

Kawasaki

FH770D KAI



4-stroke air-cooled v-twin gasoline engine

Service Manual

Quick Reference Guide

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

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



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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.

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)		

Read OWNER'S MANUAL before operating.

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 gasses. The blow-by gasses are led to a breather chamber through the crankcase and from there to the air cleaner.

Oil is separated from the gasses while passing through the inside of the breather chamber from the crankcase, and then returned 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.

How to Use This Manual

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

For example, if you want ignition coil information, use the Quick Reference Guide to locate

the Electrical System chapter. Then, use the Table of Contents on the first page of the chapter to find the Ignition coil section.

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

▲ WARNING

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

CAUTION

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

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

NOTE

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

- Indicates a procedural step or work to be done.
- Indicates a procedural sub-step or how to do the work of the procedural step it follows. It also precedes the text of a 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) 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 matter 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.

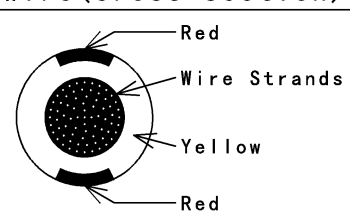

(16) Lubrication

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	

GB020801W1 C

(18) 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.

(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 | |

1-4 GENERAL INFORMATION

Before Servicing

(20) Specifications

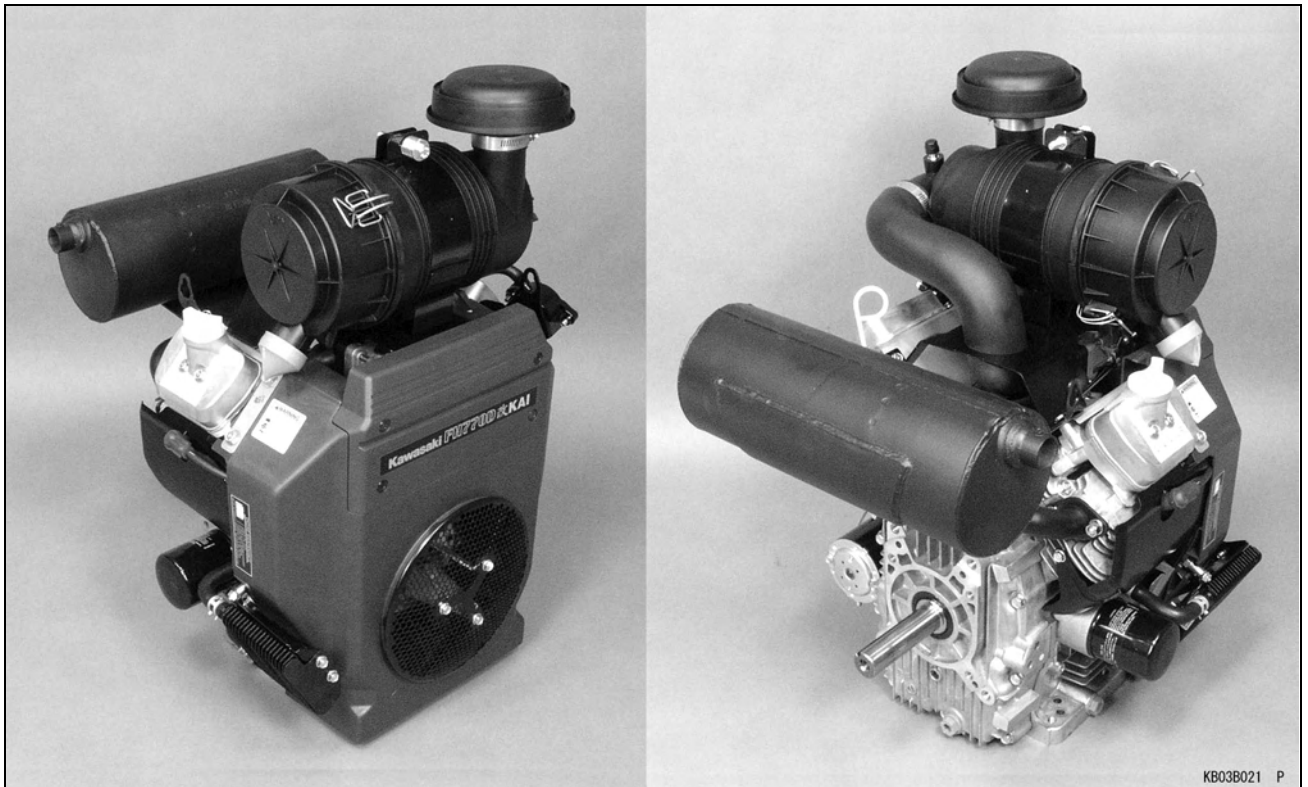
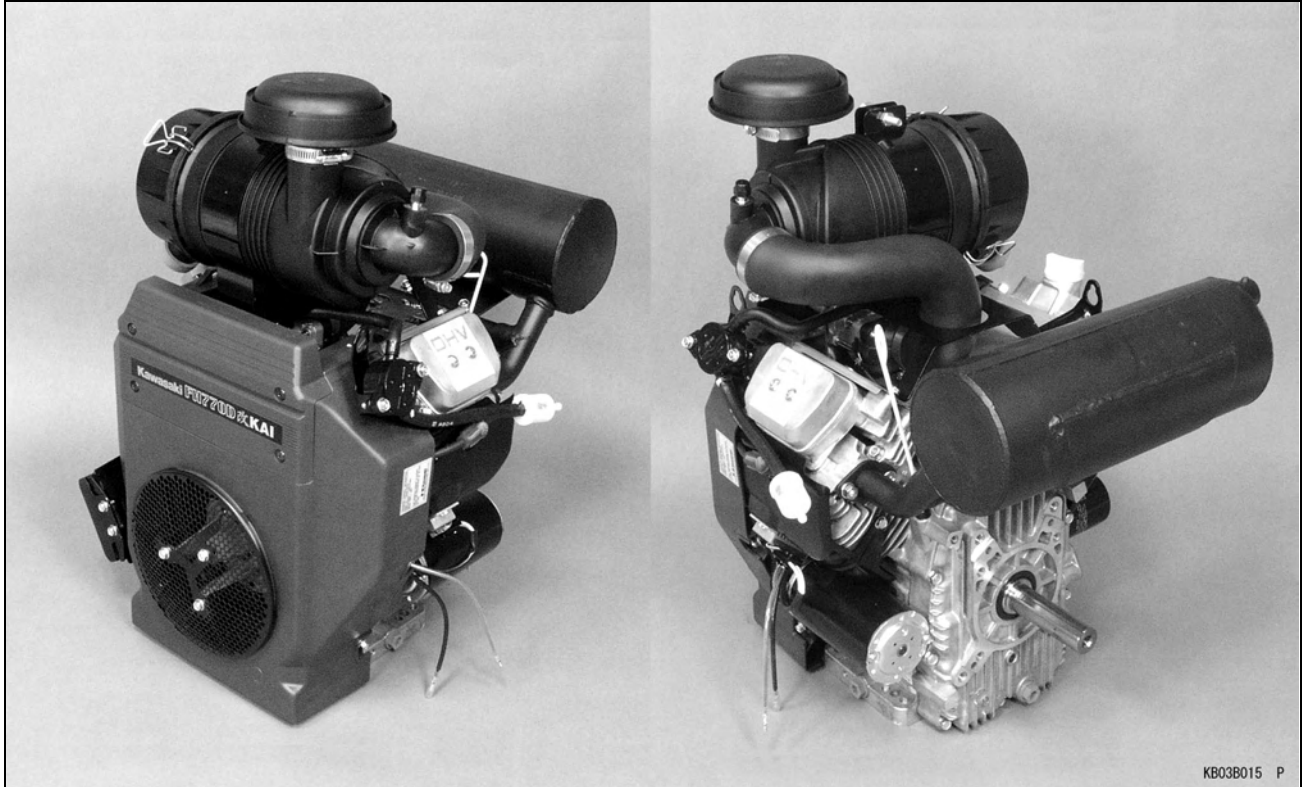
Specification terms are defined as follows:

"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.

Model Identification

FH770D KAI



Cylinder Number Designation

No.1 Cylinder is on the electric starter side.

No.2 Cylinder is on the oil fileter side.

1-6 GENERAL INFORMATION

General Specifications

Items	FH770D KAI
Type of Engine	Forced air-cooled, horizontal shaft, OHV, 4-stroke gasoline engine
Cylinder Layout	90° V-Twin
Bore × Stroke	80 mm × 76 mm (3.15 in. × 2.99 in.)
Piston Displacement	764 mL (46.62 cu. in.)
Direction of Rotation	Counterclockwise facing the PTO shaft
Compression Release	Automatic compression release
Low Idle Speed (Carburetor idle rpm)	1 450 r/min (rpm)
Low Idle Speed (Governor idle rpm)	1 550 r/min (rpm)
High Idle Speed	3 600 r/min (rpm)
Ignition System	Transistorized-flywheel magneto
RFI	Per Canada and U.S.A. requirements
Starting System	Electric starter
Charging System	12 V - 13 amps with regulator
Spark Plug	NGK BPR4ES
Carburetor	Float type, fixed main jet, two barrel
Fuel Pump	Diaphragm type pulse pump
Air Cleaner	Dual stage element, dry type
Governor	Flyweight all speed governor
Lubrication System: Oil Filter Oil Pressuer Switch Oil Capacity	Pressure feed by positive displacement pump Cartridge type full flow filter ON-OFF switch 1.6 L (1.7 US·qt)...(when engine is completely dry)
Cooling System	Forced air cooling by fan
Dimensions (L × W × H): without Muffler	444 mm × 428 mm × 665 mm (17.5 in. × 16.9 in. × 26.2 in.)
Dry Weight: without Muffler	46.4 kg (102.3 lb)

Specifications are 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 or clean air inlet screen	●								
Check and add engine oil	●								
Check for fuel and oil leakage	●								
Check for loose or lost nut and screw	●								
Check battery electrolyte level	●								
Replace air cleaner primary element (Heavy duty air cleaner model) (1)							●		
Check air cleaner secondary element (Heavy duty air cleaner model) (1)							●		
Replace air cleaner secondary element (Heavy duty air cleaner model) (1)									●
Clean dust and dirt from 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 silicone sealant etc.

Letters used in the "Remarks" column mean:

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

O: Apply an oil to the threads, seated surface, or washer.

R: Replacement parts

S: Tighten the fasteners following the specified sequence.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Fuel System				
Air Cleaner Body Bracket Bolts	5.9	0.60	52 in·lb	
Air Cleaner Body Bracket Nuts	9.8	1.0	87 in·lb	
Carburetor Mounting Nuts	6.9	0.70	61 in·lb	
Carburetor Cover Screws	2.5	0.25	22 in·lb	
Chamber Screws	3.9	0.40	35 in·lb	
Choke Valve Screws	0.9	0.09	8 in·lb	
Control Panel Mounting Bolts	6.9	0.70	61 in·lb	
Drain Screw	2.0	0.20	18 in·lb	
Fuel Pump Bracket Bolts	5.9	0.60	52 in·lb	
Fuel Pump Mounting Bolts	5.9	0.60	52 in·lb	
Governor Arm Clamp Nut	7.8	0.80	69 in·lb	
Governor Shaft Plate Screws	2.0	0.20	18 in·lb	
Inlet Manifold Bolts	6.9	0.70	61 in·lb	
Solenoid Valve	12	1.2	106 in·lb	
Throttle Valve Screws	0.9	0.09	8 in·lb	
Cooling System				
Engine Shroud Bolts	5.9	0.60	52 in·lb	
Fan Housing Bolts (Upper)	6.9	0.70	61 in·lb	
Fan Housing Bolts (Lower)	5.9	0.60	52 in·lb	
Screen Bolts	5.9	0.60	52 in·lb	
Fan Bolts	16	1.6	12	
Fan Housing Cover Screws	2.0	0.20	18 in·lb	
Engine Top End				
Connecting Rod Big End Cap Bolts	9.8	1.0	87 in·lb	O
Rocker Arm Bolts	28	2.8	21	
Valve Clearance Lock Screws	6.9	0.70	61 in·lb	O
Cylinder Head Bolts	32	3.3	24	S
Rocker Cover Mounting Bolts	6.9	0.70	61 in·lb	
Spark Plugs	22	2.2	16	
Muffler Bracket Bolts	13	1.3	115 in·lb	
Muffler Flange Nuts	15	1.5	11	
Muffler Stay Mounting Bolts	15	1.5	11	
Lubrication System				
Oil Drain Plugs	6.9	0.70	61 in·lb	
Oil Filter	9.8	1.0	87 in·lb	O, R
Oil Filter Joint Pipe	44	4.5	32	

2-4 PERIODIC MAINTENANCE

Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Oil Pump Cover Plate Mounting Bolts	6.9	0.70	61 in·lb	S L
Oil Pipe Mounting Bolts	6.9	0.70	61 in·lb	
Crankcase Cover Bolts	29	3.0	22	
Oil Passage Plugs	2.9	0.30	26 in·lb	
Oil Cooler Bracket Bolt	5.9	0.60	52 in·lb	
Oil Cooler Bracket Nuts	5.9	0.60	52 in·lb	
Oil Cooler Mounting Bolts	5.9	0.60	52 in·lb	
Camshaft/Transmission				
Crankcase Cover Bolts	32	3.3	24	S
Breather Chamber Cover Bolts	5.9	0.60	52 in·lb	
Breather Valve Mounting Screws	2.9	0.30	26 in·lb	
Connecting Rod Big End Cap Bolts	9.8	1.0	87 in·lb	O
Electrical System				
Spark Plugs	22	2.2	16	
Stator Coil Screws	2.9	0.30	26 in·lb	
Flywheel Bolt	56	5.7	41	
Regulator Screw	3.4	0.35	30 in·lb	
Starter Motor Mounting Bolts	15	1.5	11	
Ignition Coil Bolts	6.9	0.70	61 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
Fuel System Idle Speed: (1) Low Idle Speed (Carburetor Idle rpm) Low Idle Speed (Governed Idle rpm) High Idle Speed Air Cleaner: Type Pre-Cleaner Two-Stage Cleaner	 1 450 r/min (rpm) 1 550 r/min (rpm) 3 600 r/min (rpm) Heavy duty type Primary element Secondary element
Engine Top End Valve Clearance: Inlet, Exhaust Valve Seating Surface Angle: Inlet, Exhaust Valve Seating Surface Width: Inlet Exhaust	 0.10 ~ 0.15 mm (0.0039 ~ 0.0059 in.) 45° 0.8 ~ 1.4 mm (0.03 ~ 0.06 in.) 1.1 ~ 1.6 mm (0.04 ~ 0.06 in.)
Lubrication System Engine Oil: Type Viscosity Capacity Level	 SF, SG, SH, SJ or SL class SAE 40, SAE 30, SAE 10W-30/SAE 10W-40, or SAE 5W-20 1.4 L (1.5 US qt) (When filter is not removed) 1.6 L (1.7 US qt) (When filter is removed) Between "H" and "L" marks on oil gauge.
Electrical System Spark Plug Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)
Item	Service Limit
Engine Top End Cylinder Head Warp	0.03 mm (0.001 in.)

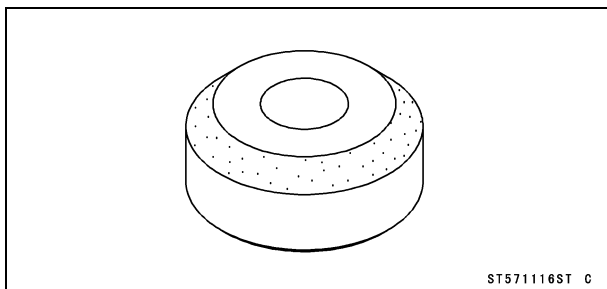
(1) Idle speeds may vary depending on each equipment. Refer to the equipment specification.

2-6 PERIODIC MAINTENANCE

Special Tools

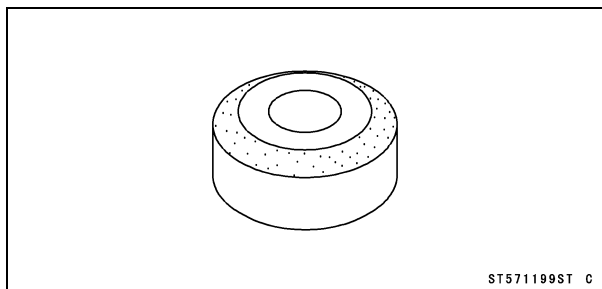
Valve Seat Cutter, 45° - ϕ 35:

57001-1116



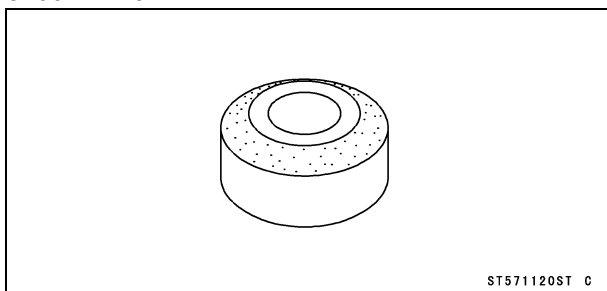
Valve Seat Cutter, 32° - ϕ 33:

57001-1199



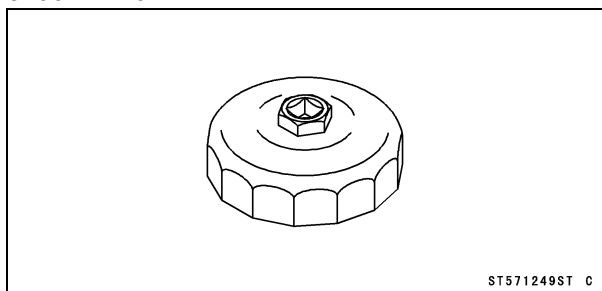
Valve Seat Cutter, 32° - ϕ 30:

57001-1120



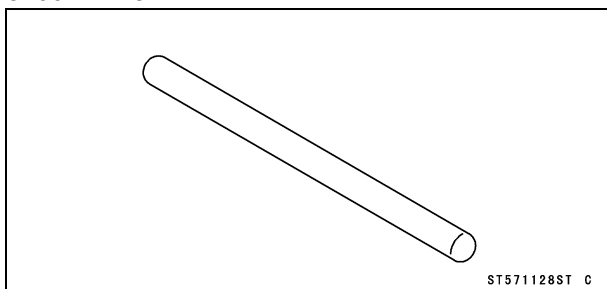
Oil Filter Wrench:

57001-1249



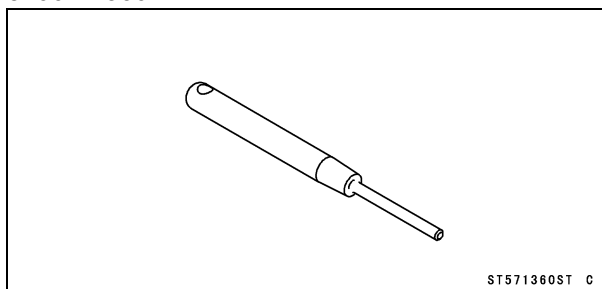
Valve Seat Cutter Holder Bar:

57001-1128



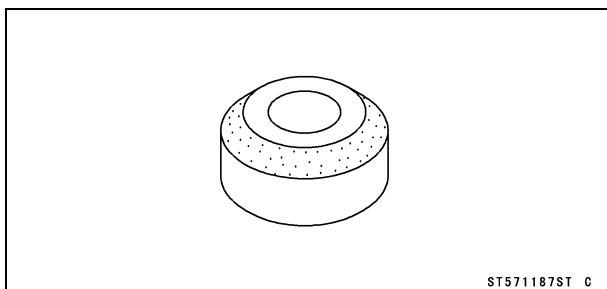
Valve Seat Cutter Holder, ϕ 6:

57001-1360



Valve Seat Cutter, 45° - ϕ 30:

57001-1187



Periodic Maintenance Procedures

Fuel System

NOTE

○High and low idle speeds may vary depending on the equipment on which the engine is used. Refer to the equipment specification.

Low Idle Speed Adjustment

- Disconnect all possible external loads from the engine.
- Start the engine and warm it up thoroughly.

⚠ WARNING

Always keep your hands clear of the moving parts.

- Remove the fan housing cover (see Cleaner Body Removal in the Fuel System chapter).
- Move the throttle lever on dash to the idle position, and hold the throttle lever on the carburetor in closed position (turn the governor arm clockwise all the way) and adjust the low idle speed screw [A] until the engine idles at specified speed.

Idle Speed (Carburetor idle rpm)

Standard: 1 450 rpm

- Release the throttle lever and adjust the low idle speed set screw [A] on the control plate to obtain the specified governed low idle speed.

Low Idle Speed (Governed idle rpm)

Standard: 1 550 rpm

- Install the fan housing cover.
- Torque - Fan Housing Cover Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

High Idle Speed Adjustment

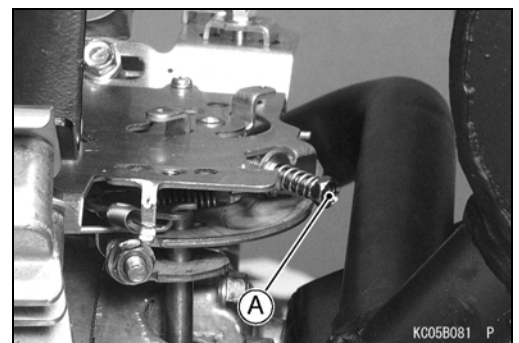
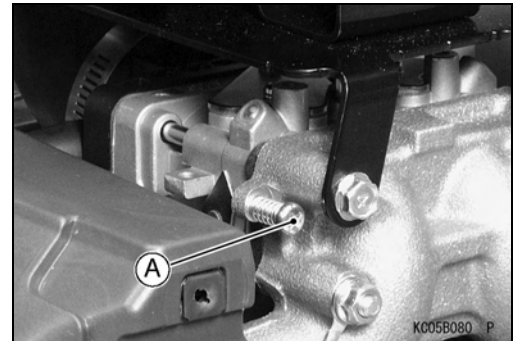
NOTE

○High idle speed adjustment should be made after the idle speed adjustment is performed.

CAUTION

Do not adjust high idle speed with the air cleaner removed.

- Start and warm up the engine thoroughly.



2-8 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

⚠ WARNING

Always keep your hands clear of the moving parts.

- Move the throttle lever at a dash to the high idle position and match the lever hole position with the panel hole by inserting $\phi 6$ mm ($\phi 0.2$ in.), pin or bolt [A].
- Loosen the control panel mounting bolts [B] enough to move the control panel assembly.
- Carefully move the control panel assembly right side [C] up or down to obtain the specified high idle speed.

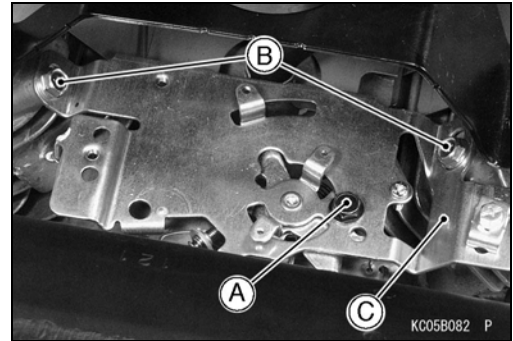
High Idle Speed

Standard: 3 600 rpm

- Tighten:
Torque - Control Panel Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)
- Remove the $\phi 6$ mm ($\phi 0.02$ in.), pin or bolt.
- Check the idle speed, and readjust the idle speed if necessary.

CAUTION

Be sure to make the idle and high idle speeds respectively correspond to those of the equipment.

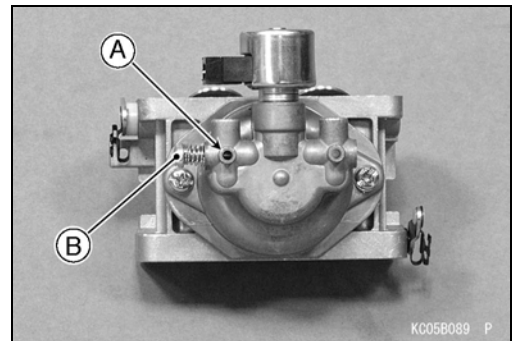


Fuel System Cleanliness Inspection

⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.

- Remove the carburetor (see Carburetor Removal in the Fuel System chapter).
- Connect a plastic tube to the carburetor drain hole [A] and place a suitable container under the plastic tube other end.
- Turn out the drain screw [B] a few turns to drain the carburetor and check to see if water or dirt has accumulated in the carburetor.
- Tighten the drain screw.
Torque - Drain Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)
- If any water or dirt is found, clean the carburetor (see Carburetor Cleaning in the Fuel System chapter), and fuel tank, and check the fuel filter.



Periodic Maintenance Procedures

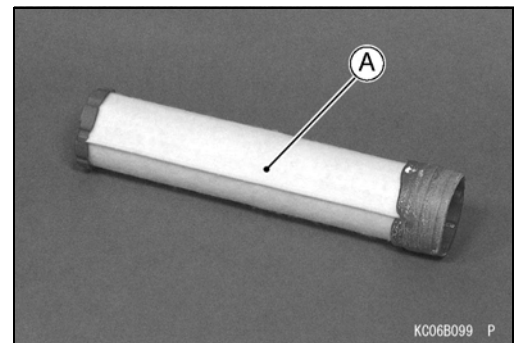
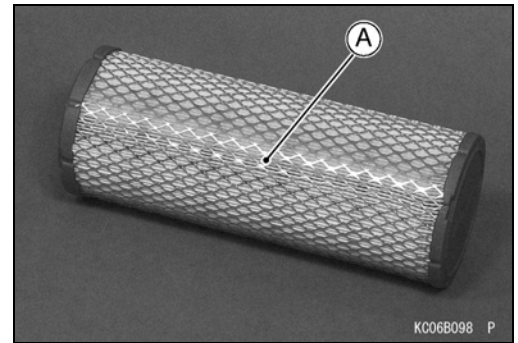
Element Cleaning and Inspection

This air cleaner elements are not recommended to be cleaned, and each air cleaner element should be replaced with the new one at the maintenance time as shown in the maintenance chart.

NOTE

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

- Remove the elements (see Elements Removal in the Fuel System chapter).
- Replace the primary element [A] every 250 hrs.
- Replace the secondary element [A] with the new one if dirty when primary element is checked.
- Replace the secondary element every 500 hrs.



CAUTION

Do not wash air cleaner elements. Do not oil air cleaner elements. Do not use pressurized air to clean air cleaner elements.

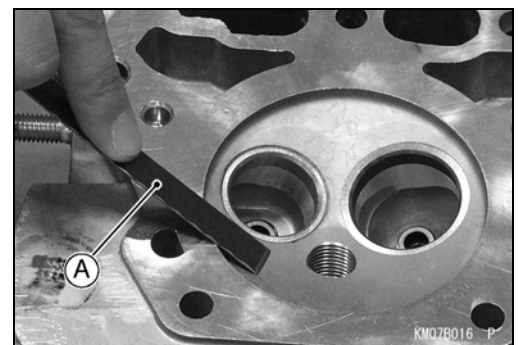
Housing (Cap and Body) Inspection

- Clean the housing with detergent and water and dry thoroughly.
- Check the housing for deformation or other damage.
- The housing must seal well and permit only filtered air to reach the carburetor.
- ★If the housing is damaged, it must be replaced.
- Check that no foreign material is obstructing the air passage.

Engine Top End

Cylinder Head Cleaning and Inspection

- Remove the valves (see Valve Mechanism Removal/Installation in the Engine Top End chapter).
- Scrape the carbon deposits from the head and exhaust port with a suitable tool [A].
- To avoid gouging, use scrapers that are made of a material that will not cause damage.
- Clean the head in a bath of high-flash point solvent and dry it with compressed air.



⚠ WARNING

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

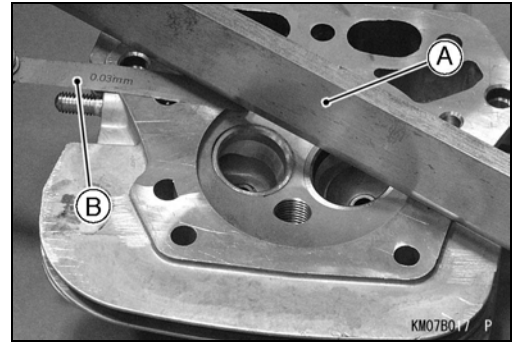
2-10 PERIODIC MAINTENANCE

Periodic Maintenance Procedures

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

Cylinder Head Warp

Service Limit: 0.03 mm (0.001 in.)



- Check the cylinder head for cracks or other damage.
- Cracks not visible to the eye may be detected by coating the suspected area with mixture of 25% kerosene and 75% light engine oil.
- Wipe the area dry and immediately apply a coating of zinc oxide dissolved in wood alcohol. If a crack is present, the coating will become discolored at the defective area.
- If a crack is present in the cylinder head, replace it.
- Inspect the mating surfaces for burrs and nicks.

Valve Clearance Inspection

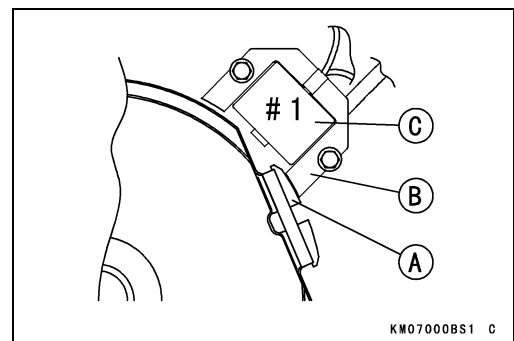
NOTE

○ Valve clearance must be checked when the engine is cold (at room temperature).

- Remove the rocker cover (see Cylinder Head Assembly Removal in the Engine Top End chapter).
- Place the piston at top dead center (TDC) of the compression stroke turning the crankshaft clockwise facing the flywheel.

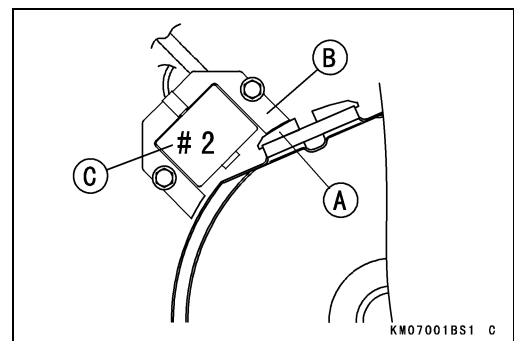
No.1 Cylinder:

- The left projection [A] on the flywheel is faced with the right leg [B] on the #1 ignition coil [C] as shown.
- Check the intake and exhaust valves are closed completely, if not turn the flywheel one turn (360°) clockwise and face the left projection with the right leg again.



No.2 Cylinder:

- The left projection [A] on the flywheel is faced with the right leg [B] on the #2 ignition coil [C] as shown. Follow No.1 Cylinder alignment.



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