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**VULCAN 2000**  
**VN2000**



# Motorcycle Service Manual

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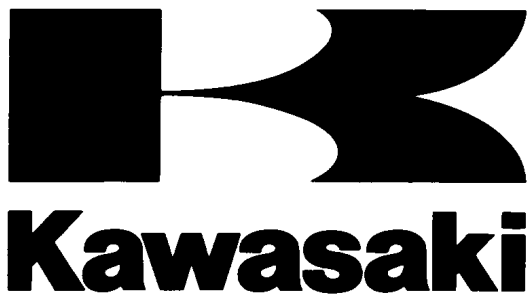
# Quick Reference Guide

<b>General Information</b>	<b>1</b>
<b>Periodic Maintenance</b>	<b>2</b>
<b>Fuel System (DFI)</b>	<b>3</b>
<b>Cooling System</b>	<b>4</b>
<b>Engine Top End</b>	<b>5</b>
<b>Clutch</b>	<b>6</b>
<b>Engine Lubrication System</b>	<b>7</b>
<b>Engine Removal/Installation</b>	<b>8</b>
<b>Crankshaft/Transmission</b>	<b>9</b>
<b>Wheels/Tires</b>	<b>10</b>
<b>Final Drive</b>	<b>11</b>
<b>Brakes</b>	<b>12</b>
<b>Suspension</b>	<b>13</b>
<b>Steering</b>	<b>14</b>
<b>Frame</b>	<b>15</b>
<b>Electrical System</b>	<b>16</b>
<b>Appendix</b>	<b>17</b>

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.





**VULCAN 2000**  
**VN2000**

# **Motorcycle Service Manual**

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No liability can be accepted for any inaccuracies or omissions in this publication, although every possible care has been taken to make it as complete and accurate as possible.

The right is reserved to make changes at any time without prior notice and without incurring an obligation to make such changes to products manufactured previously. See your Motorcycle dealer for the latest information on product improvements incorporated after this publication.

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	r/min, 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) (mass)	W	watt(s)
h	hour(s)	Ω	ohm(s)
kg	(mass)		
kgf	(force)		
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 in compliance with applicable regulations of the United States Environmental Protection Agency and California Air Resources Board. Additionally, Kawasaki has incorporated an evaporative emission control system (3) in compliance with applicable regulations of the California Air Resources Board on vehicles sold in California only.

### 1. Crankcase Emission Control System

This system eliminates the release of crankcase vapors into the atmosphere. Instead, the vapors are routed through an oil separator to the inlet side of the engine. While the engine is operating, the vapors are drawn into combustion chamber, where they are burned along with the fuel and air supplied by the fuel injection system.

### 2. Exhaust Emission Control System

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

The exhaust system of this model motorcycle manufactured primarily for sale in California includes a catalytic converter system.

### 3. Evaporative Emission Control System

Vapors caused by fuel evaporation in the fuel system are not vented into the atmosphere. Instead, fuel vapors are routed into the running engine to be burned, or stored in a canister when the engine is stopped. Liquid fuel is caught by a vapor separator and returned to the fuel tank.

The Clean Air Act, which is the Federal law covering motor vehicle pollution, contains what is commonly referred to as the Act's "tampering provisions."

"Sec. 203(a) The following acts and the causing thereof are prohibited...

(3)(A) for any person to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title prior to its sale and delivery to the ultimate purchaser, or for any manufacturer or dealer knowingly to remove or render inoperative any such device or element of design after such sale and delivery to the ultimate purchaser.

(3)(B) for any person engaged in the business of repairing, servicing, selling, leasing, or trading motor vehicles or motor vehicle engines, or who operates a fleet of motor vehicles knowingly to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title following its sale and delivery to the ultimate purchaser..."

### NOTE

○The phrase "remove or render inoperative any device or element of design" has been generally interpreted as follows:

1. Tampering does not include the temporary removal or rendering inoperative of devices or elements of design in order to perform maintenance.
2. Tampering could include:
  - a. Maladjustment of vehicle components such that the emission standards are exceeded.
  - b. Use of replacement parts or accessories which adversely affect the performance or durability of the motorcycle.
  - c. Addition of components or accessories that result in the vehicle exceeding the standards.
  - d. Permanently removing, disconnecting, or rendering inoperative any component or element of design of the emission control systems.

**WE RECOMMEND THAT ALL DEALERS OBSERVE THESE PROVISIONS OF FEDERAL LAW, THE VIOLATION OF WHICH IS PUNISHABLE BY CIVIL PENALTIES NOT EXCEEDING \$10,000 PER VIOLATION.**

## **TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED**

Federal law prohibits the following acts or the causing thereof: (1) The removal or rendering inoperative by any person other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use, or (2) the use of the vehicle 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:

- Replacement of the original exhaust system or muffler with a component not in compliance with Federal regulations.
- Removal of the muffler(s) or any internal portion of the muffler(s).
- Removal of the air box or air box cover.
- Modifications to the muffler(s) or air inlet system by cutting, drilling, or other means if such modifications result in increased noise levels.

# Foreword

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

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

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

To get the longest life out of your vehicle:

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

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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 Periodic Maintenance 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 Periodic Maintenance 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 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

Before Servicing .....	1-2
Model Identification.....	1-7
General Specifications.....	1-9
Technical Information – Oxygen Sensor.....	1-11
Technical Information – Electric Solenoid Operated Decompressor .....	1-16
Technical Information – Dual Balancer Shaft System.....	1-17
Unit Conversion Table .....	1-19

## 1-2 GENERAL INFORMATION

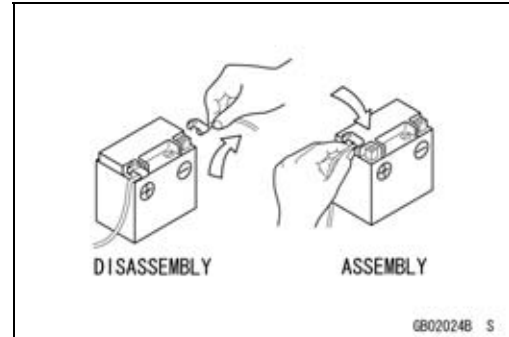
### Before Servicing

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

Especially note the following:

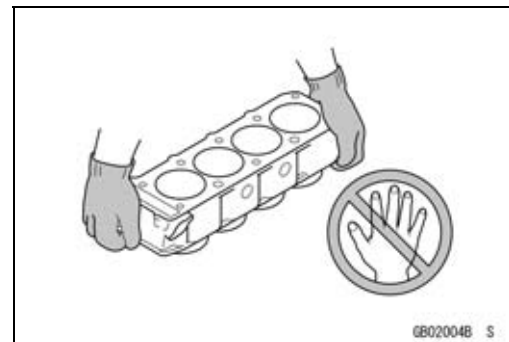
#### *Battery Ground*

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



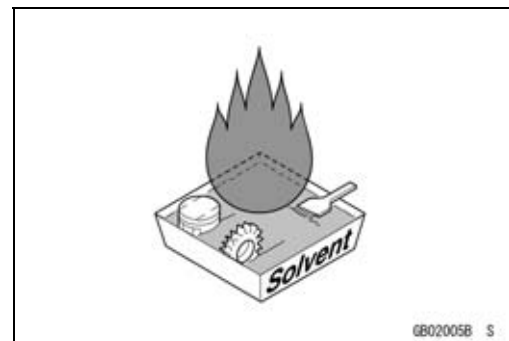
#### *Edges of Parts*

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



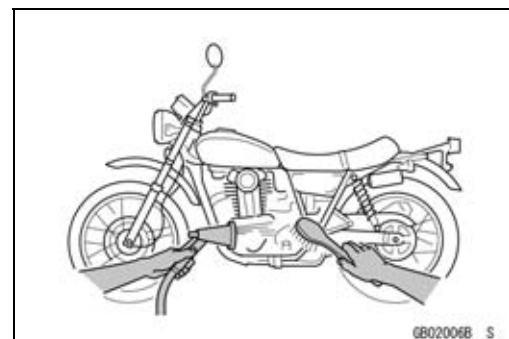
#### *Solvent*

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



#### *Cleaning vehicle before disassembly*

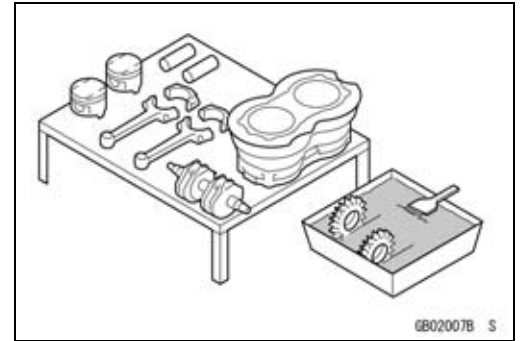
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



**Before Servicing**

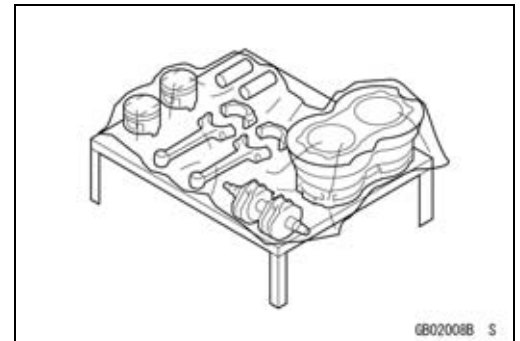
*Arrangement and Cleaning of Removed Parts*

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



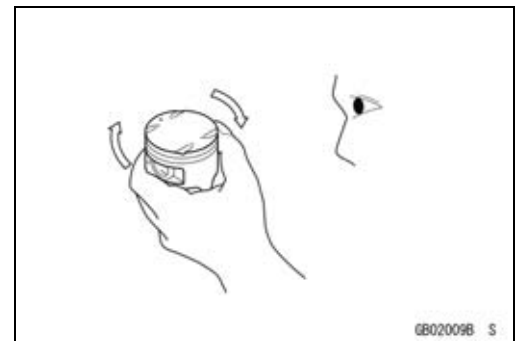
*Storage of Removed Parts*

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



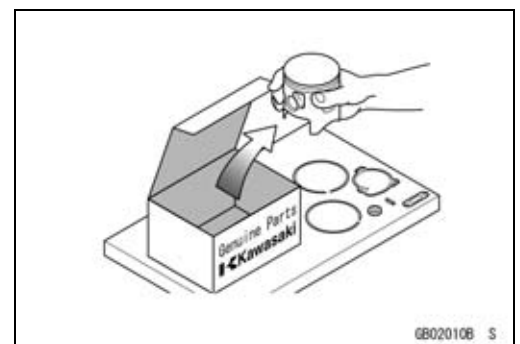
*Inspection*

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



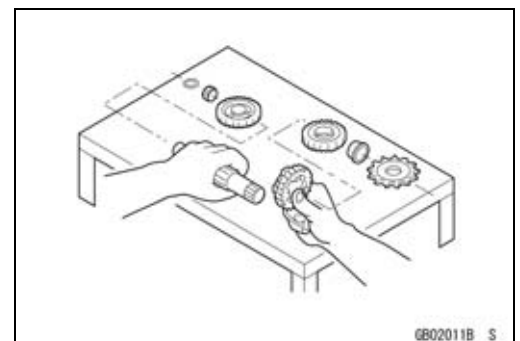
*Replacement Parts*

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



*Assembly Order*

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

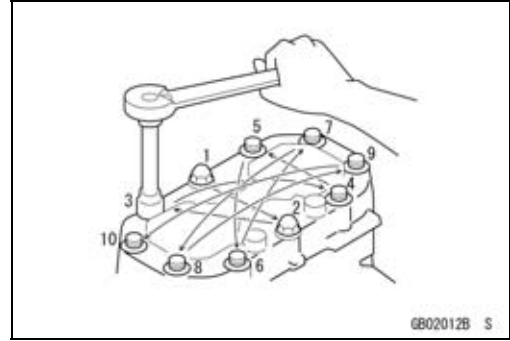


# 1-4 GENERAL INFORMATION

## Before Servicing

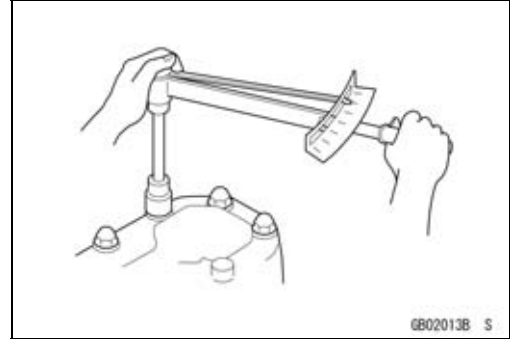
### *Tightening Sequence*

Bolts, nuts, or screws must be tightened according to the specified sequence to prevent case warpage or deformation which can lead to malfunction. If the specified tightening sequence is not indicated, tighten the fasteners alternating diagonally.



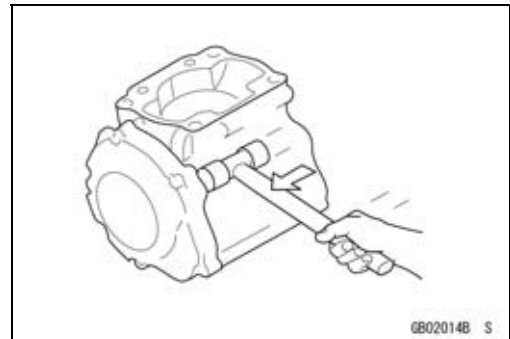
### *Tightening Torque*

Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench. Often, the tightening sequence is followed twice-initial tightening and final tightening with torque wrench.



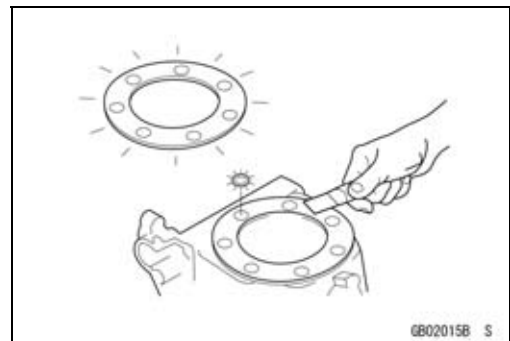
### *Force*

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



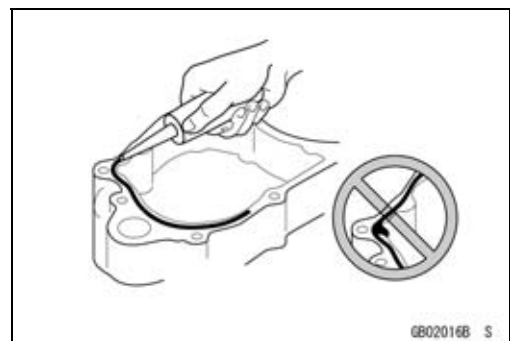
### *Gasket, Oring*

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



### *Liquid Gasket, Locking Agent*

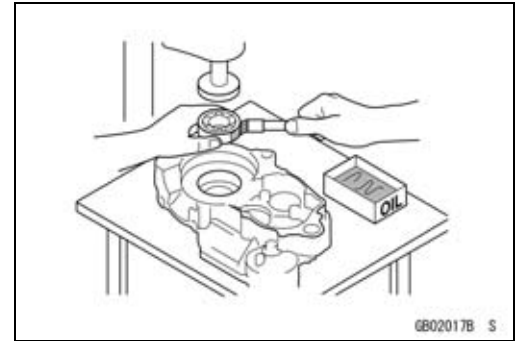
For applications that require Liquid Gasket or a Locking agent, clean the surfaces so that no oil residue remains before applying liquid gasket or locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



**Before Servicing**

*Press*

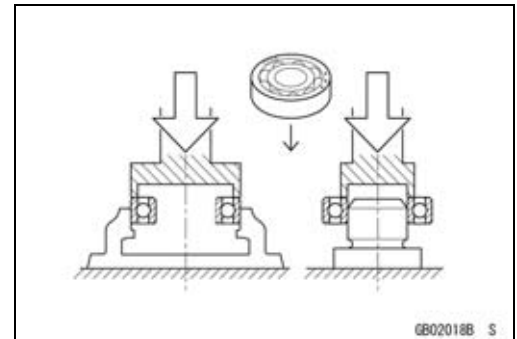
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



*Ball Bearing and Needle Bearing*

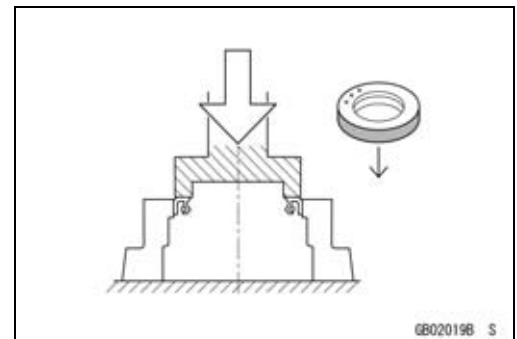
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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



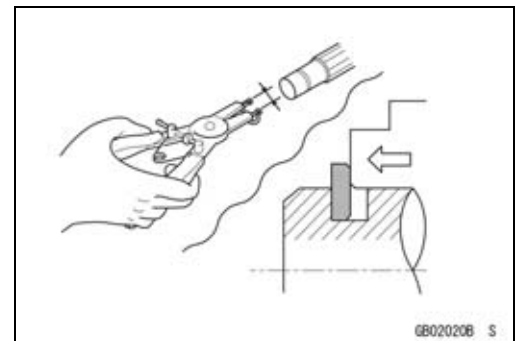
*Oil Seal, Grease Seal*

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



*Circlips, Cotter Pins*

Replace circlips or cotter pins that were removed with new ones. Install the circlip with its sharp edge facing outward and its chamfered side facing inward to prevent the clip from being pushed out of its groove when loaded. Take care not to open the clip excessively when installing to prevent deformation.



*Lubrication*

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

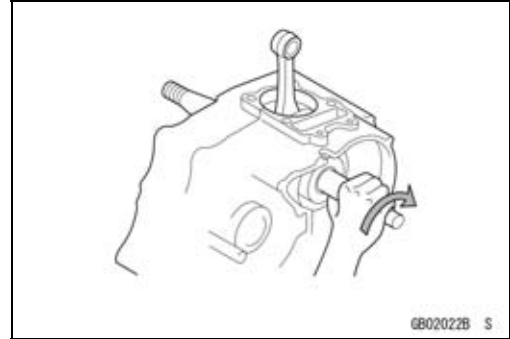


## 1-6 GENERAL INFORMATION

### Before Servicing

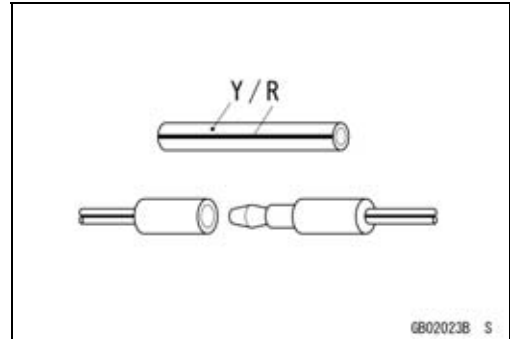
#### *Direction of Engine Rotation*

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



#### *Electrical Wires*

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



**Model Identification**

**VN2000-A1 (US, and Canada) Left Side View:**



**VN2000-A1 (US, and Canada) Right Side View:**



## 1-8 GENERAL INFORMATION

### Model Identification

VN2000-A1 (Europe) Left Side View:



VN2000-A1 (Europe) Right Side View:



**General Specifications**

Items	VN2000-A1
<b>Dimensions:</b>	
Overall length	2 535 mm (99.80 in.)
Overall width	1 025 mm (40.35 in.), (AU) 985 mm (38.8 in.)
Overall height	1 155 mm (45.47 in.)
Wheelbase	1 735 mm (68.31 in.)
Road clearance	135 mm (5.32 in.)
Seat height	680 mm (26.8 in.)
Dry mass	340 kg (750 lb)
Curb mass:	176 kg (388 lb)
Front	
Rear	195 kg (429 lb)
Fuel tank capacity	21 L (5.5 US gal)
Fuel	Unleaded and high-octane gasoline (see VN2000-A1 Owner's Manual)
<b>Performance:</b>	
Minimum turning radius	3.2 m (10.5 ft)
<b>Engine:</b>	
Type	4-stroke, OHV, V2-cylinder
Cooling system	Liquid-cooled
Bore and stroke	103 × 123.2 mm (4.06 × 4.850 in.)
Displacement	2 053 mL (125.3 cu in.)
Compression ratio	9.5 : 1
Maximum horsepower	76 kW (103 PS) @4 800 r/min (rpm), (CA) (CAL) (US) –
Maximum torque	177 N·m (18.05 kgf·m, 130.6 ft·lb) @3 200 r/min (rpm), (CA) (CAL) (US) –
Carburetion system	DFI (Digital Fuel Injection) System
Starting system	Electric starter
Ignition system	Battery and coil (transistorized)
Timing advance	Electronically advanced (digital)
Ignition timing	From 13° BTDC @900 r/min (rpm) ~ 51° BTDC
Front	@4 000 r/min (rpm)
Rear	From 15° BTDC @900 r/min (rpm) ~ 51° BTDC
Rear	@4 000 r/min (rpm)
Spark plugs	NGK IZFR6F-11
Cylinder numbering method	Front to Rear, 1-2
Firing order	1-2
Valve timing:	
Inlet	Open
Close	39° BTDC
Duration	69° ABDC
Exhaust	Open
Close	288°
Duration	69° BBDC
Open	39° ATDC
Close	288°
Duration	
Lubrication system	Forced lubrication (semi-dry sump)
Engine oil:	Type
Type	API SE, SF or SG class API SH or SJ class with JASO MA
Viscosity	SAE10W-40
Capacity	5.5 L (5.8 US qt, when engine is completely disassembled and dry)

# 1-10 GENERAL INFORMATION

## General Specifications

Items	VN2000-A1
<b>Drive Train:</b>	
Primary reduction system:	
Type	Chain
Reduction ratio	1.500 (48/32)
Clutch type	Wet multi disc
Transmission:	
Type	5-speed, constant mesh, return shift
Gear ratios:	
1st	2.550 (51/20)
2nd	1.629 (44/27)
3rd	1.218 (39/32)
4th	0.939 (31/33)
5th	0.729 (27/37)
Final drive system:	
Type	Belt
Reduction ratio	2.744 (50/40 × 72/32), (EU) 2.455 (48/44 × 72/32)
Overall drive ratio	3.003 @ Top gear, (EU) 2.687 @ Top gear
<b>Frame:</b>	
Type	Tubular, double cradle
Caster (rake angel)	32°
Trail	182 mm (7.17 in.)
Front tire:	
Type	Tubeless
Size	150/80 - R16MC 71V
Rear tire:	
Type	Tubeless
Size	200/60 - R16MC 79V
Front suspension:	
Type	Telescopic fork
Wheel travel	150 mm (5.91 in.)
Rear suspension:	
Type	Swingarm with mono-shock (non-link type)
Wheel travel	100 mm (3.94 in.)
Brake Type:	
Front	Dual disc
Rear	Single disc
<b>Electrical Equipment:</b>	
Battery	
Capacity	12 V 18 Ah
Headlight:	
Type	Semi-sealed beam
Bulb	12 V 65 W (quartz-halogen)
	12 V 55 W (quartz-halogen)
Tail/brake light	12 V 5/21 W
Alternator:	
Type	Three-phase AC
Rated output	38A × 14 V @5 000 r/min (rpm)

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

AU: Australia  
 CAL: California  
 CA: Canada  
 US: United States of America  
 EU: Europe

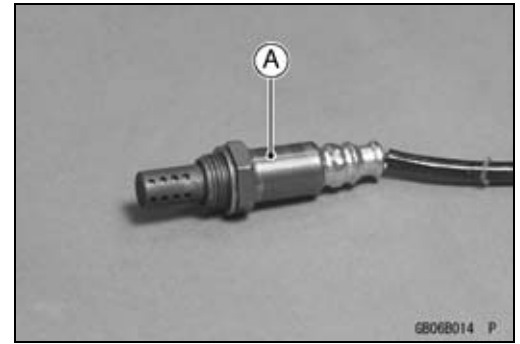
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**Technical Information – Oxygen Sensor**

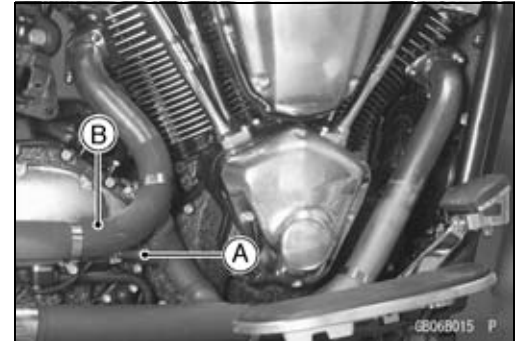
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**Overview**

Kawasaki has adopted an oxygen sensor [A] for the European and California models in addition to the secondary air injection system and honeycomb catalyst. This helps Kawasaki keep the motorcycle with cleaner exhaust gas and cope with the emission regulations.



The oxygen sensor [A] is mounted above the exhaust manifold [B], whereas the honeycomb catalyst is located inside the silencer in the downstream of the exhaust gas.



The oxygen sensor uses the substance called zirconia ( $ZrO_2$ ). The electromotive force varies depending on the density of the oxygen. The sensor measures the oxygen density of the exhaust gas to detect whether the air/fuel mixture is lean or rich in relation to the optimum air/fuel mixture.

When the ECU is in the oxygen sensor feedback mode, it controls combustion by making the fuel injection amount of the injector rich or lean through the signal from the sensor.

# 1-12 GENERAL INFORMATION

## Technical Information – Oxygen Sensor

### Construction and Operation

The oxygen sensor uses, a solid electrolyte called zirconia.

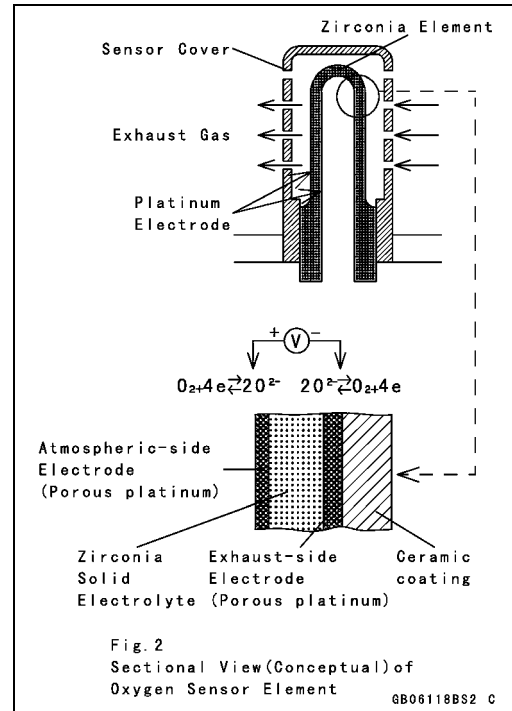
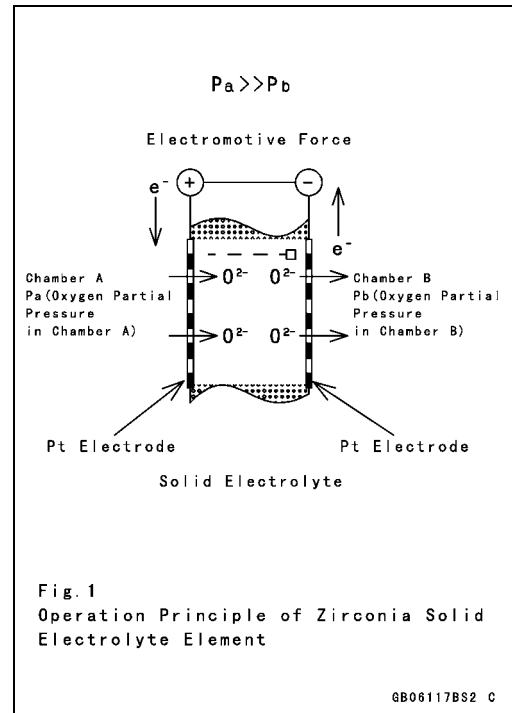
An electrolyte is a substance that has positive (+) and negative (-) ions and can move freely in a liquid.

For explanation purposes, picture a solid electrolyte plate as a wall and chambers A and B are divided by this wall. If both sides of the wall have platinum electrodes with holes, the difference in oxygen density (weight) between chambers A and B will move the oxygen from the chamber of higher oxygen density to the chamber of lower oxygen density until the two chambers are about equal in density. What actually moves are the oxygen ions (-) through the wall of the solid electrolyte.

The higher-density-side chamber will receive the "Pt" electrode surface with holes on the solid electrolyte wall and will become minus the oxygen ions ( $O_2^-$ ). At this point, the  $O_2^-$  ions reach the "Pt" electrode of the opposite side.

Since the result of this  $O_2^-$  move also brings movement of "e-" (just like "cells" work in a battery), voltage will be built within the sensor.

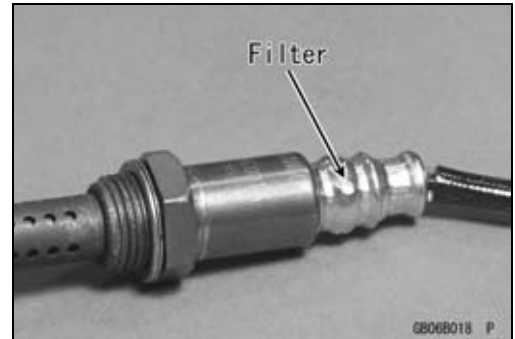
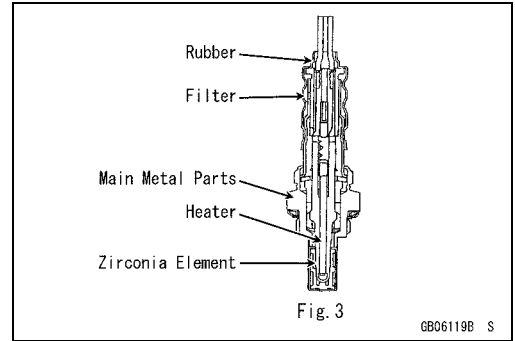
The (conceptual) sectional view of the actual element in the oxygen sensor is shown. The sensor is exposed to exhaust gas. The shape of the sensor is tubular since the atmospheric side and exhaust gas side are parted by the wall. That means that the inside of this tubular solid electrolyte is the atmosphere side (higher oxygen density), and the outside of the tube faces the exhaust gas. The outside surface, which is in the stream of exhaust gases, has a coated layer of porous ceramic. Voltage is generated and can be measured because of the difference in oxygen density (positive and negative ions).



**Technical Information – Oxygen Sensor**

The sensor, uses the fresh air as the oxygen reference, and consists of a passageway to lead the fresh air inside the tubular element. Installed in this passageway is, a air permeable filter that allows the fresh air to pass through, but won't allow moisture through. This keeps the sensor in touch with the atmosphere.

At a normal temperature, Zirconia (solid electrolyte) is an insulator and not able to sense the gases. Since the exhaust gas temperature does not become hot instantly, it takes sometime before the sensor starts to work. To solve the problem of the slow temperature increase of exhaust gases (which warms the electrolyte element), a built-in heater located inside the tubular element increases the temperature of the sensor so it can operate at a low exhaust gas temperature. Furthermore this built-in heater helps keep the sensor at a constant temperature.

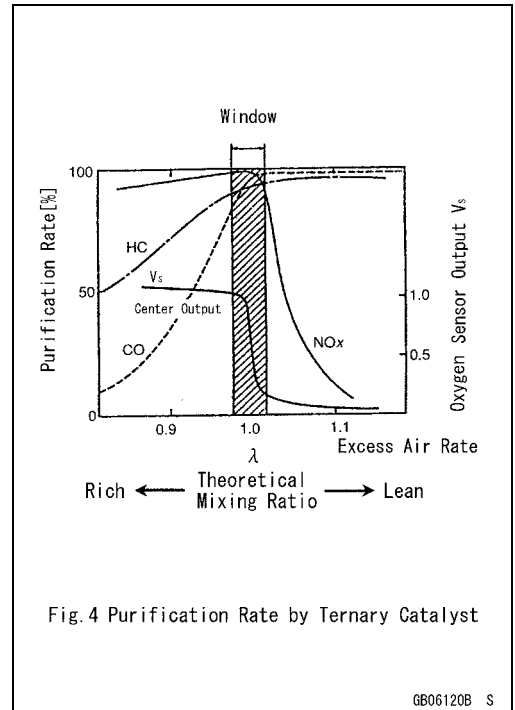


**Air/Fuel Ratio Control By Oxygen Sensor**

" $\lambda=1$ " indicates the optimum air/fuel ratio point, meaning the air/fuel ratio at which optimum (complete) combustion can be obtained. In the proximity of this mixture, the purification efficiency of the catalyst will be maximized.

The purification ratio of the three kinds of gas, HC (hydrocarbons), CO (carbon monoxide), Nox (nitrogen oxides) using the ternary (three) catalyst is shown in Fig. 4.

The best purification rate is at the zone where the oxygen sensor's signal shows the sharp changes. This zone is called the "window" and if the oxygen sensor signal moves back and forth between the rich side (fuel rich) and lean side (fuel lean) from the optimum mix ratio (but still within the width of the window), it indicates that the exhaust gas is in a good purification rate zone.

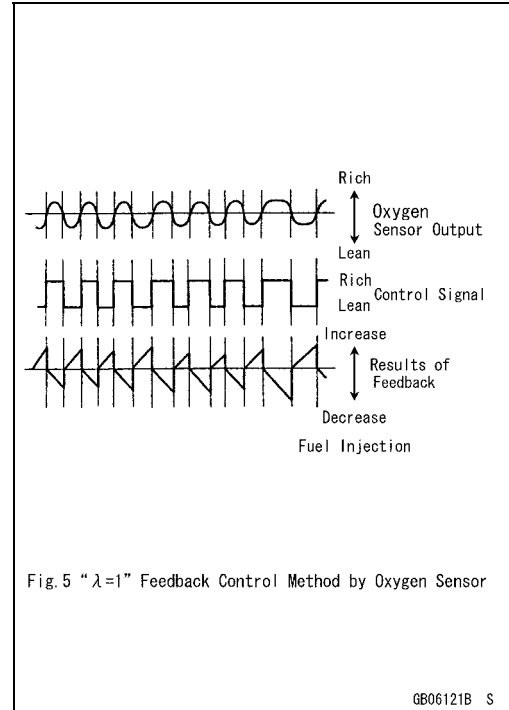


# 1-14 GENERAL INFORMATION

## Technical Information – Oxygen Sensor

Figure 5 shows how the sensor operates the controlling factors.

There is a sharp voltage drop of about 1V (in reality, about 0.9 V) the sensor uses for control (a standard reference). By utilizing this voltage and using 0.45 V as the reference line, an output larger than the line indicates that exhaust gas is in the lean zone. So, when the system senses a “rich” condition through the sensor’s output voltage, it controls the fuel injection amount to make the fuel gradually leaner. When it reaches a leaner point, the sensor voltage signal drops sharply at the proximity  $\lambda=1$  and goes below 0.45V. The system, at this level, senses that it has changed to “lean” and reverse the voltage signal to make the fuel richer. It then controls the fuel injection amount to make the fuel gradually richer. When it drops to a richer point, the signal drops sharply at the proximity  $\lambda=1$  and goes over 0.45V. The system, at this level, senses that it has changed to “rich” and reverse the signal to make the fuel leaner. By having the signal repeat back and forth between the rich and lean sides, it can constantly stay within the window of the good purification rates. Thereby the oxygen sensor, works as a combustion control sensor for the optimum air/fuel ratio.



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**Technical Information – Oxygen Sensor**


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**Maintenance**

- 1) Periodic Inspections  
Periodic inspections or special maintenance is not required for the sensor.
- 2) Oxygen Sensor Removal and Installation  
Handle the oxygen sensor with care. Be careful not to damage sensor wires. Do not service the oxygen sensor while it is hot and not use an impact wrench while removing or installing the oxygen sensor.  
Avoid the fouling (damaging) of the sensing part of the sensor with foreign substances such as coolant, battery fluid, anti-corrosion fluid, and brake fluid.  
Stop using the sensor if it is fouled with these substances.  
Also stop using the sensor if the head part of the sensor (exposed to the atmosphere) is fouled. Since the sensor has a filter that allows air to escape but stop water, fouling of the sensor head may clog this filter.  
Being subjected to a flame is also unacceptable for the sensor with the same reason as above.
- 3) Condition of the Sensor  
Perform resistance measurements and visually check for scars, bends, and clogging of the sensor filter.
- 4) If trouble with the sensor occurs, one of the following service codes will be displayed. Accordingly, follow the related procedures in the Service Manual for necessary maintenance.

Service Code	Outline of trouble
33	Oxygen sensor is not activated
67	Heater trouble due to wiring short or open
94	Oxygen sensor output voltage is incorrect

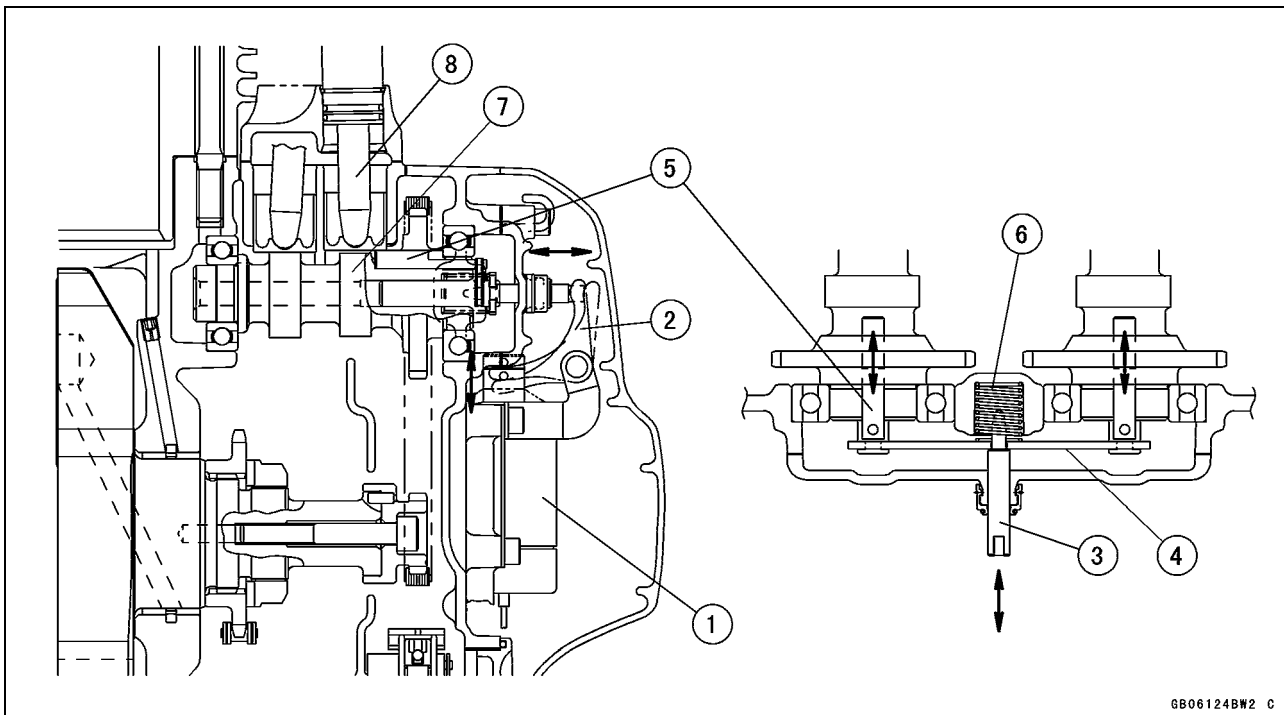
# 1-16 GENERAL INFORMATION

## Technical Information – Electric Solenoid Operated Decompressor

An automatic decompressor (Automatic Compression Release) system is installed to the right side of the engine. This decompressor is activated by an electric solenoid to make starting engine easy. When the ignition is switched on and the starter button depressed, the solenoid pulls a fulcrum-mounted link that depresses push rods in each camshaft.

The push rods activate the decompression mechanism to partially open the exhaust valves as the piston nears top dead center, releasing some of compression that can cause resistance during starting.

Releasing the starter button de-activates the solenoid and a spring returns the push rods to their normal operating position.



- 1. Decompression Solenoid
- 2. Decompression Lever
- 3. Decompression Push Rod
- 4. Holder

- 5. Decompression Shaft
- 6. Spring
- 7. Exhaust Cam
- 8. Push Rod

**Technical Information – Dual Balancer Shaft System**

Dual balancers harmonize primary balance and reduce vibration.

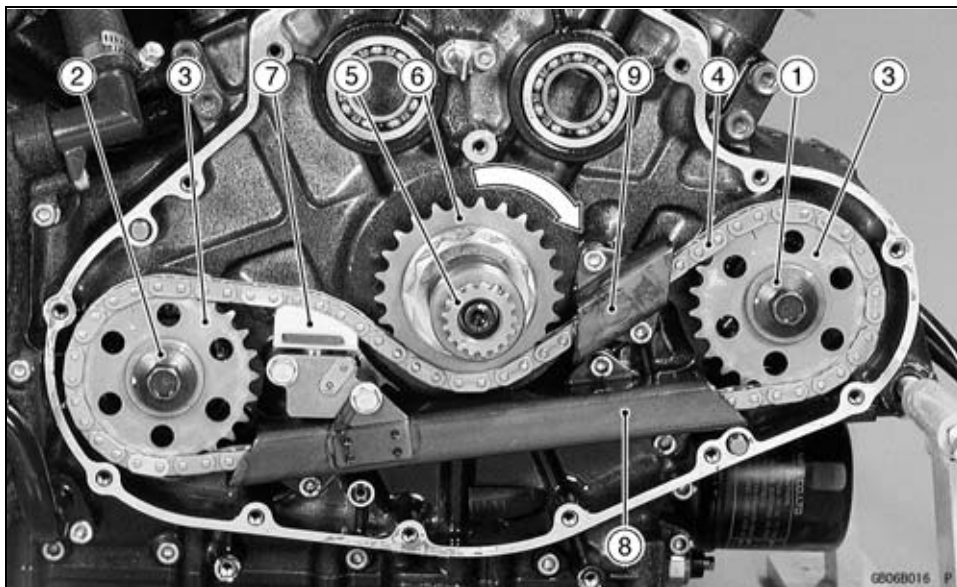
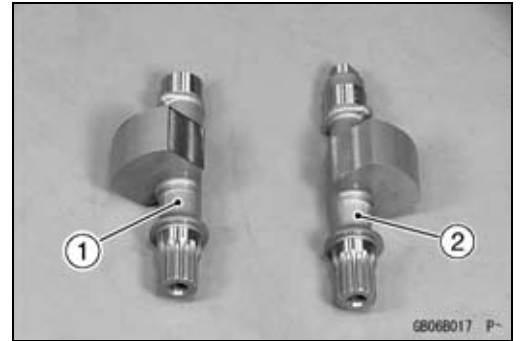
The VN2000-A1 engine applied two balancer shafts, one [1] is located in front of the front cylinder and another one [2] is behind the rear cylinder.

Each balancer shaft is driven by the chain which driven to the counterclockwise by crankshaft sprocket that rotate to the clockwise viewed from the right side.

The hydraulically operated chain tensioner is located between crankshaft and rear balancer shaft.

The hydraulic chain tensioner is supplied the oil pressure from lubrication feed pump.

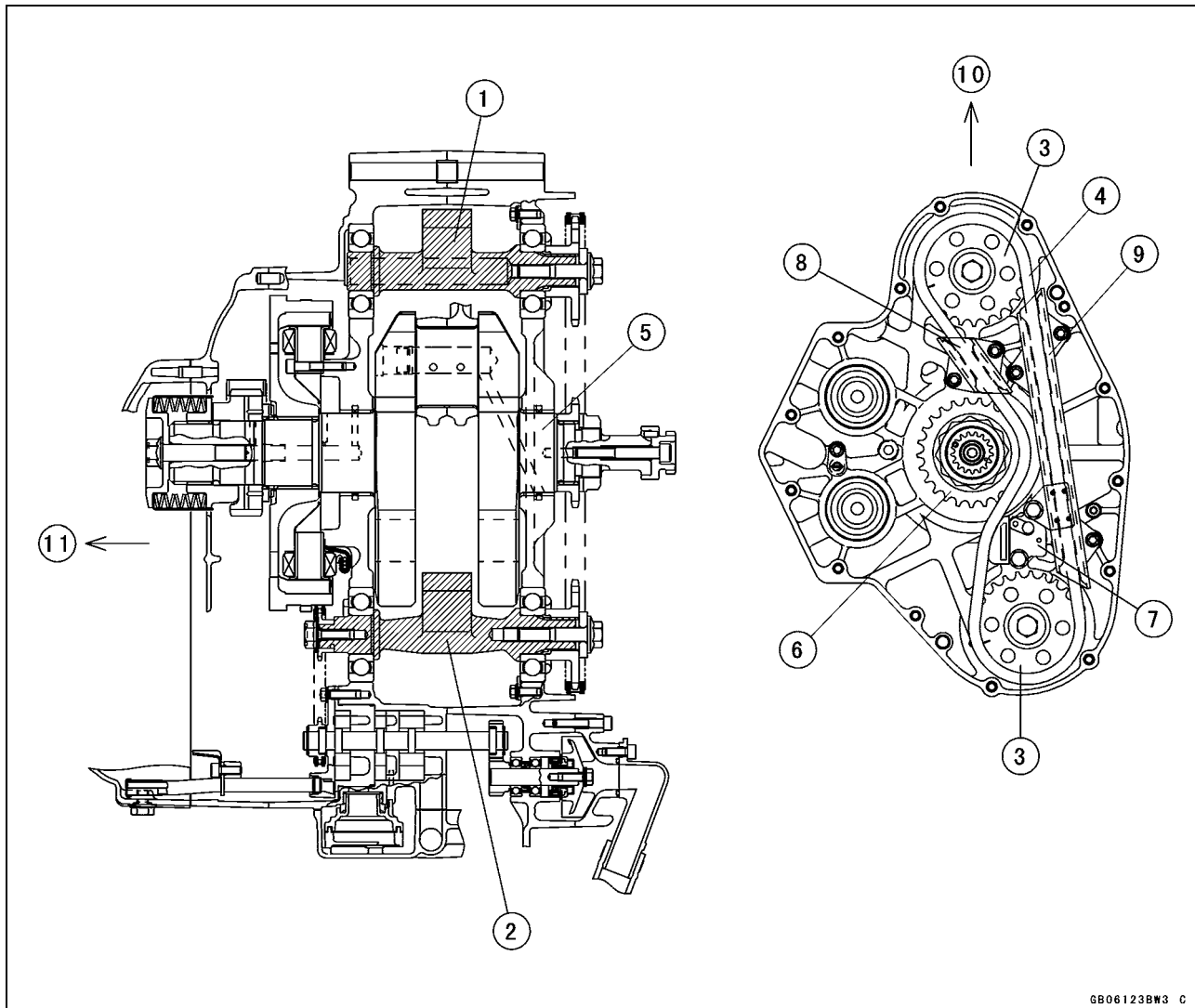
Two chain guides applied, one is between the crankshaft and front balancer shaft and another is under the crankshaft sprocket.



- |                                     |  |
|-------------------------------------|--|
| 1. Front Balancer Shaft             | 7. Hydraulic Chain Tensioner                                 |
| 2. Rear Balancer Shaft              | 8. Chain Guide (under Crankshaft)                            |
| 3. Front and Rear Balancer Sprocket | 9. Chain Guide (between Crankshaft and Front Balancer Shaft) |
| 4. Balancer Drive Chain             |  |
| 5. Crankshaft                       |  |
| 6. Balancer Drive Sprocket          |  |

# 1-18 GENERAL INFORMATION

## Technical Information – Dual Balancer Shaft System



- |                                     |  |                                   |
|-------------------------------------|--|-----------------------------------|
| 1. Front Balancer Shaft             | 6. Balancer Drive Sprocket                                   | 9. Chain Guide (under Crankshaft) |
| 2. Rear Balancer Shaft              | 7. Hydraulic Chain Tensioner                                 | 10. Front                         |
| 3. Front and Rear Balancer Sprocket | 8. Chain Guide (between Crankshaft and Front Balancer Shaft) | 11. Left                          |
| 4. Balancer Drive Chain             |  |                                   |
| 5. Crankshaft                       |  |                                   |

**Unit Conversion Table**

**Prefixes for Units:**

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

**Units of Mass:**

kg	×	2.205	=	lb
g	×	0.03527	=	oz

**Units of Volume:**

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

**Units of Force:**

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

**Units of Length:**

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

**Units of Torque:**

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

**Units of Pressure:**

kPa	×	0.01020	=	kgf/cm <sup>2</sup>
kPa	×	0.1450	=	psi
kPa	×	0.7501	=	cm Hg
kgf/cm <sup>2</sup>	×	98.07	=	kPa
kgf/cm <sup>2</sup>	×	14.22	=	psi
cm Hg	×	1.333	=	kPa

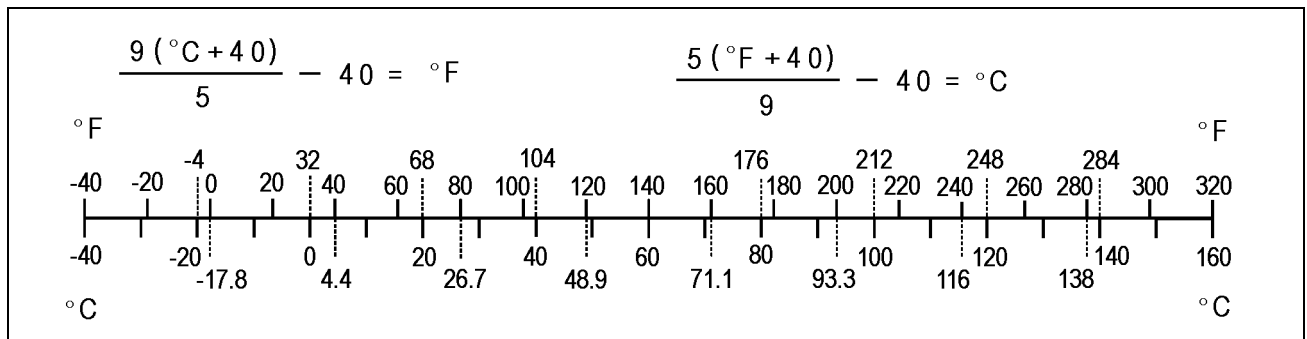
**Units of Speed:**

km/h	×	0.6214	=	mph
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**Units of Power:**

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

**Units of Temperature:**



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