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Kawasaki

TJ27D



2-Stroke Air-Cooled Gasoline Engine
Service Manual

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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.

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TJ27D

2-Stroke Air-Cooled Gasoline Engine Service Manual

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All information contained in this publication is based on the latest product information available at the time of publication. Illustrations and photographs in this publication are intended for reference use only and may not depict actual model component parts.

LIST OF ABBREVIATIONS

A	ampere(s)	lb	pounds(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) per minute
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.

EMISSION CONTROL INFORMATION

To protect the environment in which we all live, Kawasaki has incorporated exhaust emission control systems (EM) in compliance with applicable regulations of the United States Environmental Protection Agency and California Air Resources Board.

Exhaust Emission Control System

The exhaust emission control system applied to this engine consists of a carburetor and an ignition system having optimum ignition timing characteristics.

The carburetor has been calibrated to provide lean air/fuel mixture characteristics and optimum fuel economy with a suitable air cleaner and exhaust system.

TAMPERING WITH EMISSION CONTROL SYSTEM PROHIBITED

Federal law and California State 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 purpose 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 part:

- Carburetor and internal parts
- Spark plug
- Magneto or electronic ignition system
- Fuel filter
- Air cleaner element

Foreword

This manual is designed primarily for use by trained mechanics in a properly equipped shop. However, it contains enough detail and 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 has doubts as to 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.

To get the longest life out of your equipment.

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki engine parts. 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

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 WARNING, CAUTION, or 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 the engine, carefully read the applicable section 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 required for successful work.

Especially note the following:

(1) Dirt

Before removal and disassembly, clean the engine. Any dirt entering the engine, carburetor, or other parts, will work as an abrasive and shorten the life of engine. For the same reason, before installing a new part, clean off any dust or metal filings.

(2) Tightening Sequence

Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them evenly, in a staggered sequence. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely when loosening the bolts, nuts, or screws, first loosen all of them by about a quarter of a turn and then remove them. Where there is a tightening sequence indication in this Service Manual, the bolts, nuts, or screws must be tightened in the order and method indicated.

(3) 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.

(4) 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 removal of screws held by a locking agent) in order to avoid damaging the heads.

(5) Edges

Watch for sharp edges, especially during major engine disassembly and assembly. Protect your hands with gloves or a piece of thick cloth when lifting the engine or turning it over.

(6) 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.

(7) Gasket, O-Ring

Do not reuse a gasket or O-ring once it has been in service. The mating surfaces around the gasket should be free of foreign matter and perfectly smooth to avoid oil or compression leaks.

(8) Liquid Gasket, Non-Permanent Locking Agent

Follow manufacturer's directions for cleaning and preparing surfaces where these compounds will be used. Apply sparingly. Excessive amounts may block engine oil passages and cause serious damage. An example of a non-permanent locking agent commonly available in North America is Loctite Lock'n Seal (Blue).

(9) Press

A part installed using a press or driver, such as a journal, should first be coated with oil on its outer or inner circumference so that it will go into place smoothly.

(10) Ball Bearing, 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 to the end of the race that contacts the press fit portion, and press it evenly over the base component.

(11) Oil Seal and Grease Seal

Replace any oil or grease seals that were removed with new ones, as removal generally damages seals.

When pressing in a seal which has manufacturer's marks, press it in with the marks facing out. Seals should be pressed into place using a suitable driver, which contacts evenly with the side of seal, until the face of the seal is even with the end of the hole.

Before Servicing

(12)Seal Guide

A seal guide is required for certain oil or grease seals during installation to avoid damage to the seal lips. Before a shaft passes through a seal, apply a little oil, preferably high temperature grease on the lips to reduce rubber to metal friction.

(13)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 running, leading to a problem.

(14)Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the rubbing surfaces have an adequate lubricative film. During assembly, oil or grease (whichever is more suitable) should be applied to any rubbing surface which has lost its lubricative film. Old grease and dirty oil should be cleaned off. Deteriorated grease has lost its lubricative quality and may contain abrasive foreign particles.

Don't use just any oil or grease. 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. This manual makes reference to molybdenum disulfide grease (MoS2) in the assembly of certain engine parts. Always check manufacturer recommendations before using such special lubricants.

(15)Electrical Wires

All the electrical wires are either single-color or two-color and, with only a few exceptions, must be connected to wires of the same color. On any of the two-color wires there is a greater amount of one color and a lesser amount of a second color, so a two-color wire is identified by first the primary color and then the secondary 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 to make red the main color.

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

GB020601W1 C

(16)Replacement Parts

When there is a replacement instruction, replace these parts with new ones every time they are removed. There replacement parts will be damaged or lose their original function once removed.

(17)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 | |

(18)Service Data

Service Data 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.

1-4 GENERAL INFORMATION

Model Identification



GENERAL INFORMATION 1-5**General Specifications**

Item	TJ27D
Type of Engine	Forced air cooled, 2-stroke, horizontal shaft, gasoline engine
Bore × Stroke	34 mm × 29 mm (1.34 in. × 1.14 in.)
Piston Displacement	26.3 mL (1.60 cu. in.)
Direction of Rotation	Counterclockwise facing the PTO shaft
Ignition System	Flywheel magneto transistor type
Starting System	Kar Recoil starter (Coil damper type)
Spark Plug	NGK BPMR6A
Clutch Type	Automatic centrifugal type
Clutch Drum Bore	Φ54
Carburetor	Diaphragm with starter button type (TZ11K-2A by TK)
Air Cleaner	Dry type
Dimensions (L × W × H)	167 mm × 217 mm × 231 mm (6.57 in. × 8.54 in. × 9.09 in.)
Dry Weight	2.3 kg (5.1 lbs)
Mixing Ratio	Regular unleaded gasoline 50 : 1 2 stroke engine oil (JASO-FC class)
Tank Capacity	0.6 L (0.63 US qt)

Specifications subject to change without notice.

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Periodic Maintenance

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2-2 PERIODIC MAINTENANCE

Periodic Maintenance Chart

⚠ WARNING

**Accidental engine starting can cause injury.
Always remove the spark plug cap from the spark plug before servicing the engine to prevent accidental starting.**

Maintenance	Interval				
	Daily	First 20 hours	Every 20 hours	Every 50 hours	Every 100 hours
Check and replenish fuel	•				
Check for fuel leakage	•				
Check bolts, nuts and screws for looseness and loss	•				
Clean fuel filter			•		
Clean fuel tank cap			•		
★ Clean air filter element			•		
Tighten bolts, nuts and screws		•		•	
Clean spark plug and adjust electrode gap				•	
★ Remove dust and dirt from cylinder fins				•	
K Remove carbon deposits on piston head and inside cylinder				•	
K Remove carbon deposits in the exhaust pipe of muffler				•	
Clean net of spark arrester				•	
K Check the sliding portion of crankshaft, connecting rod etc.					•
Fuel tube	It is recommended to replace every 3 years.				

NOTE

○ *The service intervals indicated are to be used as a guide.*

K: These items must be performed with proper tools. See your authorized Kawasaki dealer for service.

★: These items must be performed more frequently as necessary by operating condition.

PERIODIC MAINTENANCE 2-3

Tightening Torque

The following tables list the tightening torque for the major fasteners and the parts requiring use of a non-permanent locking agent or liquid gasket.

Letters used in the following "Tightening Torque" table mean.

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

LG: Apply a liquid gasket to the sealing surface.

Tightening Torque

Fasteners	Size	Torque			Remarks
		N·m	kgf·m	ft·lb	
Ignition Coil	M4	2.2	0.22	1.6 in·lb	
Recoil Starter	M4	1.8	0.18	1.3 in·lb	L
Crankcase	M5	3.7	0.38	2.7 in·lb	LG
Engine Shroud	M5	2.7	0.28	2.0 in·lb	L
Fan Housing	M5	3.7	0.38	2.7 in·lb	
Carburetor (Tighten with Air Cleaner Case)	M5	3.7	0.38	2.7 in·lb	
Insulator	M5	3.7	0.38	2.7 in·lb	L
Fuel Tank	M5	1.6	0.16	1.2 in·lb	L
Muffler	M5	3.7	0.38	2.7 in·lb	L
Cylinder	M5	3.7	0.38	2.7 in·lb	L
Clutch	M6	8.8	0.90	6.5 in·lb	L
Flywheel Nut	M8	15	1.50	11	
Starting Pulley	M6	15	1.50	11	
Spark Plug	M14	14	1.50	11	

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.

Basic Torque for General Fasteners

Threads dia (mm)	Torque		
	N·m	kgf·m	ft·lb
4	2.0	0.20	17 in·lb
5	3.4	0.35	30 in·lb
6	5.9	0.60	52 in·lb
8	15	1.5	11

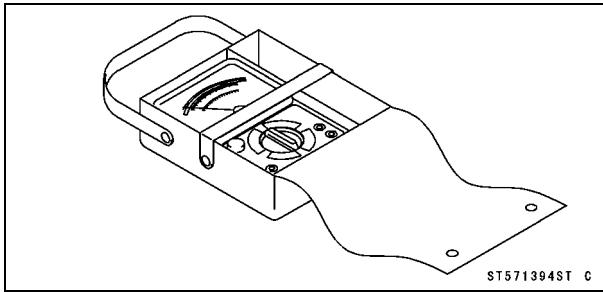
2-4 PERIODIC MAINTENANCE

Specifications

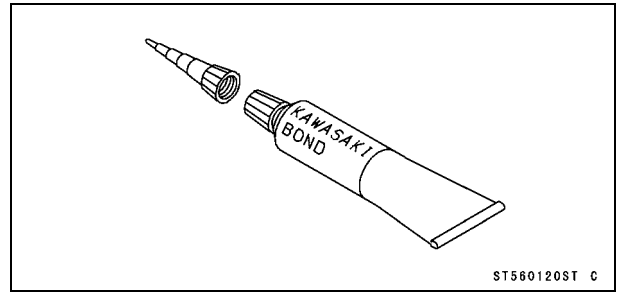
Item	Standard
Fuel System Maximum Speed Idling Speed Air Cleaner Type Carburetor Main Jet	Different depend on matching machine 3 000 ±200 r/min (rpm) Dry type #40
Electrical System Spark Plug Gap Ignition Coil Air-gap	0.6 ~ 0.7 mm (0.024 ~ 0.028 in.) 0.3 ~ 0.5 mm (0.012 ~ 0.020 in.)

Special Tools and Sealant

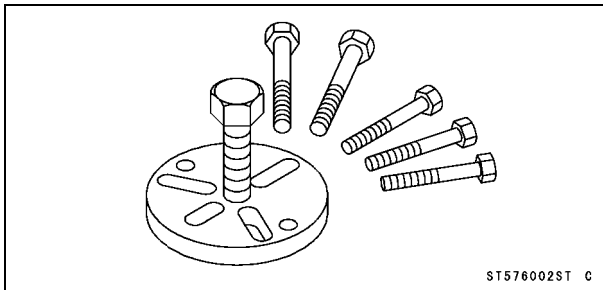
**Hand Tester:
57001-1394**



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



**Flywheel Puller:
57001-6002**



2-6 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Fuel System

Idling Speed Adjustment

- Start the engine and leave it running at idling speed to warm it up thoroughly.
- Adjust the throttle stop screw [A] until a stable running condition is obtained at the lowest speed possible.

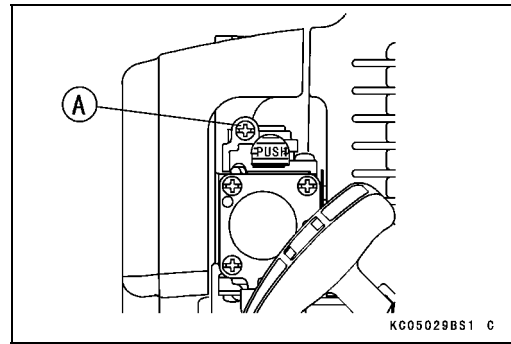
Idling Speed

3 000 ±200 r/min (rpm)

Throttle Stop Screw

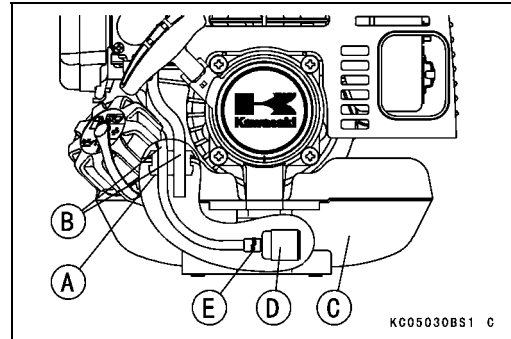
Turning clockwise: Revolution rises.

Turning counterclockwise: Revolution drops.



Fuel Tube Replacement

- Remove the fuel tube that they are assembled inlet pipe and outlet pipe on the carburetor.
- Remove the tank grommet [A] together with the fuel tubes [B] from the fuel tank [C].
- Remove the fuel filter [D] from the fuel tube.
- Replace the fuel tube with a new one, and through it to the grommet hole.
- Install the fuel filter to the long fuel tube, and fix it by the clamp [E].
- Insert on the part of installed fuel filter to the tank inside, and insert the fuel tube assembled tank grommet to the grommet hole on the fuel tank.

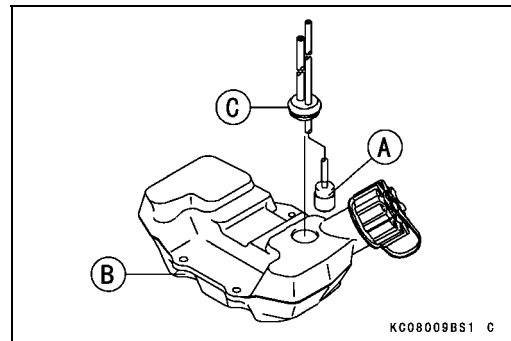


NOTE

- Apply a bit of 2-stroke engine oil to the grommet in order to make the insertion easy.

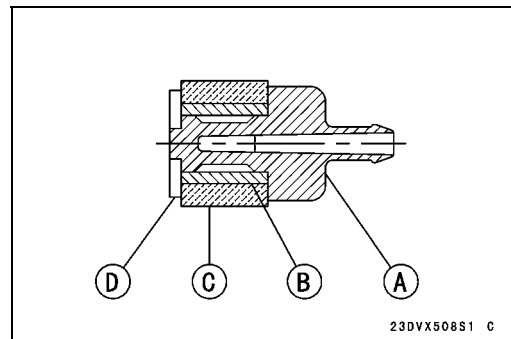
Fuel Filter Cleaning

- Remove the fuel filter [A] together with the grommet [C] from the fuel tank [B].
- Remove the fuel filter from the fuel tube (see Fuel Tank Removal in Fuel System chapter).
- The filter is caulked and unable to be disassembled.
- Clean the fuel filter in a bath of high-flash point solvent.
- Dry the fuel filter before installing as dust does not adhere.



- This fuel filter is double-filtration and prevents dirt from clogging in the foul passage inside the carburetor. If the filter gets foul, clean it in pure gasoline and apply air from the outlet of the filter body. If the filter is still foul, replace it with a new one.

- [A] Filter Body
- [B] Secondary Filter
- [C] Primary Filter
- [D] Washer



NOTE

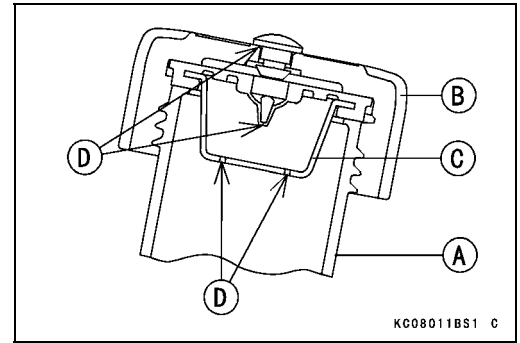
- If fuel does not flow better with the fuel filter cleaned, replace the fuel filter with a new one.

Periodic Maintenance Procedures

Fuel Tank Cap Inspection

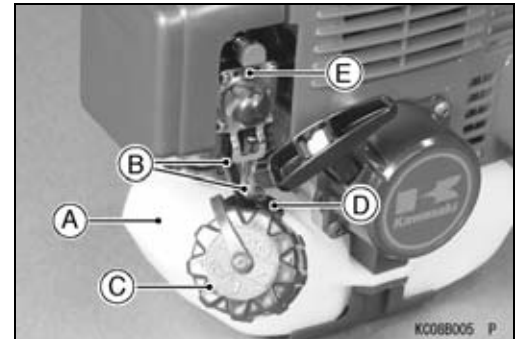
○The tank cap works as a lid for the fuel inlet. It also needs to work to keep the internal pressure of the fuel tank [A] equal to the atmospheric pressure in order to prevent poor fuel flow caused by internal pressure drop (or rise) because of fuel use for operation or temperature change. For this purpose both the tank cap [B] and the breather [C] have an air vents [D] as shown in the figure.

★When cleaning the fuel tank inside, check to see if no clogging is found in the air vents and breather passage. If found, clean or replace the parts.

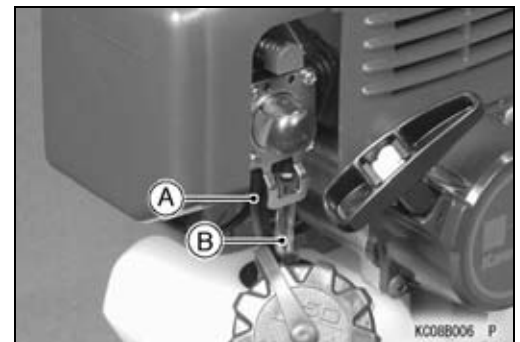


Fuel Leakage Inspection

● Visually inspect for the crack, split and fuel leakage on the fuel tank [A], fuel tubes [B], tank cap [C], tank grommet [D] and carburetor [E].



● Be sure that the inlet tube [A] and overflow tube [B] install lightly into the pipe on the carburetor.

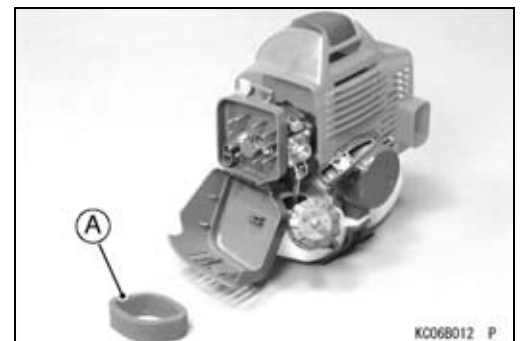


Air Cleaner Element Inspection and Cleaning

- Remove the air cleaner element [A] (see Air Cleaner Removal in Fuel System chapter).
- Visually inspect for the stain in the element.
- Clean the air cleaner element with an approved high-flash point solvent only.
- ★ If the element is very stain, replace it with a new one.

NOTE

○Operating in dusty condition may require more frequent maintenance than above.



CAUTION

Improper element cleaning can result in engine damage. Do not use compressed air to clean or dry element. Do not oil the element.

CAUTION

Do not operate engine with air cleaner parts removed.

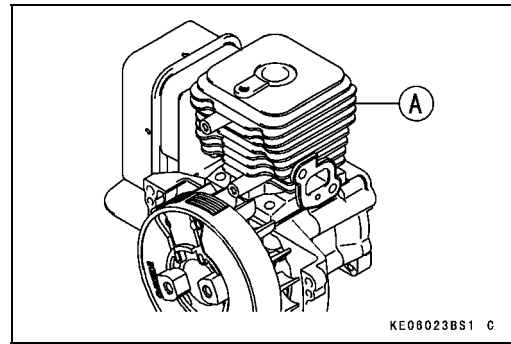
2-8 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

Engine Top

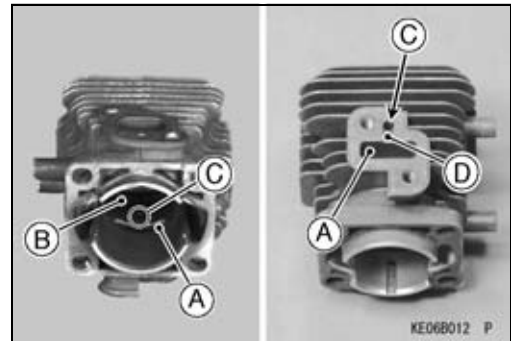
Cylinder Fins Cleaning

- Remove:
 - Air Cleaner (see Air Cleaner Removal in Fuel System chapter)
 - Carburetor (see Carburetor Removal in Fuel System chapter)
 - Muffler (see Muffler Removal in Engine Top chapter)
 - Engine Shroud (see Cylinder Removal in Engine Top chapter)
 - Fan Housing (see Flywheel Removal in Electrical System chapter).
 - Ignition Coil (see Ignition Coil Removal in Electrical System chapter)
- Remove the muffler (see Muffler Removal in Engine Top chapter).
- Clean the cylinder fins [A] with a wire brush or compressed air.



Cylinder Cleaning

- Remove the cylinder (see Cylinder Removal in Engine Top chapter).
- Scrape the carbon deposits inside the cylinder exhaust hole [A], combustion chamber [B], decompression hole [C] and decompression slot [D] with a suitable tool.



Piston Cleaning

- Remove the piston and piston rings (see Piston Removal in Engine Top chapter).

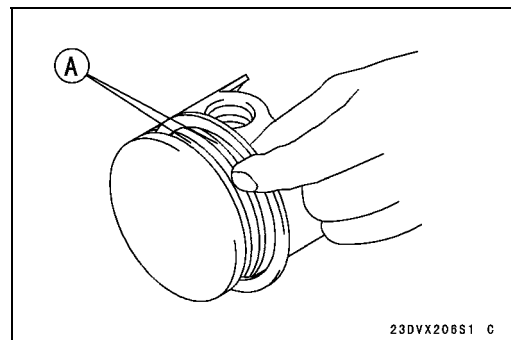
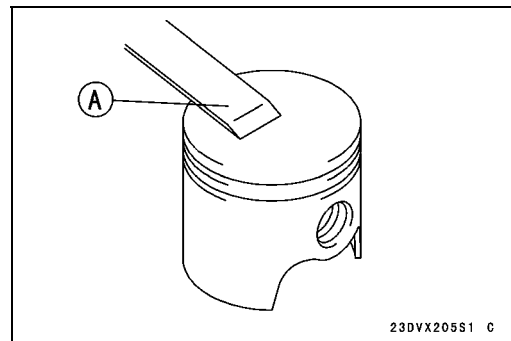
CAUTION

Never clean the piston head with the engine assembled. Carbon particles will fall between the piston and cylinder, and damage the crankshaft bearing.

- Scrape the carbon off the piston head, using a scraper [A] that made of a material that will not cause damage.
- Clean the piston ring grooves [A] with a broken piston ring or other suitable tool.

CAUTION

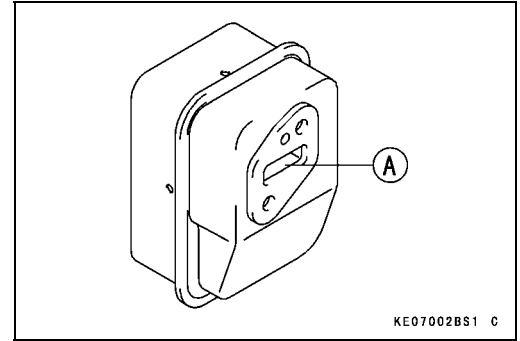
Be careful not to widen the ring grooves. Damaged ring grooves will require piston replacement.



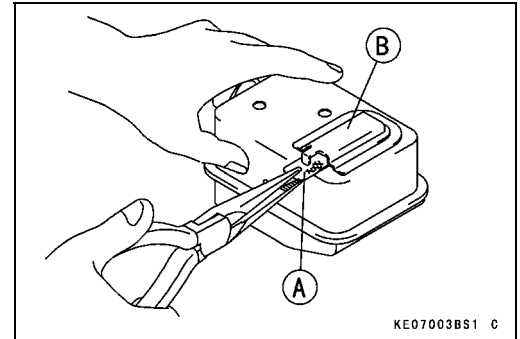
Periodic Maintenance Procedures

Muffler Cleaning

- Remove the muffler (see Muffler Removal in Engine Top chapter).
- Scrape the carbon off the exhaust pipe [A] with a wire brush.



- Remove the spark arrester [A] from the exhaust pipe of muffler [B].
- Clean the spark arrester screen by brushing it.
- Install the spark arrester.



Crankshaft

Crankshaft, Connecting Rod Inspection

- Remove the crankshaft (see Crankshaft Removal in Crankshaft chapter).
- Visually inspect for the damage on the crankshaft and connecting rod.
- ★ If the crankshaft or connecting rod are damaged, replace them with a new one.
- Install the crankshaft to the crankcase.
- After assembly, turn the crankshaft by hand to make sure that it turns lightly.

2-10 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

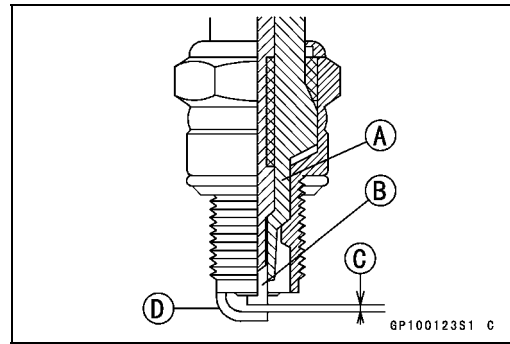
Electrical System

Spark Plug Cleaning and Inspection

- Remove the spark plug (see Spark Plug Removal in Electrical System chapter).
- ★ If the plug is oily or has carbon build up on it, clean the plug using a high-flash point solvent and a wire brush or other suitable tool.
- ★ If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the spark plug with a new one. Use the standard spark plug or its equivalent.

- [A] Insulator
- [B] Center Electrode
- [C] Plug Gap
- [D] Side Electrode

Standard: NGK BPMR6A



Spark Plug Gap Inspection and Adjustment

- Measure the plug gap [C] of the center electrode [B] and/or side electrode [D] are regulation range with a wire-type thickness gauge.

Spark Plug Gap

Standard: 0.6 ~ 0.7 mm (0.024 ~ 0.028 in.)

- When spark plug gap is except standard, adjustment side electrode is bent carefully.
- Install the spark plug(see Spark Plug Installation in Electrical System chapter).
- Pull up the spark plug cap lightly to make sure of the installation of the spark plug cap.

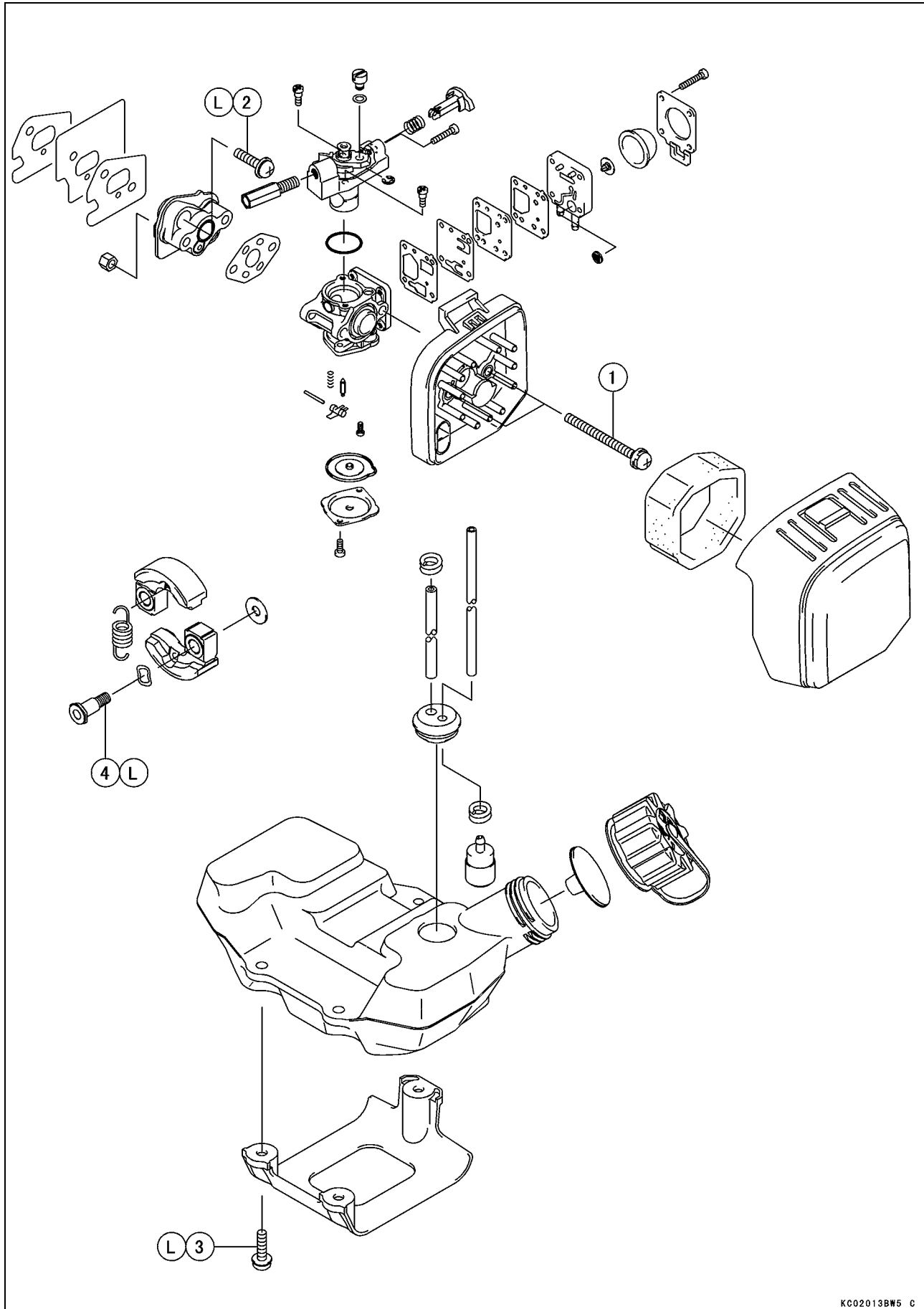
Fuel System

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3-2 FUEL SYSTEM

Exploded View



KG02013BW5 C

Exploded View

No.	Item	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Carburetor Mounting Screws	3.7	0.38	2.7 in·lb	
2	Insulator Mounting Screws	3.7	0.38	2.7 in·lb	L
3	Fuel Tank Mounting Screws	1.6	0.16	1.2 in·lb	L
4	Clutch Pins	8.8	0.90	6.5 in·lb	L

L: Apply non-permanent locking agent.

3-4 FUEL SYSTEM

Specifications

Item	Standard
Carburetor Make/type Main Jet (MJ)	TK TZ11K-2A #40
Idling Speed Idling speed	3 000 ±200 r/min (rpm)
Air Cleaner Type	Dry type

Idling speeds may vary depending on each mounting equipment. Refer to the mounting equipment specification.

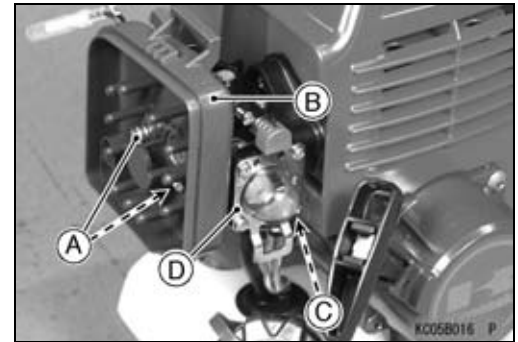
Carburetor

Idling Speed Adjustment

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

Carburetor Removal

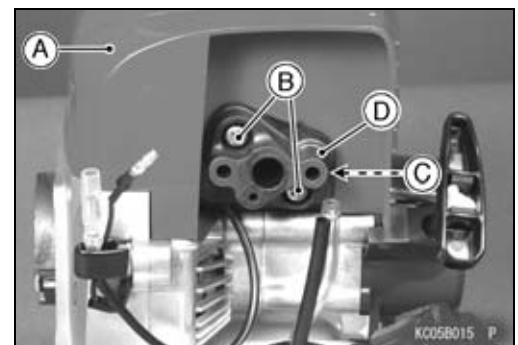
- Remove:
 - Air Cleaner Cap (see Air Cleaner Removal in this chapter)
 - Air Cleaner Element (see Air Cleaner Removal in this chapter)
- Remove the fuel tubes from the carburetor (see Fuel Tank Removal in this chapter).
- Unscrew the carburetor mounting screws [A] and remove the air cleaner case [B] and gasket [C] together with the carburetor [D].



NOTE

○Do not remove the carburetor if not needed.

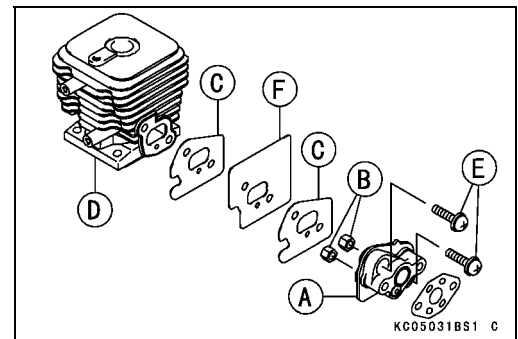
- Remove the engine shroud [A] (see Cylinder Removal in Engine Top chapter).
- Unscrew the insulator mounting screws [B] and remove the gasket and plate [C] together with the insulator [D] and gasket.



Carburetor Installation

- If the insulator [A] is removed, apply a non-permanent locking agent to the mounting screws, and fit the screw to round seat and nuts [B] to the hexagonal seats in the insulator.
- Put the new insulator gasket [C] and plate [F] to the nut side of the insulator and install the new insulator gasket [C] and insulator to the cylinder [D].
- Tighten the insulator mounting screws [E].

Torque - Insulator Mounting Screws: 3.7 N·m (0.38 kgf·m, 2.7 in·lb)



CAUTION

Engine pulse hole must align to prevent the engine malfunction or hard starting from the gap between the pulse hole of the gaskets, insulator, and cylinder.

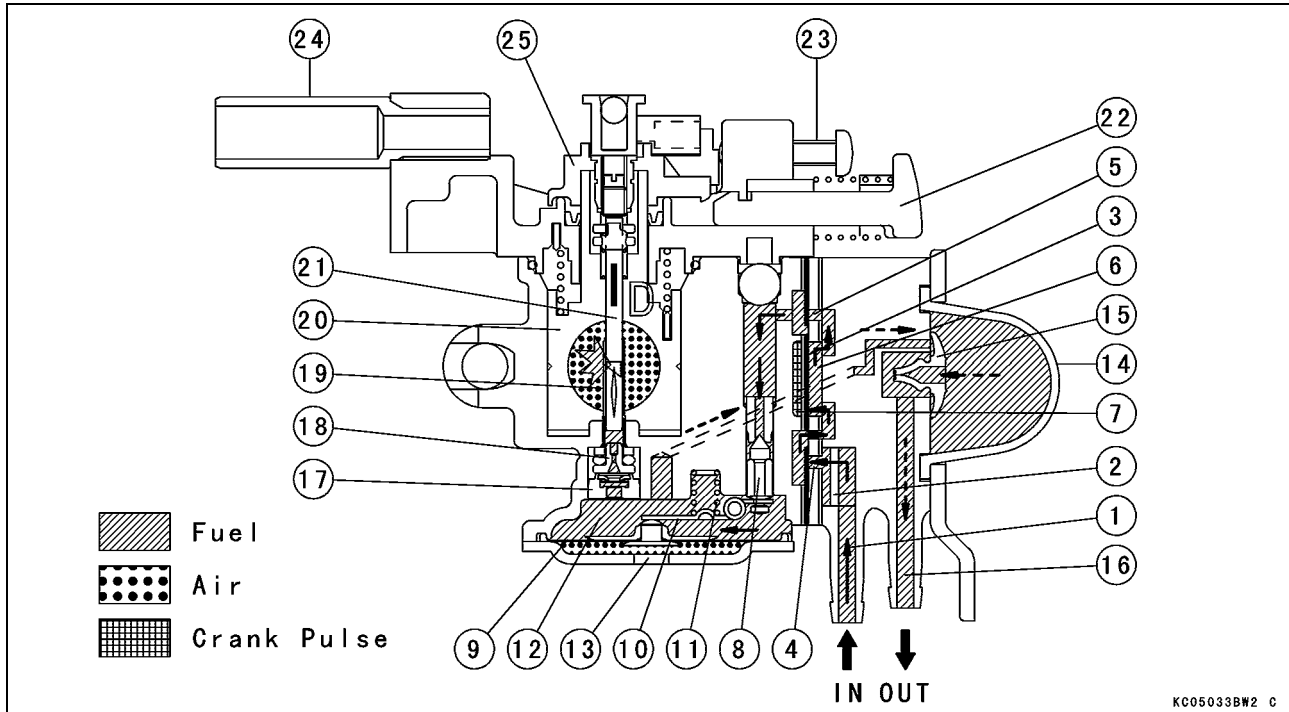
- Replace the carburetor gasket with a new one and install the carburetor gasket, carburetor and air cleaner case.

Torque - Carburetor Mounting Screws: 3.7 N·m (0.38 kgf·m, 2.7 in·lb)

- Install the air cleaner element and air cleaner cap (see Air Cleaner Installation in this chapter).

3-6 FUEL SYSTEM

Carburetor



KC05033BW2 C

- | | |
|--------------------------|------------------------------|
| 1. Fuel Inlet Port | 14. Priming Pump |
| 2. Filter | 15. Priming Pump Check Valve |
| 3. Pump Diaphragm | 16. Fuel Outlet Port |
| 4. Inlet Check Valve | 17. Main Check Valve |
| 5. Outlet Check Valve | 18. Main Jet |
| 6. Pump Chamber | 19. Needle Jet |
| 7. Pulse Chamber | 20. Throttle Valve |
| 8. Needle Valve | 21. Jet Needle |
| 9. Main Diaphragm | 22. Starter Button |
| 10. Control Lever | 23. Idle Adjust Screw |
| 11. Control Lever Spring | 24. Cable Adjuster |
| 12. Metering Chamber | 25. Throttle Lever |
| 13. Air Vent | |

Function of each Portion

1. Fuel inlet port
Fuel inlet from the fuel tank
2. Filter
Prevention of penetration of dirt in fuel
3. Pump diaphragm
Pump diaphragm is actuated by the engine pulse, that is, the alternating positive-negative pressure in crank case which is caused by the reciprocating motion of piston in engine, and by this operation fuel is sucked through fuel inlet and fed under pressure to needle valve.
4. Inlet check valve
This valve set at a part of pump diaphragm works with operation of the pump diaphragm and opens for only fuel flow into pump chamber.
5. Outlet check valve
This valve set at a part of pump diaphragm also works with operation of the pump diaphragm, but opens for only fuel delivery from pump chamber.
6. Pump chamber
This chamber is formed between the pump diaphragm and pump cover, and volume of the chamber is increased and decreased by operation of pump diaphragm. Fuel enters the chamber as the chamber volume increases and drains from the chamber as the volume decreases.

Carburetor

7. Pulse chamber
This chamber is formed between pump diaphragm and a part of the carburetor body at the opposite side of the pump chamber. The engine pulse to actuate pump diaphragm is introduced into this chamber.
8. Needle valve
This valve, moving along with the operation of main diaphragm, controls fuel flow from fuel pump into metering chamber.
9. Main diaphragm
Main diaphragm is pulled up towards the carburetor body by the engine inlet pressure (negative pressure) applied through needle jet from the carburetor venturi, and this movement opens needle valve through control lever.
10. Control lever
Control lever transmits the movement of main diaphragm to needle valve linked with the lever.
11. Control lever spring
This spring works to keep control lever in contact with main diaphragm.
12. Metering chamber
This chamber is formed between main diaphragm and the carburetor body, and performs functions of drawing fuel into the chamber and keeping fuel in the chamber at constant volume by the operation of the diaphragm.
13. Air vent
To make the diaphragm movement smooth, the hole is exposed to the atmosphere.
14. Priming pump
Pushed repeatedly by hand, the pump sucks fuel into the metering chamber from the fuel tank and discharges the air.
15. Priming pump check valve
This valve works with the operation of priming pump and opens for only flow from metering chamber to fuel outlet.
16. Fuel outlet port
Overflow of fuel sucked up from metering chamber by operating priming pump drains through this outlet and flows back into the fuel tank.
17. Main check valve
During priming pump operation, the valve prevents air from entering the metering chamber through the nozzle.
18. Main jet
Fuel at high speed is controlled.
19. Needle jet
Fuel jet hole. Fuel in metering chamber is drawn by the negative pressure in the carburetor venturi, flows out of needle jet through main adjust screw portion, and is sucked into the engine cylinder in form of air-fuel mixture.
20. Throttle valve
Throttle valve controls the air/fuel mix supplied to the engine and controls engine output.
21. Jet needle
Jet needle is installed to throttle valve, and the opening area between this needle and needle jet changes with the movement of the throttle valve.
22. Starter button
Increase the air and fuel when the engine starts.
23. Idle adjust screw
Turning this screw changes minimum opening of throttle valve to adjust the idling speed of the engine.
24. Cable adjuster
This is a sort of hollow bolt of adjusting play of the throttle wire.
25. Throttle lever
Throttle valve and jet needle are moved at the same time with the throttle lever.

3-8 FUEL SYSTEM

Carburetor

Operation of Carburetor

Priming Pump System

When starting the engine, by pushing the priming pump, air is pushed out toward the overflow pipe from the priming check valve, which causes negative pressure inside the metering chamber and the needle valve opens. Then fuel from the fuel tank is sucked into the metering chamber through the inlet check valve and then into the priming pump. And excessive fuel is discharged from the overflow pipe. This operation is called "Priming operation at starting."

Starter System

This carburetor has a starter button instead of choke lever. The quantity of air and fuel increases by pushing the starter button after the priming operation. As a result, it becomes easy to start the engine.

Fuel Pump System

After starting the engine, part of pressure change inside the crankcase caused by engine revolution is transmitted to the pump diaphragm through the engine pulse passage, which deforms the pump diaphragm and it starts reciprocating motion. Namely, fuel is sucked from the tank into the carburetor under pressure by volume change due to the pump diaphragm's reciprocating motion and the inlet and the outlet check valves function.

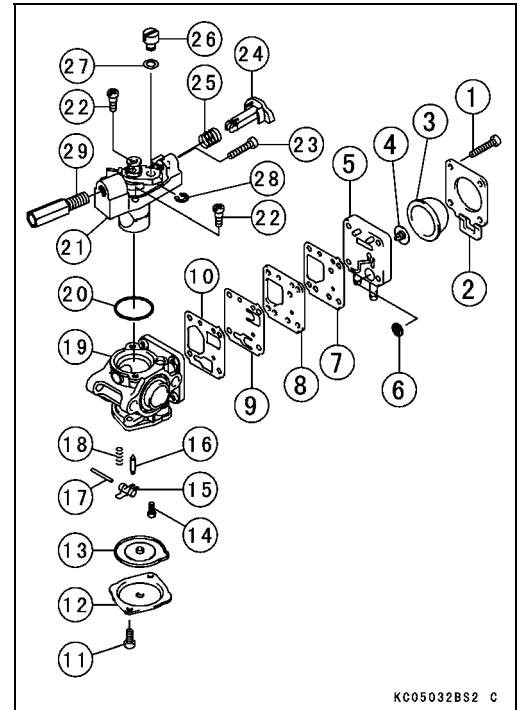
Metering Chamber System

The main diaphragm forming the metering chamber senses inside fuel pressure change of the metering chamber, which occurs in accordance with the engine revolution change, as vertical motion. And it works to keep a uniform pressure (equivalent to the fuel surface of a float type carburetor) inside the metering chamber by opening and closing the needle valve.

Fuel in the metering chamber is drawn by the negative pressure in the venturi, blown out from the main nozzle, mixed with air passed through the venturi and sucked into the engine. When the engine stops, negative pressure in the venturi becomes zero; the control lever is pushed up with the valve spring; and the needle valve closes. Then fuel flow stops and overflow is prevented.

Carburetor

1. Plate Screw
2. Plate
3. Priming Pump
4. Priming Pump Check Valve
5. Air Purge Body
6. Filter
7. Gasket
8. Pump Plate
9. Pump Diaphragm
10. Gasket
11. Diaphragm Cover Screw
12. Diaphragm Cover
13. Main Diaphragm
14. Lever Pin Screw
15. Control Lever
16. Needle Valve
17. Lever Pin
18. Valve Spring
19. Carburetor Body
20. O-ring
21. Throttle Valve Assy
22. Throttle Collar Screw
23. Idle Adjust Screw
24. Starter Button
25. Spring
26. Lever End
27. Washer
28. Snap Ring
29. Cable Adjuster



Carburetor Disassembly

Before disassembling, clean the carburetor with a high-flash point solvent so that no dirt enters the carburetor.

- Remove the 2 throttle-collar screws to remove the throttle valve assembly and O-ring from the carburetor body.

CAUTION

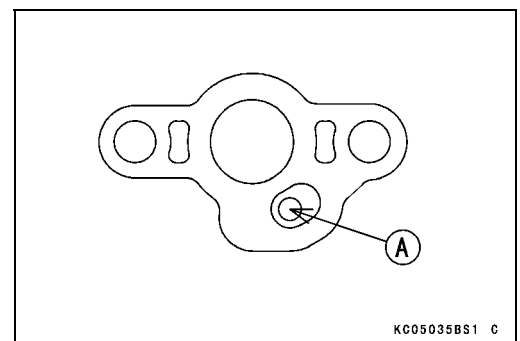
Do not disassemble the throttle valve assembly.

- Remove 4 plate screws.
- Remove the plate, priming pump, air purge body, gasket, plate, pump diaphragm and gasket in that order.

- Blow air against pulse hole [A] to see if pulse passage is not clogged, and confirm outflow of air from the other side of the passage.

CAUTION

Do not remove the main nozzle as it is press fitted. If much dirt is found inside the carburetor, especially on the inlet screen, clean the fuel tank inside and replace the fuel filter.



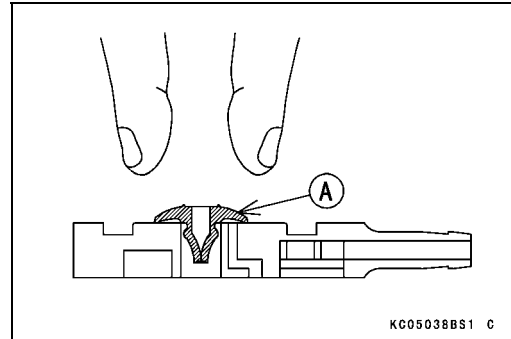
3-10 FUEL SYSTEM

Carburetor

- Unscrew the diaphragm cover screws, and remove the diaphragm cover and main diaphragm. Check to see if main diaphragm is not rapped. If the diaphragm or gasket is damaged, replace with new parts.
- Unscrew the lever pin screw, and remove the control lever, lever pin, needle valve, and spring.

Priming pump check valve removal

- Do not remove check valve installed into priming pump cover normally. If it is removed because of clogging with dust and so on, take care not to damage seat surface to check valve and contact area of the valve.
- When removing the check valve, do not use tip of screwdriver, metal and the like.
- When replacing the priming pump check valve installed on the air purge body, pinch the check valve [A] with care so that it does not get damage.



Carburetor Inspection

- Clean the carburetor with cleaning oil and apply air.
- Check and see that no dirt or corrosion is found in the main jet. If dirt is found, clean and apply air. If corrosion is found, replace the main jet with a new one.
- As to the gaskets, check to see if no deformation or damage is found. If deformation or damage is found, replace them with new ones.
- Check the pump diaphragm to see if no damage or hardening is found. Check the inlet check valve and the outlet check valve in particular and make sure that they are flat and not bent.
- ★ If they are bent, replace them with new ones.
- Check the main diaphragm to see if there is any peeling, damage or aluminum plate bend.
- ★ If there is any, replace it with a new one.
- ★ After cleaning the pump body, check to see that the control lever functions well and the lever height is correct. Also check to see that the main check valve works well and that no dirt is found on the inlet screen.

CAUTION

Do not use compressed air the valve.

Carburetor

Main check valve function check

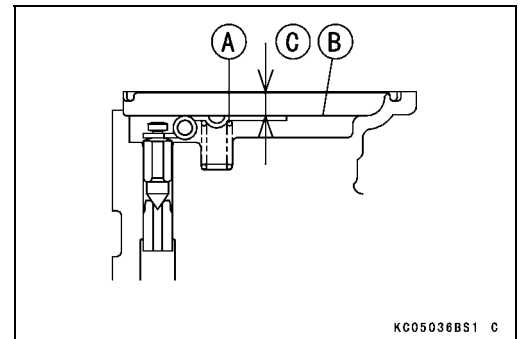
- To check function of the main check valve, stick vinyl pipe end to the main check valve and breather in and out from the other end.
- ★ If the valve opens when breathing in and closes when breathing out, the valve functions well.
- If any problems are found, soak the valve in gasoline for about 10 minutes and repeat breathing in and out several times.
- ★ If no improvement shows, replace the pump body with a new one.

Control lever function check and needle valve wear

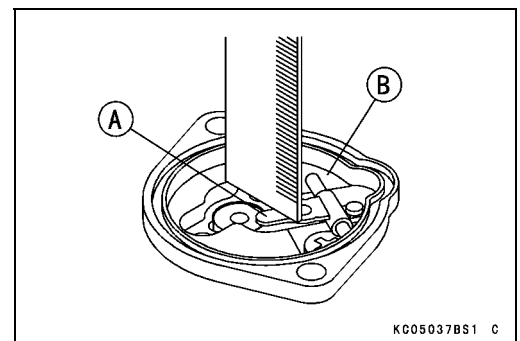
- Push the tip end of the control lever lightly and make sure that the lever moves smoothly.
- ★ If the needle valve, which opens and closes with the control lever movement, has got some damage on its tip end or wear due to its long use, applying air to the tip end of the needle valve will not be the solution for overflow.
- ★ In this case, replace the pump body assembly with a new one.

Control lever height adjustment

- Adjust the control lever [A] so as to be at the same level as the bottom of the metering camber [B] as shown in the figure. Adjust the lever to be from 2.5 mm (0.099 in.) to 2.7 mm (0.106 in.) [C] with the pump body surface as standard.



- Use ruler etc. as a simple method to check the control lever height as shown. If necessary, adjust by bending the lever slightly.
Control Lever [A]
Plate [B]



Carburetor Assembly

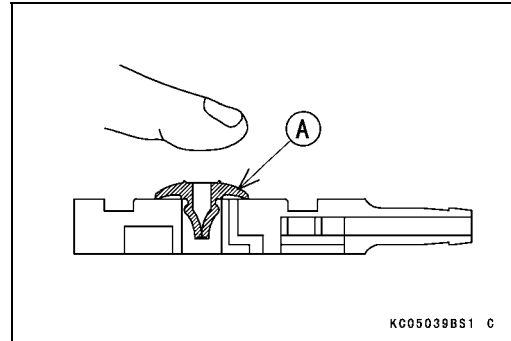
Before assembling, clean the carburetor with a high-flash point solvent so that no dirt enters the carburetor.

3-12 FUEL SYSTEM

Carburetor

Priming pump check valve installation

When reinstalling the priming pump check valve, apply oil lightly to the valve and push the tip end of the valve lightly into the air purge body hole. Put the valve in the hole by pushing the center of the check valve [A] hard and turning the center right and left with thumb as shown.



- Install the pump gasket, pump diaphragm, pump plate, gasket, air purge body, priming pump, and priming pump cover onto the carburetor body.
- Install the control lever spring, needle valve, control lever and control lever pin, and fix pin with screw. Push tip of control lever lightly to check the smooth movement of the lever.
- Check the control lever height (see Control lever height adjustment in this chapter).
- Install the throttle valve assembly onto the carburetor body (take care about the installing direction) and tighten the two throttle collar screws.

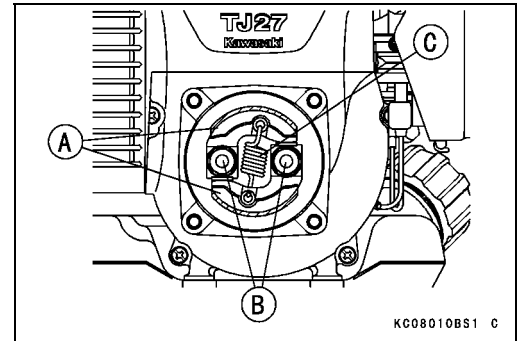
Carburetor Adjustment

Adjustment is not normally necessary. But if the engine runs in an unstable condition, see Troubleshooting in this chapter.

Clutch

Clutch Removal

- Keeping the clutch shoes [A] from turning by using a pair of pliers, release the clutch pins [B] by turning counter-clockwise to remove the clutch assembly.
- Take care not to scratch the clutch shoes [A].
- Do not remove the clutch spring [C] if not needed.



Clutch Installation

- Apply locking agent to screw threads of the clutch pins.
- Apply bit of heat resisting grease to the clutch-pin holes.
- Put the clutch shoes and the plate on the flywheel with raised letter such as R54 toward you to install them by tightening the clutch pins to the specified torque.

Torque - Clutch Pins: 8.8 N·m (0.90 kgf·m, 6.5 in·lb)

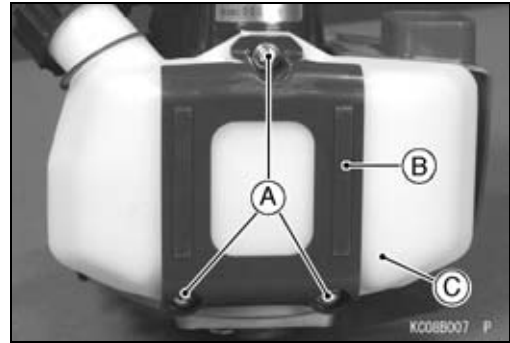
- Install the clutch spring to the clutch shoes before installing the clutch shoes on the flywheel if the clutch spring is removed.

3-14 FUEL SYSTEM

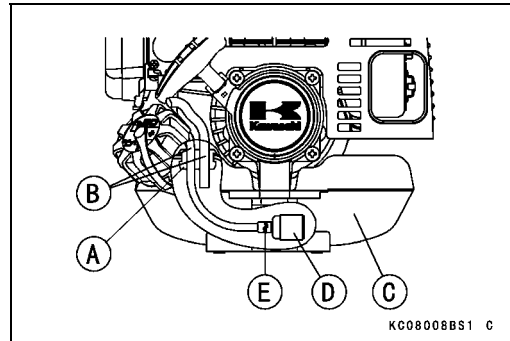
Fuel Tank

Fuel Tank Removal

- Unscrew the fuel tube clamps and remove the fuel tubes.
- Unscrew the screws [A] and remove the stand [B] and the fuel tank [C].



- Remove the tank grommet [A] together with the fuel tubes [B] from the fuel tank [C].
- Remove the clamp [E] and remove the fuel filter [D] from the fuel tube.



Fuel Tank Installation

- Install the fuel filter to the long fuel tube, and fix it by the clamp [A].
- Insert on the part of installed fuel filter to the tank inside, and insert the fuel tube assembled tank grommet [B] to the grommet hole on the fuel tank.

NOTE

○Apply a bit of 2-stroke engine oil to the grommet in order to make the insertion easy.

- Install the grommet as raised letter face to the fuel tank outside.
- Apply a non-permanent locking agent to the stand mounting screws, and install the fuel tank.

Torque - Fuel Tank Mounting Screws: 1.6 N·m (0.16 kgf·m, 1.2 in·lb)

- Fix the fuel tube to the carburetor by the clamp.

Fuel Tube Replacement

- Refer to the Fuel Tube Replacement in Periodic Maintenance chapter.

Fuel Filter Cleaning

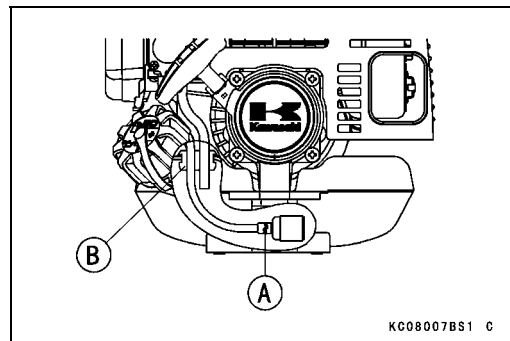
- Refer to the Fuel Filter Cleaning in Periodic Maintenance chapter.

Fuel Tank Cap Inspection

- Refer to the Fuel Tank Cap Inspection in Periodic Maintenance chapter.

Fuel Leakage Inspection

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



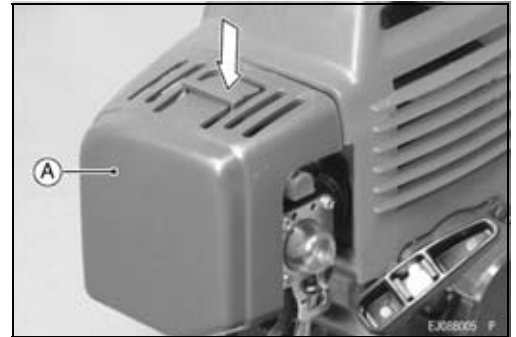
Air Cleaner

Air Cleaner Element Inspection and Cleaning

- Refer to the Air Cleaner Element Inspection and Cleaning in Periodic Maintenance chapter.

Air Cleaner Removal

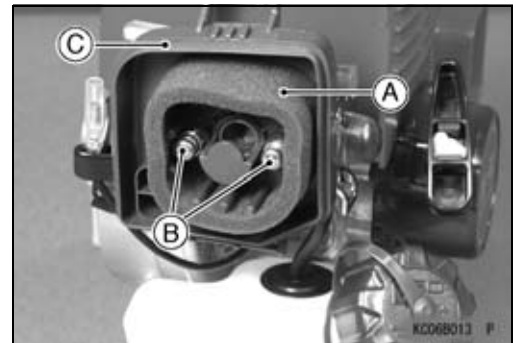
- Pushing down the hook, remove the air cleaner cap [A].



- Remove the air cleaner element [A].
- Unscrew the carburetor mounting screws [B] to remove the air cleaner case [C].
- Check to see that no dirt is found in the air cleaner case.
- ★ If dirt is found, clean it.

NOTE

○ Do not remove the carburetor if not needed.



Air Cleaner Installation

- Install the air cleaner case and tighten with the screws.
Torque - Carburetor Mounting Screws: 3.7 N·m (0.38 kgf·m, 2.7 in·lb)
- Install the air cleaner element and air cleaner cap.

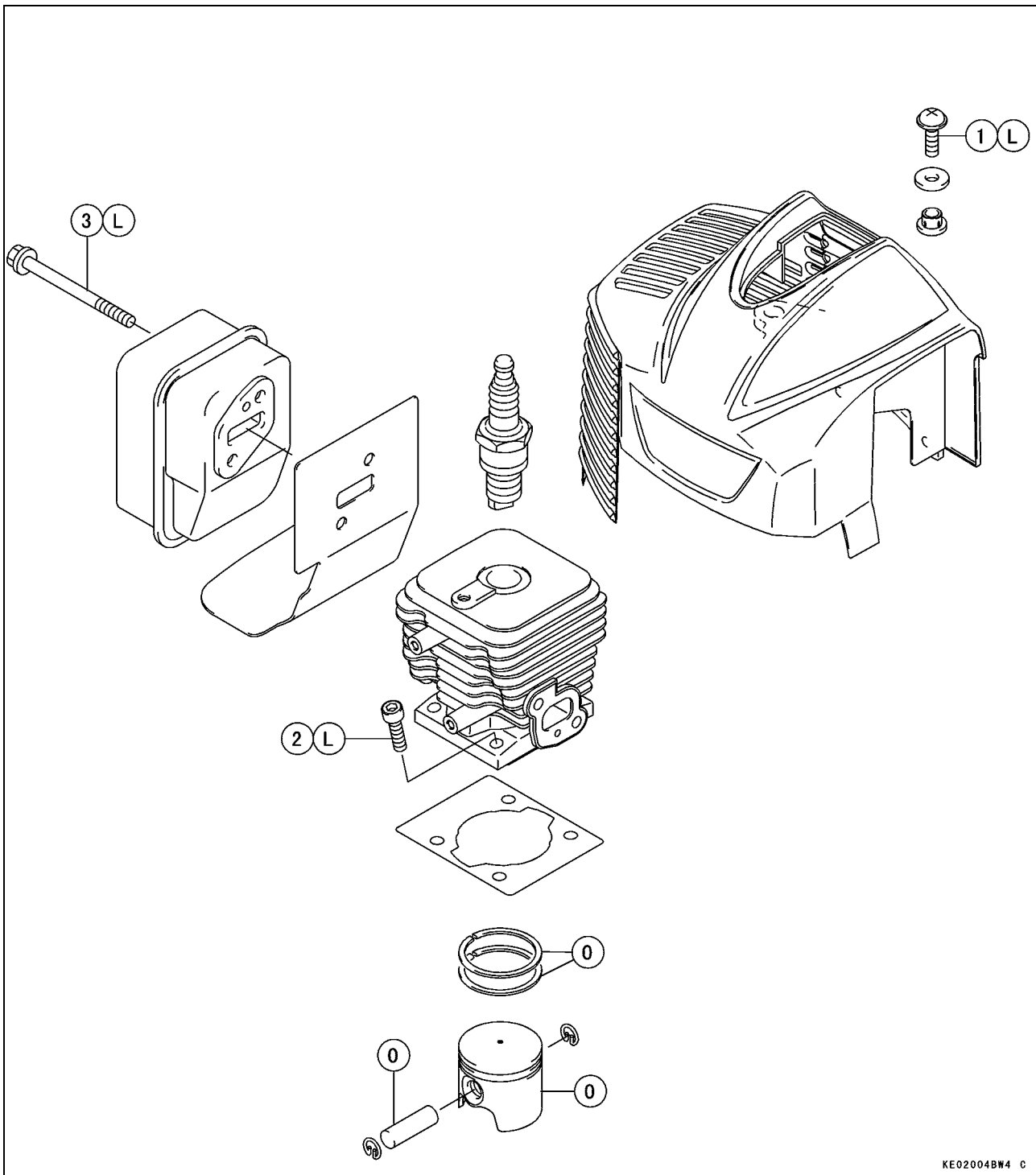
Engine Top End

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4-2 ENGINE TOP END

Exploded View



Exploded View

No.	Item	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Shroud Mounting Screw	2.7	0.28	2.0 in·lb	L
2	Cylinder Bolts	3.7	0.38	2.7 in·lb	L
3	Muffler Mounting Bolts	3.7	0.38	2.7 in·lb	L

L: Apply non-permanent locking agent.

O: Apply engine oil.

4-4 ENGINE TOP END

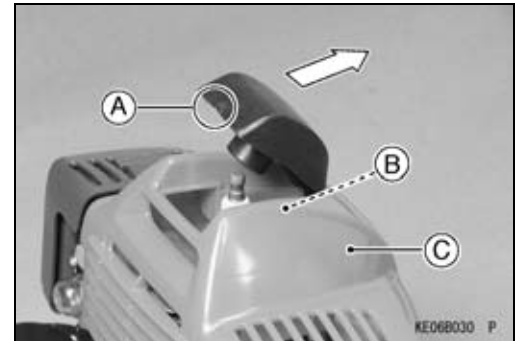
Specifications

Item	Service Limit
Cylinder, Piston	
Cylinder Bore	34.1 mm (1.342 in.)
Piston-to-cylinder Clearance	0.15 mm (0.0059 in.)
Piston Ring-to-goove Clearance	0.17 mm (0.0067 in.)
Piston Ring End-gap	0.7 mm (0.0028 in.)
Piston-to-piston Pin Clearance	0.1 mm (0.0039 in.)
Connecting Rod Big-end Radial Play	0.15 mm (0.0059 in.)
Piston Pin-to-needle Bearing Radial Play	0.15 mm (0.0059 in.)

Cylinder/Piston

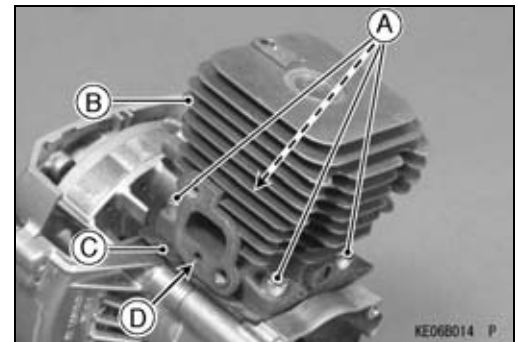
Cylinder Removal

- Pull the spark plug cap [A] in the direction shown, and remove it from the spark plug.
- Unscrew the shroud mounting screw [B] to remove the engine shroud [C].



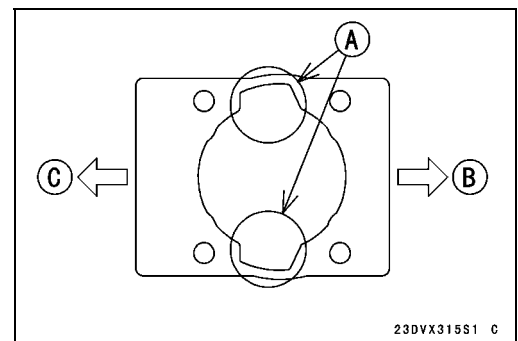
- Remove the recoil starter (see Recoil Starter Removal in Recoil Starter chapter).
- Remove the engine shroud.
- Remove:
 - Fuel Tank (see Fuel Tank Removal in Fuel System chapter)
 - Air Cleaner (see Air Cleaner Removal in Fuel System chapter)
 - Carburetor (see Carburetor Removal in Fuel System chapter)
 - Muffler (see Muffler Removal in Engine Top chapter)
 - Ignition Coil (see Ignition Coil Removal in Electrical System chapter)

- Unscrew the cylinder bolts [A] and remove the cylinder [B] and cylinder gasket [C] from the crankcase.
- Check to see if the pulse hole [D] is clogged.
- If pulse hole clogged, clean it.



Cylinder Installation

- Apply a non-permanent locking agent to the cylinder bolts.
- Apply engine oil to the piston and sliding surfaces.
- Replace the cylinder gasket with a new one, and install the cylinder and cylinder gasket.
- Set the cylinder gasket noting its profile [A] for scavenging port.
- [B]: Air Cleaner Side
- [C]: Muffler Side



4-6 ENGINE TOP END

Cylinder/Piston

- First, tighten each cylinder bolt with 1.8 N·m (0.18 kgf·m, 1.3 in·lb) of torque, and afterward tighten them with specified torque.

Torque - Cylinder Bolts: 3.7 N·m (0.38 kgf·m, 2.7 in·lb)

- Apply a non-permanent locking agent to the engine shroud mounting screw.
- Install the engine shroud, and then tighten the engine shroud mounting screw.

Torque - Engine Shroud Mounting Screw: 2.7 N·m (0.28 kgf·m, 2.0 in·lb)

- Install the removed parts.

Cylinder Fins Cleaning

- Refer to the Cylinder Fins Cleaning in Periodic Maintenance chapter.

Cylinder Cleaning

- Refer to the Cylinder Cleaning in Periodic Maintenance chapter.

Piston Removal

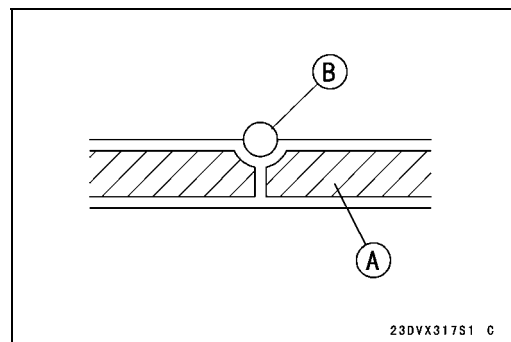
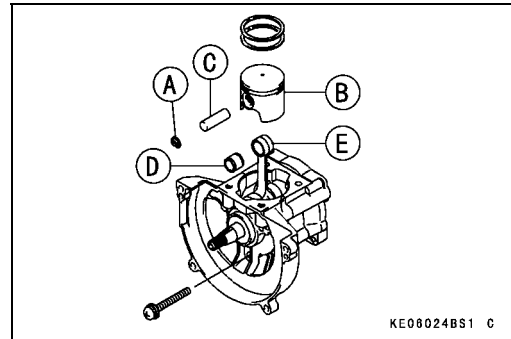
CAUTION

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

- Remove:
 - Flywheel (see Flywheel Removal in Electrical System chapter)
 - Cylinder (see Cylinder Removal)
- Remove the snap rings [A] from the piston [B].
- Pull out the piston pin [C] from the piston, and remove the piston and the needle bearing [D] out of the small-end of the connecting rod [E].
- Remove the piston rings out of the piston.

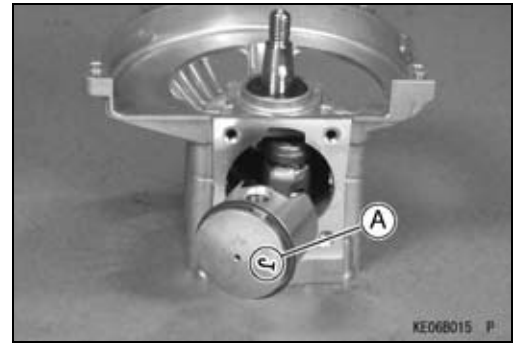
Piston Installation

- Install the piston rings [A] that ring fit at the piston ring stopper [B] in the piston groove.
- Top and second ring are common rings.



Cylinder/Piston

- Fit the needle bearing into small end of the connecting rod, and install the piston to small end of the connecting rod together with piston pin.
- “J mark” [A] on the piston crown should face the muffler side.
- Install the new snap rings into the piston.



Piston Cleaning

- Refer to the Piston Cleaning in Periodic Maintenance chapter.

4-8 ENGINE TOP END

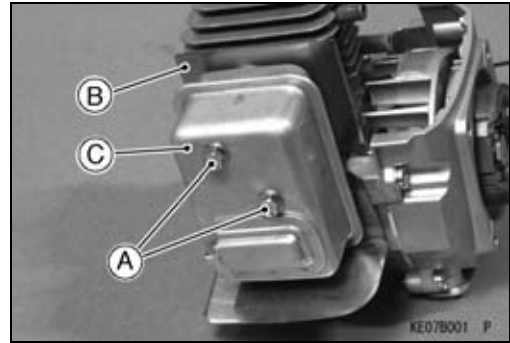
Muffler

Muffler Removal

- Remove the engine shroud (see Cylinder Removal in this chapter).
- Unscrew the muffler mounting bolts [A] and remove the muffler [C] together with the gasket [B].

NOTE

○In ordinary circumstances, there is no need to remove the muffler out of the cylinder.



Muffler Installation

- Apply a non-permanent locking agent to the mounting screws.
- Replace the gasket with a new one and install the muffler together with the gasket.

Torque - Muffler Mounting Bolts: 3.7 N·m (0.38 kgf·m, 2.7 in·lb)

Muffler Cleaning

- Refer to the Muffler Cleaning in Periodic Maintenance chapter.

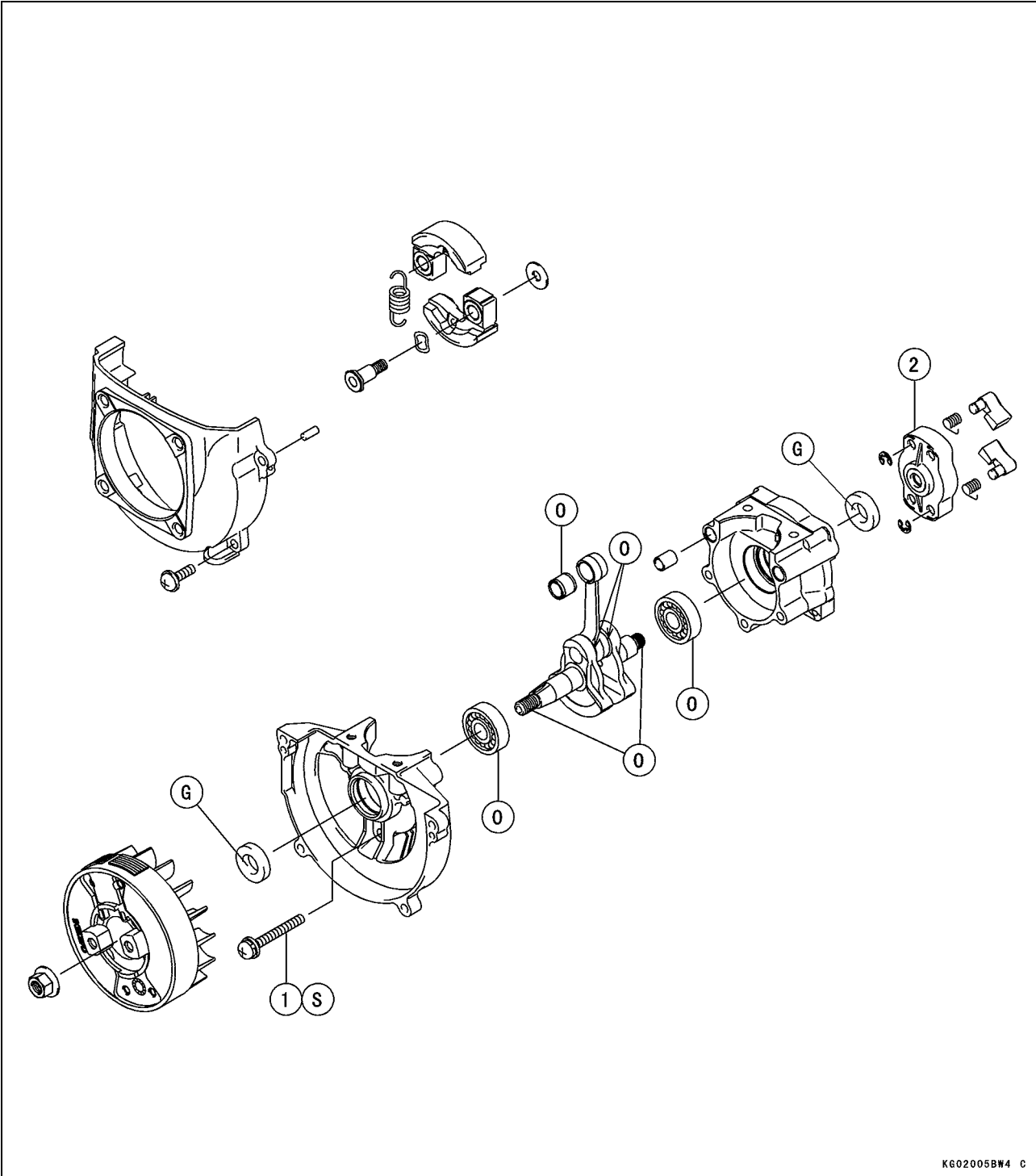
Crankshaft

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5-2 CRANKSHAFT

Exploded View



Exploded View

No.	Item	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Crankcase Screws	3.7	0.38	2.7 in·lb	S
2	Starting Pulley	15	1.5	11	

G: Apply grease.

O: Apply engine oil.

S: Follow the specific tightening sequence.

5-4 CRANKSHAFT

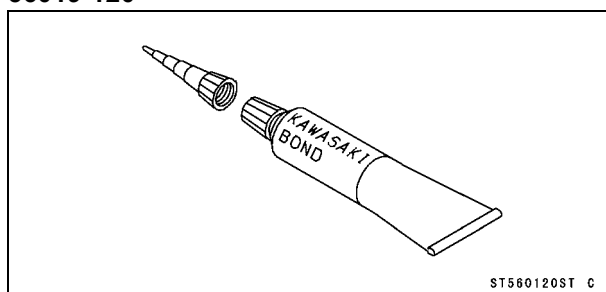
Specifications

Item	Service Limit
Ball Bearing Axial Play	0.5 mm (0.019 in.)

Sealant

Kawasaki Bond (Silicone Sealant):

56019-120

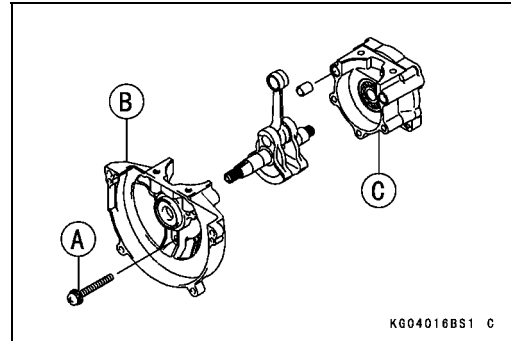


5-6 CRANKSHAFT

Crankcase

Crankcase Disassembly

- Remove:
 - Cylinder (see Cylinder Removal in Engine Top chapter)
 - Flywheel (see Flywheel Removal in Electrical System chapter)
 - Starting Pulley
- Remove the crankcase screws [A], and split the flywheel side crankcase [B] and starter side crankcase [C].
- If the crankcase is hard to split, lightly tap the crankcase with a plastic hammer.
- Take care not to damage the oil seals.



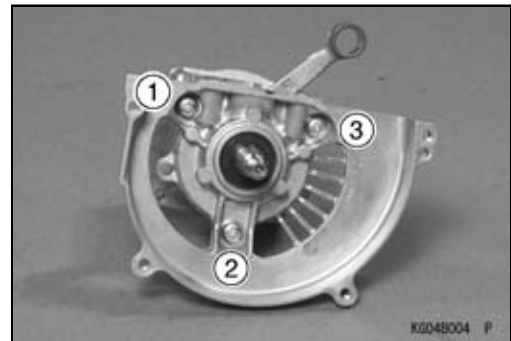
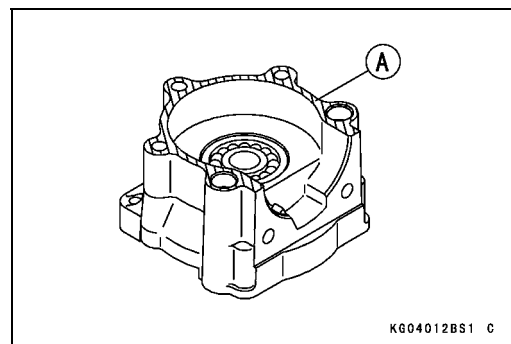
Crankcase Assembly

- If the original crankcase is reused, removed liquid gasket must be cleaned thoroughly to secure airtight.
 - Sparingly apply liquid gasket on the sealing surface [A] of the PTO shaft side of the crankcase.
- Sealant - Kawasaki Bond (Silicone Sealant): 56019-120**

CAUTION

Excessive amounts may block something inside and cause serious damage.

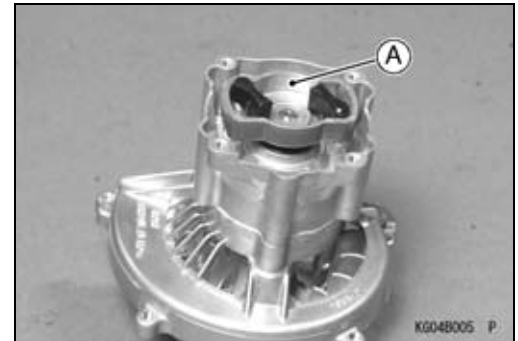
- Install the crankshaft to the crankcase (see Crankshaft Installation in this chapter).
 - Take care not to damage the oil seals.
 - Make sure that dowel pins are in place, and combine the flywheel side crankcase and starter side crankcase, and tighten the screws to the specified torque evenly in the order as shown.
- Torque - Crankcase Screws: 3.7 N·m (0.38 kgf·m, 2.7 in·lb)**
- Install the removed parts.



Crankshaft

Crankshaft Removal

- Remove:
 - Cylinder (see Cylinder Removal in Engine Top chapter)
 - Flywheel (see Flywheel Removal in Electrical System chapter)
- Remove the starting pulley [A] from the crankshaft by turning itself counterclockwise.
- Split the crankcase assembly (see Crankcase Disassembly).
- Remove the crankshaft.

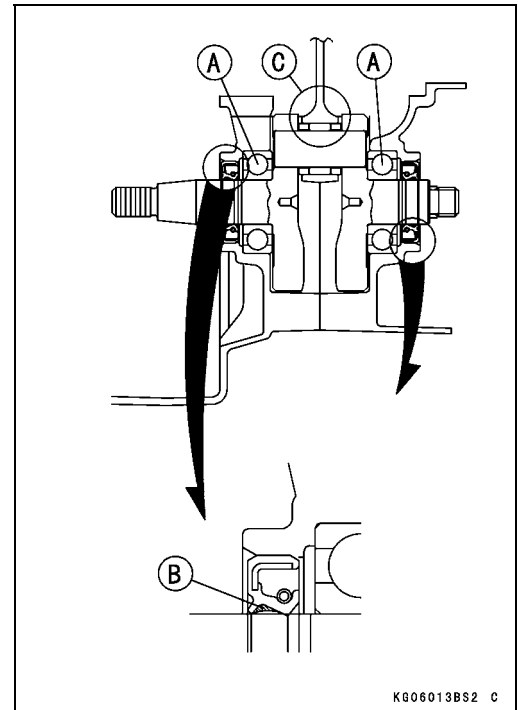


Crankshaft Installation

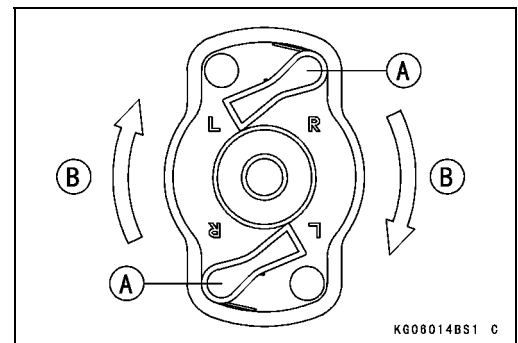
The crankshaft, the connecting rod, and the needle bearing are inseparable. This means that the crankshaft must be replaced as a complete unit in the event of damage to any one of these parts when fitting a replacement always install new ball bearings.

- Apply a fine oil to the both ball bearings [A].
- Apply a heat resisting grease between oil seal lips [B].
- Apply a fine oil to the connecting rod big end [C].
- Install the crankshaft to the crankcase.
- Combine the crankcase (see Crankcase Assembly).
- Install the starting pulley to the crankshaft by turning clockwise, and tighten it to the specified torque.

Torque - Starting Pulley: 15 N·m (1.5 kgf·m, 11 ft·lb)



- The recoil pawl [A] must be fitted on the pulley as shown.
- [B] Rotating Direction (viewed from recoil side)



Electrical System

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Exploded View

No.	Item	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Ignition Coil Mounting Bolts	2.2	0.22	1.6 in·lb	
2	Flywheel Nut	15	1.5	11	
3	Spark Plug	14	1.5	11	
4	Fan Housing Screws	3.7	0.38	2.7 in·lb	

O: Apply engine oil.

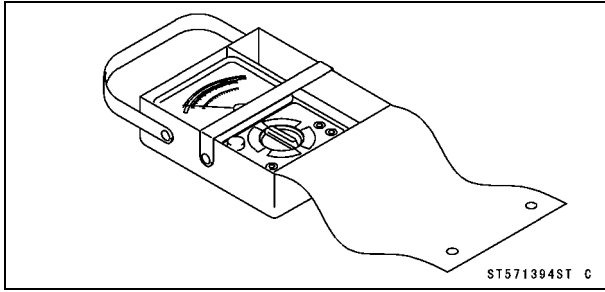
6-4 ELECTRICAL SYSTEM

Specifications

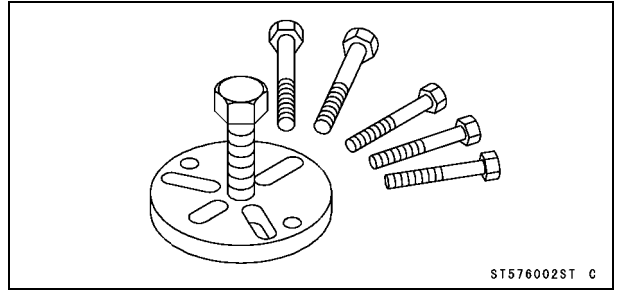
Item	Standard	Service Limit
Ignition System		
Spark Plug	NGK BPMR6A	---
Plug Gap	0.6 ~ 0.7 mm (0.024 ~ 0.028 in.)	---

Special Tools

**Hand Tester:
57001-1394**



**Flywheel Puller:
57001-6002**

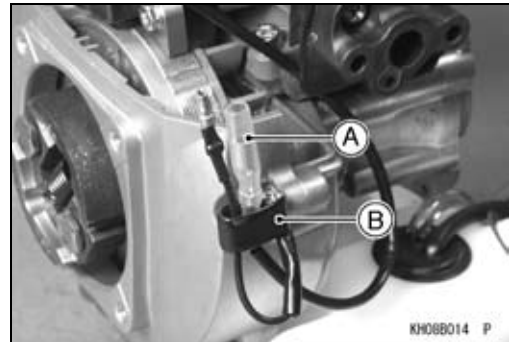


6-6 ELECTRICAL SYSTEM

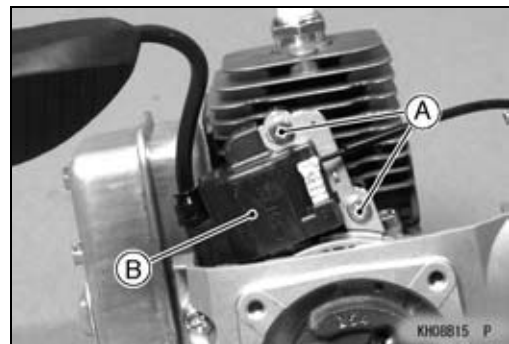
Ignition System

Ignition Coil Removal

- Remove:
 - Recoil Starter (see Recoil Starter Removal in Recoil Starter chapter)
 - Engine Shroud (see Cylinder Removal in Engine Top chapter)
 - Fuel Tank (see Fuel Tank Removal in Fuel System chapter)
 - Air Cleaner (see Air Cleaner Removal in Fuel System chapter)
 - Carburetor (see Carburetor Removal in Fuel System chapter)
- Remove the ignition coil lead wire [A] from the clamp [B] and disconnect the ignition coil lead wire.

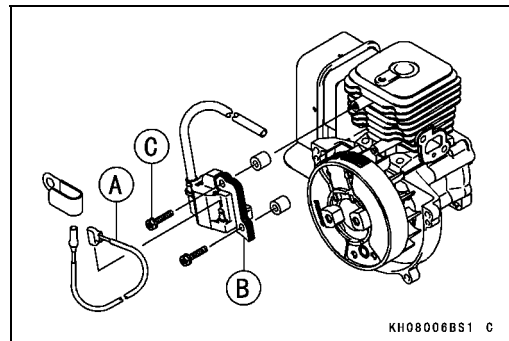


- Unscrew the ignition coil mounting bolts [A] and remove the ignition coil [B].



Ignition Coil Installation

- Install the ignition coil as shown.
 - [A] Ignition Coil Lead Wire
 - [B] Ignition Coil
 - [C] Ignition Coil Mounting Bolts

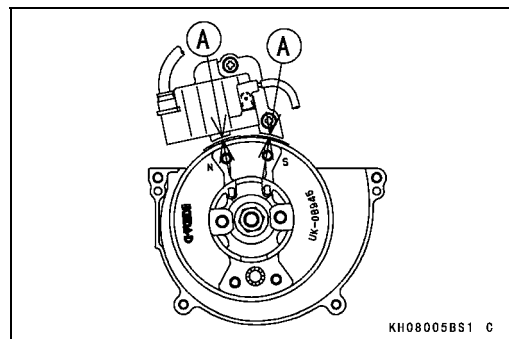


- Adjust the ignition coil air gap [A] to the standard value with a thickness gauge, and install the ignition coil.

Ignition Air Gap

Standard: 0.3 ~ 0.5 mm (0.012 ~ 0.019 in.)

- Tighten the ignition coil mounting bolts.
 - Torque - Ignition Coil Mounting Screws: 2.2 N·m (0.22 kgf·m, 1.6 in·lb)
- Install the fan housing (see Flywheel Installation).
- Install the ignition coil wire lead to the clamp.
- Install the removed parts.



Ignition System

Ignition Coil Inspection

- Remove the ignition coil (see Ignition Coil Removal in this chapter).
- The ignition coil has been integrated with an igniter being solid-state.
- Use the Kawasaki hand tester. Resistance value may vary with individual meters.

Special Tool - Hand Tester: 57001-1394

- Set the Kawasaki hand tester to the specified range (100 Ω).
- Connect the test lead to the point shown and read the resistance.
- ★ If the resistance is not as specified, replace the ignition coil.
- ★ If the meter reads as specified, the ignition coil windings probably is good. However if the ignition system still does not perform as it should after all other components have been checked, replace the ignition coil with one known to be good.

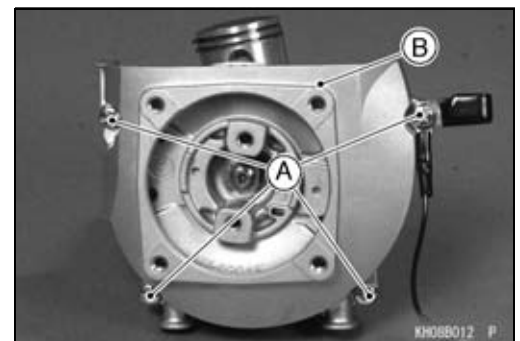
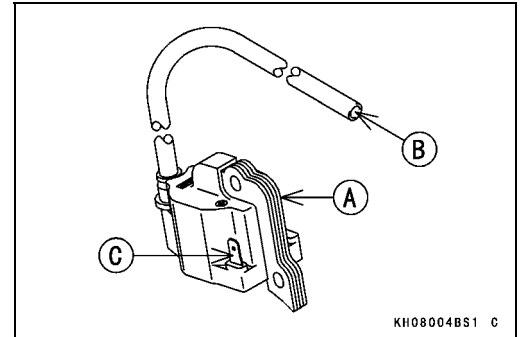
		Resistance between		
		(A)	(B)	(C)
+	-			
(A)		-	5.0 ~ 7.0 k Ω	600 ~ 800 M Ω
	(B)	5.0 ~ 7.0 k Ω	-	5.0 ~ 7.0 k Ω
	(C)	600 ~ 800 M Ω	5.0 ~ 7.0 k Ω	-

NOTE

- It is unable to inspect the igniter whether it is good or bad with the Kawasaki hand tester since it was integrated with the ignition coil.
- Whenever you have doubt as to function of the igniter to operate, try replacing the ignition coil with one known to be good.

Flywheel Removal

- Unscrew the fan housing screws [A] and remove the fan housing [B].

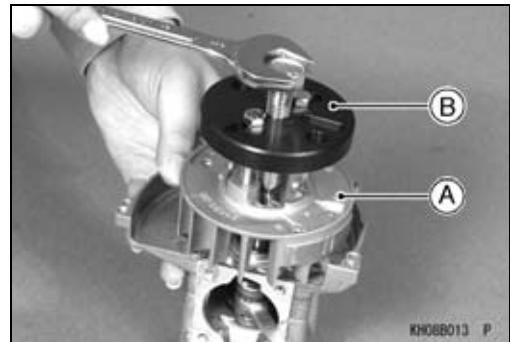
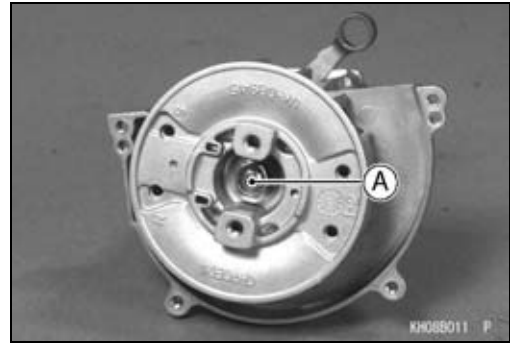


6-8 ELECTRICAL SYSTEM

Ignition System

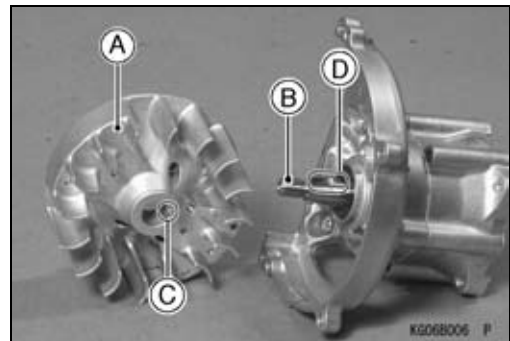
- Remove:
 - Fuel Tank (see Fuel Tank Removal in Fuel System chapter)
 - Air Cleaner (see Air Cleaner Removal in Fuel System chapter)
 - Carburetor (see Carburetor Removal in Fuel System chapter)
 - Muffler (see Muffler Removal in Engine Top chapter)
 - Engine Shroud (see Cylinder Removal in Engine Top chapter)
 - Ignition Coil (see Ignition Coil Removal in this chapter)
- Release the flywheel nut [A] counterclockwise to remove it.
- Remove the flywheel [A] by using a flywheel puller [B] as shown.

Special Tool - Flywheel Puller: 57001-6002



Flywheel Installation

- Fit the flywheel [A] to the crankshaft [B] so that the key part [C] drops in the key way [D].
- Tighten the flywheel nut by turning clockwise.
Torque - Flywheel Nut: 15 N·m (1.5 kgf·m, 11 ft·lb)
- Install the fan housing and tighten the screws.
Torque - Fan Housing Screws: 3.7 N·m (0.38 kgf·m, 2.7 in·lb)
- Install the removed parts.

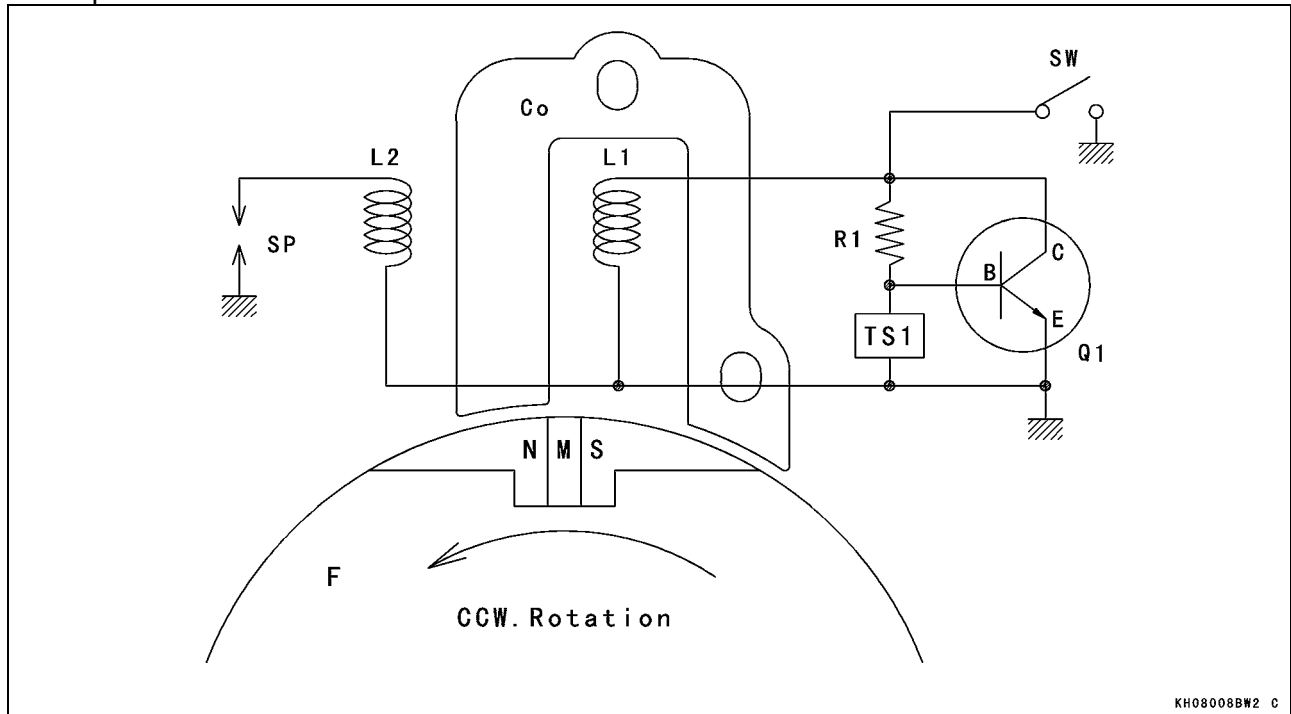


Ignition System

This engine ignition is controlled by a solid state ignition assembly and requires no periodic maintenance except for the spark plug.

The system consists of the following:

- Inductive Ignition Assemblies
- Permanent Magnet Flywheel
- Spark Plug
- Stop Switch



Co: Core (Lamination)
 L1: Primary Coil
 L2: Secondary Coil
 Q1: Transistor
 B: Base
 C: Collector
 E: Emitter
 R1: Control Resistor

TS1: Trigger Sensor
 SP: Spark Plug
 SW: Stop Switch
 F: Flywheel
 M: Magnet
 N: North Pole
 S: South Pole

Ignition System Operation Theory

Permanent magnets are mounted around the edge area of a flywheel. As the flywheel (magnetic pole) rotates clockwise and passes the ignition module on a laminated core group, voltage is produced at the primary winding (L1), allowing a small bias current to flow from the control resistor (R1) to the transistor (Q1) base and thereby exciting the transistor base. Thus the transistor forms (turns ON) the primary circuit. This circuit current flows from the plus (+) side of the primary winding to ground through the transistor [Collector C to Emitter (E)].

When the base current is flowing, the trigger sensor (TS1) detects optimum time (peak current) to shut off the transistor base current. With the transistor rapidly shutting off the current at the primary coil, counter-electromotive force is generated and voltage in hundreds-of-volts is induced through the primary winding (L1), thereby producing extremely high voltage at the secondary winding (L2). When this secondary voltage steps up to k-volts, "ionization" meaning "ignition" occurs across the electrodes at the spark plug (SP).

The trigger sensor located internally in the ignition system is set to give constant ignition timing according to engine speed and temperature.

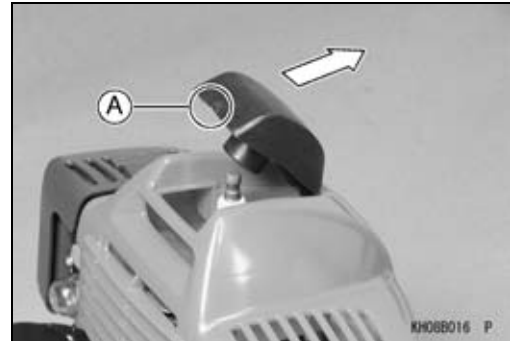
When the stop switch (SW) is set at the closed position, primary voltage is routed to ground, not allowing igniting operation.

6-10 ELECTRICAL SYSTEM

Ignition System

Spark Plug Removal

- Pull the spark plug cap [A] in the direction shown, and remove it from the spark plug.
- Remove the spark plug using a suitable plug wrench.



Spark Plug Installation

- Screw the spark plug gently into the plug hole with the plug installed in the plug wrench.
- Tighten the plug.

Torque - Spark Plug: 14 N·m (1.5 kgf·m, 11 ft·lb)

- Fit the plug cap securely.
- Pull up the spark plug cap lightly to make sure of the installation of the spark plug cap.

Spark Plug Cleaning and Inspection

- Refer to the Spark Plug Cleaning and Inspection in the Periodic Maintenance Chapter.

Spark Plug Gap Inspection

- Refer to the Spark Plug Gap Inspection in the Periodic Maintenance Chapter.

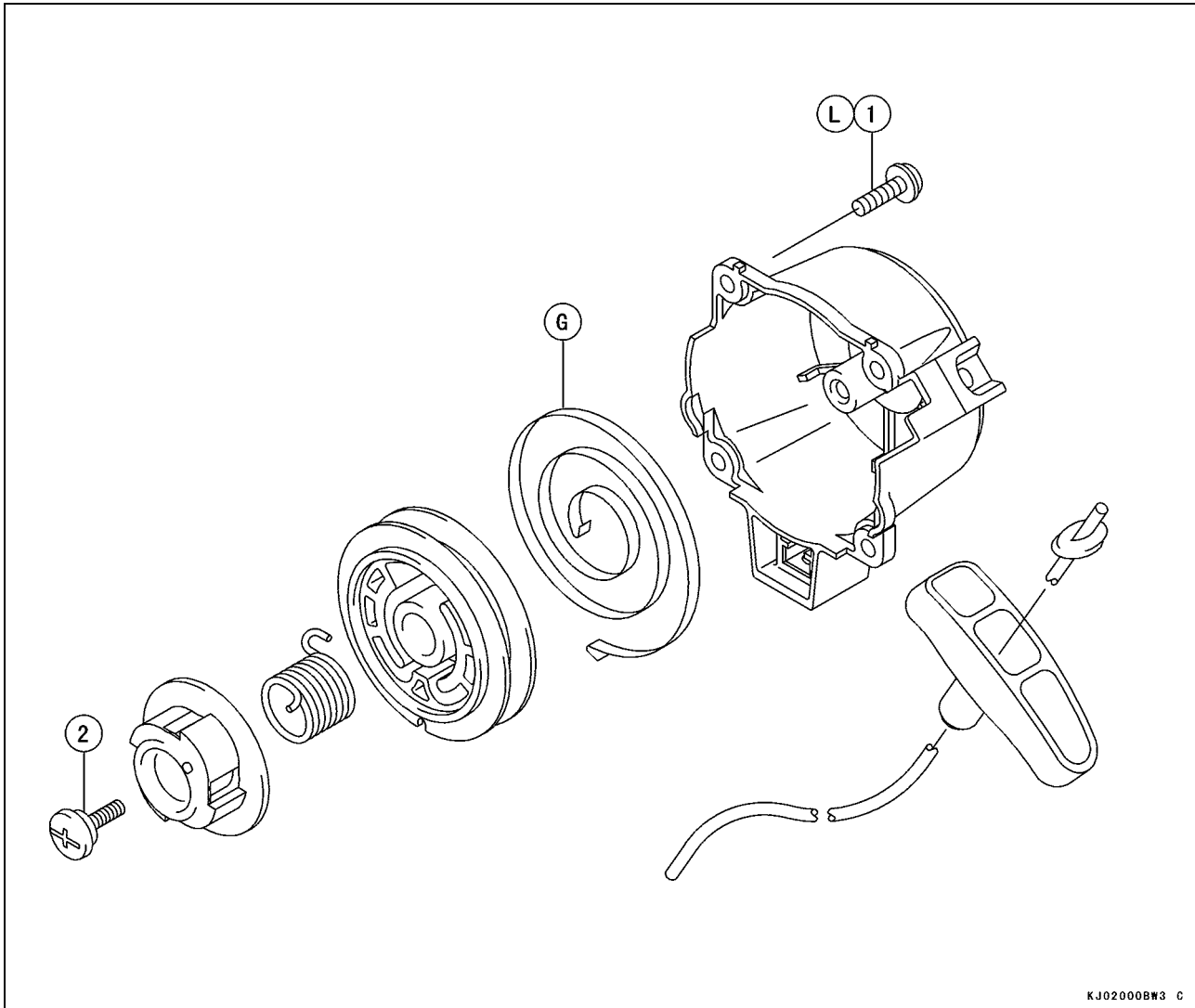
Recoil Starter

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Recoil Starter Assembly	7-6

7-2 RECOIL STARTER

Exploded View



RECOIL STARTER 7-3

Exploded View

No.	Item	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Recoil Starter Mounting Screws	1.8	0.18	1.3 in·lb	L
2	Recoil Starter Set Screw	3.4	0.35	30 in·lb	

G: Apply grease.

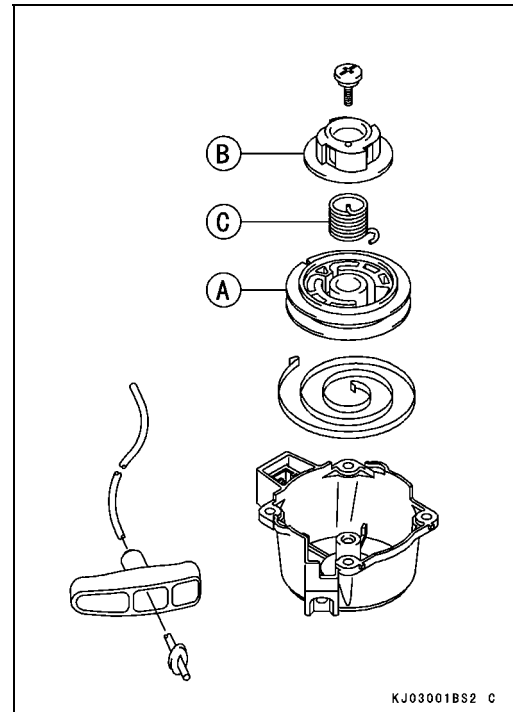
L: Apply non-permanent locking agent.

7-4 RECOIL STARTER

Kar Recoil Starter

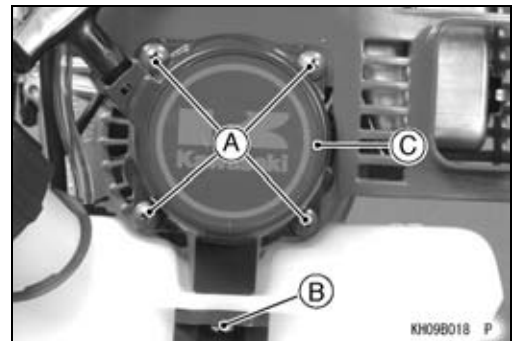
Kar Recoil Starter

This recoil starter is more simplified when starting the engine against a past recoil starter. The damper spring [C] located between the reel [A] and cam plate [B] is bent by the engine starting torque when the starter grip is pulled. The peak load is eased when starting engine by the effect of this damper spring. The compression load of the second and third rotation is absorbed by the damper spring. Moreover, the rotational speed of the engine crankshaft rises, and the engine can be started easily even at the same rope pull speed as a past model. This recoil starter is lightness and a compact type.



Recoil Starter Removal

- Unscrew the recoil starter mounting screws [A] and screw [B] and remove the recoil starter [C].



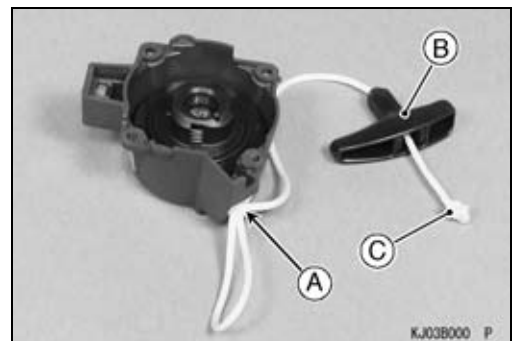
Recoil Starter Installation

- Apply a non-permanent locking agent to the recoil starter mounting screws, and install the recoil starter.

Torque - Recoil Starter Mounting Screws: 1.8 N·m (0.18 kgf·m, 1.3 in·lb)

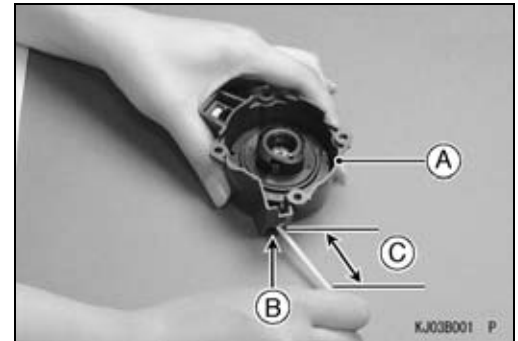
Recoil Starter Disassembly

- Remove the recoil starter (see Recoil Starter Removal).
- Pull out the rope end about 300 mm (11.81 in.) and make a temporary knot [A] at that point.
- Pull out the rope end from the starter grip [B] and untie the knot [C] at the rope end to remove the grip.

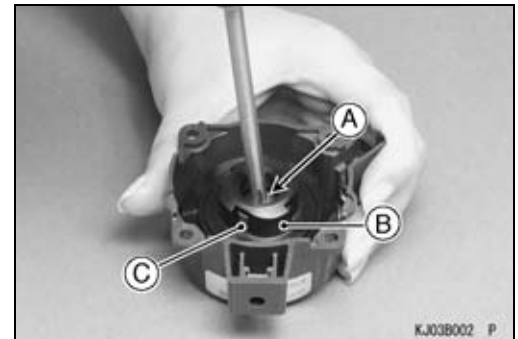


Kar Recoil Starter

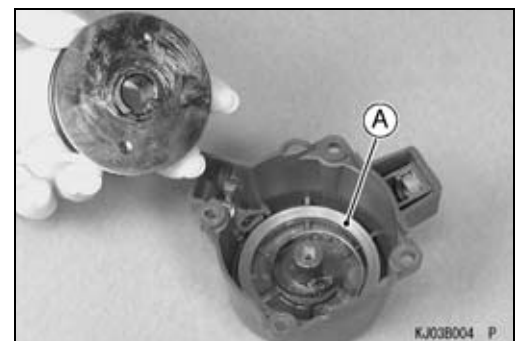
- Holding the reel [A] with hand, untie the temporary knot.
- If the rope end winds back at a one, there is likely to be a broken recoil spring under the reel. First, release the thumb little by little until the rope length is about 30 mm (1.18 in.) [C] from the rope guide [B] to the rope end, and then wind off the reel slowly.



- After confirming that no tension of recoil spring can be felt, remove the recoil starter set screw [A], cam plate [B] and damping spring [C], holding the case lightly by hand for fear that recoil spring should come up from case.



- The free end of recoil spring [A] is hooked with reel tab. Make sure, by turning reel a little in the counterclockwise, reel is unhooked before removing it. Next, carefully lift reel straight up out of case. Recoil spring wound up remains in the case.



⚠ WARNING
Be careful that recoil spring does not fly loose and injure you. It is under big pressure.

NOTE

○ *There should be no spring tension on reel when removing reel. If tension is felt, push reel back into place and gently wiggle it until reel may be easily removed.*

CAUTION
Do not remove the recoil spring except when the parts replacement is necessary.

⚠ WARNING
In removing and installing the recoil spring, protect your hands with gloves. The recoil spring that flies loose can injure you. Press the spring with thumb work with care so that spring will not fly.

- When removing the recoil spring, press the spring with thumb to remove it from the case in the way like freeing the spring from winding gradually from the center of the coil to outer side.

7-6 RECOIL STARTER

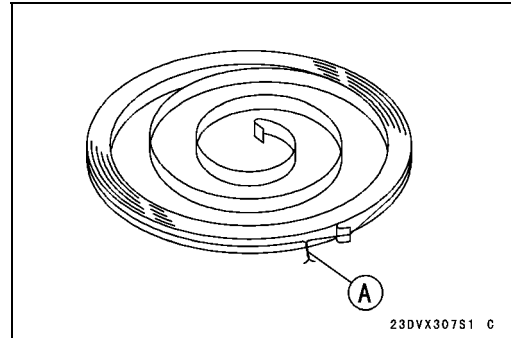
Kar Recoil Starter

Recoil Starter Assembly

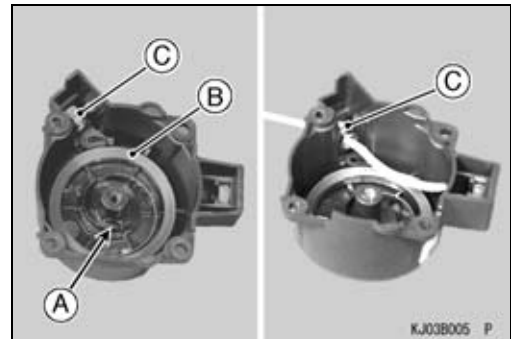
⚠ WARNING

In removing and installing the recoil spring, protect your hands with gloves. The recoil spring that flies loose can injure you. Press the spring with thumb work with care so that spring will not fly.

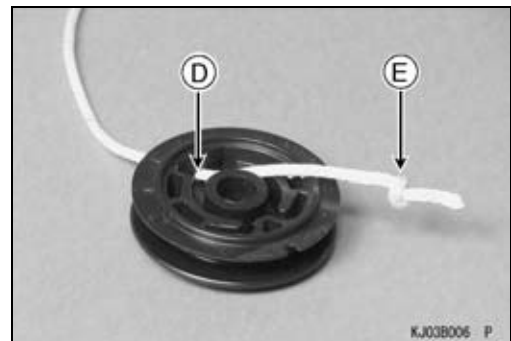
- When reinstalling the removed recoil spring, first wind it to make its outer diameter smaller than the inner diameter of the case, and tie it with fine wire [A] as shown. Then, put the spring with its outer end hooked in the case.



- Apply a grease to the center shaft [A] of the case and the recoil spring [B].
- Pass the rope end through the rope guide [C] from the outside of the case.

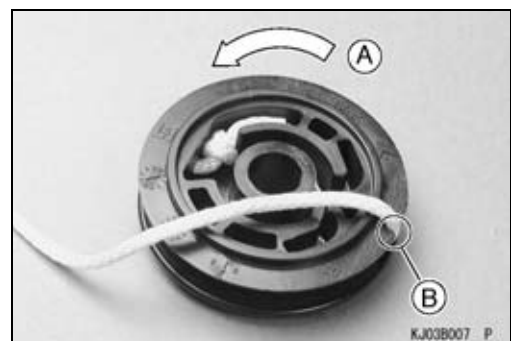


- Pass the rope end through the reel hole [D] as shown.
- Make a knot [E] at the rope end.



- Wind the rope onto the reel two and half turns and insert the rope end into the notch [B] on the out side of reel as shown.

★ Taking care not to reverse the winding direction [A].

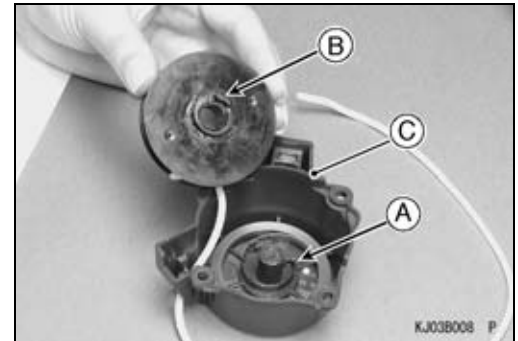


Kar Recoil Starter

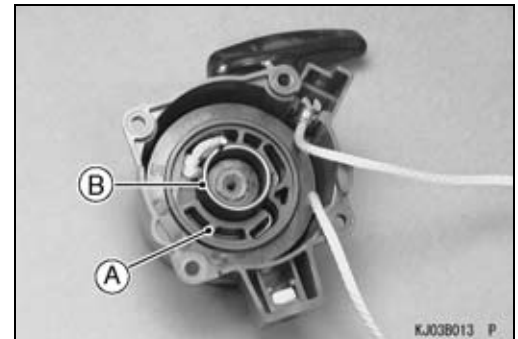
- Set the reel onto the center shaft of the case [C] so that the hook [A] inside the recoil spring securely catches on the tab [B] of the reel.

CAUTION

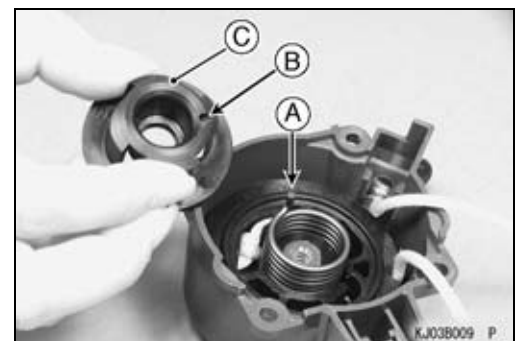
Be careful that the recoil spring may fly out and cause injury. The spring is under great pressure.



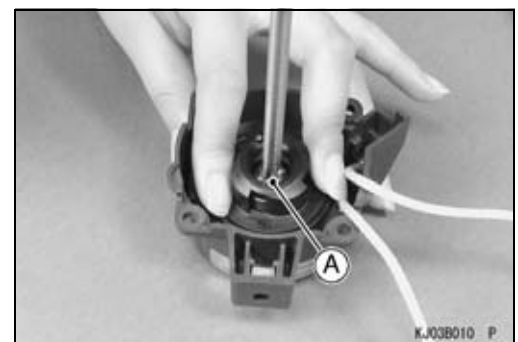
- Pass the rope end through the rope guide from the inside of the case. After threading rope through grip, make a knot at the rope end and push the knot into the hole of grip.
- Install the damper spring [B] into the reel [A].



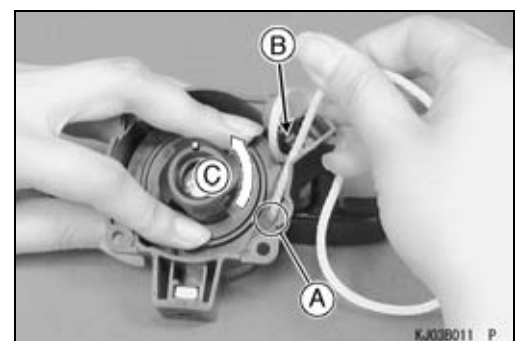
- Fit the projection [A] of the damper spring into the hole [B] of the cam plate [C], and set the cam plate onto the reel.



- Tighten the recoil starter set screw [A].
Torque - Recoil Starter Set Screw: 3.4 N·m (0.35 kgf·m, 30 in·lb)



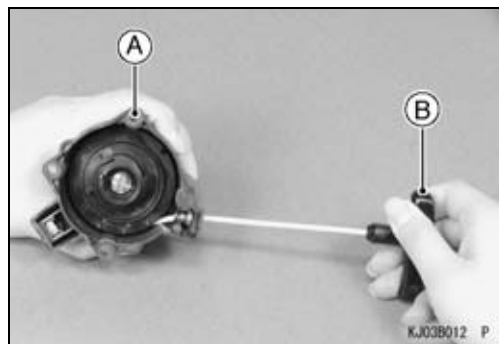
- First, align the notch [A] with the rope guide [B].
- Holding the reel with hand, rotate the reel another five turns with the rope inserted into the notch on the outside of reel in the counterclockwise [C].
- While holding the reel to keep it from unwinding, out of the rope from the notch of the reel.



7-8 RECOIL STARTER

Kar Recoil Starter

- While carefully holding the starter case [A] and starter grip [B], draw out the rope through the starter case and return it slowly.
- Check if the reel operates smoothly by pulling the rope.



Troubleshooting

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8-2 TROUBLESHOOTING

Engine Troubleshooting

Hard Starting

Symptom	Cause	Remedy
Pulling recoil starter grip would not cause sufficient compression.	Poor compression <ul style="list-style-type: none"> ● Wear in piston ● Wear in piston ring Stick of piston ring ● Wear or deformation of cylinder bore. ● Poor tightening of cylinder and spark plug 	<ul style="list-style-type: none"> ● Replace ● Replace ● Clean ring groove and replace piston ring ● Replace cylinder and piston ring as a set ● Tighten
After making several starting attempts, it is found, on removing spark plug, that electrodes are still dry.	Insufficient fuel <ul style="list-style-type: none"> ● No fuel in fuel tank ● Clogging of dust or entry of air in fuel pipe ● Clogged fuel tank cap air vent and breather ● Foul fuel filter in fuel tank ● Air entering at gasket fitted to carburetor flange ● Clogged carburetor needle jet or main jet 	<ul style="list-style-type: none"> ● Replenish ● Clean ● Clean ● Clean ● Tighten or replace gasket ● Clean
After making several starting attempts, it is found, on removing spark plug, that electrodes are excessively wet.	Excess fuel <ul style="list-style-type: none"> ● Faulty starter button pushing (In summer, or when engine is warm, starter button pushing gives too rich mixture) ● Overflow of fuel from carburetor ● Clogged air cleaner 	<ul style="list-style-type: none"> ● Remove spark plug, with engine switch OFF, exhaust excess fuel by pulling starter rope ● Check carburetor and exhaust excess fuel from cylinder ● Clean air cleaner and exhaust excess fuel from cylinder
On removing spark plug, moisture condensed on spark plug electrodes.	Faulty fuel <ul style="list-style-type: none"> ● Mixture of water into fuel ● Deterioration in fuel because of poor long-term storage ● Use of fuel other than designated 	<ul style="list-style-type: none"> ● Change fuel ● Change fuel <p>Change fuel</p>
Make spark check. No spark but spark appears on spark plug replaced.	Faulty spark plug <ul style="list-style-type: none"> ● Electrodes are burned and damaged to cause too wide gap ● Much carbon bridging electrodes gap ● Small foreign matter being caught between electrodes ● Faulty insulation of electrodes 	<ul style="list-style-type: none"> ● Correct gap or replace ● Clean or replace ● Clean ● Clean or replace spark plug

Engine Troubleshooting

Symptom	Cause		Remedy
		<ul style="list-style-type: none"> ● Looseness of terminal (Provided that only spare parts) 	<ul style="list-style-type: none"> ● Tighten securely
<p>No spark in any spark plug, but spark appears when the end of high tension cord is touched to engine block.</p>	<p>Faulty plug cap</p>	<ul style="list-style-type: none"> ● Faulty contacting at spark plug cap 	<ul style="list-style-type: none"> ● Remove plug cap and connect terminal again
<p>No fuel drains into the return pipe in spite of several priming operation.</p>	<ul style="list-style-type: none"> ● Clogging in fuel tube at inlet side. ● Broken tube at inlet side ● Air leakage from joint portion of fuel tube at inlet side. ● Adhesion of dust to check valve of priming pump. ● Broken check valve of priming pump or damaged seat surface of pump cover. ● Air leakage from fitting area of priming pump. ● Broken priming pump. ● Air leakage from main check valve. ● Loosen main diaphragm cover. ● Broken main diaphragm. 		<ul style="list-style-type: none"> ● Clean the tube ● Replace ● Fit fuel tube to the joint or replace ● Disassembly and clean parts. ● Replace ● Tighten ● Replace ● Disassembly and clean the check valve. If not good, replace the main check valve and plate. ● Tighten ● Replace
<p>Fuel drains into the return pipe by priming operation, but engine does not start.</p>	<ul style="list-style-type: none"> ● Clogged air filter ● Clogged needle jet. ● Overflow of fuel from needle jet to the venturi of carburetor. 		<ul style="list-style-type: none"> ● Clean ● Disassemble and clean ● Clean or replace
<p>After starting, engine revolution does not continue.</p>	<ul style="list-style-type: none"> ● Clogged pulse passage. ● Improper height of control lever. 		<ul style="list-style-type: none"> ● Clean ● Adjust

8-4 TROUBLESHOOTING

Engine Troubleshooting

Symptom		Cause		Remedy
No spark or very weak spark at the end of high tension on cord	Spark appears when engine switch lead wire is disconnected at connectors.	Faulty engine switch	<ul style="list-style-type: none">● Engine switch lead wire is jammed● Short circuit in engine switch	<ul style="list-style-type: none">● Correct● Replace
	No spark appears even when stop switch wire is disconnected at connectors.	Slow recoil starter revolution	<ul style="list-style-type: none">● Recoil starter revolution is lower than that igniter begins to work.	<ul style="list-style-type: none">● Pull recoil starter rope more rapidly
	Spark appears when ignition coil is replaced with a new one.	Faulty ignition coil	<ul style="list-style-type: none">● Wiring of coil coming short circuited or disconnect● Engine switch lead wire is jammed	<ul style="list-style-type: none">● Replace● Correct or replace
	Spark appears when flywheel is replaced with a new one.	Faulty flywheel	<ul style="list-style-type: none">● Flywheel demagnetized	<ul style="list-style-type: none">● Replace

Engine Troubleshooting

Engine Malfunction

Symptom	Cause		Remedy
When throttle valve is opened gradually, revolution speed drops at some position or engine stops.	<ul style="list-style-type: none"> ● Faulty carburetor ● Faulty fuel filter ● Air enters at carburetor flange 	<ul style="list-style-type: none"> ● Clogging in carburetor inside ● Foul fuel filter ● Faulty carburetor gasket ● Incomplete fitting of carburetor 	<ul style="list-style-type: none"> ● Disassemble and clean ● Clean or replace ● Replace ● Tighten
When spark test of spark plug is made with recoil starter rope pulled, spark appears very weak.	<ul style="list-style-type: none"> ● Faulty ignition system 	<ul style="list-style-type: none"> ● Faulty insulation of spark plug ● Foul electrodes ● Faulty magneto ● Faulty ignition coil 	<ul style="list-style-type: none"> ● Replace ● Clean ● Replace
Loaded operation causes revolution fluctuation with big frequency.	<ul style="list-style-type: none"> ● Clogged fuel tank cap air vent and breather ● Dust clogging in or entry of air into fuel pipe or carburetor 		<ul style="list-style-type: none"> ● Clean ● Clean
Unstable idling and the running does not continue.	<ul style="list-style-type: none"> ● Air entering engine through the fitting portion of carburetor. ● Too low idling speed (rpm). ● Clogged main check valve. ● Clogged needle jet or main jet ● Improper height of control lever. 		<ul style="list-style-type: none"> ● Tighten ● Adjust ● Disassemble and clean ● Disassemble and clean ● Adjust
Engine does not accelerate in spite of opening throttle valve.	<ul style="list-style-type: none"> ● Clogged air filter ● Clogging in fuel tube at inlet side. ● Fuel passage or pulse passage of fuel pump is clogged. ● Clogged needle jet or main jet. ● Clogged main check valve. ● Improper height of control lever. 		<ul style="list-style-type: none"> ● Clean the filter ● Clean ● Disassemble and clean ● Disassemble and clean ● Disassemble and clean ● Adjust
Unstable revolution at high speed.	<ul style="list-style-type: none"> ● Clogged air filter. ● Clogged in fuel tube at inlet side. ● Fuel passage or pulse passage of fuel pump is clogged. ● Clogged needle jet or main jet. ● Clogged main check valve. ● Improper height of control lever. 		<ul style="list-style-type: none"> ● Clean ● Remove and clean ● Disassemble and clean ● Disassemble and clean ● Disassemble and clean ● Adjust

8-6 TROUBLESHOOTING

Engine Troubleshooting

Insufficient Power

Symptom	Cause		Remedy
Same as "Hard Starting"	<ul style="list-style-type: none"> ● Poor compression ● Insufficient fuel ● Excess fuel ● Faulty fuel ● Faulty magneto ● Faulty ignition coil 	Same as "Hard Starting"	Same as "Hard Starting"
Engine overheated	<ul style="list-style-type: none"> ● Clogged air cleaner ● Carbon deposit inside combustion chamber ● Inappropriate mixing ratio (too little oil) ● Broken cooling fan blade ● Dirt or dust attached to cooling fins of cylinder ● Grass or dirt attached to cooling air passage and flywheel blade 		<ul style="list-style-type: none"> ● Clean ● Clean ● Change fuel ● Replace ● Clean ● Clean
Thick smoke issues from exhaust port.	Excess fuel	<ul style="list-style-type: none"> ● Same as "Hard Starting" 	<ul style="list-style-type: none"> ● Same as "Hard Starting"
	Faulty exhaust system	<ul style="list-style-type: none"> ● Carbon deposit narrows exhaust passage and muffler ● Excessive oil mixed 	<ul style="list-style-type: none"> ● Clean ● Change fuel
Engine knocking	<ul style="list-style-type: none"> ● Inferior fuel 		<ul style="list-style-type: none"> ● Change fuel

Abnormal Engine Noises

Symptom	Cause	Remedy
Piston Slapping	<ul style="list-style-type: none"> ● Cylinder and piston ring wear ● Wear and/or deformation in piston ● Carbon deposit inside combustion chamber ● Wear in piston pin and connecting rod small end bearing ● Wear in piston and piston pin 	<ul style="list-style-type: none"> ● Replace ● Replace ● Clean ● Replace ● Replace
Connecting rod noise	<ul style="list-style-type: none"> ● Wear in large and small end bearings 	<ul style="list-style-type: none"> ● Replace (Crankshaft Assy)

Surging

Symptom	Cause	Remedy
Surging	<ul style="list-style-type: none"> ● Foul air cleaner ● Dust clogging in or air entry into fuel pipe ● Clogged fuel tank cap air vent and breather ● Clogged carburetor 	<ul style="list-style-type: none"> ● Clean ● Clean ● Clean ● Clean

Engine Troubleshooting

Fuel Leakage from Carburetor

Symptom	Cause	Remedy
Fuel leak from carburetor	<ul style="list-style-type: none"> ● Foreign matter attached to needle valve and/or valve seat ● Correction or wear in needle valve and/or valve seat ● Poor tightening of diaphragm gasket 	<ul style="list-style-type: none"> ● Clean ● Replace needle valve assembly ● Tighten or replace

Excessive Fuel Consumption

Symptom	Cause	Remedy
Same as "Hard Starting"	<ul style="list-style-type: none"> ● Poor compression ● Same as "Hard Starting" 	<ul style="list-style-type: none"> ● Same as "Hard Starting"
Sufficient compression but excessive fuel consumption.	<ul style="list-style-type: none"> ● Too rich fuel mixture ● Inferior fuel ● Foul air cleaner ● Too high idling speed 	<ul style="list-style-type: none"> ● Adjust ● Replace ● Clean ● Adjust
Same as "Fuel Leakage from Carburetor"	<ul style="list-style-type: none"> ● Same as "Fuel Leakage from Carburetor" 	<ul style="list-style-type: none"> ● Same as "Fuel Leakage from Carburetor"

Engine Stops during Operation

Symptom	Cause	Remedy
Difficulty in cranking, or seizure	<p>Overheat</p> <ul style="list-style-type: none"> ● Excessively lean fuel mixture (too little fuel) ● Inferior lubricating oil mixed ● Excessive carbon deposit in combustion chamber ● Dust accumulation on cooling fins of cylinder 	<ul style="list-style-type: none"> ● Adjust carburetor ● Change fuel ● Clean ● Clean
Cranking is easy	<p>Faulty electrical system</p> <ul style="list-style-type: none"> ● Faulty spark plug ● Faulty magneto ● Looseness in connections ● Faulty ignition coil 	<ul style="list-style-type: none"> ● Clean or replace ● Replace ● Check and repair ● Replace
	<p>Faulty fuel system</p> <ul style="list-style-type: none"> ● Clogged fuel line ● Foul air cleaner ● Fuel in tank used up 	<ul style="list-style-type: none"> ● Clean ● Clean or replace ● Replenish
	<p>Faulty carburetor</p> <ul style="list-style-type: none"> ● Dust clogging in fuel passage 	<ul style="list-style-type: none"> ● Clean



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