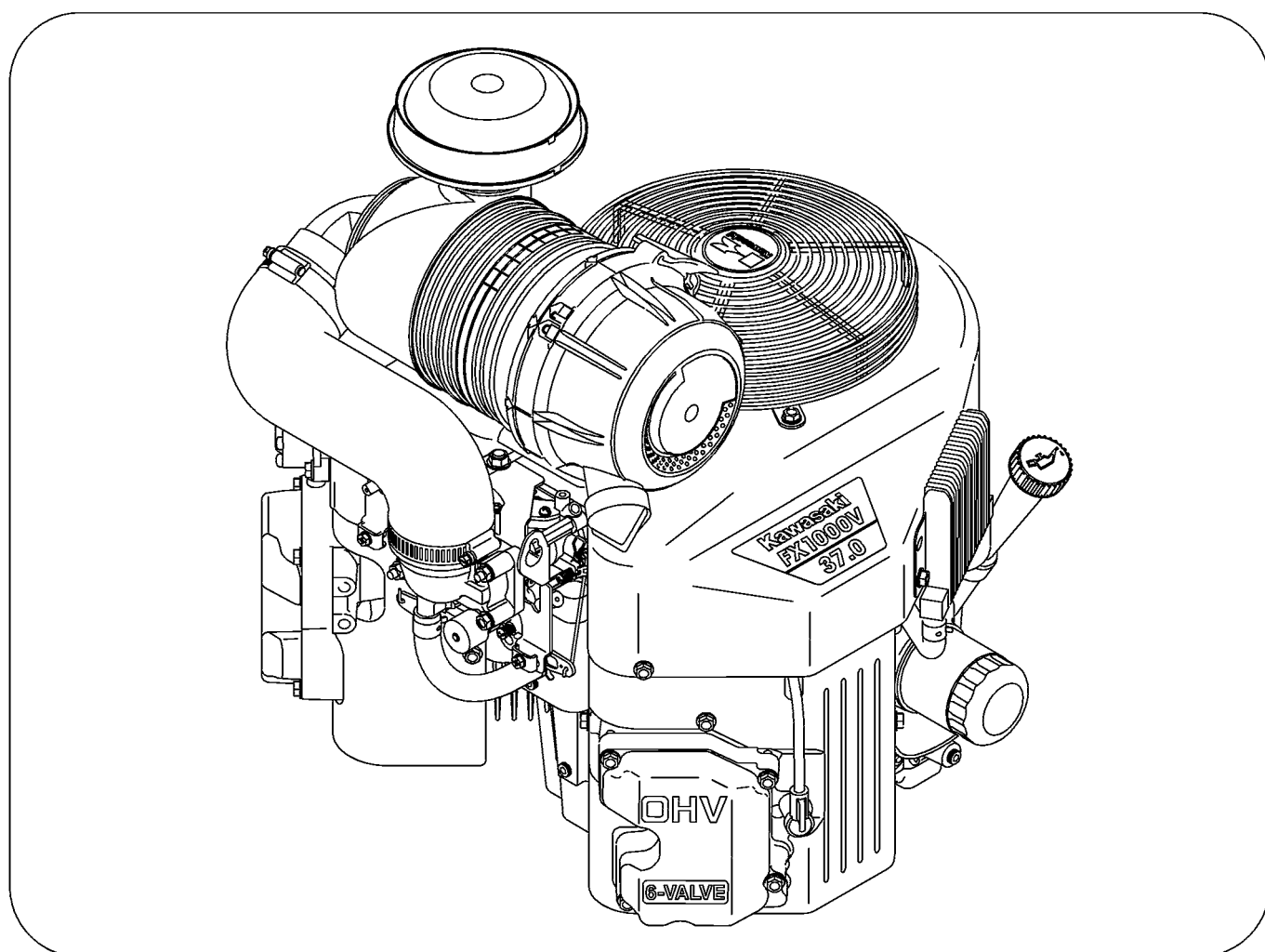




**FX921V**  
**FX1000V**



**4-Stroke Air-Cooled V-Twin Gasoline Engine**  
**Service Manual**

# Quick Reference Guide

<b>General Information</b>	<b>1</b>
<b>Periodic Maintenance</b>	<b>2</b>
<b>Fuel System</b>	<b>3</b>
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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.



**FX921V**  
**FX1000V**

# **4-Stroke Air-Cooled V-Twin 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.

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## 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) 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)		

## EMISSION CONTROL INFORMATION

To protect the environment in which we all live, Kawasaki has incorporated crankcase emission (1) and exhaust emission (2) control systems (EM) in compliance with applicable regulations of the United States Environmental Protection Agency and California Air Resources Board.

### 1. **Crankcase Emission Control System**

A sealed-type crankcase emission control system is used to eliminate blow-by gases. The blow-by gases are led to the breather chamber through the crankcase. Then, it is led to the air cleaner.

Oil is separated from the gases while passing through the inside of the breather chamber from the crankcase, and then returned back to the bottom of crankcase.

### 2. **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 plugs
- Magneto or electronic ignition system
- Fuel filter element
- Air cleaner elements
- Crankcase
- Cylinder heads
- Breather chamber and internal parts
- Inlet pipe and tube

# 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 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 engine:

- 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.

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## How to Use This Manual

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In preparing this manual, we divided the product into its major systems. These systems became the manual's chapters. All information for a particular system from adjustment through disassembly and inspection is located in a single chapter.

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.

The Periodic Maintenance Chart is located in the General Information chapter. The chart gives a time schedule for required maintenance

operations.

If you want spark plug information, for example, go to the Periodic Maintenance Chart first. The chart tells you how frequently to clean and gap the plug. Next, 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 Spark Plug 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 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

## Table of Contents

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## 1-2 GENERAL INFORMATION

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### Before Servicing

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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) Battery Ground

Remove the ground (–) lead from the battery before performing any disassembly operations on the equipment. This prevents:

(a) the possibility of accidentally turning the engine over while partially disassembled.

(b) sparks at electrical connections which will occur when they are disconnected.

(c) damage to electrical parts.

(3) 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.

(4) 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.

(5) 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.

(6) 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.

(7) 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.

(8) 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 material and perfectly smooth to avoid oil or compression leaks.

(9) 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).

(10) 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.

(11) Ball Bearing

When installing a ball bearing, the bearing race which is affected by friction should be pushed by a suitable driver. This prevents severe stress on the balls and races, and prevents races and balls from being dented. Press a ball bearing until it stops at the stop in the hole or on the shaft.

(12) Oil Seal and Grease Seal

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



**Before Servicing**

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.

**(13) 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.

**(14) Circlip, Retaining Ring**

Replace any circlips and retaining rings that were removed with new ones, as removal weakens and deforms them. When installing circlips and retaining rings, take care to compress or expand them only enough to install them and no more.

**(15) Cotter Pin**

Replace any cotter pins that were removed with new ones, as removal deforms and breaks them.

**(16) 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.

**(17) 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

**(18) Replacement Parts**

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

**(19) 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	

**(20) Specifications**

Specification terms are defined as follows:

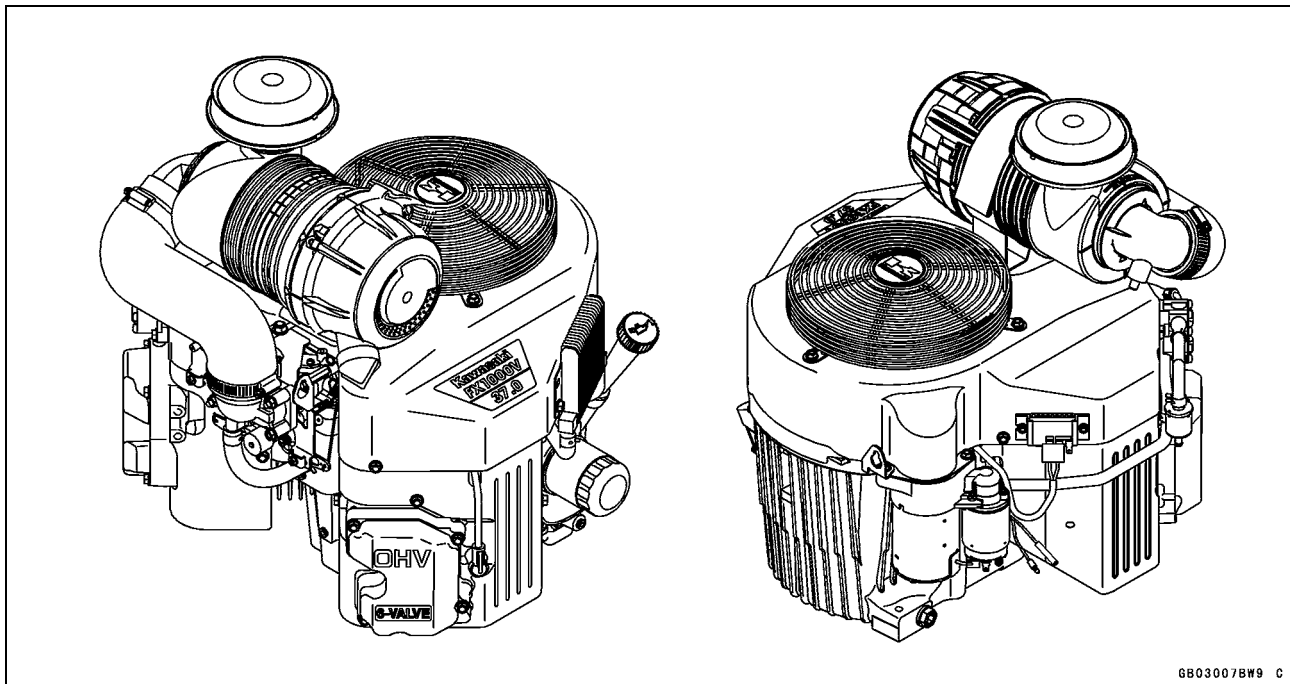
"Standards" show dimensions or performances which brand-new parts or systems have.

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

## 1-4 GENERAL INFORMATION

### Model Identification

FX921V, FX1000V



#### **Cylinder Number Designation:**

No.1 Cylinder is the left-hand cylinder viewed from the air cleaner.

No.2 Cylinder is the right-hand cylinder viewed from the air cleaner.

**General Specifications**

<b>Item</b>	<b>FX921V, FX1000V</b>
Type	Forced air-cooled, vertical shaft, OHV 6 valves, 4-stroke gasoline engine.
Cylinder Layout	90° V-Twin
Bore × Stroke	89.15 mm × 80 mm (3.5 in. × 3.15 in.)
Displacement	999 cm <sup>3</sup> (61 cu. in.)
Direction of Rotation	Counterclockwise facing the PTO shaft
Compression Release	Automatic compression release
Low Idle Speed	1 550 rpm
High Idle Speed	3 600 rpm
Ignition System	Transistorized-flywheel magneto
RFI	Per Canada and U.S.A. requirements
Starting System	Shift type electric starter
Charging System	12 V - 15 amp with regulator
Spark Plug	NGK BPR5ES
Carburetor	Float type, fixed main jet, two barrel
Fuel Pump	Diaphragm type pulse pump
Air Cleaner	Dual stage element, Heavy duty type
Governor	Flyweight all speed governor
Lubrication System	Pressure feed by positive displacement pump
Oil Filter	Cartridge type full flow filter
Oil Capacity (when engine is completely dry)	2.35 L (2.48 US-qt)
Cooling System	Forced air cooling by fan with oil cooler
Dimensions (L × W × H )	511 mm × 502 mm × 626 mm (20.12 in. × 19.76 in. × 24.65 in.)
Dry Weight (without muffler)	62.6 kg (138 lbs)

Specifications subject to change without notice.

# Periodic Maintenance

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## 2-2 PERIODIC MAINTENANCE

### Periodic Maintenance Chart

To ensure satisfactory operation over an extended period of time, any engine requires normal maintenance regular intervals. The Periodic Maintenance Chart below shows periodic inspection and maintenance items and suitable intervals. The bullet mark (●) designates that the corresponding item should be performed at that interval.

Some adjustments require the use of special tools or other equipment. An electronic tachometer will facilitate setting idle and running speeds.

OPERATION	INTERVAL								
	Daily	First 8 hr.	Every 25 hr.	Every 50 hr.	Every 100 hr.	Every 200 hr.	Every 250 hr.	Every 300 hr.	Every 500 hr.
Check and clean air inlet screen	●								
Check and add engine oil	●								
Check for fuel and oil leakage	●								
Check for loose or lost nuts and screws	●								
Check battery electrolyte level	●								
Replace air cleaner primary element (1)							●		
Check air cleaner secondary element (1)							●		
Replace air cleaner secondary element (1)									●
Clean cylinder and cylinder head fins (1)					●				
Tighten nut and screws					●				
Change engine oil		●			●				
Clean and re-gap spark plugs					●				
Check and clean oil cooler fins					●				
Change oil filter						●			
◆ Check and adjust valve clearance								●	
◆ Clean and lap valve seating surface								●	
◆ Clean combustion chambers								●	

(1): Service more frequently under dusty conditions.

◆: These items must be performed with the proper tools. See your authorized Kawasaki Engine Dealer for service, unless you have the proper equipment and mechanical proficiency.

**Torque and Locking Agent**

The following tables lists 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 "Remarks" column mean:

EO: Apply oil to the threads.

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

R: Replacement Parts

S: Tighten the fasteners following the specified sequence.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
<b>Fuel System</b>				
Carburetor and Inlet Pipe Mounting Bolts	5.9	0.60	52 in·lb	
Carburetor and Inlet Pipe Mounting Nuts	5.9	0.60	52 in·lb	
Air Creaner Bracket Mounting Nuts	19.6	2.00	14.4	
Air Creaner Mounting Bracket Bolt	19.6	2.00	14.4	
Fuel Pump Mounting Bolts	5.9	0.60	52 in·lb	
Inlet Manifold Bolts	5.9	0.60	52 in·lb	S
Governor Shaft Plate Screws	2.0	0.20	18 in·lb	
Governor Arm Joint Bolt	5.9	0.60	52 in·lb	
Governor Arm Clamp Nut	7.8	0.80	69 in·lb	
<b>Cooling System</b>				
Engine Shroud Bolts	5.9	0.60	52 in·lb	
Cooling Fan Screen Bolts	5.9	0.60	52 in·lb	
Cooling Fan Plate Mounting Stud Bolts	5.9	0.60	52 in·lb	
Guard Mounting Bolts	5.9	0.60	52 in·lb	
Fan Housing Bolts	5.9	0.60	52 in·lb	
<b>Engine Top End</b>				
Cylinder Head Bolts	46	4.7	34	S
Rocker Cover Bolts	5.9	0.60	52 in·lb	
Exhaust Pipe Nuts	22	2.2	16	
Valve Clearance Adjusting Locknuts	9.8	1.0	87 in·lb	
Connecting Rod Big End Cap Bolts	20.6	2.10	15.2	EO
<b>Lubrication System</b>				
Oil Filter Joint Pipe	6.9	0.70	61 in·lb	
Oil Pump Cover Plate Bolts	5.9	0.60	52 in·lb	
Oil Filter	11.8	1.20	104 in·lb	R
Engine Oil Drain Plugs	6.9	0.70	61 in·lb	EO
Oil Filler Mounting Bolt	5.9	0.60	52 in·lb	
Oil Cooler Bolts	5.9	0.60	52 in·lb	
<b>Camshaft/Crankshaft</b>				
Breather Valve Mounting Screws	2.0	0.20	18 in·lb	
Breather Chamber Cover Bolts	5.9	0.60	52 in·lb	
Crankcase Cover Bolts	46	4.7	34	S
Oil Passage Plugs	3.9	0.40	34 in·lb	L
Connecting Rod Big End Cap Bolts	20.6	2.10	15.2	EO
<b>Starter System</b>				
Starter Motor Mounting Bolts	19.6	2.00	14.4	

## 2-4 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
<b>Electrical System</b>				
Ignition Coil Bolts	6.9	0.70	61 in·lb	
Stator Coil Screws	3.4	0.35	30 in·lb	
Flywheel Bolt	56	5.7	41	
Regulator Screws	3.5	0.36	31 in·lb	
Spark Plugs	22	2.2	16	
Fan Housing Bolts	5.9	0.60	52 in·lb	

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

**Specifications**

Item	Standard
<p><b>Fuel System</b></p> <p>Idle Speed: (1)</p> <p>    Low Idle Speed (Carburetor idle rpm)</p> <p>    Low Idle Speed (Governor idle rpm)</p> <p>    High Idle Speed</p> <p>Air Cleaner:</p> <p>    Type</p> <p>    Pre-cleaner</p> <p>    Second-stage cleaner</p>	<p>1 450 r/min (rpm)</p> <p>1 550 r/min (rpm)</p> <p>3 600 r/min (rpm)</p> <p>Heavy duty type</p> <p>Primary element</p> <p>Secondary element</p>
<p><b>Engine Top End</b></p> <p>Valve Clearance:</p> <p>    Inlet, Exhaust</p> <p>Valve Seating Surface Angle:</p> <p>    Inlet, Exhaust</p> <p>Valve Seating Surface Width:</p> <p>    Exhaust</p> <p>    Inlet</p>	<p>0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.)</p> <p>45°</p> <p>1.0 ~ 1.5 mm (0.039 ~ 0.059 in.)</p> <p>0.7 ~ 1.1 mm (0.028 ~ 0.043 in.)</p>
<p><b>Lubrication System</b></p> <p>Engine Oil:</p> <p>    Type</p> <p>    Viscosity</p> <p>    Capacity</p> <p>    Level</p>	<p>SF, SG, SH, SJ or SL class</p> <p>SAE 40, SAE 30, SAE 10W-30/SAE 10W-40, or SAE 5W-20</p> <p>1.7 L (1.8 US qt) (When the oil filter is not removed)</p> <p>1.9 L (2.0 US qt) (When the oil filter is removed)</p> <p>Operating range (grid area) on dipstick</p>
<p><b>Electrical System</b></p> <p>Spark Plug</p> <p>Spark Plug Gap</p>	<p>NGK BPR5ES</p> <p>0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)</p>

(1) Idle speeds may vary depending on each equipment. Refer to the equipment specification.

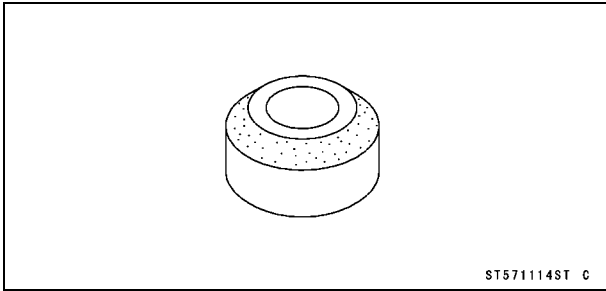


## 2-6 PERIODIC MAINTENANCE

### Special Tools

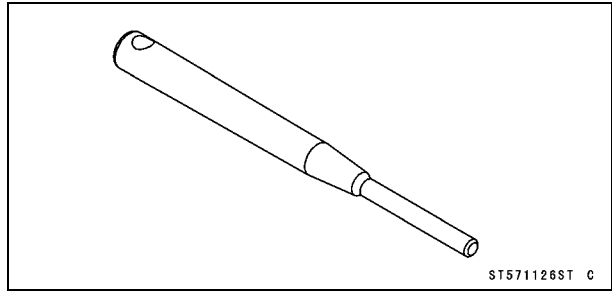
Valve Seat Cutter, 45° -  $\phi 27.5$ :

57001-1114



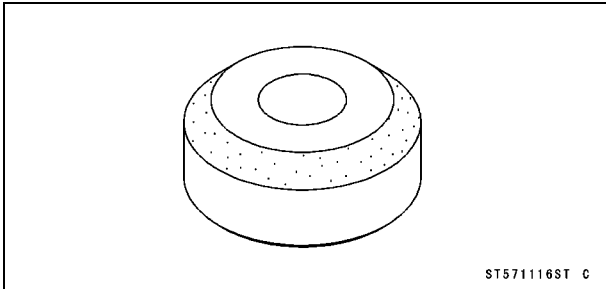
Valve Seat Cutter Holder,  $\phi 7$ :

57001-1126



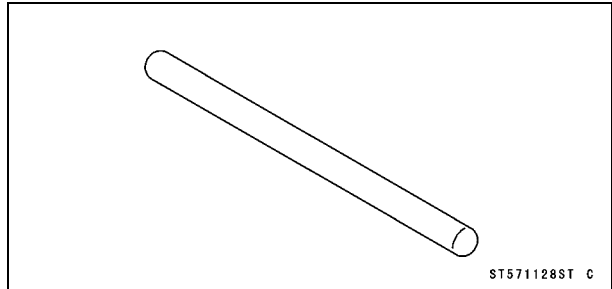
Valve Seat Cutter, 45° -  $\phi 35$ :

57001-1116



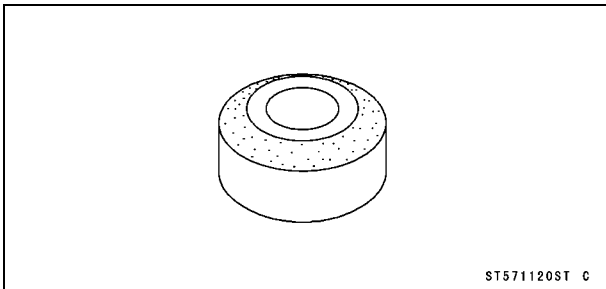
Valve Seat Cutter Holder Bar:

57001-1128



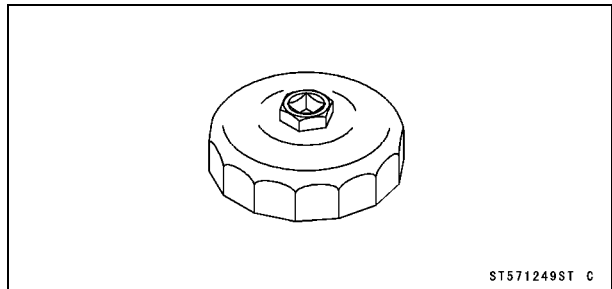
Valve Seat Cutter, 32° -  $\phi 30$ :

57001-1120



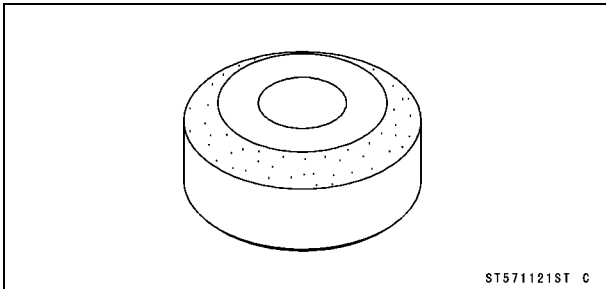
Oil Filter Wrench:

57001-1249



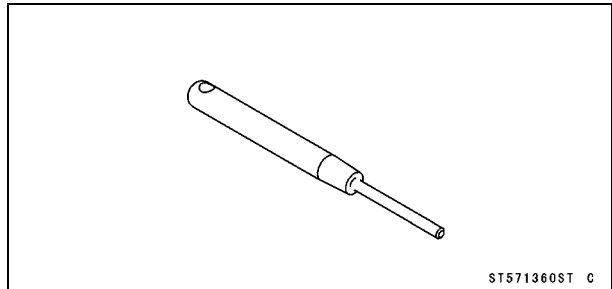
Valve Seat Cutter, 32° -  $\phi 35$ :

57001-1121



Valve Seat Cutter Holder,  $\phi 6$ :

57001-1360



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