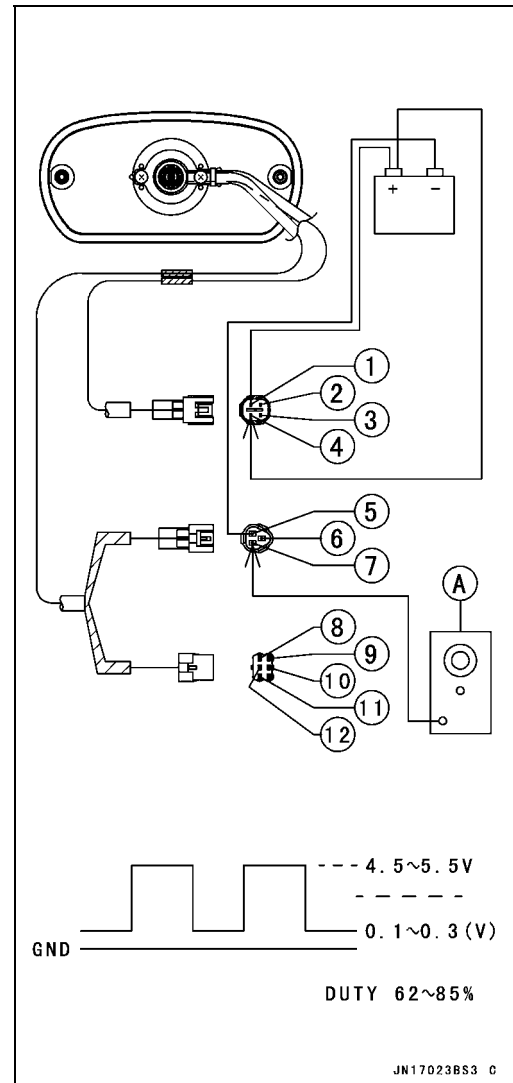


14-56 ELECTRICAL SYSTEM

Multifunction Meter

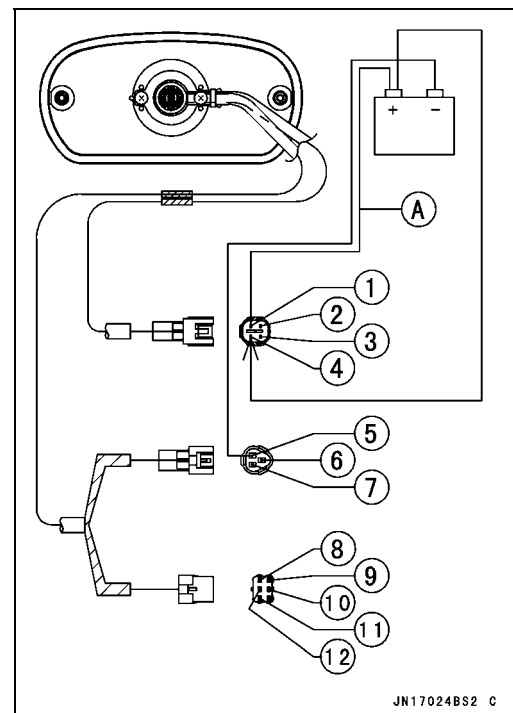
Tachometer Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Display Function Inspection”.
- The revolutions per minute (rpm) equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown) would be input into the terminal [7].
- The tachometer indicates approximately 3 000 rpm in case the input frequency would be approximately 66 Hz.
- ★ If the tachometer does not work normally, replace the meter assembly.



Battery Symbol/Warning Light Inspection

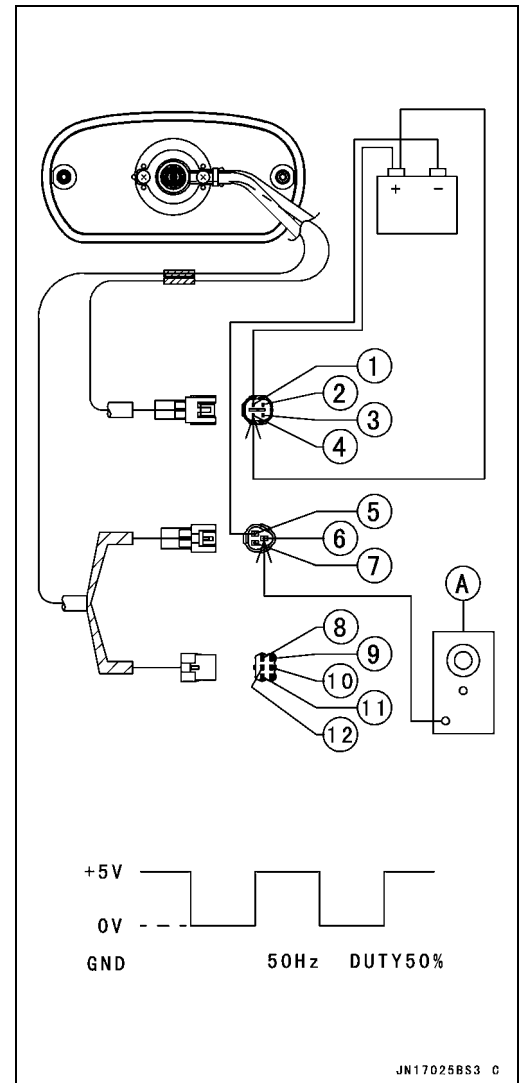
- Connect the 12 V battery and terminals in the same manner as specified in the “Display Function Inspection”.
- Check that the battery symbol/warning light flash when the input voltage to the terminal [A] is lowered to 12 ± 0.1 volts or less. And check that the meter returns in the state of normality when the input voltage to the black lead terminal is raised to 12.5 V or more.
- ★ If any display function does not work, replace meter assembly.



Multifunction Meter

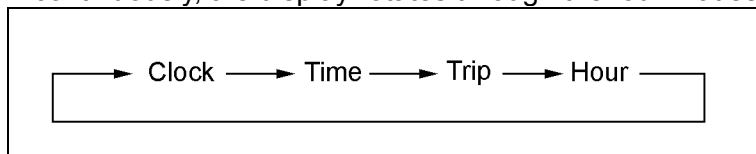
Heat Symbol/Warning Light Inspection

- Connect the 12 V battery and terminals in the same manner as specified in the “Display Function Inspection”.
- Check that the heat symbol/warning light flash when the equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown) would be input into terminal [6].
- Check that the meter returns in the state of normality when the terminal for input frequency is opened.
- ★ If any display function does not work, replace meter assembly.



MODE/SET Button Inspection

- Check that when the MODE button is pushed and held continuously, the display rotates through the four modes.



- Indicate the clock mode.
- Check that when the SET button is pushed for more than two seconds, the meter display turns to the clock set mode.
- ★ If the display function does not work, replace the meter assembly.
- Indicate the time mode.
- Check that when the SET button is pushed for more than two seconds, the meter display turns to “00:00”.
- ★ If the display function does not work, replace the meter assembly.

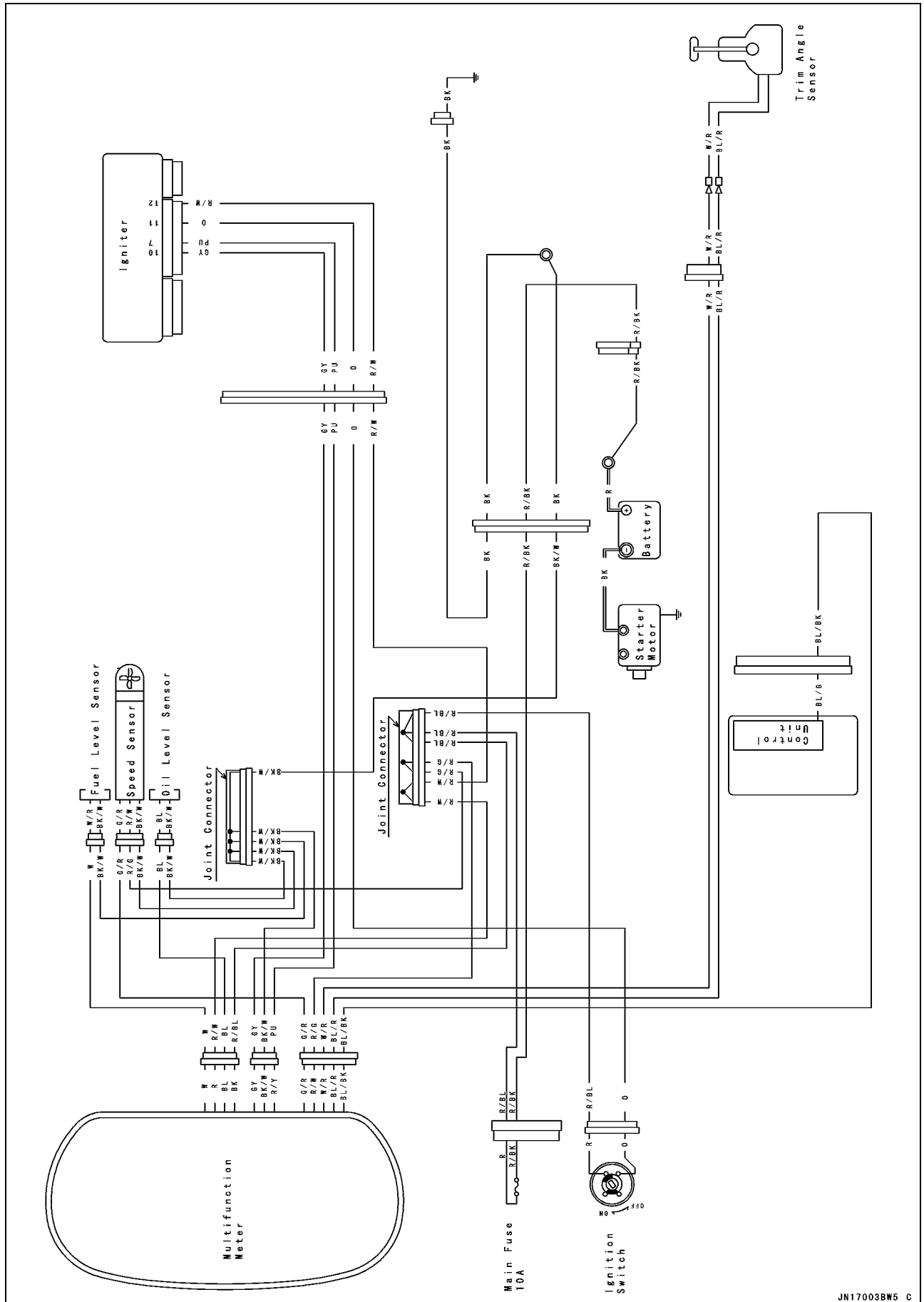
14-58 ELECTRICAL SYSTEM

Multifunction Meter

- Indicate the trip mode.
- Check that when the SET button is pushed for more than two seconds, the meter display turns to "000.0".
- ★ If the display function does not work, replace the meter assembly.

Multifunction Meter

Multifunction Meter Circuit



14-60 ELECTRICAL SYSTEM

Switches

Switch Inspection

- Using an ohmmeter, check to see that only the connections shown in the table have continuity (about zero ohms).
- ★ If the switch has an open or short, repair it or replace it with new one.

Ignition Switch

	R	○
ON	○	○
OFF		

Start Switch

	Y/R	Y/R
FREE		
PUSH	○	○

Stop & Tether Switch

STOP BUTTON	TETHER CODE	BK	W	R/PU	Y/R
FREE	SET			○	○
PUSH	PULL	○	○		

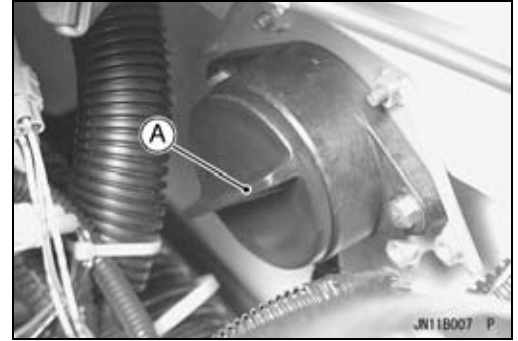
Trim Switch

	R/W	BK	BL/W	G/W
UP	○			○
		○	○	
FREE				
DOWN	○		○	
		○		○

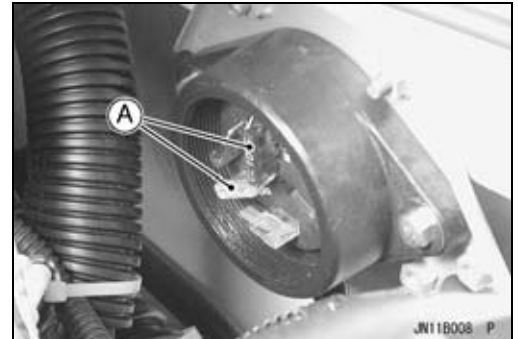
Fuse

Inspection

- Remove the fuse plug [A].

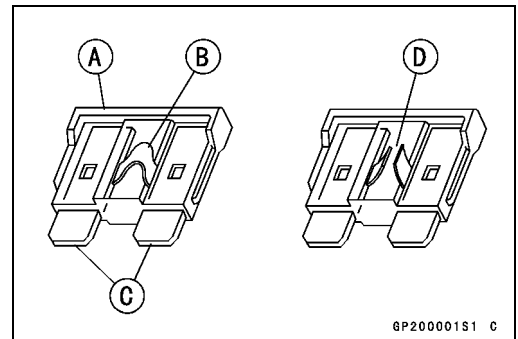


- Take out the fuse [A].



- Inspect the fuse element.
- ★ If it blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

Housing [A]
 Fuse Element [B]
 Terminals [C]
 Blown Element [D]



CAUTION

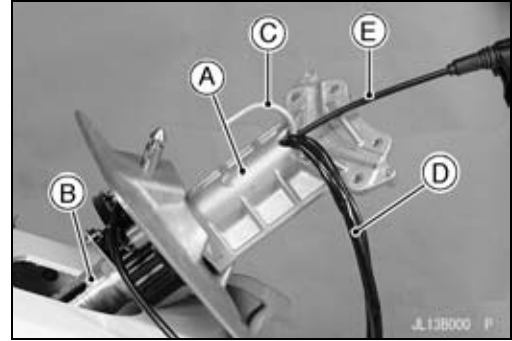
When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.

14-62 ELECTRICAL SYSTEM

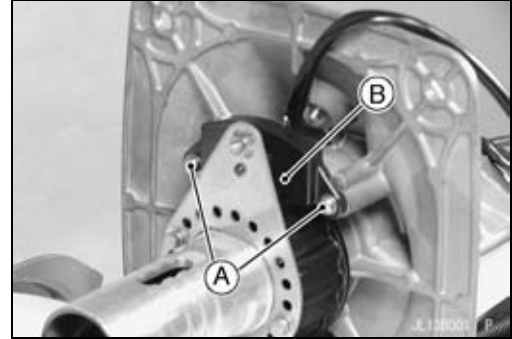
Smart Steering System

Steering Position Sensor and Magnet Removal

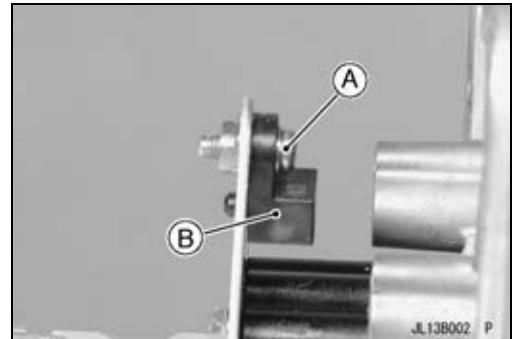
- Remove:
Steering (Refer to the steering removal in the Steering chapter)
- Remove the steering holder [A] with the steering shaft [B], fuel vent hose [C], start/stop switch leads [D] and throttle cable [E].



- Unscrew the mounting screws [A] and remove the steering position sensor [B].

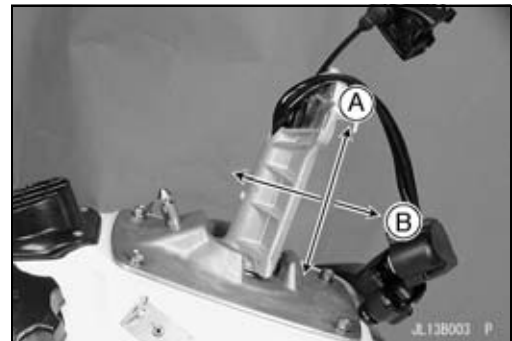


- Unscrew the mounting screw [A] and remove the magnet [B].

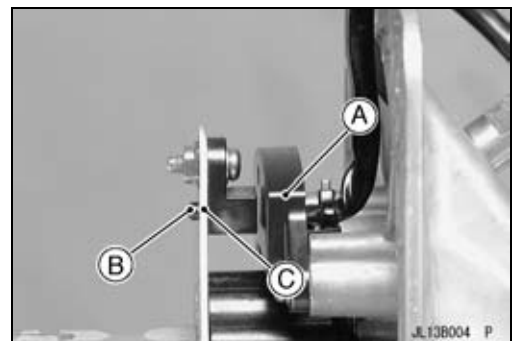


Steering Position Sensor and Magnet Installation

- Move the steering shaft in the direction of [A] and [B], inspect the steering shaft for excessive play.
- ★ If necessary, adjust the steering nut or replace the bushings (see Steering Installation in the Steering chapter).



- Apply a non-permanent locking agent to the steering position sensor mounting screws and magnet mounting screw.
- Install the steering position sensor [A] to the steering holder and align the projection [B] on the magnet with the hole [C] on the steering shaft plate.



Smart Steering System

- Turning the steering shaft fully to the left and right direction, check whether the steering position sensor comes in contact with the magnet.
- Check the clearance [A] between the steering position sensor [B] and the magnet [C] with a feeler gauge.

Steering Position Sensor Clearance

Standard: 0.5 ~ 1.5 mm (0.02 ~ 0.06 in.)

- ★ If necessary, adjust the steering nut (see Steering Installation in the Steering chapter).
- Check the operation of the Smart Steering system.

Smart Steering System Inspection

- Inspect the smart steering system with the watercraft in the water.
- Center the handlebar in the straight-ahead position.
- Start the engine and allow it to idle for 4 seconds or more.
- Turn the handlebar all the way to the left or right, and check that the engine speed does not change, i.e. the engine maintains and idle.
- Center the handlebar in the straight-ahead position.
- Squeeze the throttle lever and rev the engine increase engine speed to approx. 4 000 r/min (rpm) or above for 4 seconds or more.
- Release the throttle lever.
- Within 1 second, turn the handlebar all the way to the left or right and check that the engine speed increases to approx. 2800 r/min (rpm).
- Center the handlebar in the straight-ahead position, and check that the engine speed decreases to an idle speed.
- ★ If the Smart Steering system does not operate normally, check the following.
 - Smart Steering Cable (see Smart Steering Cable Adjustment in the Fuel System.)
 - Smart Steering Actuator (see this chapter.)
 - Steering Position Sensor Clearance (see this chapter.)

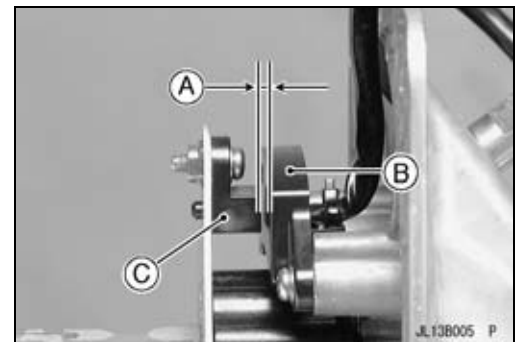
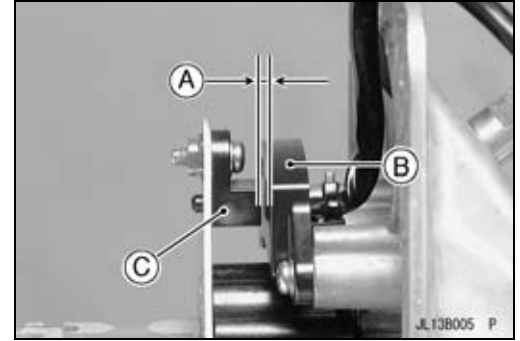
Steering Position Sensor Clearance

- Check the clearance [A] between the steering position sensor [B] and the magnet [C] with a feeler gauge.

Steering Position Sensor Clearance

Standard: 0.5 ~ 1.5 mm (0.02 ~ 0.06 in.)

- ★ If the clearance is the specified value, inspect steering position sensor input voltage.
- ★ If necessary, adjust the steering nut.



14-64 ELECTRICAL SYSTEM

Smart Steering System

Steering Position Sensor Input Voltage Inspection

- Measure the input voltage to the steering position sensor.

NOTE

○ Be sure the battery is fully charged.

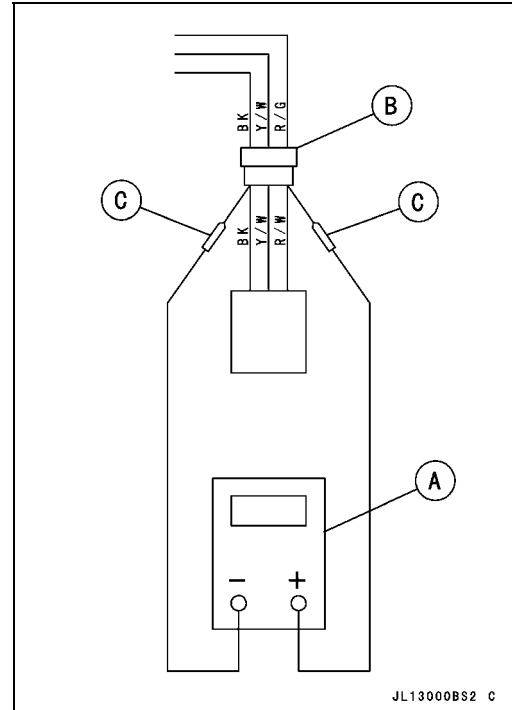
- Connect a digital voltmeter [A] to the lead connector [B] of the steering position sensor using the needle adapter set [C].

Special Tool - Needle Adapter Set: 57001-1457

Connections to Steering Position Sensor Connector

Meter (+) → R/W Terminal

Meter (-) → BK Terminal



- Turn the ignition switch ON.
- Center the handlebar in the straight-ahead position.
- Measure the input voltage.

Steering Position Sensor Input Voltage

Standard: Battery Voltage

- Turn the ignition switch OFF.
- ★ If the reading is good, inspect steering position sensor output voltage.
- ★ If the reading is out of standard, check the following.
 - Battery Voltage
 - Main Fuse 10 A
 - Power Source Wiring (see Smart Steering System Circuit)

Smart Steering System

Steering Position Sensor Output Voltage Inspection

- Measure the output voltage from the steering position sensor.

NOTE

- Be sure the battery is fully charged
- Connect a digital voltmeter [A] to the lead connector [B] of the steering position sensor using the needle adapter set [C].

Special Tool - Needle Adapter Set: 57001-1457

Connections to steering Position Sensor Connector

Meter (+) → Y/W Terminal

Meter (-) → BK Terminal

- Turn the ignition switch ON.
- Turn the handlebar fully left or right.
- Measure the output voltage.

Steering Position Sensor Output Voltage

Standard: approx. 0 V

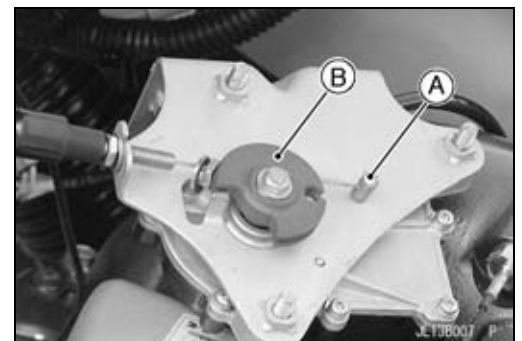
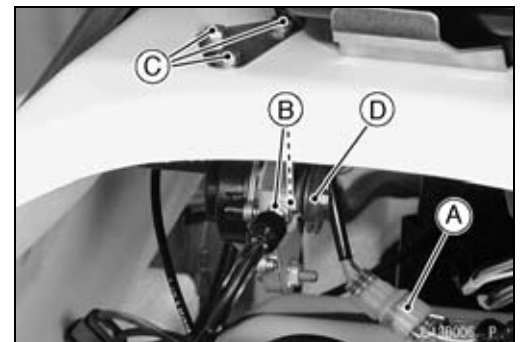
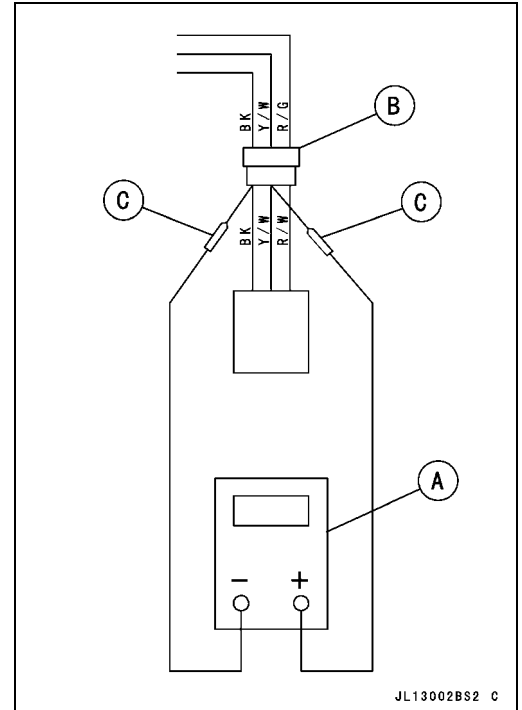
NOTE

- When the handlebar is centered in straight-ahead position the output voltage standard value is battery voltage.
- Turn the ignition switch OFF.
- ★ If the reading is out of the standard, suspect the following.
 - Damaged Steering Position Sensor
 - Open Sensor Circuit
- ★ If the reading is the standard, but the Smart Steering system does not operate, suspect the igniter.

Smart Steering Actuator Removal

- Disconnect the actuator connector [A].
- Loosen the locknuts [B] at the bracket.
- Remove the actuator bracket mounting bolts [C] and pull the actuator [D] with the bracket out of the hull.

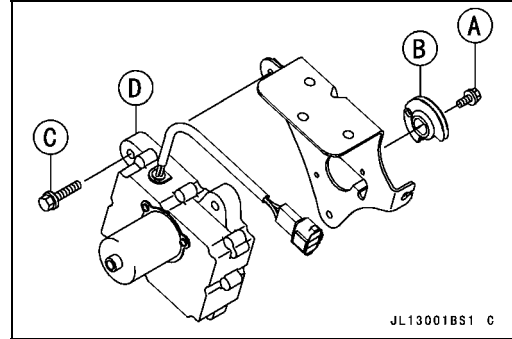
- Disconnect the smart steering cable end [A] from the pulley [B].



14-66 ELECTRICAL SYSTEM

Smart Steering System

- Unscrew the pulley mounting bolt [A] and remove the pulley [B].
- Unscrew the actuator mounting bolts [C] and remove the bracket [D].



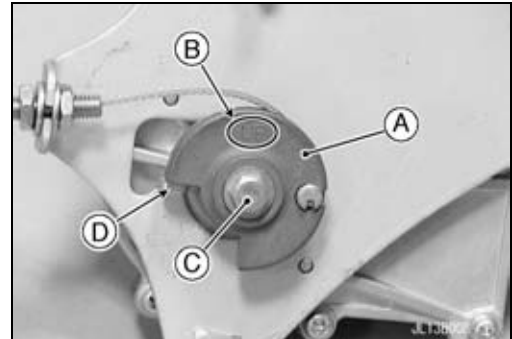
Smart Steering Actuator Installation

- Apply a non-permanent locking agent to the actuator mounting bolts and install the actuator to the bracket.

Torque - Actuator Mounting Bolts: 8.8 N·m (0.9 kgf·m, 78 ft·lb)

- Insert the pulley [A] into the actuator shaft so that “UP” mark [B] faces upward.
Projection [D]
- Apply a non-permanent locking agent to the pulley mounting bolt [C] and torque it.

Torque - Pulley Mounting Bolt: 3.5 N·m (0.36 kgf·m, 31 in·lb)



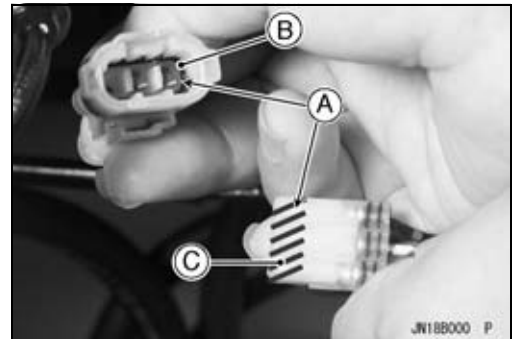
CAUTION

When tightening the pulley mounting bolt, do not use a power wrench (impact tool) to prevent damaging the D.C. servomotor. Torque it to 3.5 N·m (0.36 kgf·m, 31 in·lb).

- Install the smart steering cable to the bracket and pulley.
- Apply a non-permanent locking agent to the actuator bracket mounting bolts and torque them.

Torque - Actuator Bracket Mounting Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)

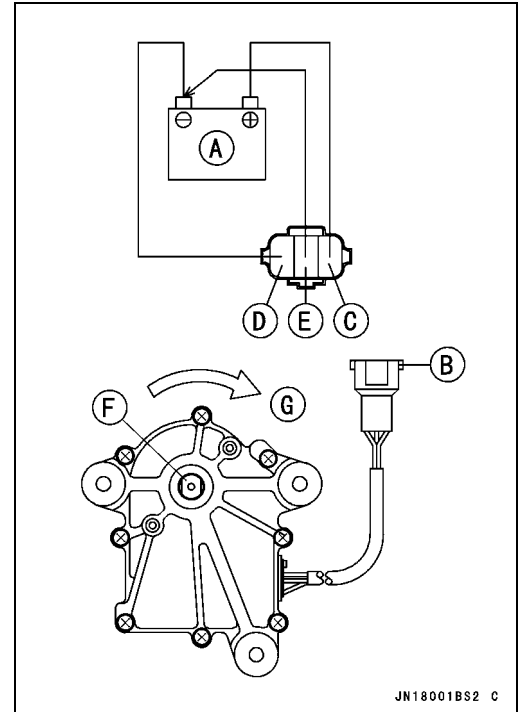
- When reconnecting the actuator connector, apply water-resistance grease [A] to the O-ring [B] and connector [C].
- Adjust the smart steering cable (see Smart Steering Cable Adjustment in the Fuel System chapter).



Smart Steering System

Smart Steering Actuator Inspection

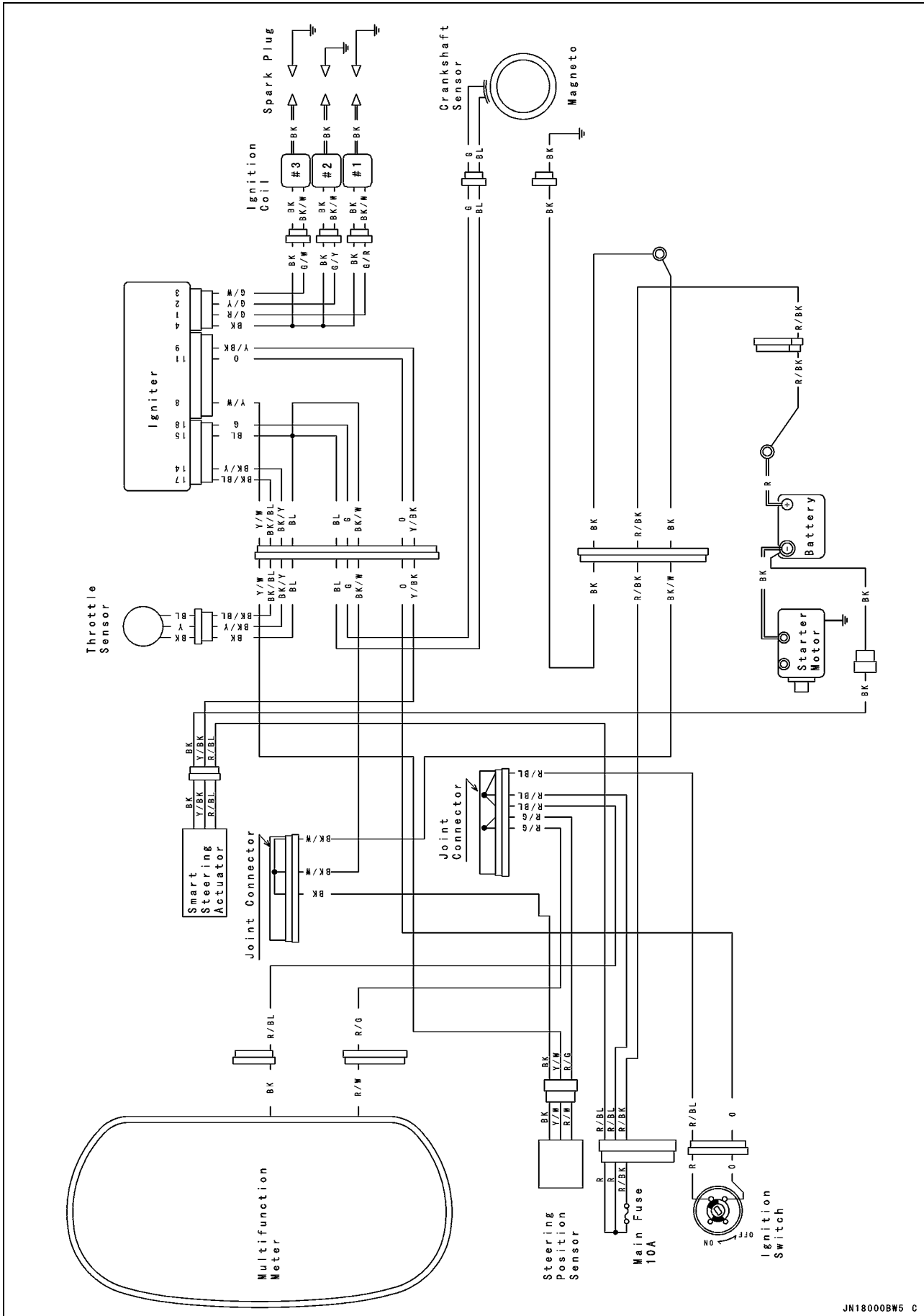
- Remove the smart steering actuator (see this chapter).
- Unscrew the pulley mounting bolt and remove the pulley (see Smart Steering Actuator Removal in this chapter).
- Using auxiliary wires, connect a 12 V battery [A] to the actuator connector [B] as follows.
 - Connect the battery positive terminal to the R/W terminal [C].
 - Connect the battery negative terminal to the BK terminal [D].
- Check that when the battery negative terminal is connected to the Y/W terminal [E] using the auxiliary wire, the actuator shaft [F] turns clockwise [G].
- ★ If the actuator shaft does not turn, replace the actuator.



14-68 ELECTRICAL SYSTEM

Smart Steering System

Smart Steering System Circuit



Storage

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15-2 STORAGE

Preparation for Storage

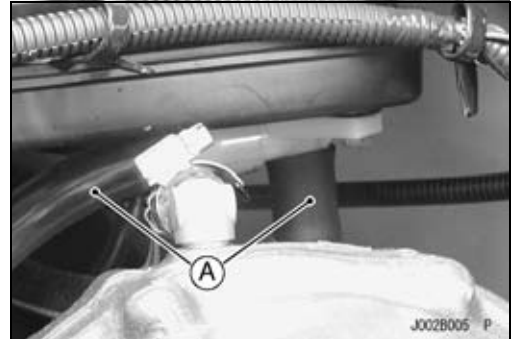
During the winter, or whenever the watercraft will not be in use for a long period of time, proper storage is essential. It consists of checking and replacing missing or worn parts; lubricating parts to ensure that they do not become rusted; and, in general, preparing the watercraft so that when the time comes to use it again, it will be in top condition.

Cooling System

- Clean the cooling system (see Cooling System Flushing in the Periodic Maintenance chapter).

Bilge System

- Clean the bilge system (see Bilge System Flushing in the Periodic Maintenance chapter). Before reconnecting the hoses to the plastic breather fitting, blow air through both hoses [A] to force all water out of the bilge system.



Fuel System

WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Pull the lanyard key off the stop button. Do not smoke. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

- Drain the fuel tank. This should be done with a siphon or pump.
[A] Siphon Hose
- Clean the filter screens (see Fuel Filter Screen Cleaning in the Periodic Maintenance chapter).
- Inspect/replace the fuel filter (see Fuel Filter Inspection in the Periodic Maintenance chapter).
- Leave the fuel filter cap loose to prevent condensation in the tank.
- Turn the ignition switch on.
- Push the lanyard key under the stop button, and start the engine and run it in 15 second periods until all fuel in the carburetor is used up. Wait 5 minutes between 15 second running periods.
- Pull the lanyard key off the stop button and turn the ignition switch off.

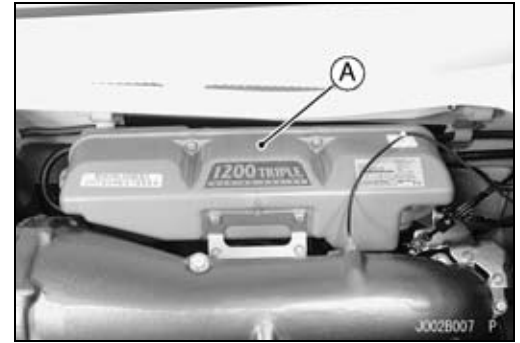


CAUTION

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.

Preparation for Storage

- Remove the air inlet cover [A] from the carburetor.
- Lift out the flame arresters and clean them, if necessary (see Flame Arrester Cleaning in the Periodic Maintenance chapter).
- Spray a penetrating rust inhibitor down the carburetor bore.
- Install the flame arrester.
- Reinstall the cover, apply a non-permanent locking agent to the threads of the air intake cover bolts and tighten securely.



Engine

- Remove the spark plugs and push the plug caps fully onto the plug cap holder on the cylinder head.
- Pour one ounce of motor oil into each cylinder.

CAUTION

Do not use too much oil, or the crank seals may be damaged when the engine is next started.

- Turn the ignition switch on.
- Push the lanyard key under the stop switch. Turn the engine over several times with the start switch to coat the cylinder walls with oil.
- Pull the lanyard key off the stop switch and turn the ignition switch off.
- Reinstall the spark plugs and caps.

Battery

- Give a refresh charge before you store the watercraft and store it with the negative lead removed. Give a refresh charge once a month during storage.
- Remove the battery (see Battery Removal in the Electrical System chapter).
- Clean the exterior with a solution of baking soda and water (one heaping tablespoon of baking soda in one cup of water). Rinse thoroughly with water.
- Cover both battery terminals with grease.
- Store the battery in a cool, dry place. Do not expose it to freezing temperatures.

Lubrication

- Carry out all recommended lubrication procedures (see Lubrication in the Periodic Maintenance chapter).
- During the storage, lubricate the following with penetrating rust inhibitor as well.
 - Steering Cable Joint Connector at Steering Nozzle
 - Trim Cable Joint Connector at Steering Nozzle

15-4 STORAGE

Preparation for Storage

General

- Wash the engine compartment with fresh water and remove the drain screw in the stern to drain the water. Wipe up any water left in the compartment.

CAUTION

Use only a mild detergent in water to wash the hull. Harsh solvents may attack the surface or smear the colors.
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- Apply a good grade of wax to all exterior hull surfaces.
- Lightly spray all exposed metal parts with a penetrating rust inhibitor.
- Remove the seat, or block the seat up with 10 mm spacers to insure adequate ventilation, and prevent corrosion.
- Cover the watercraft and store it in a clean, dry place.

Removal from Storage

Lubrication

- Carry out all recommended lubrication procedures (see Lubrication in the Periodic Maintenance chapter).

General Inspection

- Check for binding or sticking throttle, choke, or steering or trim mechanism. The throttle lever must return fully when released.
- Clean and gap spark plugs (see Spark Plug Cleaning and Spark Plug Adjustment in the Periodic Maintenance chapter).
- Check all rubber hoses for weathering a cracking, or looseness.
- Check that the drain screw in the stern is securely tightened.
- Check the fire extinguisher for a full charge.
- Check the battery, charge if necessary, and clean the terminals. Install the battery (see Battery Installation in the Electrical System chapter).

Fuel System

- Check and clean or replace the fuel filter screens as necessary (see Fuel Filter Screen Cleaning in the Periodic Maintenance chapter).

WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Pull the lanyard key off the stop button. Do not smoke. Make sure the area is well ventilated and free from source of flame or spark; this includes any appliance with a pilot light.

- After refueling and before starting the engine, tilt the seat to the rear for several minutes to ventilate the engine compartment.

WARNING

A concentration of gasoline fumes in the engine compartment can cause a fire or explosion.

- Check for fuel leaks. Repair if necessary.
- Check the engine oil level. Fill the oil tank with the specified oil.

15-6 STORAGE

Removal from Storage

Test Run

WARNING

Do not run the engine in a closed area. Exhaust gases contain carbon monoxide, a colorless, odorless, poisonous gas. Breathing exhaust gas leads to carbon monoxide poisoning, asphyxiation, and death.

- Start the engine and run it only for 15 seconds. Check for fuel, oil and exhaust leaks. Any leaks must be repaired.

CAUTION

Do not run the engine without cooling water supply for more than 15 seconds or severe engine and exhaust system damage will occur.

- Install the seat making sure it is locked.

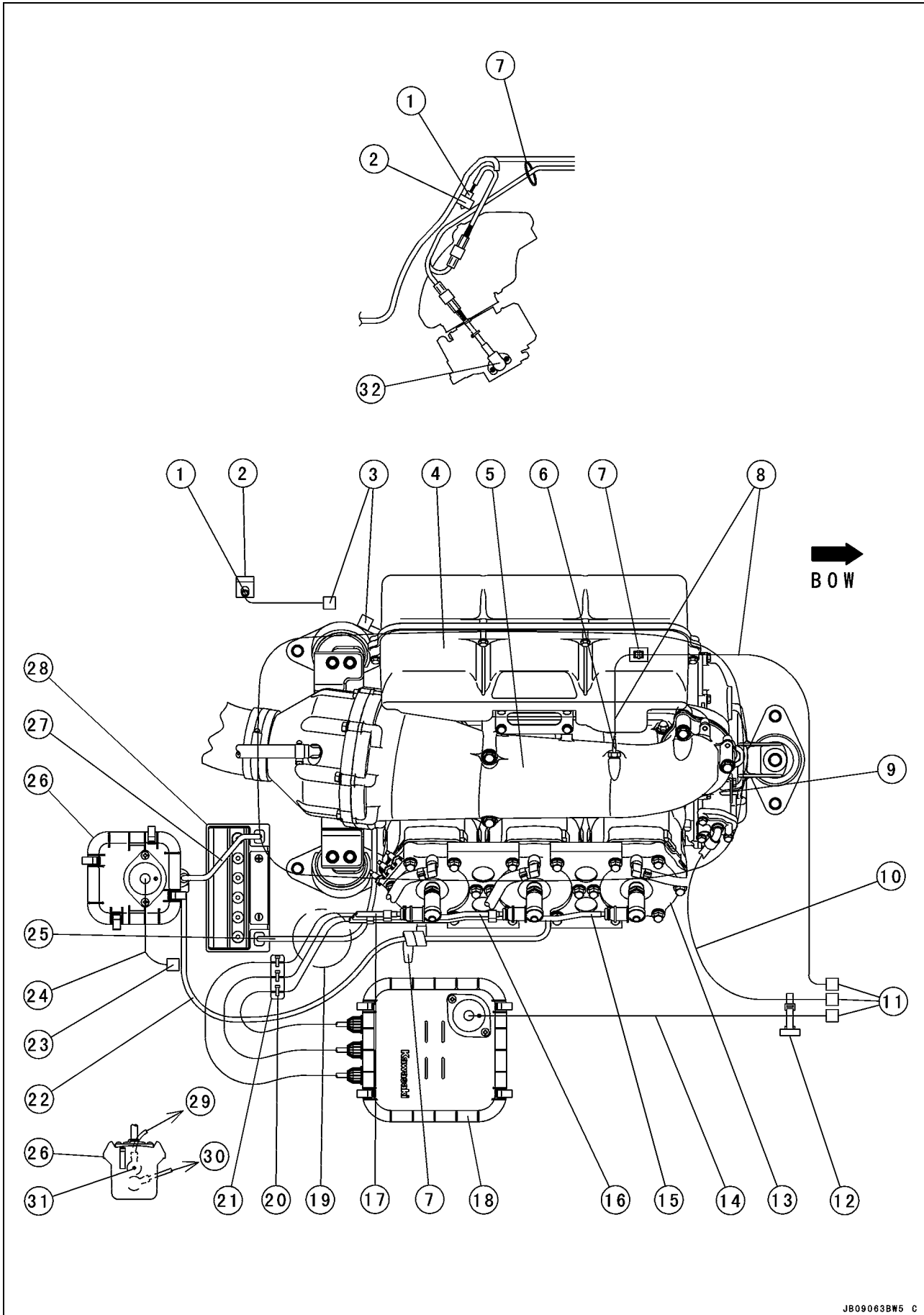
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16-2 APPENDIX

Cable, Wire and Hose Routing

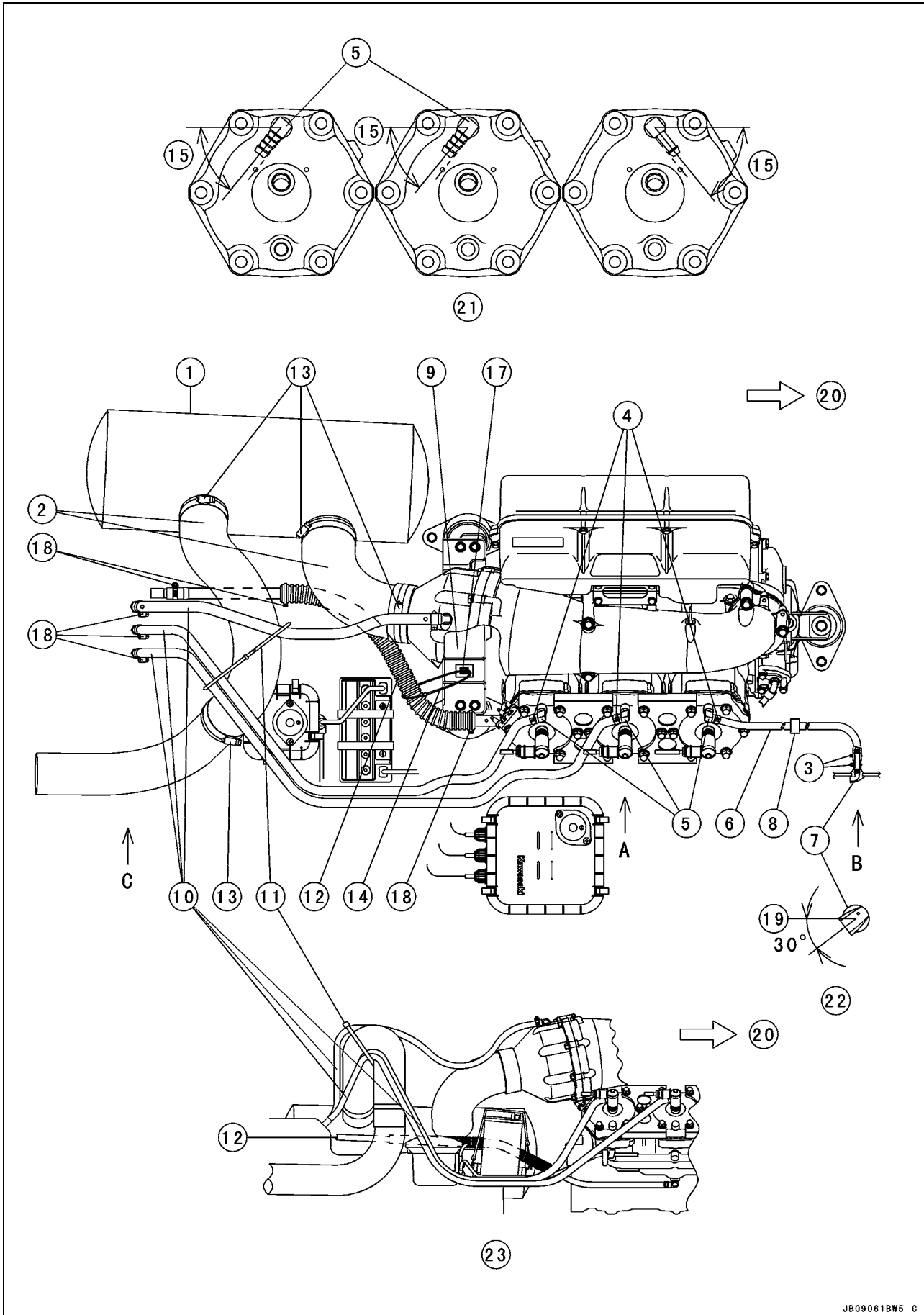


Cable, Wire and Hose Routing

1. Inlet Air Temperature Sensor (Out off the end of the sensor from the holder.)
2. Holder
3. Connect the inlet air temperature sensor lead to the main harness.
4. Air Inlet Cover
5. Exhaust Pipe
6. Water Temperature Sensor
7. Clamp
8. Keep the water temperature sensor lead loose.
9. Magneto Cover
10. Keep the magneto leads loose.
11. Connect the leads to the main harness.
12. Band
13. Cylinder Head
14. Front Electric Case Lead
15. #1 Spark Plug Lead
16. #2 Spark Plug Lead
17. #3 Spark Plug Lead
18. Front Electric Case
19. Keep the spark plug leads loose (Do not contact the spark plug leads and the battery (-) cable).
20. Clamp spark plug lead.
21. The holder should be parallel with the battery front.
22. Starter Motor Cable (Red)
23. Connect the rear electric case leads to the main harness.
24. Rear Electric Case Leads
25. Connect the battery (-) cable to the ground.
26. Rear Electric Case
27. Connect the battery (+) cable to the starter relay terminal.
28. Battery
29. To Battery (+) Terminal
30. To Starter Motor Terminal
31. Red Mark
32. Throttle Sensor

16-4 APPENDIX

Cable, Wire and Hose Routing

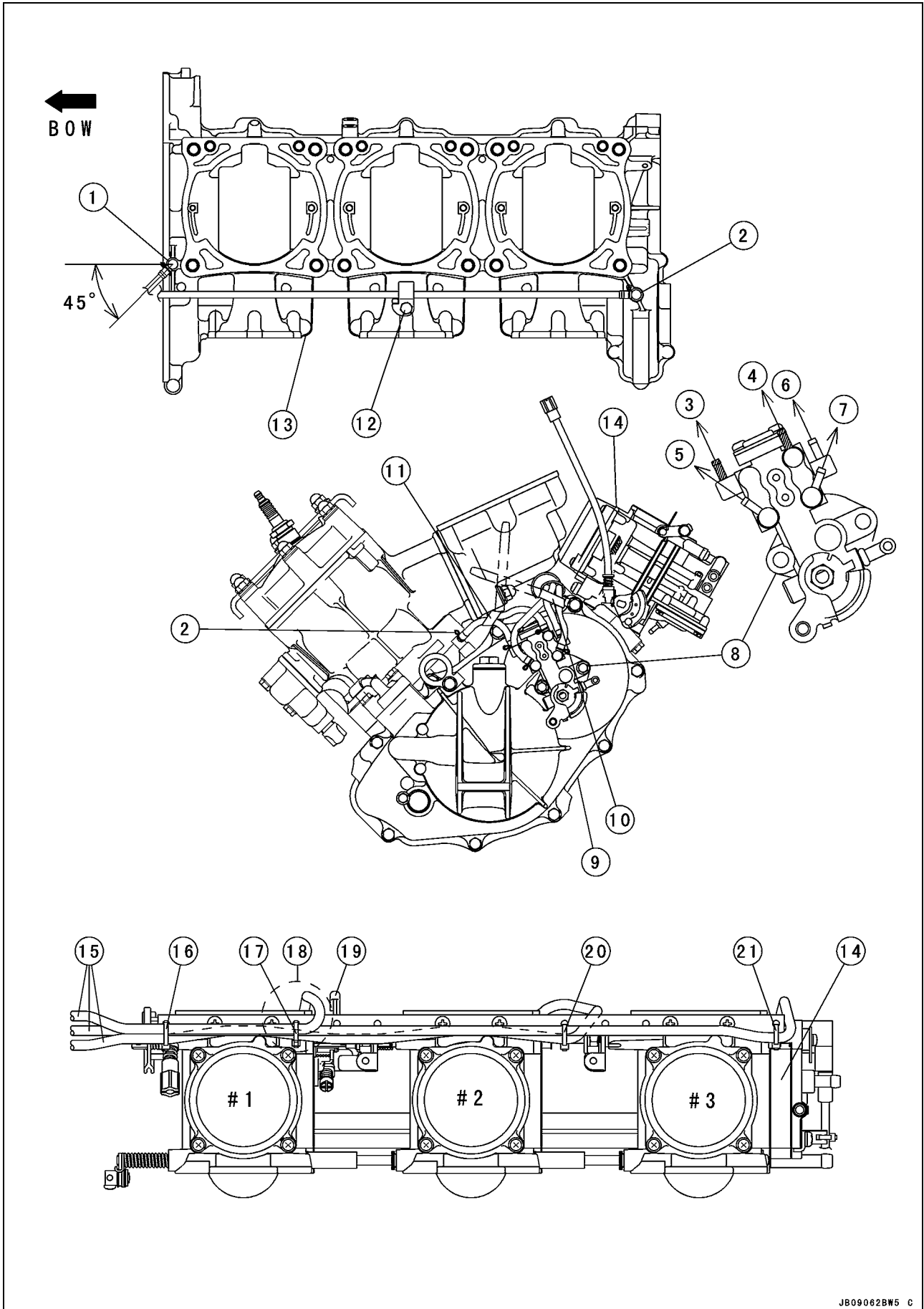


Cable, Wire and Hose Routing

1. Water Box Muffler
2. Exhaust Tube
3. Clamp
4. Bands (Cut off the band as the cutting edge not facing up.)
5. Water Pipe Joint
6. Bypass Cooling Hose
7. Bypass Outlet
8. Detent (Rubber)
9. Coupling Cover
10. Drain Hose
11. Band (Clamp loosely the exhaust tube, drain hoses and the inlet cooling hose.)
12. Inlet Cooling Hose
13. Note the clamp screw position on the exhaust tubes.
14. Band (Keep the inlet cooling hose loose.)
15. Approximately 50°
16. Aligning Mark
17. Detent (Plastic)
18. Clamps
19. Horizontal Line
20. Bow
21. Viewed A
22. Viewed B
23. Viewed C

16-6 APPENDIX

Cable, Wire and Hose Routing

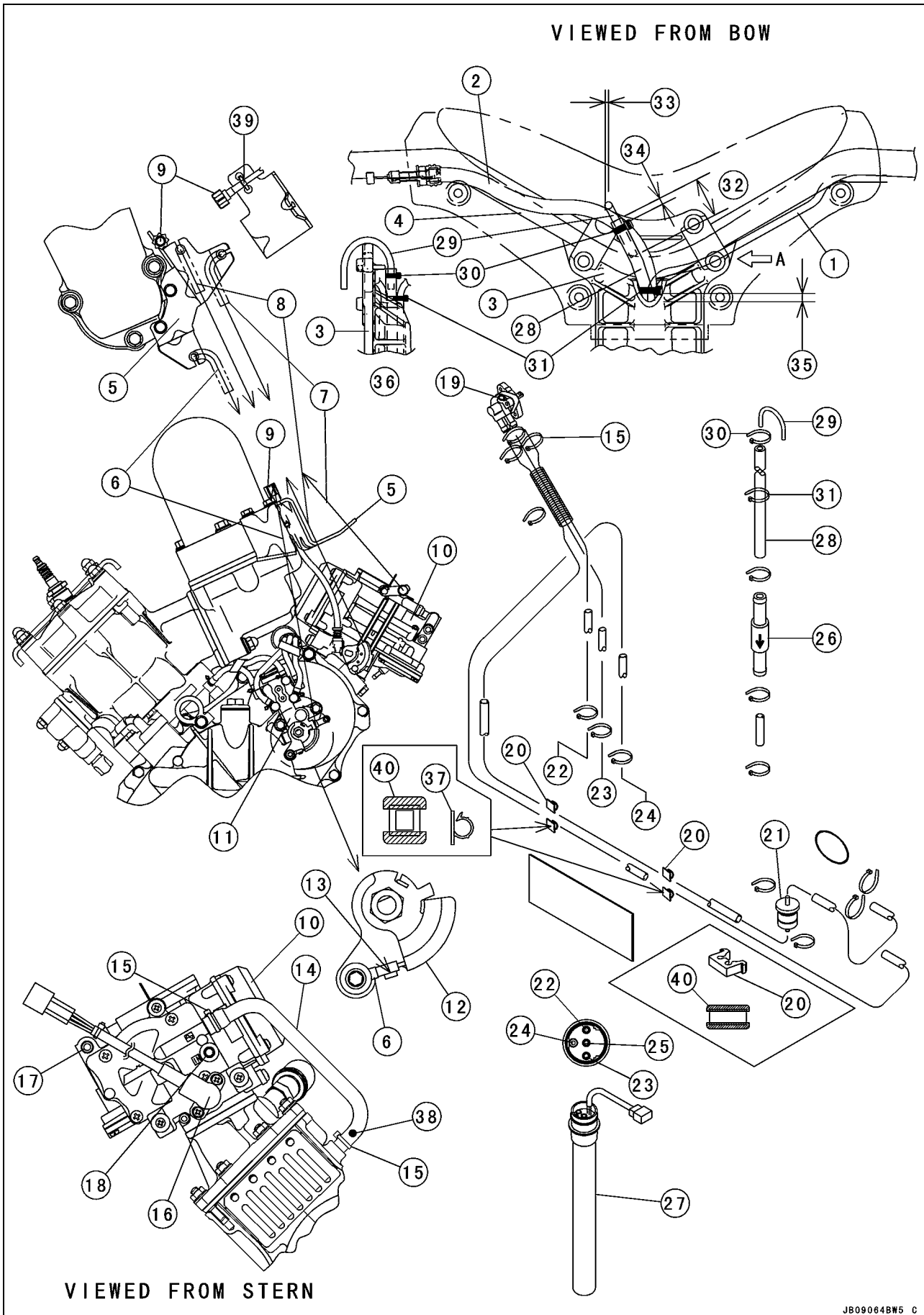


Cable, Wire and Hose Routing

1. Front Check Valve
2. Rear Check Valve
3. To Front Check Valve
4. To Rear Check Valve
5. To #1 Carburetor Check Valve
6. To #2 Carburetor Check Valve
7. To #3 Carburetor Check Valve
8. Oil Pump
9. Magneto Cover
10. Clamp the oil hoses which lead to the carburetors
11. Clamp the oil hoses which lead to the check valves on the upper crankcase.
12. Clamp (Clamp the rear check valve hose.)
13. Upper Crankcase
14. Carburetors
15. To oil pump
16. Band (Clamp the carburetor check valve oil hoses, #1, #2 and #3.)
17. Insert the band to the hole as shown (Clamp the carburetor check valve oil hoses #1, #2 and #3.)
18. Do not contact the oil hose to the smart steering lever and movable parts of the carburetor.
19. Smart Steering Lever
20. Band (Clamp the carburetor check valve oil hoses #2 and #3.)
21. Band (Clamp the carburetor check valve oil hose #3.)

16-8 APPENDIX

Cable, Wire and Hose Routing

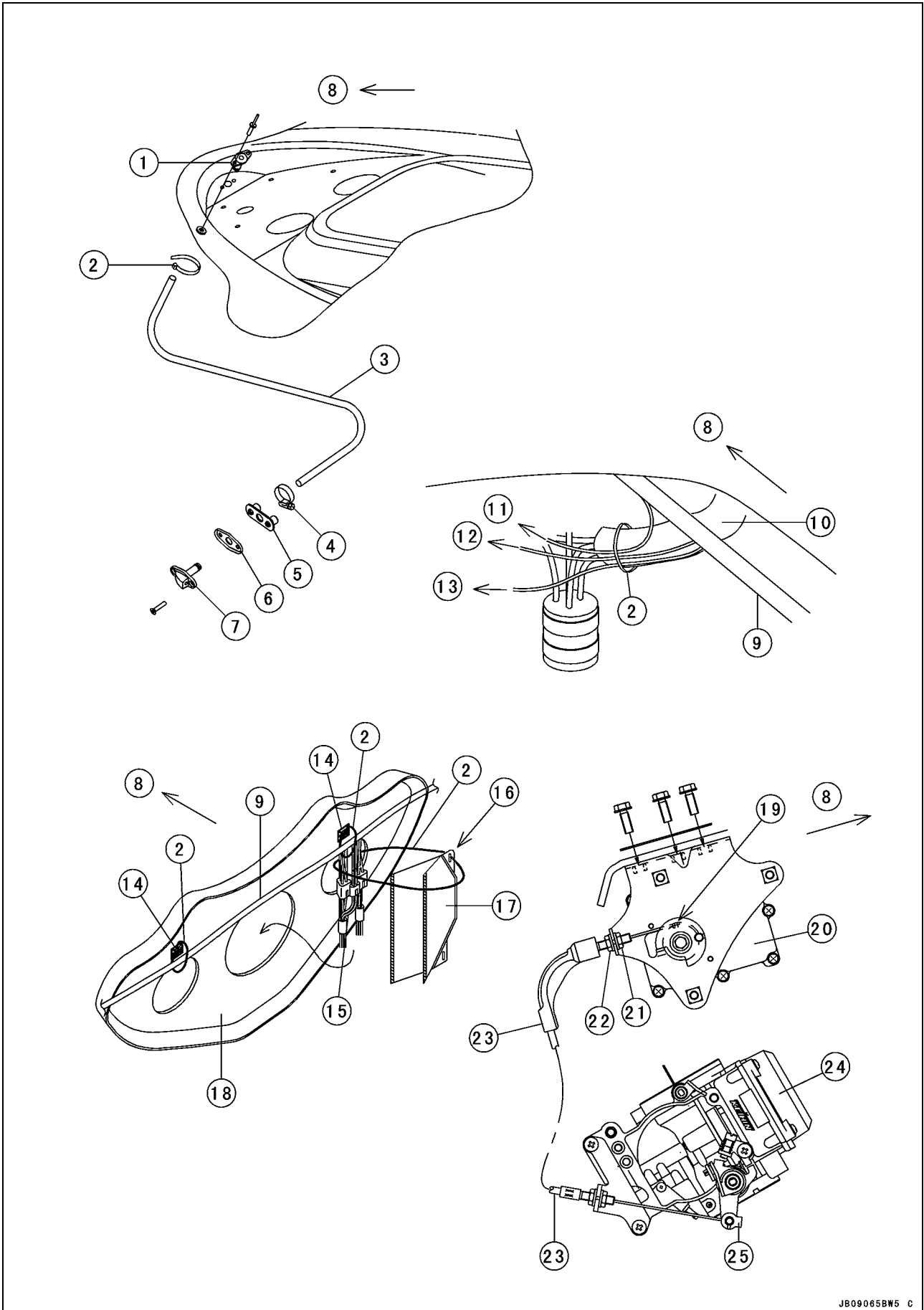


Cable, Wire and Hose Routing

1. Start/Stop Switch Leads
2. Throttle Cable
3. Steering Shaft
4. Handlebar
5. Cable Holder
6. Oil Pump Cable
7. Choke Cable
8. Carburetor Cable
9. Idle Adjust Screw
10. Carburetor
11. Oil Pump
12. Oil Pump Pulley
13. Be sure the cable portion indicated in the figure is in contact with the pulley portion indicated in the figure.
14. Pulse Hose (White marked side shall be installed to engine side.)
15. Band
16. Throttle Sensor
17. Fuel Hose (Return) Fitting
18. Fuel Hose (Supply) Fitting
19. Fuel Tap
20. Detent (Rubber)
21. Fuel Filter
22. RESERVE
23. ON
24. RETURN
25. VENT
26. Fuel Vent Check Valve (The arrow toward the fuel tank)
27. Fuel Level Sensor Assembly
28. Vent Tube
29. Vent Pipe
30. Band
31. Install the band after hanging the pipe to the steering shaft.
32. 30 mm (1.18 in.) (Insert length of vent pipe).
33. 2.5 mm (0.098 in.)
34. 7 mm (0.28 in.)
35. 7 mm (0.28 in.)
36. Viewed A
37. Detent (Plastic)
38. White Mark
39. Band (Clamp the cable holder.)
40. Apply a cyanoacrylate cement.

16-10 APPENDIX

Cable, Wire and Hose Routing

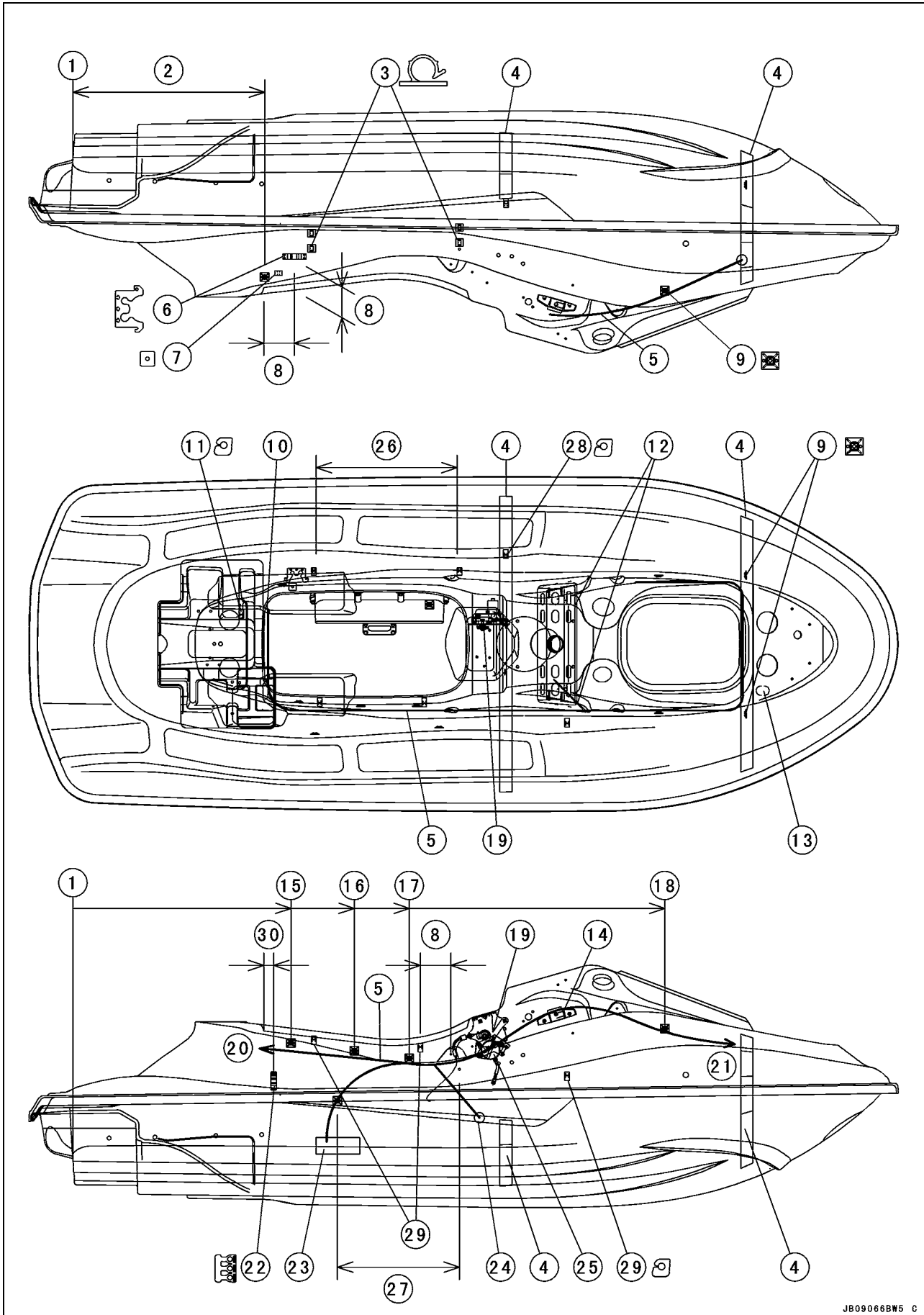


Cable, Wire and Hose Routing

1. Drain Plug
2. Band
3. Drain Tube
4. Clamp
5. Bracket
6. Gasket
7. Drain Plug
8. BOW
9. Main Harness
10. Tube
11. To the oil level gauge.
12. To the smart steering actuator.
13. To the water temperature sensor.
14. Detents
15. Meter Leads
16. Clamp the meter connector cover upside.
17. Meter Connector Cover
18. Bulkhead Stern Side
19. "UP" mark
20. Smart Steering Actuator
21. Locknut
22. Adjust Nut
23. Smart Steering Cable
24. Carburetor
25. Cable Lever

16-12 APPENDIX

Cable, Wire and Hose Routing



Cable, Wire and Hose Routing

1. Standard Point (Transom)
2. 570 mm (22.4 in.) from the standard point to the center of the detent.
3. Detents
4. Bulkhead
5. Main Harness
6. Detent for Fuel Filter
7. Detent for Inlet Air Temperature Sensor
8. 100 mm (3.94 in.)
9. Detent for Main Harness
10. Speed Sensor Connectors
11. Detent for Speed Sensor Lead
12. Tube
13. Holder for Multifunction Meter Leads
14. Run the main harness over the crossmember
15. 700 mm (27.6 in.) from the standard point to the center of the detent.
16. 900 mm (35.4 in.) from the standard point to the center of the detent.
17. 1100 mm (43.31 in.) from the standard point to the center of the detent.
18. 1950 mm (76.77 in.) from the standard point to the center of the detent.
19. Smart Steering Actuator
20. To Left Side
21. To Left Side
22. Detent
23. Rear Electric Case
24. Front Electric Case
25. Fuse Box
26. 470 mm (18.5 in.)
27. 400 mm (15.7 in.)
28. Detent
29. Detents
30. 60 mm (2.4 in.)

16-14 APPENDIX

Troubleshooting

Starting difficulty or failure to start

Ignition System

Ignition Spark Present

- Fault in fuel system
- Lack of compression

No Spark

- Faulty or fouled spark plug
- Faulty plug wire insulation
- Faulty CDI igniter
- Faulty ignition coil
- Faulty magneto
- Battery voltage low

Fuel System (check that fuel tank contains fuel)

Outside Carburetor

- Fuel feed line leaking or clogged
- Pulse line leaking or clogged
- Fuel filter screen clogged
- Vent line clogged
- Faulty fuel pump

Inside Carburetor

- Carburetor diaphragm damaged
- Water in carburetor
- Float arm not adjusted

Battery/Starter System

- Faulty magneto solenoid switch
- Battery voltage low
- Starter motor brushes worn
- Faulty starter clutch
- Ignition switch turned OFF and/or lanyard key not pushed under stop button

Engine starts but stops right away

Compression

- Faulty crankshaft oil seal
- Crankcase joint leak
- Worn piston and rings
- Head gasket leak
- Spark plug leak

Fuel System

Outside Carburetor

- Misuse of choke
- Fuel filter screen clogged

Troubleshooting

- Fuel feed line leaking or clogged
- Pulse line leaking or clogged
- Vent line clogged
- Faulty fuel pump

Inside Carburetor

- Water in carburetor
- Carburetor diaphragm damaged
- Float arm not adjusted

Electrical System

- Faulty or fouled spark plug
- Poor wiring connection
- Faulty magneto

Engine misfires, does not run smoothly

Fuel System

Fuel mixture too lean

Fault in Carburetor

- Obstruction in fuel passage or outlet
- Diaphragm leaking or damaged
- Float arm not adjusted

Other

- Poor fuel supply (fuel filter screens, hoses, or vent line clogged)
- Carburetor mounting loose
- Faulty fuel pump

Fuel mixture too rich

Fault in Carburetor

- Diaphragm needle dirty or damaged
- Float arm not adjusted
- Choke not adjusted

Other

- Flame arrester clogged

Electrical System

Other

- Ignition timing wrong

Weak Spark

- Reduced ignition coil output
- High voltage insulation breakdown
- Spark plug fouled
- Spark plug gap wrong
- Poor wiring connection, spark plug cap
- Faulty CDI igniter

16-16 APPENDIX

Troubleshooting

- Faulty magneto
- Battery voltage low

Engine Lubrication System

- Oil line clogged
- Faulty oil pump

Abnormal engine sound

During normal cruising

- Slight piston seizure
- Piston ring broken or sticking
- Main bearing worn or damaged

During sudden acceleration

- Excessive clearance between connecting rod small end and piston pin, or between pin and piston
- Excessive connecting rod big end clearance

Pinging

- Ignition timing too advanced
- Carbon accumulation in cylinder head
- Poor quality gasoline
- Spark plug wrong heat range

When the engine is idling while cold

- Excessive piston clearance
- Piston rings worn
- Piston worn
- Connecting rod bent, twisted

Low engine power (This trouble often has more than one cause, and trouble symptoms may not be clear)

Ignition System

- Spark plug gap or heat range wrong
- Ignition timing wrong
- Reduced ignition coil output
- Loose wiring connection in ignition circuit

Fuel System

- Insufficient fuel supply to carburetor
- Carburetor diaphragm damaged
- Pulse line leaking or clogged
- High speed nozzle clogged
- Throttle valve does not fully open
- Fuel filter screen clogged
- Faulty fuel pump

Troubleshooting

Other

- Flame arrester clogged
- Muffler or exhaust system clogged
- Water or foreign matter in gasoline or engine oil
- Exhaust gas leak in engine compartment

Overheating

- Ignition wrong
- Carburetor not adjusted
- Flame arrester or exhaust system clogged
- Carbon accumulation in combustion chamber
- Wrong type of gasoline or oil
- Obstruction in oil pump hoses
- Cooling water line leaking or clogged

Heavy Fuel Consumption

- Carburetor not adjusted
- Flame arrester clogged
- Muffler or exhaust system clogged
- Worn cylinder, piston or piston ring
- Fuel feed line leaking
- Carburetor diaphragm needle dirty or damaged

Poor performance though engine runs properly

Jet Pump

- Inlet area obstructed
- Impeller or pump case damaged
- Excessive clearance between impeller and pump case

Poor steering control (Since faulty steering is dangerous, this problem should be examined by an authorized Jet Ski dealer)

Handlebar hard to turn

- Steering maladjusted
- Bushings damaged or cracked
- Steering shaft bent
- No lubricant on steering pivot
- Steering cable damaged or improperly routed

MODEL APPLICATION

Year	Model	Beginning Hull No.
2003	JH1200-B1	KAW40001 ? 203
2004	JH1200-B2	KAW20001 ? 304
2005	JH1200-B3	US-KAW10001 ? 405

? :This digit in the hull number changes from one machine to another.