ZUKI

VZ800

SERVICE MANUAL

SAMPLE

FOREWORD

This manual contains an introductory description on the SUZUKI VZ800 and procedures for its inspection/service and overhaul of its main components. Other information considered as generally known is not included.

Read the GENERAL INFORMATION section to familiarize yourself with the motorcycle and its maintenance. Use this section as well as other sections to use as a guide for proper inspection and service. This manual will help you know the motorcycle better so that you can assure your customers of fast and reliable service.

- ** This manual has been prepared on the basis of the latest specifications at the time of publication. If modifications have been made since then, differences may exist between the content of this manual and the actual motorcycle.*
- ** Illustrations in this manual are used to show the basic principles of operation and work procedures. They may not represent the actual motorcycle exactly in detail.*
- ** This manual is written for persons who have enough knowledge, skills and tools, including special tools, for servicing SUZUKI motorcycles. If you do not have the proper knowledge and tools, ask your authorized SUZUKI motorcycle dealer to help you.*

⚠ WARNING

Inexperienced mechanics or mechanics without the proper tools and equipment may not be able to properly perform the services described in this manual.
Improper repair may result in injury to the mechanic and may render the motorcycle unsafe for the rider and passenger.

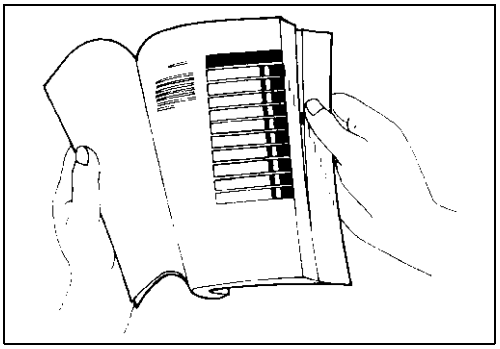
GROUP INDEX

SUZUKI MOTOR CORPORATION

HOW TO USE THIS MANUAL

TO LOCATE WHAT YOU ARE LOOKING FOR:

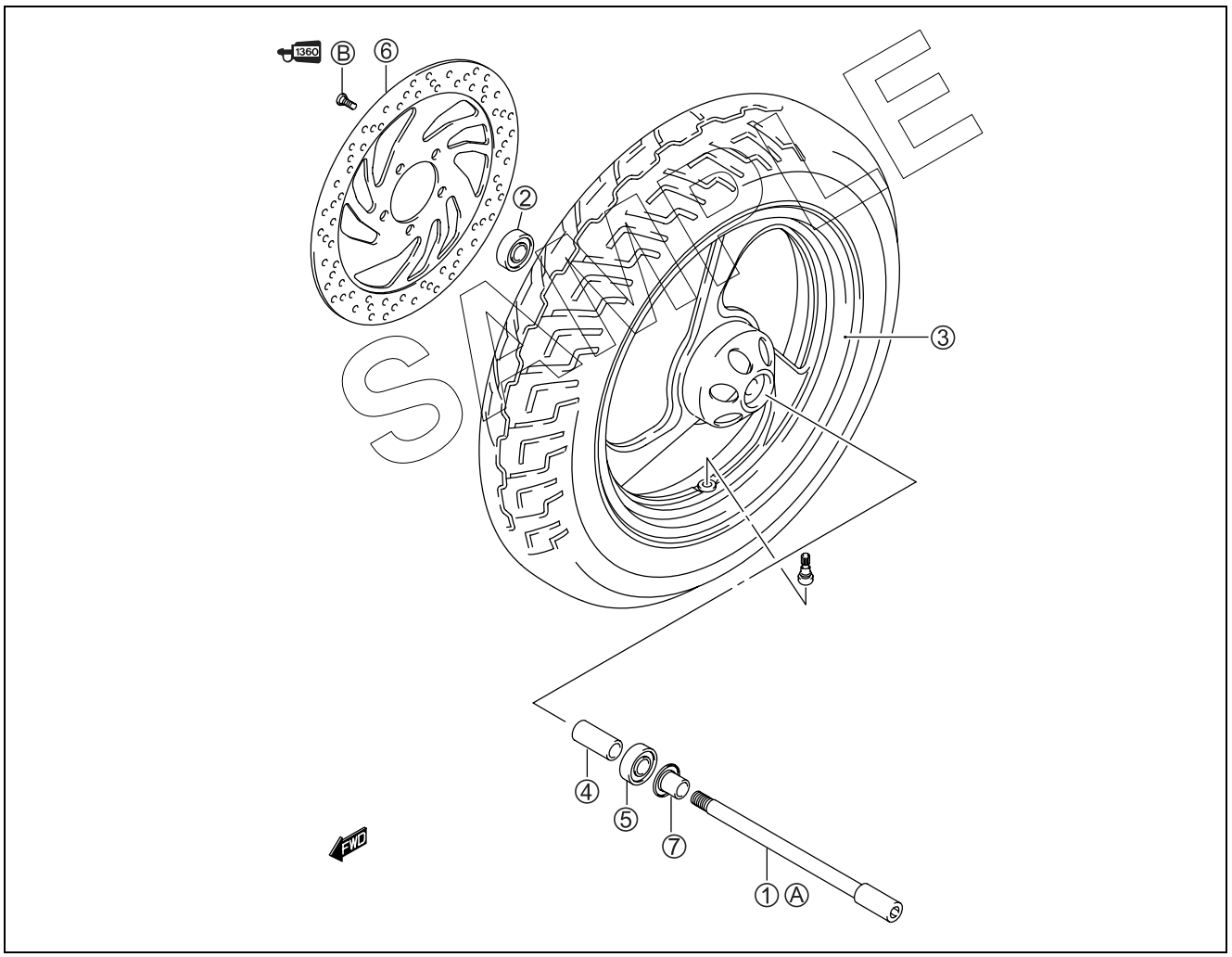
1. The text of this manual is divided into sections.
2. The section titles are listed in the GROUP INDEX.
3. Holding the manual as shown at the right will allow you to find the first page of the section easily.
4. The contents are listed on the first page of each section to help you find the item and page you need.



COMPONENT PARTS AND WORK TO BE DONE

Under the name of each system or unit, is its exploded view. Work instructions and other service information such as the tightening torque, lubricating points and locking agent points, are provided.

Example: Front wheel

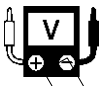
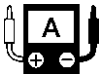
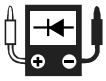


①	Front axle	⑥	Brake disc
②	Bearing (R)	⑦	Spacer
③	Front wheel		
④	Spacer	Ⓐ	Front axle
⑤	Bearing (L)	Ⓑ	Brake disc mounting bolt

ITEM	N·m	kgf-m	lb-ft
Ⓐ	65	6.5	47.0
Ⓑ	23	2.3	16.5

SYMBOL

Listed in the table below are the symbols indicating instructions and other information necessary for servicing. The meaning of each symbol is also included in the table.

SYMBOL	DEFINITION	SYMBOL	DEFINITION
	Torque control required. Data beside it indicates specified torque.		Apply THREAD LOCK SUPER “1360”. 99000-32130
	Apply oil. Use engine oil unless otherwise specified.		Use engine coolant. 99000-99032-11X
	Apply molybdenum oil solution. (Mixture of engine oil and SUZUKI MOLY PASTE in a ratio of 1 : 1)		Use fork oil. 99000-99044-L01
	Apply SUZUKI SUPER GREASE “A”. 99000-25030 (USA) 99000-25010 (Others)		Apply or use brake fluid.
	Apply SUZUKI MOLY PASTE. 99000-25140		Measure in voltage range.
	Apply SUZUKI SILICONE GREASE. 99000-25100		Measure in resistance range.
	Apply SUZUKI BOND “1207B”. 99000-31140		Measure in current range.
	Apply SUZUKI BOND “1216B”. 99000-31230		Measure in diode test range.
	Apply THREAD LOCK SUPER “1303”. 99000-32030		Measure in continuity test range.
	Apply THREAD LOCK SUPER “1322”. 99000-32110 (Except USA)		Use special tool.
	Apply THREAD LOCK “1342”. 99000-32050		Indication of service data.

ABBREVIATIONS USED IN THIS MANUAL

A

ABDC	: After Bottom Dead Center
AC	: Alternating Current
ACL	: Air Cleaner, Air Cleaner Box
API	: American Petroleum Institute
ATDC	: After Top Dead Center
ATM Pressure	: Atmospheric Pressure Atmospheric Pressure Sensor (APS)
A/F	: Air Fuel Mixture

B

BBDC	: Before Bottom Dead Center
BTDC	: Before Top Dead Center
B+	: Battery Positive Voltage

C

CKP Sensor	: Crankshaft Position Sensor (CKPS)
CKT	: Circuit
CLP Switch	: Clutch Lever Position Switch (Clutch Switch)
CO	: Carbon Monoxide
CPU	: Central Processing Unit

D

DC	: Direct Current
DMC	: Dealer Mode Coupler
DOHC	: Double Over Head Camshaft
DRL	: Daytime Running Light

E

ECM	: Engine Control Module Engine Control Unit (ECU) (FI Control Unit)
EOT Sensor	: Engine Oil Temperature Sensor (EOTS), Oil Temp. Sensor
EVAP	: Evaporative Emission
EVAP Canister	: Evaporative Emission Canister (Canister)

F

FI	: Fuel Injection, Fuel Injector
FP	: Fuel Pump
FPR	: Fuel Pressure Regulator
FP Relay	: Fuel Pump Relay

G

GEN	: Generator
GND	: Ground
GP Switch	: Gear Position Switch

H

HC	: Hydrocarbons
HO2 Sensor	: Heated Oxygen Sensor (HO2S)

I

IAP Sensor	: Intake Air Pressure Sensor (IAPS)
IAT Sensor	: Intake Air Temperature Sensor (IATS)
IG	: Ignition

L

LCD	: Liquid Crystal Display
LED	: Light Emitting Diode (Malfunction Indicator Lamp)
LH	: Left Hand

M

MAL-Code	: Malfunction Code (Diagnostic Code)
Max	: Maximum
MIL	: Malfunction Indicator Lamp (LED)
Min	: Minimum

N

NOx	: Nitrogen Oxides

O

OHC	: Over Head Camshaft
OPS	: Oil Pressure Switch

P

PCV	: Positive Crankcase Ventilation (Crankcase Breather)

R

RH	: Right Hand
ROM	: Read Only Memory

S

SAE	: Society of Automotive Engineers
SDS	: Suzuki Diagnosis System
STC System	: Secondary Throttle Control System (STCS)
STP Sensor	: Secondary Throttle Position Sensor (STPS)
ST Valve	: Secondary Throttle Valve (STV)
STV Actuator	: Secondary Throttle Valve Actuator (STVA)

T

TO Sensor	: Tip Over Sensor (TOS)
TP Sensor	: Throttle Position Sensor (TPS)

WIRE COLOR

B	: Black	Gr	: Gray	R	: Red
Bl	: Blue	Lbl	: Light blue	W	: White
Br	: Brown	Lg	: Light green	Y	: Yellow
Dg	: Dark green	O	: Orange		
G	: Green	P	: Pink		

B/Bl	: Black with Blue tracer	B/Br	: Black with Brown tracer
B/G	: Black with Green tracer	B/Lg	: Black with Light green tracer
B/R	: Black with Red tracer	B/W	: Black with White tracer
B/Y	: Black with Yellow tracer	Bl/B	: Blue with Black tracer
Bl/G	: Blue with Green tracer	Bl/R	: Blue with Red tracer
Bl/W	: Blue with White tracer	Bl/Y	: Blue with Yellow tracer
Br/B	: Brown with Black tracer	Br/W	: Brown with White tracer
G/B	: Green with Black tracer	G/W	: Green with White tracer
G/Y	: Green with Yellow tracer	Gr/B	: Gray with Black tracer
Gr/R	: Gray with Red tracer	Gr/W	: Gray with White tracer
Lg/G	: Light green with Green tracer	O/B	: Orange with Black tracer
O/Bl	: Orange with Blue tracer	O/G	: Orange with Green tracer
O/R	: Orange with Red tracer	O/W	: Orange with White tracer
O/Y	: Orange with Yellow tracer	P/W	: Pink with White tracer
R/B	: Red with Black tracer	R/Bl	: Red with Blue tracer
W/B	: White with Black tracer	W/Bl	: White with Blue tracer
W/R	: White with Red tracer	Y/B	: Yellow with Black tracer
Y/Bl	: Yellow with Blue tracer	Y/G	: Yellow with Green tracer
Y/R	: Yellow with Red tracer	Y/W	: Yellow with White tracer

GENERAL INFORMATION

1

CONTENTS

COUNTRY AND AREA CODES

The following codes stand for the applicable country(-ies) and area(-s).

CODE	COUNTRY or AREA	EFFECTIVE FRAME NO.
E-02	U.K.	JS1B4111200100001 –
E-03	U.S.A. (Except for California)	JS1VS56A 52100001 –
E-19 (VZ800)	E.U.	JS1B4111100100001 –
E-19 (VZ800U)	E.U.	JS1B4211100100001 –
E-24	Australia	JS1B4111300100001 –
E-28	Canada	JS1VS56A 52100001 –
E-33	California (U.S.A.)	JS1VS56A 52100001 –

WARNING/CAUTION/NOTE

Please read this manual and follow its instructions carefully. To emphasize special information, the symbol and the words WARNING, CAUTION and NOTE have special meanings. Pay special attention to the messages highlighted by these signal words.

⚠ WARNING

Indicates a potential hazard that could result in death or injury.

CAUTION

Indicates a potential hazard that could result in motorcycle damage.

NOTE:
Indicates special information to make maintenance easier or instructions clearer.

Please note, however, that the warnings and cautions contained in this manual cannot possibly cover all potential hazards relating to the servicing, or lack of servicing, of the motorcycle. In addition to the WARNINGS and CAUTIONS stated, you must use good judgement and basic mechanical safety principles. If you are unsure about how to perform a particular service operation, ask a more experienced mechanic for advice.

GENERAL PRECAUTIONS

⚠ WARNING

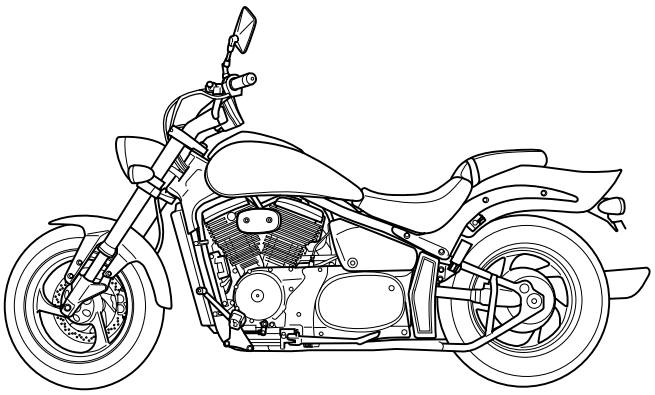
- **Proper service and repair procedures are important for the safety of the service mechanic and the safety and reliability of the motorcycle.**
- **When 2 or more persons work together, pay attention to the safety of each other.**
- **When it is necessary to run the engine indoors, make sure that exhaust gas is forced outdoors.**
- **When working with toxic or flammable materials, make sure that the area you work in is well-ventilated and that you follow all of the material manufacturer's instructions.**
- **Never use gasoline as a cleaning solvent.**
- **To avoid getting burned, do not touch the engine, engine oil, radiator and exhaust system until they have cooled.**
- **After servicing the fuel, oil, water, exhaust or brake systems, check all lines and fittings related to the system for leaks.**

CAUTION

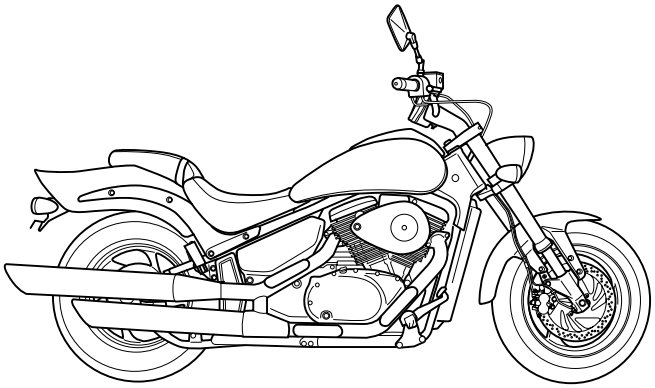
*** If parts replacement is necessary, replace the parts with Suzuki Genuine Parts or their equivalent.**
*** When removing parts that are to be reused, keep them arranged in an orderly manner so that they may be reinstalled in the proper order and orientation.**
*** Be sure to use special tools when instructed.**
*** Make sure that all parts used in reassembly are clean. Lubricate them when specified.**
*** Use the specified lubricant, bond or sealant.**
*** When removing the battery, disconnect the negative cable first and then the positive cable.**
*** When reconnecting the battery, connect the positive cable first and then the negative cable, and replace the terminal cover on the positive terminal.**
*** When performing service to electrical parts, if the service procedures do not require use of battery power, disconnect the negative cable from the battery.**
*** When tightening the cylinder head and case bolts or nuts, tighten the larger sizes first. Always tighten the bolts and nuts diagonally from the inside toward outside and to the specified tightening torque.**
*** Whenever you remove oil seals, gaskets, packing, O-rings, locking washers, self-locking nuts, cotter pins, circlips and certain other parts as specified, be sure to replace them with new ones. Also, before installing these new parts, be sure to remove any left over material from the mating surfaces.**
*** Never reuse a circlip. When installing a new circlip, take care not to expand the end gap larger than required to slip the circlip over the shaft. After installing a circlip, always ensure that it is completely seated in its groove and securely fitted.**
*** Use a torque wrench to tighten fasteners to the specified torque. Wipe off grease and oil if a thread is smeared with them.**
*** After reassembling, check parts for tightness and proper operation.**

*** To protect the environment, do not unlawfully dispose of used motor oil, engine coolant and other fluids: batteries and tires.**
*** To protect Earth's natural resources, properly dispose of used motorcycle and parts.**

SUZUKI VZ800K5 ('05-MODEL)



RIGHT SIDE

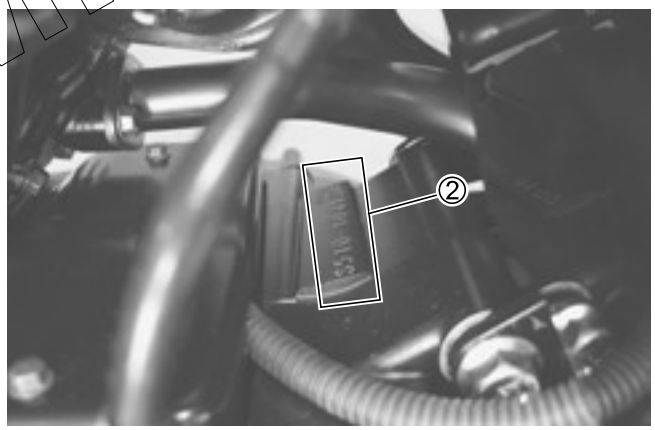


LEFT SIDE

* Difference between illustration and actual motorcycle may exist depending on the markets.

SERIAL NUMBER LOCATION

The frame serial number or V.I.N. (Vehicle Identification Number) ① is stamped on the right side of the steering head pipe. The engine serial number ② is located on the right side of the crankcase. These numbers are required especially for registering the machine and ordering spare parts.



FUEL, OIL AND ENGINE COOLANT RECOMMENDATION

FUEL (FOR USA AND CANADA)

Use only unleaded gasoline of at least 87 pump octane (R/2 + M/2) or 91 octane or higher rated by the research method.

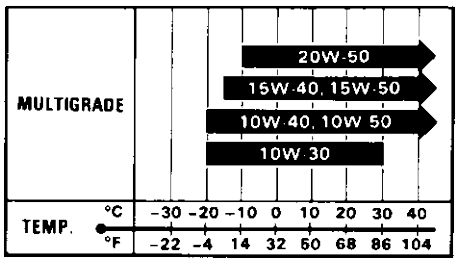
Gasoline containing MTBE (Methyl Tertiary Butyl Ether), less than 10% ethanol, or less than 5% methanol with appropriate cosolvents and corrosion inhibitor is permissible.

FUEL (FOR OTHER COUNTRIES)

Gasoline used should be graded 91 octane (Research Method) or higher. Unleaded gasoline is recommended.

ENGINE OIL

Oil quality is a major contributor to your engine's performance and life. Always select good quality engine oil. Use of API SF/SG or SH/SJ with JASO MA.
Suzuki recommends the use of SAE 10W-40 engine oil. If SAE 10W-40 engine oil is not available, select an alternative according to the right chart.



BRAKE FLUID

Specification and classification: DOT 4

⚠ WARNING

Since the brake system of this motorcycle is filled with a glycol-based brake fluid by the manufacturer, do not use or mix different types of fluid such as silicone-based and petroleum-based fluid for refilling the system, otherwise serious damage will result.
Do not use any brake fluid taken from old or used or unsealed containers.
Never re-use brake fluid left over from a previous servicing, which has been stored for a long period.

FRONT FORK OIL

Use fork oil L01 or an equivalent fork oil.

ENGINE COOLANT

Use an anti-freeze/engine coolant compatible with an aluminum radiator, mixed with distilled water only.

WATER FOR MIXING

Use distilled water only. Water other than distilled water can corrode and clog the aluminum radiator.

ANTI-FREEZE/ENGINE COOLANT

The engine coolant performs as a corrosion and rust inhibitor as well as anti-freeze. Therefore, the engine coolant should be used at all times even though the atmospheric temperature in your area does not go down to freezing point.

Suzuki recommends the use of SUZUKI COOLANT anti-freeze/engine coolant. If this is not available, use an equivalent which is compatible with an aluminum radiator.

LIQUID AMOUNT OF WATER/ENGINE COOLANT

Solution capacity (total): 1 750 ml (1.85/1.54 US/Imp qt)

For engine coolant mixture information, refer to cooling system section in page 5-3.

CAUTION

Mixing of anti-freeze/engine coolant should be limited to 60%. Mixing beyond it would reduce its efficiency. If the anti-freeze/engine coolant mixing ratio is below 50%, rust inhabiting performance is greatly reduced. Be sure to mix it above 50% even though the atmospheric temperature does not go down to the freezing point.

BREAK-IN PROCEDURES

During manufacturing only the best possible materials are used and all machined parts are finished to a very high standard. It is still necessary to allow the moving parts to “BREAK-IN” before subjecting the engine to maximum stresses. The future performance and reliability of the engine depends on the care and restraint exercised during its early life. Refer to the following break-in engine speed recommendations.

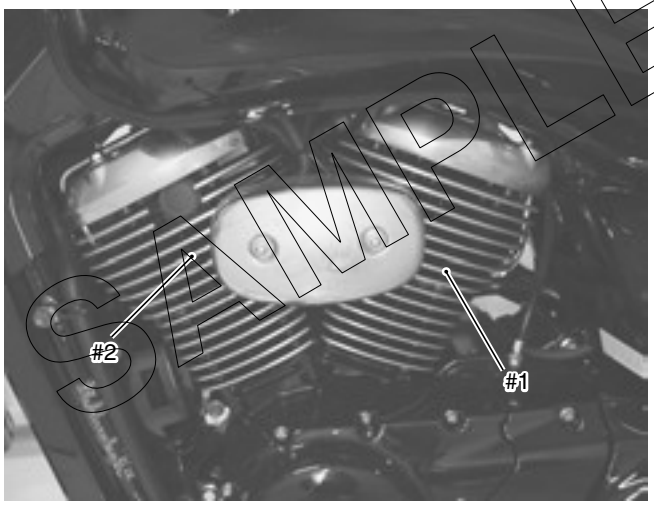
- Keep to these break-in throttle positions during the break-in period.

Break-in throttle operation
Initial 800 km (500 miles): Less than 1/2 throttle
Up to 1 600 km (1 000 miles): Less than 3/4 throttle

- Upon reaching an odometer reading of 1 600 km (1 000 miles) you can subject the motorcycle to full throttle operation.

CYLINDER IDENTIFICATION

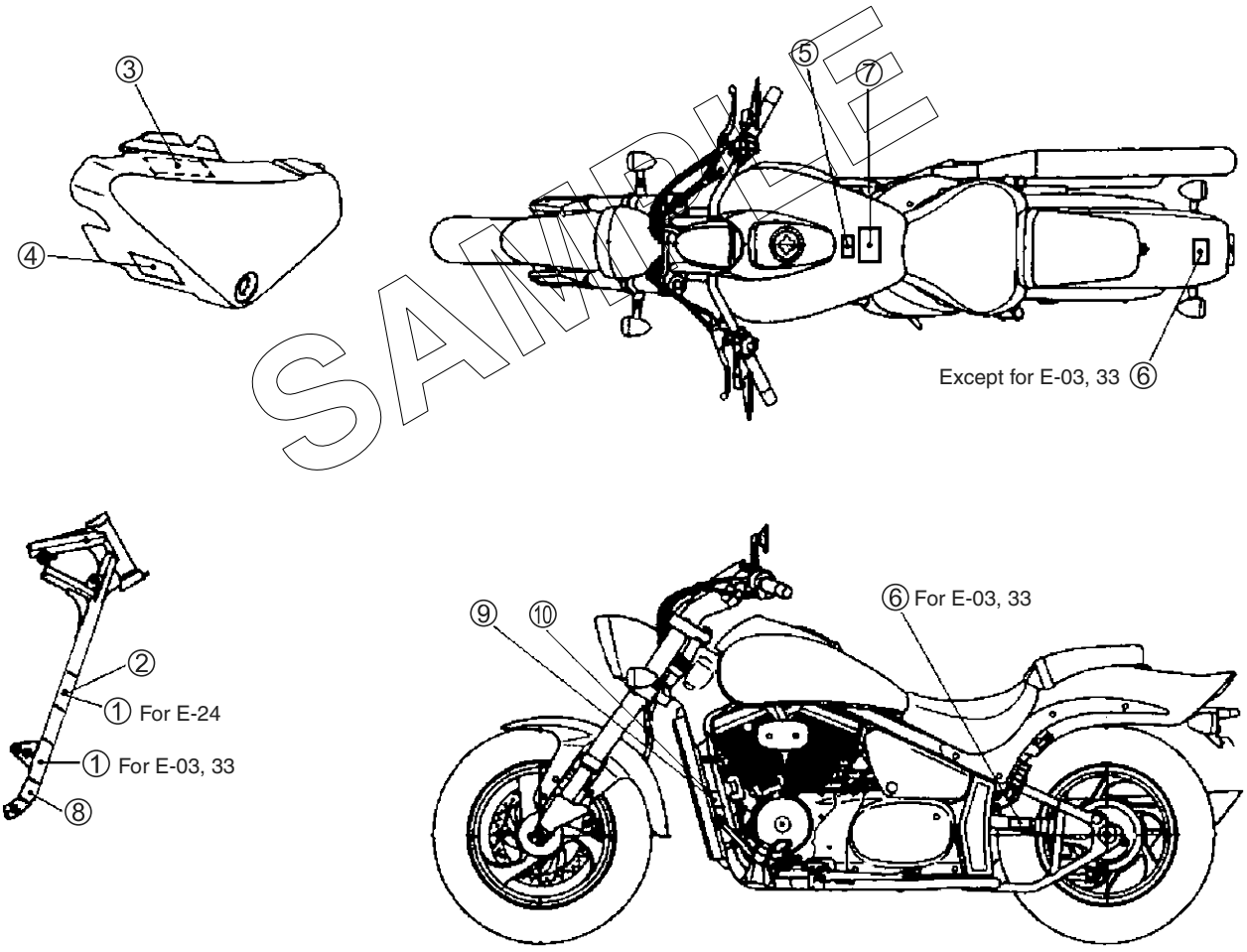
The two cylinders of this engine are identified as No. 1 and No. 2 cylinder, as counted from front to rear (as viewed by the rider on the seat).



INFORMATION LABELS

	VZ800
① Noise label	A For E-03, 24, 33
② Information label	A For E-03, 28, 33
③ Vacuum hose routing label	A For E-33
④ Manual notice label	A For E-03, 33
⑤ Fuel caution label	A For E-02, 24
⑥ Tire information label	A
⑦ General warning label	A
⑧ ICES Canada label	A For E-28
⑨ I.D. plate	A Except for E-03, 28, 33
⑩ Safety plate	A For E-03, 28, 33

A: Attached



SPECIFICATIONS

DIMENSIONS AND DRY MASS

Overall length	2 370 mm (93.3 in)
Overall width	920 mm (36.2 in)
Overall height	1 125 mm (44.3 in)
Wheelbase	1 655 mm (65.2 in)
Ground clearance	140 mm (5.5 in)
Seat height	700 mm (27.6 in)
Dry mass	247 kg (545 lbs)

ENGINE

Type	4-stroke, liquid-cooled, OHC, 45° degree V-twin
Number of cylinders	2
Bore	83.0 mm (3.268 in)
Stroke	74.4 mm (2.929 in)
Displacement	805 cm³ (49.1 cu. in)
Compression ratio	9.4 : 1
Fuel system	Fuel injection
Air cleaner	Non-woven fabric element
Starter system	Electric
Lubrication system	Wet sump
Idle speed	1 100 ± 100 r/min

DRIVE TRAIN

Clutch	Wet multi-plate type
Transmission	5-speed constant mesh
Gearshift pattern	1-down, 4-up
Primary reduction ratio	1.690 (71/42)
Gear ratios, Low	2.461 (32/13)
2nd	1.631 (31/19)
3rd	1.227 (27/22)
4th	1.000 (25/25)
Top	0.814 (22/27)
Final reduction ratio	3.503 (17/15 × 34/11)
Drive system	Shaft drive

CHASSIS

Front suspension	Inverted telescopic, coil spring, oil damped
Rear suspension	Swingarm type, coil spring, oil damped
Front suspension stroke	140 mm (5.5 in)
Rear wheel travel	105 mm (4.1 in)
Caster	33° 15’
Trail	141 mm (5.6 in)
Steering angle	38° (right & left)
Turning radius	3.0 m (9.8 ft)
Front brake	Disc brake, twin
Rear brake	Drum brake
Front tire size	130/90-16M/C (67H), tubeless
Rear tire size	170/80-15M/C (77H), tubeless

ELECTRICAL

Ignition type	Electronic ignition (Transistorized)	
Ignition timing	5° B.T.D.C at 1 100 r/min	
Spark plug	NGK: DPR7EA-9 or DENSO: X22EPR-U9	
Battery	12 V 36.0 kC (10 Ah)/10 HR	
Generator	Three-phase A.C. Generator	
Main fuse	30 A	
Fuse	10/10/10/10/10/15 A	
Headlight	12 V 60/55 W (H4)	
Parking or city light	12 V 5 W	For E-02, 19
Front turn signal light	12 V 21/5 W	For E-03, 28, 33
	12 V 21 W	For the others
Rear turn signal light	12 V 21 W	
Brake light/Taillight	LED	
Speedometer light	LED	
Fuel level indicator light	LED	
Turn signal indicator light	LED	
Neutral indicator light	LED	
High beam indicator light	LED	
Oil pressure/Coolant temperature/Fuel injection warning light	LED	

CAPACITIES

Fuel tank, including reserve	15.0 L (4.0/3.3 US/Imp gal)	For E-33
	15.5 L (4.1/3.4 US/Imp gal)	For the others
reserve	3.0 L (0.8/0.7 US/Imp gal)	
Engine oil, oil change	3 000 ml (3.2/2.6 US/Imp qt)	
with filter change	3 400 ml (3.6/3.0 US/Imp qt)	
overhaul	3 700 ml (3.9/3.3 US/Imp qt)	
Front fork oil (each leg)	493 ml (16.7/17.4 US/Imp oz)	
Coolant	1.5 L (1.59/1.32 US/Imp qt)	

These specifications are subject to change without notice.

PERIODIC MAINTENANCE

CONTENTS

PERIODIC MAINTENANCE SCHEDULE

The chart below lists the recommended intervals for all the required periodic service work necessary to keep the motorcycle operating at peak performance and economy. Mileages are expressed in terms of kilometers, miles and time for your convenience.

NOTE:
More frequent servicing may be performed on motorcycles that are used under severe conditions.

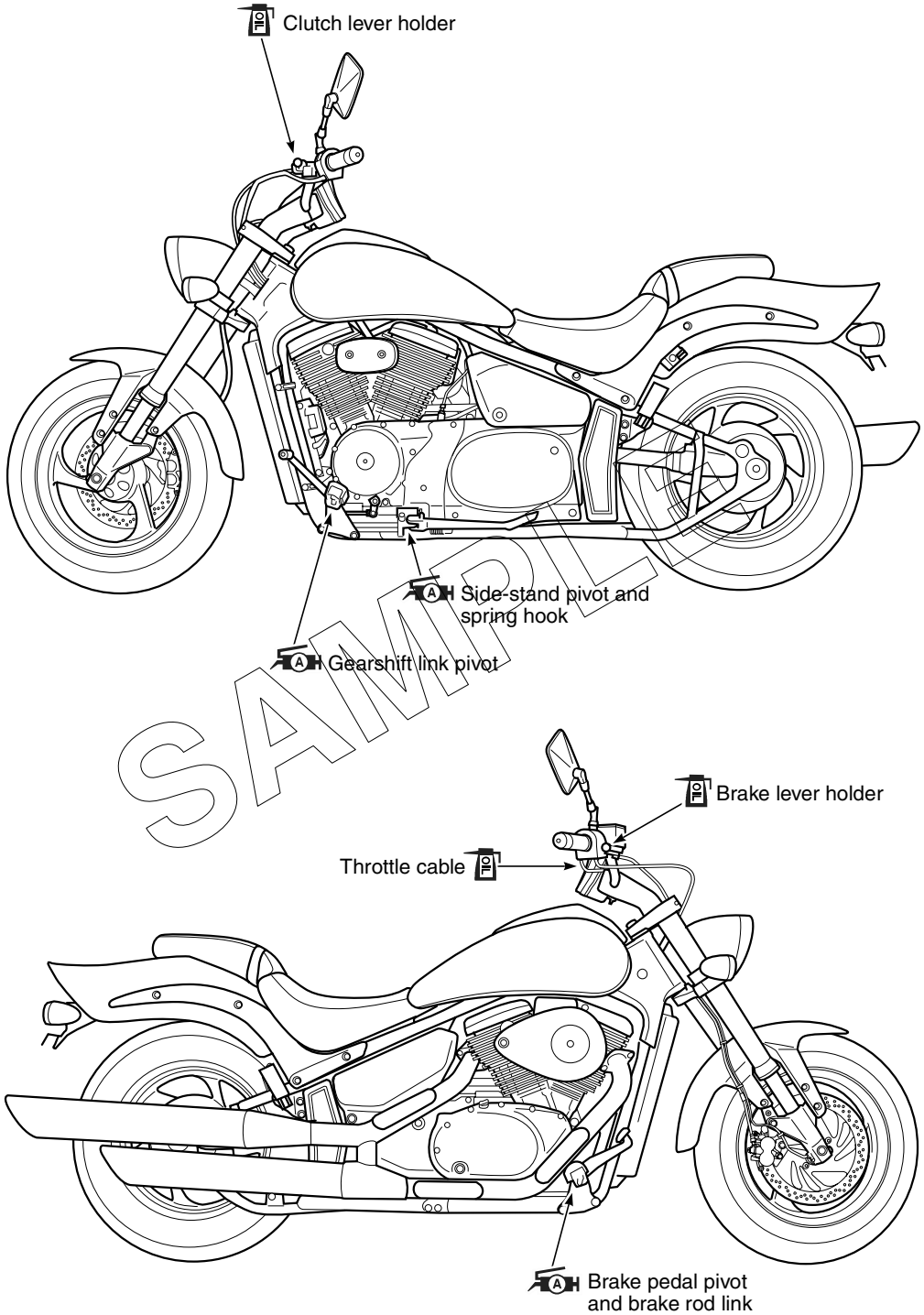
PERIODIC MAINTENANCE CHART

Item \ Interval	km	1 000	6 000	12 000	18 000	24 000
	miles	600	4 000	7 500	11 000	14 500
	months	2	12	24	36	48
Air cleaner element		—	I	I	R	I
Exhaust pipe bolts and muffler bolts		T	—	T	—	T
Valve clearance		I	—	I	—	I
Spark plugs		—	I	R	I	R
Fuel hose		—	I	I	I	I
Engine oil		R	R	R	R	R
Engine oil filter		R	—	—	R	—
Idle speed		I	I	I	I	I
Throttle cable play		I	I	I	I	I
Throttle valve synchronization		I (CA. only)	—	I	—	I
Evaporative emission control system (California model only)		—	—	I	—	I
		Replace vapor hose every 4 years.				
PAIR (air supply) system		—	—	I	—	I
Engine coolant		Replace every 2 years.				
Radiator hose		—	I	I	I	I
Clutch		—	I	I	I	I
Final gear oil		R	—	I	—	I
Brakes		I	I	I	I	I
Brake hose		—	I	I	I	I
		Replace every 4 years.				
Brake fluid		—	I	I	I	I
		Replace every 2 years.				
Tires		—	I	I	I	I
Steering		I	—	I	—	I
Front fork		—	—	I	—	I
Rear suspension		—	—	I	—	I
Chassis bolts and nuts		T	T	T	T	T

NOTE:
I = Inspect and clean, adjust, replace or lubricate as necessary
R = Replace
T = Tighten

LUBRICATION POINTS

Proper lubrication is important for smooth operation and long life of each working part of the motorcycle. Major lubrication points are indicated below.



NOTE:

** Before lubricating each part, clean off any rusty spots and wipe off any grease, oil, dirt or grime.*

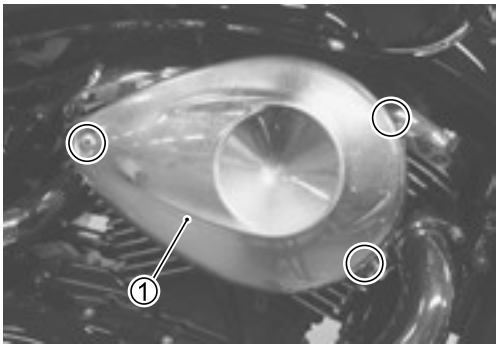
** Lubricate exposed parts which are subject to rust, with a rust preventative spray whenever the motorcycle has been operated under wet or rainy conditions.*

MAINTENANCE AND TUNE-UP PROCEDURES

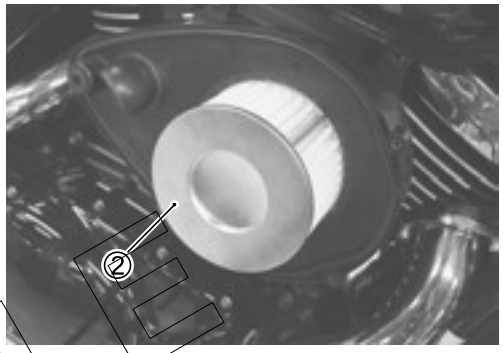
This section describes the servicing procedures for each item of the Periodic Maintenance requirements.

AIR CLEANER

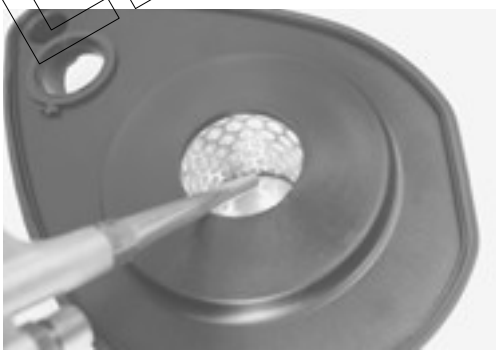
Inspect every 6 000 km (4 000 miles, 12 months) and replace every 18 000 km (11 000 miles, 36 months).



- Remove the air cleaner cover ①.
- Remove the air cleaner element ②.



- Carefully use air hose to blow the dust from the cleaner element.



CAUTION

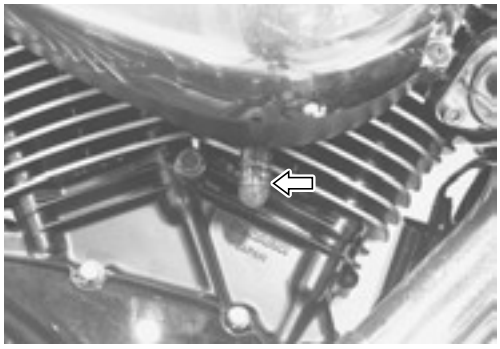
Always use air pressure on the engine side of the air cleaner element. If air pressure is used on the other side, dirt will be forced into the pores of the air cleaner element thus restricting air flow through the air cleaner element.

- Reinstall the cleaned or new air cleaner element in the reverse order of removal.

CAUTION

If driving under dusty condition, clean the air cleaner element more frequently. The surest way to accelerate engine wear is to use the engine without the element or to use a ruptured element. Make sure that the air cleaner is in good condition at all times. Life of the engine depends largely on this component!

NOTE:
When cleaning the air cleaner element, drain water from the air cleaner by removing the drain plug.



SPARK PLUG

Inspect every 6 000 km (4 000 miles, 12 months) and replace every 12 000 km (7 500 miles, 24 months).

No. 1 (FRONT) SPARK PLUG REMOVAL

- Remove the rear and front seats. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Remove the right frame cover ①.

☆: Hooked part

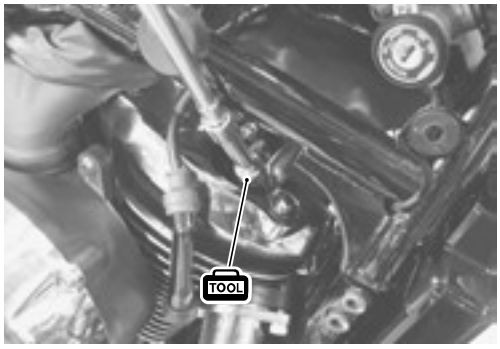
- Remove the spark plug cap.

⚠ WARNING

The hot radiator and the hot engine can burn you. Wait until the radiator and the engine are cool enough to touch.

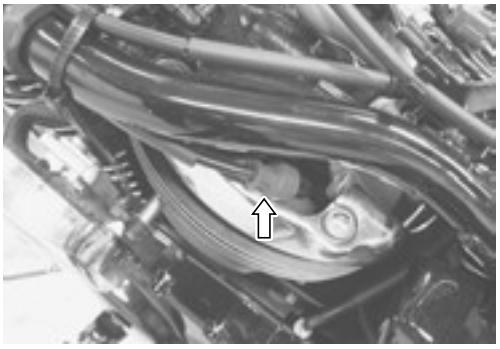
- Remove the spark plug with a spark plug wrench.

TOOL 09930-14530: Universal joint



No. 2 (REAR) SPARK PLUG REMOVAL

- Remove the rear and front seats. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Remove the spark plug cap.
- Remove the spark plug with a spark plug wrench.



HEAT RANGE

- Check to see the heat range of the plug.

	Standard	Cold type
NGK	DPR7EA-9	DPR8EA-9
DENSO	X22EPR-U9	X24EPR-U9

CARBON DEPOSIT

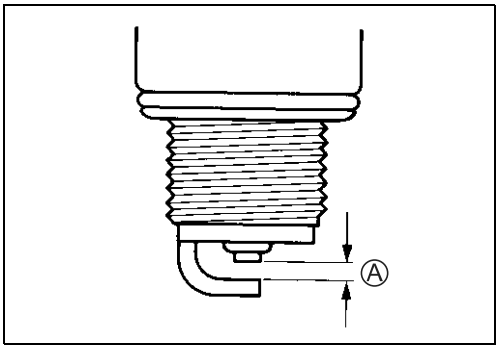
- Check to see if there are carbon deposits on the plugs. If carbon is deposited, remove it with a spark plug cleaner machine or carefully using a tool with a pointed end.

SPARK PLUG GAP

- Measure the plug gap with a thickness gauge. If out of specification, adjust it to the following gap.

TOOL 09900-20803: Thickness gauge

DATA Spark plug gap Ⓐ
Standard: 0.8 – 0.9 mm (0.031 – 0.035 in)

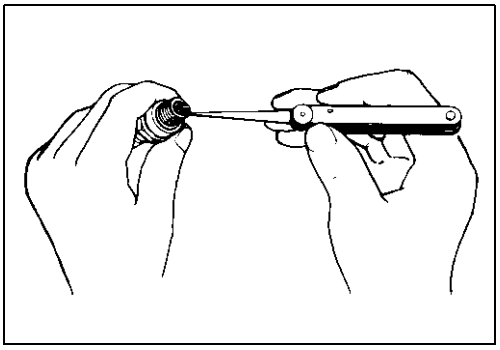


ELECTRODES CONDITION

- Check to see the worn or burnt condition of the electrodes. If it is extremely worn or burnt, replace the plug. And also replace the plug if it has a broken insulator, damaged thread.

CAUTION

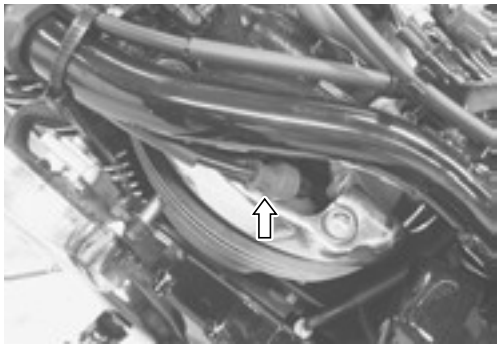
Confirm the thread size and reach when replacing the plug. If the reach is too short, carbon will be deposited on the screw portion of the plug hole and engine damage may result.



SPARK PLUG AND PLUG CAP INSTALLATION

- Install the spark plugs to the cylinder heads by finger tight, and then tighten them to the specified torque.

Spark plug: 11 N·m (1.1 kgf-m, 8.0 lb-ft)



CAUTION

When installing a spark plug, carefully turn the spark plug wrench by finger into the threads of the cylinder head to prevent damage the aluminum threads.

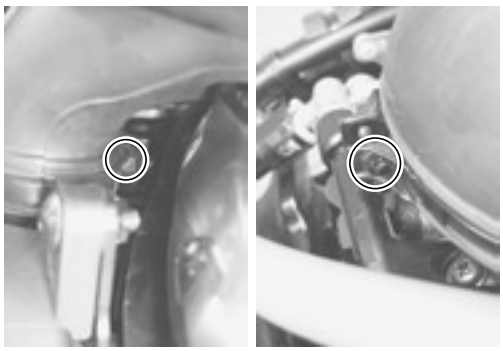
- Install the spark plug caps.

VALVE CLEARANCE

Inspect initially at 1 000 km (600 miles, 2 months) and every 12 000 km (7 500 miles, 24 months) thereafter.

Valve clearance must be checked and adjusted when:
(1) the valve mechanism is service, and
(2) the camshafts are serviced.
Check and adjust the clearance to the specification.

DATA Valve clearance (when cold):
IN. 0.08 – 0.13 mm (0.003 – 0.005 in)
EX. 0.17 – 0.22 mm (0.007 – 0.009 in)



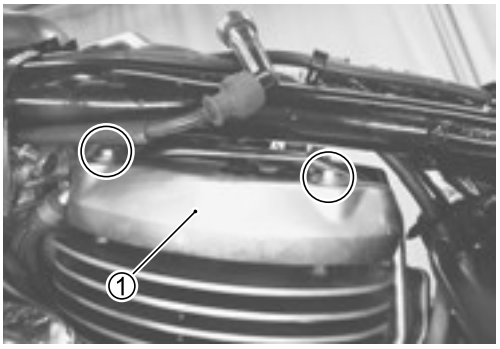
NOTE:

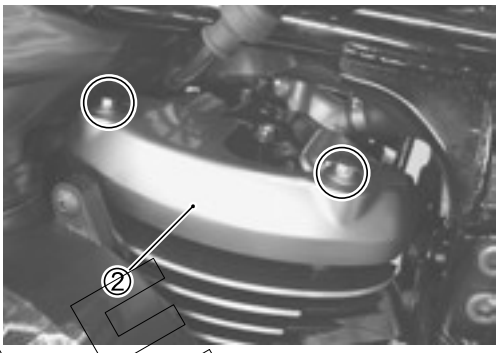
** The clearance specification is for COLD state.*

** Both intake and exhaust valves must be checked and adjusted when the piston is at Top Dead Center (TDC) of the compression stroke.*

- Remove the rear and front seats. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Remove the right frame cover. (☞8-4)
- Remove the spark plug caps.
- Loosen the inlet pipe screws.

• Remove the cylinder head cover caps (①, ②).



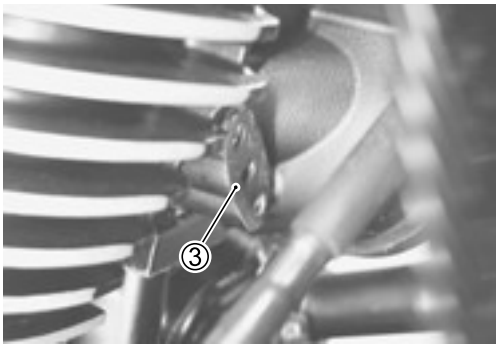


• Remove the PAIR pipe.

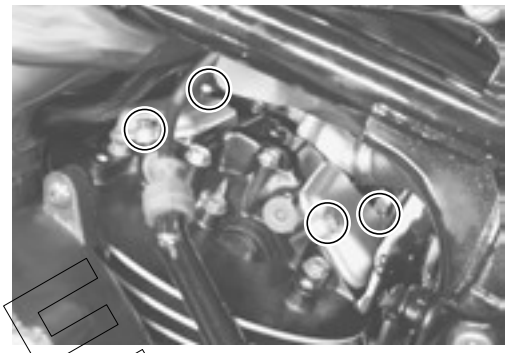
• Remove the gasket ③.

CAUTION

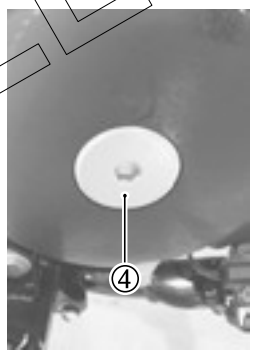
Do not reuse the removed gasket.

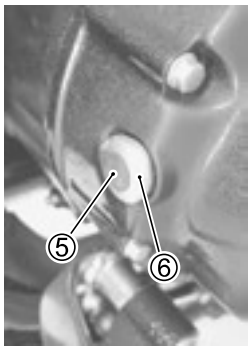


- Remove all the inspection caps.
- Remove all the spark plugs.

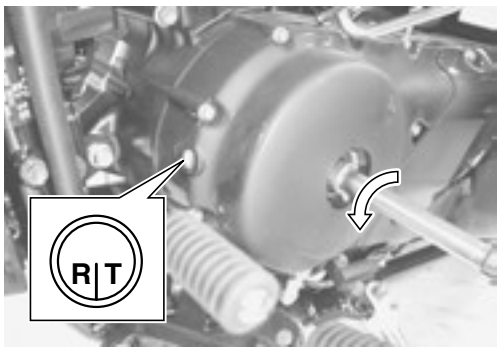


- Remove the generator cover plug ④.
- Remove the cap ⑤ and the timing inspection plug ⑥.





- Rotate the generator rotor to set the No. 1 engine's piston at TDC of the compression stroke. (Rotate the rotor until the "R I T" line on the rotor is aligned with the center of hole on the generator cover.)

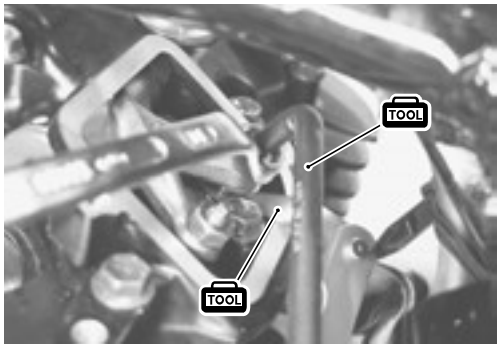


- To inspect the No. 1 engine's valve clearance, insert the thickness gauge to the clearance between the valve stem end and the adjusting screw on the rocker arms.

TOOL 09900-20806: Thickness gauge

- If the clearance is out of the specification, bring it into the specified range by using the special tool.

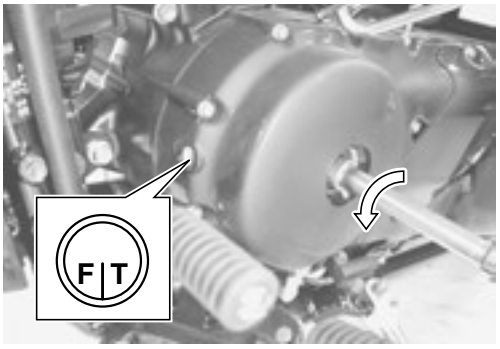
TOOL 09917-10410: Valve adjust driver



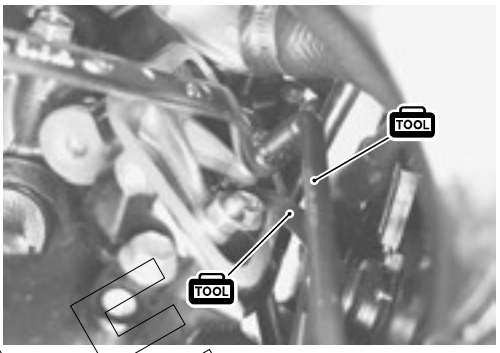
CAUTION

Both right and left valve clearances should be as closely set as possible.

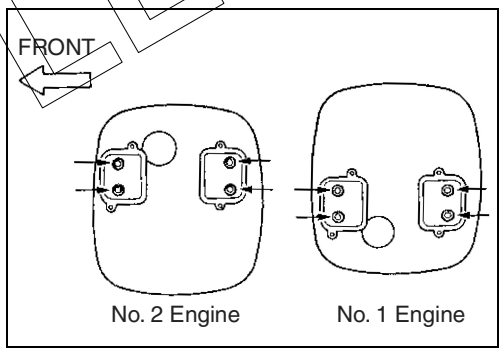
- Rotate the generator rotor 450 degrees (1 and 1/4 turns) and align the “F I T” line on the rotor with the center of hole on the generator cover.



Inspect the No. 2 engine’s valve clearance as the same manner above.



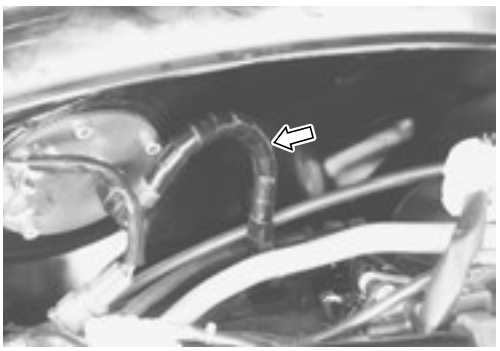
NOTE:
Use the thickness gauge from the arrow marks as shown in the illustration.



FUEL HOSE

Inspect every 6 000 km (4 000 miles, 12 months).

Inspect the fuel feed hose for damage and fuel leakage. If any defects are found, the fuel hoses must be replaced.



ENGINE OIL AND OIL FILTER

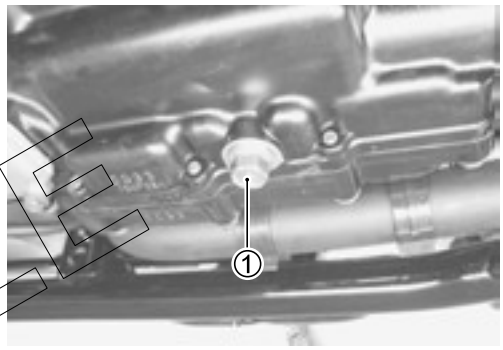
(ENGINE OIL)
Replace initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.

(OIL FILTER)
Replace initially at 1 000 km (600 miles, 2 months) and every 18 000 km (11 000 miles, 36 months) thereafter.

Oil should be changed while the engine is warm. Oil filter replacement at the above intervals, should be done together with the engine oil change.

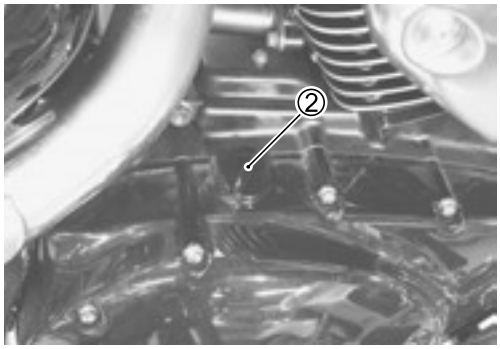
ENGINE OIL REPLACEMENT

- Keep the motorcycle upright.
- Place an oil pan below the engine, and drain oil by removing the drain plug ① and filler cap ②.

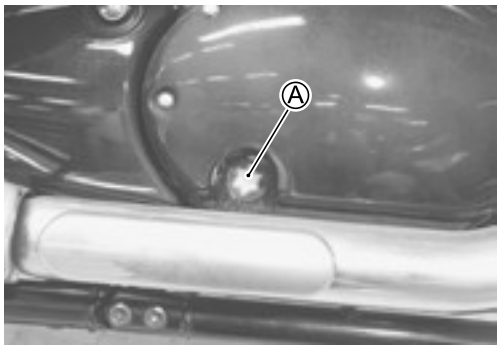


- Tighten the drain plug ① to the specified torque, and pour fresh oil through the oil filler. The engine will hold about 3.0 L (3.2/2.6 US/Imp qt) of oil. Use of API SF/SG or SH/SJ with JASO MA.

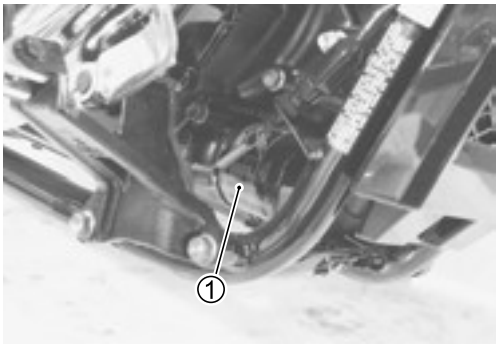
Oil drain plug: 21 N·m (2.1 kgf-m, 15.0 lb-ft)



- Start up the engine and allow it to run for several minutes at idling speed.
- Turn off the engine and wait about three minutes, then check the oil level through the inspection window Ⓐ. If the level is below mark “L”, add oil to “F” level. If the level is above mark “F”, drain oil to “F” level.

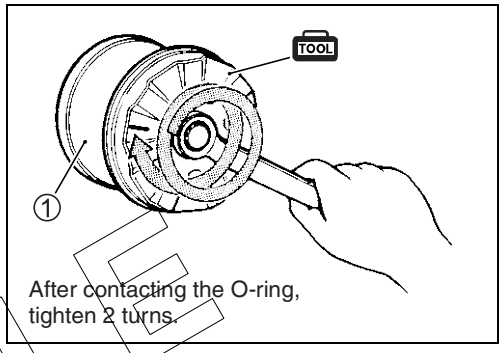


OIL FILTER REPLACEMENT



- Drain engine oil in the same manner of engine oil replacement procedure.
- Remove the oil filter ① by using the oil filter wrench. (Special tool)
- Apply engine oil lightly to the O-ring of the new filter before installation.
- Install the new filter turning it by hand until you feel that the filter O-ring contacts the mounting surface. Then tighten it 2 turns using the oil filter wrench. (20 N·m, 2.0 kgf-m, 14.5 lb-ft)

TOOL 09915-40610: Oil filter wrench



After contacting the O-ring, tighten 2 turns.

NOTE:
To properly tighten the filter, use the special tool. Never tighten the filter by hand.

- Pour fresh engine oil and check the oil level in the same manner of engine oil replacement procedure.

DATA Engine oil capacity

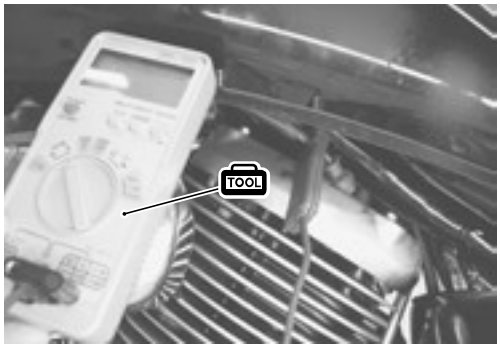
Oil change:	**3.0 L (3.2/2.6 US/Imp qt)**
Filter change:	**3.4 L (3.6/3.0 US/Imp qt)**
Overhaul engine:	**3.7 L (3.9/3.3 US/Imp qt)**

CAUTION

ONLY USE A GENUINE SUZUKI MOTORCYCLE OIL FILTER. Other manufacturer's oil filters may differ in thread specifications (thread diameter and pitch), filtering performance and durability which may lead to engine damage or oil leaks. Also, do not use a genuine Suzuki automobile oil filter on this motorcycle.

ENGINE IDLE SPEED

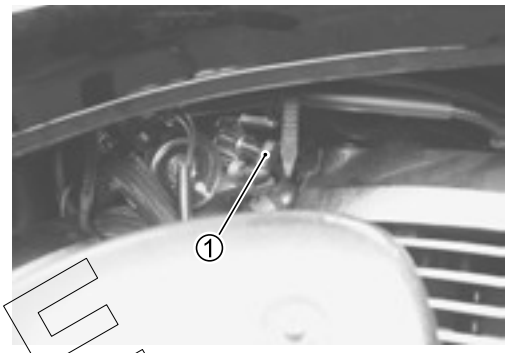
Inspect initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.



NOTE:
Warm up the engine before adjusting the engine idle speed.

- Connect the multi-circuit tester to the high-tension cord.

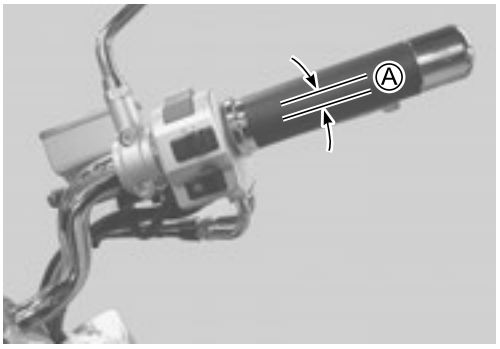
- Start up the engine and set its idle speed to the specified range by turning the throttle stop screw ①.



DATA Engine idle speed: 1 100 ± 100 r/min

TOOL 09900-25008: Multi-circuit tester set

THROTTLE CABLE PLAY



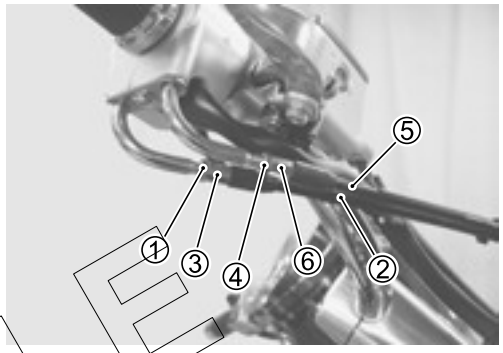
Inspect initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.

Adjust the throttle cable play Ⓐ with the following three steps.

MINOR ADJUSTMENT

First step:

- Loosen the lock nut ① of the throttle returning cable ② and turn in the adjuster ③ fully into the threads.



Second step:

- Loosen the lock nut ④ of the throttle pulling cable ⑤.
- Turn the adjuster ⑥ in or out until the throttle cable play Ⓐ should be 2.0 – 4.0 mm (0.08 – 0.16 in) at the throttle grip.
- Tighten the lock nut ④ while holding the adjuster ⑥.

Third step:

- While holding the throttle grip at the fully closed position, slowly turn out the adjuster ③ of the throttle returning cable ② to feel resistance.
- Tighten the lock nut ① while holding the adjuster ③.

DATA Throttle cable play Ⓐ: 2.0 – 4.0 mm (0.08 – 0.16 in)

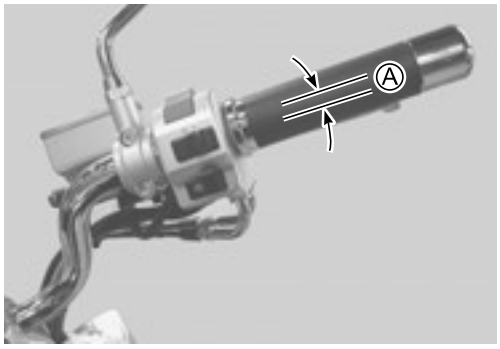
⚠ WARNING

After the adjustment is completed, check that handlebar movement does not raise the engine idle speed and that the throttle grip returns smoothly and automatically.

NOTE:

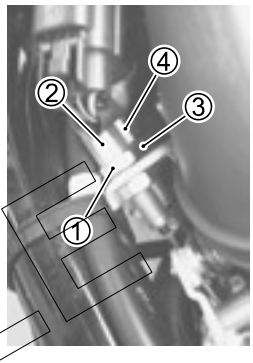
Major adjustment can be made by the throttle body side adjuster.

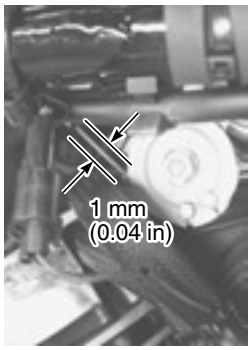
MAJOR ADJUSTMENT



- Remove the rear and front seats. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Loosen the lock nut ① of the throttle returning cable.
- Turn the returning cable adjuster ② to obtain proper cable play.
- Loosen the lock nut ③ of the throttle pulling cable.
- Turn the pulling cable adjuster ④ in or out until the throttle cable play Ⓐ should be 2.0 – 4.0 mm (0.08 – 0.16 in) at the throttle grip.
- Tighten the lock nut ③ securely while holding the adjuster ④.

DATA Throttle cable play Ⓐ: 2.0 – 4.0 mm (0.08 – 0.16 in)





- While holding the throttle grip at the fully closed position, slowly turn the returning cable adjuster ② to obtain a slack of 1.0 mm (0.04 in).
- Tighten the lock nut ① securely.

⚠ WARNING

After the adjustment is completed, check that handlebar movement does not raise the engine idle speed and that the throttle grip returns smoothly and automatically.

THROTTLE VALVE SYNCHRONIZATION

Inspect initially at 1 000 km (600 miles, 2 months) (For E-33 only) and every 12 000 km (7 500 miles, 24 months).

Inspect the throttle valve synchronization periodically.
(☞6-24)

EVAPORATIVE EMISSON CONTROL SYSTEM (FOR E-33 ONLY)

Inspect every 12 000 km (7 500 miles, 24 months).
Replace vapor hose every 4 years.

(☞11-9)

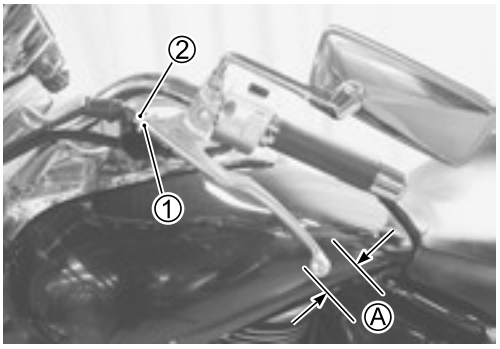
PAIR (AIR SUPPLY) SYSTEM

Inspect every 12 000 km (7 500 miles, 24 months).

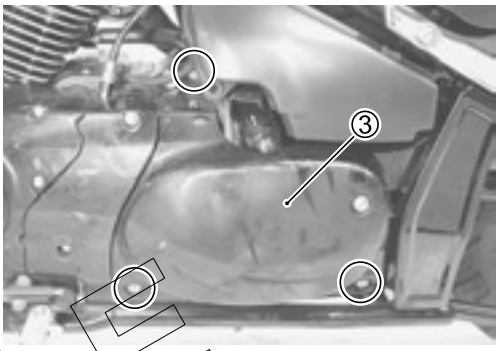
Inspect the PAIR (air supply) system periodically.
(☞11-5)

CLUTCH

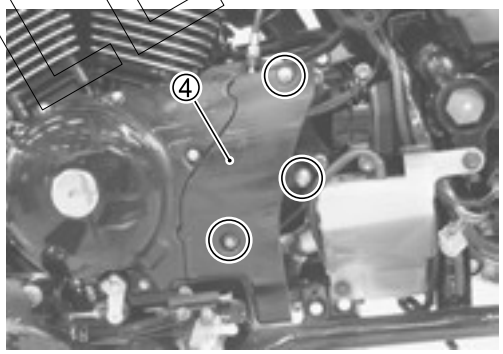
Inspect every 6 000 km (4 000 miles, 12 months).



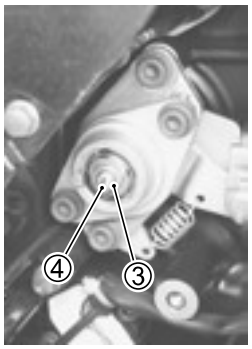
- Loosen the lock nut ①.
- Turn in the adjuster ② all the way into the clutch lever assembly.

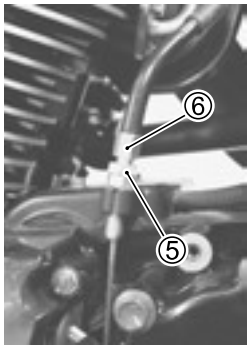


- Remove the left frame cover. (☞8-3)
- Remove the secondary gear case cover ③.



- Remove the clutch release cover ④.



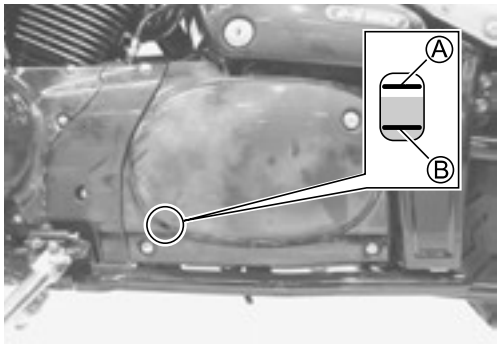


- Loosen the lock nut ③ and turn out the adjusting screw ④ two or three rotations.
- From that position, slowly turn in the adjusting screw ④ to feel resistance.
- From this position, turn out the adjusting screw ④ 1/4 rotations, and tighten the lock nut ③.
- Loosen the lock nut ⑤, and turn the cable adjuster ⑥ to obtain 10 – 15 mm (0.4 – 0.6 in) of free play Ⓐ at the clutch lever end.
- Tighten the lock nut ⑤.
- Tighten the lock nut ①.

DATA Clutch lever play Ⓐ: 10 – 15 mm (0.4 – 0.6 in)
Clutch release screw: 1/4 turn out

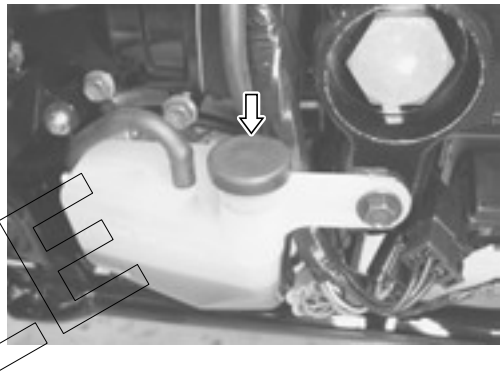
COOLING SYSTEM

RADIATOR HOSE
Inspect every 6 000 km (4 000 miles, 12 months).
ENGINE COOLANT
Replace engine coolant every 2 years.



ENGINE COOLANT LEVEL CHECK

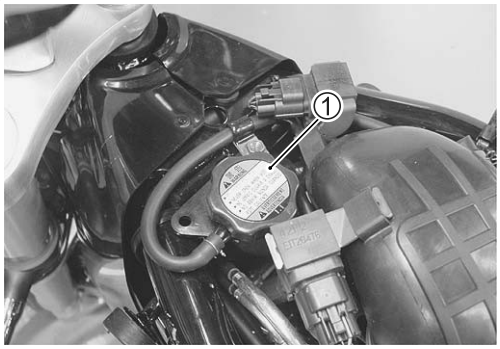
- Keep the motorcycle upright.
- Check the engine coolant level by observing the full and lower lines on the engine coolant reserve tank.
  Ⓐ Full line Ⓑ Lower line
- If the level is below the lower line, add engine coolant to the full line from the engine coolant reserve tank filler.



NOTE:
To remove the filler cap, remove the tool box cover and secondary gear case cover. (☞2-16)

ENGINE COOLANT CHANGE

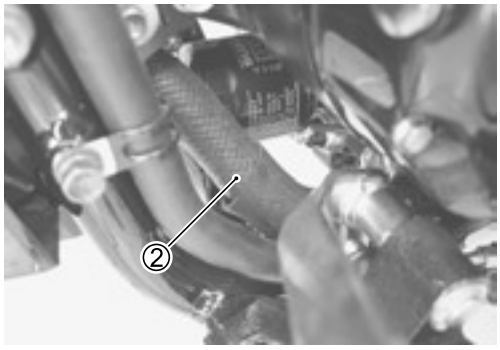
- Remove the rear and front seat. (☞8-3)
- Remove the fuel tank. (☞6-3)
- Remove the radiator cap ①.
- Drain engine coolant by disconnecting the radiator hose ② from the pump.



⚠ WARNING

*** Do not open the radiator cap when the engine is hot, as you may be injured by escaping hot liquid or vapor.**
*** Engine coolant may be harmful if swallowed or if it comes in contact with skin or eyes. If engine coolant gets into the eyes or in contact with the skin, flush thoroughly with plenty of water. If swallowed, induce vomiting and call physician immediately!**

- Flush the radiator with fresh water if necessary.
- Connect the radiator hose ② securely.
- Pour the specified engine coolant up to the radiator inlet.
- Bleed the air from the engine coolant circuit as following procedure.



NOTE:
For engine coolant information, refer to page 7-2.

AIR BLEEDING THE COOLING CIRCUIT

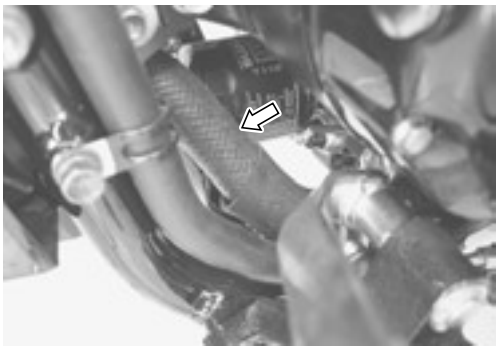
- Add engine coolant up to the radiator inlet.
- Support the motorcycle upright.
- Slowly swing the motorcycle, right and left, to bleed the air trapped in the cooling circuit.
- Add engine coolant up to the radiator inlet.
- Start up the engine and bleed air from the radiator inlet completely.
- Add engine coolant up to the radiator inlet.
- Repeat the above procedure until bleed no air from the radiator inlet.
- Close the radiator cap securely.
- After warming up and cooling down the engine several times, add the engine coolant up to the full level of the reservoir.

CAUTION

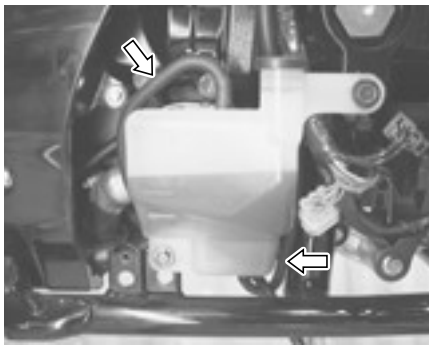
Repeat the above procedure several times and make sure that the radiator is filled with engine coolant up to the reserve tank full level.

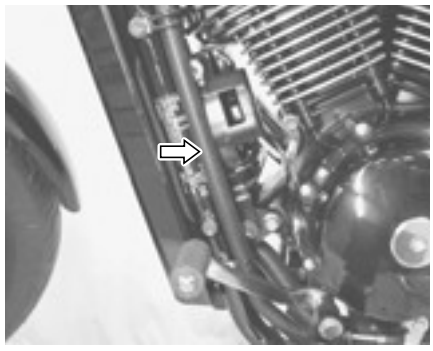
LLC Engine coolant capacity
Reverse tank side: 250 ml (0.26/0.22 US/Imp qt)
Engine side: 1 500 ml (1.59/1.32 US/Imp qt)

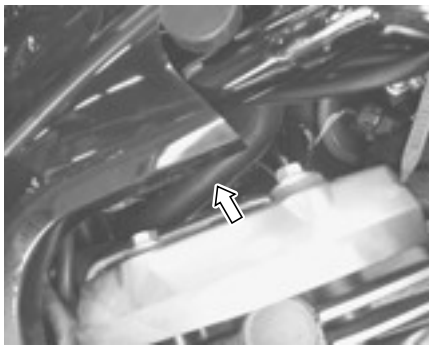
RADIATOR HOSES



- Check to see the radiator hoses for crack, damage or engine coolant leakage.
- If any defects are found, replace the radiator hoses with new ones.

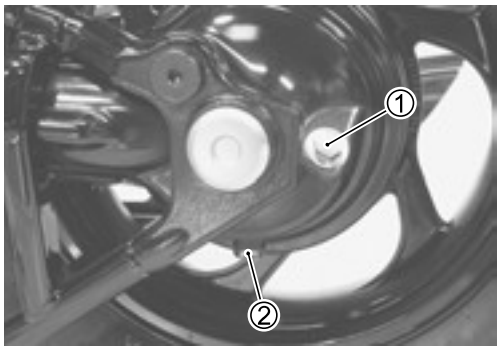






FINAL GEAR OIL

Replace initially at 1 000 km (600 miles, 2 months) and inspect every 12 000 km (7 500 miles, 24 months) thereafter.



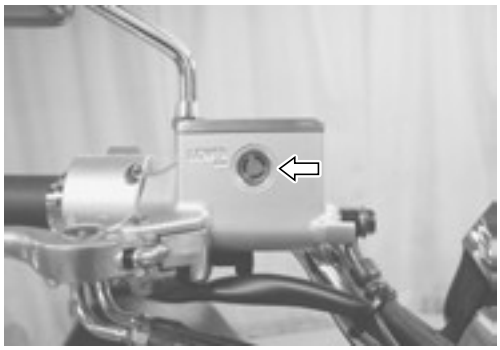
- Keep the motorcycle upright.
- Place an oil pan under the final gear case.
- Remove the filler cap ① and drain plug ② to drain oil.
- Refit the drain plug ②. Pour the specified oil (SAE 90 hypoid gear oil with GL-5 under API classification) through the filler hole until the oil level reaches the filler hole.
- Refit the filler cap ①.

DATA **Final gear oil: 200 – 220 ml**
(6.8/7.0 – 7.4/7.7 US/Imp oz)

BRAKE

(BRAKE)
Inspect initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.

(BRAKE HOSE AND BRAKE FLUID)
Inspect every 6 000 km (4 000 miles, 12 months). Replace hoses every 4 years. Replace fluid every 2 years.



FRONT BRAKE FLUID LEVEL CHECK

- Keep the motorcycle upright and place the handlebars straight.
- Check the brake fluid level by observing the lower limit line on the front brake fluid reservoir.
- When the level is below the lower limit line, replenish with brake fluid that meets the following specification.

BF **Specification and classification: DOT 4**

⚠ WARNING

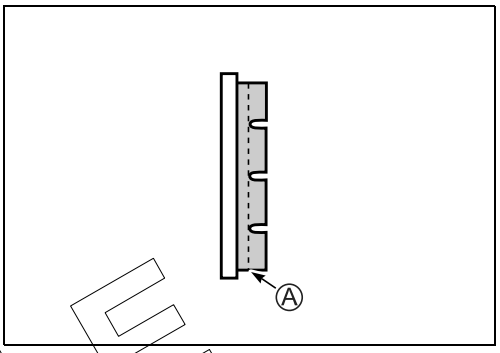
*** The brake system of this motorcycle is filled with a glycol-based brake fluid. Do not use or mix different types of fluid such as silicone-based or petroleum-based. Do not use any brake fluid taken from old, used or unsealed containers. Never re-use brake fluid left over from the last servicing or stored for a long period.**
*** Brake fluid, if it leaks, will interfere with safe running and immediately discolor painted surfaces. Check the brake hoses and hose joints for cracks and oil leakage before riding.**

FRONT BRAKE PADS

The extent of brake pad wear can be checked by observing the grooved limit Ⓐ on the pad. When the wear exceeds the grooved limit, replace the pads with new ones.
(☞8-52)

CAUTION

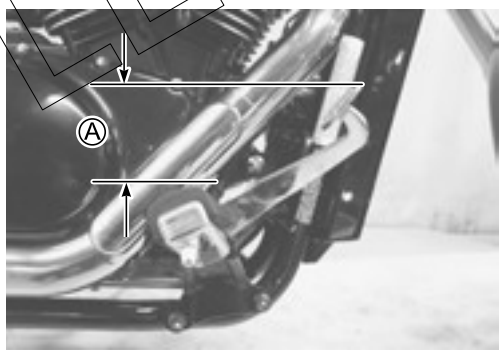
Replace the brake pads as a set, otherwise braking performance will be adversely affected.



REAR BRAKE PEDAL HEIGHT

- Loosen the lock nut ①.
- Adjust the brake pedal height Ⓐ by turning the adjuster ②.

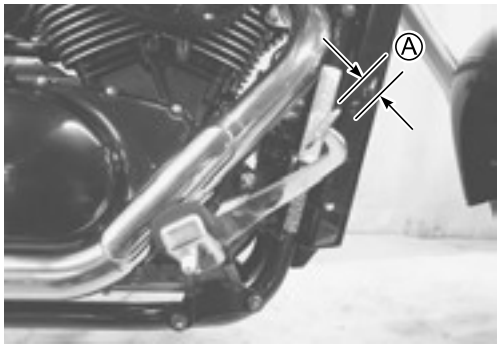
DATA Rear brake pedal height : 75 – 85 mm (3.0 – 3.3 in)

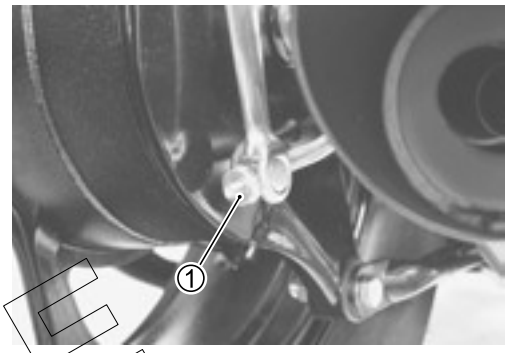


REAR BRAKE ADJUSTING

- Adjust the free travel Ⓐ to 20 – 30 mm by turning the adjusting nut ①.

DATA Rear brake pedal free travel Ⓐ:
20 – 30 mm (0.8 – 1.2 in)

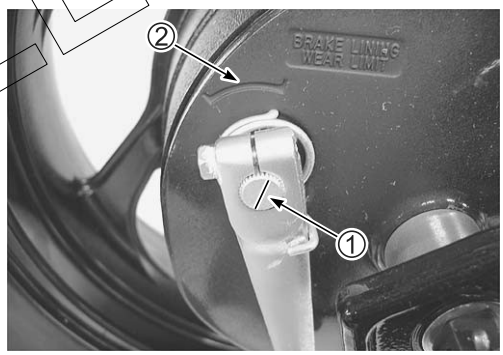




REAR BRAKE SHOE WEAR

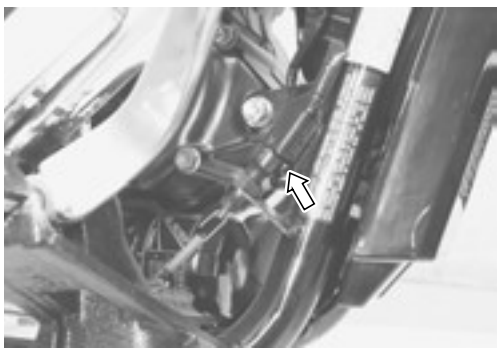
This motorcycle is equipped with brake lining wear limit indicator on the rear brake.
To check brake lining wear, perform the following steps.

- Make sure that the rear brake is properly adjusted.
- Depress the rear brake pedal. Make sure that the index mark ① is within the range ② embossed on the brake panel.
- If the index mark goes beyond the range, the brake shoe assembly should be replaced with a new set of shoes. (☞8-62)



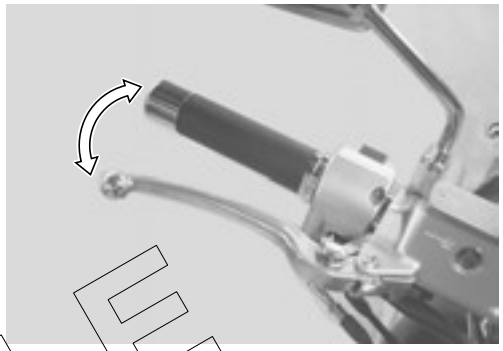
BRAKE LIGHT SWITCH

Adjust the rear brake light switch so that the brake light will come on just before pressure is felt when the brake pedal is depressed.



AIR BLEEDING FROM THE BRAKE FLUID CIRCUIT

Air trapped in the fluid circuit acts like a cushion to absorb a large proportion of the pressure developed by the master cylinder and thus interferes with the full braking performance of the brake caliper. The presence of air is indicated by "sponginess" of the brake lever and also by lack of braking force. Considering the danger to which such trapped air exposes the machine and rider, it is essential that, after remounting the brake and restoring the brake system to the normal condition, the brake fluid circuit be purged of air in the following manner:



- Fill up the master cylinder reservoir to the top of the inspection window. Place the reservoir cap to prevent entry of dirt.
- Attach a pipe to the air bleeder valve, and insert the free end of the pipe into a receptacle.
- Squeeze and release the brake lever several times in rapid succession and squeeze the lever fully without releasing it. Loosen the bleeder valve by turning it a quarter of a turn so that the brake fluid runs into the receptacle; this will remove the tension of the brake lever causing it to touch the handlebar grip. Then, close the valve, pump and squeeze the lever, and open the valve. Repeat this process until the fluid flowing into the receptacle no longer contains air bubbles.

NOTE:
Replenish the brake fluid in the reservoir as necessary while bleeding the brake system. Make sure that there is always some fluid visible in the reservoir.

- Close the bleeder valve, and disconnect the pipe. Fill the reservoir with brake fluid to the top of the inspection window.

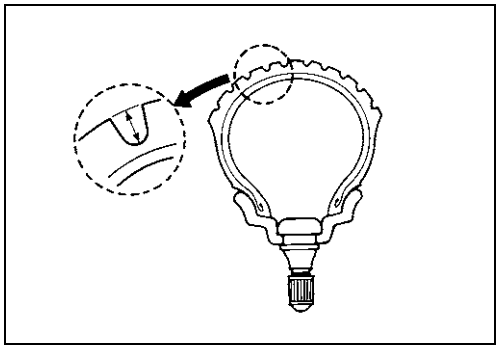
Air bleeder valve: 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)

CAUTION

Handle brake fluid with care: the fluid reacts chemically with paint, plastics, rubber materials and so on.

TIRE

Inspect every 6 000 km (4 000 miles, 12 months).

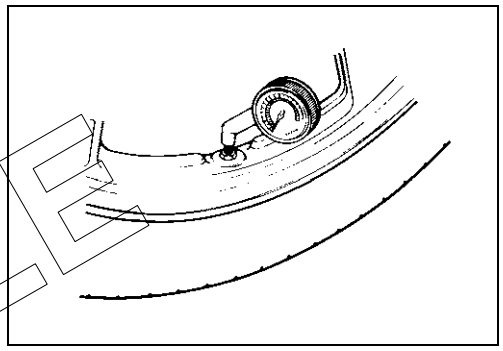


TIRE TREAD CONDITION

Operating the motorcycle with excessively worn tires will decrease riding stability and consequently invite a dangerous situation. It is highly recommended to replace a tire when the remaining depth of tire tread reaches the following specification.

09900-20805: Tire depth gauge

Tire tread depth
Service Limit (FRONT) : 1.6 mm (0.06 in)
(REAR) : 2.0 mm (0.08 in)



TIRE PRESSURE

If the tire pressure is too high or too low, steering will be adversely affected and tire wear increased. Therefore, maintain the correct tire pressure for good roadability or shorter tire life will result. Cold inflation tire pressure is as follows.

COLD INFLATION TIRE PRESSURE	SOLO RIDING			DUAL RIDING		
	kPa	kgf/cm²	psi	kPa	kgf/cm²	psi
FRONT	200	2.0	29	200	2.0	29
REAR	250	2.5	36	250	2.5	36

CAUTION

The standard tire fitted on this motorcycle is 130/90-16M/C (67H) for front and 170/80-15M/C (77H) for rear. The use of tires other than those specified may cause instability. It is highly recommended to use a SUZUKI Genuine Tire.

TIRE TYPE

IRC (FRONT) : GS-23F A
IRC (REAR) : GS-23R A

STEERING

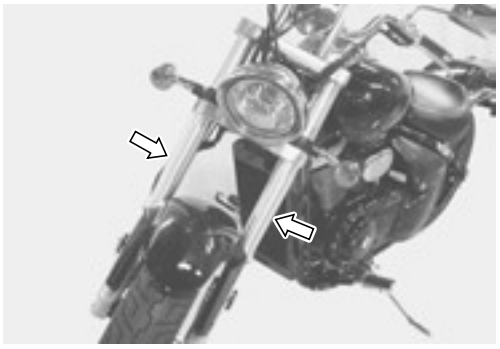
Inspect initially at 1 000 km (600 miles, 2 months) and every 12 000 km (7 500 miles, 24 months) thereafter.

Steering should be adjusted properly for smooth turning of handlebars and safe running. Overtighten steering prevents smooth turning of the handlebars and too loose steering will cause poor stability. Check that there is no play in the steering stem while grasping the lower fork tubes by supporting the machine so that the front wheel is off the ground, with the wheel straight ahead, and pull forward. If play is found, perform steering bearing adjustment as described in page 8-24 of this manual.

FRONT FORK

Inspect every 12 000 km (7 500 miles, 24 months).

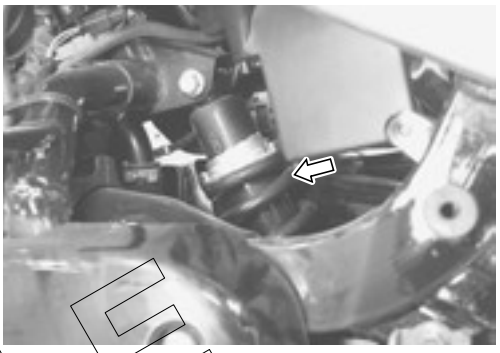
Inspect the front forks for oil leakage, scoring or scratches on the outer surface of the inner tubes. Replace any defective parts, if necessary. (☞8-13)



REAR SUSPENSION

Inspect every 12 000 km (7 500 miles, 24 months).

Inspect the damper for oil leakage and the spring unit for damage. Check that there is no play in the swingarm assembly. Replace any defective parts, if necessary. (☞8-40)



EXHAUST PIPE BOLT

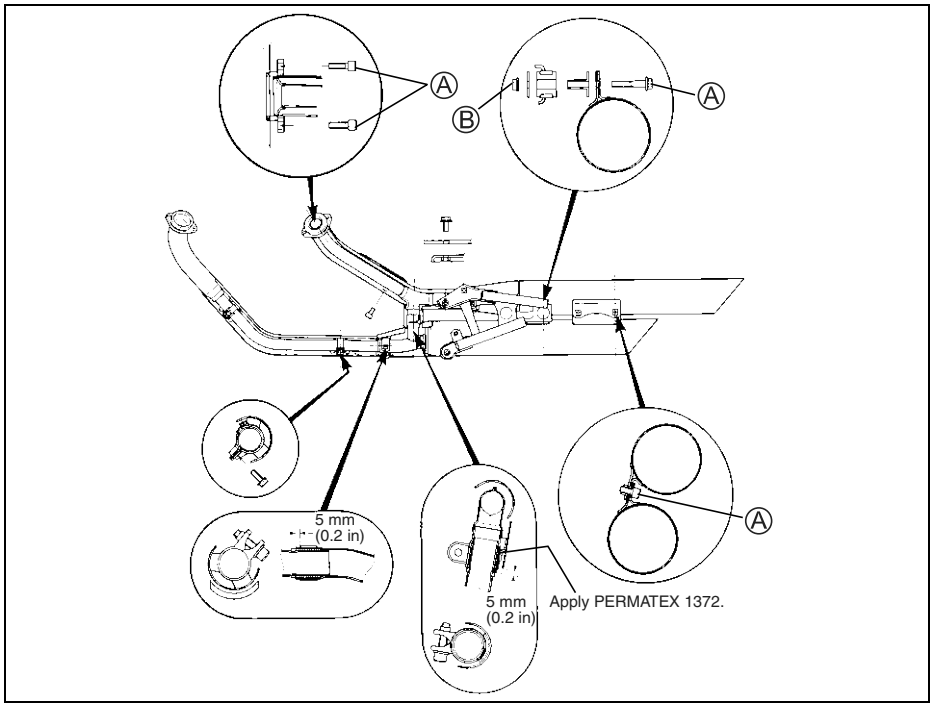
Tighten initially at 1 000 km (600 miles, 2 months) and every 12 000 km (7 500 miles, 24 months) thereafter.

- Tighten the exhaust pipe bolts and muffler mounting bolts to the specified torque.

Muffler mounting bolt and exhaust pipe bolt Ⓐ: 23 N·m (2.3 kgf-m, 16.5 lb-ft)
Muffler mounting nut Ⓑ: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

1342 99000-32050: THREAD LOCK "1342"

EXHAUST GAS SEALER: PERMATEX 1372



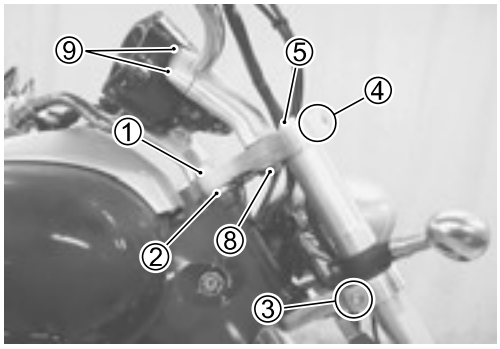
ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	23	2.3	16.5

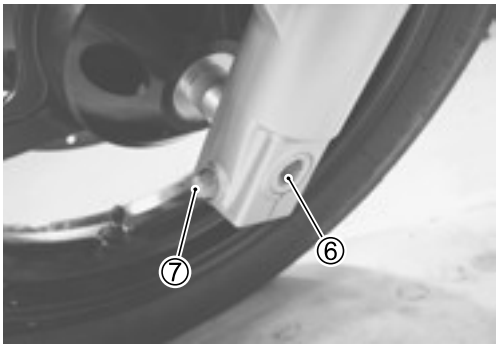
CHASSIS BOLT AND NUT

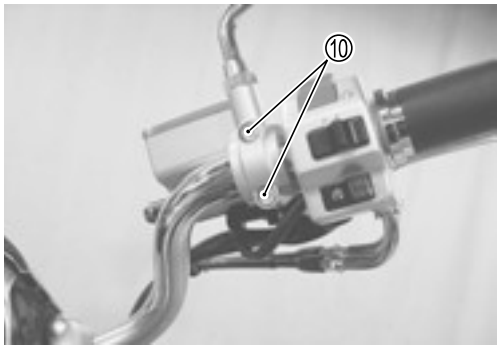
Tighten initially at 1 000 km (600 miles, 2 months) and every 6 000 km (4 000 miles, 12 months) thereafter.

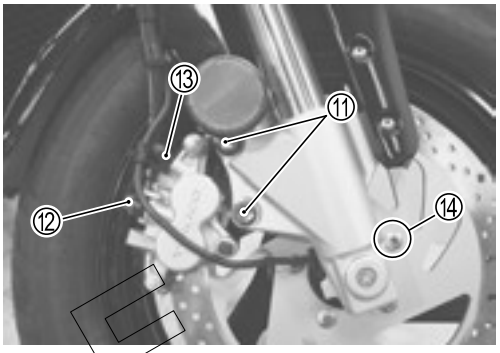
Check that all chassis bolts and nuts are tightened to their specified torque. (Refer to page 2-26 for the locations of the following nuts and bolts on the motorcycle.)

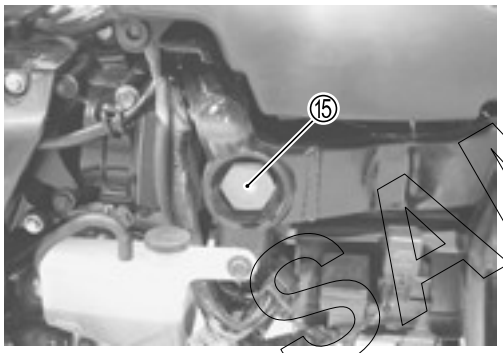
ITEM	N·m	kgf-m	lb-ft
① Steering stem head nut	90	9.0	65.0
② Steering stem nut	45	4.5	32.5
③ Front fork lower clamp bolt	30	3.0	21.5
④ Front fork upper clamp bolt	23	2.3	16.5
⑤ Front fork cap bolt	23	2.3	16.5
⑥ Front axle	65	6.5	47.0
⑦ Front axle pinch bolt	23	2.3	16.5
⑧ Handlebar holder set nut	45	4.5	32.5
⑨ Handlebar clamp bolt	23	2.3	16.5
⑩ Front brake master cylinder mounting bolt	10	1.0	7.0
⑪ Front brake caliper mounting bolt	39	3.9	28.0
⑫ Brake hose union bolt	23	2.3	16.5
⑬ Caliper air bleeder valve	7.5	0.75	5.5
⑭ Brake disc bolt	23	2.3	16.5
⑮ Swingarm pivot bolt lock nut	100	10.0	72.5
⑯ Torque link bolt and nut (Front)	35	3.5	25.5
⑰ Torque link bolt and nut (Rear)	25	2.5	18.0
⑱ Rear shock absorber mounting bolt/nut (Upper & Lower)	50	5.0	36.0
⑲ Rear cushion lever/rod mounting nut	78	7.8	57.5
⑳ Rear axle nut	65	6.5	47.0
㉑ Brake cam lever bolt	10	1.0	7.0
㉒ Front footrest bracket mounting bolt	55	5.5	40.0

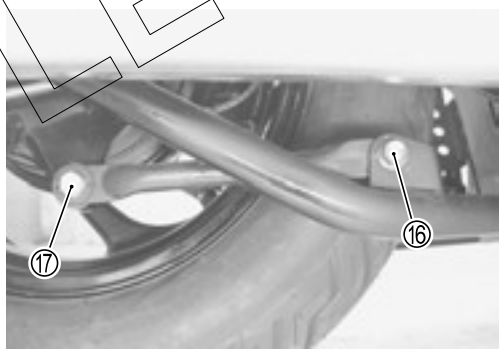


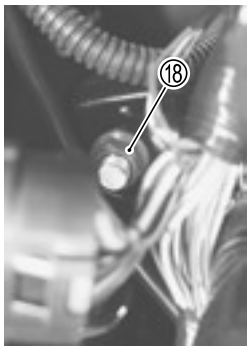


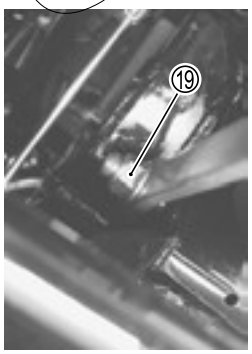


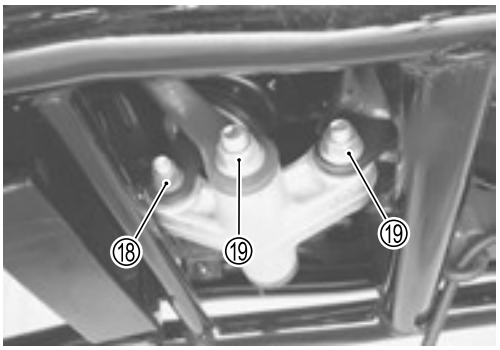


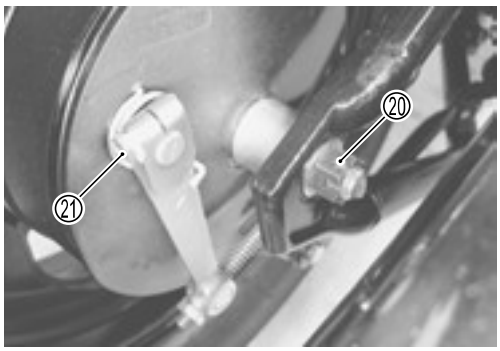


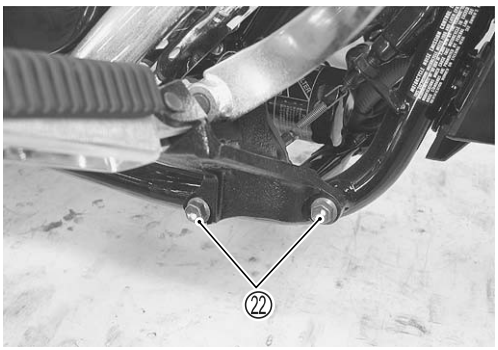












COMPRESSION PRESSURE CHECK

The compression of a cylinder is a good indicator of its internal condition.
The decision to overhaul the cylinder is often based on the results of a compression test. Periodic maintenance records kept at your dealership should include compression readings for each maintenance service.

COMPRESSION PRESSURE SPECIFICATION (Automatic de-comp. actuated)

Standard	Limit	Difference
1 300 – 1 700 kPa (13 – 17 kgf/cm², 185 – 242 psi)	1 100 kPa (11 kgf/cm², 156 psi)	200 kPa (2 kgf/cm², 28 psi)

Low compression pressure can indicate any of the following conditions:

* Worn-down piston or piston rings
* Piston rings stuck in grooves
* Poor seating of valves
* Ruptured or otherwise defective cylinder head gasket

Overhaul the engine in the following cases:

* Compression pressure in one of the cylinders is less than 1 100 kPa (11 kgf/cm², 156 psi).
* Difference in compression pressure between two cylinders is more than 200 kPa (2 kgf/cm², 28 psi).
* All compression pressure are below 1 100 kPa (11 kgf/cm², 156 psi) even when they measure more than 1 300 kPa (13 kgf/cm², 185 psi).

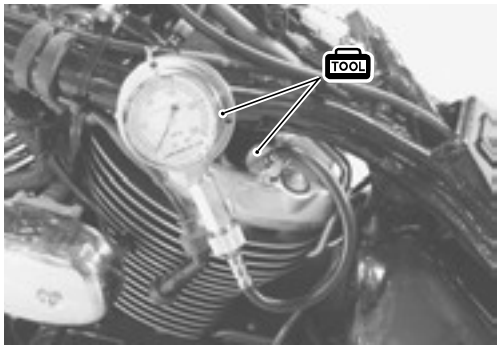
COMPRESSION TEST PROCEDURE

NOTE:

* *Before testing the engine for compression pressure, make sure that the cylinder head bolts are tightened to the specified torque values and valves are properly adjusted.*
* *Have the engine warmed up by idling before testing.*
* *Be sure that the battery used is in fully-charged condition.*

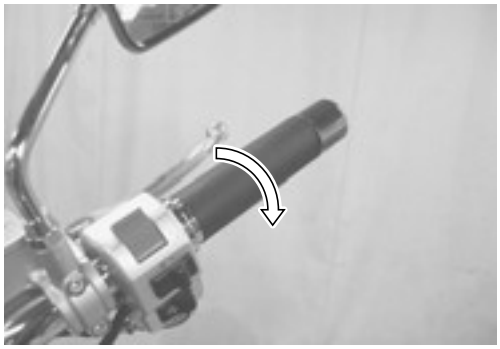
Remove the parts concerned and test the compression pressure in the following manner.

- Remove all the spark plugs. (☞2-5 and -6)
- Fit the compression gauge in one of the plug holes, while taking care of the tight connection.



- Keep the throttle grip in full-open position.
- While cranking the engine a few seconds with the starter, and record the maximum gauge reading as the compression of that cylinder.
- Repeat this procedure with an other cylinder.

TOOL 09915-64512: Compression gauge
09915-63210: Compression gauge adaptor



OIL PRESSURE CHECK

Check periodically the oil pressure in the engine to judge roughly the condition of the moving parts.

OIL PRESSURE SPECIFICATION

Above 350 kPa (3.5 kgf/cm², 50 psi) **Below 650 kPa (6.5 kgf/cm², 92 psi)**	**at 3 000 r/min, Oil temp. at 60°C (140°F)**

If the oil pressure is lower or higher than the specification, the following causes may be considered.

LOW OIL PRESSURE

* Clogged oil filter
* Oil leakage from the oil passage way
* Damaged O-ring
* Defective oil pump
* Combination of the above items

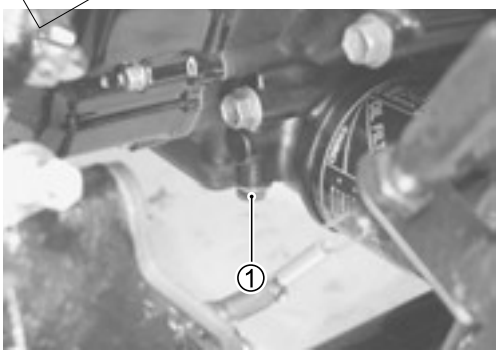
HIGH OIL PRESSURE

* Used of high viscosity engine oil
* Clogged oil passage way
* Combination of the above items

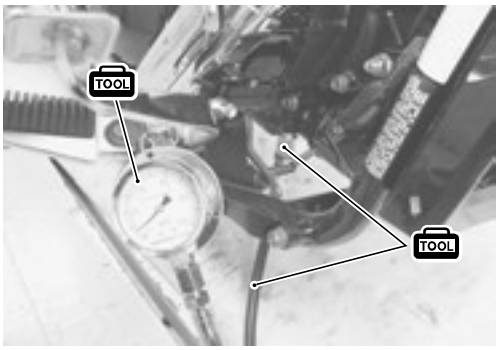
OIL PRESSURE TEST PROCEDURE

Start the engine and check if the oil pressure indicator light is turned on. If it keeps on lighting, check the oil pressure indicator light circuit. If it is in good condition, check the oil pressure in the following manner.

- Remove the main oil gallery plug ①.



- Install the oil pressure gauge with attachment in the position shown in the photo.
- Warm up the engine as follows:
  Summer 10 min at 2 000 r/min
  Winter 20 min at 2 000 r/min
- After warming up, increase the engine speed to 3 000 r/min (with the multi circuit tester ☞2-13), and read the oil pressure gauge.



TOOL **09915-74511: Oil pressure gauge hose**
09915-74532: Oil pressure gauge attachment
09915-77331: Meter (for high pressure)

Oil gallery plug: 18 N·m (1.8 kgf-m, 13.0 lb-ft)

SDS CHECK

Using SDS, take the sample of data from the new motorcycle and at the time of periodic maintenance at your dealership.

Save the data in the computer or by printing and filing the hard copies. The saved or filed data are useful for troubleshooting as they can be compared periodically with changes over time or failure conditions of the motorcycle.

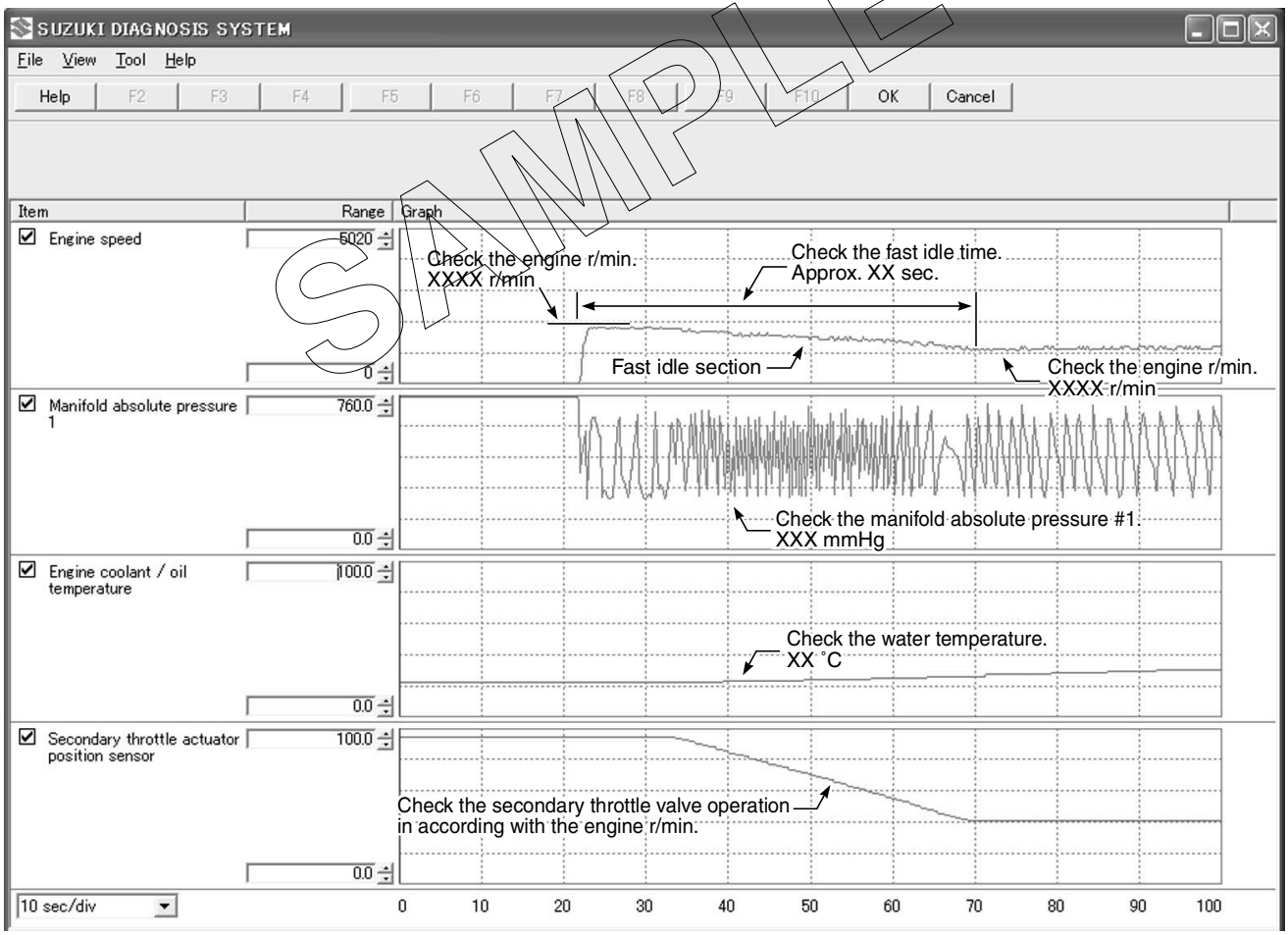
For example, when a motorcycle is brought in for service but the troubleshooting is difficult, comparison with the normal data that have been saved or filed can allow the specific engine failure to be determined.

- Remove the right frame cover. (☞8-3)
- Set up the SDS tool. (☞5-24)

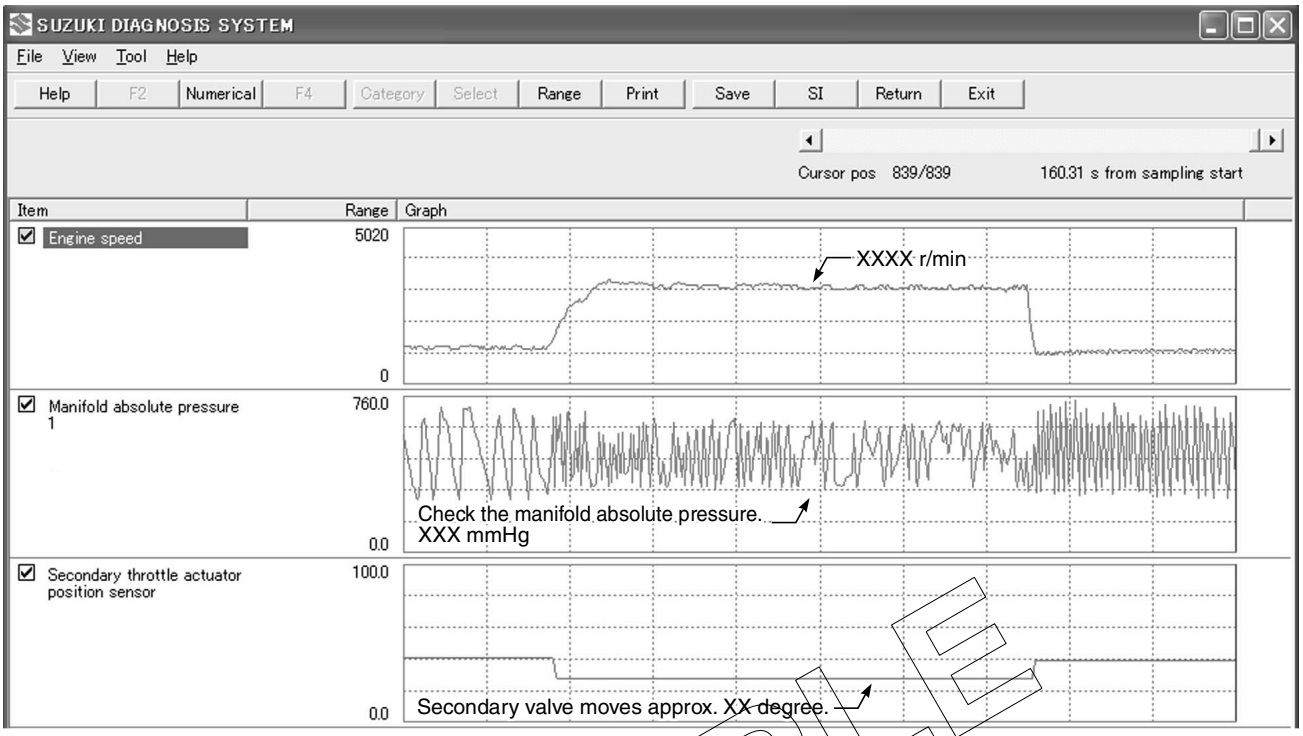
TOOL 09904-41010: SDS set tool
99565-01010: CD-ROM Ver. 5

A number of different data under a fixed condition as shown below should be saved or filed as sample.

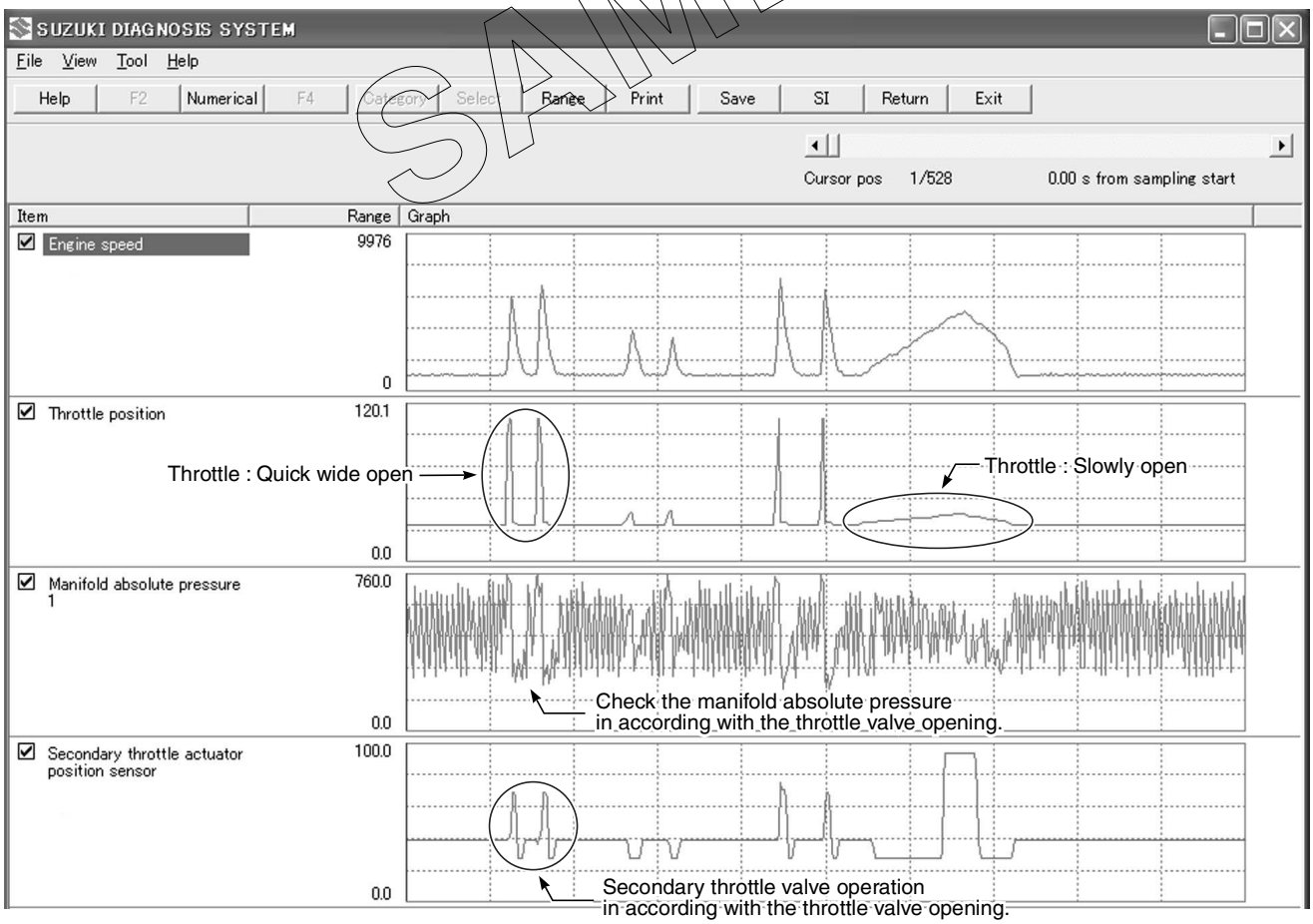
SAMPLE:
Data sampled from cold starting through warm-up



Data at 3 000 r/min under no load



Data at the time of racing



ENGINE

CONTENTS

ENGINE COMPONENTS REMOVABLE WITH ENGINE IN PLACE

The parts listed below can be removed and reinstalled without removing the engine from the frame. Refer to the page listed in this section for removal and reinstallation instructions.

ENGINE CENTER

PARTS	REMOVAL	INSTALLATION
Inspection cap	3-12	3-85
PAIR pipe	3-11	3-86
Starter motor	9-14	9-14
Oil filter	3-21	3-72

ENGINE LEFT SIDE

PARTS	REMOVAL	INSTALLATION
Neutral switch	3-22	3-72
Generator	3-23	3-71
Water pump	3-24	3-69
Secondary driven bevel gear	3-24	3-68

ENGINE RIGHT SIDE

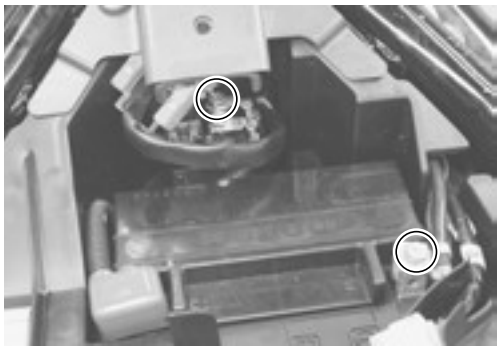
PARTS	REMOVAL	INSTALLATION
Clutch	3-18	3-76
Oil pump	3-20	3-74
Gearshift	3-20	3-74
Primary drive gear	3-21	3-73
Driveshaft bolt/Secondary driven gearshaft nut	3-21	3-69

ENGINE REMOVAL AND INSTALLATION

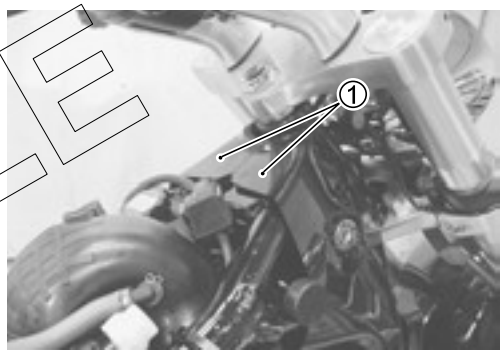
ENGINE REMOVAL

Before taking the engine out of the frame, wash the engine using a steam cleaner. Engine removal is sequentially explained in the following steps. Reinstall the engine by reversing the removal procedure.

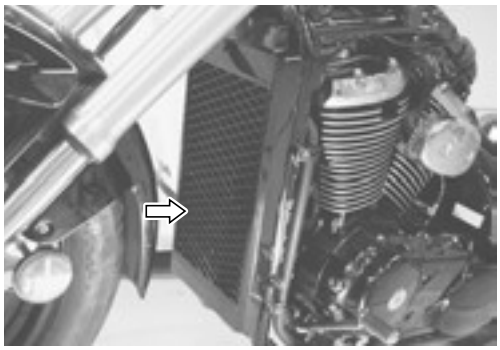
- Drain engine oil. (☞2-11)
- Drain engine coolant. (☞2-17)
- Remove the seats. (☞8-3)
- Remove the fuel tank. (☞ 6-3)
- Disconnect the battery ⊖ lead wire and starter motor lead wire.



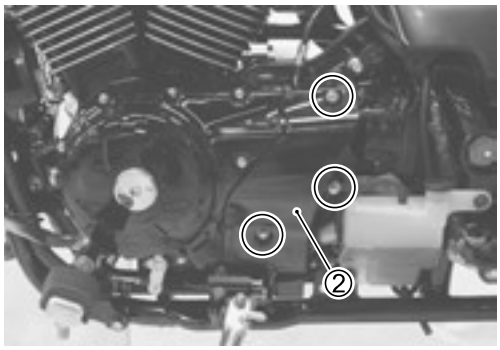
- Remove the frame head covers ①.



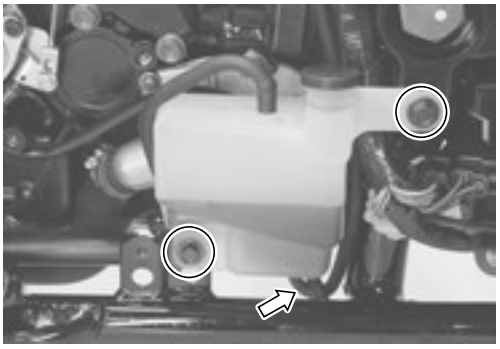
- Remove the radiator. (☞7-4)



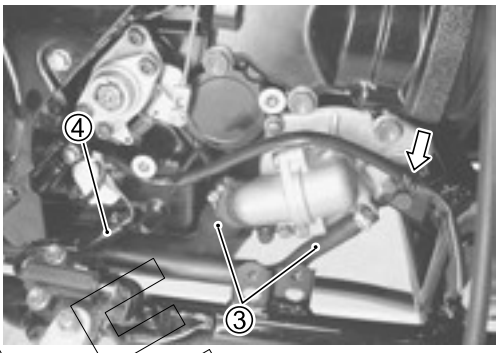
- Remove the left frame cover. (☞8-3)
- Remove the tool box and secondary gear case cover. (☞2-16)
- Remove the secondary drive unit cover ②.



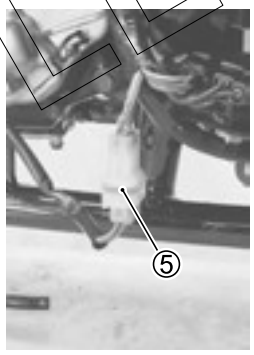
- Remove the engine coolant reservoir tank.

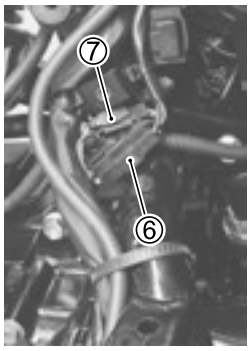


- Disconnect the water hoses ③.
- Disconnect the side-stand switch lead wire coupler ④.

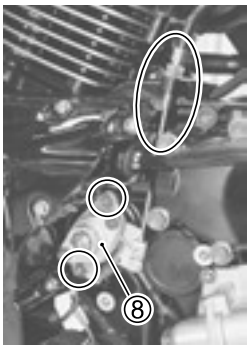


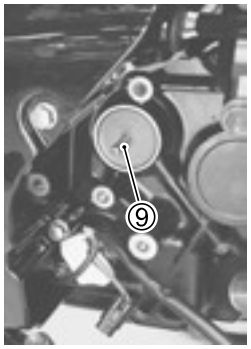
- Disconnect the neutral switch lead wire coupler ⑤.
- Disconnect the generator lead wire coupler ⑥ and the signal generator lead wire coupler ⑦.



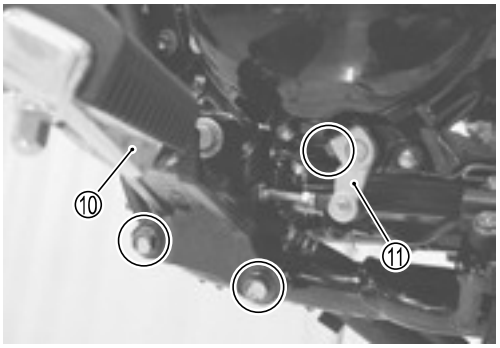


- Remove the clutch release mechanism ⑧.
- Remove the push rod ⑨.



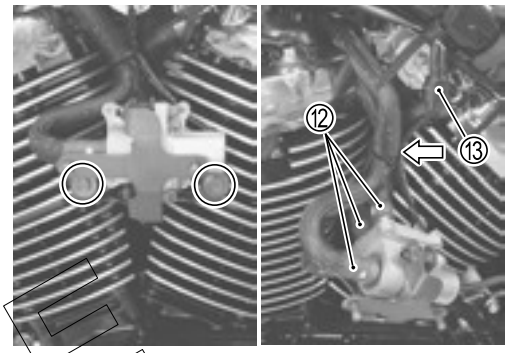


- Remove the left footrest ⑩ and the gearshift lever ⑪.

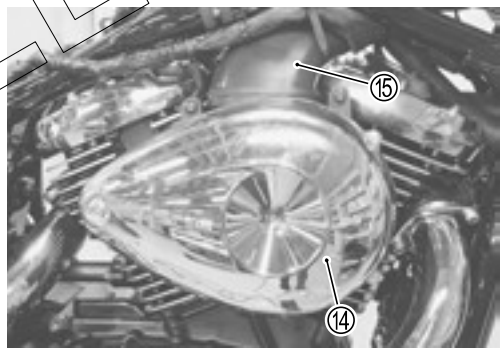


- Remove the PAIR (AIR SUPPLY) cover.

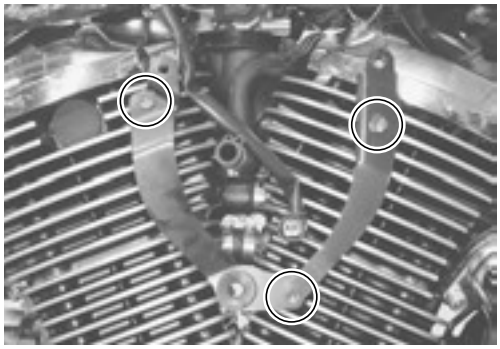
- Remove the PAIR mounting bolts.
- Disconnect the PAIR hoses ⑫ and lead wire coupler ⑬.



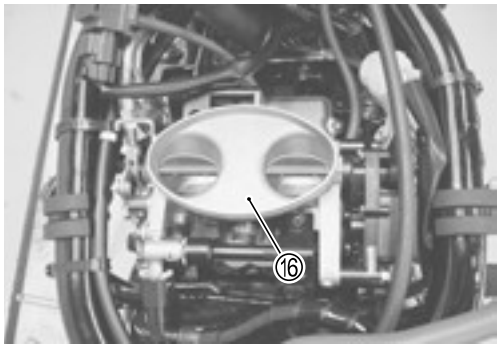
- Remove the air cleaner box ⑭ and air intake pipe ⑮. (☞5-47)



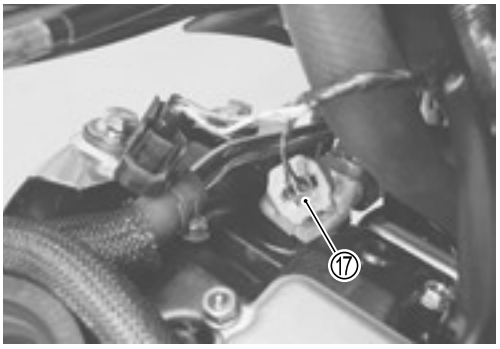
- Remove the air cleaner box bracket.



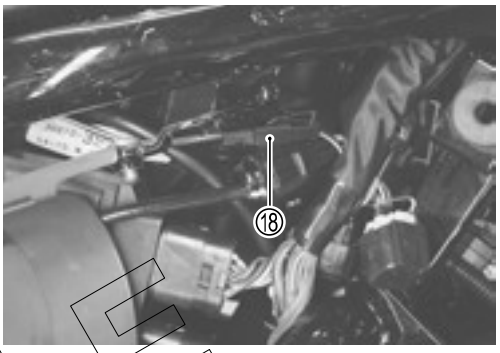
- Remove the throttle body ⑯. (☞6-14)



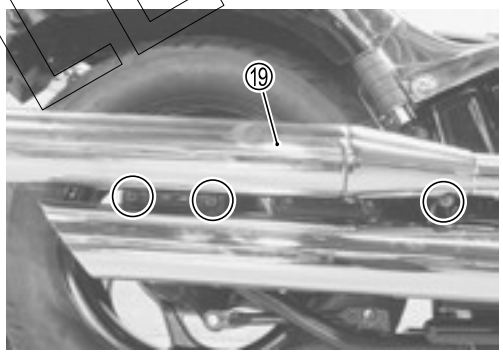
- Disconnect the ECT sensor lead wire coupler ⑰.
- Disconnect the spark plug caps.



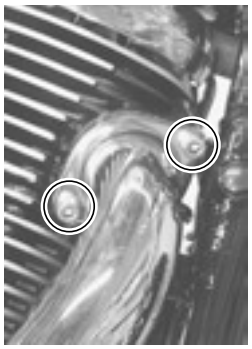
- Remove the right frame cover. (☞8-4)
- Disconnect the HO2 sensor lead wire coupler ⑱. (For E-02, 19, 24)

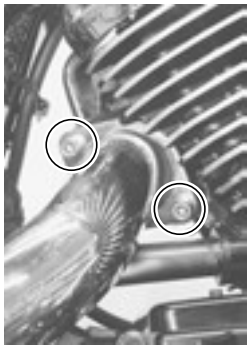


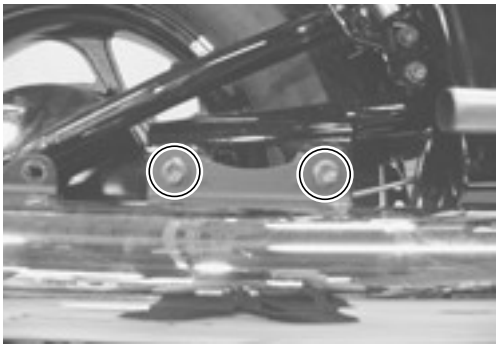
- Remove the No. 1 muffler ⑲.



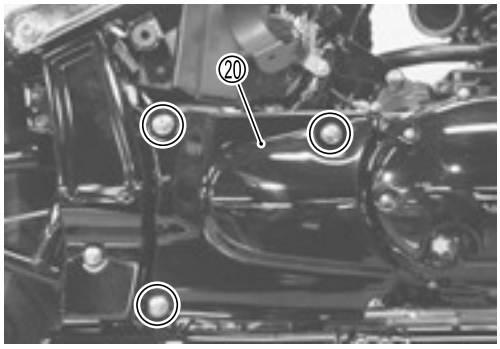
- Remove the exhaust pipes and the No. 2 muffler.



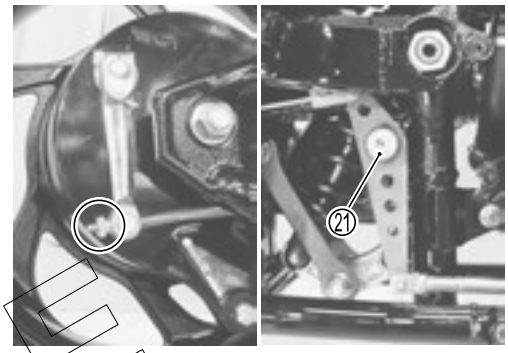




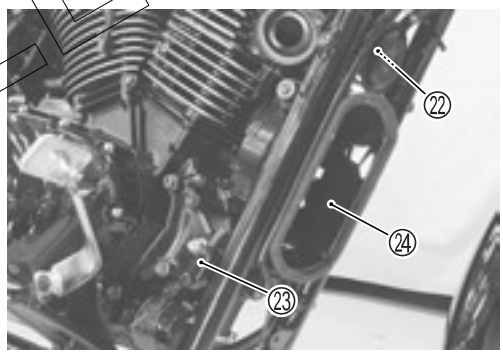
- Remove the rear clutch cover ⑳.



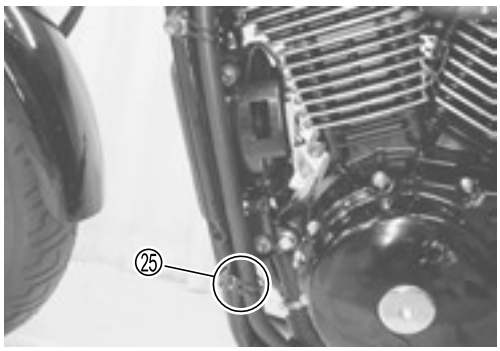
- Remove the rear brake link ㉑.



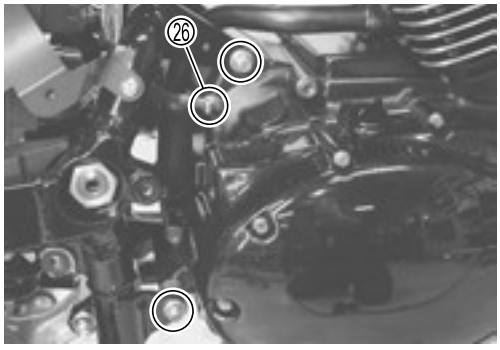
- Disconnect the horn lead wire coupler ㉒ and rear brake switch lead wire coupler ㉓.
- Remove the cooling fan ㉔. (☞7-8)



- Remove the engine frame mounting bolt ㉕.



- Remove the ground lead wire ㉖.
- Support the engine with an engine jack.
- Remove the engine mounting bolts and nuts.
- Gradually lower the engine.

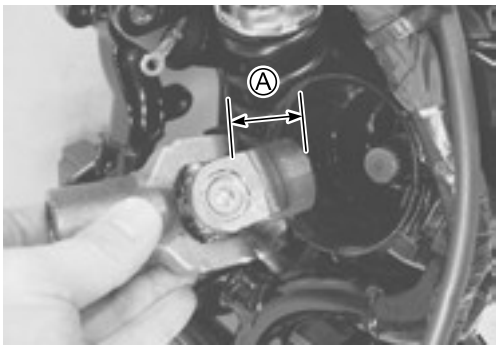


ENGINE INSTALLATION

Install the engine in the reverse order of engine removal.
Pay attention to the following points:

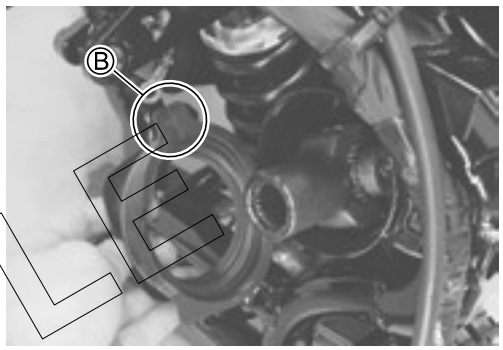
- Install the universal joint.

NOTE:
Be sure to face the short portion Ⓐ backward when installing it.

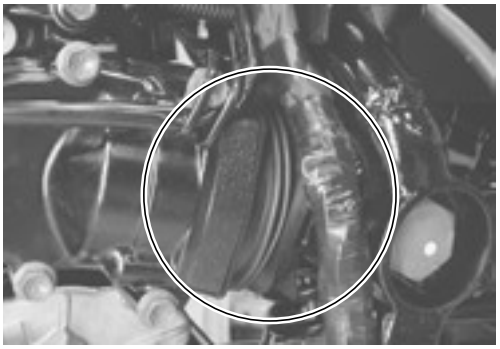


- Install the boot.

NOTE:
Make sure that the "UP" mark Ⓑ faces up.

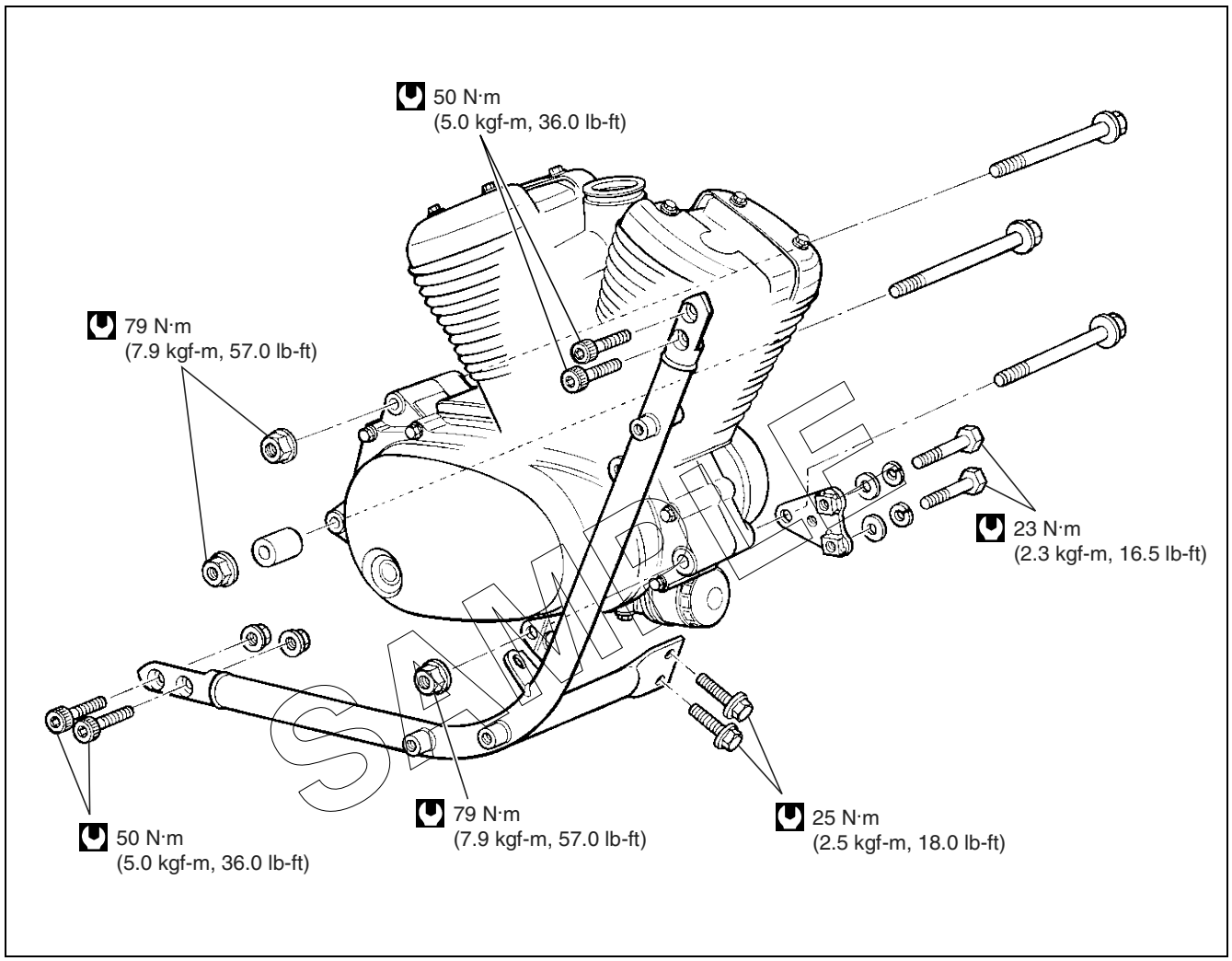


- Gradually raise the engine, and then engage the secondary driven gear shaft to the universal joint.
- Properly fit the boot onto the engine and the swingarm.



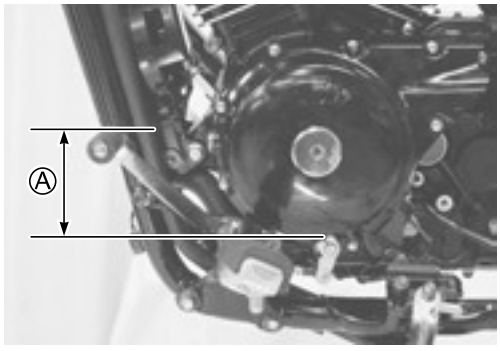
- Install the engine mounting bolts and nuts and tighten them.

NOTE:
** The engine mounting nuts are self-locking. Once the nut has been removed, they are no longer of any use.*
** Be sure to use new nuts and tighten them to the specified torque.*



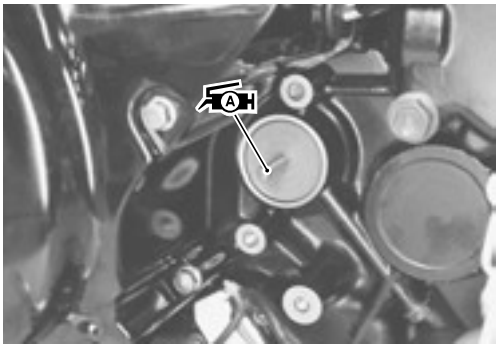
- Install the gearshift lever and the footrest in the correct position.

DATA Gearshift lever height Ⓐ
Standard: 85 – 95 mm (3.3 – 3.7 in)



• Apply grease to the push rod and install it.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

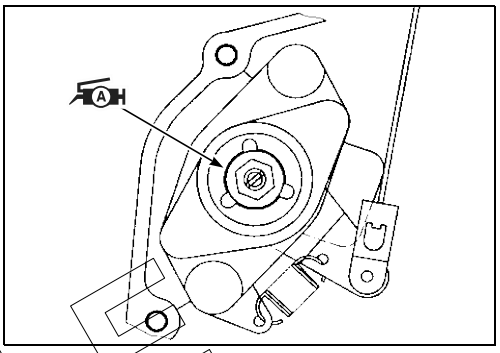


• Apply grease to the clutch release mechanism and install it.

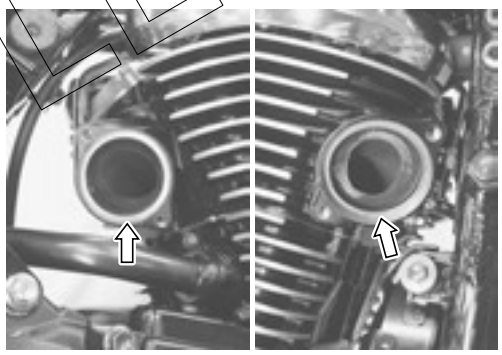
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

DATA Clutch release screw
Standard: 1/4 turn back

CLUTCH CABLE ADJUSTMENT ☞2-16

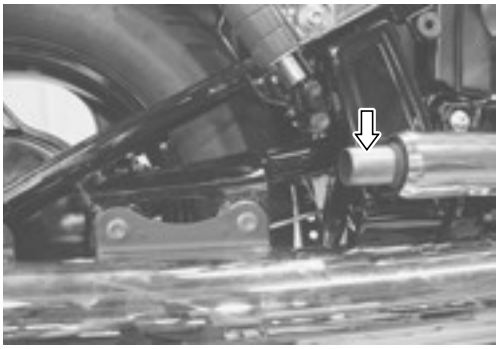


• Install the new gaskets.
• Install the exhaust pipes and mufflers.



• Apply gas sealer to the exhaust pipe connectors.

EXHAUST GAS SEALER: PERMATEX 1372

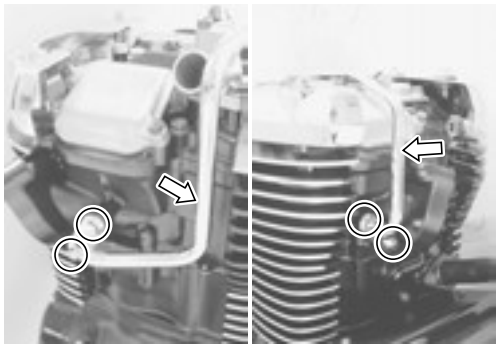


• Adjust the following items.
* Engine oil ☞2-11
* Engine coolant ☞2-17 and -18
* Idling adjustment ☞2-13
* Throttle cable play ☞2-14 and -15
* Rear brake adjusting ☞2-21

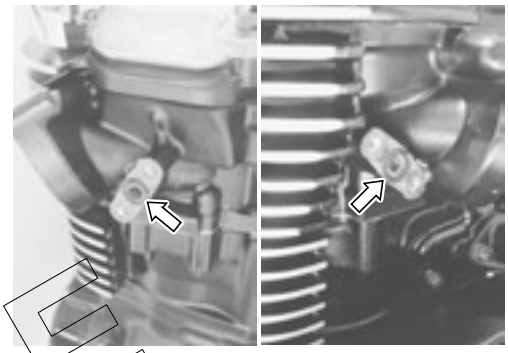
ENGINE DISASSEMBLY

- Remove the PAIR pipes.
- Remove the spark plugs.

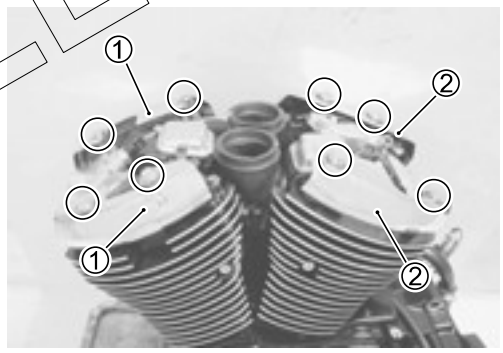
TOOL 09930-10121: Spark plug wrench set



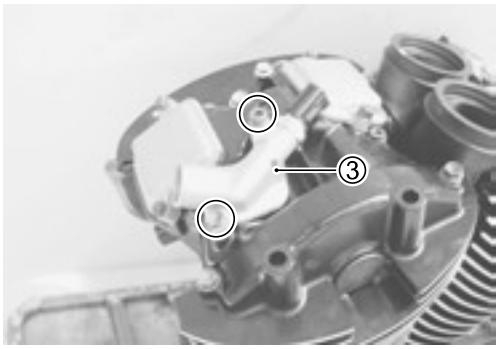
- Remove the gaskets.



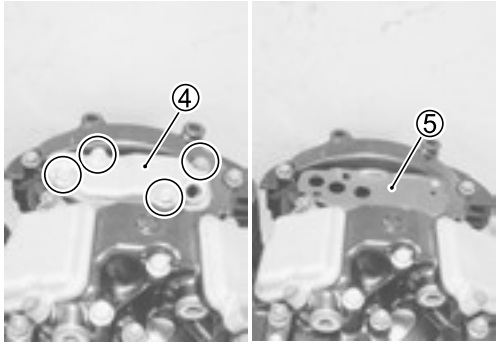
- Remove the cylinder head cover caps (①, ②).



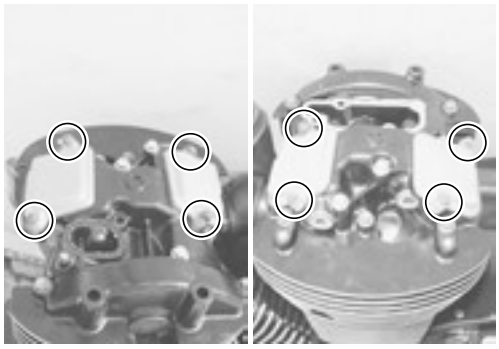
- Remove the water outlet union ③.



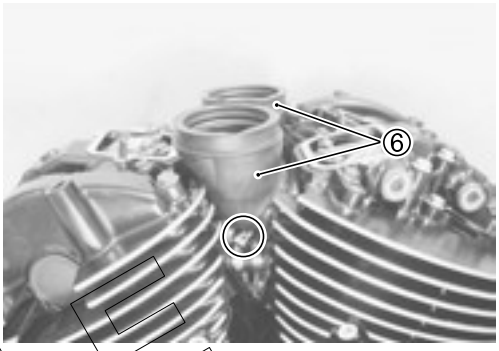
- Remove the breather cover ④ and gasket ⑤.



• Remove the valve inspection caps. (F & R)

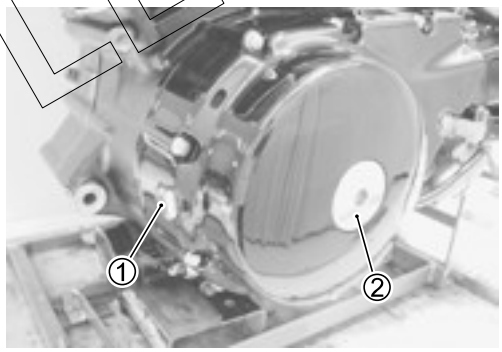


• Remove the intake pipes ⑥. (F & R)

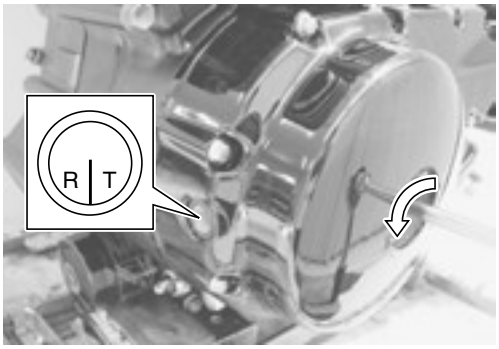


CYLINDER HEAD COVER

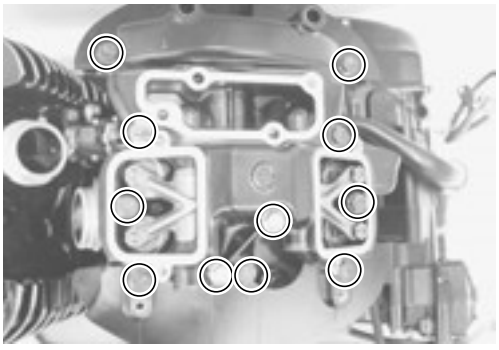
• Remove the valve timing inspection plug ① and the generator cover cap ②.



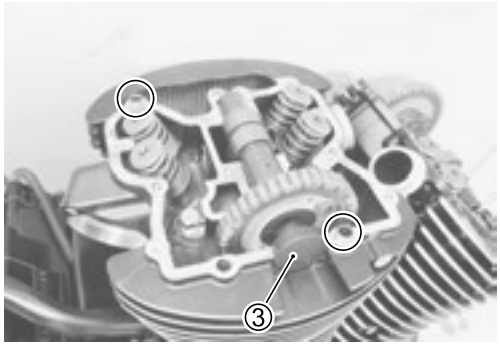
• Position “R I T” line on the generator with the center of the valve timing inspection hole.



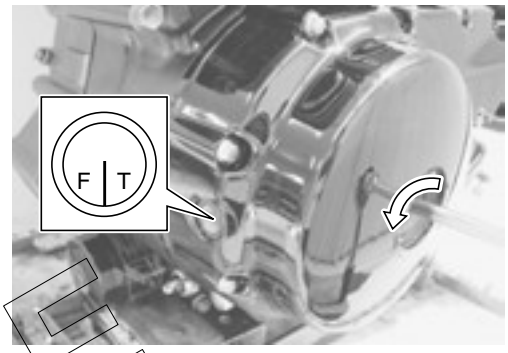
• Remove the cylinder head cover. (Rear)



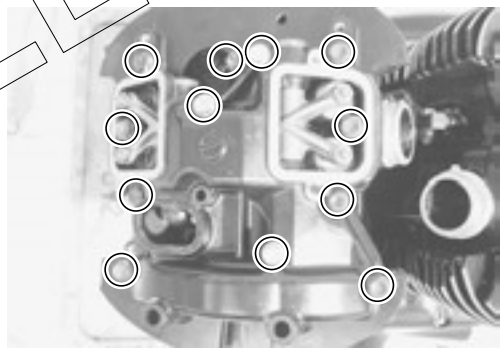
- Remove the dowel pins and camshaft end cap ③.



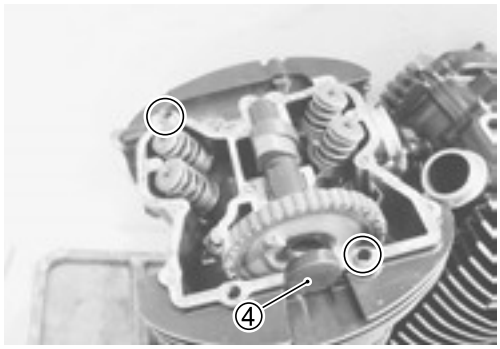
- Rotate the generator rotor 450 degrees (1 and 1/4 turns) and align the “F I T” line on the generator with the center of the valve timing inspection hole.



- Remove the cylinder head cover. (Front)

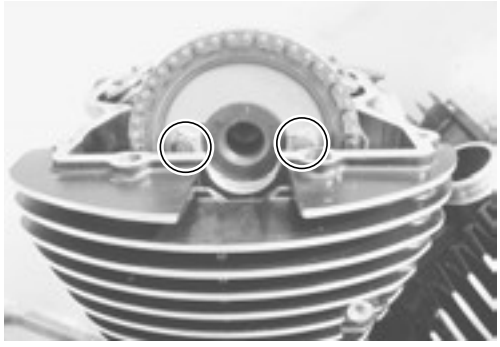


- Remove the dowel pins and camshaft end cap ④.



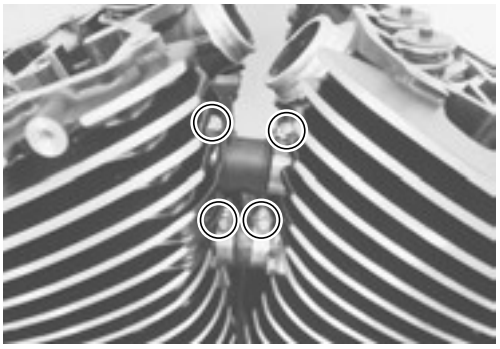
CAMSHAFT

- Flatten the lock washer.
- Remove the cam sprocket and camshaft. (Front and rear cylinders)

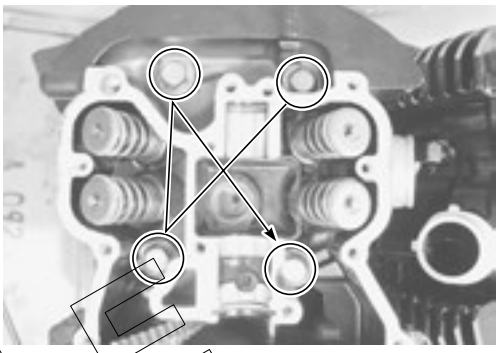


CYLINDER HEAD/CYLINDER

- Loosen the water hose clamp screws.

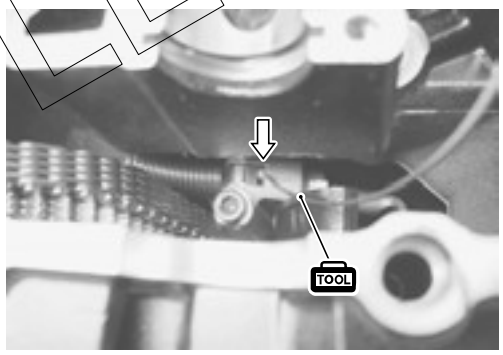


- Remove the cylinder head bolts. (Front cylinder)

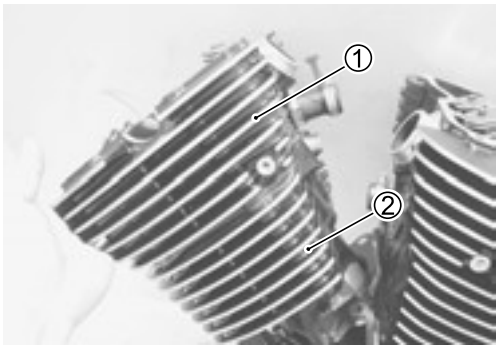


- After unlocking the ratchet, push the cam chain tension adjuster rod fully.
- Insert the special tool between the ratchet and the adjuster body.

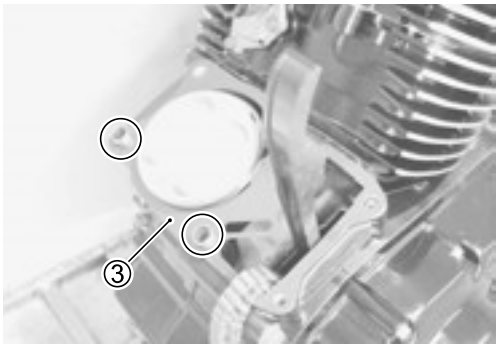
TOOL 09918-53810: Chain tensioner lock tool



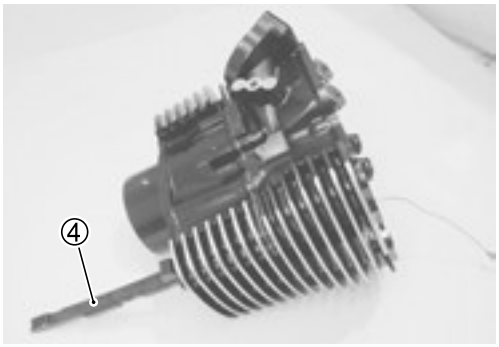
- Remove the cylinder head ① and cylinder ②. (Front cylinder)



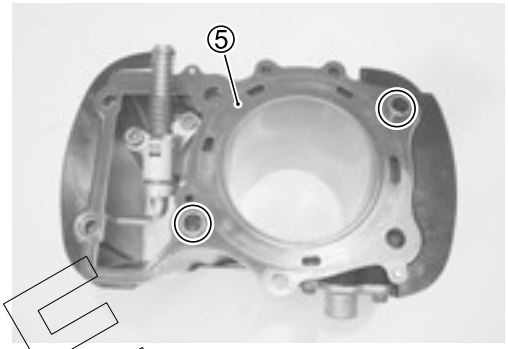
- Remove the dowel pins and gasket ③.



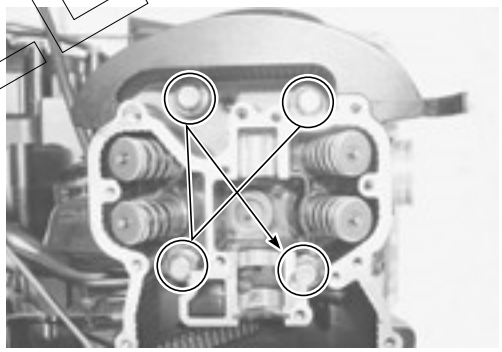
- Separate the cylinder head/cylinder assembly. (Front cylinder)
- Remove the cam chain guide ④.



- Remove the dowel pins and gasket ⑤.

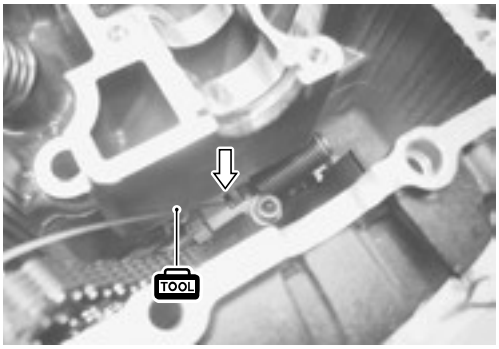


- Remove the cylinder head bolts. (Rear cylinder)

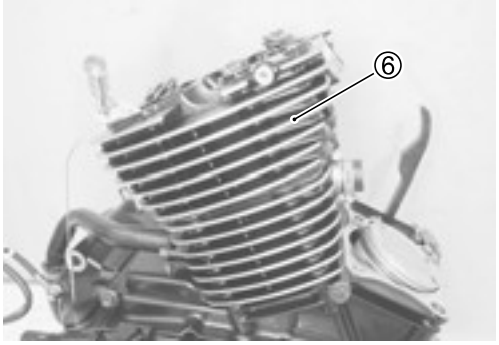


- Push the cam chain tension adjuster rod and insert the special tool.

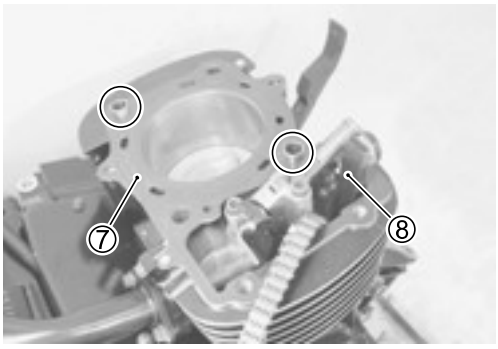
TOOL 09918-53810: Chain tensioner lock tool



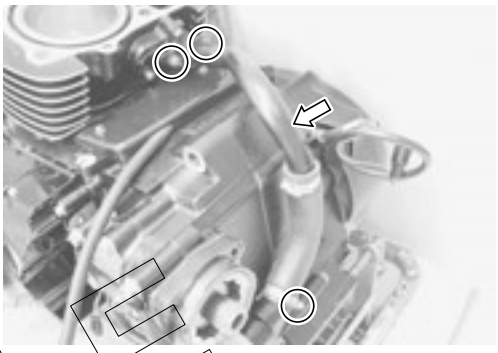
- Remove the cylinder head ⑥. (Rear cylinder)



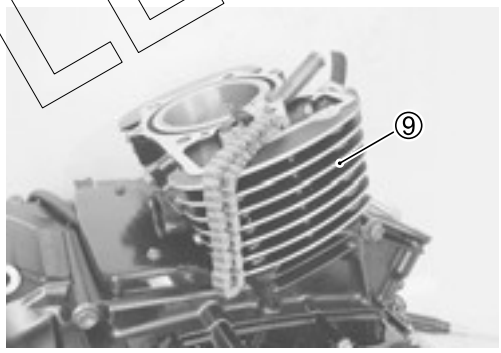
- Remove the dowel pins and gasket ⑦.
- Remove the cam chain guide ⑧.



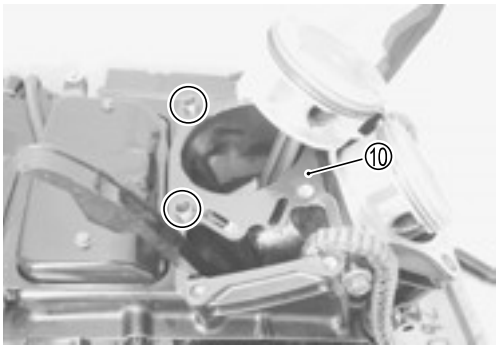
- Remove the water hose and pipe.



- Remove the cylinder ⑨. (Rear cylinder)



- Remove the dowel pins and gasket ⑩.

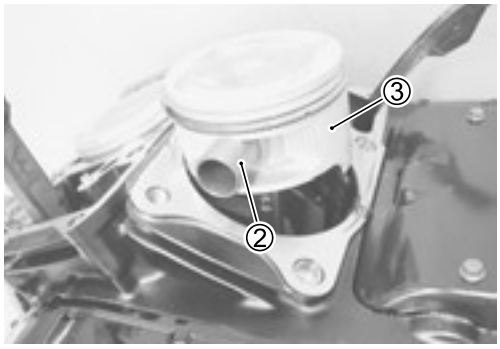


PISTON

- Place a clean rag under the piston to prevent any parts from falling into the crankcase.
- Remove the piston pin circlip ① using long-nose pliers.

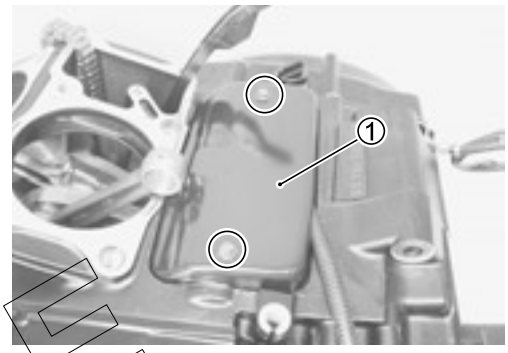
• Draw out each piston pin ② and remove the pistons ③. (F & R)

NOTE:
Scribe the cylinder position on the head.

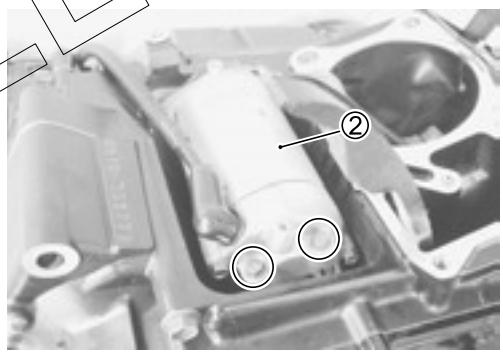


STARTER MOTOR

• Remove the starter motor cover ①.

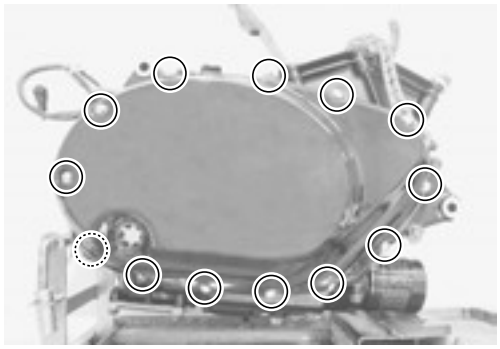


• Remove the starter motor ②.

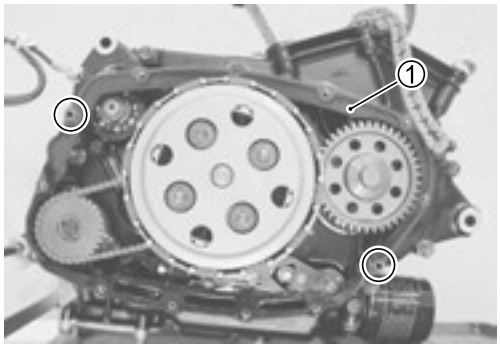


CLUTCH

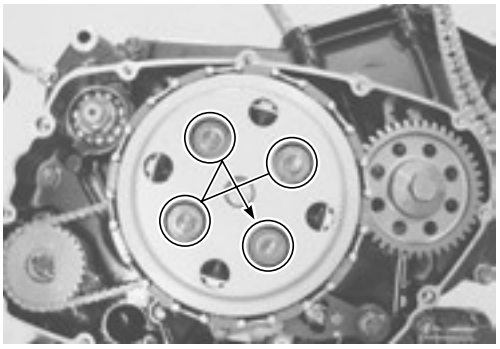
• Remove the clutch cover.



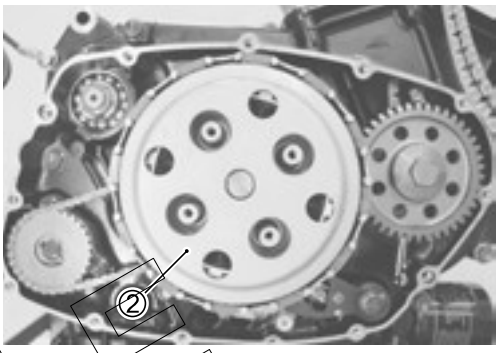
• Remove the dowel pins and gasket ①.



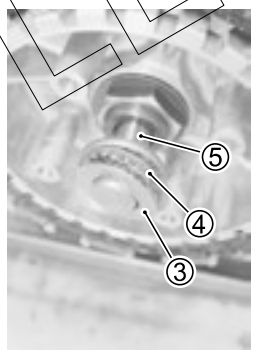
- Remove the clutch spring mounting bolts and springs diagonally.

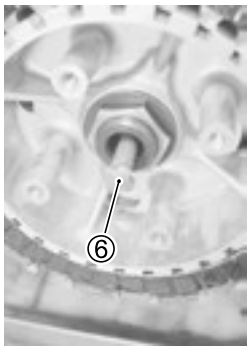


- Remove the pressure plate ②.

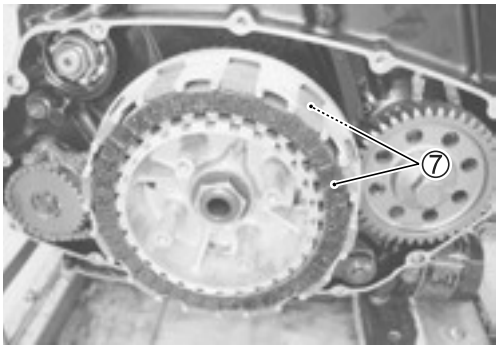


- Remove the thrust washer ③, bearing ④, push piece ⑤ and push rod ⑥.

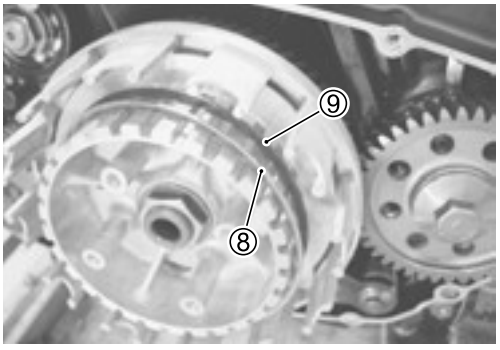




- Remove the clutch drive and driven plates ⑦.

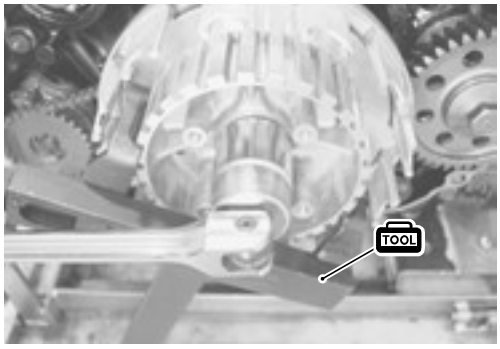


- Remove the spring washer ⑧ and spring washer seat ⑨.

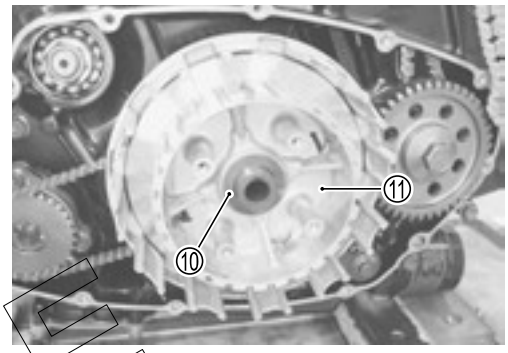


- Remove the clutch sleeve hub nut with the special tool.

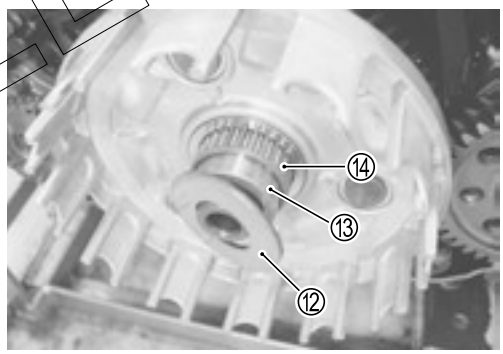
TOOL 09920-53740: Clutch sleeve hub holder



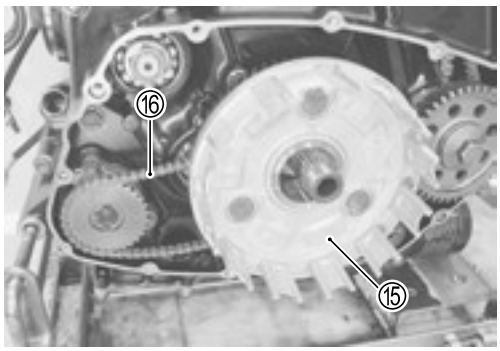
- Remove the washer ⑩ and the clutch sleeve hub ⑪.



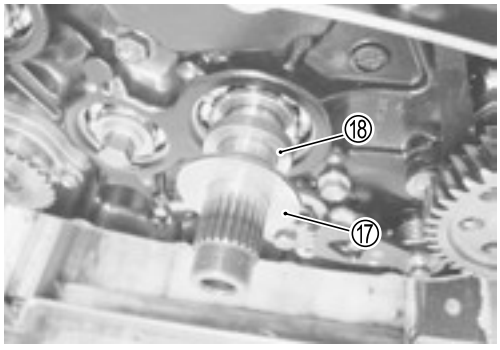
- Remove the thrust washer ⑫, spacer ⑬, and needle roller bearing ⑭.



- Remove the primary driven gear assembly ⑮ and the oil pump drive chain ⑯.



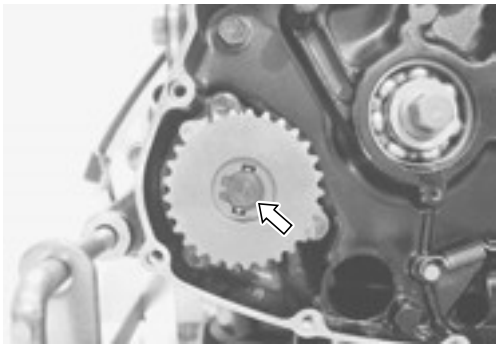
- Remove the thrust washer ⑰ and spacer ⑱.



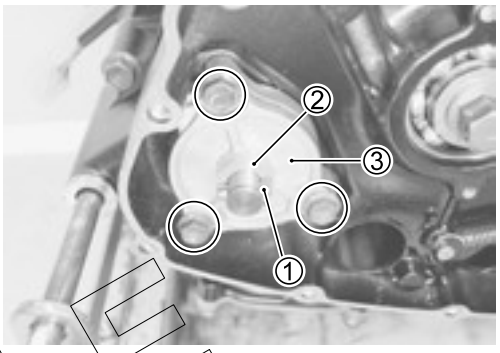
OIL PUMP

- Remove the oil pump by removing the snap ring.

09900-06107: Snap ring pliers

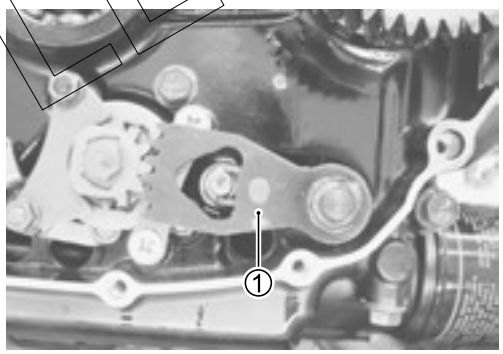


- Remove the pin ① and washer ②.
- Remove the oil pump ③.

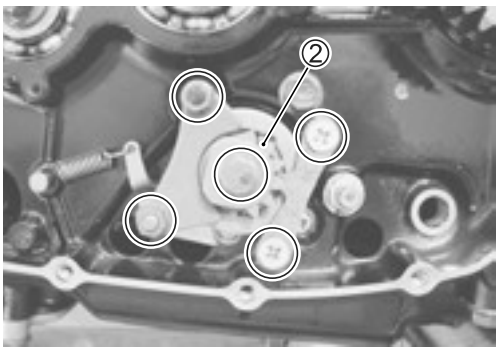


GEARSHIFT

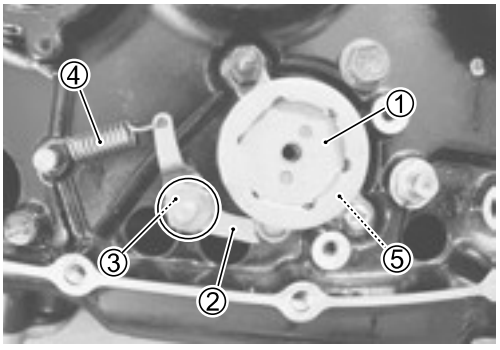
- Draw out the gearshift shaft ①.



- Remove the cam guide and the pawl lifter.
- Remove the cam driven gear assembly ② by removing the gearshift cam stopper bolt.



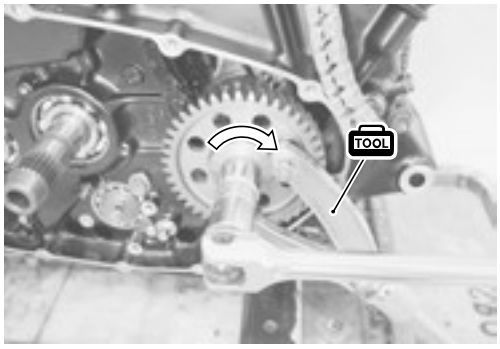
- Remove the gearshift cam plate ①.
- Remove the gearshift cam stopper ②, washer ③, spring ④.
- Remove the washer ⑤.



PRIMARY DRIVE GEAR

- Remove the primary drive gear by removing the primary drive gear bolt with the special tool.

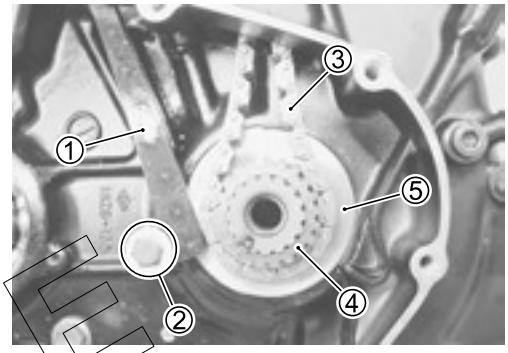
TOOL 09930-40113: Rotor holder



CAUTION

This bolt has left-hand thread.
Turning it counter-clockwise may cause damage.

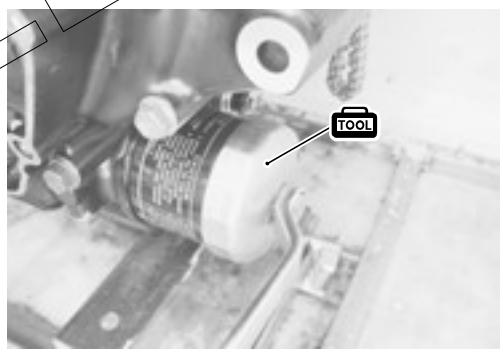
- Remove the cam chain tensioner ①, washers, spacer ② and the chain ③.
- Remove the cam chain drive sprocket ④ and the thrust washer ⑤.



OIL FILTER

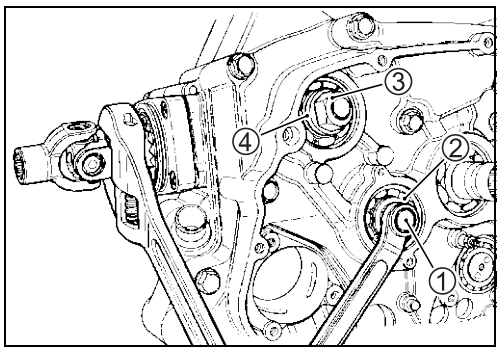
- Remove the oil filter with the special tool.

TOOL 09915-40610: Oil filter wrench



DRIVESHAFT BOLT/SECONDARY DRIVEN GEAR SHAFT NUT

- Install the universal joint on the secondary driven gear shaft.
- While holding the universal joint with an adjustable wrench, remove the driveshaft bolt ①, thrust washer ②, secondary drive gear shaft nut ③ and the thrust washer ④.

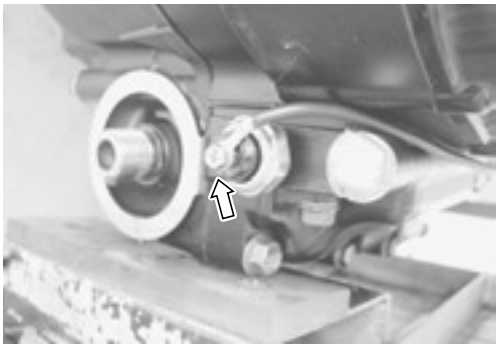


CAUTION

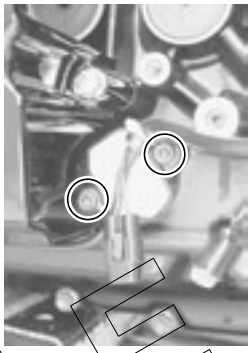
The driveshaft bolt ① has left-hand thread.
Turning it counter-clockwise may cause damage.

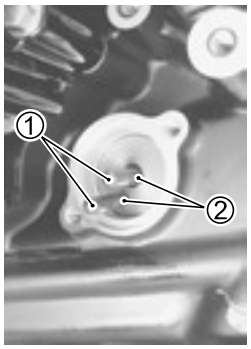
NEUTRAL SWITCH

- Remove the oil pressure switch lead wire.



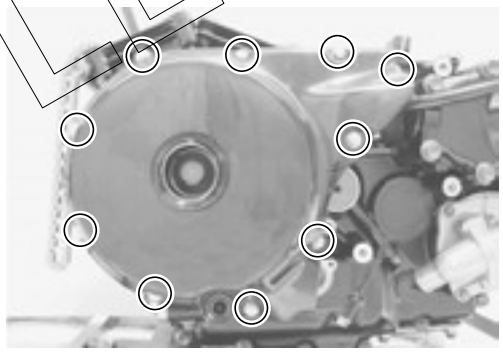
- Remove the neutral switch assembly.
- Remove the neutral switch contacts ① and spring ②.



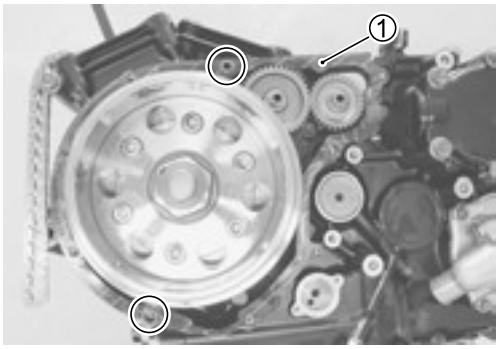


GENERATOR

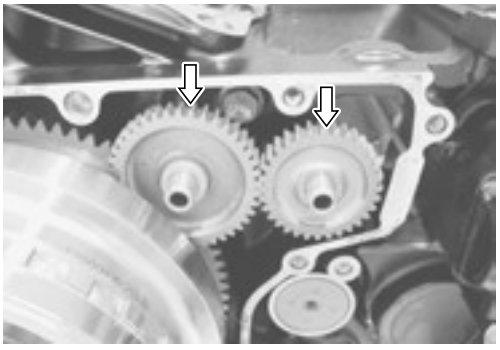
- Remove the generator cover.



- Remove the dowel pins and gasket ①.

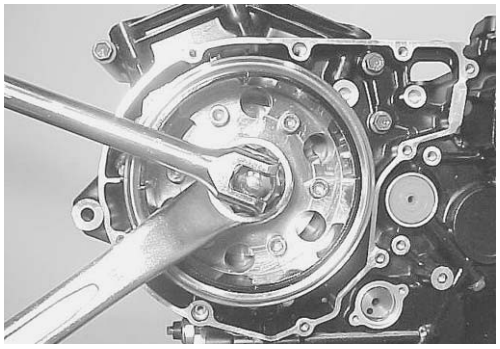


- Remove the starter motor driven gear and the idle gear.



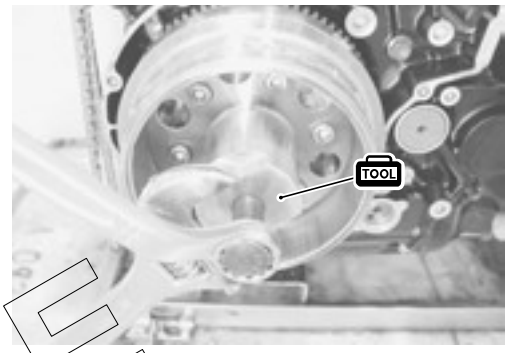
• Loosen the generator rotor bolt.

NOTE:
When loosen the rotor bolt, do not remove it. The rotor bolt is used in conjunction with the rotor remover when removing the rotor.

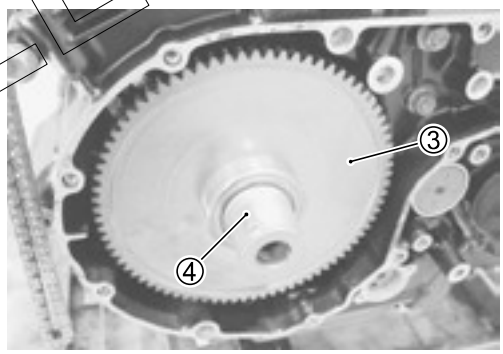


• Remove the generator rotor assembly with the special tool.

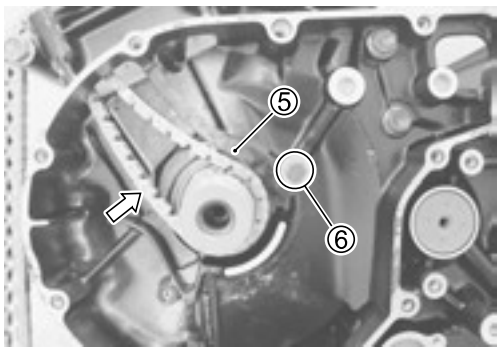
TOOL 09930-33730: Rotor remover



• Remove the starter gear ③ and key ④.

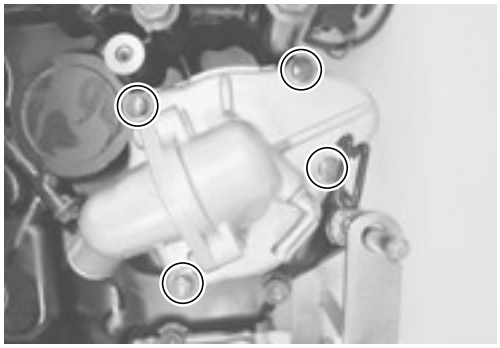


• Remove the cam chain tensioner ⑤, washers, spacer ⑥ and the chain.

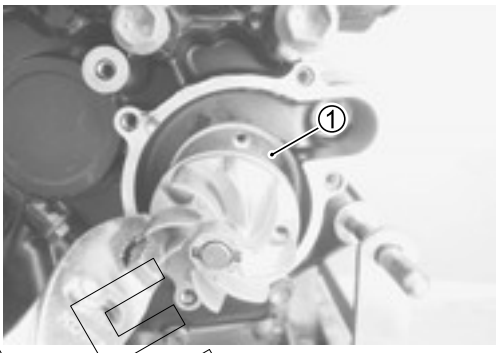


WATER PUMP

• Remove the water pump cover.

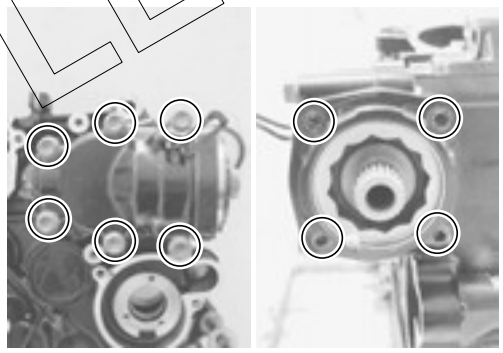


• Remove the water pump assembly and gasket ①.

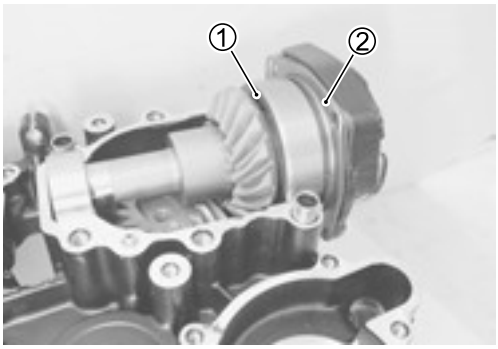


SECONDARY DRIVEN GEAR

• Remove the secondary driven gear housing bolts.
• Remove the secondary driven gear case.



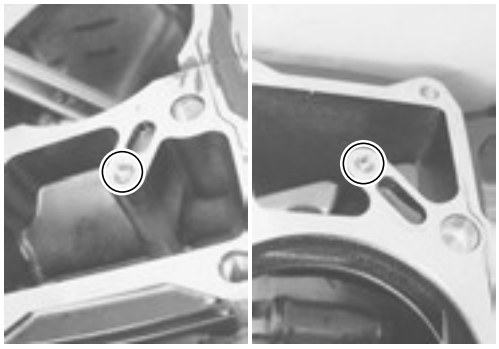
• Remove the secondary driven gear assembly ① and shims ②.



• Remove the bearing ③, pin ④, oil jet ⑤, and dowel pins.

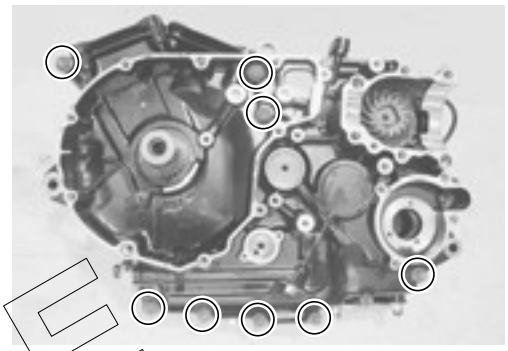
OIL JET

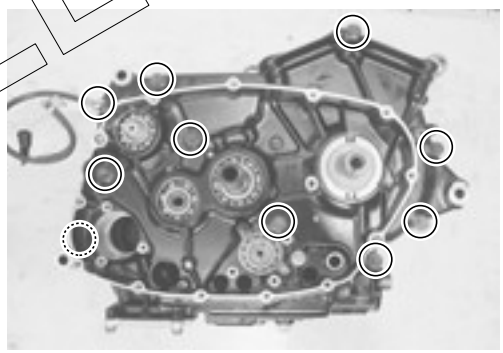
- Remove the oil jets.



CRANKCASE

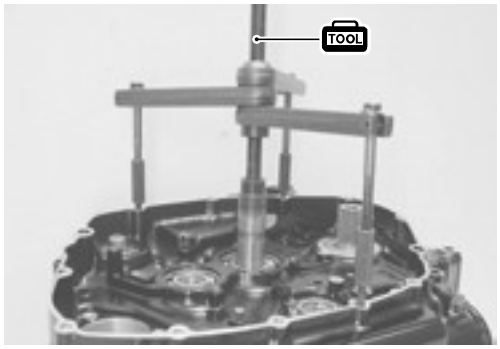
- Remove the crankcase bolts.



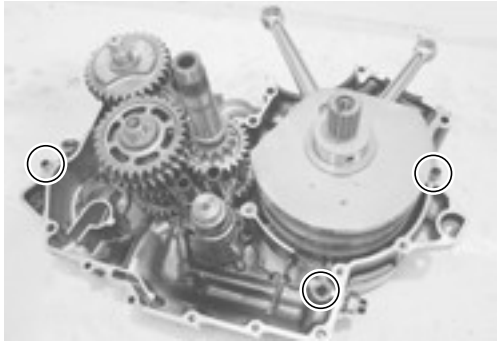


- Separate the crankcase into two parts with the special tool.

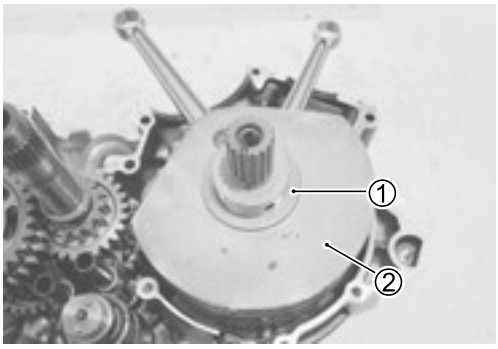
TOOL 09920-13120: Crankcase separator



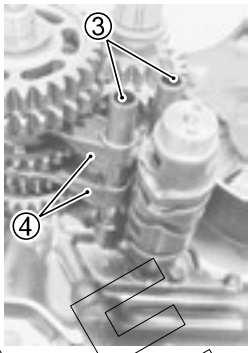
- Remove the dowel pins and O-ring.

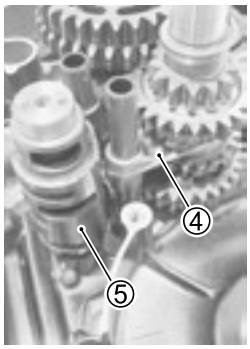


- Remove the thrust shim ① and crankshaft ②.

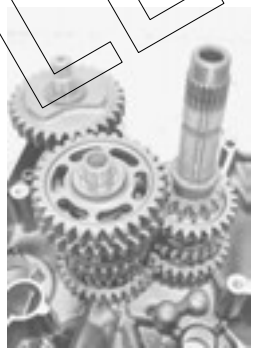


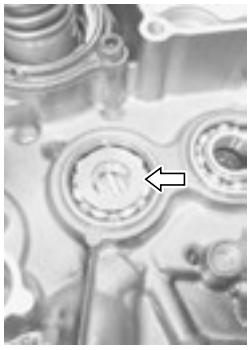
- Remove the gearshift fork shafts ③ gearshift forks ④ and gearshift cam ⑤.





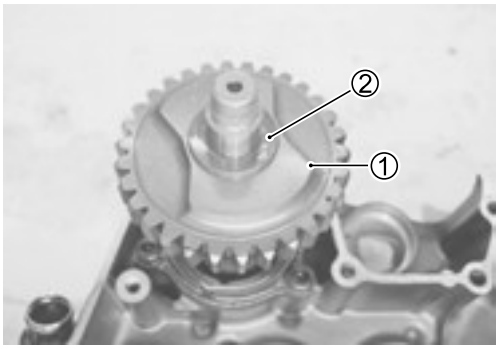
- Remove the transmission.
- Remove the washer.



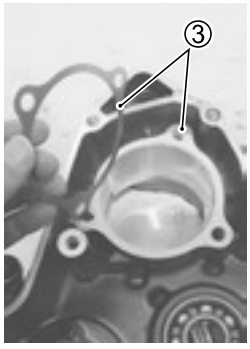


SECONDARY DRIVE BEVEL GEAR

- Remove the over driving gear ① and bush ②.



- Remove the secondary drive bevel gear assembly.
- Remove the shims ③.



ENGINE COMPONENTS INSPECTION AND SERVICING

CYLINDER HEAD COVER

DISASSEMBLY

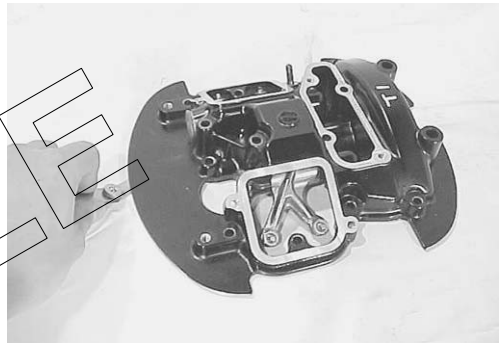
CAUTION

Be sure to identify each removed part as to its location, and lay the parts out in groups designated as "No. 1 cylinder", "No. 2 cylinder", "Exhaust", "Intake", so that each will be restored to the original location during assembly.

- Loosen the rocker arm shafts and pull out the rocker arm shafts.

CYLINDER HEAD COVER DISTORTION

After removing sealant from the fitting surface of the cylinder head cover, place the cylinder head cover on a surface plate and check for distortion with a thickness gauge.



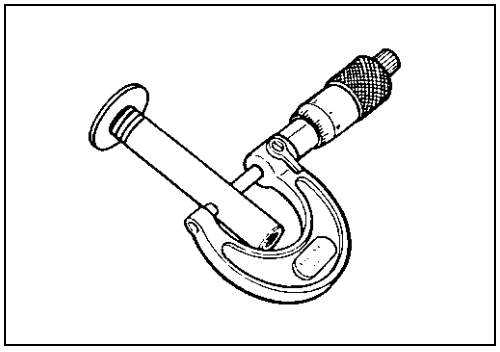
DATA **Cylinder head cover distortion**
Service Limit: 0.05 mm (0.002 in)

TOOL **09900-20803: Thickness gauge**

If the distortion exceeds the limit, replace the cylinder head cover.

ROCKER ARM SHAFT O.D.

Measure diameter of rocker arm shaft.

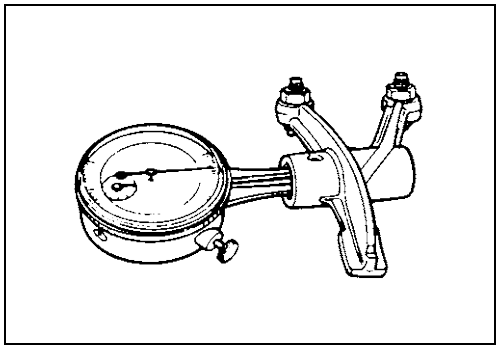


DATA **Rocker arm shaft O.D. (IN. & EX.)**
Standard: 11.977 – 11.995 mm (0.4715 – 0.4722 in)

TOOL **09900-20205: Micrometer (0 – 25 mm)**

ROCKER ARM I.D.

When checking the valve rocker arm, the inside diameter of the valve rocker arm and wear of the camshaft contacting surface should be checked.



DATA **Rocker arm I.D.**
Standard: 12.000 – 12.018 mm (0.4724 – 0.4731 in)

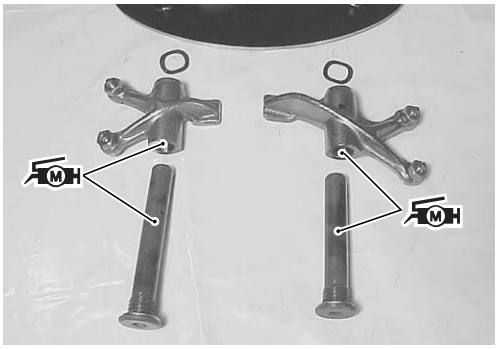
TOOL **09900-20605: Dial calipers**

REASSEMBLY

- Apply SUZUKI MOLY PASTE to the rocker arms and their shafts.

99000-25140: SUZUKI MOLY PASTE

Rocker arm shaft: 27 N·m (2.7 kgf-m, 19.5 lb-ft)



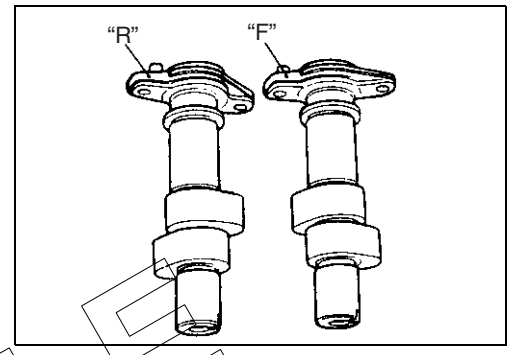
CAMSHAFT

The camshafts should be checked for wear and also for runout of cams and journals if the engine has been noted to produce abnormal noise or vibration or to lack output power. Any of these malconditions could be caused by a worn camshafts.

The camshaft can be distinguished by the embossed-letters, "F" and "R", on the camshaft.

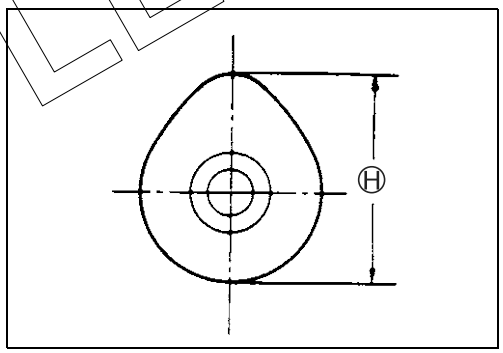
"F" : Front (No. 2) camshaft

"R" : Rear (No. 1) camshaft



CAMSHAFT CAM WEAR

Worn-down cams are often the cause of mistimed valve operation resulting in reduced output power. The limit of cam wear is specified for both intake and exhaust cams in terms of cam height Ⓗ, which is to be measured with a micrometer. Replace camshafts if found worn down to the limit.



Cam height Ⓗ

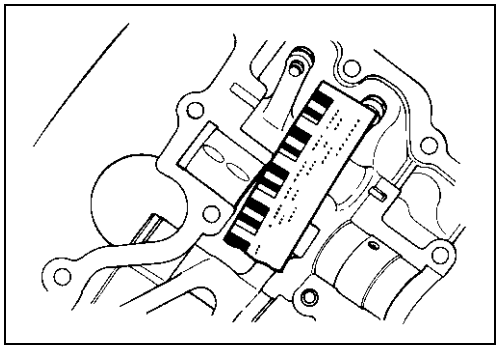
Service Limit: (IN.) : 35.20 mm (1.386 in)

(EX.): 36.28 mm (1.428 in)

09900-20202: Micrometer (25 – 50 mm)

CAMSHAFT JOURNAL WEAR

Determine whether each journal is worn down to the limit or not by measuring camshaft journal oil clearance with the camshaft installed. Use plastigauge to read the clearance, which is specified as follows:



DATA Camshaft journal oil clearance
Service Limit: 0.150 mm (0.0059 in)

TOOL 09900-22302: Plastigauge

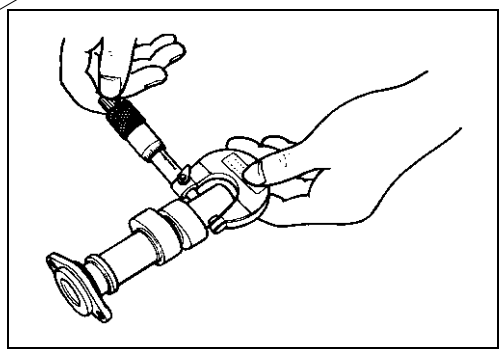
NOTE:
To properly measure the oil clearance with plastigauge, all gasket material must be removed from fitting surfaces of cylinder head and cover. Do not apply SUZUKI BOND "1216B" until after the oil clearance has been determined.

- Tighten the cylinder head cover bolts evenly and diagonally to the specified torque.

Cylinder head cover bolts
(M6): 10 N·m (1.0 kgf-m, 7.0 lb-ft)
(M8): 24.5 N·m (2.45 kgf-m, 18.0 lb-ft)

NOTE:
Do not rotate the camshafts with the plastigauge in place.

Remove the cylinder head cover, and read the width of the compressed plastigauge with envelop scale. This measurement should be taken at the widest part.



If the camshaft journal oil clearance measured exceeds the limit, measure the outside diameter of camshaft.
Replace either the cylinder head set or the camshaft if the clearance is incorrect.

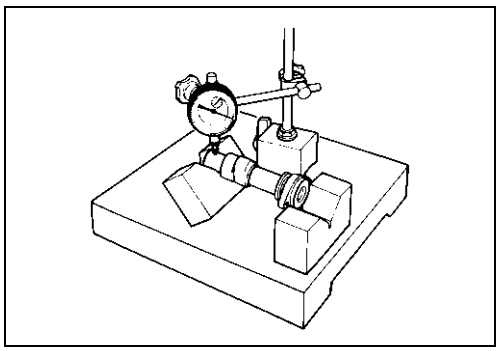
DATA Camshaft journal O.D.

(Sprocket side):	**24.959 – 24.980 mm (0.9826 – 0.9835 in)**
(Other side) :	**19.959 – 19.980 mm (0.7858 – 0.7866 in)**

TOOL 09900-20205: Micrometer (0 – 25 mm)

CAMSHAFT RUNOUT

Measure the runout with a dial gauge. Replace the camshaft if the runout exceeds the limit.



DATA Camshaft runout (IN. & EX.)
Service Limit: 0.10 mm (0.004 in)

TOOL 09900-20607: Dial gauge (1/100, 10 mm)
09900-20701: Magnetic stand
09900-21304: V-block (100 mm)

CAM CHAIN TENSIONER AND GUIDE

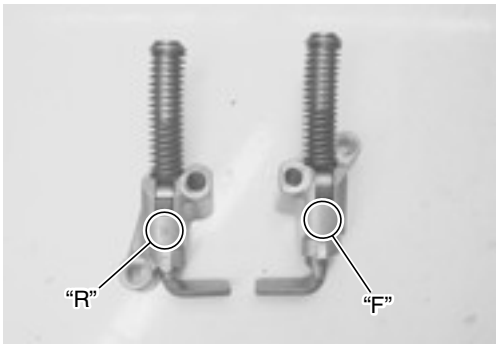
CAM CHAIN TENSIONER

For driving the camshafts, two cam chain tensioners are used on the respective cam drive chains. Unlock the ratchet mechanism, and move the push rod in place to see if it slides smoothly. If any stickiness is noted or ratchet mechanism is faulty, replace the cam chain tensioner assembly with a new one.

The cam chain tensioner can be distinguished by the embossed letters, “F” and “R”, on the cam chain tensioners.

“F”: Front (No. 2) cam chain tensioner

“R”: Rear (No. 1) cam chain tensioner



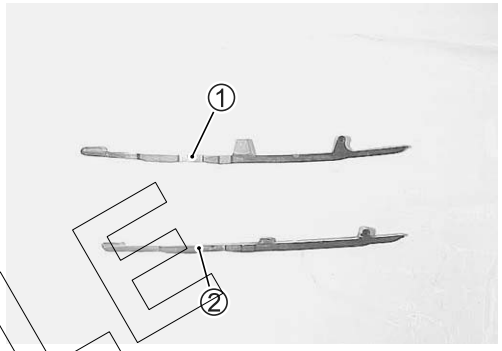
CAM CHAIN GUIDE

Check the contacting surface of the cam chain guide for wear and damage. If it is found to be damaged, replace it with a new one.

Two kinds of cam chain guide are used on the respective cam drive chains.

①: For front cylinder

②: For rear cylinder

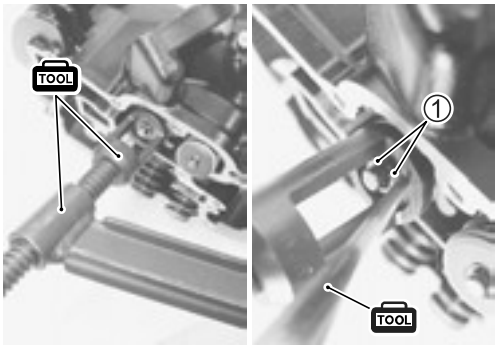


CYLINDER HEAD

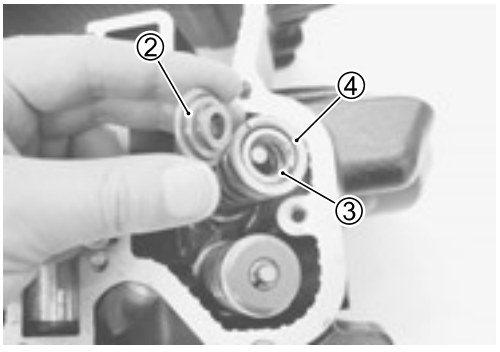
VALVE AND VALVE SPRING DISASSEMBLY

- Using special tools, compress the valve springs and remove the two cotter halves ① from valve stem.

TOOL 09916-14510: Valve spring compressor
09916-14910: Valve spring compressor attachment
09916-84511: Tweezers

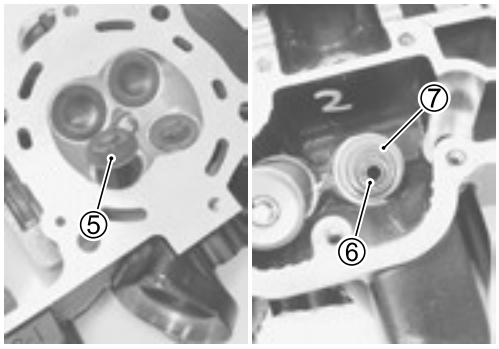


- Remove the valve spring retainer ②, inner spring ③ and outer spring ④.



- Pull out the valve ⑤ from the other side.
- Remove the valve stem seal ⑥ and valve spring seat ⑦.

NOTE:
Removal of valves completes ordinary disassembling work. If valve guides have to be removed for replacement after inspecting related parts, carry out the steps shown in valve guide servicing. (☞3-32)



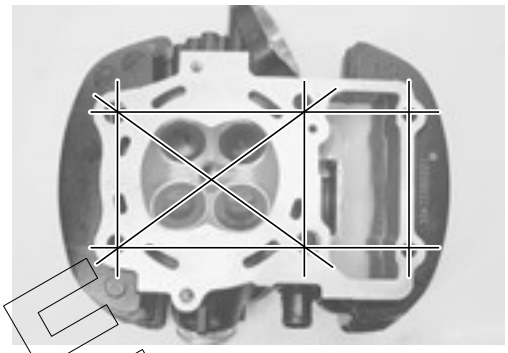
CYLINDER HEAD DISTORTION

- Decarbonize the combustion chambers.

Check the gasketed surface of the cylinder head for distortion with a straightedge and thickness gauge, taking a clearance reading at several places indicated. If the largest reading at any position of the straightedge exceeds the limit, replace the cylinder head.

DATA Cylinder head distortion
Service Limit: 0.05 mm (0.002 in)

TOOL 09900-20803: Thickness gauge

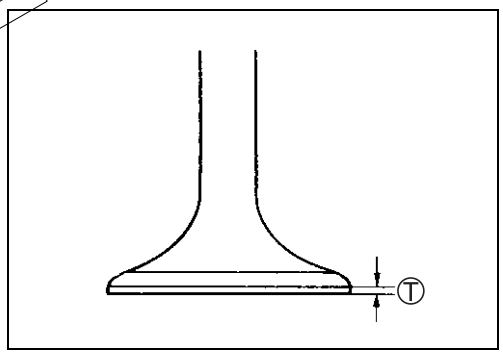


VALVE FACE WEAR

Visually inspect each valve for wear of its seating face. Replace any valve with an abnormally worn face.
The thickness Ⓣ decreases as the wear of the face advances. Measure the thickness and, if the thickness is found to have been reduced to the limit, replace it.

DATA Valve head thickness
Service Limit Ⓣ: 0.5 mm (0.02 in)

TOOL 09900-20102: Vernier calipers

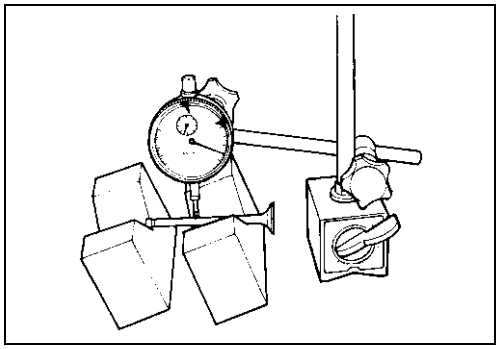


VALVE STEM RUNOUT

Support the valve with "V" blocks, as shown, and check its runout with a dial gauge.
The valve must be replaced if the runout exceeds the limit.

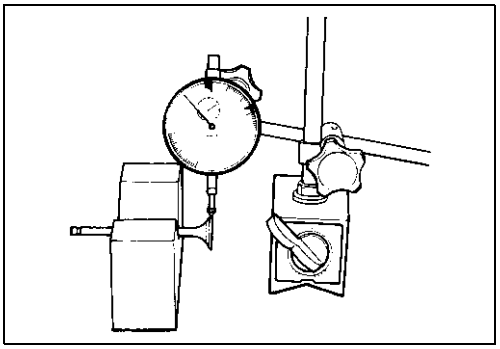
DATA Valve stem runout
Service Limit: 0.05 mm (0.002 in)

TOOL 09900-20701: Magnetic stand
09900-20607: Dial gauge (1/100 mm)
09900-21304: V-block



VALVE HEAD RADIAL RUNOUT

Place the dial gauge at right angles to the valve head face, and measure the valve head radial runout.
If it measures more than limit, replace the valve.

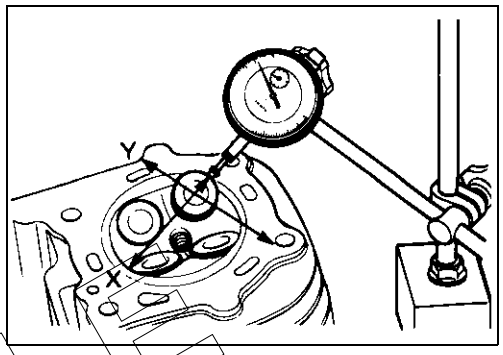


DATA Valve head radial runout
Service Limit: 0.03 mm (0.001 in)

TOOL 09900-20701: Magnetic stand
09900-20607: Dial gauge (1/100 mm)
09900-21304: V-block

VALVE STEM DEFLECTION

Lift the valve about 10 mm (0.39 in) from the valve seat. Measure the valve stem deflection in two directions, "X" and "Y", perpendicular to each other, by positioning the dial gauge as shown. If the deflection measured exceeds the limit, (see below) then determine whether the valve or the guide should be replaced with a new one.

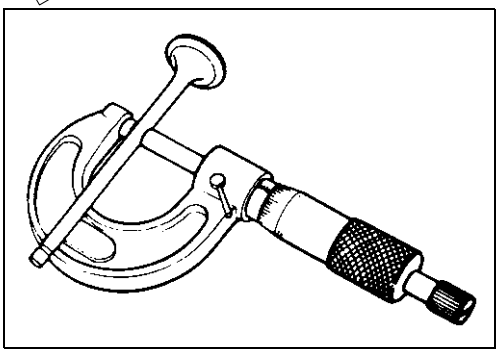


DATA Valve stem deflection (IN. & EX.)
Service Limit: 0.35 mm (0.14 in)

TOOL 09900-20607: Dial gauge (1/100 mm)
09900-20701: Magnetic stand

VALVE STEM WEAR

If the valve stem is worn down to the limit, as measured with a micrometer, where the clearance is found to be in excess of the limit indicated replace the valve, if the stem is within the limit, then replace the guide. After replacing valve or guide, be sure to re-check the clearance.

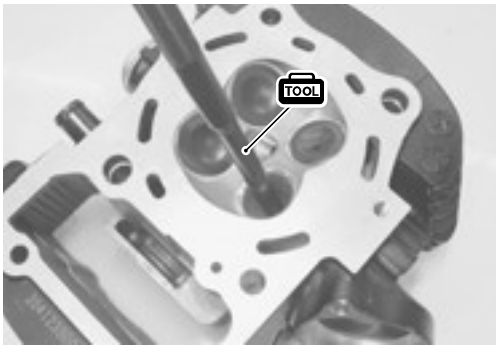


DATA Valve stem O.D.
Standard (IN.) : 5.475 – 5.490 mm (0.2156 – 0.2161 in)
(EX.) : 5.455 – 5.470 mm (0.2148 – 0.2154 in)

TOOL 09900-20205: Micrometer (0 – 25 mm)

VALVE GUIDE SERVICING

- Using the valve guide remover, drive the valve guide out toward the intake or exhaust rocker arm side.

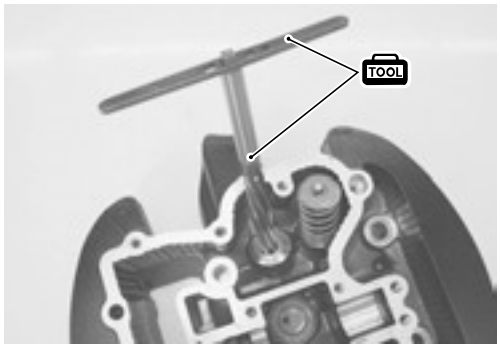


TOOL 09916-44910: Valve guide remover/installer

NOTE:
** Discard the removed valve guide subassemblies.*
** Only oversized valve guides are available as replacement parts. (Part No. 11115-38A71)*

- Re-finish the valve guide holes in cylinder head with a 10.8 mm reamer and handle.

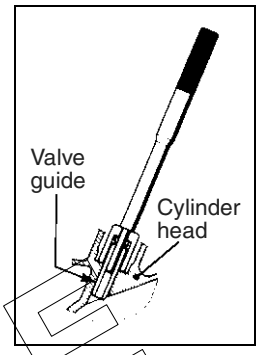
TOOL 09916-34580: Valve guide hole reamer
09916-34542: Reamer handle

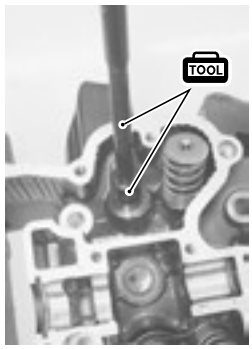


- Cool down the new valve guides in a freezer for about one hour and heat the cylinder head to 100 – 150 °C (212 – 302 °F) with a hot plate.

CAUTION

Do not use a burner to heat the valve guide hole to prevent cylinder head distortion.





- Oil the stem hole, too, of each valve guide and drive the guide into the guide hole with the valve guide installer and attachment.

TOOL 09916-44910: Valve guide remover/installer
09916-44920: Valve guide installer attachment

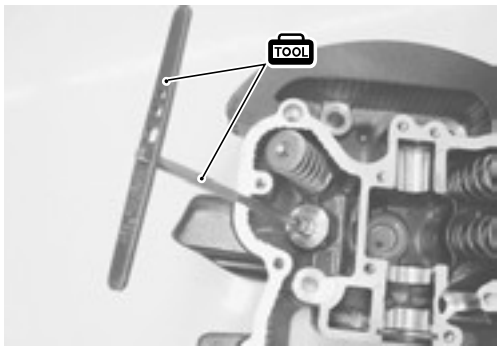
CAUTION

Failure to oil the valve guide hole before driving the new guide into place may result in a damage guide or head.

- After fitting all valve guides, re-finish their guiding bores with a 5.5 mm reamer. Be sure to clean and oil the guide after reaming.

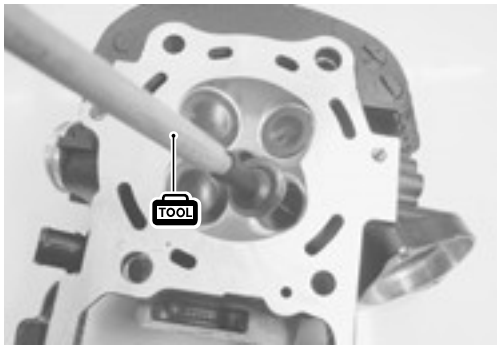
TOOL 09916-34550: Valve guide reamer
09916-34542: Reamer handle

NOTE:
** Be sure to cool down the cylinder head to ambient air temperature.*
** Insert the reamer from the combustion chamber and always turn the reamer handle clockwise.*



VALVE SEAT WIDTH

- Coat the valve seat with prussian blue uniformly. Fit the valve and tap the coated seat with the valve face in a rotating manner, in order to obtain a clear impression of the seating contact.
  In this operation, use the valve lapper to hold the valve head.

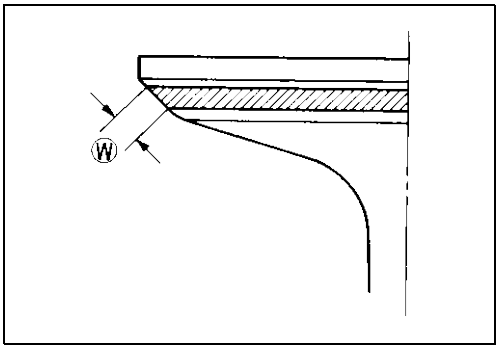


- The ring-like dye impression left on the valve face must be continuous – without any break. In addition, the width of the dye ring, which is the visualized seat "width", must be within the following specification:

DATA Valve seat width Ⓦ
Standard: 0.9 – 1.1 mm (0.035 – 0.043 in)

TOOL 09916-10911: Valve lapper set

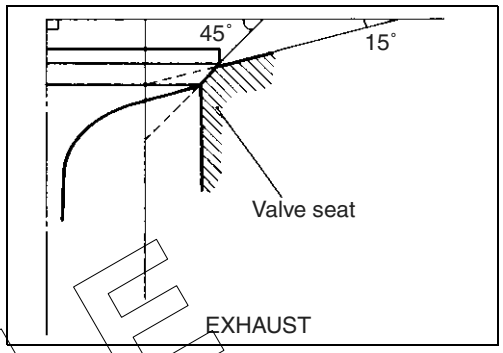
If either requirement is not met, correct the seat by servicing it as follows:



VALVE SEAT SERVICING

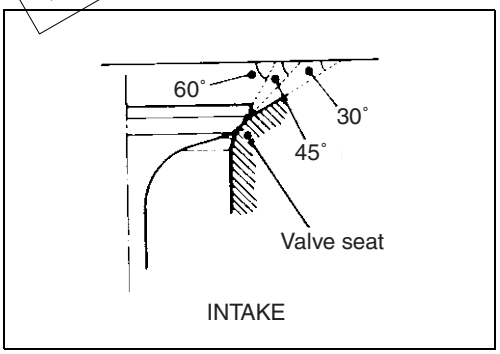
The valve seats for intake and exhaust valves are machined to four different angles. The seat contact surface is cut at 45°.

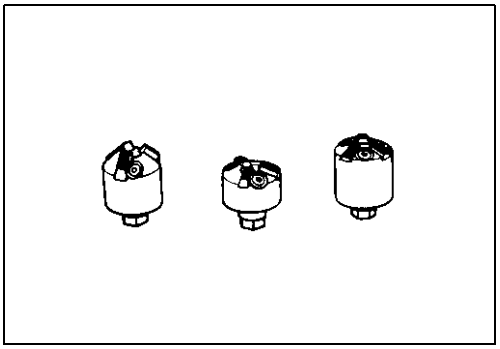
	INTAKE	EXHAUST
15°		N-121
30°	N-128	
45°	N-128	N-122
60°	N-111	



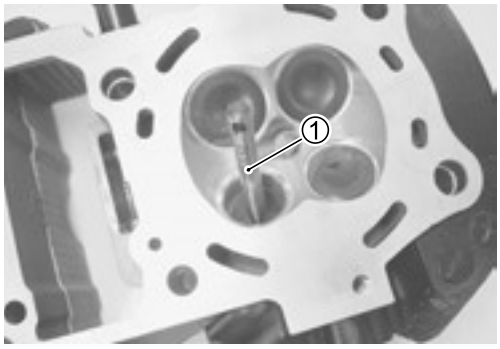
NOTE:
The valve seat contact area must be inspected after each cut.

TOOL 09916-21111: Valve seat cutter set
09916-22430: Valve seat cutter (N-128)



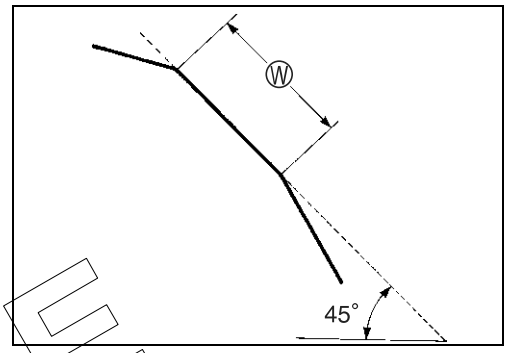


• Insert the solid pilot ① (09916-24450: N-100-5.52) with a slight rotation. Seat the pilot snugly. Install the 45° cutter, attachment and T-handle.



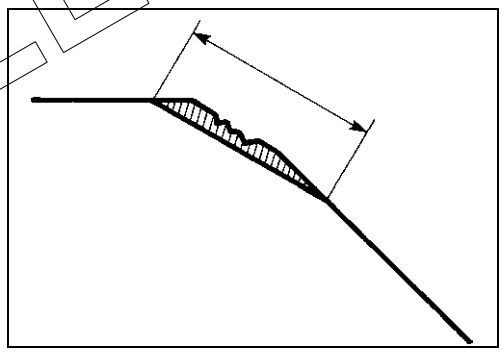
INITIAL SEAT CUT

• Using the 45° cutter, descale and clean up the seat. Rotate the cutter one or two turns.
• Measure the valve seat width Ⓦ after every cut.



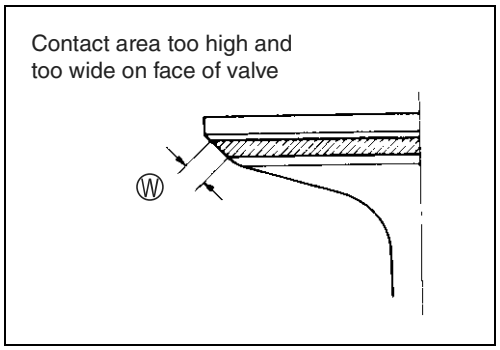
• If the valve seat is pitted or burned, use the 45° cutter to condition the seat some more.

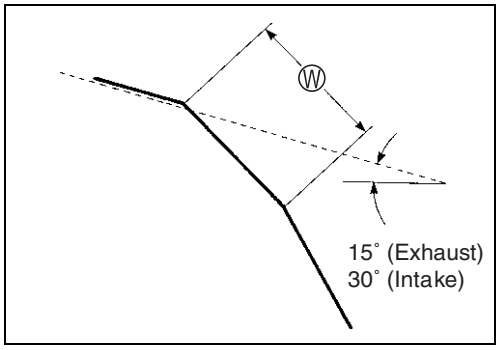
NOTE:
Cut only the minimum amount necessary from the seat to prevent the possibility of the valve stem becoming too close to the camshaft.



TOP NARROWING CUT

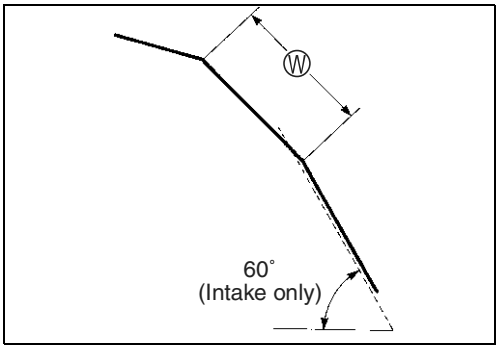
• If the contact area Ⓦ is too high on the valve, or if it is too wide, use the 15° (for the exhaust side) and the 30° (for the intake side) to lower and narrow the contact area.





BOTTOM NARROWING CUT

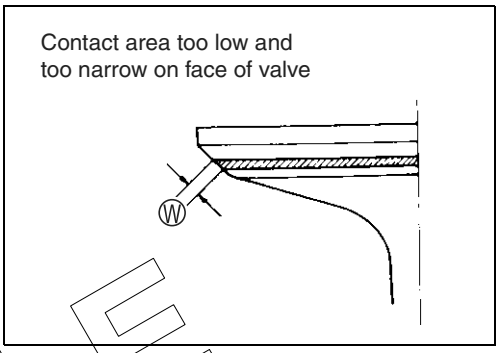
- If the contact area Ⓦ is too wide or too low, use the 60° (intake side only) to narrow and raise the contact area.

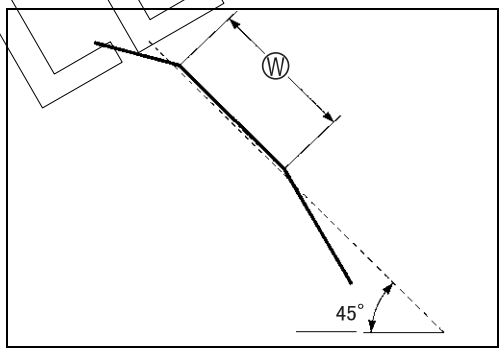


FINAL SEAT CUT

- If the contact area Ⓦ is too low or too narrow, use the 45° cutter to raise and widen the contact area.

NOTE:
After cutting the 15°, 30° and 60° angles, it is possible that the valve seat (45°) is too narrow. If so, re-cut the valve seat to the correct width.





- After the desired seat position and width is achieved, use the 45° cutter very lightly to clean up any burrs caused by the previous cutting operations.

CAUTION

Do not use lapping compound after the final cut is made. The finished valve seat should have a velvety smooth finish but not a highly polished or shiny finish. This will provide a soft surface for the final seating of the valve which will occur during the first few seconds of engine operation.

NOTE:
After servicing the valve seats, be sure to check the valve clearance after the cylinder head has been reinstalled. (☞2-7)

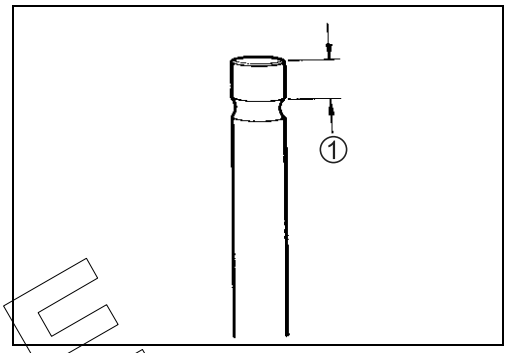
- Clean and assemble the head and valve components. Fill the intake and exhaust ports with gasoline to check for leaks.
- If any leaks occur, inspect the valve seat and face for burrs or other things that could prevent the valve from sealing.

⚠ WARNING

Always use extreme caution when handling gasoline.

VALVE STEM END CONDITION

Inspect the valve stem end face for pitting and wear. If pitting or wear of the stem end face are present, the valve stem end may be resurfaced, providing that the length ① will not be reduced to less than the service limit. If this length becomes less than the service limit, the valve must be replaced.

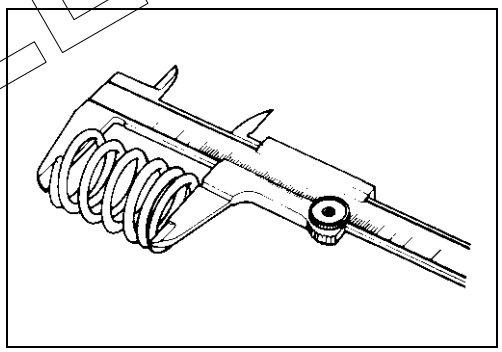


DATA Valve stem end length
Service Limit: 3.1 mm (0.12 in)

VALVE SPRING

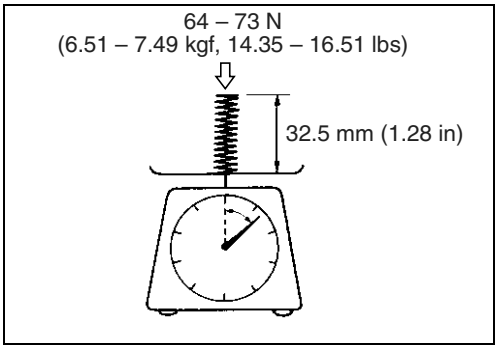
The force of the coil spring keeps the valve seat tight. Weakened spring result in reduced engine power output, and often account for the chattering noise coming from the valve mechanism.

Check the valve springs for proper strength by measuring their free length and also by the force required to compress them. If the spring length is less than the service limit, or if the force required to compress the spring does not fall within the range specified, replace both the inner and outer springs as a set.



TOOL 09900-20102: Vernier calipers

DATA Valve spring free length (IN. & EX.)
Service Limit INNER : 38.3 mm (1.51 in)
OUTER: 40.1 mm (1.58 in)

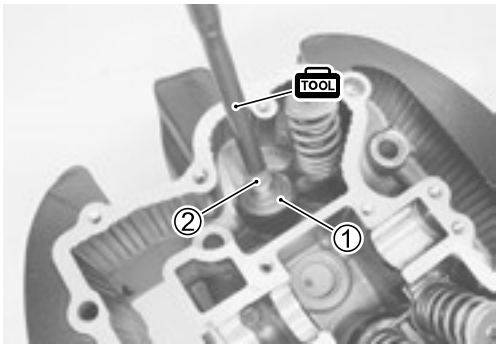


DATA Valve spring tension (IN. & EX.)
Standard
INNER:
64 – 73 N/32.5 mm
(6.51 – 7.49 kgf/32.5 mm, 14.35 – 16.51 lbs/1.28 in)
OUTER:
119 – 136 N/36.0 mm
(12.09 – 13.91 kgf/36.0 mm, 26.65 – 30.67 lbs/1.42 in)

VALVE AND VALVE SPRING REASSEMBLY

- Fit the valve spring lower seats ①.
- Oil each oil seal, and press-fit the oil seal ② into position with the valve guide installer.

09916-44910: Valve guide remover/installer

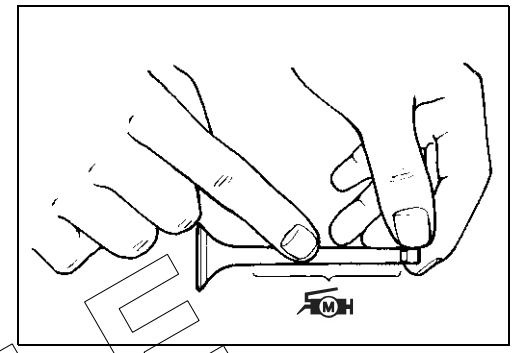


CAUTION

Do not reuse the oil seal.

- Insert the valves, with their stems coated with high quality molybdenum disfluid lubricant (SUZUKI MOLY PASTE) all around and along the full stem length without any break.

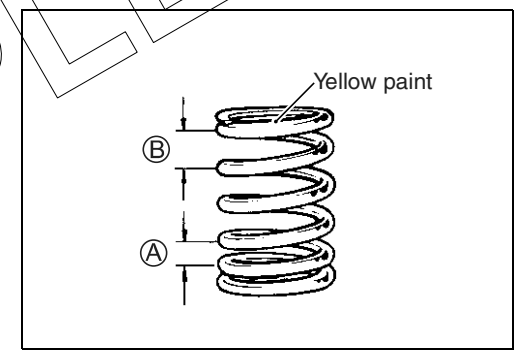
99000-25140: SUZUKI MOLY PASTE



CAUTION

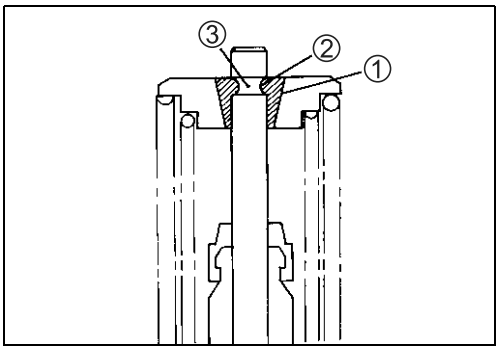
When inserting each valve, take care not to damage the lip of the stem seal.

- Install the valve springs with the small-pitch portion Ⓐ facing cylinder head.
  Ⓑ: Large-pitch portion



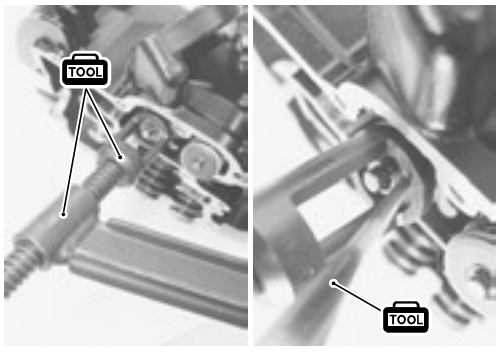
- Put on the valve spring retainer using the valve spring compressor, press down the springs, fit the two cotter halves to the stem end, and release the compressor to allow the cotter ① to wedge in between seat and stem. Be sure that the rounded lip ② of the cotter fits snugly into the groove ③ in the stem end.

09916-14510: Valve spring compressor
09916-14910: Valve spring compressor attachment
09916-84511: Tweezers



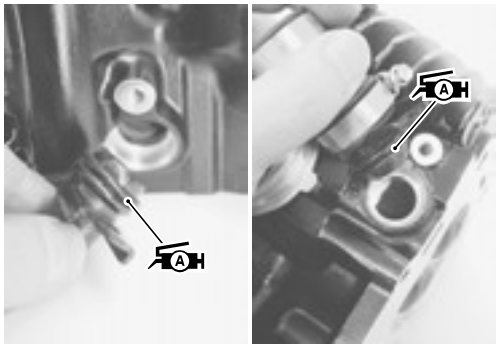
CAUTION

Be sure to restore each spring, valve and spring retainer to their original positions.



NOTE:
When installing the water union to the cylinder head, apply grease to the new O-rings.

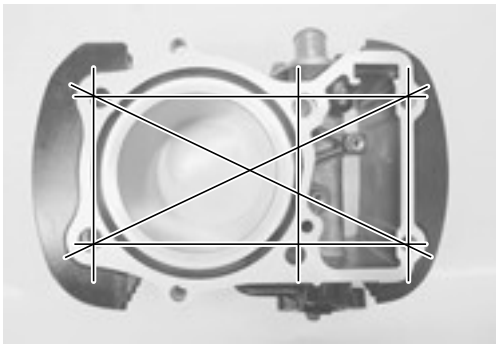
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



CYLINDER

CYLINDER DISTORTION

Check the gasketed surface of the cylinder for distortion with a straightedge and thickness gauge, taking a clearance reading at several places as indicated. If the largest reading at any position of the straightedge exceeds the limit, replace the cylinder.

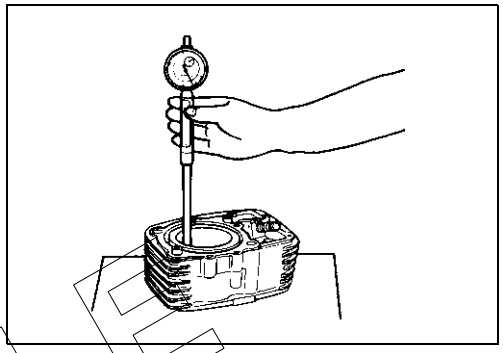


DATA Cylinder distortion
Service Limit: 0.05 mm (0.002 in)

TOOL 09900-20803: Thickness gauge

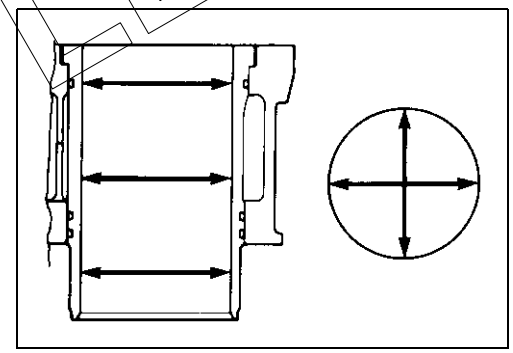
CYLINDER BORE

Measure the cylinder bore diameter at six places. If any one of the measurements exceeds the limit, overhaul the cylinder and replace the piston with an oversize, or replace the cylinder. Once the reboring is done on any one cylinder which measurements is beyond the limit, the remaining cylinders must be also rebored accordingly. Otherwise the imbalance might cause excess vibration.



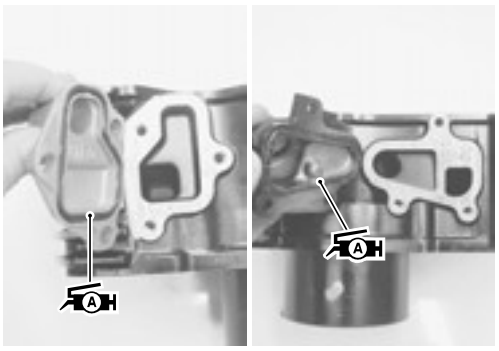
DATA Cylinder bore
Service Limit: 83.085 mm (3.2711 in)

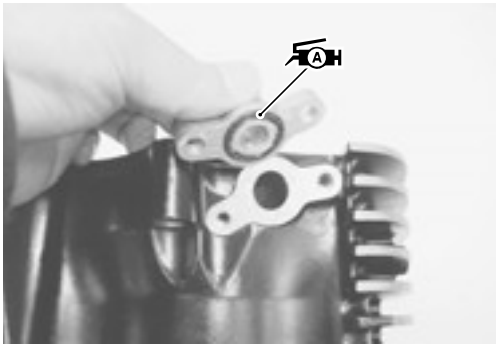
TOOL 09900-20508: Cylinder gauge set



NOTE:
When installing the water union to the cylinder, apply grease to the new O-rings.

A 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

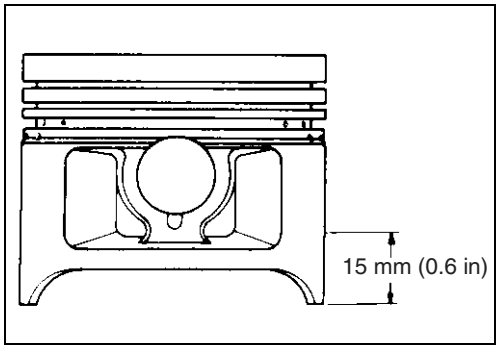




PISTON

PISTON DIAMETER

Using a micrometer, measure the piston outside diameter at the place shown in Fig. If the measurement is less than the limit, replace the piston.

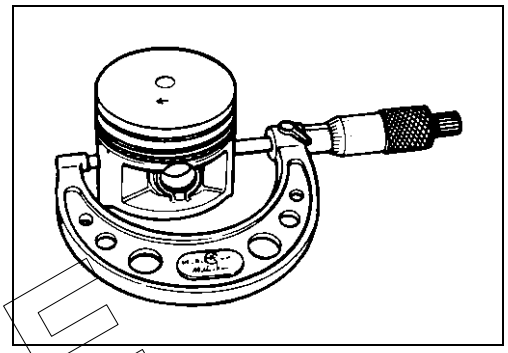


DATA Piston diameter
Service Limit: 82.880 mm (3.2630 in)

TOOL 09900-20204: Micrometer (75 – 100 mm)

PISTON-TO-CYLINDER CLEARANCE

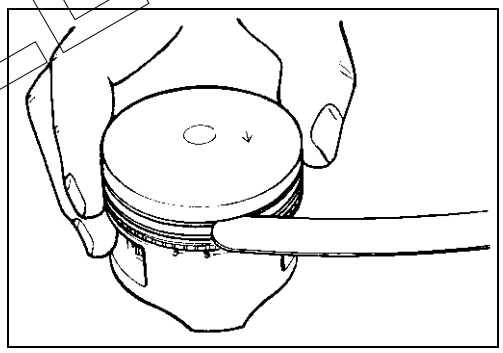
As a result of the aforesaid measurement, if the piston to cylinder clearance exceeds the following limit, overhaul the cylinder and use an oversize piston, or replace both cylinder and piston.



DATA Piston to cylinder clearance
Service Limit: 0.120 mm (0.0047 in)
Piston oversize: 0.5, 1.0 mm

PISTON RING TO GROOVE CLEARANCE

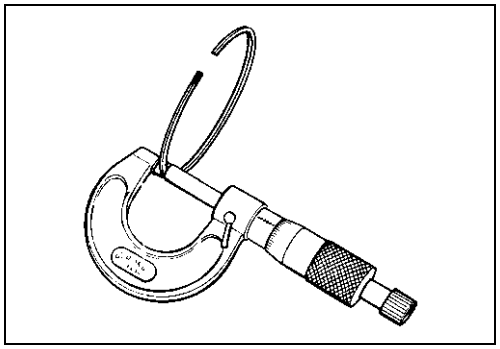
Using a thickness gauge, measure the side clearances of the 1st and 2nd rings. If any of the clearances exceeds the limit, replace both piston and piston rings.



DATA Piston ring-groove clearance
Service Limit (1st) : 0.180 mm (0.007 in)
(2nd): 0.150 mm (0.006 in)

DATA Piston ring groove width
Standard (1st) : 1.01 – 1.03 mm (0.0398 – 0.0406 in)
(2nd): 1.21 – 1.23 mm (0.0476 – 0.0484 in)
(Oil) : 2.51 – 2.53 mm (0.0988 – 0.0996 in)

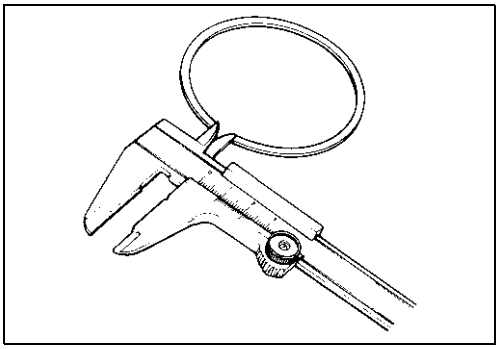
DATA Piston ring thickness
Standard (1st) : 0.970 – 0.990 mm (0.0382 – 0.0390 in)
(2nd): 1.170 – 1.190 mm (0.0461 – 0.0469 in)



TOOL 09900-20803: Thickness gauge
09900-20205: Micrometer (0 – 25 mm)

PISTON RING FREE END GAP AND END GAP

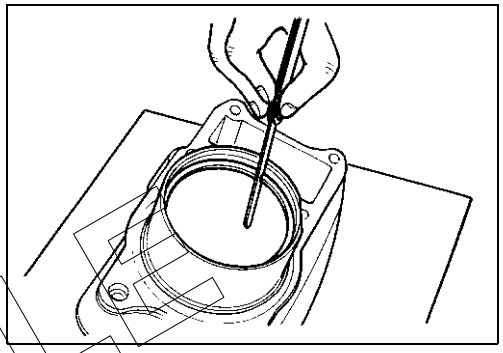
Before installing piston rings, measure the free end gap of each ring using vernier calipers. Next, fit the ring in the cylinder, and measure each ring end gap using a thickness gauge.
If any ring has an excess end gap, replace the ring.



DATA Piston ring free end gap
Service Limit (1st) : 7.7 mm (0.30 in)
(2nd): 9.4 mm (0.37 in)

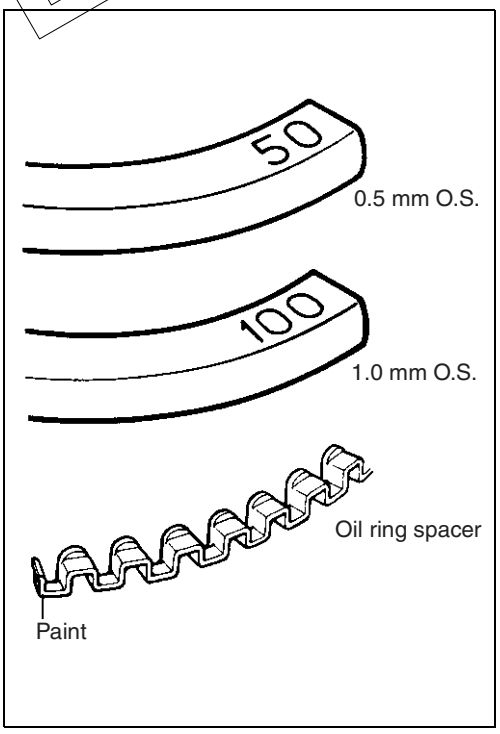
DATA Piston ring end gap
Service Limit (1st) : 0.70 mm (0.028 in)
(2nd): 0.70 mm (0.028 in)

TOOL 09900-20102: Vernier calipers
09900-20803: Thickness gauge



Oversize piston ring
The following two types of oversize piston rings are used. They bear the following identification numbers.

SIZE	1st	2nd
0.5 mm O.S.	50	50
1.0 mm O.S.	100	100



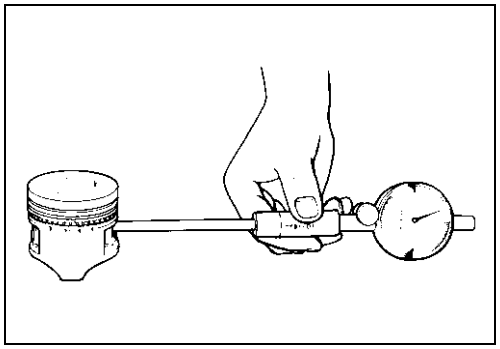
Oversize oil ring
The following two types of oversize oil rings are available as optional parts. They bear the following identification marks.

SIZE	COLOR
STD	NIL
0.5 mm O.S.	Painted Red
1.0 mm O.S.	Painted Yellow

Oversize side rail
Just measure outside diameter to identify the side rail as there is no mark or numbers on it.

PISTON PIN AND PIN BORE

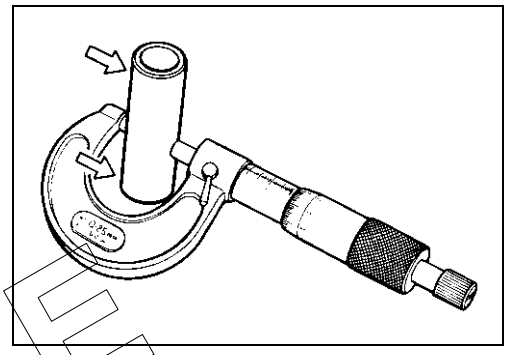
Using a small bore gauge, measure the piston pin bore inside diameter, and using a micrometer, measure the piston pin outside diameter. If the reading exceeds following limit, replace both piston and piston pin.



DATA Piston pin bore I.D.
Service Limit: 20.030 mm (0.7886 in)

TOOL 09900-20602: Dial gauge (1/1 000 mm, 1 mm)
09900-22403: Small bore gauge (18 – 35 mm)

Using a micrometer, measure the piston pin outside diameter at three positions.

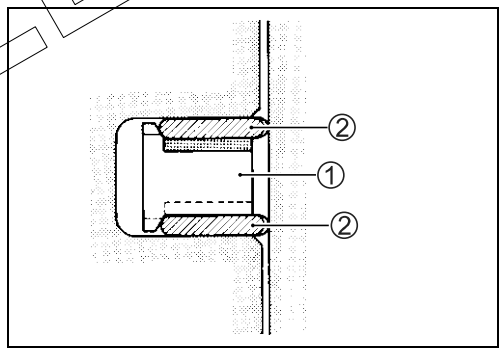


DATA Piston pin O.D.
Service Limit: 19.980 mm (0.7866 in)

TOOL 09900-20205: Micrometer (0 – 25 mm)

PISTON RING REASSEMBLY

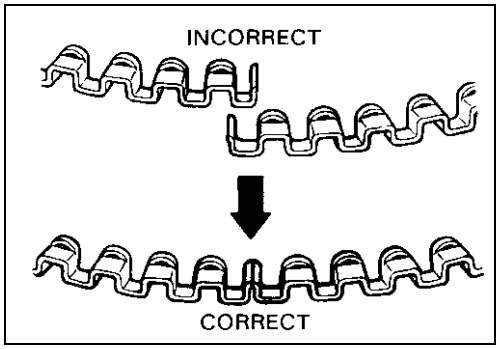
- Install the piston rings in the order of oil ring, 2nd ring and 1st ring.
- The first member to go into the oil ring groove is a spacer ①. After placing the spacer, fit the two side rails ②.



NOTE:
Side designations, top and bottom, are not applied to the spacer and side rails: you can position each either way.

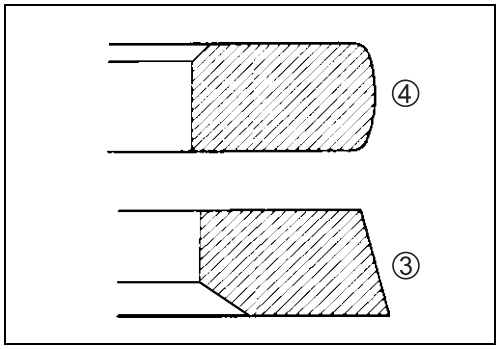
CAUTION

When installing the spacer, be careful not to allow its two ends to overlap in the groove.

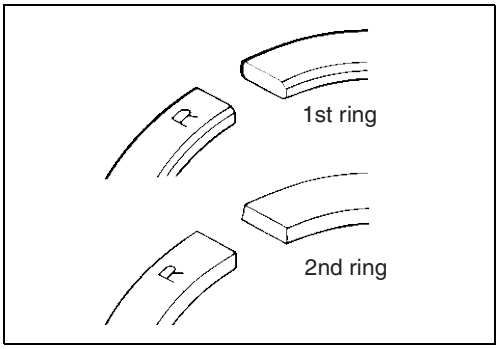


- Install the 2nd ring ③ and the 1st ring ④.

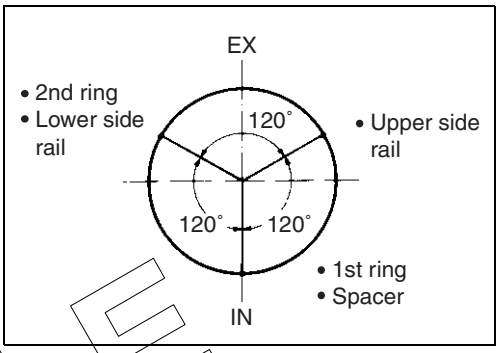
NOTE:
1st ring and 2nd ring differ in shape.



• 1st ring and 2nd ring have letter “R” marked on the side. Be sure to bring the marked side to the top when fitting them to the piston.



• Position the gaps of the three rings as shown. Before inserting each piston into the cylinder, check that the gaps are so located.



CONROD/CRANKSHAFT

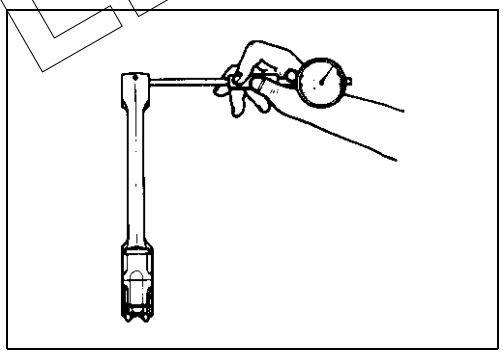
CONROD SMALL END I.D.

Using a small bore gauge, measure the conrod small end inside diameter.

DATA Conrod small end I.D.
Service Limit: 20.040 mm (0.7890 in)

TOOL 09900-20602: Dial gauge (1/1 000 mm, 1 mm)
09900-22403: Small bore gauge (18 – 35 mm)

If the conrod small end inside diameter exceeds the above mentioned limit, replace the conrod.

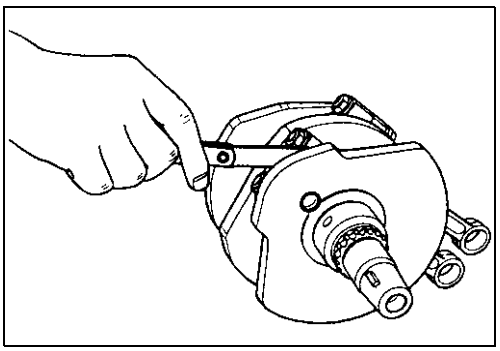


CONROD BIG END SIDE CLEARANCE

Check the conrod thrust clearance by using a thickness gauge. If the clearance exceeds the limit, replace conrod or crankshaft.

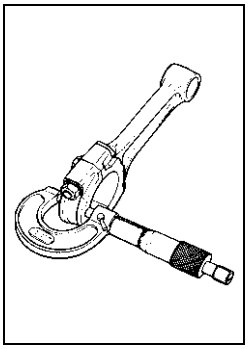
DATA Conrod big end side clearance
Service Limit: 0.30 mm (0.012 in)

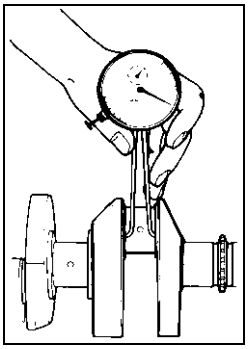
TOOL 09900-20803: Thickness gauge



DATA **Conrod big end width**
Standard: 21.95 – 22.00 mm (0.864 – 0.866 in)
Crank pin width
Standard: 22.10 – 22.15 mm (0.870 – 0.872 in)

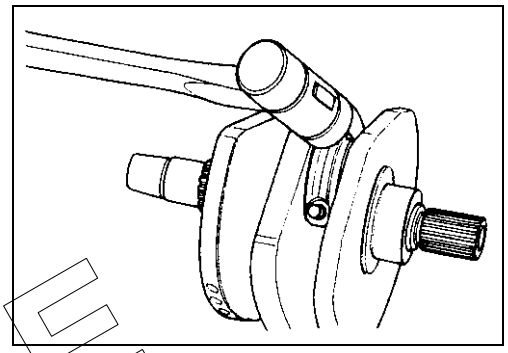
TOOL **09900-20205: Micrometer (0 – 25 mm)**
09900-20605: Dial calipers (10 – 34 mm)





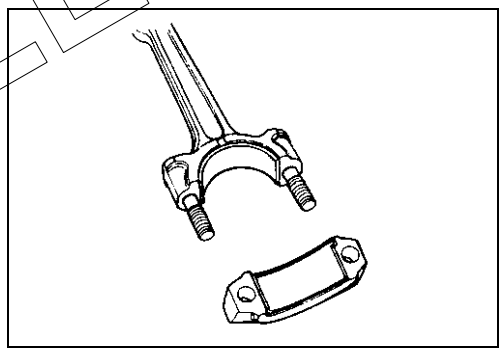
CONROD-CRANK PIN BEARING SELECTION

- Loosen the bearing cap nuts and tap the bolt end lightly with plastic hammer to remove the bearing cap.



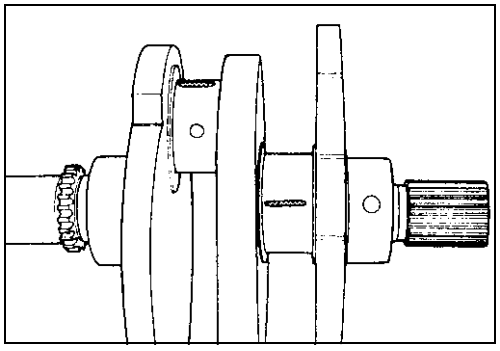
- Remove the rods and mark them to identify the cylinder position.
- Inspect the bearing surfaces for any sign of fusion, pitting, burn, or flaws. If any, replace them with a specified set of bearings.

NOTE:
Never try to remove or loosen the conrod cap bolts due to their possible loosening in the rod. Once displaced, the bearing cap will not be fitted properly.



- Place plastigauge axially on the crank pin avoiding the oil hole, at TDC or BDC side as shown.
- Tighten the bearing cap with two-step torque values.

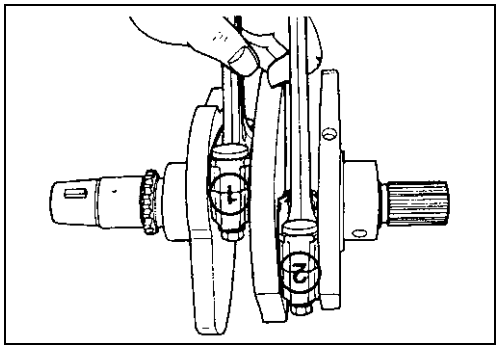
NOTE:
When fitting the bearing cap to crank pin, be sure to discriminate between its two ends, I.D. code side and the other.
I.D. code always faces intake valve side.



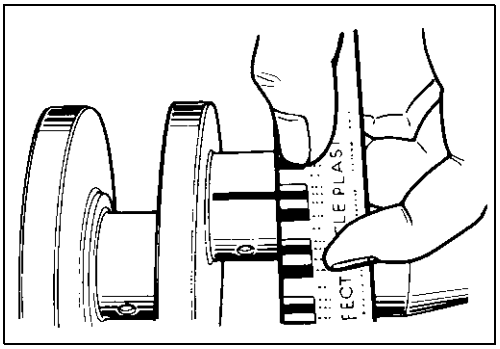
Conrod nut
Initial tightening torque: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final tightening torque: 51 N·m (5.1 kgf-m, 37.0 lb-ft)

TOOL **09900-22301: Plastigauge**

NOTE:
Never rotate the crankshaft or conrod when a piece of plastigauge is in the clearance.

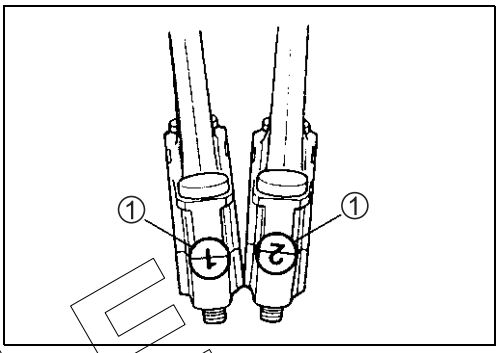


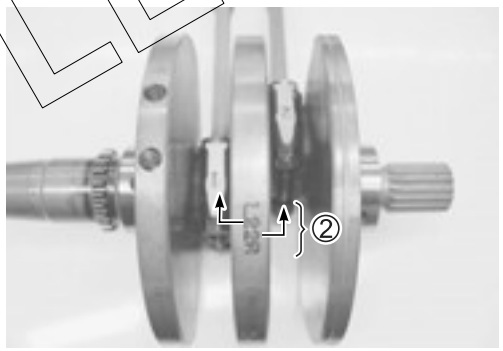
- Remove the caps and measure the width of compressed plastigauge with envelope scale. This measurement should be taken at the widest part.



DATA Conrod big end oil clearance
Standard: 0.024 – 0.042 mm (0.0009 – 0.0017 in)
Service Limit: 0.080 mm (0.0031 in)

- If oil clearance exceeds the service limit, select the specified bearings from the following table.
- Check the corresponding conrod I.D. code number ①, "1", "2" or "3".
- Check the corresponding crank pin O.D. code number ②, "1", "2" or "3".
- The crank pin O.D. code number ②, "1", "2" or "3" which are stamped on the left crank web.





Bearing selection table

		Crank pin O.D. ②		
	Code	1	2	3
Conrod I.D. code ②	1	Green	Black	Brown
	2	Black	Brown	Yellow
	3	Brown	Yellow	Blue

Conrod I.D. specification

Code ①	I.D. specification
1	44.000 – 44.006 mm (1.7323 – 1.7325 in)
2	44.006 – 44.012 mm (1.7325 – 1.7328 in)
3	44.012 – 44.018 mm (1.7328 – 1.7330 in)

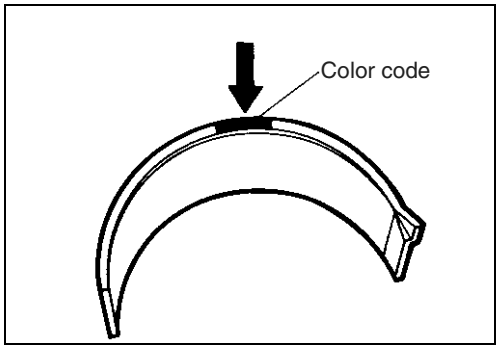
Crank pin O.D. specification

Code ②	O.D. specification
1	40.994 – 41.000 mm (1.6139 – 1.6142 in)
2	40.988 – 40.994 mm (1.6137 – 1.6139 in)
3	40.982 – 40.988 mm (1.6135 – 1.6137 in)

TOOL 09900-20202: Micrometer (25 – 50 mm)

Bearing thickness specification

Color (Part No.)	Thickness
Green (12164-38E00-0A0)	1.485 – 1.488 mm (0.0585 – 0.0586 in)
Black (12164-38E00-0B0)	1.488 – 1.491 mm (0.0586 – 0.0587 in)
Brown (12164-38E00-0C0)	1.491 – 1.494 mm (0.0587 – 0.0588 in)
Yellow (12164-38E00-0D0)	1.494 – 1.497 mm (0.0588 – 0.0589 in)
Blue (12164-38E00-0E0)	1.497 – 1.500 mm (0.0589 – 0.0591 in)

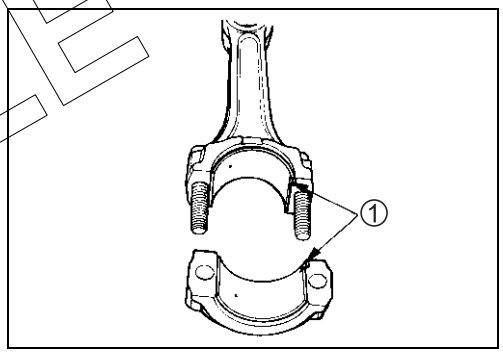


CAUTION

The bearings should be replaced as a set.

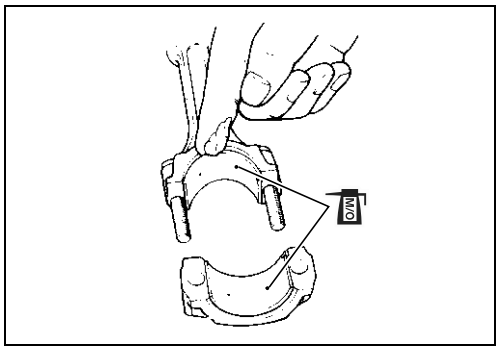
CONROD/CRANK PIN BEARING ASSEMBLY

- When fitting the bearing to the bearing cap and conrod, be sure to fix the stopper part ① first and press in the other end.



- Apply molybdenum oil solution to the crank pin and bearing surface.

MOLYBDENUM OIL SOLUTION

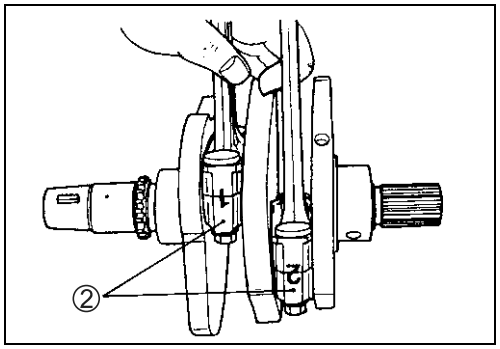


- When mounting the conrod on the crankshaft, make sure that I.D. code ② of the conrod faces rearward.
- Tighten the conrod fitting nuts with specified torque after applying engine oil to the nut thread.

Conrod nut

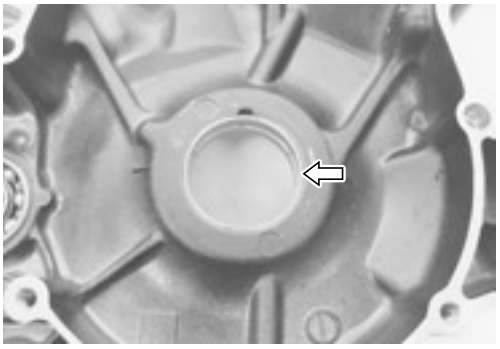
Initial tightening torque: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final tightening torque: 51 N·m (5.1 kgf-m, 37.0 lb-ft)

- Check the conrod movement for smooth turning.



CRANKCASE/CRANKSHAFT BEARING INSPECTION

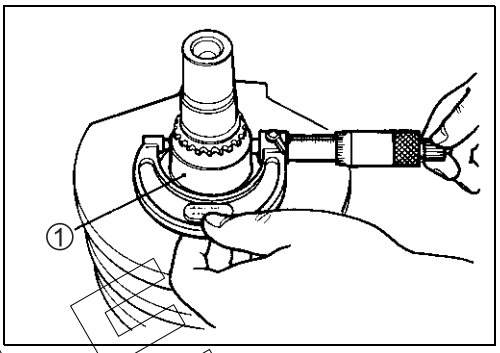
- Inspect the crankshaft and crankshaft journal bearings for any damage. If any, replace them with a specified set of bearings.



- Measure the crankshaft journal O.D. ① by using the special tool.

DATA Crankshaft journal O.D. ①
Standard: 47.965 – 47.980 mm (1.8884 – 1.8890 in)

TOOL 09900-20202: Micrometer (25 – 50 mm)

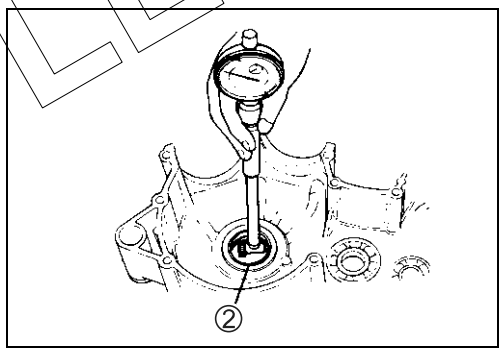


- Measure the crankshaft journal bearing I.D. ② by using the special tool.

DATA Crankshaft journal bearing I.D. ②
Standard: 48.000 – 48.015 mm (1.8898 – 1.8904 in)

TOOL 09900-20508: Cylinder gauge set

- If each crankshaft journal bearing I.D. is not within the standard range, replace them with new ones.

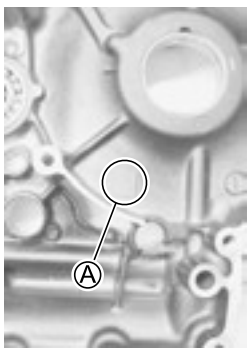


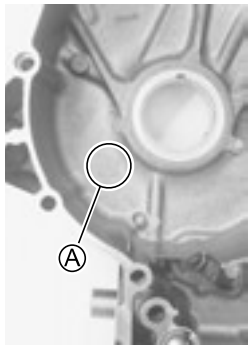
CRANKCASE-CRANKSHAFT BEARING SELECTION

Select the specified bearings from the crankcase bore I.D. code. The crankcase bore I.D. code Ⓐ "A", "B" or "C", is stamped on the inside of each crankcase half.

Bearing selection table

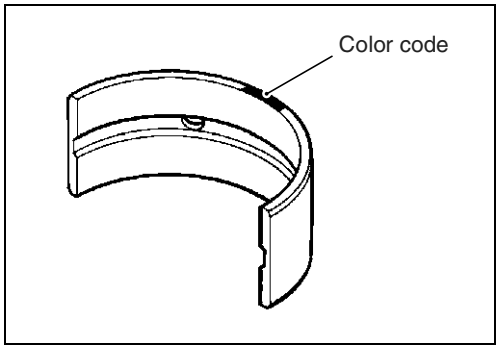
I.D. code Ⓐ	I.D. specification	Bearing
A	52.000 – 52.006 mm (2.0472 – 2.0475 in)	Green
B	52.006 – 52.012 mm (2.0475 – 2.0477 in)	Black
C	52.012 – 52.018 mm (2.0477 – 2.0479 in)	Brown





Bearing thickness

Color (Part No.)	Thickness
Green (12229-39G00-0A0)	2.006 – 2.009 mm (0.0789 – 0.0790 in)
Black (12229-39G00-0B0)	2.009 – 2.012 mm (0.0790 – 0.0792 in)
Brown (12229-39G00-0C0)	2.012 – 2.015 mm (0.0792 – 0.0793 in)



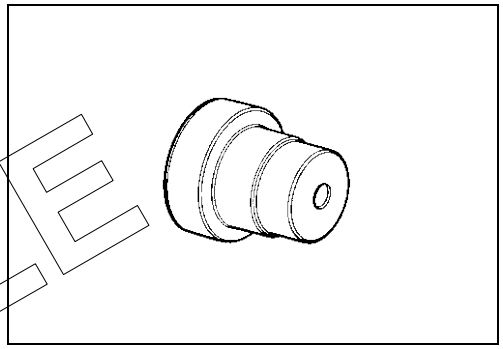
CAUTION

Bearing must be replaced as a set.

CRANKSHAFT JOURNAL BEARING REPLACEMENT

Use the special tool to replace the crankshaft journal bearings. The replacement procedure is as follows:

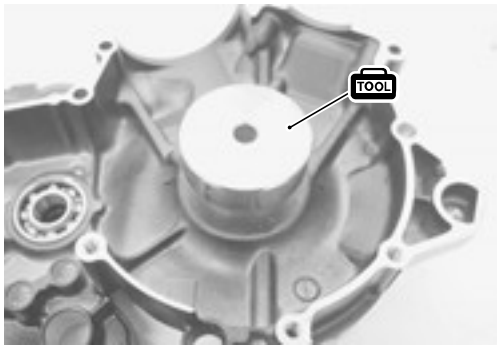
TOOL 09913-60230: Journal bearing remover/installer



- Set the special tool as shown to remove the crankshaft journal bearings.

NOTE:

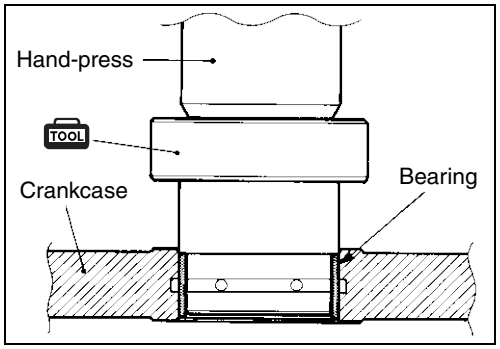
Remove the crankshaft journal bearings in only one direction, from inside to outside of each crankcase half.



- Gradually press out the bearing with the special tool by using the hand-press.

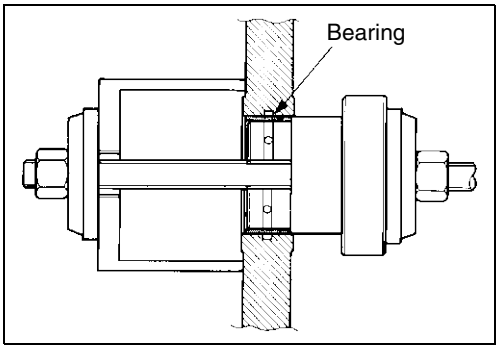
CAUTION

The removed bearings must be replaced with new ones.



NOTE:
Using the hand-press is recommended to remove the crankshaft journal bearings. However, the crankshaft journal bearings can be removed by using with the following special tools.

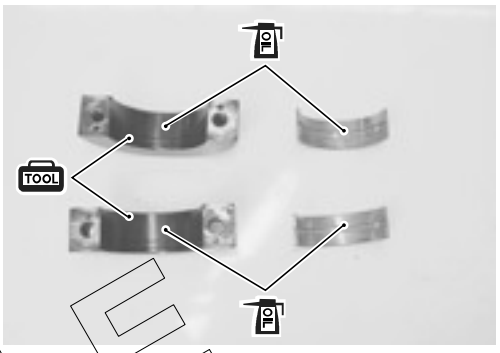
TOOL 09924-84510: Bearing installer set
09924-74570: Final drive gear bearing remover/installer



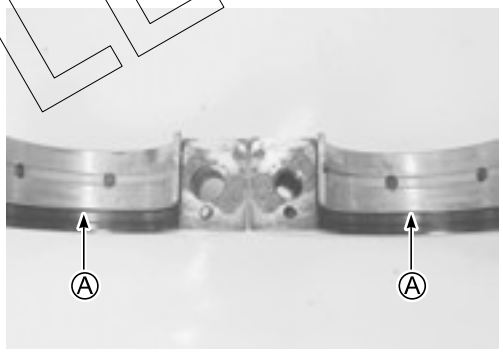
- Set the specified crankshaft journal bearings to the special tool.

CAUTION

*** Before setting the bearing, apply enough engine oil to the special tool and bearings.**
*** When setting the bearing, align the bearing side with the engraved line Ⓐ and also the bearing edge with the mating surface of the special tool.**



TOOL 09913-60241: Journal bearing remover/installer

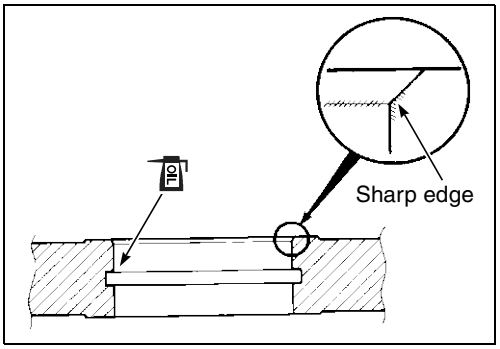


- Tighten the special tool bolt to the specified torque.

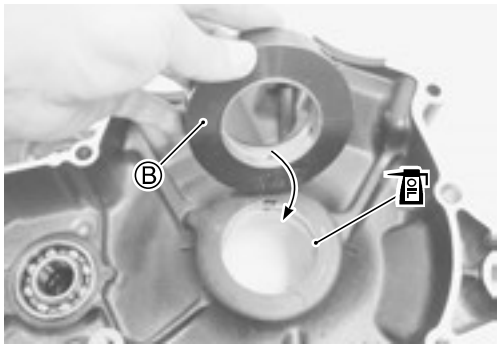
Special tool bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

CAUTION

Before installing the bearings, lightly shave off the sharp edge part of the crankcase chamfer by using an oilstone and wash the crankcase bore with enough engine oil.



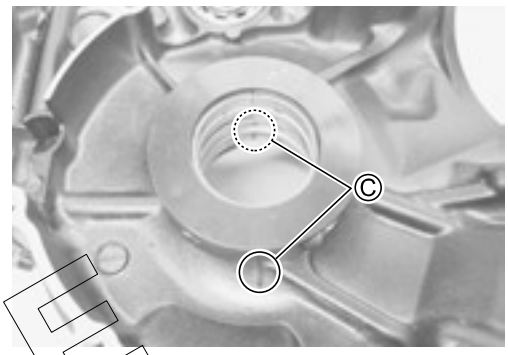
• Set the bearings installed in the special tool to the crankcase half as shown.



CAUTION

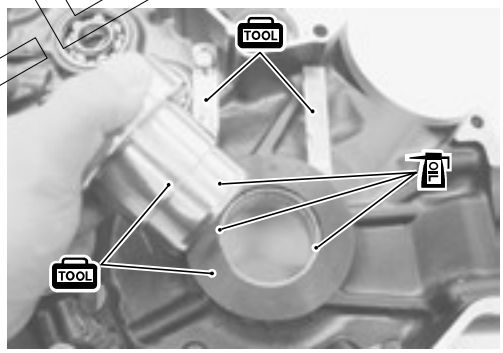
*** Be sure the bearing protruded side Ⓑ faces the crankcase bore.**
*** Align the special tool mating surface with the line mark Ⓒ on the crankcase.**

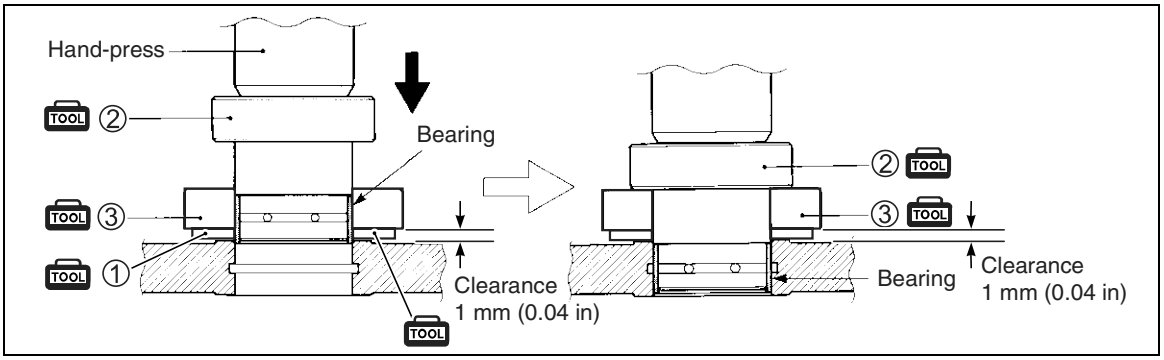
NOTE:
The upper and lower bearings are same.



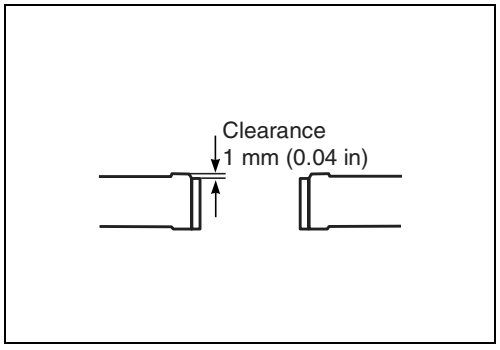
• Insert the thickness gauge ① between the crankcase and special tool ③ for 1 mm (0.04 in) clearance.
• Apply enough engine oil to the special tool and the bearings and then set the special tool carefully.
• Gradually press in the bearing into the main journal bore by using the hand-press until the special tool ② stops the special tool ③.

TOOL 09913-60230: Journal bearing remover/installer
09900-20803: Thickness gauge



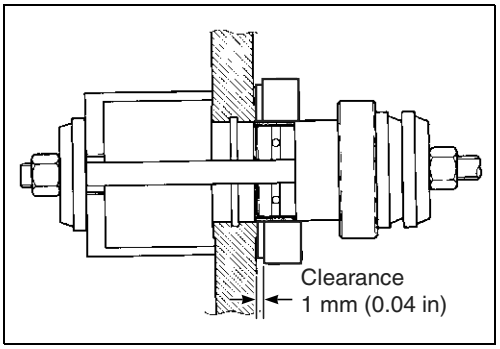


• Measure the clearance from case surface to bearing.

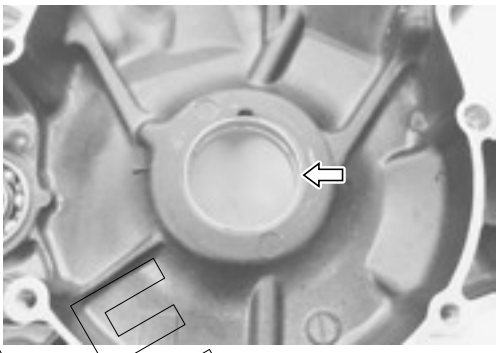


NOTE:
Using the hand-press is recommended to install the crankshaft journal bearings. However, the crankshaft journal bearings can be installed by using the following special tools.

09924-84510: Bearing installer set
09924-74570: Final drive gear bearing remover/installer

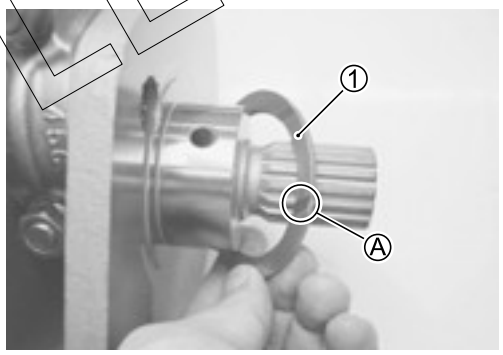


- After installing the bearings, check the bearing surface for any scratch or damage.



CRANKSHAFT THRUST CLEARANCE
Install the crankshaft in the right crankcase half after installing the thrust shim on the crankshaft.

NOTE:
The oil grooved face Ⓐ of thrust shim ① is faced to crankshaft web side.



- Place the thrust washer, camshaft drive sprocket and primary drive gear on the right end of the crankshaft and tighten primary drive gear bolt to the specified torque. (☞3-73)

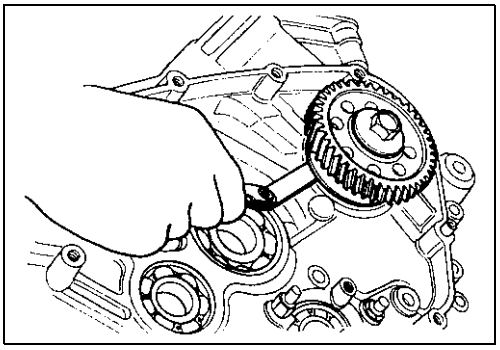
09930-40113: Rotor holder

Primary drive gear bolt: 95 N·m (9.5 kgf-m, 68.5 lb-ft)

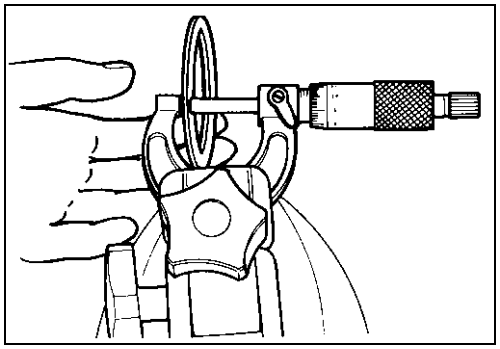
- Use a thickness gauge to measure the thrust clearance between right crankcase and thrust washer.

Crankshaft thrust clearance
Standard: 0.05 – 0.10 mm (0.002 – 0.004 in)

09900-20803: Thickness gauge



- If the thrust clearance exceeds the standard range, adjust the thrust clearance by the following procedures:
- Remove the thrust shim, and measure its thickness with a micrometer.
- Change the thrust shim with the other shim if the thrust clearance is incorrect.
- Perform the thrust clearance measurement described above once again.



TOOL 09900-20205: Micrometer (0 – 25 mm)

Checking to make sure it is within standard

Unit: mm (in)

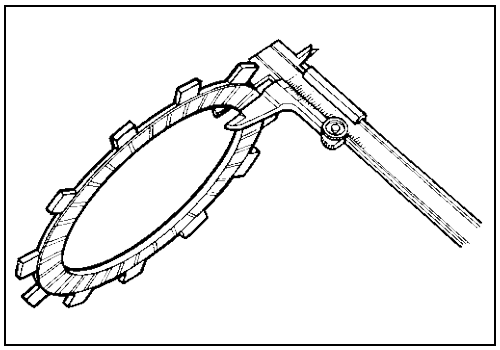
Part number	Thrust shim thickness
09160-48001	1.925 – 1.950 (0.0758 – 0.0768)
09160-48002	1.950 – 1.975 (0.0768 – 0.0778)
09160-48003	1.975 – 2.000 (0.0778 – 0.0787)
09160-48004	2.000 – 2.025 (0.0787 – 0.0797)
09160-48005	2.025 – 2.050 (0.0797 – 0.0807)
09160-48006	2.050 – 2.075 (0.0807 – 0.0817)
09160-48007	2.075 – 2.100 (0.0817 – 0.0827)
09160-48008	2.100 – 2.125 (0.0827 – 0.0837)
09160-48009	2.125 – 2.150 (0.0837 – 0.0846)
09160-48010	2.150 – 2.175 (0.0846 – 0.0856)

CLUTCH

CLUTCH DRIVE AND DRIVEN PLATES

NOTE:

Wipe off the engine oil from the drive and driven plates with a clean rag.



Measure the thickness of drive plates with a vernier calipers. If each drive plate is not within the standard range, replace it with a new one.

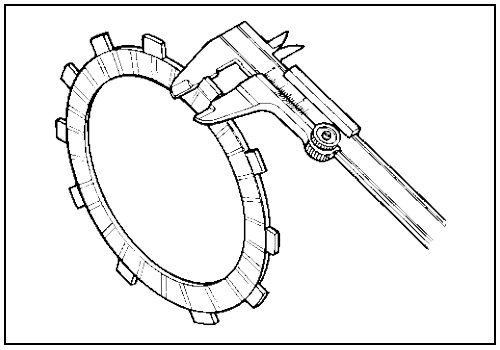
DATA Clutch drive plate thickness

Standard (No. 1): 2.92 – 3.08 mm (0.115 – 0.121 in)

(No. 2): 3.42 – 3.58 mm (0.135 – 0.141 in)

TOOL 09900-20102: Vernier calipers

Measure the claw width of drive plates with a vernier calipers. Replace the drive plates found to have worn down to the limit.



DATA Clutch drive plate claw width (No. 1 & No. 2)

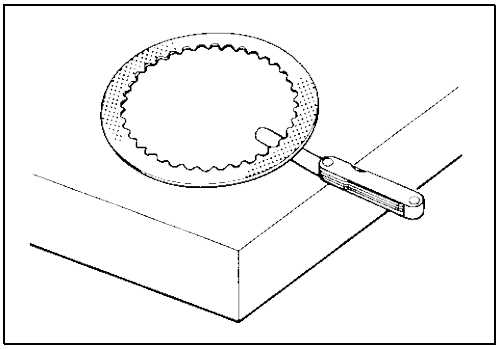
Service Limit: 15.1 mm (0.594 in)

TOOL 09900-20102: Vernier calipers

Measure each driven plate for distortion with a thickness gauge and surface plate.
Replace driven plates which exceed the limit.

DATA Clutch driven plate distortion
Service Limit: 0.10 mm (0.004 in)

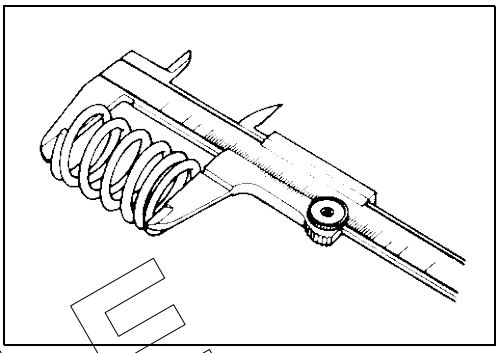
TOOL 09900-20803: Thickness gauge



CLUTCH SPRING FREE LENGTH
Measure the free length of each coil spring with a vernier calipers, and compare the elastic strength of each with the specified limit. Replace all the springs if any spring is not within the limit.

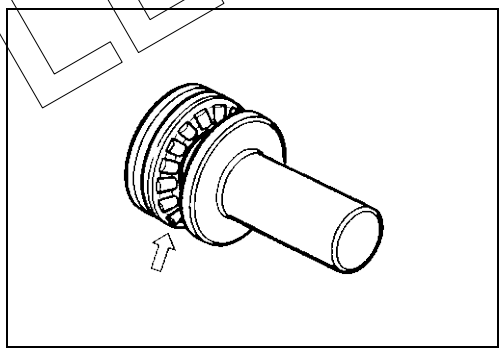
DATA Clutch spring free length
Service Limit: 46.8 mm (1.84 in)

TOOL 09900-20102: Vernier calipers



CLUTCH BEARING
Inspect the clutch release bearing for any abnormality, particularly cracks, upon removal from the clutch, to decide whether it can be reused or should be replaced.
Smooth engagement and disengagement of the clutch depends much on the condition of this bearing.

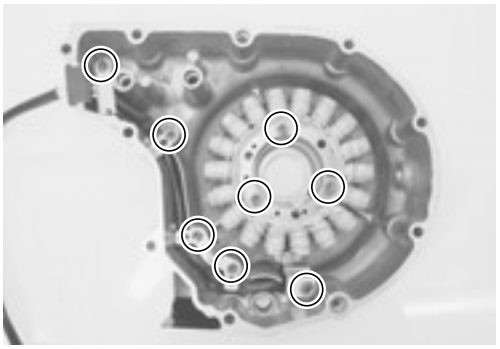
NOTE:
Thrust washer is located between the pressure plate and thrust bearing.



GENERATOR/SIGNAL GENERATOR/ STARTER CLUTCH

GENERATOR STATOR AND SIGNAL GENERATOR STATOR INSPECTION ☞9-10, -23 and -24

GENERATOR STATOR AND SIGNAL GENERATOR STATOR SERVICING
When replacing the generator stator or signal generator stator, route the wire properly.

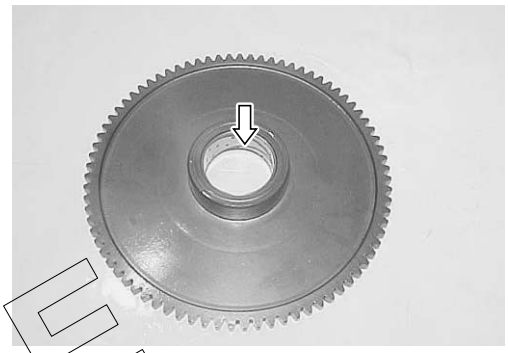


STARTER CLUTCH INSPECTION

Install the starter driven gear onto the starter clutch and turn the starter driven gear by hand to inspect the starter clutch for a smooth movement. The gear turns one direction only. If a large resistance is felt to rotation, inspect the starter clutch for damage or inspect the starter clutch contacting surface of the starter driven gear for wear or damage.
If they are found to be damaged, replace them with new ones.

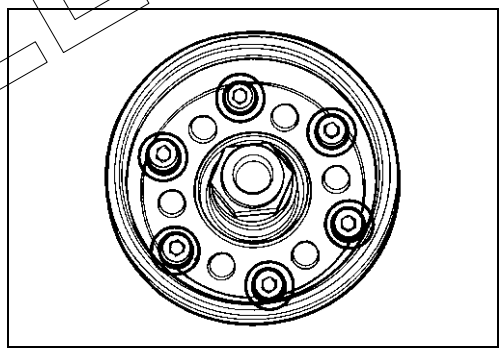
STARTER DRIVEN GEAR BEARING INSPECTION

Inspect the starter driven gear bearing for any damages.

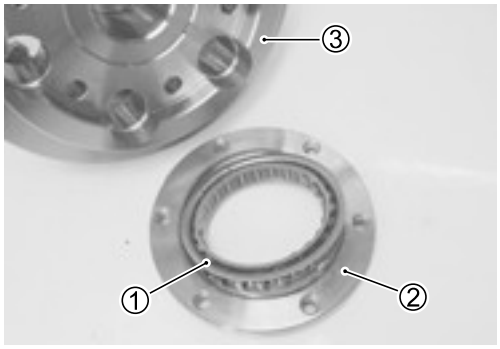


STARTER CLUTCH SERVICING

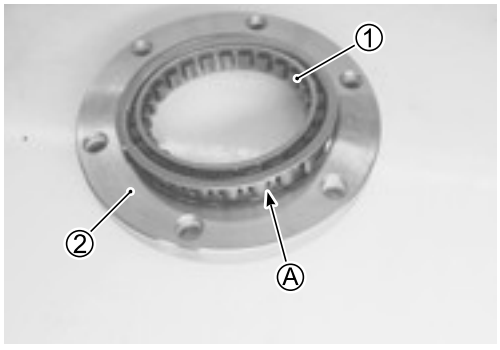
- Hold the rotor with off-set wrench and remove the starter clutch securing bolts.



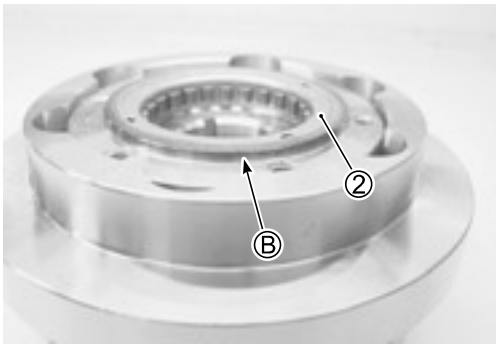
- Remove the one way clutch ① and guide ② from the rotor ③.



- When fitting the one way clutch ① to the guide ②, position flange side Ⓐ of one way clutch to the rotor side.



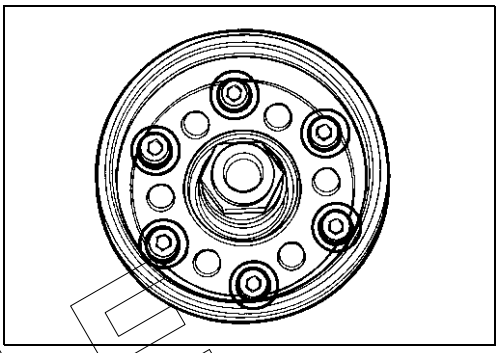
• When installing the starter clutch guide ②, make sure that the flange Ⓑ side faces out.



• Apply THREAD LOCK SUPER “1303” to the securing bolts and tighten them to the specified torque while holding the rotor with off-set wrench.

1303 99000-32030: THREAD LOCK SUPER “1303”

Starter clutch securing bolt: 26 N·m (2.6 kgf-m, 19.0 lb-ft)

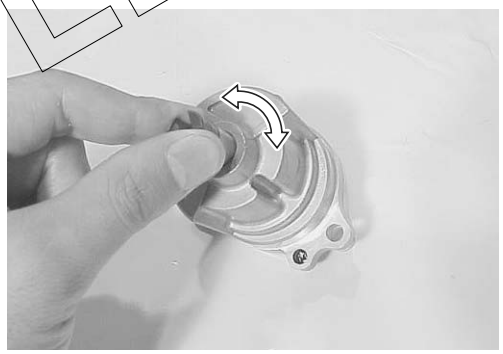


OIL PUMP

• Rotate the oil pump by hand and check that it moves smoothly.
• If it does not move smoothly, replace the oil pump assembly.

CAUTION

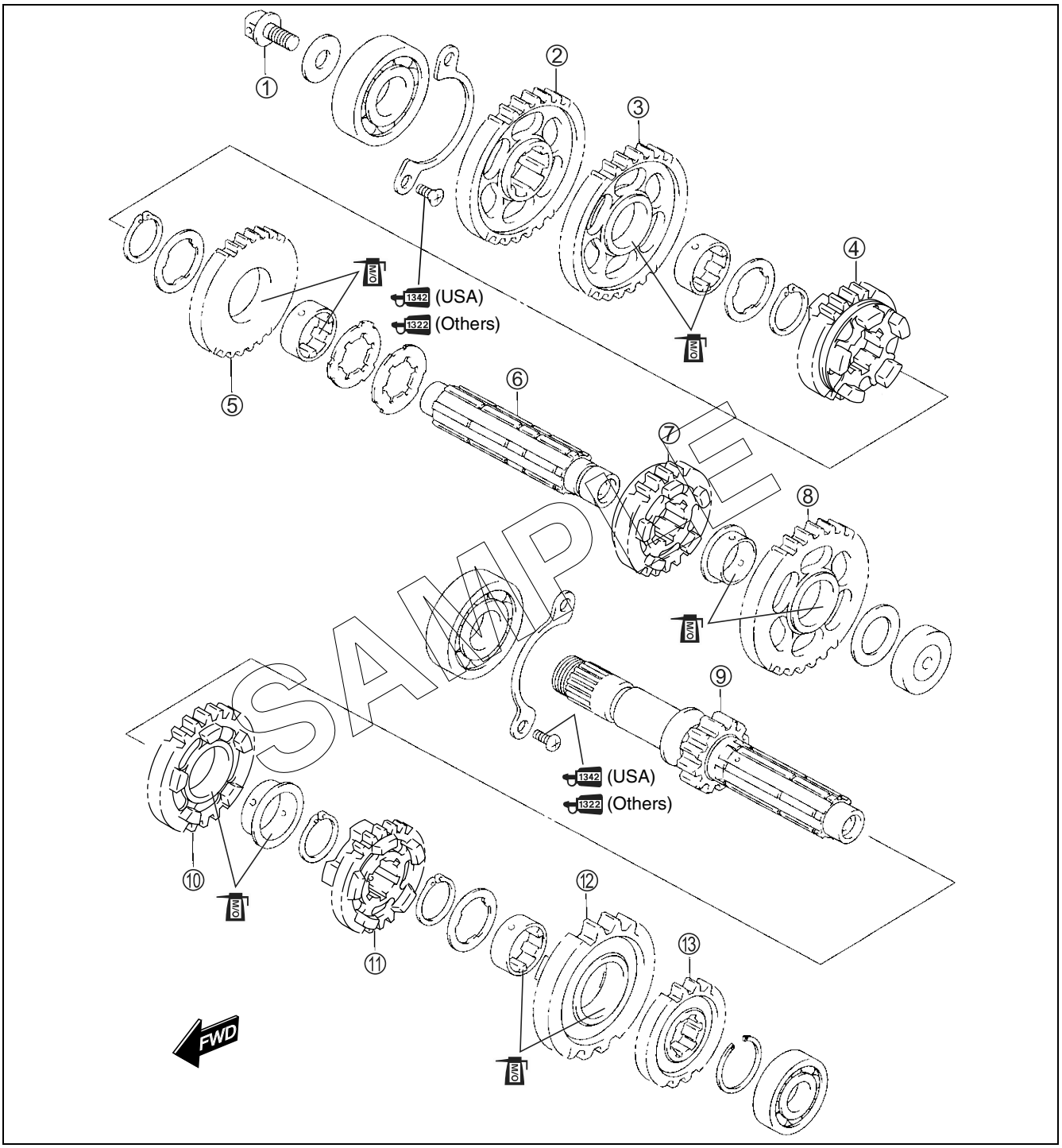
Do not attempt to disassemble the oil pump assembly. The oil pump is available only as an assembly.



TRANSMISSION

DISASSEMBLY

• Disassemble the transmission gears as shown in the illustration.



①	Driveshaft bolt	⑧	2nd driven gear
②	Over driving gear	⑨	Countershaft/1st drive gear
③	1st driven gear	⑩	4th drive gear
④	4th driven gear	⑪	3rd drive gear
⑤	3rd driven gear	⑫	5th drive gear
⑥	Driveshaft	⑬	2nd drive gear
⑦	5th driven gear		

ITEM	N·m	kgf-m	lb-ft
①	65	6.5	47.0

REASSEMBLY

Assemble the countershaft and driveshaft in the reverse order of disassembly. Pay attention to following points:

NOTE:
Always use new circlips.

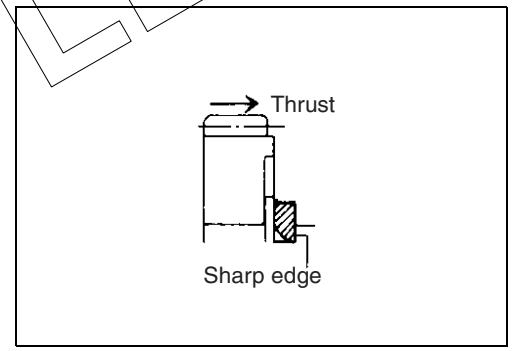
NOTE:
Before installing the gears, coat lightly moly paste or engine oil to the driveshaft and countershaft.

99000-25140: SUZUKI MOLY PASTE

CAUTION

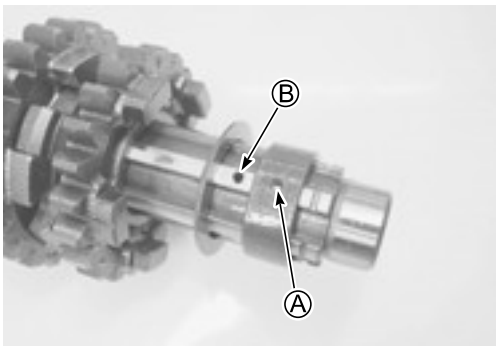
*** Never reuse a circlip. After a circlip has been removed from a shaft, it should be discarded and a new snap ring must be installed.**
*** When installing a new snap ring, care must be taken not to expand the end gap larger than required to slip the snap ring over the shaft.**
*** After installing a snap ring, always ensure that it is completely seated in its groove and securely fitted.**

- When installing a new snap ring, pay attention to the direction of the snap ring. Fit it to the side where the thrust is as shown in figure.

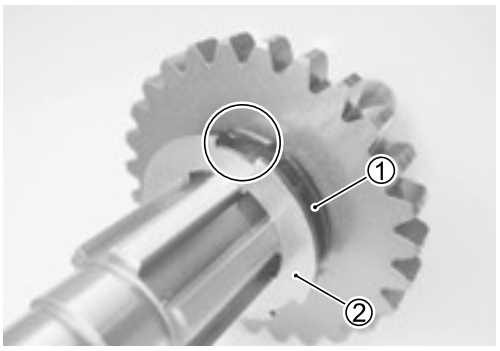


CAUTION

When installing the top drive gear bushing, align the bushing oil hole Ⓐ with the countershaft hole Ⓑ.

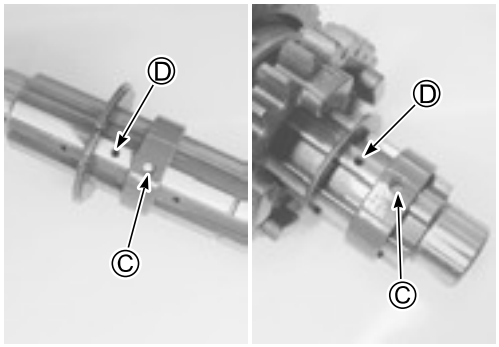


When installing the 3rd driven gear onto the driveshaft, install the lock washer No. 2 ① onto the driveshaft, and turn and fit it into the groove.
Then, fit the lock washer No. 1 ② in the lock washer No. 2 ①.

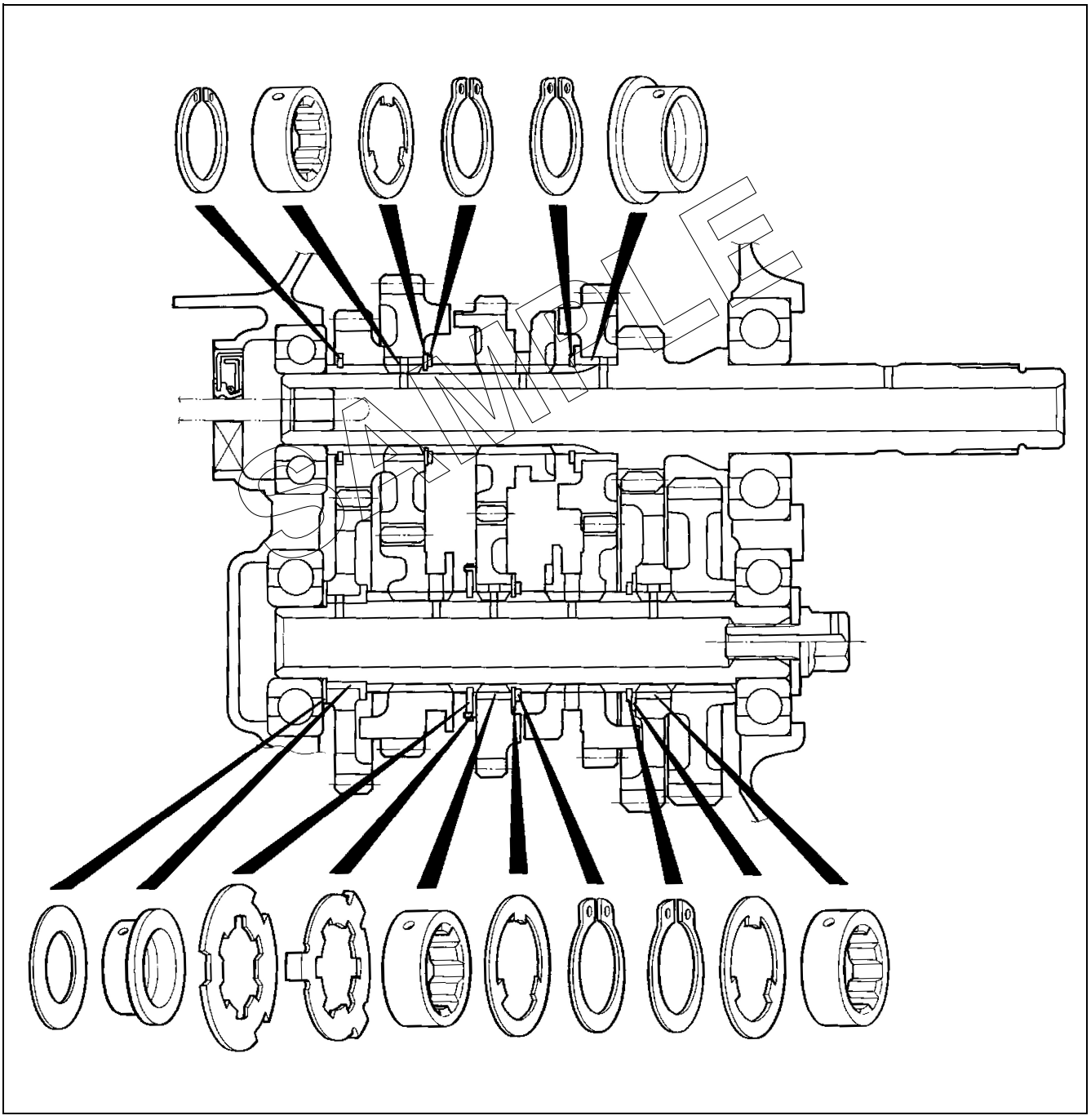


CAUTION

When installing the 1st and 3rd driven gear bushings, align the bushing oil hole Ⓒ with the driveshaft oil hole Ⓓ.



TRANSMISSION GEARS AND RELATED PARTS



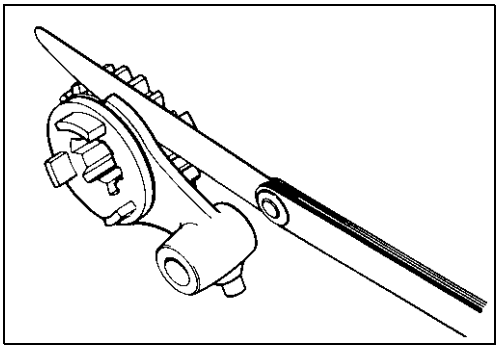
GEARSHIFT FORK

GEARSHIFT FORK TO GROOVE CLEARANCE

Using a thickness gauge, check the shifting fork clearance in the groove of its gear.

The clearance for each of the three shifting forks plays an important role in the smoothness and positiveness of shifting action.

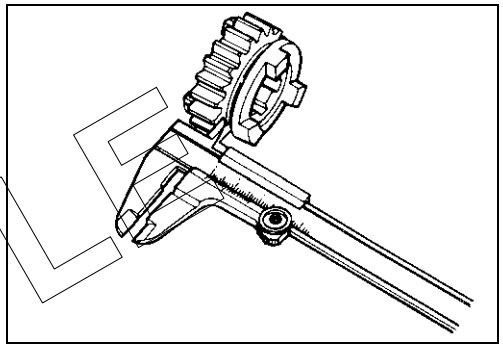
If the clearance checked is noted to exceed the limit specified, replace the fork or its gear, or both.



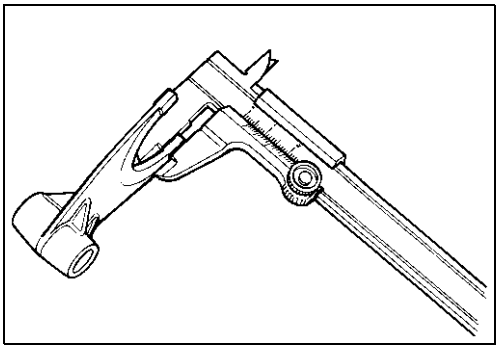
DATA Gearshift fork to groove clearance
Standard: 0.10 – 0.30 mm (0.004 – 0.012 in)
Service Limit: 0.50 mm (0.020 in)

TOOL 09900-20803: Thickness gauge
09900-20102: Vernier calipers

DATA Shift fork groove width
Standard (No. 1): 5.50 – 5.60 mm (0.217 – 0.220 in)
(No. 2): 4.50 – 4.60 mm (0.177 – 0.181 in)



DATA Shift fork thickness
Standard (No. 1): 5.30 – 5.40 mm (0.209 – 0.213 in)
(No. 2): 4.30 – 4.40 mm (0.169 – 0.173 in)



OIL JET

Check the all oil jets for clogging. If it is clogged, clean its oil passage with a compressed air.

CAUTION

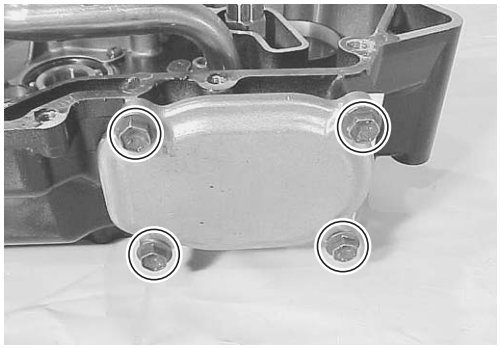
Use new O-rings to prevent the oil pressure down.

NOTE:
When installing the oil jets apply oil to the O-rings.

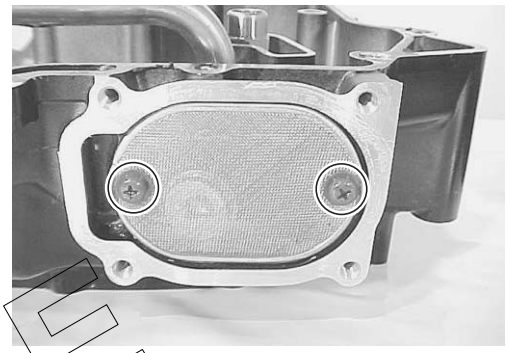
CRANKCASE

OIL SUMP FILTER

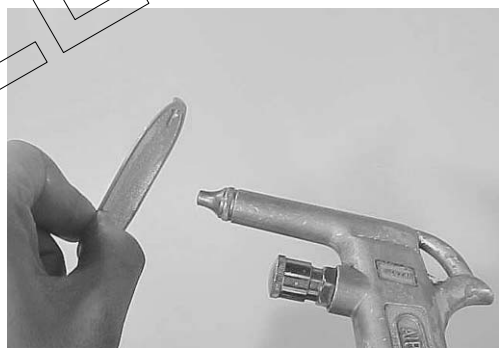
- Remove the oil sump filter cover.



- Remove the oil sump filter.

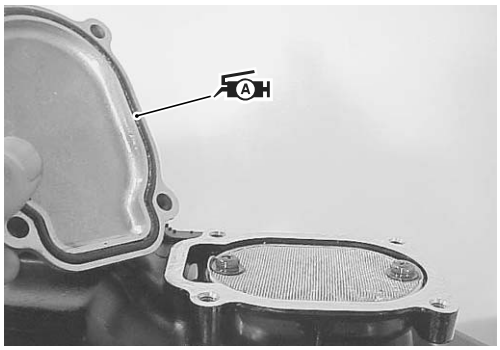


- Clean the oil sump filter using compressed air.



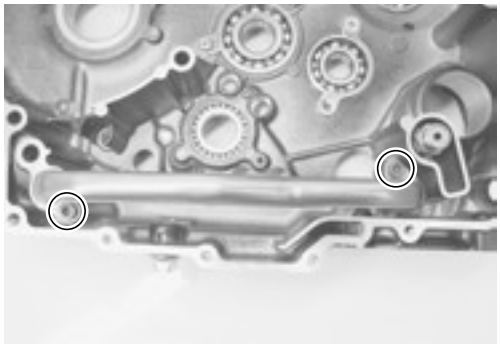
- When installing the new O-ring, apply grease to it.

A: 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



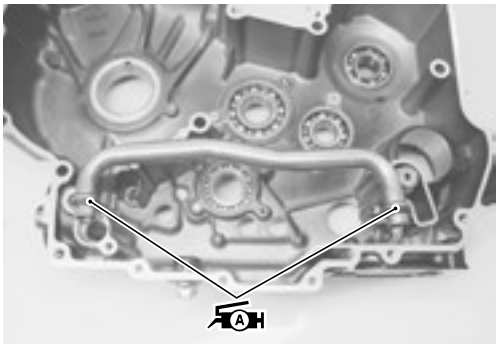
OIL PIPE

- Remove the oil pipe.



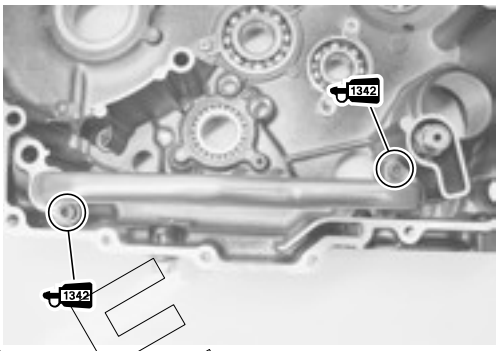
- When installing the oil pipe, use the new O-rings.
- Apply grease to the O-rings.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Apply a small quantity of the THREAD LOCK "1342" to the oil pipe retainer bolts and tighten them securely.

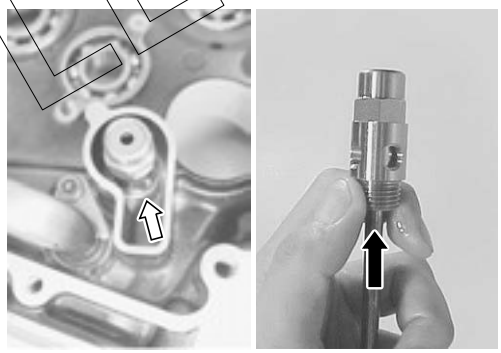
99000-32050: THREAD LOCK "1342"



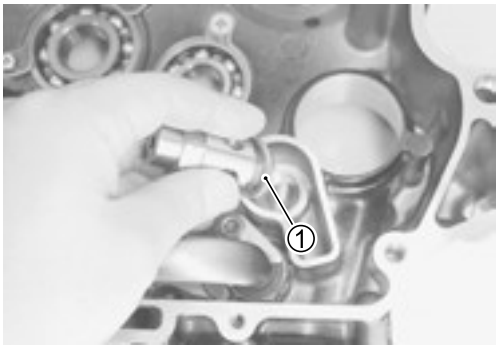
OIL PRESSURE REGULATOR

- Remove the oil pressure regulator.

Check the operation of the oil pressure regulator by pushing on the piston with an appropriately shaped tool. If the piston does not operate, replace the oil pressure regulator with a new one.

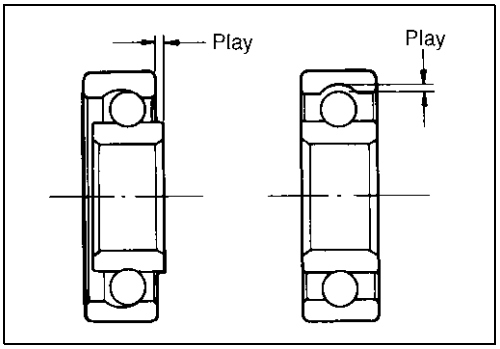


- When installing the oil pressure regulator, install the new washer ①.



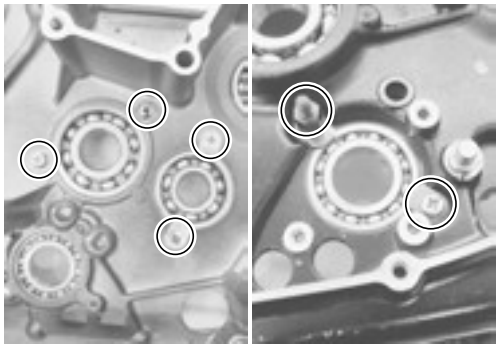
BEARING INSPECTION

Rotate the bearing inner race by finger to inspect for abnormal play, noise and smooth rotation while the bearings are in the crankcase.
Replace the bearing in the following procedure if there is anything unusual.



BEARING DISASSEMBLY

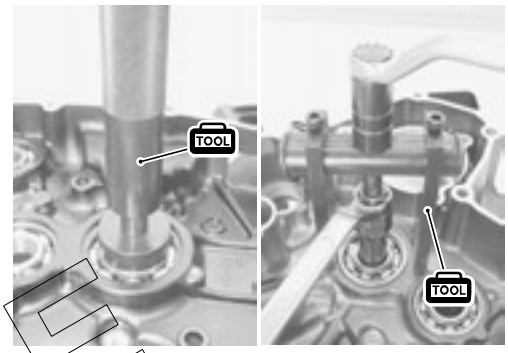
- Remove the bearing retainers.



- Remove the bearing with the special tools.

TOOL 09913-70210: Bearing installer set
09921-20240: Bearing remover set

NOTE:
If abnormal noise does not occur, it is not necessary to remove the bearing.

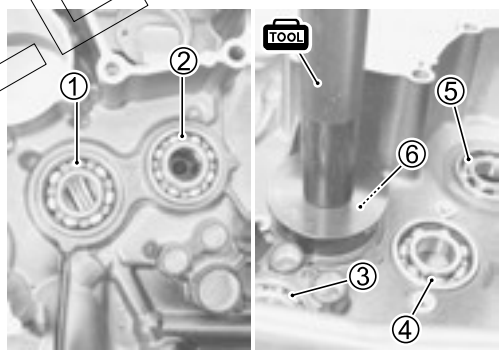


BEARING REASSEMBLY

- Install the bearing into the crankcase with the special tool.

NOTE:
** The stamped mark side of the bearing faces (①, ②, ④) outside.*
** The stamped mark side of the bearing faces (③, ⑤, ⑥) inside.*

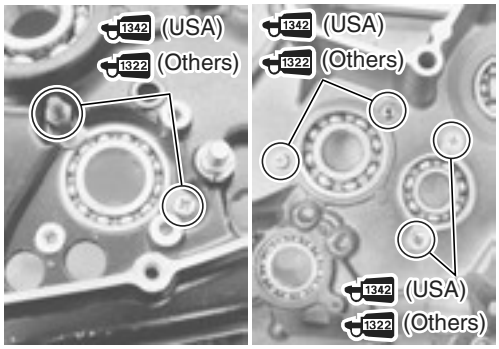
TOOL 09913-70210: Bearing installer set



- Apply a small quantity of the THREAD LOCK "1342" to the bearing retainer screws. (USA)
- Apply a small quantity of the THREAD LOCK SUPER "1322" to the bearing retainer screws. (Others)

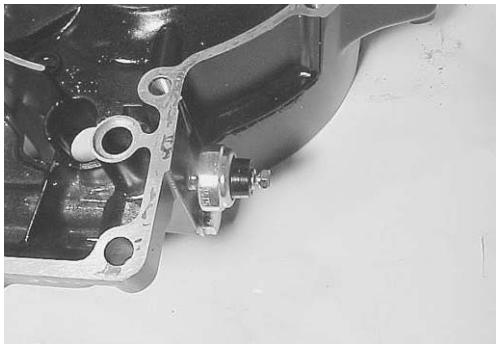
1342 99000-32050: THREAD LOCK "1342" (USA)

1322 99000-32110: THREAD LOCK SUPER "1322" (Others)



OIL PRESSURE SWITCH

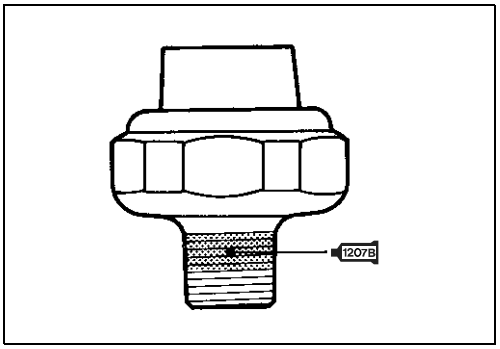
- Remove the oil pressure switch.



• When installing the switch, apply SUZUKI BOND “1207B”.

Oil pressure switch: 14 N·m (1.4 kgf-m, 10.0 lb-ft)

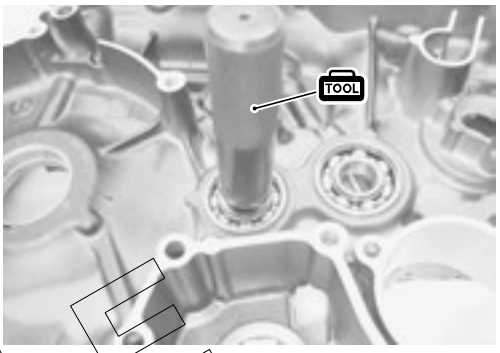
1207B 99000-31140: SUZUKI BOND “1207B”



OIL SEAL

• Remove the oil seal with the special tool.

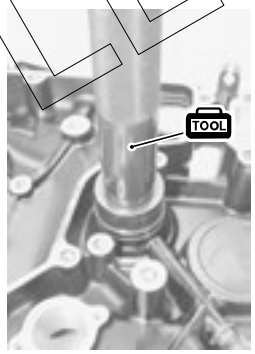
TOOL 09913-70210: Bearing installer set

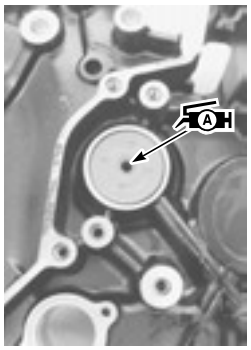


• Install the oil seal with the special tool.
• Apply grease to the oil seal lip.

A 99000-25030: SUZUKI SUPER GREASE “A” (USA)
99000-25010: SUZUKI SUPER GREASE “A” (Others)

TOOL 09913-70210: Bearing installer set





ENGINE REASSEMBLY

Reassemble the engine in the reverse order of disassembly. The following steps require special attention or precautionary measures should be taken.

NOTE:
Apply engine oil to each running and sliding part before reassembling.

SECONDARY DRIVE BEVEL GEAR

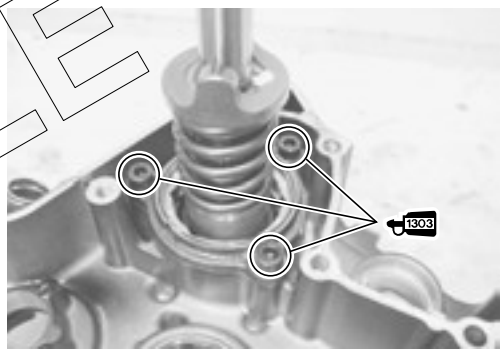
- Install the secondary drive bevel gear shim(s).
  SHIM SELECTION ☞4-7

- Install the secondary drive bevel gear assembly and tighten the retainer bolts to the specified torque.

NOTE:
Apply THREAD LOCK SUPER "1303" to the thread of the bolts.

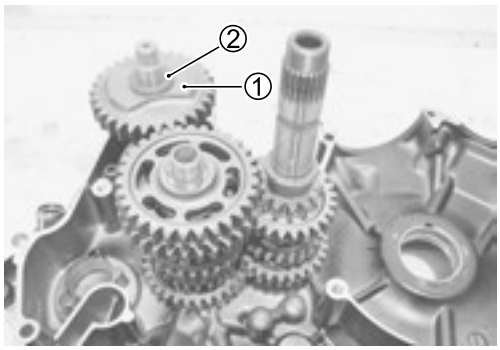
1303 99000-32030: THREAD LOCK SUPER "1303"

Secondary drive gear bearing retainer bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)

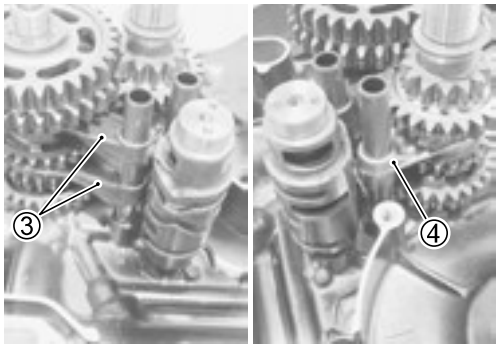


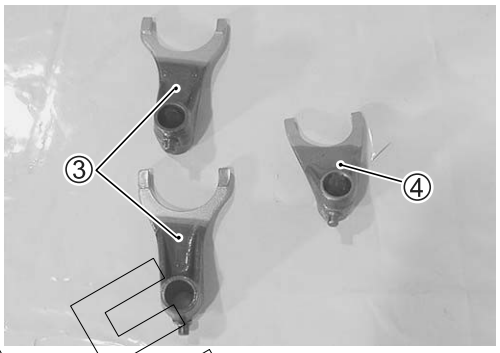
COUNTERSHAFT/DRIVESHAFT

- Install the countershaft assembly and driveshaft assembly.
- Install the over driving gear ① and bush ②.



• Install the gearshift forks ③ ④, gearshift fork shafts and gearshift cam.
③ No. 1 shift forks (For 4th and 5th driven gears)
④ No. 2 shift fork (For 3rd drive gear)





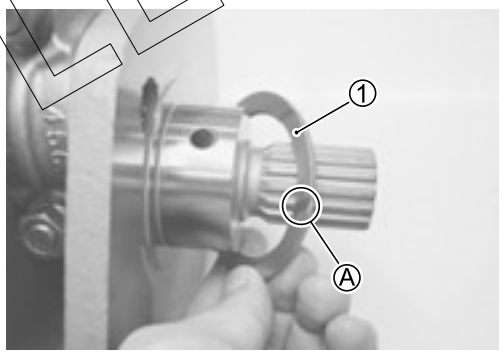
CRANKSHAFT

• Install the thrust shim ① on the crankshaft.

NOTE:

** The grooved face Ⓐ of thrust shim ① faces to crankshaft web side.*

** The thrust shim is selected by the crankshaft thrust clearance. (☞3-52)*



• Install the crankshaft into the left crankcase half.

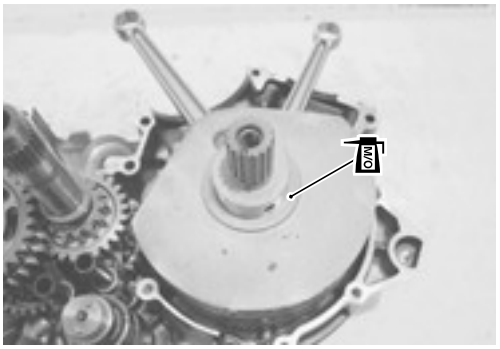
NOTE:

Coat lightly moly paste to the crankshaft journal bearings and the thrust shim.

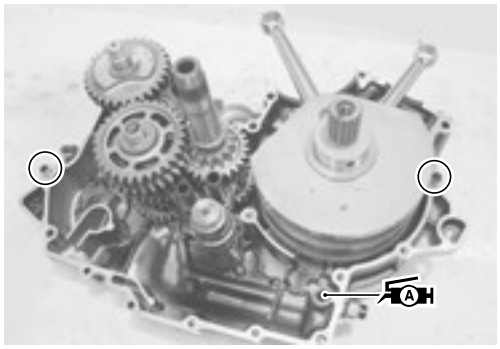
99000-25140: SUZUKI MOLY PASTE

CAUTION

Never strike the crankshaft with a plastic hammer when inserting it into the crankcase. It will be easy to install the crankshaft to left crankcase.



• Install the dowel pins and O-ring on the left crankcase half.



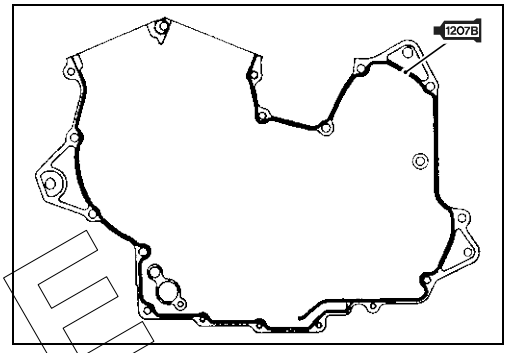
NOTE:
Apply grease to the O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

CAUTION

Use the new O-ring to prevent oil leakage.

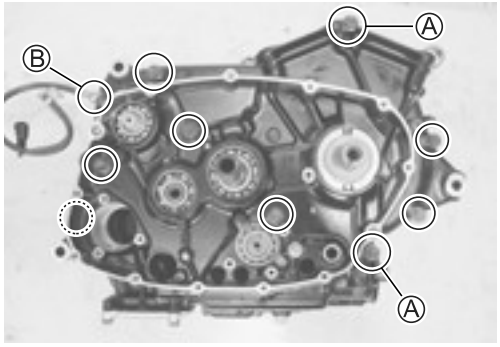
• Clean the mating surfaces of the left and right crankcase halves.
• Apply SUZUKI BOND "1207B" to the mating surface of the right crankcase.



99000-31140: SUZUKI BOND "1207B"

NOTE:
Use of SUZUKI BOND "1207B" is as follows:
** Make surfaces free from moisture, oil, dust and other foreign materials.*
** Spread on surfaces thinly to form an even layer, and assemble the crankcases within few minutes.*
** Take extreme care not to apply any BOND "1207B" to the oil hole, oil groove and bearing.*
** Apply to distorted surfaces as it forms a comparatively thick film.*

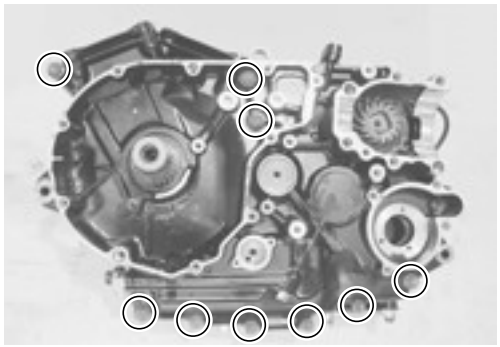
• Fit the gaskets to the bolts (A).
• Fit the lead wire to the bolt (B).
• When securing the right and left crankcase halves, tighten each bolt a little at a time to equalize the pressure. Tighten all the securing bolts to the specified torque values.



Crankcase 8 mm bolt:
Initial: 15 N·m (1.5 kgf-m, 11.0 lb-ft)
Final : 22 N·m (2.2 kgf-m, 16.0 lb-ft)
Crankcase 6 mm bolt: 11 N·m (1.1 kgf-m, 8.0 lb-ft)

CAUTION

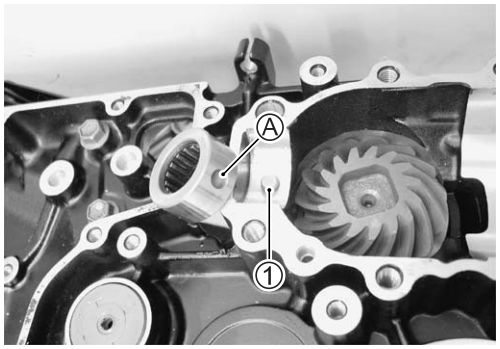
Do not drop the O-ring into the crankcase when assembling the right and left crankcase halves.



NOTE:
After the crankcase bolts have been tightened, check if the crankshaft, secondary drive bevel gear shaft, countershaft and the driveshaft rotate smoothly.

SECONDARY DRIVEN BEVEL GEAR

- Install the secondary driven bevel gear bearing and the pin ①.

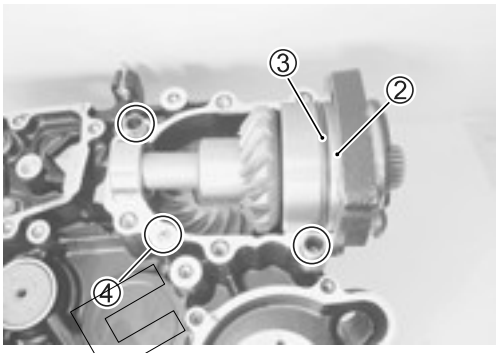


NOTE:

** Align the hole Ⓐ of the secondary driven bevel gear bearing with the pin ①.*

** The stamped mark side of the bearing face rearward.*

- Install the secondary driven bevel gear assembly, shim(s) ② and O-ring ③.
- Install the dowel pins and the oil jet ④.



CAUTION

Use the new O-ring to prevent oil leakage.

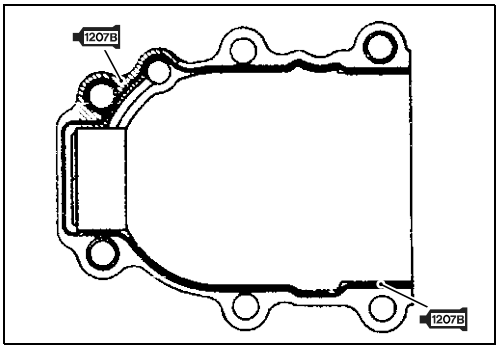
NOTE:

** Refer to the section 4 for shim selection.*

** Apply grease to the O-ring.*

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Clean the mating surfaces of the crankcase and the secondary gear case.
- Apply SUZUKI BOND "1207B" to the mating surface of the secondary gear case.



99000-31140: SUZUKI BOND "1207B"

NOTE:

** Make surfaces free from moisture, oil, dust and other foreign materials.*

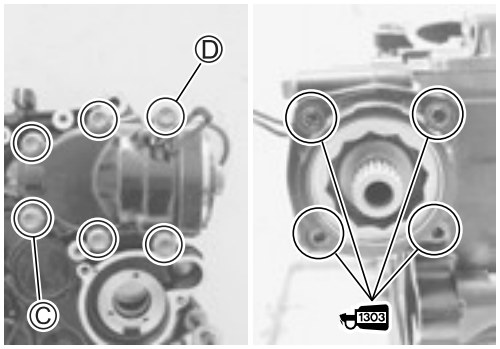
** Spread on surfaces thinly to form an even layer, and assemble the crankcases within few minutes.*

** Take extreme care not to apply any BOND "1207B" to the oil hole, oil groove and bearing.*

** Apply to distorted surfaces as it forms a comparatively thick film.*

- Tighten the secondary gear case bolts to the specified torque.

Secondary gear case bolt
Initial: 15 N·m (1.5 kgf-m, 11.0 lb-ft)
Final : 22 N·m (2.2 kgf-m, 16.0 lb-ft)



NOTE:

** Fit the washer to the bolt Ⓒ.*

** Fit the clamp to the bolt Ⓓ.*

• Tighten the secondary driven bevel gear bolt to the specified torque.

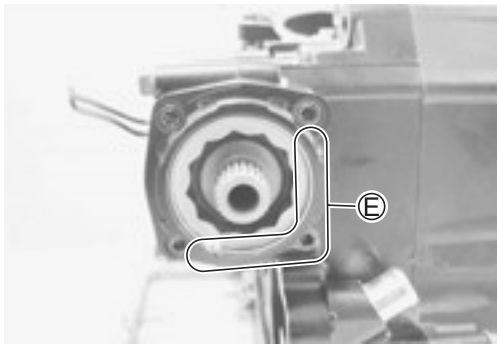
NOTE:

** Hollow portion Ⓔ of the secondary driven gear assembly faces inside.*

** Apply a small quantity of THREAD LOCK SUPER "1303" to the bolt.*

1303 99000-32030: THREAD LOCK SUPER "1303"

Secondary driven bevel gear bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)



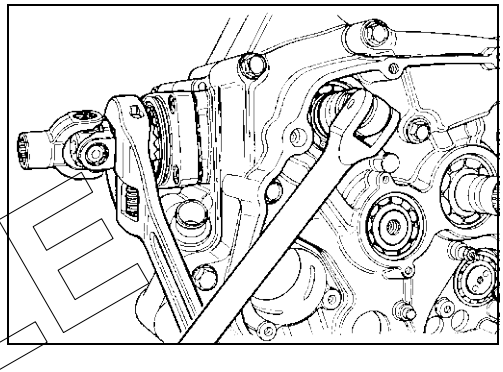
DRIVESHAFT BOLT/SECONDARY DRIVEN GEAR SHAFT NUT

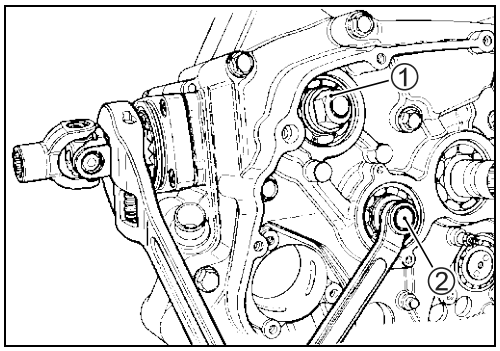
• Install the universal joint on the secondary driven gear shaft.
• While holding the universal joint with a adjustable wrench, tighten the secondary drive gear shaft nut ① and driveshaft bolt ② to the specified torque.

CAUTION

Driveshaft bolt ② has left-hand thread.

Secondary drive gear shaft nut:
105 N·m (10.5 kgf-m, 76.0 lb-ft)
Driveshaft bolt: 65 N·m (6.5 kgf-m, 47.0 lb-ft)





WATER PUMP

• Install the new O-ring and new gasket.
• Tighten the water pump mounting screws.

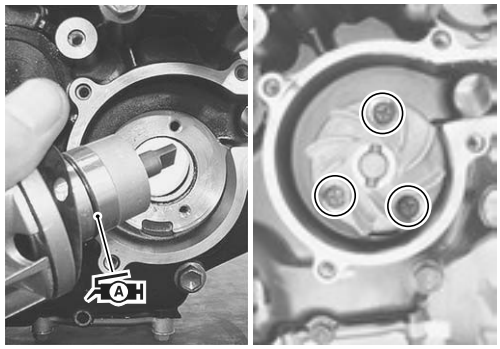
CAUTION

Use the new O-ring to prevent oil leakage.

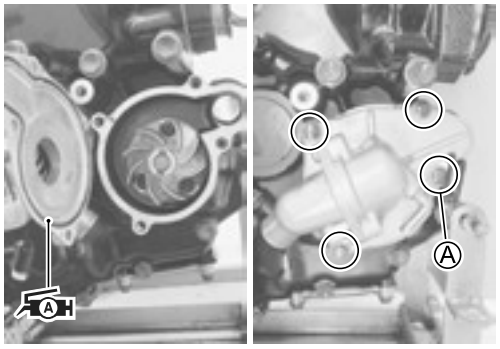
NOTE:

Apply grease to the O-ring.

A 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Install the new O-ring.
- Install the water pump cover.



CAUTION

Use the new O-ring to prevent oil leakage.

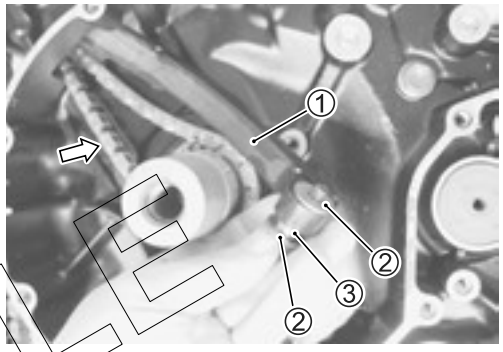
NOTE:
** Fit the clamp to the bolt Ⓐ.*
** Apply grease to the O-ring.*

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

CAM CHAIN/CAM CHAIN TENSIONER

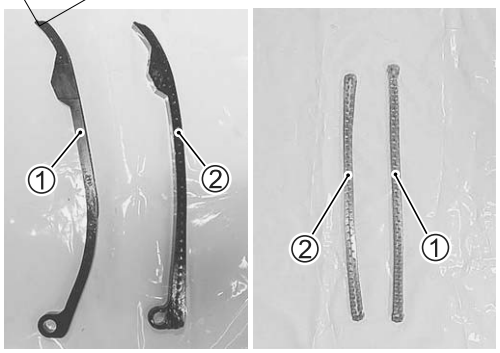
- Install the cam chain tensioner ①, washers ②, spacer ③ and cam chain.

Cam chain tensioner bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



① For front cylinder
② For rear cylinder

NOTE:
The No. 2 cam chain (For front cylinder) is a little longer than the No. 1 cam chain.

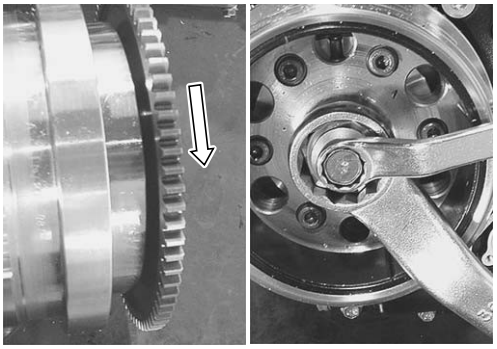


GENERATOR

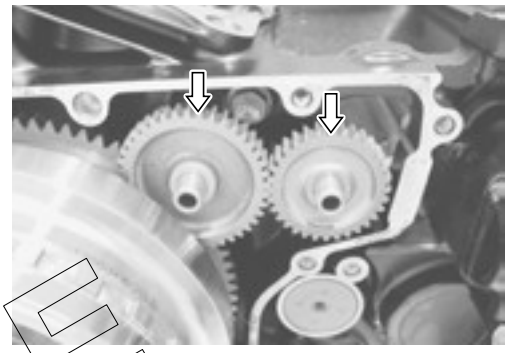
- Degrease the tapered portion of the generator rotor assembly and also the crankshaft. Use nonflammable cleaning solvent to wipe off the oily or greasy matter to make these surfaces completely dry.
- Install the key.

- Install the starter driven gear to the rotor.
- Install the generator rotor assembly and tighten its bolt to the specified torque.

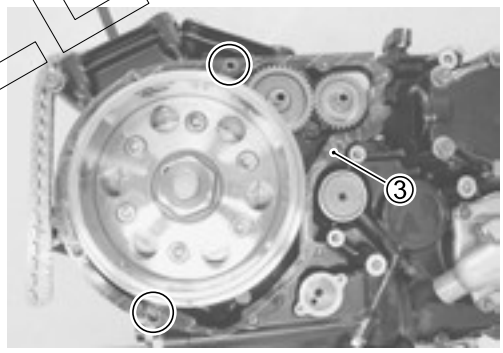
Generator rotor bolt: 160 N·m (16.0 kgf-m, 115.5 lb-ft)



- Install the starter driven gear and the idle gear.

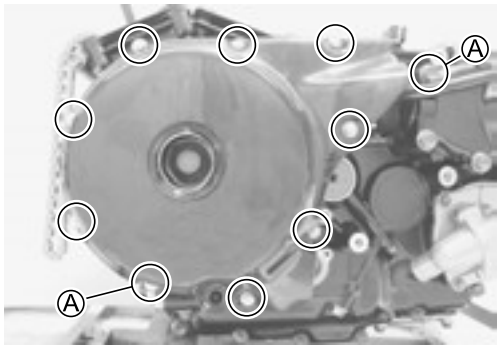


- Install the new gasket ③ and dowel pins.



- Install the generator cover.

NOTE:
Fit the new gaskets to the bolts Ⓐ.

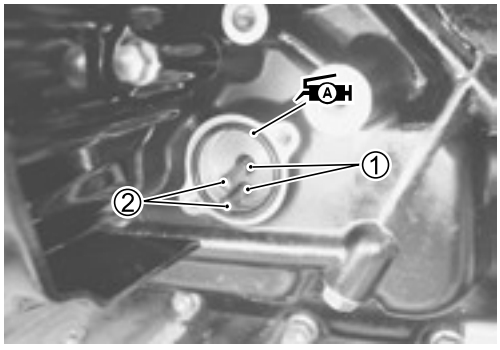


NEUTRAL SWITCH

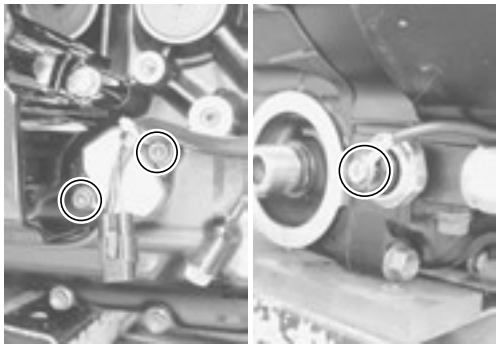
- Install the springs ① and switch contacts ②.

NOTE:
Apply grease to the O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



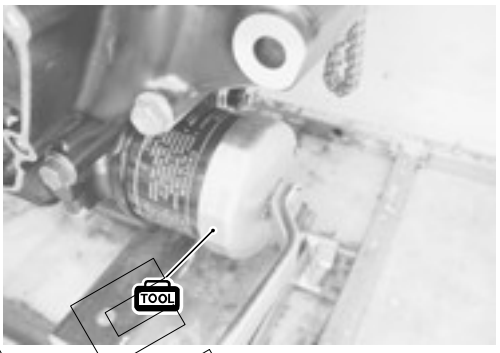
- Install the neutral switch.
- Install the oil pressure switch lead wire.



OIL FILTER

- Apply engine oil lightly to the gasket of the oil filter before installation.
- Install the oil filter turning it by hand until feeling that the filter gasket contacts the mounting surface. Then tighten it 2 turns using the oil filter wrench. (20 N·m, 2.0 kgf-m, 14.5 lb-ft)

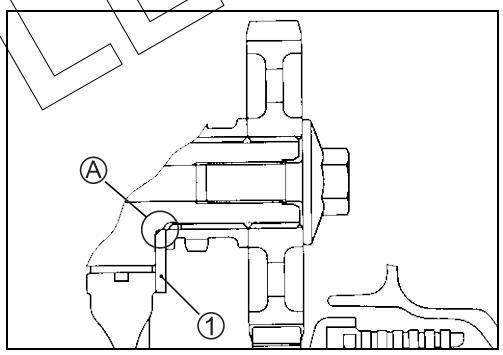
09915-40610: Oil filter wrench



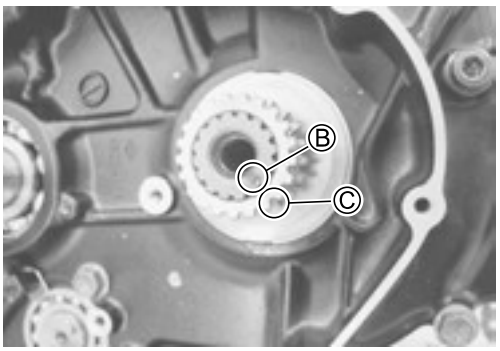
PRIMARY DRIVE GEAR

- Install the thrust washer ① onto the crankshaft.

NOTE:
The chamfer side Ⓐ of thrust washer ① face crankcase side.

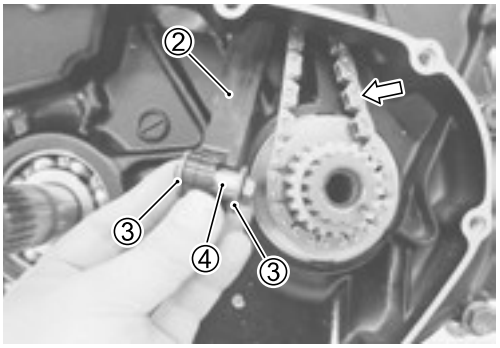


- Align the punch mark Ⓑ on the crankshaft with the punch mark Ⓒ on the camshaft drive sprocket.



- Install the cam chain, cam chain tensioner ②, washers ③ and spacer ④.
- Tighten the cam chain tensioner bolt to the specified torque.

Cam chain tensioner bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

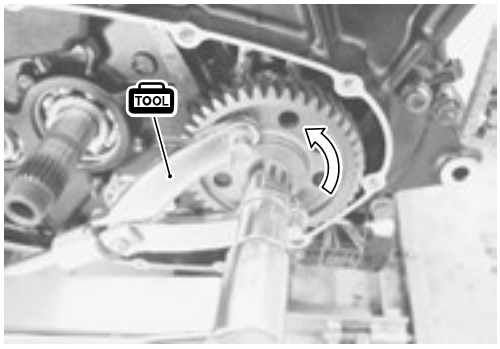


- Install the primary drive gear and tighten the primary drive gear bolt to the specified torque with the special tool.

Primary drive gear bolt: 95 N·m (9.5 kgf-m, 68.5 lb-ft)

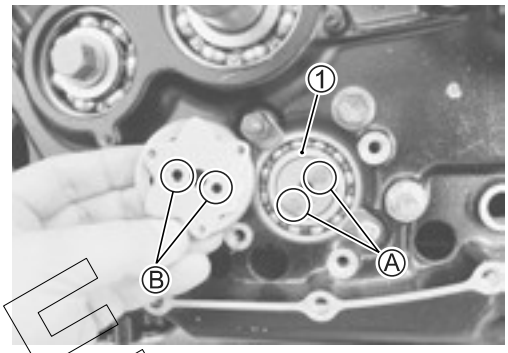
09930-40113: Rotor holder

NOTE:
This bolt has left-hand thread.



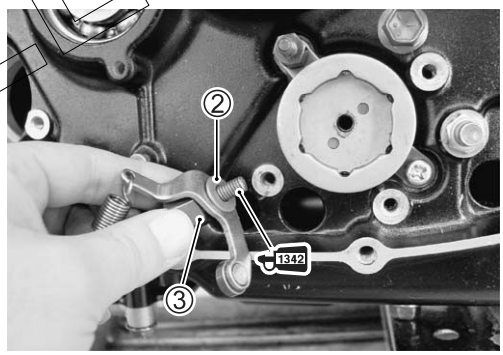
GEARSHIFT

- Install the washer ①.
- Install the gearshift cam stopper plate after aligning the gearshift cam pins Ⓐ with the gearshift cam stopper plate holes Ⓑ.

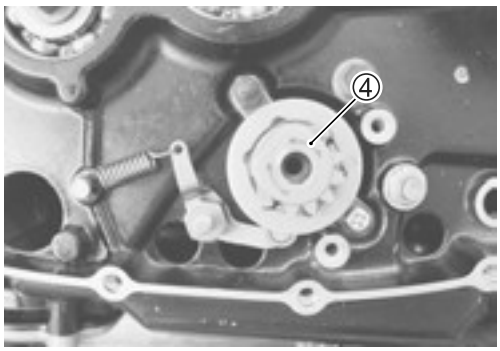


- Install the washer ②.
- Apply a small quantity of THREAD LOCK "1342" to the gearshift cam stopper bolt ③ and tighten it.

99000-32050: THREAD LOCK "1342"

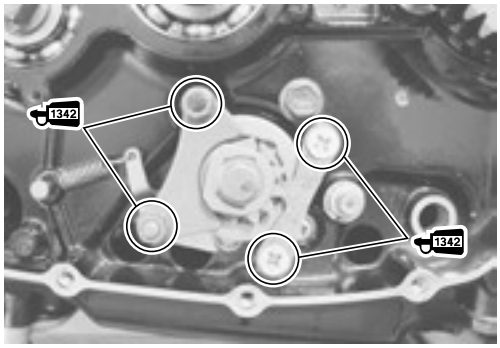


- Install the cam driven gear ④ after installing the springs, pins and gearshift pawls.

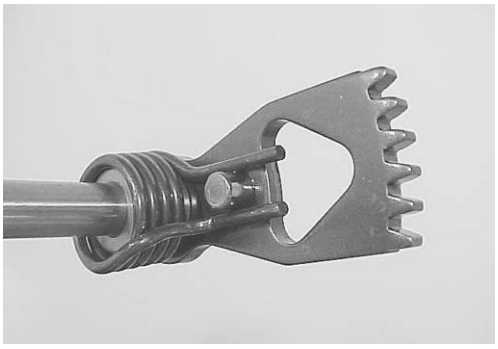


- Install the cam guide and the pawl lifter.
- Apply a small quantity of THREAD LOCK "1342" to the nuts.

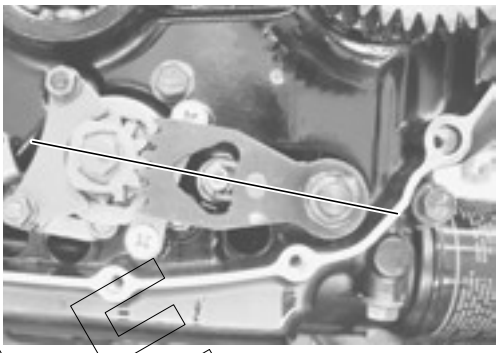
99000-32050: THREAD LOCK "1342"



• Install the gearshift return spring properly.



• Install the gearshift shaft with the center of shift gear on the shaft aligned the center of gearshift cam driven gear.



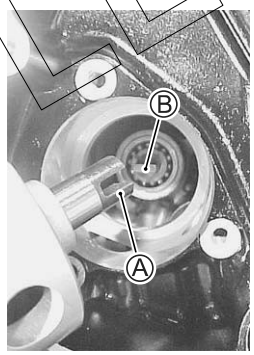
OIL PUMP

• Install the oil pump.

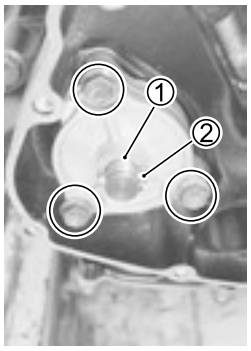
Oil pump mounting bolt: 11 N·m (1.1 kgf-m, 8 lb-ft)

NOTE:

Set the oil pump shaft end Ⓐ to the water pump shaft Ⓑ.

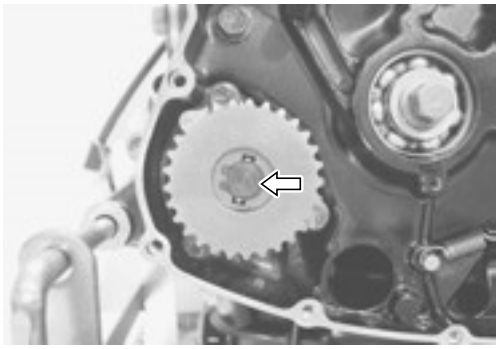


• Install the washer ① and pin ②.



• Install the oil pump driven gear and the snap ring.

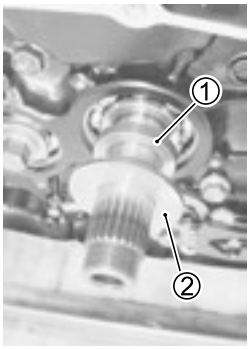
09900-06107: Snap ring pliers



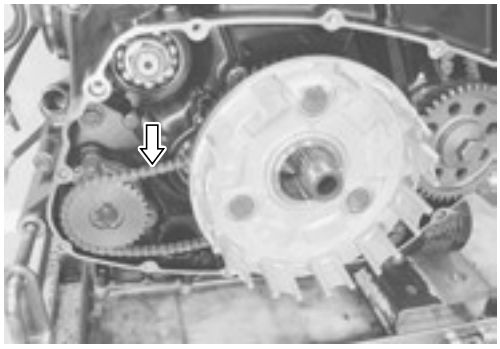
CLUTCH

• Install the spacer ① and the thrust washer ②.

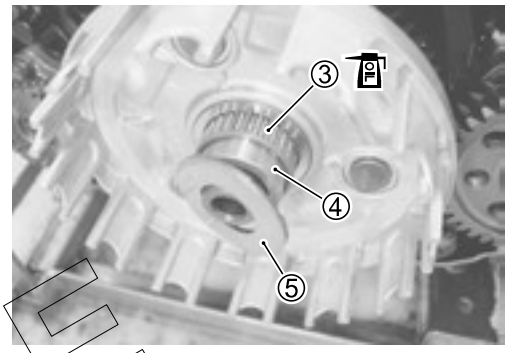
• Engage the chain with the oil pump drive gear.



- Install the primary driven gear assembly and engage the chain with the oil pump driven gear.

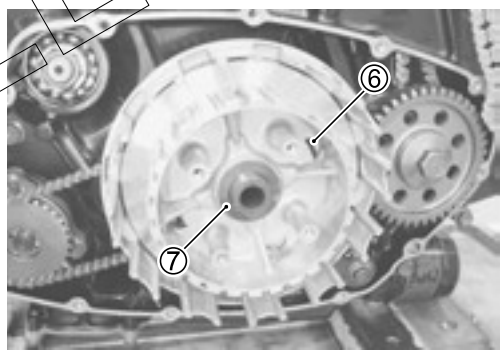


- Apply engine oil to the primary driven gear bearing ③ and install it.
- Install the spacer ④ and thrust washer ⑤.



- Install the clutch sleeve hub ⑥ and washer ⑦.

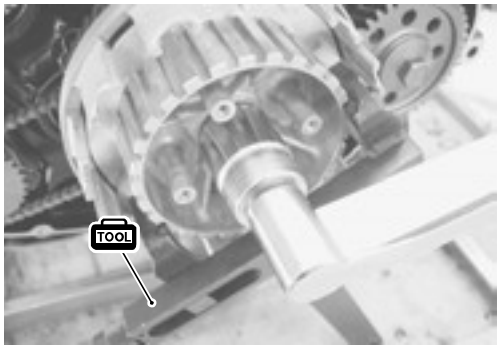
NOTE:
The convex side of the washer ⑦ faces outside.

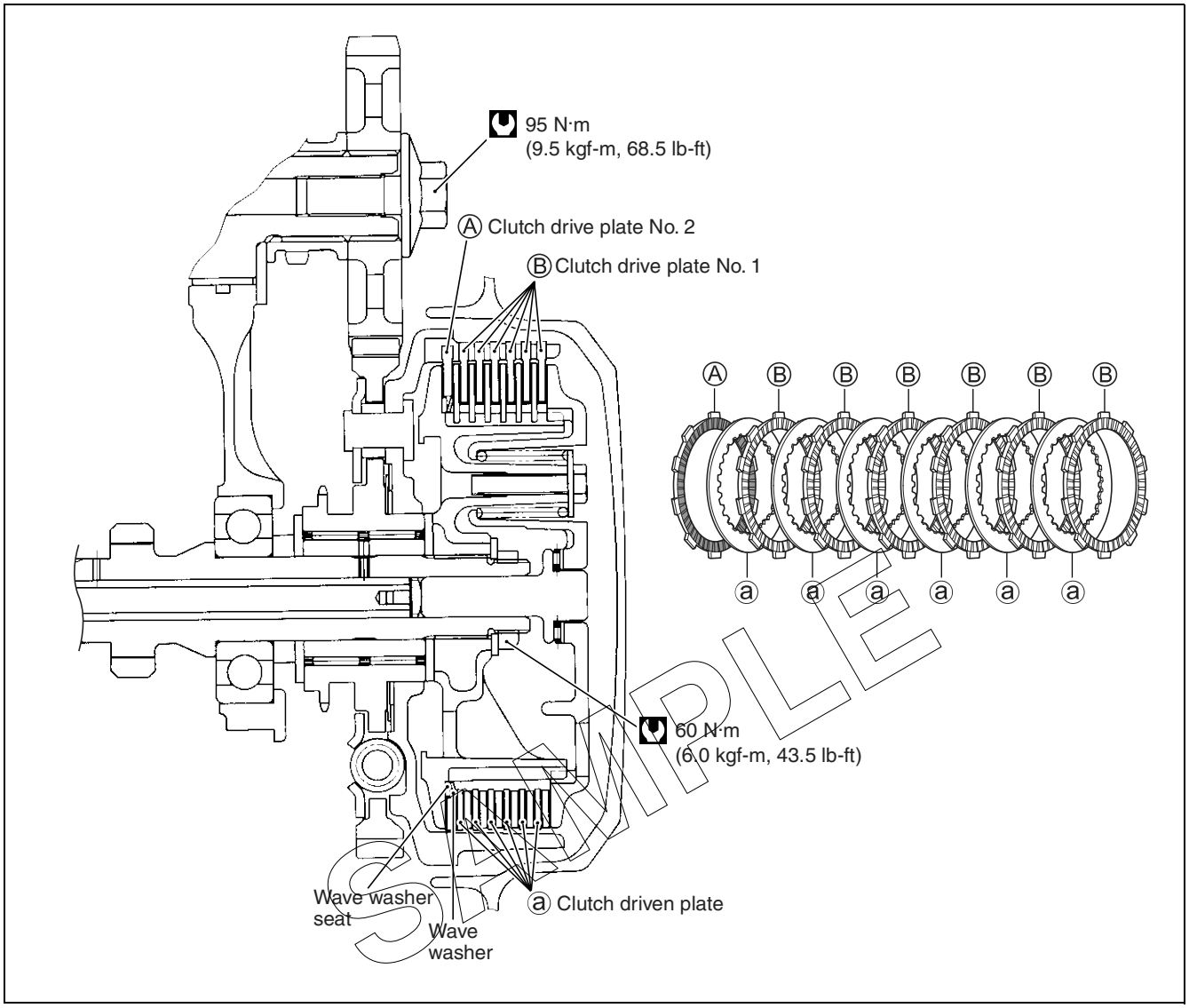


- Tighten the clutch sleeve hub nut to the specified torque with the special tool.

Clutch sleeve hub nut: 60 N·m (6.0 kgf-m, 43.5 lb-ft)

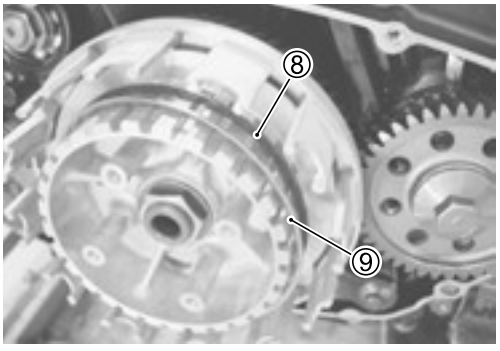
09920-53740: Clutch sleeve hub holder



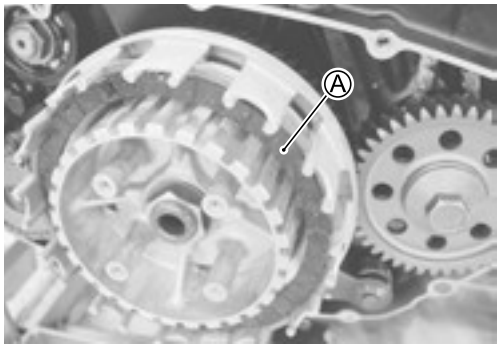


Ⓐ No. 2 Drive plate
Thickness: 3.5 mm (0.14 in) .....1 pc.
Ⓑ No. 1 Drive plate
Thickness: 3.0 mm (0.12 in) .....6 pcs.
ⓐ Driven plate .....6 pcs.

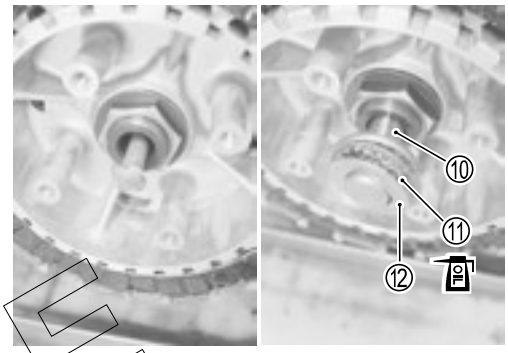
- Install the wave washer seat ⑧ and the wave washer ⑨.



- Install the clutch drive plate No. 2 Ⓐ first.
- Install the drive and driven plate one by one into the clutch sleeve hub.

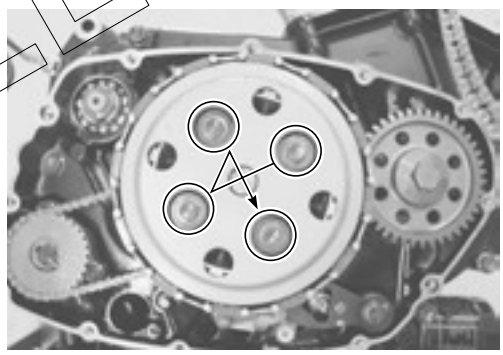


- Install the push rod.
- Install the clutch push piece ⑩, bearing ⑪ and thrust washer ⑫.
- Apply engine oil to the bearing.

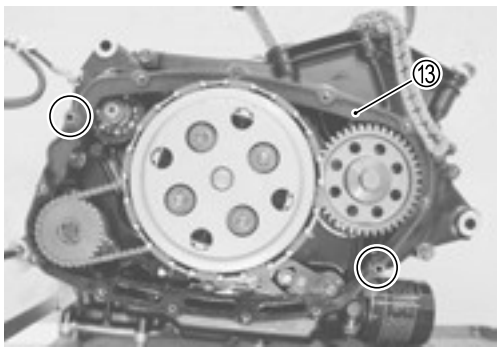


- Install the springs and tighten the clutch spring set bolts diagonally to the specified torque.

Clutch spring set bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

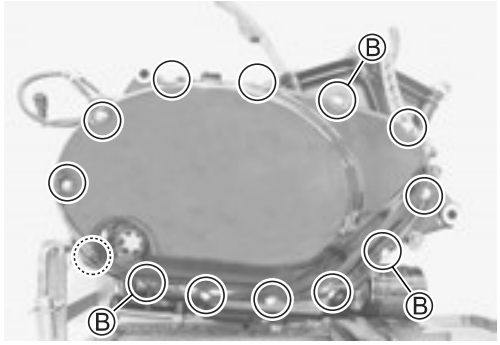


- Install the new gasket ⑬ and dowel pins.



- Install the clutch cover and tighten the bolts.

NOTE:
Fit the new gaskets to the bolts Ⓑ.

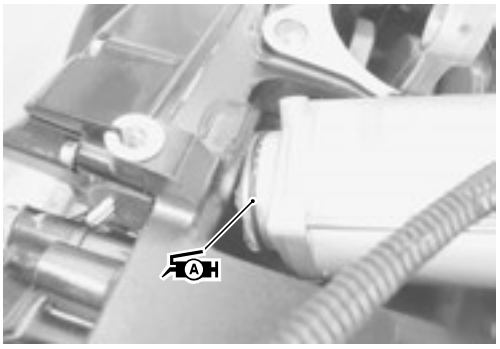


STARTER MOTOR

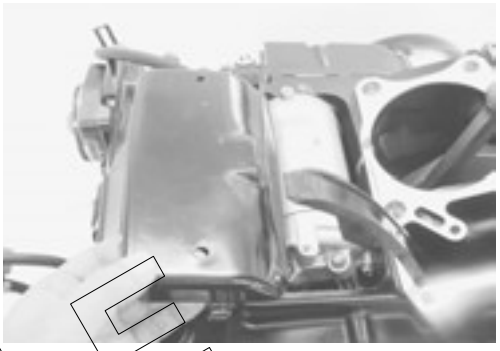
- Install the starter motor.

NOTE:
Apply grease to the new O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Install the starter motor cover.



OIL JET

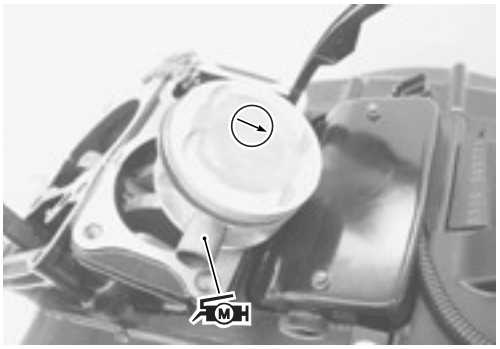
- Apply engine oil to the new O-ring and install the oil jets.

PISTON

- Apply a light coat of SUZUKI MOLY PASTE to the piston pins.

99000-25140: SUZUKI MOLY PASTE

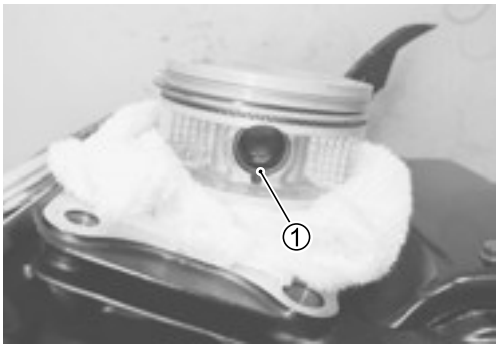
- When installing the piston, the arrow mark on the piston head is located to the exhaust side.



- Place a cloth beneath the piston, and install the circlip ①.

CAUTION

When turning the crankshaft, pull the cam chains upward, or the chains will be caught between the crankcase and the cam drive sprocket.



CYLINDER

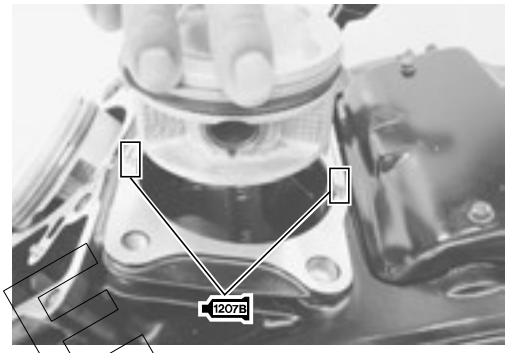
- Install the cam chain tension adjuster to the cylinder.
- After unlocking the ratchet, push the cam chain tension adjuster rod.
- Insert the special tool between the ratchet and the adjuster body.

09918-53810: Chain tensioner lock tool

Cam chain tension adjuster mounting bolt:
10 N·m (1.0 kgf-m, 7.0 lb-ft)

- Coat SUZUKI BOND "1207B" lightly to the mating surfaces among the crankcase mating surfaces.

99000-31140: SUZUKI BOND "1207B"



- Fit the dowel pins and the new gasket ①.

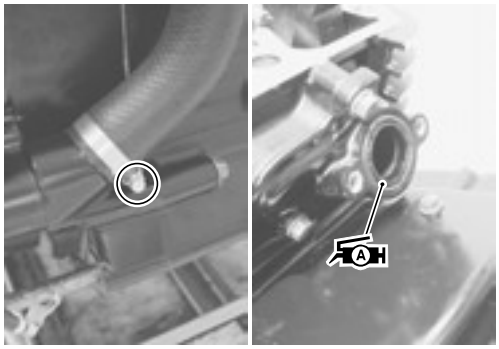
CAUTION

Use a new gasket to prevent gas leakage.

- Install the cylinder. (Rear cylinder)
- Install the water hose and pipe.

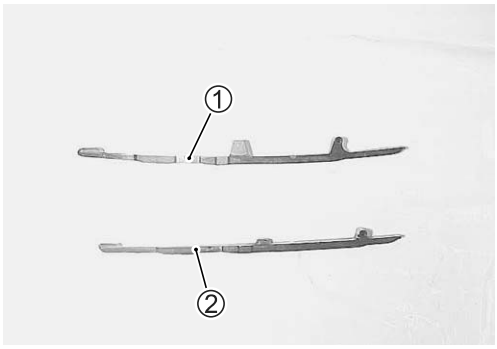
NOTE:
Apply grease to the new O-ring.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



CYLINDER HEAD

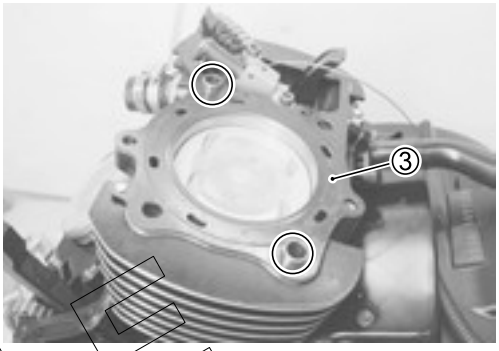
- Install the cam chain guide.
  ① For front cylinder
  ② For rear cylinder



- Fit the dowel pins and the new gasket ③.

CAUTION

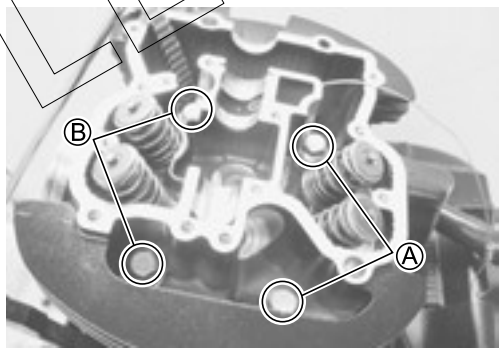
Use a new gasket to prevent gas leakage.



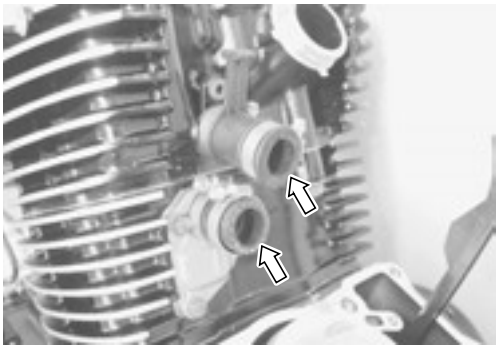
- Install the cylinder head and tighten the cylinder head bolts diagonally to the specified torque. (Rear cylinder)

Cylinder head bolt (M10):
Initial: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final : 38 N·m (3.8 kgf-m, 27.5 lb-ft)

NOTE:
Bolt Ⓐ: 165 mm (6.5 in)
Bolt Ⓑ: 155 mm (6.1 in)



- Install the water hoses to the rear cylinder.

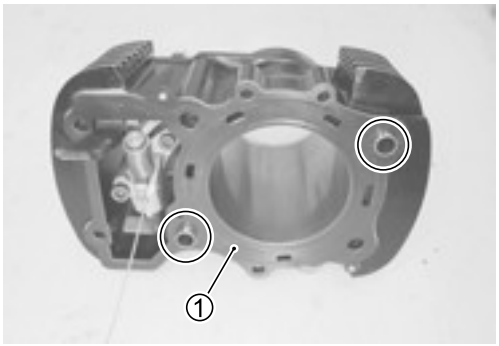


FRONT CYLINDER

- Fit the dowel pins and new gasket ①.

CAUTION

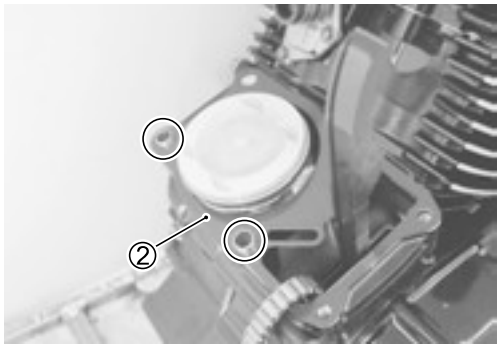
Use a new gasket to prevent gas leakage.



• Fit the dowel pins and the new gasket ②.

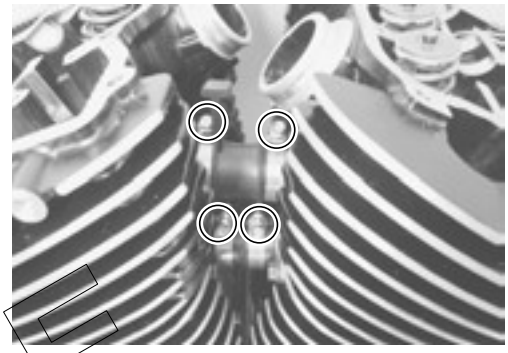
CAUTION

Use a new gasket to prevent gas leakage.



• Install the front cylinder assembly to the crankcase.

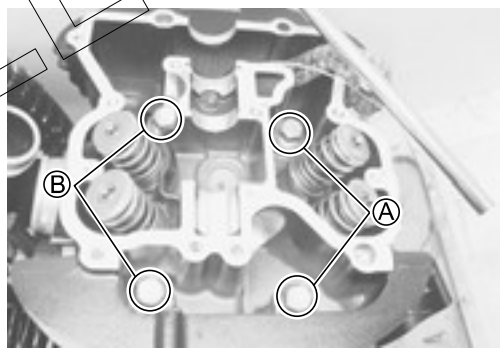
• Connect the water hoses.



• Tighten the cylinder head bolts diagonally to the specified torque.

Cylinder head bolt (M10):
Initial: 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final : 38 N·m (3.8 kgf-m, 27.5 lb-ft)

NOTE:
Bolt Ⓐ: 165 mm (6.5 in)
Bolt Ⓑ: 155 mm (6.1 in)

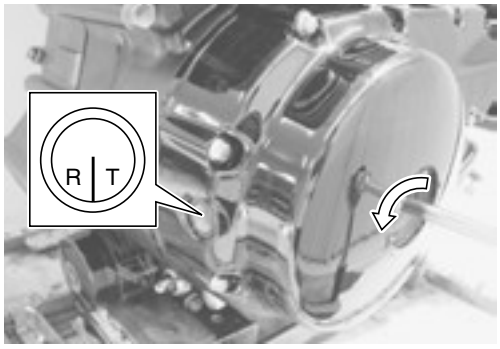


CAMSHAFT

• Position "R I T" mark on the generator rotor with the center of the valve timing inspection hole.

CAUTION

Pull the cam chains upward, or the chain will be caught between crankcase and cam drive sprocket.

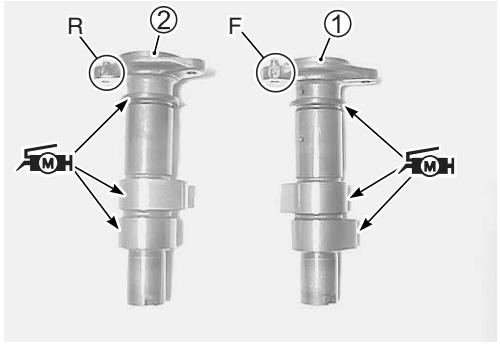


• Before installing the camshafts onto each cylinder head, apply SUZUKI MOLY PASTE onto the camshaft journals. Also, apply engine oil onto the camshaft journal holders.

99000-25140: SUZUKI MOLY PASTE

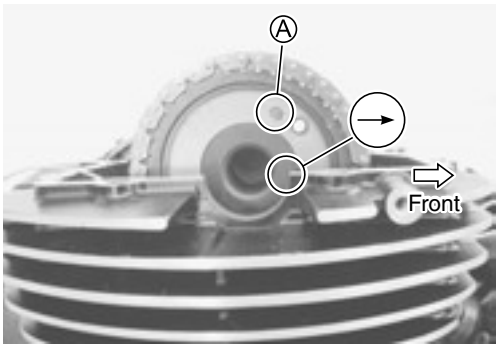
NOTE:
The camshaft is identified by the embossed letters "F" and "R".

① Front cam shaft
② Rear cam shaft



- Align the arrow marks on the front and rear camshafts so it is parallel with the surface of the cylinder heads.

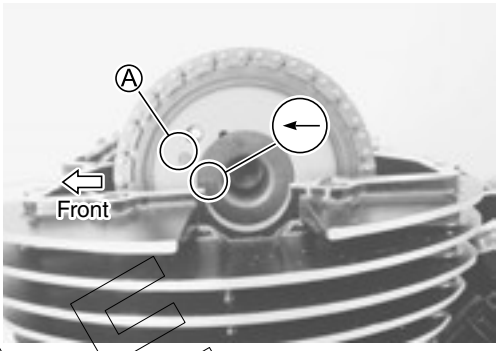
NOTE:
Arrow marks are located to forward.



- Engage the chains on the cam sprockets with the locating pin holes Ⓐ as shown in the photograph.

NOTE:
Do not rotate the generator rotor while doing this. When the sprocket is not positioned correctly, turn the sprocket.

- Recheck the position of the "R I T" mark on the generator rotor, arrow mark on the No. 1 (Rear) camshaft and arrow mark on the No. 2 (Front) camshaft.

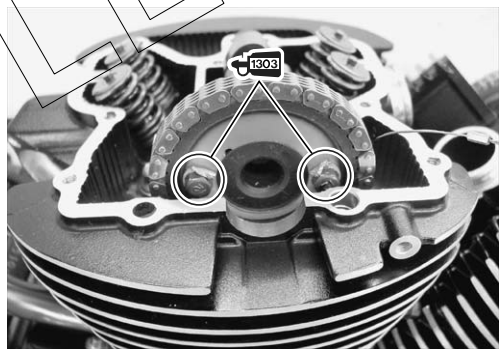


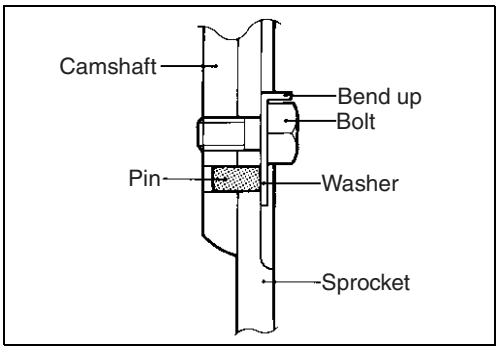
- Install the lock washer so that it is covering the locating pin.
- Apply THREAD LOCK SUPER "1303" to the bolts and tighten them to the specified torque.

Cam chain sprocket bolt: 15 N·m (1.5 kgf-m, 11.0 lb-ft)

1303 99000-32030: THREAD LOCK SUPER "1303"

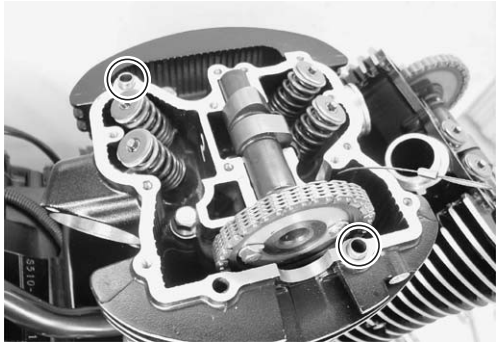
- Bend up the washer tongue positively to lock the bolts.





CYLINDER HEAD COVER

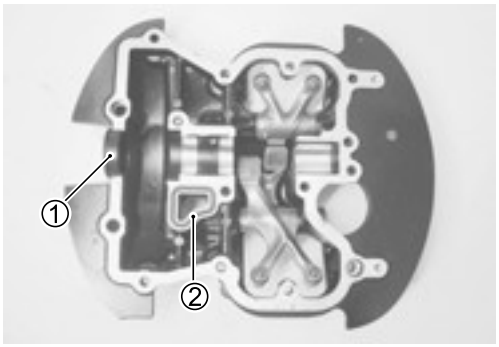
- Clean the mating surfaces of the cylinder head and head cover before matching.
- Install the dowel pins to the cylinder head.

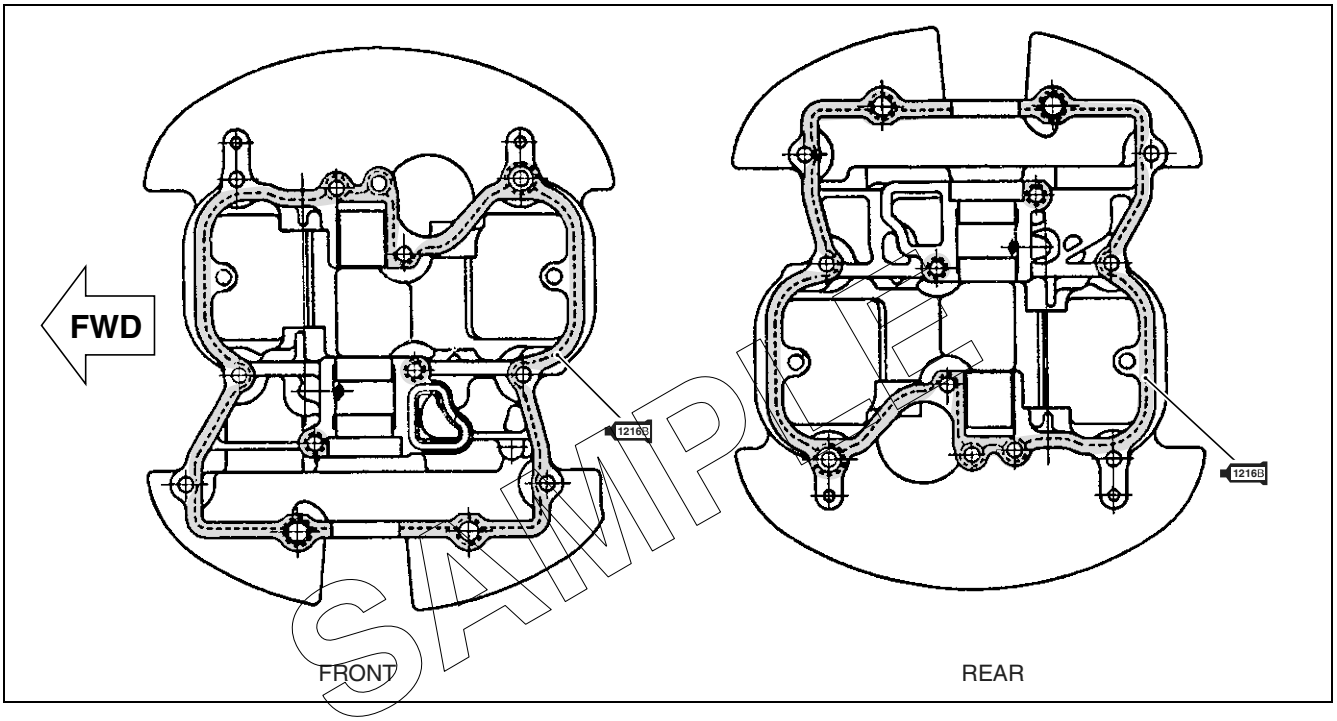


- Apply SUZUKI BOND “1216B” to the mating surface of the cylinder head cover.
- Fit the camshaft end caps ①.
- Apply grease to the new O-ring ② and install it. (Front cylinder only)

99000-31230: SUZUKI BOND “1216B”

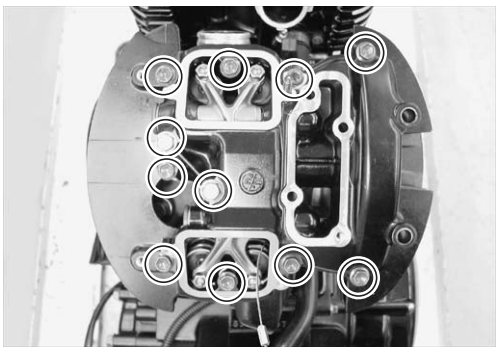
99000-25030: SUZUKI SUPER GREASE “A” (USA)
99000-25010: SUZUKI SUPER GREASE “A” (Others)



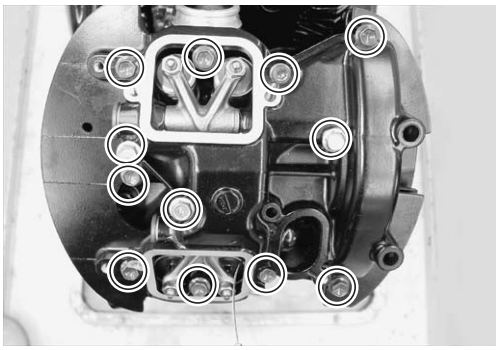


- Lightly tighten the cylinder head cover bolts diagonally, and then if everything is satisfactory, tighten securely with a torque wrench to the specified torque.

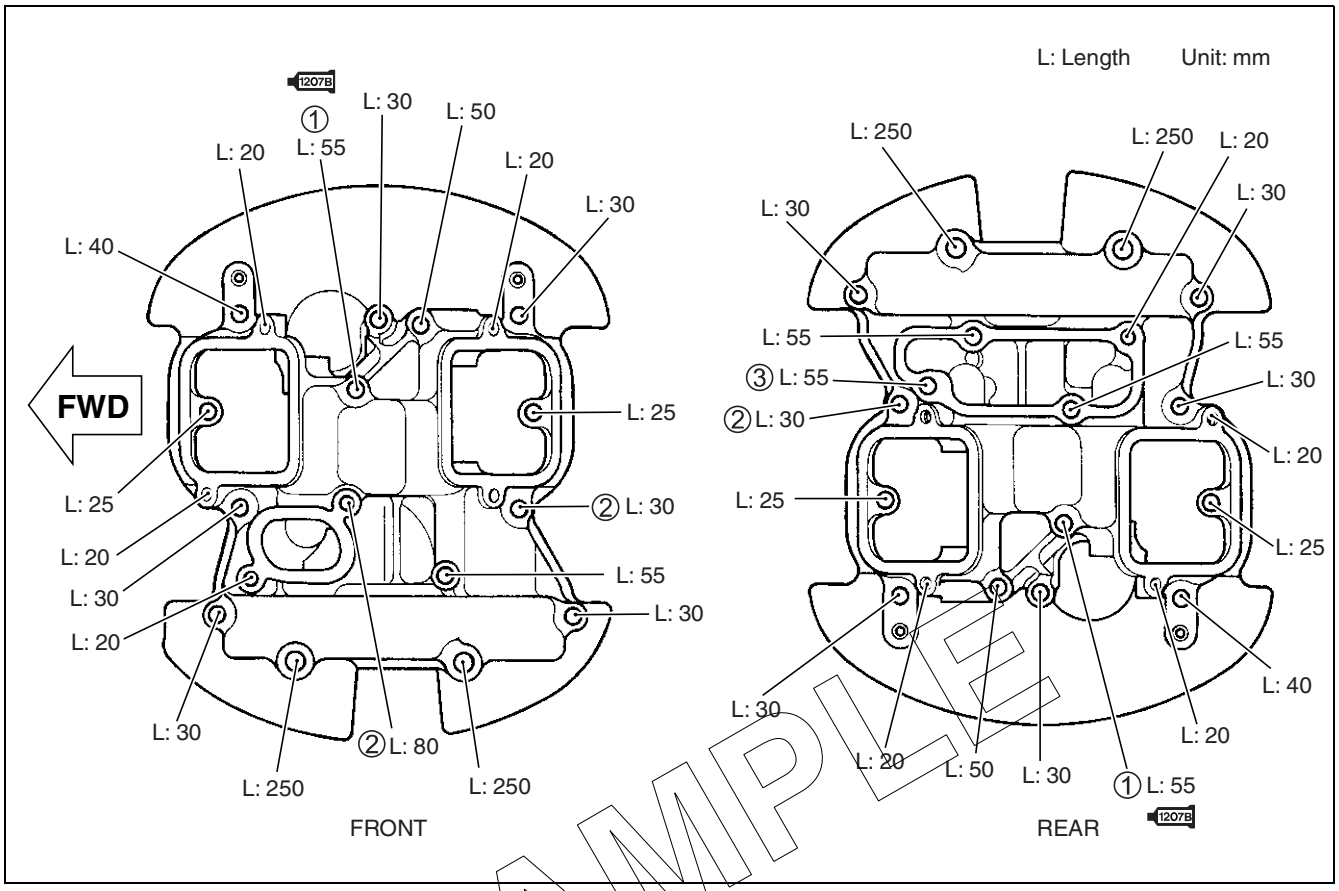
Cylinder head cover bolt
(M6): 10 N·m (1.0 kgf-m, 7.0 lb-ft)
(M8): 25 N·m (2.5 kgf-m, 18.0 lb-ft)



NOTE:
When tightening the cylinder head cover bolts, the piston must be at top dead center on the compression stroke.
(☞3-12 and -13)



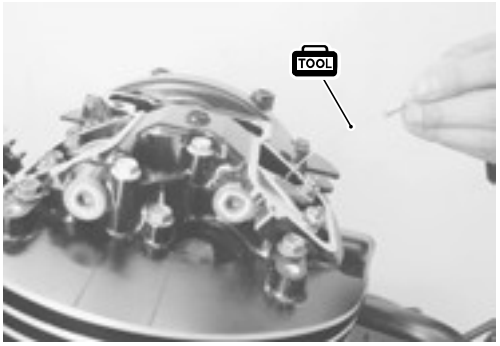
LOCATION OF CYLINDER HEAD COVER BOLT

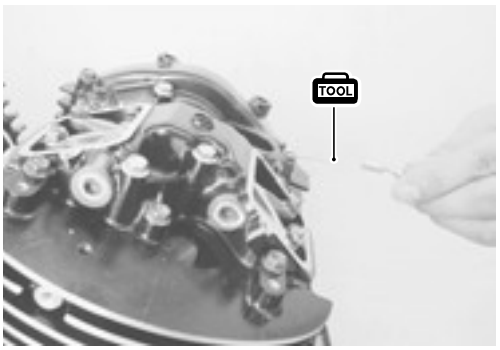


NOTE:
** Before installing the bolt ①, apply SUZUKI BOND "1207B" to the thread of the bolt.*
** Allen bolt: ②*
** Fit the gasket to the bolt ③.*

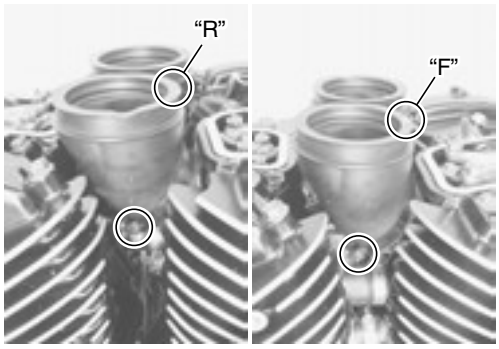
- Remove the tensioner lock tools.

NOTE:
Click sound is heard when the cam chain tension adjuster is released.





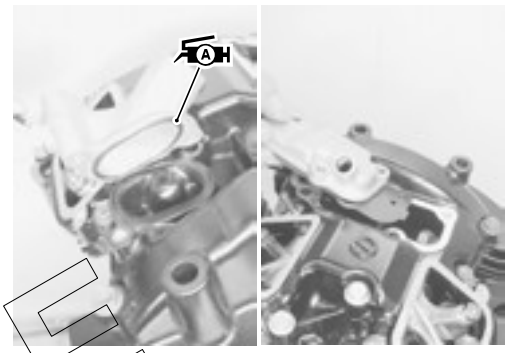
- Install the intake pipe.



- Apply grease to the new O-ring and install the water outlet union.

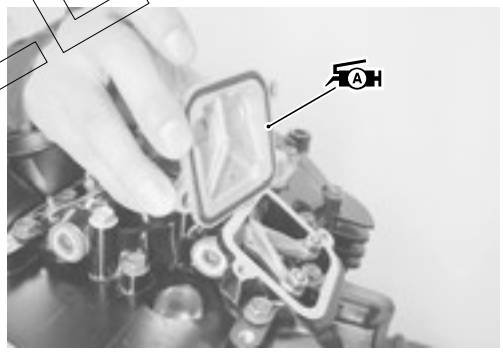
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Install the gasket and the breather cover.

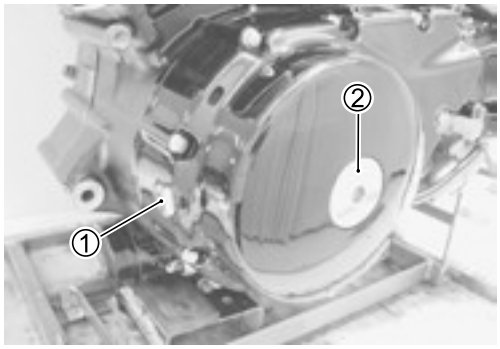


- Apply grease to the new O-rings and install the valve inspection caps.

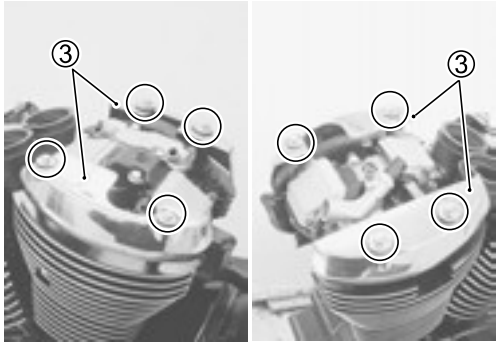
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Install the valve timing inspection plug ① and the generator cover cap ②.

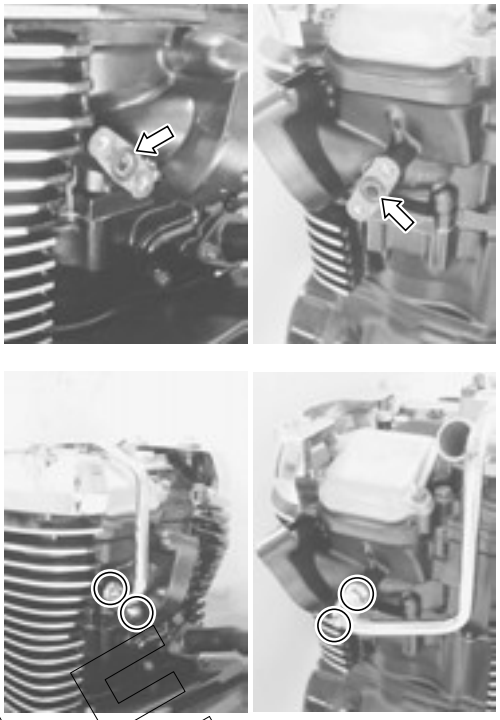


- Install the head cover caps ③.



- Install the new gaskets.
- Install the PAIR pipes.
- Install the spark plugs.

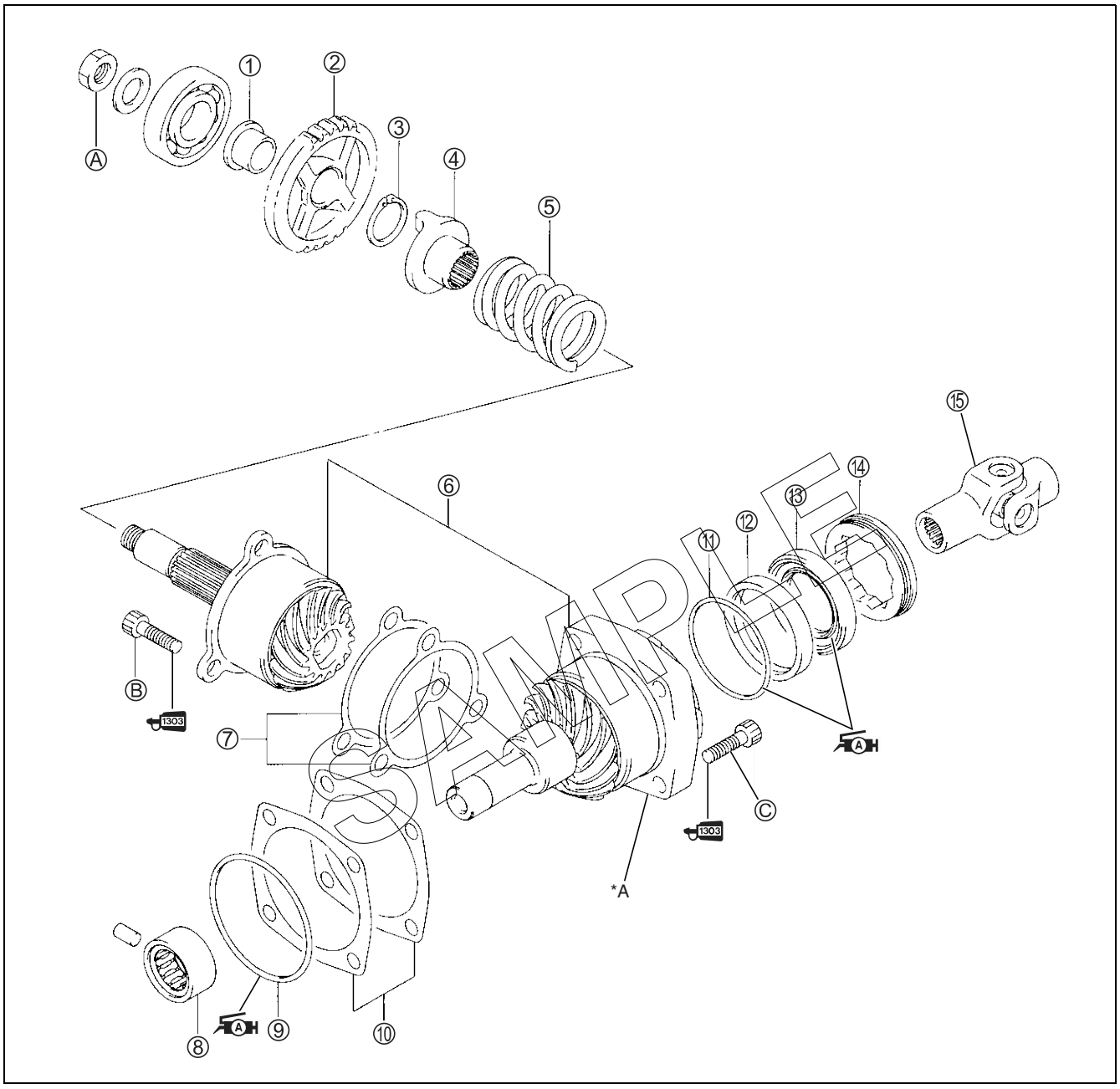
TOOL 09930-10121: Spark plug wrench set



SHAFT DRIVE

CONTENTS

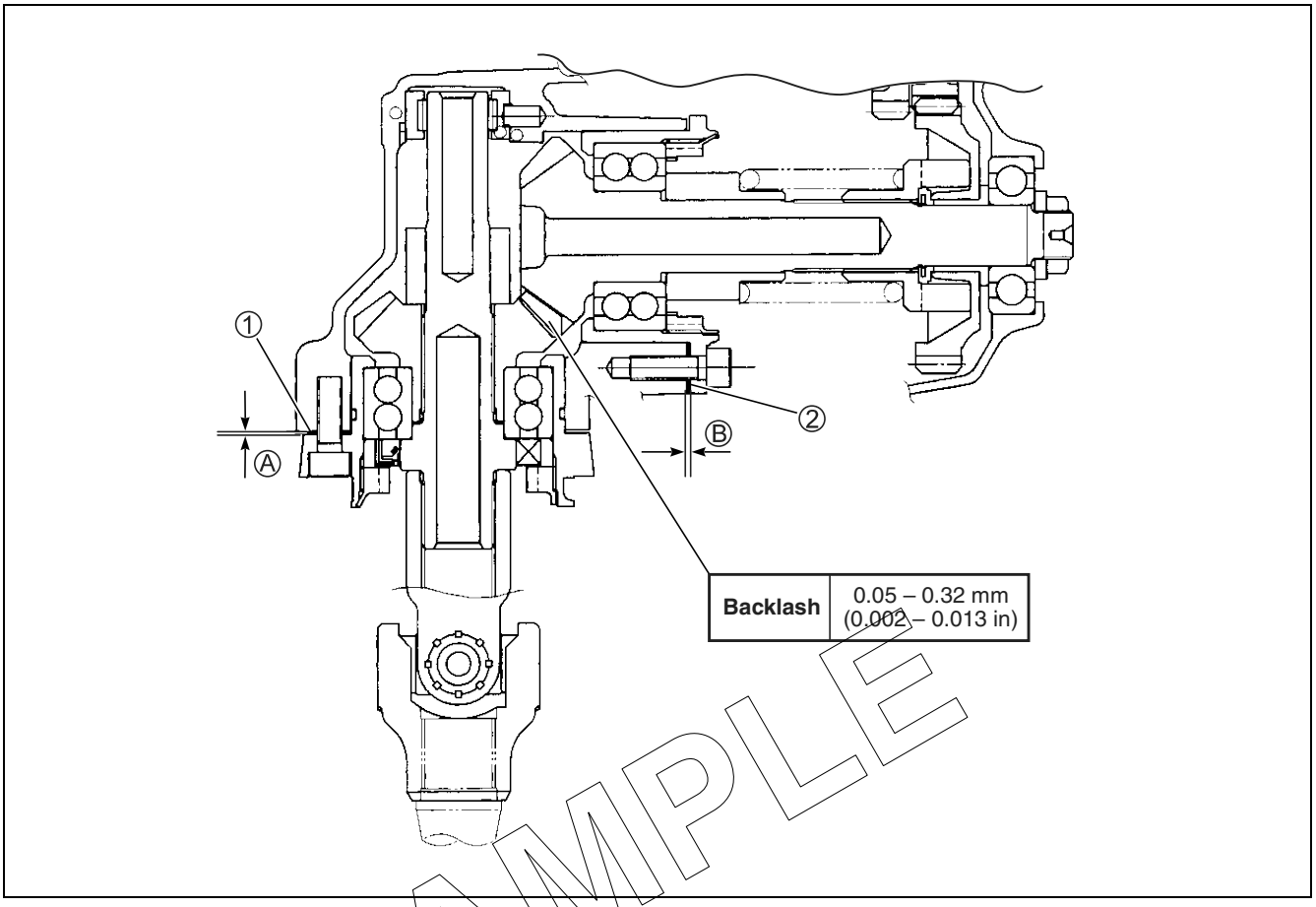
SECONDARY BEVEL GEARS
CONSTRUCTION



①	Bush	⑦	Shims (5 kinds)	⑬	Oil seal
②	Overdriving driven gear	⑧	Driven bevel gear bearing	⑭	Bearing stopper
③	Circlip	⑨	O-ring	⑮	Universal joint
④	Output cam dog	⑩	Shims (5 kinds)	Ⓐ	Secondary drive gear shaft nut
⑤	Damper spring	⑪	O-ring	Ⓑ	Secondary drive bevel gear bearing retainer bolt
⑥	Secondary bevel gear set	⑫	Oil seal housing	Ⓒ	Secondary driven bevel gear bolt

* A: Do not disassemble the secondary driven gear.

ITEM	N·m	kgf-m	lb-ft
Ⓐ	105	10.5	76.0
Ⓑ, Ⓒ	23	2.3	16.5



Standard clearance Ⓐ: 1.00 mm (0.039 in)
Ⓑ: 1.00 mm (0.039 in)

Adjust backlash by selecting shims. (Use two pieces of shims.)
Shim ① size table

Part number	Thickness
24945-05A-0A0	0.30 mm (0.012 in)
24945-05A-0B0	0.35 mm (0.014 in)
24945-05A-0C0	0.40 mm (0.016 in)
24945-05A-0D0	0.50 mm (0.020 in)
24945-05A-0E0	0.60 mm (0.024 in)

The shims ① are available as a set (24945-05810).

Shim ② size table

Part number	Thickness
24935-38A01-030	0.30 mm (0.012 in)
24935-38A01-035	0.35 mm (0.014 in)
24935-38A01-040	0.40 mm (0.016 in)
24935-38A01-050	0.50 mm (0.020 in)
24935-38A01-060	0.60 mm (0.024 in)

The shims ② are available as a set (24935-38810).

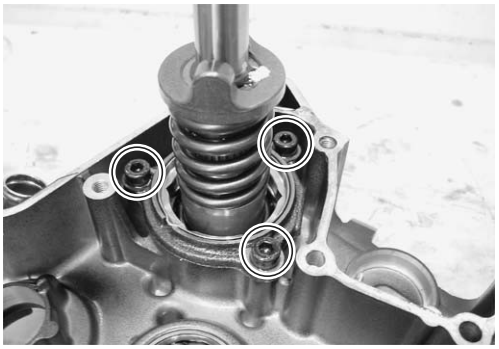
REMOVAL

SECONDARY DRIVE BEVEL GEAR

The crankcase must be separated to service the secondary drive bevel gear. The secondary drive bevel gear service requires engine removal and disassembly. Refer to the engine removal and the engine disassembly sections for secondary drive bevel gear assembly removal.

Engine removal ☞3-3

Engine disassembly ☞3-11



SECONDARY DRIVEN BEVEL GEAR

The following components must be removed in the described order before removing the secondary driven bevel gear.

NOTE:

Refer to the following pages for the details of each step.

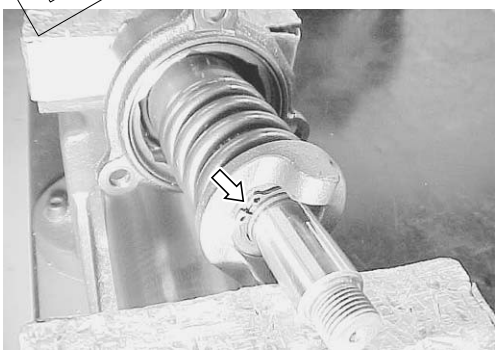
- Remove the rear wheel. (☞8-33)
- Remove the swingarm. (☞8-40)
- Remove the universal joint.
- Remove the secondary driven bevel gear.

DISASSEMBLY

SECONDARY DRIVE BEVEL GEAR

- Compress the damper spring with a vice, and remove the snap ring with the special tool.

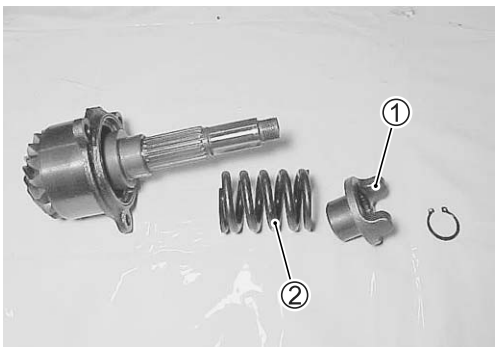
TOOL **09900-06107: Snap ring pliers**



- Remove the cam dog ① and damper spring ②.

CAUTION

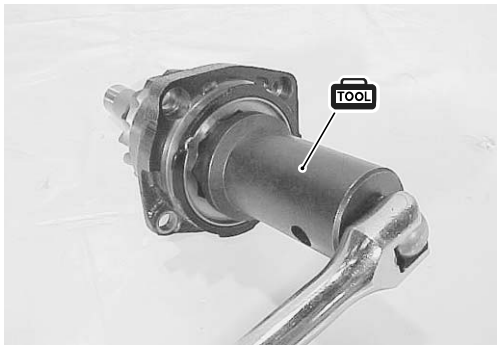
Do not attempt to remove the secondary drive bevel gear bearing. The secondary drive bevel gear and its bearing are available only as an assembly.



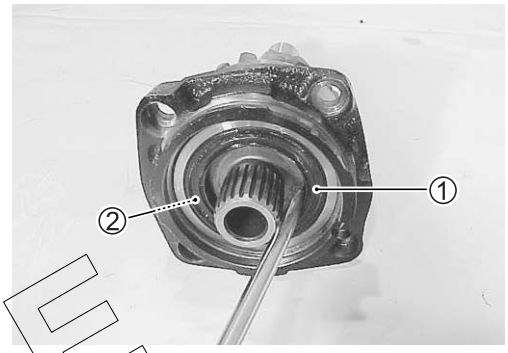
SECONDARY DRIVEN BEVEL GEAR

- Remove the bearing stopper with the special tool.

TOOL 09921-21820: Bearing retainer wrench



- Remove the oil seal ① and O-ring ②.



INSPECTION

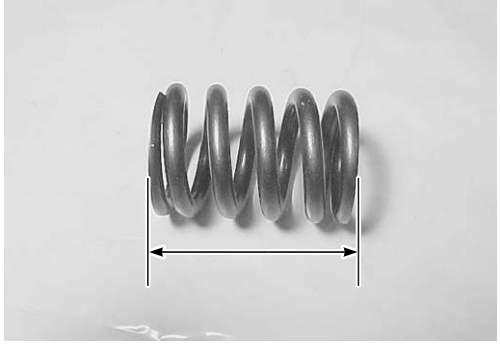
Inspect the removed parts for the following abnormalities.

* Drive and driven bevel gears damage or wear
* Improper tooth contact
* Abnormal noise of bearings
* Bearing damage or wear
* Oil seal damage or wear
* Output cam dog wear or damage
* Universal joint spline damage or wear

DAMPER SPRING

Measure the free length of the damper spring. If the length is shorter than the service limit, replace the spring with a new one.

DATA Damper spring free length
Service limit: 58.5 mm (2.30 in)



SECONDARY GEAR SHIMS ADJUSTMENT

BACKLASH

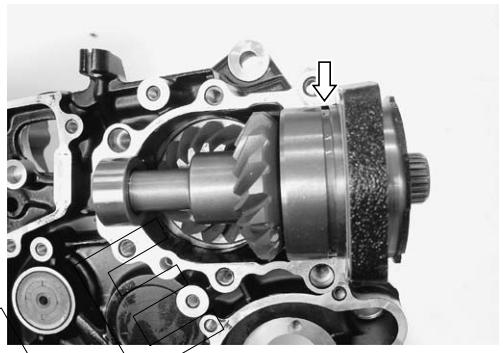
- Install the secondary drive bevel gear assembly with the removed shims and tighten the bolts to the specified torque.

Secondary drive bevel gear bearing retainer bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)

NOTE:
When replacing the secondary drive and driven bevel gears, install the removed shims to the secondary drive bevel gear assembly and tighten the bolts to the specified torque.

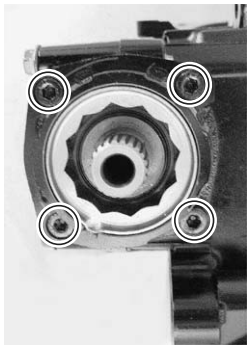
- Install the secondary driven bevel gear assembly with removed shims, the driven bevel gear bearing and secondary gear case.

NOTE:
Do not install the O-ring on the driven gear housing at this stage. O-ring is installed after backlash and tooth contact are correct.

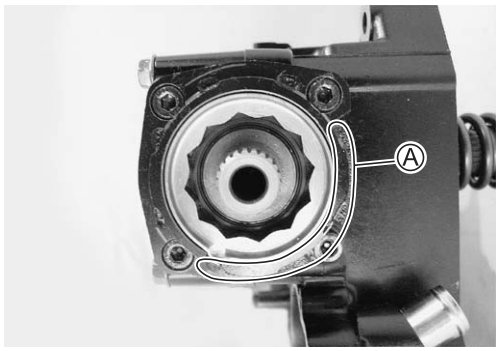


- Tighten the secondary bevel gear case bolts and secondary driven bevel gear bolts to the specified torque.

Secondary bevel gear case bolt:
22 N·m (2.2 kgf-m, 16.0 lb-ft)
Secondary driven bevel gear bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)

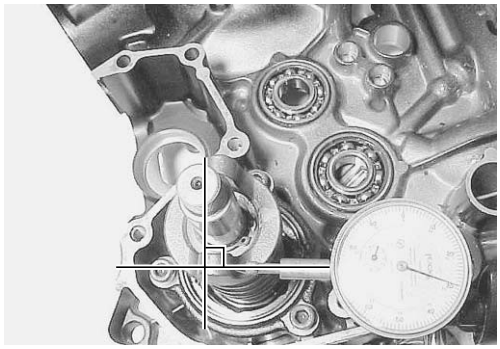


NOTE:
** Hollow portion Ⓐ of the secondary driven bevel gear assembly faces inside.*
** It is not necessary to apply SUZUKI BOND "1207B" to the matching surface at this stage.*

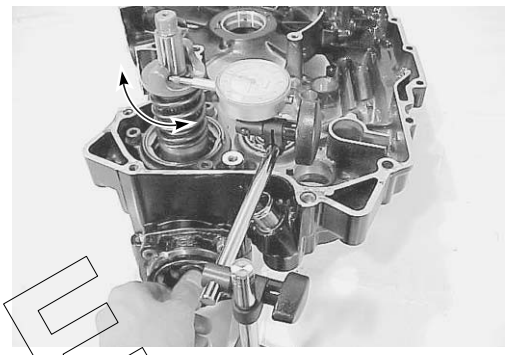


- Measure the backlash as follows.
- Set-up a dial gauge as shown in photo.

TOOL 09900-20606: Dial gauge (1/100 mm, 10 mm)
09900-20701: Magnetic stand



- Adjust the dial gauge so that it touches the secondary drive bevel gear cam dog; hold the driven bevel gear securely, and turn the drive bevel gear in each direction, reading the total backlash on the dial gauge.



DATA Secondary bevel gear backlash
Standard: 0.05 – 0.32 mm (0.002 – 0.013 in)

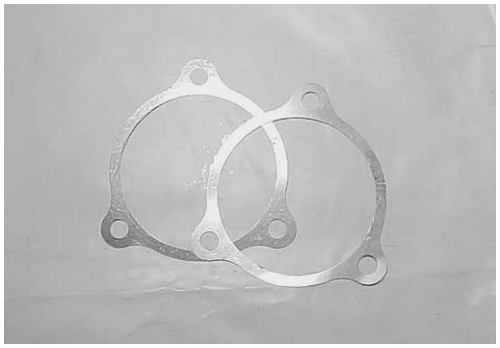
NOTE:
When measuring backlash, hold the left crankcase horizontally pull the secondary drive gear to take the bearing play out.

- If the backlash is not within specification, the shims (Driven bevel gear side) must be changed and the backlash should be re-checked until correct.
  Refer to the chart for appropriate changes.

NOTE:
When changing the shims (Driven bevel gear side), measure the thickness of old shims. Using the thickness of the old shims as a guide, adjust the backlash by referring to the chart.

Backlash	Shim adjustment
Under 0.05 mm (0.002 in)	Increase shim thickness
0.05 – 0.32 mm (0.002 – 0.013 in)	Correct
Over 0.32 mm (0.013 in)	Decrease shim thickness

SHIM SPECIFICATIONS
Drive bevel gear side



Part No.	Shim thickness
24935-38A01-030	0.30 mm (0.012 in)
24935-38A01-035	0.35 mm (0.014 in)
24935-38A01-040	0.40 mm (0.016 in)
24935-38A01-050	0.50 mm (0.020 in)
24935-38A01-060	0.60 mm (0.024 in)

NOTE:
The shims (drive bevel gear side) are available as a set (24935-38810).

Driven bevel gear side

Part No.	Shim thickness
24945-05A00-0A0	0.30 mm (0.012 in)
24945-05A00-0B0	0.35 mm (0.014 in)
24945-05A00-0C0	0.40 mm (0.016 in)
24945-05A00-0D0	0.50 mm (0.020 in)
24945-05A00-0E0	0.60 mm (0.024 in)

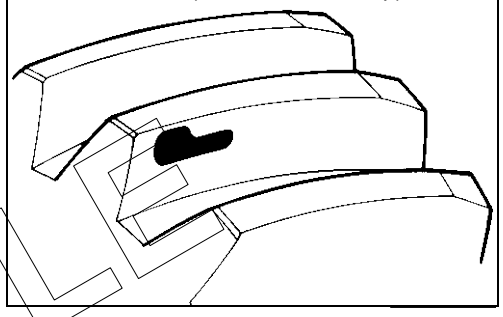
NOTE:
The shims (driven bevel gear side) are available as a set (24945-05810).

TOOTH CONTACT

After bringing the backlash within specification by changing the secondary driven bevel gear shims, it will be necessary to check tooth contact.

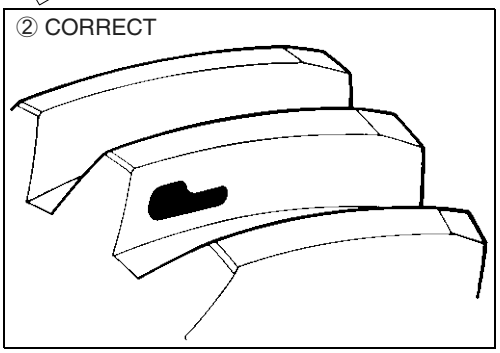
- Remove the drive bevel gear assembly from the crankcase.
- Clean and degrease the secondary drive bevel gear teeth, and apply a coating of machinist's layout dye or paste to several teeth.

① INCORRECT (Contact at tooth top)



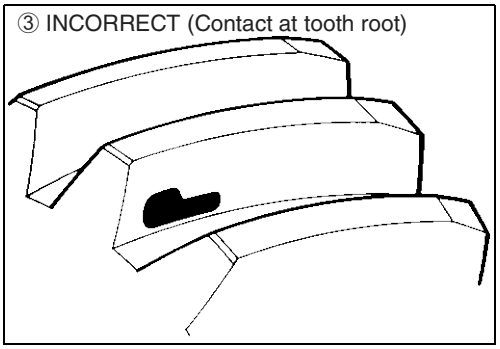
- Reinstall the secondary drive bevel gear assembly, with correct shim, onto the secondary gear housing.
- Rotate the secondary driven bevel gear several turns in both directions.
- Remove the secondary drive bevel gear from the crankcase, and observe the tooth contact pattern made in the dye or paste.
- Compare the tooth contact pattern to the examples as shown in ①, ② and ③.

② CORRECT



- If tooth contact is found to be incorrect, the shims of the secondary drive bevel gear and secondary driven bevel gear must be changed, tooth contact should be re-checked until correct.

③ INCORRECT (Contact at tooth root)



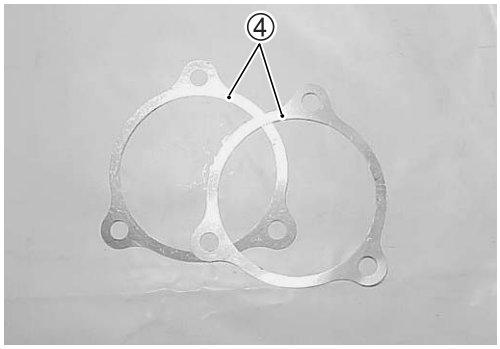
CAUTION

After the tooth contact adjustment is made, the backlash must be re-checked, as it may change. Refer to the backlash checking sub-section, and readjust until both backlash and tooth contact are correct.

Tooth contact	Shim adjustment
Contact at tooth top ①	Decrease thickness of shims ④ or ⑤
Contact at tooth root ③	Increase thickness of shims ④ or ⑤

SHIM SPECIFICATIONS

Drive bevel gear side

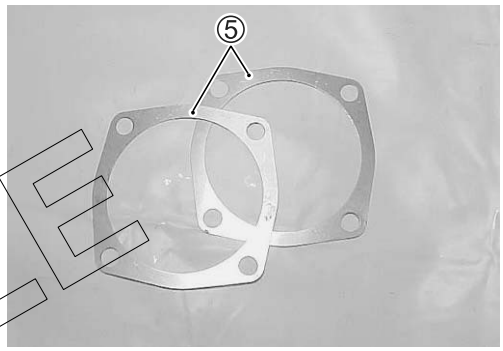


Part No.	Shim thickness
24935-38A01-030	0.30 mm (0.012 in)
24935-38A01-035	0.35 mm (0.014 in)
24935-38A01-040	0.40 mm (0.016 in)
24935-38A01-050	0.50 mm (0.020 in)
24935-38A01-060	0.60 mm (0.024 in)

NOTE:

The shims (drive bevel gear side) are available as a set (24935-38810).

Driven bevel gear side



Part No.	Shim thickness
24945-05A00-0A0	0.30 mm (0.012 in)
24945-05A00-0B0	0.35 mm (0.014 in)
24945-05A00-0C0	0.40 mm (0.016 in)
24945-05A00-0D0	0.50 mm (0.020 in)
24945-05A00-0E0	0.60 mm (0.024 in)

NOTE:

The shims (driven bevel gear side) are available as a set (24945-35810).

REASSEMBLY

SECONDARY DRIVEN BEVEL GEAR

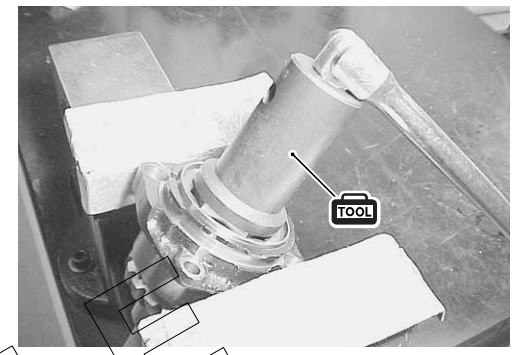
- Apply grease to the lip of oil seal.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Tighten the bearing stopper to the specified torque with the special tool.

Bearing stopper: 105 N·m (10.5 kgf-m, 76.0 lb-ft)

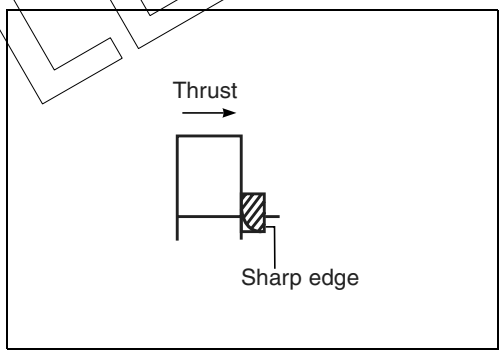
09921-21820: Bearing retainer wrench



SECONDARY DRIVE BEVEL GEAR

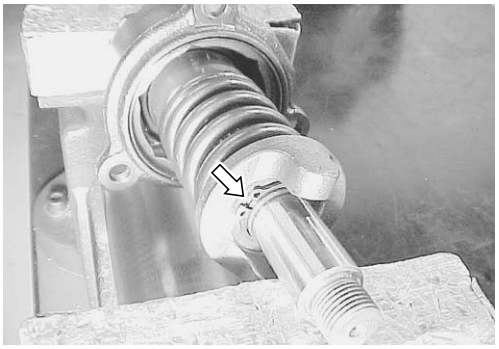
Reassemble the secondary drive bevel gear in the reverse order of disassembly. Pay attention to the following points.

- When installing a new circlip, pay attention to the direction of the snap ring. Fit the snap ring to the side where the thrust is, as shown in the illustration. The rounded side should be against the output cam dog surface.



CAUTION

*** Never reuse a snap ring. After a snap ring has been removed from a shaft, it should be discarded and a new circlip must be installed.**
*** When installing a new snap ring, do not expand the end gap larger than required to slip the circlip over the shaft.**
*** After installing a snap ring, make sure that it is completely seated in its groove and securely fitted.**



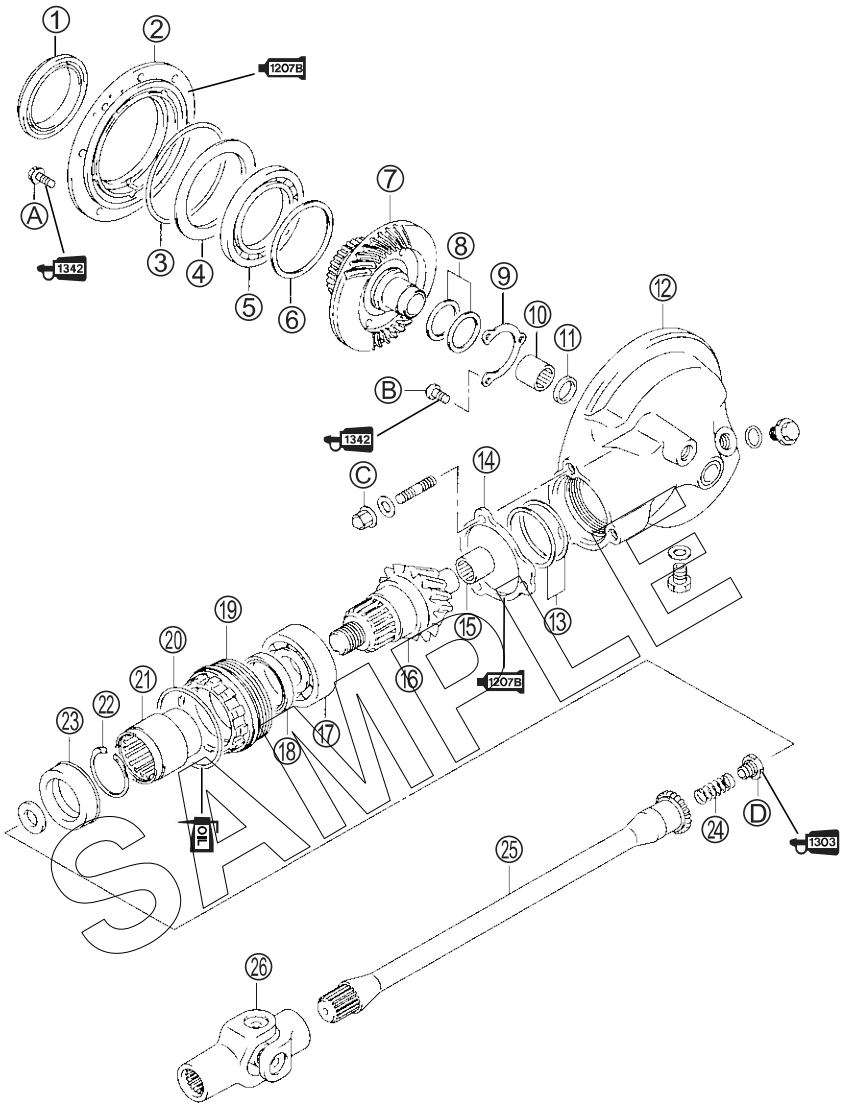
INSTALLATION

SECONDARY DRIVEN BEVEL GEAR/SECONDARY DRIVE BEVEL GEAR

- Refer to the engine reassembly sections.

Engine reassembly ☞3-65

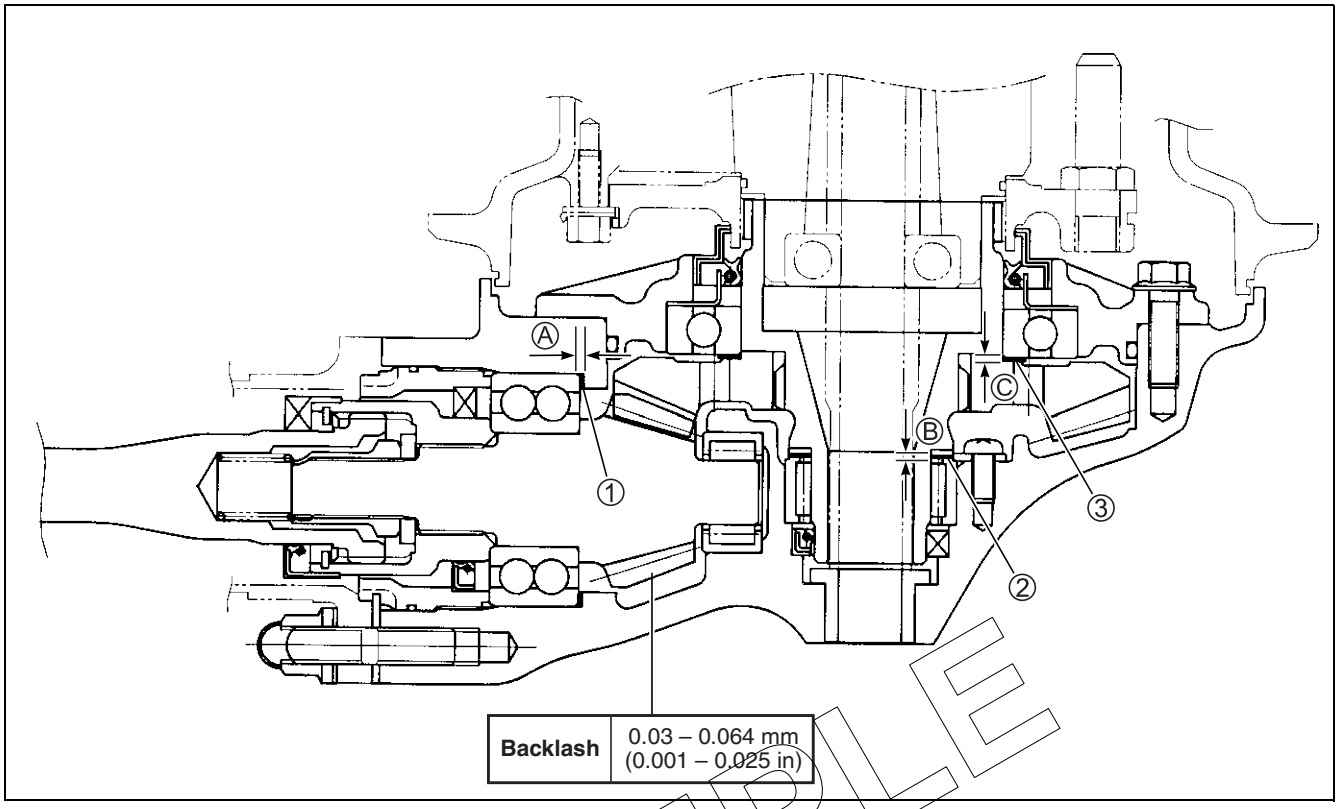
FINAL BEVEL GEARS
CONSTRUCTION



①	Oil seal	⑪	Oil seal	㉑	Final drive coupling
②	Final gear bearing case	⑫	Final gear case	㉒	Snap ring
③	O-ring	⑬	Shims (5 kinds)	㉓	Oil seal
④	Plate	⑭	Stopper plate (2 kinds)	㉔	Spring
⑤	Final driven gear bearing	⑮	Final drive gear bearing	㉕	Propeller shaft
⑥	Shims (4 kinds)	⑯	Final drive bevel gear	㉖	Universal joint
⑦	Final driven bevel gear	⑰	Final drive bevel gear bearing	Ⓐ	Final gear case bolt
⑧	Shims (8 kinds)	⑱	Oil seal	Ⓑ	Final driven bevel gear bearing retainer screw
⑨	Bearing retainer	⑲	Bearing stopper	Ⓒ	Final gear case nut
⑩	Final driven gear bearing	⑳	O-ring	Ⓓ	Final driven bevel gear coupling nut

ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	9	0.9	6.5

ITEM	N·m	kgf-m	lb-ft
Ⓒ	40	4.0	29.0
Ⓓ	100	10.0	72.5



Standard clearance Ⓐ: 1.00 mm (0.039 in)
Shim ① size table

Part number	Thickness
27445-38A00-030	0.30 mm (0.012 in)
27445-38A00-035	0.35 mm (0.014 in)
27445-38A00-040	0.40 mm (0.016 in)
27445-38A00-050	0.50 mm (0.020 in)
27445-38A00-060	0.60 mm (0.024 in)

The shims ① are available as a set (27445-38810).

Standard clearance Ⓒ: 1.00 mm (0.039 in)
Shim ③ size table

Part number	Thickness
27327-34200	0.35 mm (0.014 in)
27327-34210	0.40 mm (0.016 in)
27327-34220	0.50 mm (0.020 in)
27327-34230	0.60 mm (0.024 in)

The shims ③ are available as a set (27327-34810).

Standard clearance Ⓑ: 2.3 mm (0.091 in)
Shim ② size table

Part number	Thickness
27326-34201	1.05 mm (0.041 in)
27326-34211	1.10 mm (0.043 in)
27326-34221	1.20 mm (0.047 in)
27326-34231	1.25 mm (0.049 in)
27326-34241	1.35 mm (0.053 in)
27326-34201-140	1.40 mm (0.055 in)
27326-34201-145	1.45 mm (0.057 in)
27326-34201-150	1.50 mm (0.059 in)

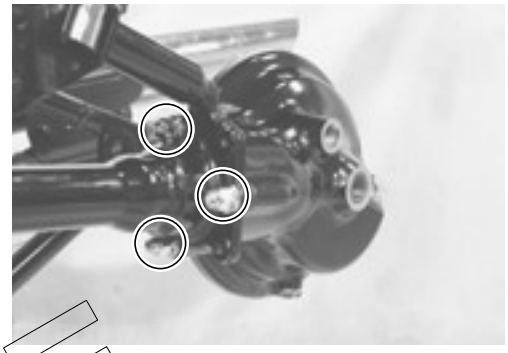
The shims ② are available as a set {27326-34810 (1.40 – 1.50), 27326-34820 (1.05 – 1.35)}.

FINAL GEAR CASE REMOVAL

After draining final gear oil, the following components must be removed in the described order before removing the final gear case.

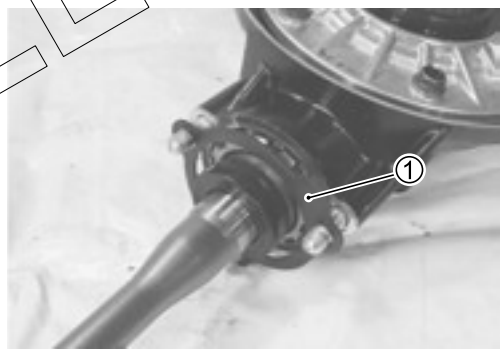
NOTE:
Refer to the following pages for the details of each step.

- Drain final gear oil. (☞2-19)
- Remove the rear wheel. (☞8-33)
- Remove the final gear case.



FINAL GEAR CASE DISASSEMBLY

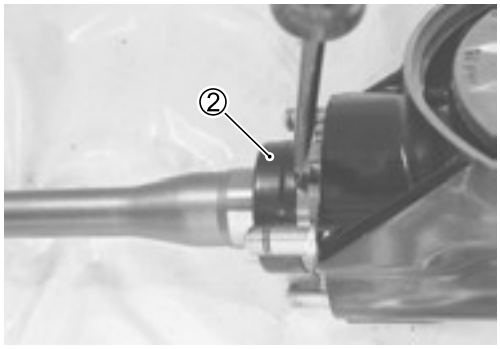
- Remove the plate ①.



- Remove the oil seal ②.

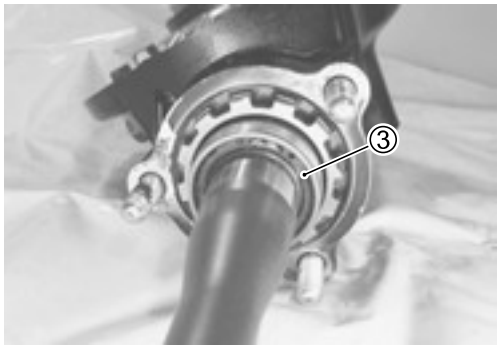
CAUTION

The removed oil seal must be replaced with a new one.

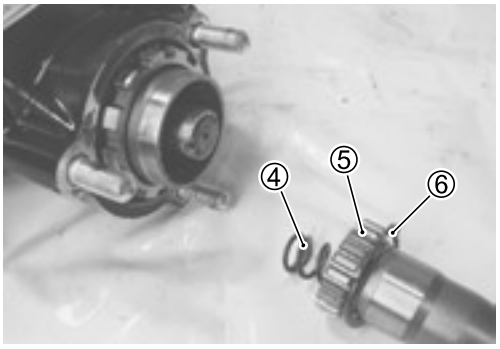


- Remove the snap ring ③ with the special tool and take off the propeller shaft and spring.

TOOL 09900-06108: Snap ring pliers

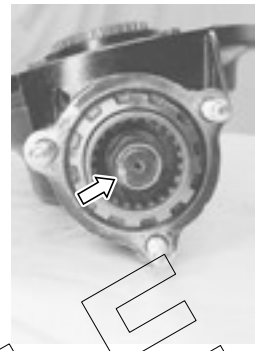


④ Spring
⑤ Propeller shaft
⑥ Snap ring

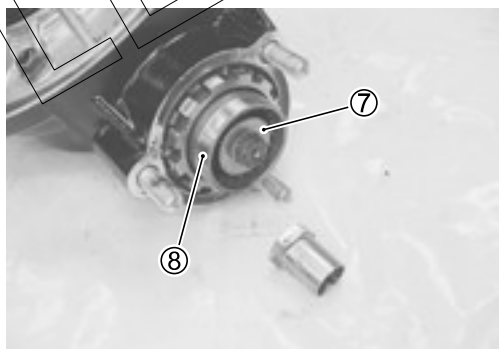


- Using a chisel, unlock the nut.
- Remove the final drive bevel gear coupling nut with the special tool.

TOOL 09924-62430: 22 mm Long socket
09924-64510: Final drive gear coupling holder

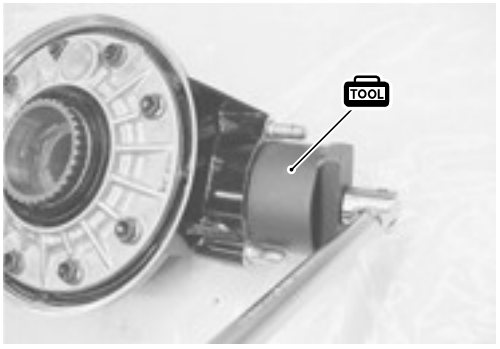


- Remove the washer ⑦ and the final drive coupling ⑧.

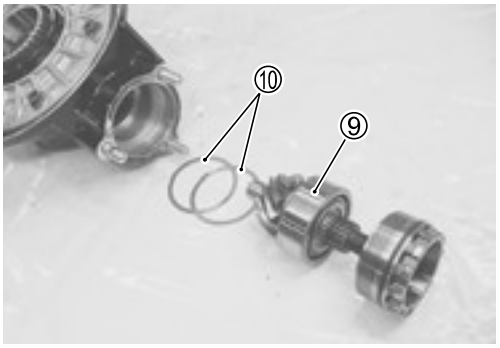


- Remove the bearing stopper by with the special tool.

TOOL 09924-62410: Final drive gear bearing holder wrench



- Remove the final drive bevel gear ⑨ and shims ⑩.



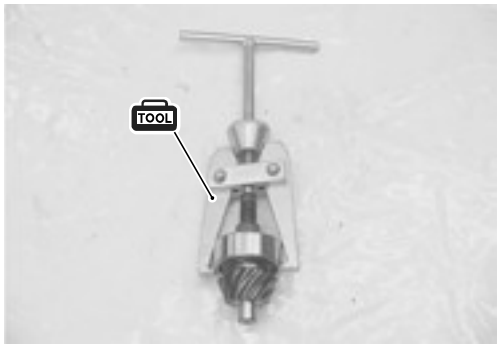
• Remove the bearing from the final drive bevel gear with the special tool.

TOOL 09913-50121: Bearing puller

CAUTION

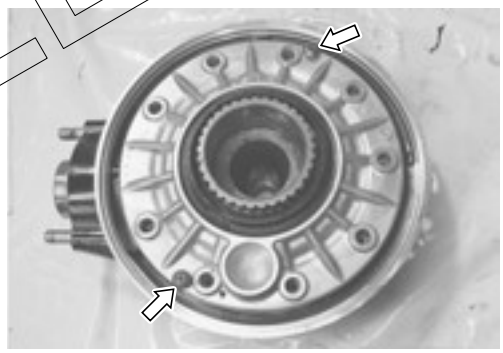
The removed bearing must be replaced with a new one.

NOTE:
If no abnormal noise, the bearing removal is not necessary.

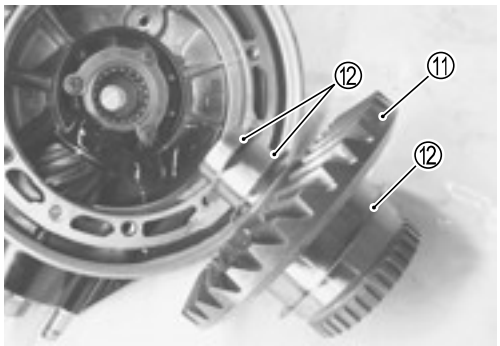


• Remove the final gear bearing case bolts.

• Remove the final gear bearing case from the final gear case, by using two 5 mm screws.



• Remove the final driven bevel gear ⑪ and shims ⑫.



• Remove the oil seal with the special tool.

TOOL 09913-50121: Oil seal remover

NOTE:
If no oil leakage, the oil seal removal is not necessary.

• Remove the bearing retainer screws, using an impact driver set.

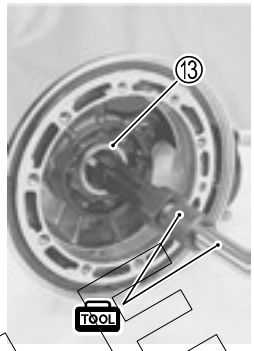
TOOL 09900-09004: Impact driver set

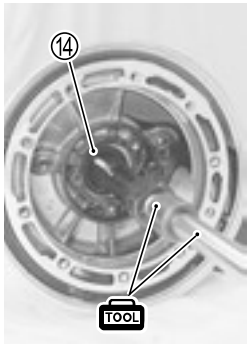
• Remove the final driven gear bearing ⑬ and oil seal ⑭ with the special tools.

TOOL 09941-64511: Bearing remover
09930-30104: Sliding shaft

CAUTION

The removed bearing and oil seal must be replaced with new ones.





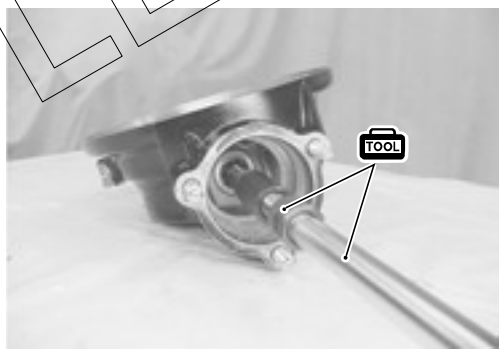
NOTE:
If no abnormal noise, the bearing removal is not necessary.

• Remove the final drive gear bearing with the special tools.

TOOL 09923-73210: Bearing remover
09930-30104: Sliding shaft

CAUTION

The removed bearing must be replaced with a new one.

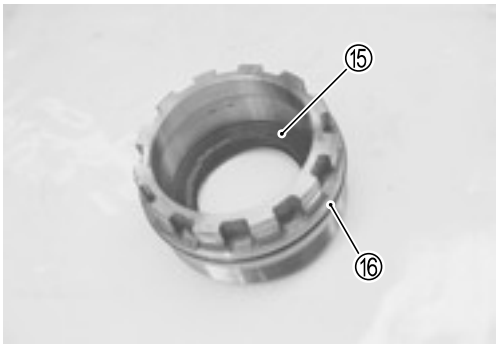


NOTE:
If no abnormal noise, the bearing removal is not necessary.

• Remove the oil seal ⑮ and O-ring ⑯ from the bearing stopper.

CAUTION

The removed oil seal and O-ring must be replaced with new ones.



NOTE:
If no oil leakage, the oil seal removal is not necessary.

INSPECTION

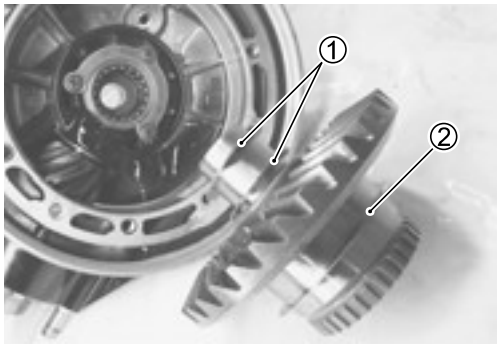
Inspect the removed parts for the following abnormalities.

* Drive and driven bevel gear damage or wear
* Improper tooth contact
* Abnormal noise of bearings
* Bearing damage or wear
* Oil seal damage or wear
* Propeller shaft spline damage or wear

FINAL GEAR SHIMS ADJUSTMENT

FINAL GEAR BEARING CASE SHIM CLEARANCE

- Install the final driven gear, shims (① and ②) and final gear bearing case to the final gear case.



- Tighten the final gear case bolts to the specified torque.

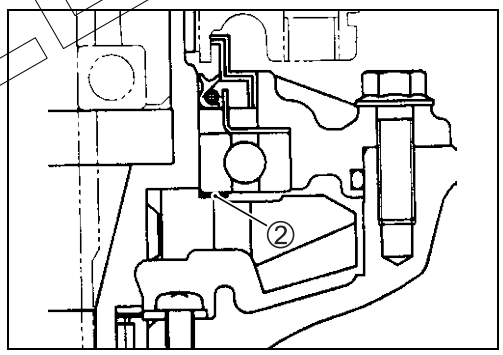
DATA Final gear case bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

NOTE:
It is not necessary to apply SUZUKI BOND "1207B" to the matching surface at this stage.

- Measure the clearance between the shims and bearing. If it is not within the specification, the shims must be changed.

Standard

DATA Final gear case shim clearance
Standard: 1.00 mm (0.039 in)



Shims ② specifications

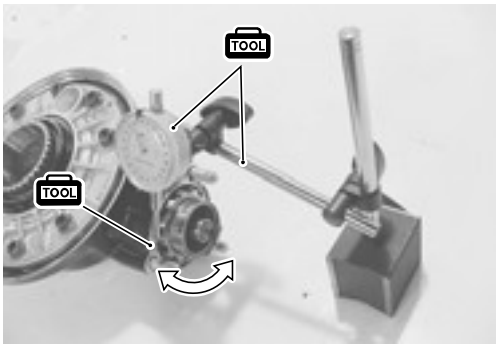
Part No.	Shim thickness
27327-34200	0.35 mm (0.014 in)
27327-34210	0.40 mm (0.016 in)
27327-34220	0.50 mm (0.020 in)
27327-34230	0.60 mm (0.024 in)

NOTE:
The shims ② are available as a set (27327-34810).

BACKLASH

After assembling the final gear case, measure the final bevel gear backlash as follows.

- Install the backlash measuring tool on the drive bevel gear coupling, and set-up a dial gauge as shown in photo.

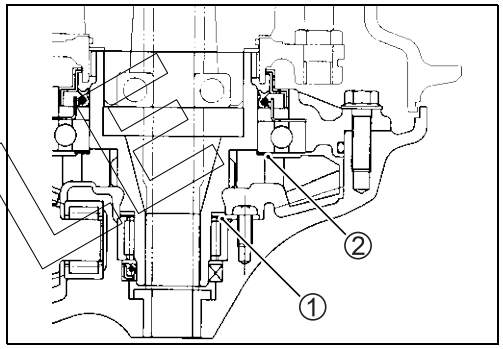


TOOL 09924-34510: Backlash measuring tool (27 – 50 mm)
09900-20607: Dial gauge (1/100 mm, 10 mm)
09900-20701: Magnetic stand

- Adjust the dial gauge so that it touches the backlash measuring tool arm at the mark; hold the final driven bevel gear securely, and turn the final drive bevel gear coupling slightly in each direction, reading the total backlash on the dial gauge.

DATA Final bevel gear backlash
Standard: 0.03 – 0.64 mm (0.001 – 0.025 in)

If the backlash is not within the specification, adjust the shim thickness as follows:



- Remove shims from final gear bearing case and final gear case, and measure total thickness.
- In order not to change the clearance between final driven bevel gear and bearing, the total thickness of the shims installed after a change is made must equal the original total thickness of shims.
- If backlash is too large:
  a) Install a thinner shim pack ① between final driven bevel gear and final gear case.
  b) Increase thickness of shims ② between final driven bevel gear bearing and bearing case by an amount equal to decrease above.
- If backlash is too small:
  a) Install a thicker shim pack ① between final driven bevel gear and final gear case.
  b) Decrease thickness of shims ② between final driven gear bearing and bearing case by an amount equal to increase above.

Shims ① specifications

Part No.	Shim thickness
27326-34201	1.05 mm (0.041 in)
27326-34211	1.10 mm (0.043 in)
27326-34221	1.20 mm (0.047 in)
27326-34231	1.25 mm (0.049 in)
27326-34241	1.35 mm (0.053 in)
27326-34201-140	1.40 mm (0.055 in)
27326-34201-145	1.45 mm (0.057 in)
27326-34201-150	1.50 mm (0.059 in)

The shims ① are available as a set {27326-34810 (1.40 – 1.50), 27326-34820 (1.05 – 1.35)}.

Shims ② specifications

Part No.	Shim thickness
27327-34200	0.35 mm (0.014 in)
27327-34210	0.40 mm (0.016 in)
27327-34220	0.50 mm (0.020 in)
27327-34230	0.60 mm (0.024 in)

The shims ① are available as a set (27327-34810).

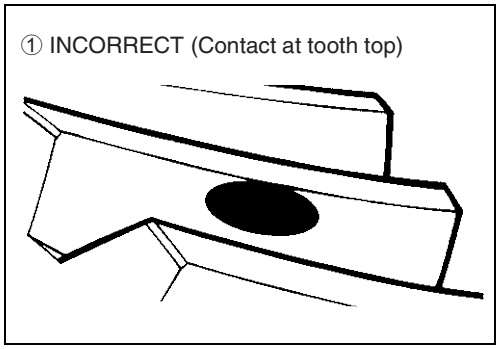
EXAMPLE:
Final gear to case shims ①; 1.45 mm + 1.40 mm = 2.85 mm
Final gear bearing to bearing case shims ②,
0.35 mm + 0.60 mm = 0.95 mm
Original total measurement = 3.80 mm

Backlash too large:
Final gear to case shims ①; 1.35 mm + 1.45 mm = 2.80 mm
Final gear bearing to bearing case shims ②,
0.60 mm + 0.40 mm = 1.00 mm
Total thickness = 3.80 mm

Backlash too small:
Final gear to case shims ①; 1.50 mm + 1.40 mm = 2.90 mm
Final gear bearing to bearing case shims ②;
0.50 mm + 0.40 mm = 0.90 mm
Total thickness = 3.80 mm

TOOTH CONTACT
After backlash adjustment is carried out, the tooth contact must be checked.

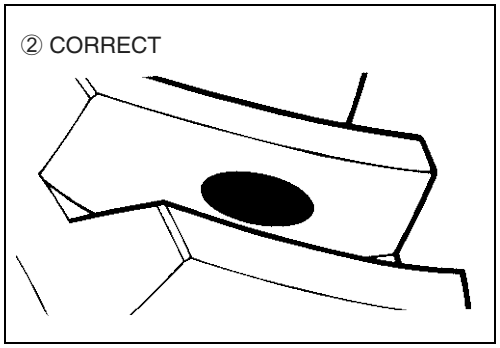
- Remove the bolts from the final gear bearing case, and remove the case with the two 5 mm screws. (☞4-15) Do not misplace the shims. Remove the final driven bevel gear.
- Clean and de-grease several teeth on the final driven bevel gear. Coat these teeth with machinist's dye or paste, preferably of a light color.



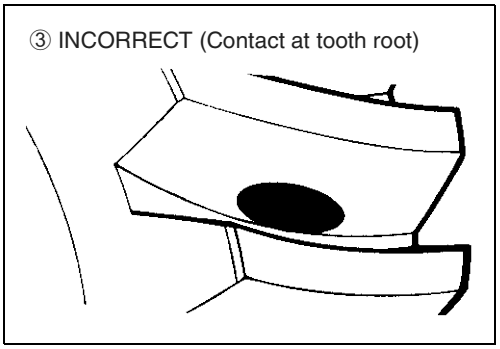
- Re-install the final driven bevel gear with shims in place, positioning the coated teeth so that they are centered on the final drive bevel gear.
- Re-install the final gear bearing case and bolts, and tighten to specification.

Final gear case bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

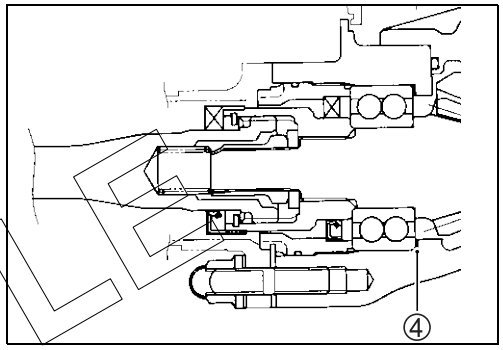
- Using a socket and handle on the final drive bevel gear coupling nut, rotate the final drive bevel gear several turns in each direction, while loading the final driven bevel gear. This will provide a contact pattern on the coated teeth of the driven bevel gear.



- Remove the final gear bearing case and final driven bevel gear, and inspect the coated teeth of the driven bevel gear. The contact patch should be as shown at right:
- If the tooth contact pattern is incorrect, as shown in ①, a thinner shim ④ is needed between the final drive bevel gear bearing and final gear case.
- If the tooth contact pattern is incorrect, as shown in ③, a thicker shim ④ is needed between the final drive bevel gear bearing and final gear case.
- If the tooth contact pattern is incorrect for either reason, the appropriate shim must be installed, and the tooth contact pattern rechecked by repeating the tooth coating procedure above.



NOTE:
If it is necessary to adjust the shim ④ thickness between final drive bevel gear bearing and final gear case, the final gear backlash may change, and should be re-checked according to the procedure outlined under the Backlash Measurement sub-section. Both adjustments may be needed until both backlash and tooth contact are correct.



Shims ④ specification

Part No.	Shim thickness
27445-38A00-030	0.30 mm (0.012 in)
27445-38A00-035	0.35 mm (0.014 in)
27445-38A00-040	0.40 mm (0.016 in)
27445-38A00-050	0.50 mm (0.020 in)
27445-38A00-060	0.60 mm (0.024 in)

The shims ④ are available as a set (27445-38810).

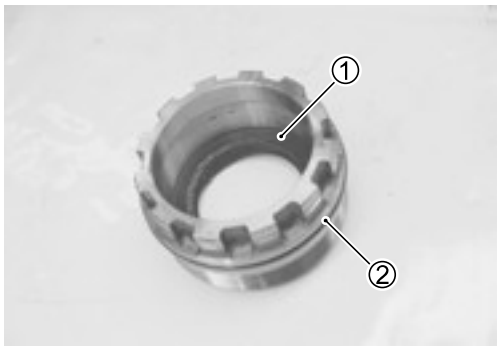
FINAL GEAR CASE REASSEMBLY

Reassemble the final gear case in the reverse order of disassembly. Pay attention to the following points.

- Install a new oil seal ① and O-ring ② to the bearing stopper.

CAUTION

Use new O-ring and oil seat to prevent oil leakage.

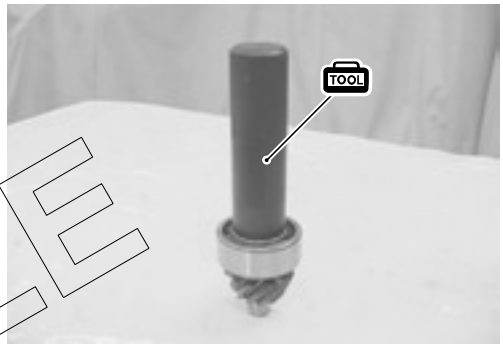


- Install the bearing to the final drive bevel gear with the special tool.

TOOL 09913-84510: Bearing installer

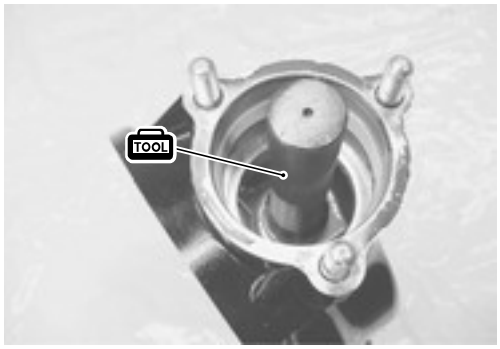
CAUTION

When replacing the drive bevel gear, replace the driven bevel gear also, as they must be replaced together.



- Install the needle roller bearing for the final drive bevel gear into the final gear case with the special tool.

TOOL 09913-75821 : Bearing installer

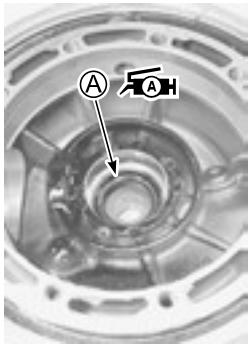


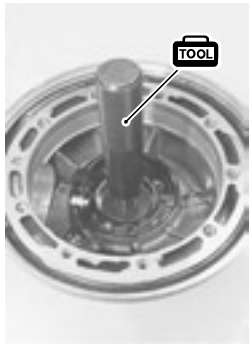
- Install the oil seal into the final gear case with the special tool.

TOOL 09913-70210: Bearing installer set (40 mm)

CAUTION

*** Use a new oil seal to prevent oil leakage.**
*** Apply final gear oil to the lip of the oil seal.**
*** The lip and spring of the oil seal should face Ⓐ to the driven bevel gear side.**

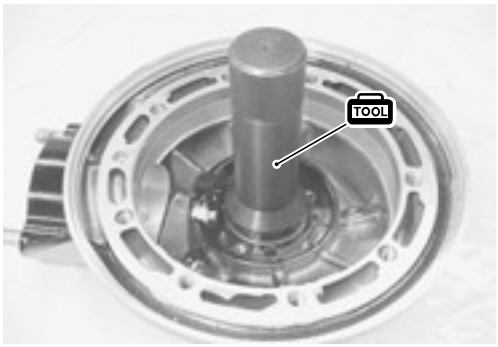




- Install the needle roller bearing for the final driven bevel gear into the final gear case with the special tool.

TOOL 09913-76010: Bearing installer

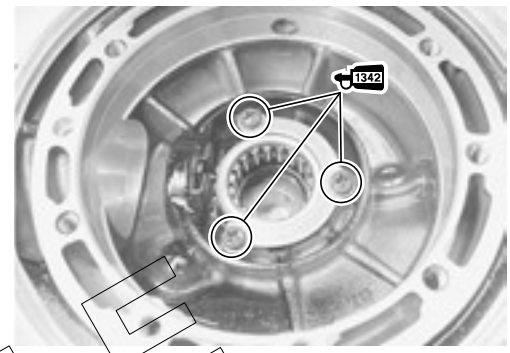
NOTE:
The boss on the bearing end should face to the driven bevel gear side.



- Install the bearing retainer. Apply a small quantity of the THREAD LOCK on the screws, and tighten them to the specified torque.

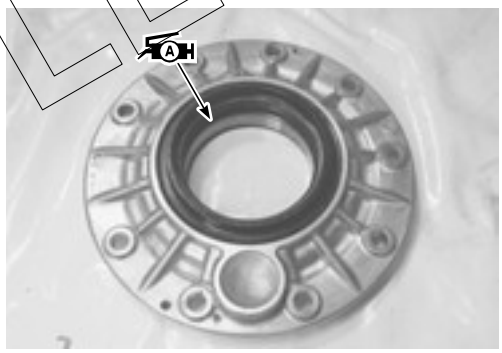
1342 99000-32050: THREAD LOCK "1342"

Bearing retainer screw: 9 N·m (0.9 kgf-m, 6.5 lb-ft)



- Install a new oil seal to the final gear bearing case.
- Apply grease to the lip of the oil seal.

A H 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

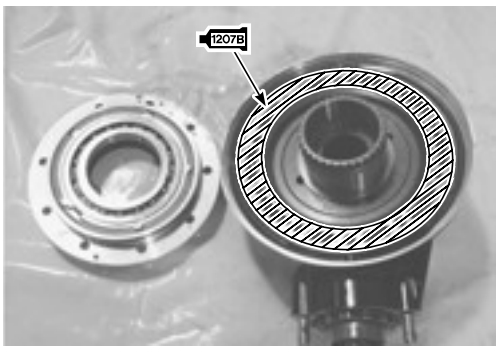


- Apply SUZUKI BOND to the mating surface of the final gear case and final gear bearing case.

CAUTION

Do not block the breather passage when applying SUZUKI BOND.

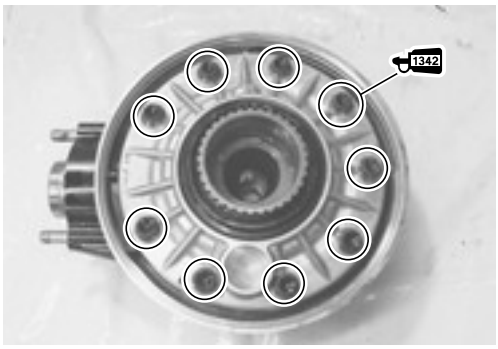
1207B 99000-31140: SUZUKI BOND "1207B"



- Apply THREAD LOCK to the final gear case bolts and tighten them to the specified torque.

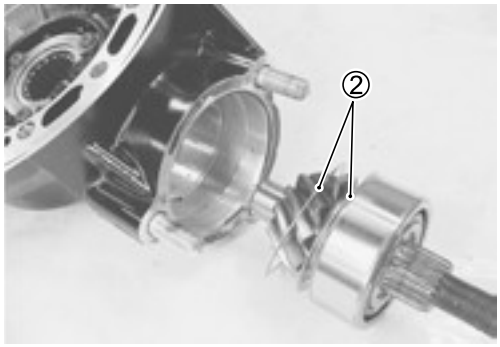
Final gear case bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

1342 99000-32050: THREAD LOCK "1342"



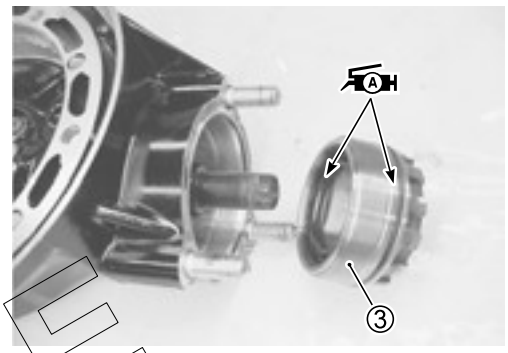
- Install the correct shims ② to the final drive bevel gear and install the bevel gear to the final gear case.

Shim adjustment (☞4-18)



- Apply grease to the O-ring and the oil seal.
- Install the bearing stopper ③.

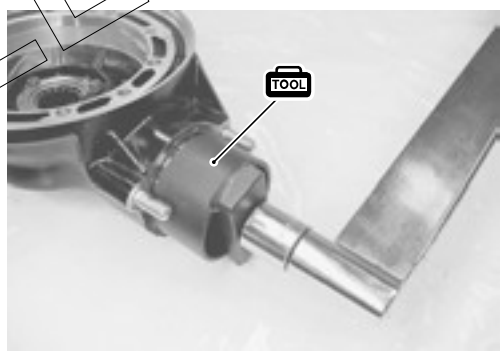
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Tighten the bearing stopper to the specified torque with the special tool.

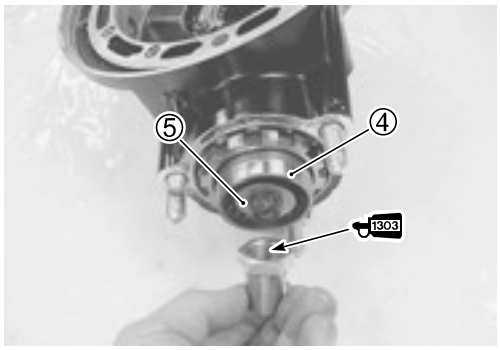
09924-62410: Final drive gear bearing holder wrench

Final drive bevel gear bearing stopper:
110 N·m (11.0 kgf-m, 79.5 lb-ft)



- Install the final drive coupling ④ and washer ⑤.
- Apply a small quantity of the THREAD LOCK to the final drive bevel gear coupling nut.

99000-32030: THREAD LOCK "1303"

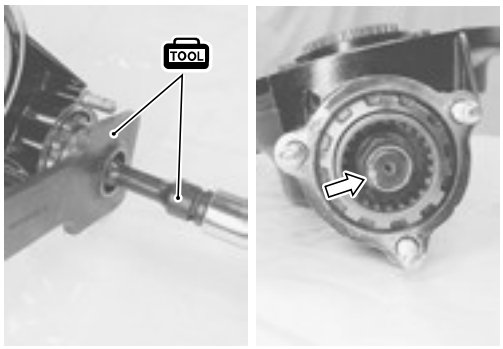


- Tighten the nut to the specified torque with the special tool.

Final drive bevel gear coupling nut:
100 N·m (10.0 kgf-m, 72.5 lb-ft)

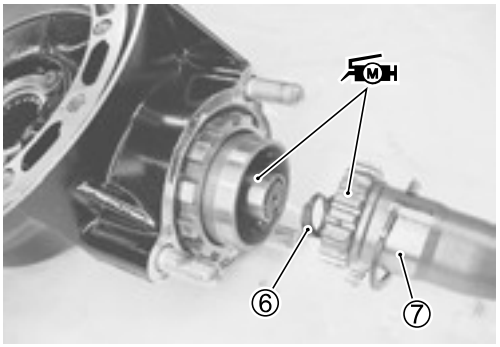
09924-62430: 22 mm Long socket
09924-64510: Final drive gear coupling holder

- Lock the final drive bevel gear coupling nut with a center punch.



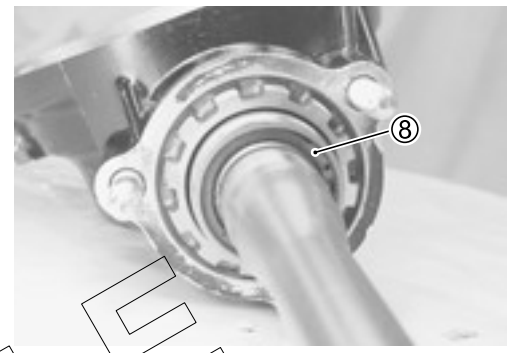
- Apply Lithium Base Molybdenum grease (NLGI #2) to the propeller shaft splines and final drive bevel gear coupling.
- Install the spring ⑥ and propeller shaft ⑦.

99000-25140: SUZUKI MOLY PASTE



- Install the snap ring ⑧.
- After installing the propeller shaft with a new snap ring, make sure that the propeller shaft turns smoothly without any hitch or bearing noise.

09900-06108: Snap ring pliers



- Install the oil seal with the special tool.

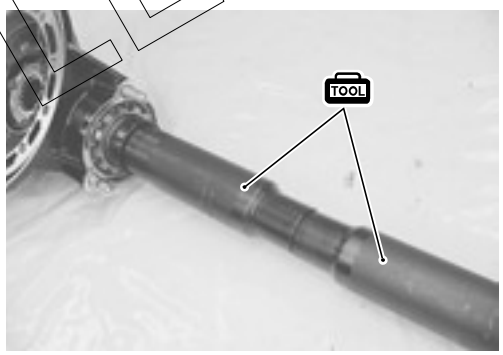
09940-51410: Steering bearing installer
09925-18011: Bearing installer

- Apply grease to the lip of the oil seal.

CAUTION

Use a new oil seal to prevent oil leakage.

99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

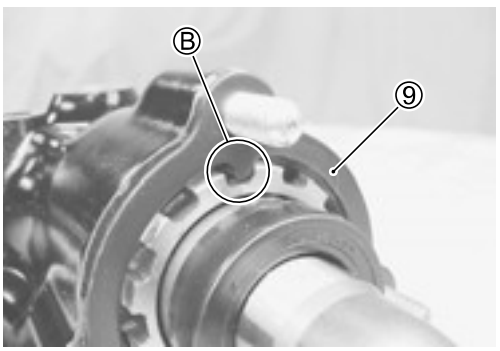


- Install the stopper plate ⑨.

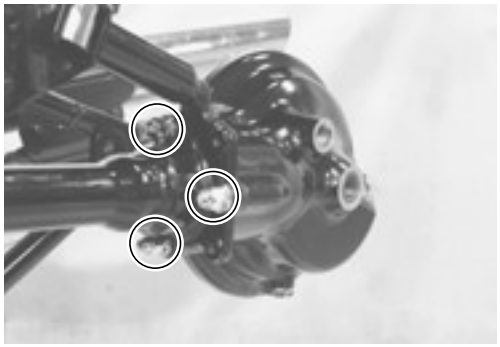
CAUTION

When installing the plate, fit the protrusion Ⓑ of plate to the one of the bearing stopper grooves.

NOTE:
Two kinds of plates are available to lock the stopper at the proper position.



FINAL GEAR CASE INSTALLATION



Installation is in the reverse order of removal.

NOTE:

Refer to the following pages for the details of each step.

- Install the final gear case.
- Tighten the final gear case bolts to the specified torque.

Final gear case nut: 40 N·m (4.0 kgf-m, 29.0 lb-ft)

- Install the rear wheel. (☞8-37)
- Pour final gear oil. (☞2-19)

FI SYSTEM

CONTENTS

FI SYSTEM

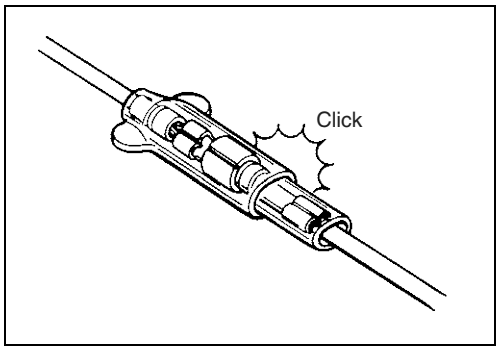
CONTENTS

PRECAUTIONS IN SERVICING

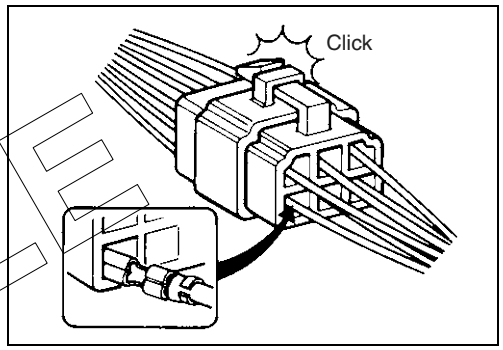
When handling the FI component parts or servicing the FI system, observe the following points for the safety of the system.

CONNECTOR/COUPLER

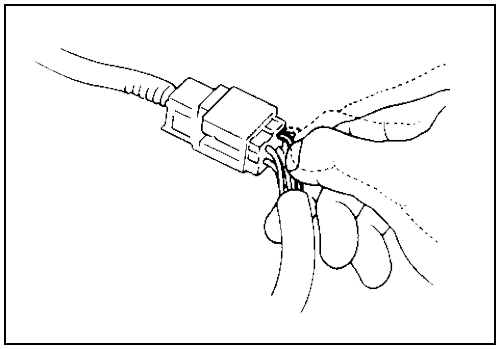
- When connecting a connector, be sure to push it in until a click is felt.
- With a lock type coupler, be sure to release the lock when disconnecting, and push in fully to engage the lock when connecting.
- When disconnecting the coupler, be sure to hold the coupler body and do not pull the lead wires.
- Inspect each terminal on the connector/coupler for looseness or bending.



- Inspect each terminal for corrosion and contamination.
  The terminals must be clean and free of any foreign material which could impede proper terminal contact.

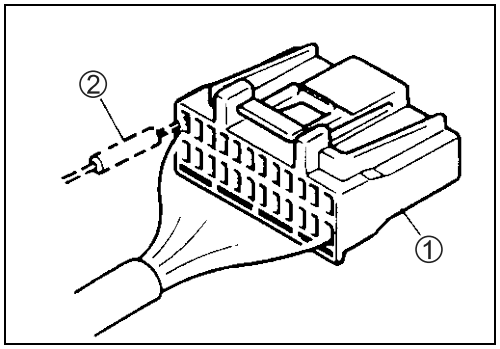


- Inspect each lead wire circuit for poor connection by shaking it by hand lightly. If any abnormal condition is found, repair or replace.

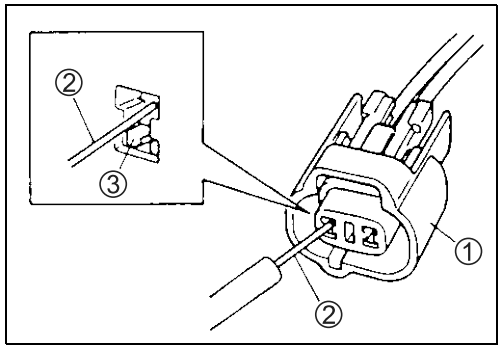


- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector/coupler.

① Coupler
② Probe



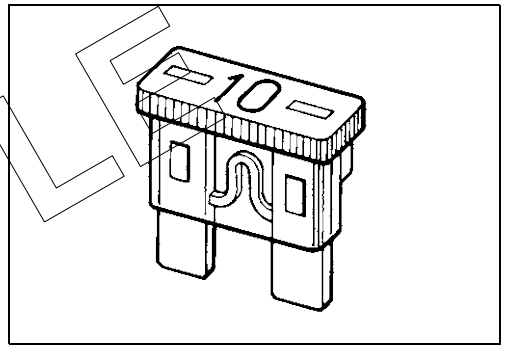
- When connecting meter probe from the terminal side of the coupler where (connection from harness side not being possible), use extra care not to force and cause the male terminal to bend or the female terminal to open.
  Connect the probe as shown to avoid opening of female terminal.
  Never push in the probe where male terminal is supposed to fit.
- Check the male connector for bend and female connector for excessive opening. Also check the coupler for locking (looseness), corrosion, dust, etc.



① Coupler
② Probe
③ Where male terminal fits

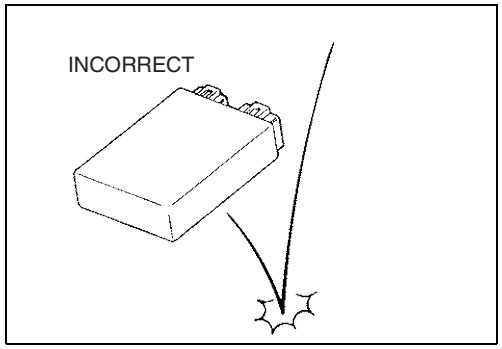
FUSE

- When a fuse blows, always investigate the cause to correct it and then replace the fuse.
- Do not use a fuse of a different capacity.
- Do not use wire or any other substitute for the fuse.

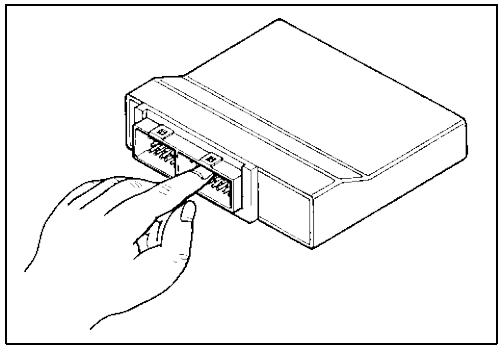


ECM/VARIOUS SENSORS

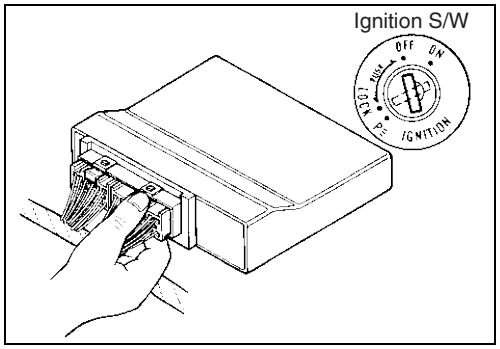
- Since each component is a high-precision part, great care should be taken not to apply any sharp impacts during removal and installation.



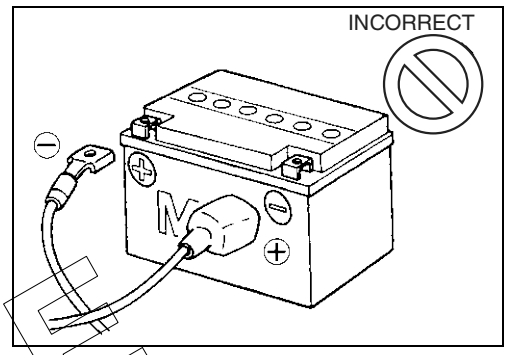
- Be careful not to touch the electrical terminals of the ECM. The static electricity from your body may damage this part.



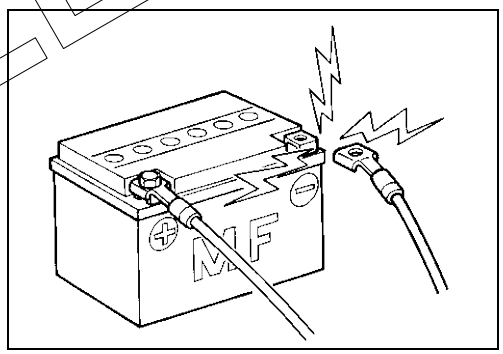
- When disconnecting and connecting the ECM couplers, make sure to turn OFF the ignition switch, or electronic parts may get damaged.



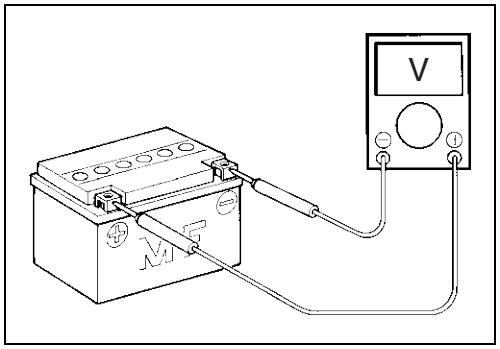
- Battery connection in reverse polarity is strictly prohibited. Such a wrong connection will damage the components of the FI system instantly when reverse power is applied.



- Removing any battery terminal of a running engine is strictly prohibited.
  The moment such removal is made, damaging counter electromotive force will be applied to the ECM which may result in serious damage.



- Before measuring voltage at each terminal, check to make sure that battery voltage is 11 V or higher. Terminal voltage check with a low voltage battery will lead to erroneous diagnosis.



- Never connect any tester (voltmeter, ohmmeter, or whatever) to the ECM when its coupler is disconnected. Otherwise, damage to the ECM may result.
- Never connect an ohmmeter to the ECM with its coupler connected. If attempted, damage to the ECM or sensors may result.
- Be sure to use a specified voltmeter/ohmmeter. Otherwise, accurate measurements may not be obtained and personal injury may result.

ELECTRICAL CIRCUIT INSPECTION PROCEDURE

While there are various methods for electrical circuit inspection, described here is a general method to check for open and short circuit using an ohmmeter and a voltmeter.

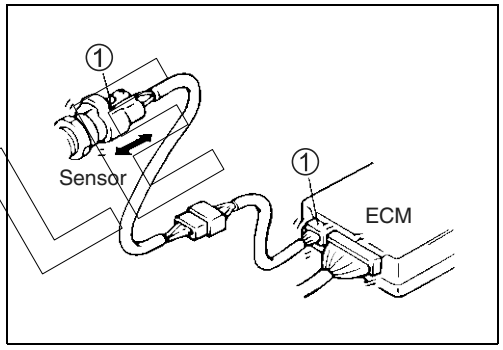
OPEN CIRCUIT CHECK

Possible causes for the open circuit are as follows. As the cause can exist in the connector/coupler or terminal, they need to be checked carefully.

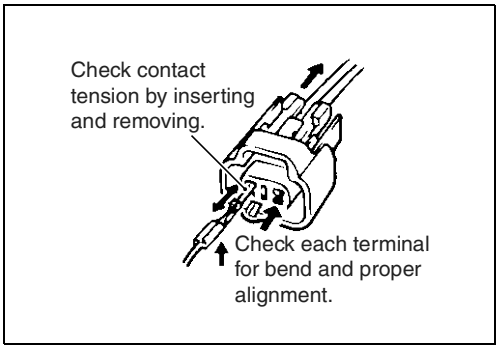
- Loose connection of connector/coupler
- Poor contact of terminal (due to dirt, corrosion or rust, poor contact tension, entry of foreign object etc.)
- Wire harness being open
- Poor terminal-to-wire connection

- Disconnect the negative cable from the battery.
- Check each connector/coupler at both ends of the circuit being checked for loose connection. Also check for condition of the coupler lock if equipped.

① Check for loose connection

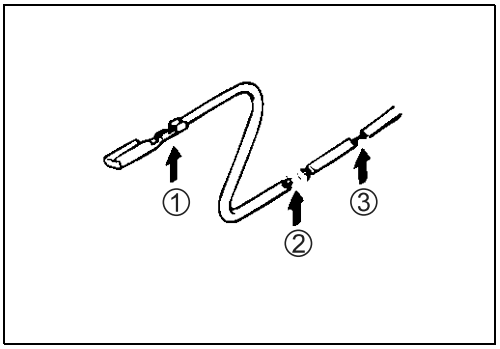


- Using a test male terminal, check the female terminals of the circuit being checked for contact tension.
  Check each terminal visually for poor contact (possibly caused by dirt, corrosion, rust, entry of foreign object, etc.). At the same time, check to make sure that each terminal is fully inserted in the coupler and locked.
  If contact tension is not enough, rectify the contact to increase tension or replace.
  The terminals must be clean and free of any foreign material which could impede proper terminal contact.



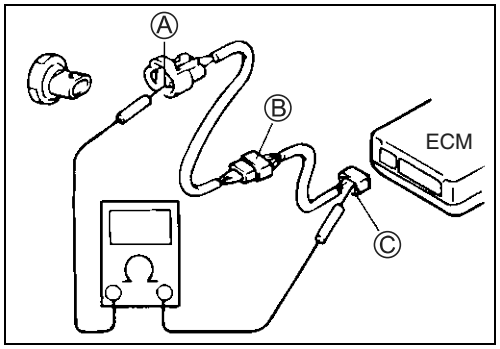
- Using continuity inspect or voltage check procedure as described below, inspect the wire harness terminals for open circuit and poor connection. Locate abnormality, if any.

① Looseness of crimping
② Open
③ Thin wire (a few strands left)

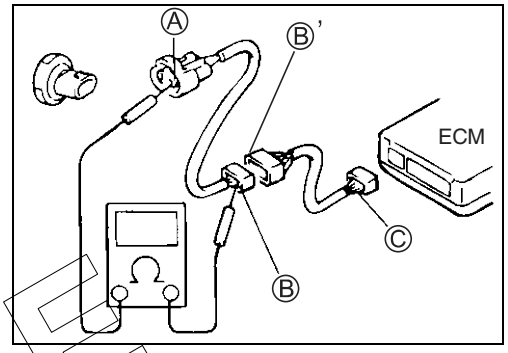


Continuity check

- Measure resistance across coupler Ⓑ (between Ⓐ and Ⓒ in the figure).
  If no continuity is indicated (infinity or over limit), the circuit is open between terminals Ⓐ and Ⓒ.



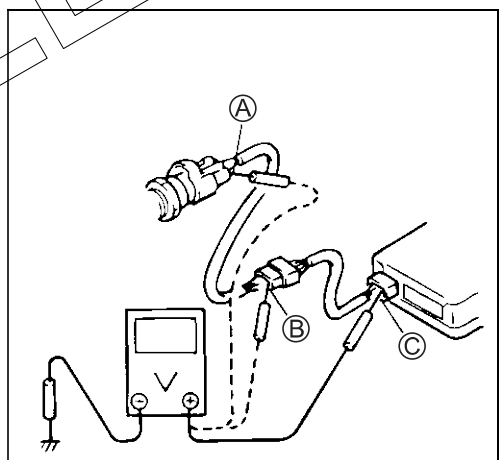
- Disconnect the coupler Ⓑ and measure resistance between couplers Ⓐ and Ⓑ.
  If no continuity is indicated, the circuit is open between couplers Ⓐ and Ⓑ. If continuity is indicated, there is an open circuit between couplers Ⓑ' and Ⓒ or an abnormality in coupler Ⓑ' or coupler Ⓒ.



VOLTAGE CHECK

If voltage is supplied to the circuit being checked, voltage check can be used as circuit check.

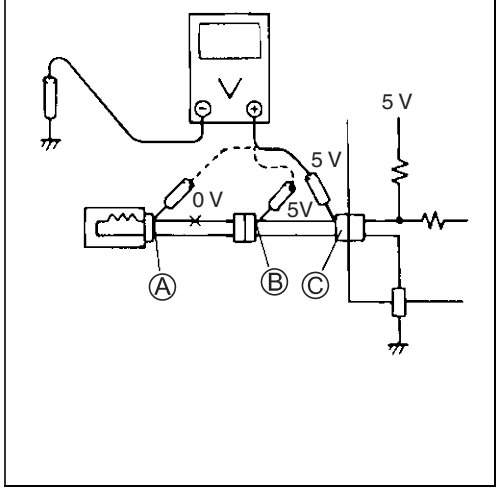
- With all connectors/couplers connected and voltage applied to the circuit being checked, measure voltage between each terminal and body ground.



If measurements were taken as shown in the figure at the right and results are as listed below, it means that the circuit is open between terminals Ⓐ and Ⓑ.

Voltage Between:

Ⓒ and body ground: Approx. 5 V
Ⓑ and body ground: Approx. 5 V
Ⓐ and body ground: 0 V



Also, if measured values are as listed below, a resistance (abnormality) exists which causes the voltage drop in the circuit between terminals Ⓐ and Ⓑ.

Voltage Between:

Ⓒ and body ground: Approx. 5 V
Ⓑ and body ground: Approx. 5 V
Ⓐ and body ground: 3 V

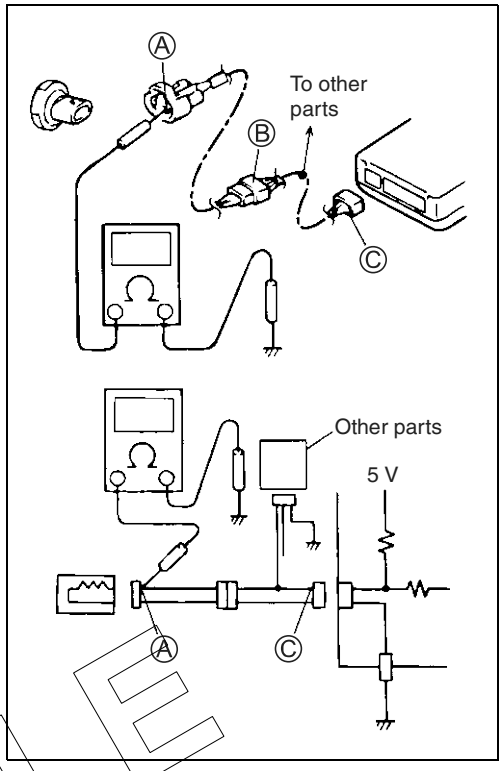
2 V voltage drop

SHORT CIRCUIT CHECK (WIRE HARNESS TO GROUND)

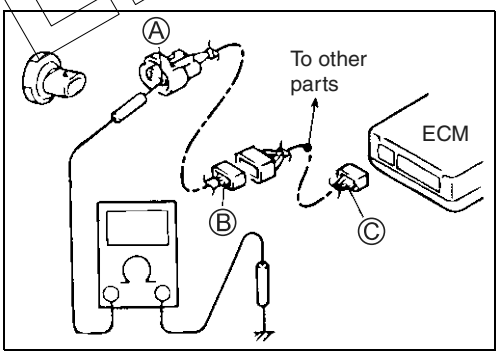
- Disconnect the negative cable from the battery.
- Disconnect the connectors/couplers at both ends of the circuit to be checked.

NOTE:
If the circuit to be checked branches to other parts as shown, disconnect all connectors/couplers of those parts. Otherwise, diagnosis will be misled.

- Measure resistance between terminal at one end of circuit (Ⓐ terminal in figure) and body ground. If continuity is indicated, there is a short circuit to ground between terminals Ⓐ and Ⓒ.

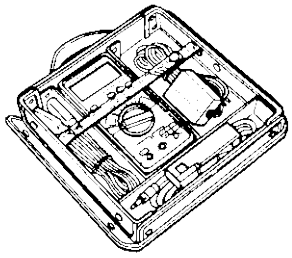


- Disconnect the connector/coupler included in circuit (coupler Ⓑ) and measure resistance between terminal Ⓐ and body ground.
  If continuity is indicated, the circuit is shorted to the ground between terminals Ⓐ and Ⓑ.



USING THE MULTI-CIRCUIT TESTER

- Use the Suzuki multi-circuit tester (09900-25008).
- Use well-charged batteries in the tester.
- Be sure to set the tester to the correct testing range.



USING THE TESTER

- Incorrectly connecting the ⊕ and ⊖ probes may cause the inside of the tester to burnout.
- If the voltage and current are not known, make measurements using the highest range.
- When measuring the resistance with the multi-circuit tester, ∞ will be shown as 10.00 MΩ and "1" flashes in the display.
- Check that no voltage is applied before making the measurement. If voltage is applied, the tester may be damaged.
- After using the tester, turn the power off.

TOOL 09900-25008: Multi-circuit tester set

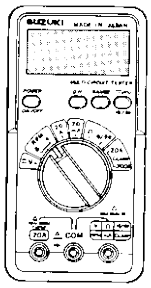
NOTE:

** When connecting the multi-circuit tester, use a needle pointed probe set to the back side of the lead wire coupler and connect the probes of tester to them.*

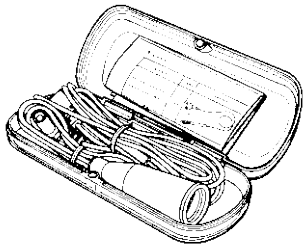
** Use a needle pointed probe set to prevent the rubber of the water proof coupler from damage.*

TOOL 09900-25009: Needle pointed probe set

MULTI-CIRCUIT TESTER



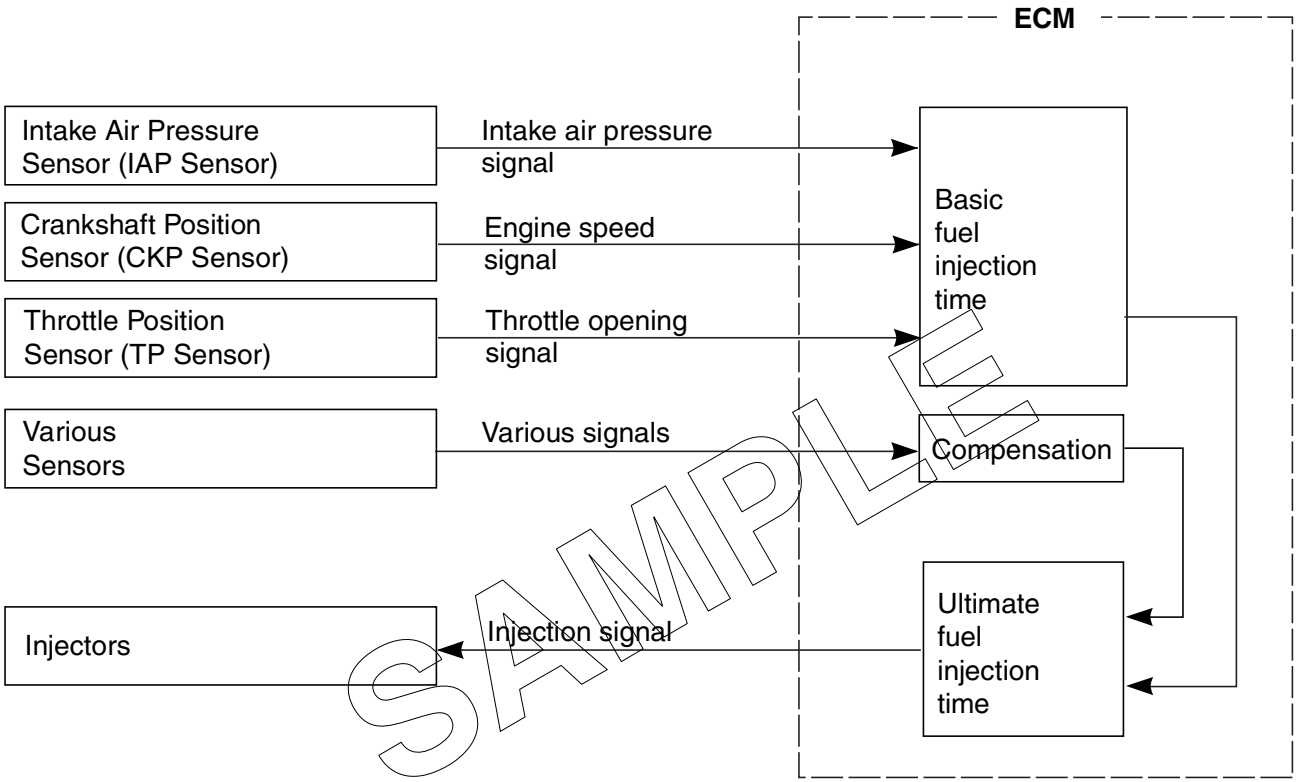
NEEDLE POINTED PROBE SET



FI SYSTEM TECHNICAL FEATURES

INJECTION TIME (INJECTION VOLUME)

The factors to determine the injection time include the basic fuel injection time which is calculated on the basis of the intake air pressure, engine speed and throttle opening angle, and various compensations. These compensations are determined according to the signals from various sensors that detect the engine and driving conditions.



COMPENSATION OF INJECTION TIME (VOLUME)

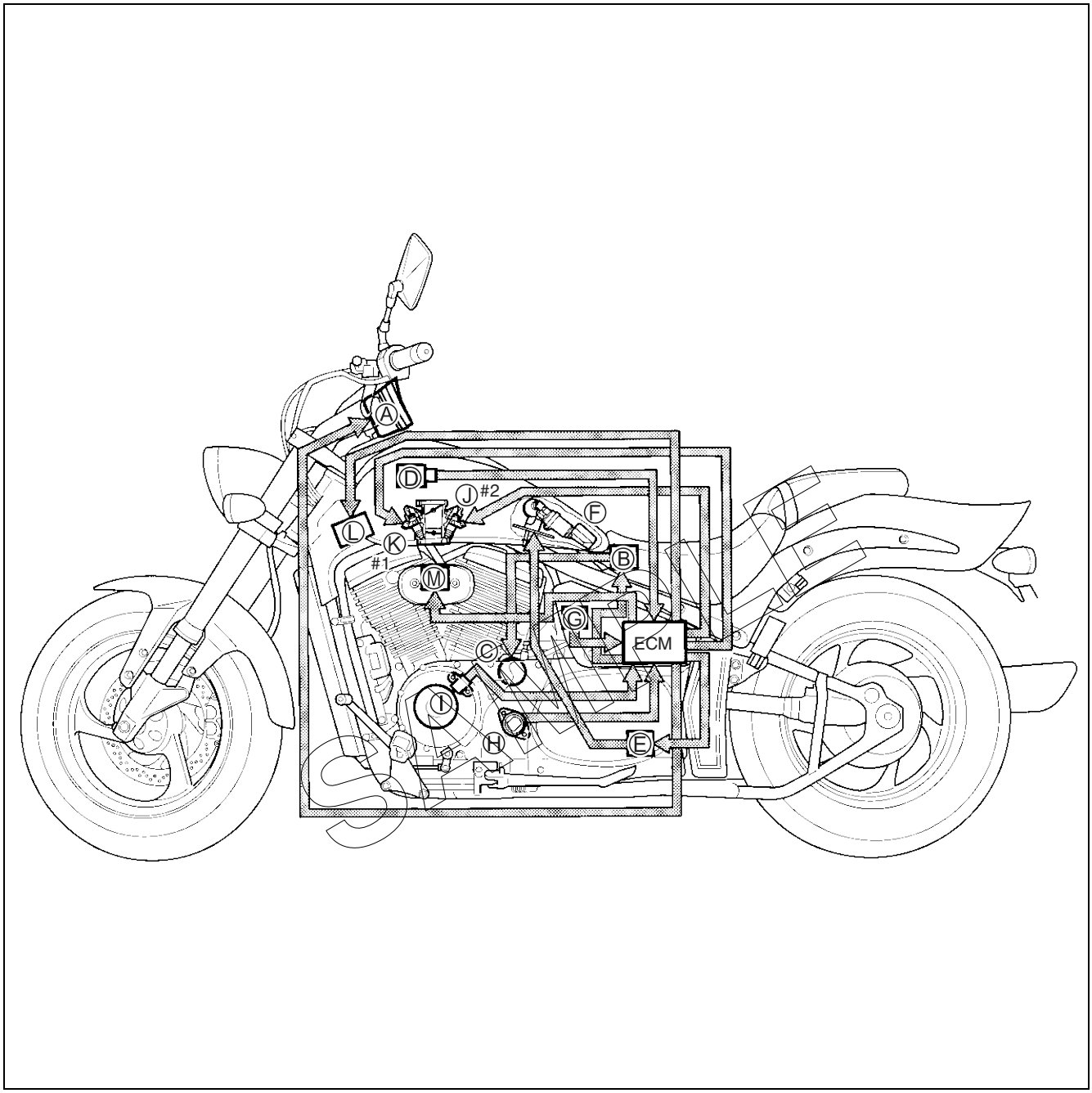
The following different signals are output from the respective sensors for compensation of the fuel injection time (volume).

SIGNAL	DESCRIPTION
ENGINE COOLANT TEMPERATURE SENSOR SIGNAL	When engine coolant temperature is low, injection time (volume) is increased.
INTAKE AIR TEMPERATURE SENSOR SIGNAL	When intake air temperature is low, injection time (volume) is increased.
HEATED OXYGEN SENSOR SIGNAL (FOR E-02, 19, 24)	Air/fuel ratio is compensated to the theoretical ratio from density of oxygen in exhaust gasses. The compensation occurs in such a way that more fuel is supplied if detected air/fuel ratio is lean and less fuel is supplied if it is rich.
BATTERY VOLTAGE SIGNAL	ECM operates on the battery voltage and at the same time, it monitors the voltage signal for compensation of the fuel injection time (volume). A longer injection time is needed to adjust injection volume in the case of low voltage.
ENGINE RPM SIGNAL	At high speed, the injection time (volume) is increased.
STARTING SIGNAL	When starting engine, additional fuel is injected during cranking engine.
ACCELERATION SIGNAL/ DECELERATION SIGNAL	During acceleration, the fuel injection time (volume) is increased, in accordance with the throttle opening speed and engine rpm. During deceleration, the fuel injection time (volume) is decreased.

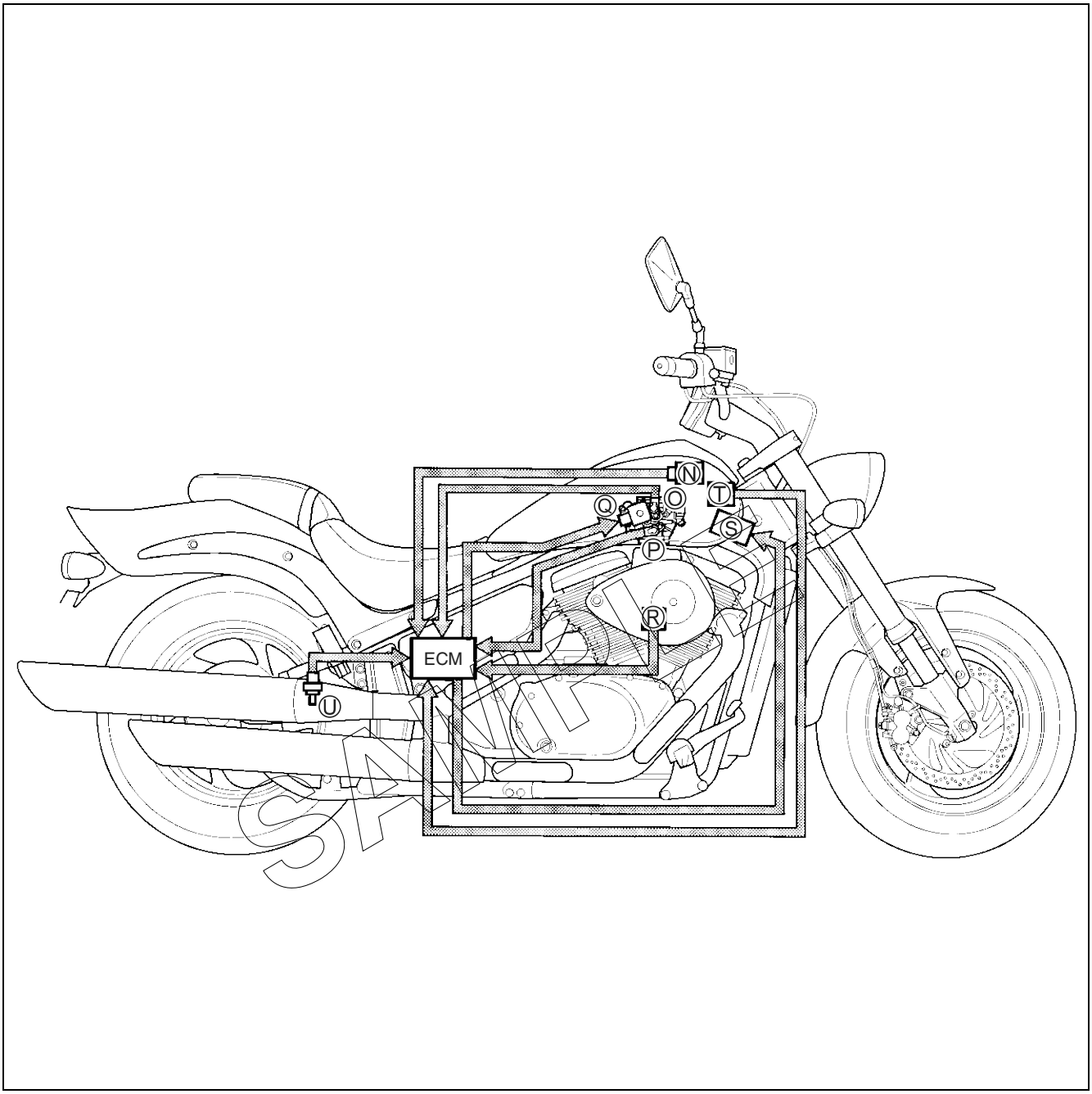
INJECTION STOP CONTROL

SIGNAL	DESCRIPTION
TIP-OVER SENSOR SIGNAL (FUEL SHUT-OFF)	When the motorcycle tips over, the tip-over sensor sends a signal to the ECM. Then, this signal cuts OFF current supplied to the fuel pump, fuel injectors and ignition coils.
OVER-REV. LIMITER SIGNAL	The fuel injectors stop operation when engine rpm reaches rev. limit rpm.

FI SYSTEM PARTS LOCATION

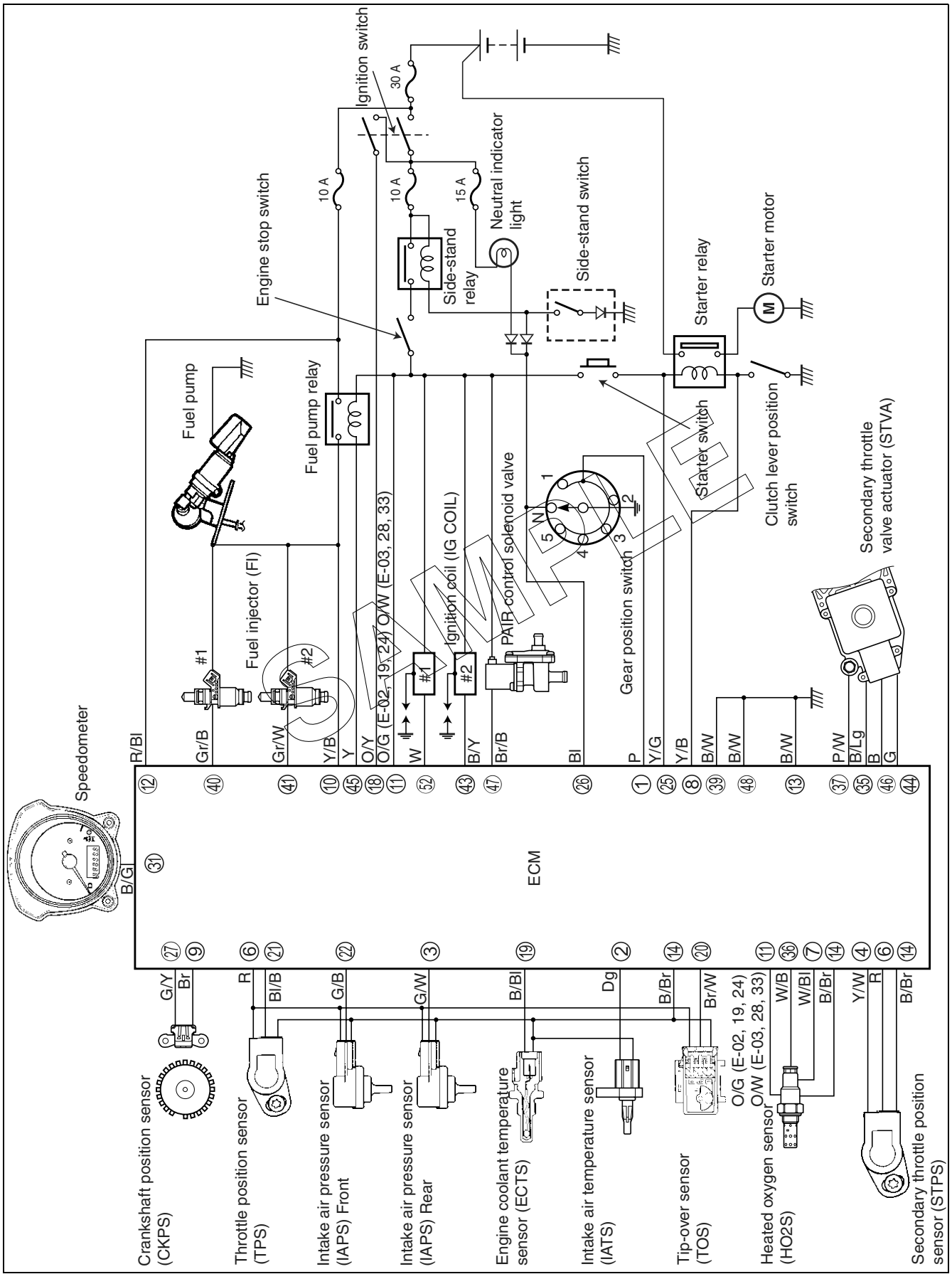


Ⓐ	Speedometer	Ⓗ	Gear position switch
Ⓑ	Starter relay	Ⓘ	Crankshaft position sensor (CKPS)
Ⓒ	Starter motor	Ⓙ	Fuel injector #2 (FI)
Ⓓ	Intake air pressure sensor #1 (IAPS)	Ⓚ	Fuel injector #1 (FI)
Ⓔ	Fuel pump relay (FP RELAY)	Ⓛ	Ignition coil #1 (IG COIL)
Ⓕ	Fuel pump	Ⓜ	PAIR solenoid valve
Ⓖ	Tip-over sensor (TOS)		

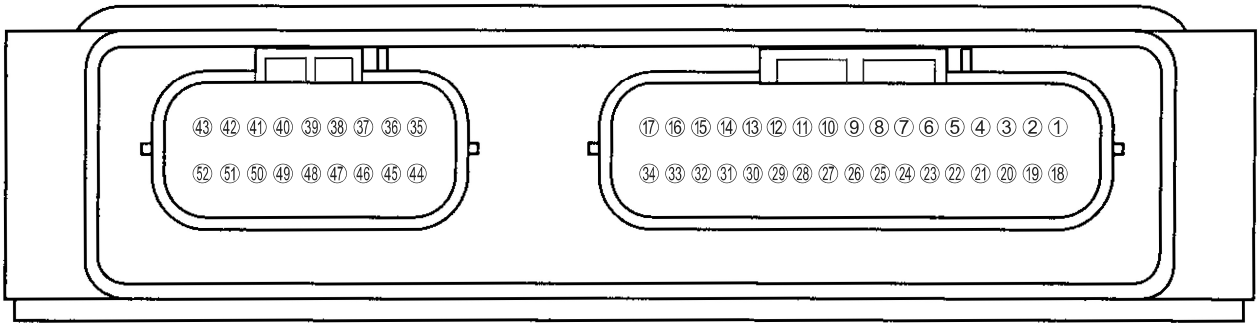


Ⓝ	Intake air pressure sensor #2 (IAPS)	Ⓡ	Intake air temperature sensor (IATS)
Ⓞ	Secondary throttle position sensor (STPS)	Ⓢ	Ignition coil #2 (IG COIL)
Ⓟ	Throttle position sensor (TPS)	Ⓣ	Engine coolant temperature sensor (ECTS)
Ⓠ	Secondary throttle valve actuator (STVA)	Ⓤ	HO2 sensor (HO2S) [For E-02, 19, 24]

FI SYSTEM WIRING DIAGRAM



ECM TERMINAL



TERMINAL NO.	CIRCUIT	TERMINAL NO.	CIRCUIT
①	GP switch signal (GP)	⑱	Ignition switch signal (AT)
②	IAT sensor signal (IAT)	⑲	ECT sensor signal (ECT)
③	Rear cylinder IAP sensor signal (IAP. R)	⑳	TO sensor signal (TOS)
④	STP sensor signal (STP)	㉑	TP sensor signal (TP)
⑤	Blank	㉒	Front cylinder IAP sensor signal (IAP. F)
⑥	Power source for sensors (VCC)	㉓	HO2 control selector (EXS) [For E-02, 19, 24]
⑦	HO2 sensor signal (HO2S) [For E-02, 19, 24]	㉔	Mode select switch (MS)
⑧	Clutch lever position switch (CLP)	㉕	Starter switch (STA)
⑨	CKP sensor signal (CKP-)	㉖	Neutral switch (NT)
⑩	Power source for fuel injector (VM)	㉗	CKP sensor signal (CKP+)
⑪	Power source (B+1)	㉘	–
⑫	Power source for back-up (B+2)	㉙	Blank
⑬	ECM ground (E1)	㉚	Blank
⑭	Sensors ground (E2)	㉛	Serial data for speedometer (TECH)
⑮	–	㉜	Serial data for self-diagnosis (SDL)
⑯	–	㉝	–
⑰	–	㉞	–

TERMINAL NO.	CIRCUIT	TERMINAL NO.	CIRCUIT
㉟	STVA signal (STVA. 1B)	㊹	STVA signal (STVA. 2B)
㊱	HO2 sensor heater (HO2. H) [For E-02, 19, 24]	㊺	Fuel pump relay (FP Relay)
㊲	STVA signal (STVA. 1A)	㊻	STVA signal (STVA. 2A)
㊳	Blank	㊼	PAIR control solenoid valve (PAIR)
㊴	Ground (E01)	㊽	Ground (E02)
㊵	Rear cylinder Fuel injector (#1)	㊾	Blank
㊶	Rear cylinder Fuel injector (#2)	㊿	Blank
㊷	Blank	(51)	Blank
㊸	Front cylinder Ignition coil (IG2)	(52)	Rear cylinder Ignition coil (IG1)

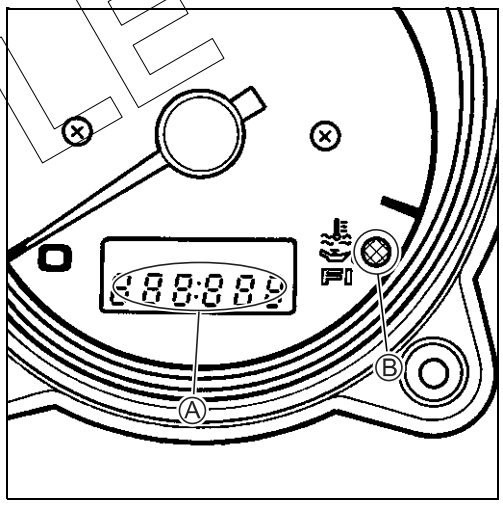
SELF-DIAGNOSIS FUNCTION

The self-diagnosis function is incorporated in the ECM. The function has two modes, “User mode” and “Dealer mode”. The user can only be notified by the LCD (DISPLAY) panel and LED (FI light). To check the function of the individual FI system devices, the dealer mode is prepared. In this check, the special tool is necessary to read the code of the malfunction items.

USER MODE

MALFUNCTION	LCD (DISPLAY) INDICATION Ⓐ	FI LIGHT INDICATION Ⓑ	INDICATION MODE
“NO”	Odometer *1	—	—
“YES”	Odometer (*1) and “FI” letters	FI light turns ON.	Each 2 sec. Odometer (*1) and “FI” are indicated alternately.
Engine can start	*2		
Engine can not start	“FI” letter *3	FI light turns ON and blinks.	“FI” is indicated continuously.

*1
Current letter displayed any one of the Odometer, Tripmeter or Clock.
*2
When one of the signals is not received by ECM, the fail-safe circuit works and injection is not stopped. In this case, “FI” and Odometer (*1) are indicated in the LCD panel and motorcycle can run.
*3
The injection signal is stopped, when the crankshaft position sensor signal, tip-over sensor signal, both #1/#2 ignition signals, both #1/#2 injector signals, fuel pump relay signal or ignition switch signal is not sent to ECM. In this case, “FI” is indicated in the LCD panel. Motorcycle does not run.



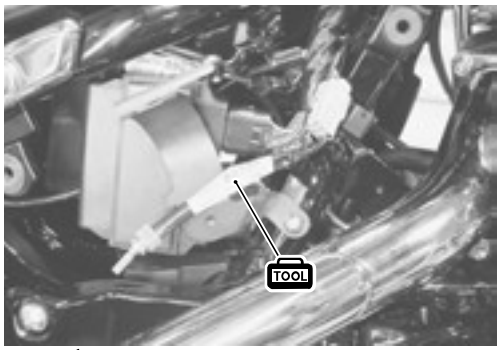
“CHEC”: The LCD panel indicates “CHEC” when no communication signal from the ECM is received for 3 seconds.
For Example
: The ignition switch is turned ON, and the engine stop switch is turned OFF. In this case, the speedometer does not receive any signal from ECM, and the panel indicates “CHEC”.
If CHEC is indicated, the LCD does not indicate the trouble code. It is necessary to check the wiring harness between ECM and speedometer couplers.
The possible cause of this indication is as follows;
Engine stop switch is in OFF position. Side-stand/ignition inter-lock system is not working. Ignition fuse is burnt.

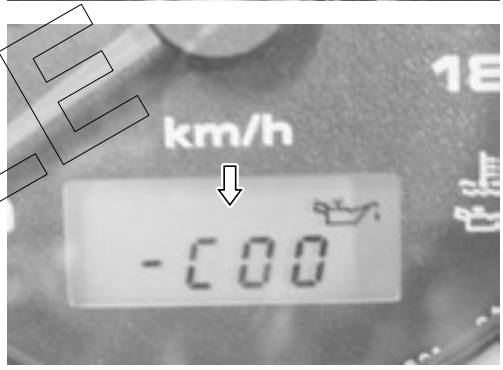
NOTE:
Until starting the engine, the FI light turns ON.
The FI light is also turned ON when engine temperature is high or oil pressure is low.

DEALER MODE

The defective function is memorized in the computer. Use the special tool's coupler to connect to the dealer mode coupler. The memorized malfunction code is displayed on the LCD (DISPLAY) panel. Malfunction means that the ECM does not receive signal from the devices. These affected devices are indicated in the code form.

09930-82720: Mode select switch





CAUTION

Before checking the malfunction code, do not disconnect the ECM lead wire couplers.
If the couplers from the ECM are disconnected, the malfunction code memory is erased and the malfunction code can not be checked.

MALFUNCTION	LCD (DISPLAY) INDICATION	FI LIGHT INDICATION	INDICATION MODE
"NO"	C00	FI light turns OFF.	—
"YES"	C** code is indicated from small numeral to large one.		For each 2 sec., code is indicated.

CODE	MALFUNCTION PART	REMARKS
C00	None	No defective part
C12	Crankshaft position sensor (CKPS)	Pick-up coil signal, signal generator
C13	Intake air pressure sensor #2 (IAPS #2)	For Front cylinder
C14	Throttle position sensor (TPS)	*1
C15	Engine coolant temp. sensor (ECTS)	
C17	Intake air pressure sensor #1 (IAPS #1)	For Rear cylinder
C21	Intake air temp. sensor (IATS)	
C23	Tip-over sensor (TOS)	
C24	Ignition signal #1 (IG coil #1)	For Rear cylinder
C25	Ignition signal #2 (IG coil #2)	For Front cylinder
C28	Secondary throttle valve actuator (STVA)	
C29	Secondary throttle valve position sensor (STPS)	*2
C31	Gear position signal (GP switch)	
C32	Injector signal #1 (FI #1)	For Rear cylinder
C33	Injector signal #2 (FI #2)	For Front cylinder
C41	Fuel pump control system (FP control system)	Fuel pump, fuel pump relay
C42	Ignition switch signal (IG switch signal)	Anti-theft
C44	Heated oxygen sensor (HO2S)	For E-02, 19, 24
C49	PAIR control solenoid valve (PAIR valve)	

In the LCD (DISPLAY) panel, the malfunction code is indicated from small code to large code.

*1

To get the proper signal from the throttle position sensor, the sensor basic position is indicated in the LCD (DISPLAY) panel. The malfunction code is indicated in three digits. In front of the three digits, a line appears in any of the three positions, upper, middle or lower line. If the indication is upper or lower line when engine rpm is 1 100 r/min, slightly turn the throttle position sensor and bring the line to the middle.

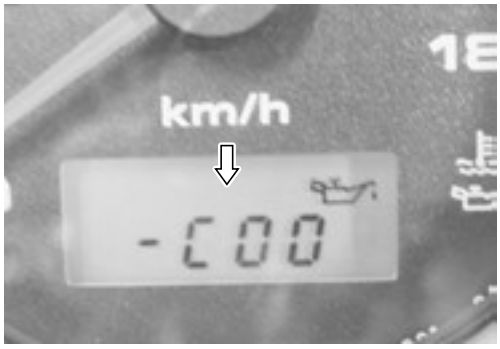
In the normal condition, the throttle valve stop screw pushes throttle valves slightly, and middle line will be indicated.

*2

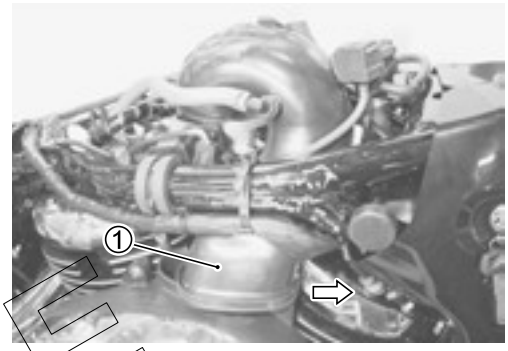
When the secondary throttle valve actuator and secondary throttle position sensor signals are not sent to ECM. In this case, C28 and C29 are indicated alternately.

TPS ADJUSTMENT

1. Warm up the engine and adjust the engine idle speed to 1 100 ± 100 r/min. (☞2-13)
2. Connect the special tool (Mode select switch) and select the dealer mode.



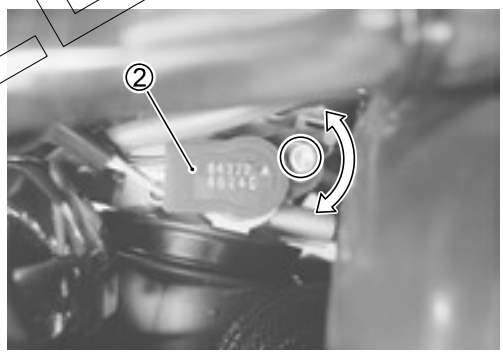
3. Remove the fuel tank. (☞6-3)
4. Loosen the inlet pipe screws. (☞5-47)
5. Move the inlet pipe ①.

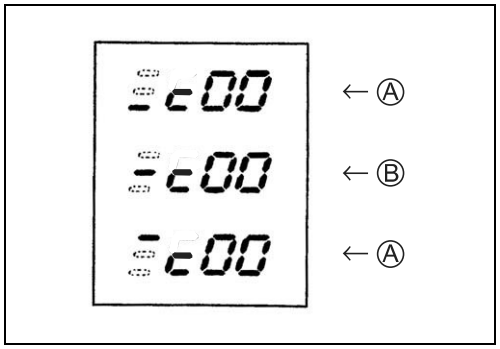


6. Loosen the screw with a torx wrench (T25) and turn the throttle position sensor ② and bring the line to the middle.
7. Then, tighten the screw to fix the throttle position sensor.

TOOL 09930-82720: Mode select switch

The LCD displays the line for 0.4 sec. at a time, and when such a display repeats two times, it indicates the current position where the sensor is fixed.





Ⓐ Incorrect
Ⓑ Correct position

FAIL-SAFE FUNCTION

FI system is provided with fail-safe function to allow the engine to start and the motorcycle to run in a minimum performance necessary even under malfunction condition.

ITEM	FAIL-SAFE MODE	STARTING ABILITY	RUNNING ABILITY
IAP sensor	Intake air pressure is fixed to 760 mmHg.	"YES"	"YES"
TP sensor	The throttle opening is fixed to full open position. Ignition timing is also fixed.	"YES"	"YES"
ECT sensor	Engine coolant temperature value is fixed to 80 °C (176 °F).	"YES"	"YES"
IAT sensor	Intake air temperature value is fixed to 40 °C (104 °F).	"YES"	"YES"
Ignition signal	#1 Ignition-off and #1 Fuel-cut	"YES"	"YES"
		#2 cylinder can run.	
	#2 Ignition-off and #2 Fuel-cut	"YES"	"YES"
		#1 cylinder can run.	
Injection signal	#1 Fuel-cut	"YES"	"YES"
		#2 cylinder can run.	
	#2 Fuel-cut	"YES"	"YES"
		#1 cylinder can run.	
Secondary throttle valve actuator	Secondary throttle valve is fixed to full close position. When motor disconnection or lock occurs, power from ECM is shut off.	"YES"	"YES"
STP sensor	Secondary throttle valve is fixed to full close position.	"YES"	"YES"
Gear position signal	Gear position signal is fixed to 5th gear.	"YES"	"YES"
Heated oxygen sensor (E-02, 19, 24)	Fuel-air compensation ratio is fixed to normal condition.	"YES"	"YES"
PAIR control solenoid valve	ECM stops controlling PAIR control solenoid valve.	"YES"	"YES"

The engine can start and can run even if the above signal is not received from each sensor. But, the engine running condition is not complete, providing only emergency help (by fail-safe circuit). In this case, it is necessary to bring the motorcycle to the workshop for complete repair.

When two ignition signals or two injector signals are not received by ECM, the fail-safe circuit can not work and ignition or injection is stopped.

FI SYSTEM TROUBLESHOOTING

CUSTOMER COMPLAINT ANALYSIS

Record details of the problem (failure, complaint) and how it occurred as described by the customer. For this purpose, use of an inspection form such as below will facilitate collecting information required for proper analysis and diagnosis.

EXAMPLE: CUSTOMER PROBLEM INSPECTION FORM

User name:	Model:	VIN:	
Date of issue:	Date Reg.	Date of problem:	Mileage:

Malfunction indicator lamp condition (LED)	☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition
Malfunction display/code (LCD)	User mode: ☐ No display ☐ Malfunction display ( )
	Dealer mode: ☐ No code ☐ Malfunction code ( )

PROBLEM SYMPTOMS	
☐ **Difficult Starting** ☐ No cranking ☐ No initial combustion ☐ No combustion ☐ Poor starting at (☐ cold ☐ warm ☐ always) ☐ Other _____	☐ **Poor Driveability** ☐ Hesitation on acceleration ☐ Back fire/☐ After fire ☐ Lack of power ☐ Surging ☐ Abnormal knocking ☐ Engine rpm jumps briefly ☐ Other _____
☐ **Poor Idling** ☐ Poor fast idle ☐ Abnormal idling speed (☐ High ☐ Low) (r/min) ☐ Unstable ☐ Hunting (r/min to r/min) ☐ Other _____	☐ **Engine Stall when** ☐ Immediately after start ☐ Throttle valve is opened ☐ Throttle valve is closed ☐ Load is applied ☐ Other _____
☐ OTHERS:	

MOTORCYCLE/ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental condition	
Weather	☐ Fair ☐ Cloudy ☐ Rain ☐ Snow ☐ Always ☐ Other _____
Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (°C/ °F) ☐ Always
Frequency	☐ Always ☐ Sometimes (times/ day, month) ☐ Only once
	☐ Under certain condition
Road	☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous (☐ Uphill ☐ Downhill)
	☐ Tarmacadam ☐ Gravel ☐ Other _____
Motorcycle condition	
Engine condition	☐ Cold ☐ Warming up phase ☐ Warmed up ☐ Always ☐ Other at starting
	☐ Immediately after start ☐ Racing without load ☐ Engine speed (r/min)
Motorcycle condition	During driving: ☐ Constant speed ☐ Accelerating ☐ Decelerating
	☐ Right hand corner ☐ Left hand corner
	☐ At stop ☐ Motorcycle speed when problem occurs (km/h, mile/h)
	☐ Other _____

NOTE:
The above form is a standard sample. The form should be modified according to conditions and characteristics of each market.

VISUAL INSPECTION

- Prior to diagnosis using the mode select switch or SDS, perform the following visual inspections. The reason for visual inspection is that mechanical failures (such as oil leakage) cannot be displayed on the screen with the use of mode select switch or SDS.

* Engine oil level and leakage (☞2-11)
* Fuel level and leakage (☞2-10)
* Clogged air cleaner element (☞2-4)
* Battery condition (☞9-37)
* Throttle cable play (☞2-14)
* Vacuum hoses looseness, bend and disconnection
* Broken fuse
* FI light operation (☞5-16 and 9-29)
* Each warning light operation (☞9-29)
* Speedometer operation (☞9-31)
* Exhaust gas leakage and noise (☞2-24)
* Each coupler disconnection
* Clogged radiator core (☞7-5)
* Engine coolant level and leakage. (☞7-6)

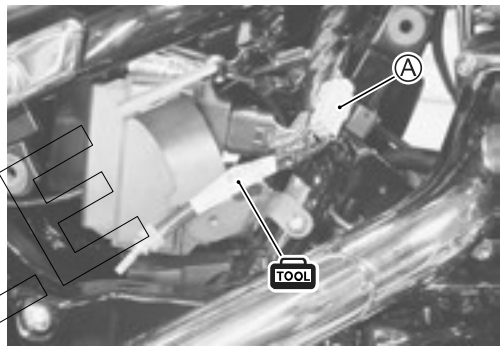
SELF-DIAGNOSTIC PROCEDURES

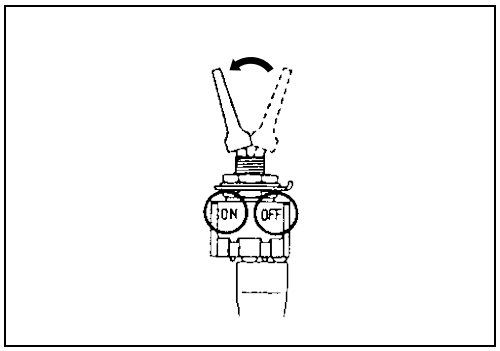
NOTE:

* *Don't disconnect couplers from the ECM, the battery cable from the battery, ECM ground wire harness from the engine or main fuse before confirming the malfunction code (self-diagnostic trouble code) stored in memory. Such disconnection will erase the memorized information in ECM memory.*
* *Malfunction code stored in ECM memory can be checked by the special tool.*
* *Before checking malfunction code, read SELF-DIAGNOSIS FUNCTION "USER MODE and DEALER MODE" (☞5-16 and -17) carefully to have good understanding as to what functions are available and how to use it.*
* *Be sure to read "PRECAUTIONS IN SERVICING" (☞5-3) before inspection and observe what is written there.*

- Remove the right frame cover. (☞8-4)
- Connect the special tool to the dealer mode coupler Ⓐ at the wiring harness, and start the engine or crank the engine for more than 4 seconds.
- Turn the special tool's switch ON and check the malfunction code to determine the malfunction part.

TOOL 09930-82720: Mode select switch



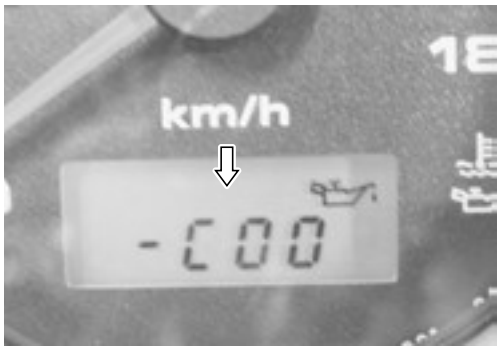


SELF-DIAGNOSIS RESET PROCEDURE

- After repairing the trouble, turn OFF the ignition switch and turn ON again.
- If the malfunction code indicates (C00), the malfunction is cleared.
- Disconnect the special tool from the dealer mode coupler.

NOTE:

* *Even though the malfunction code (C00) is indicated, the previous malfunction history code still remains stored in the ECM. Therefore, erase the history code memorized in the ECM using SDS.*
* *The malfunction code is memorized in the ECM also when the wire coupler of any sensor is disconnected. Therefore, when a wire coupler has been disconnected at the time of diagnosis, erase the stored malfunction history code using SDS.*

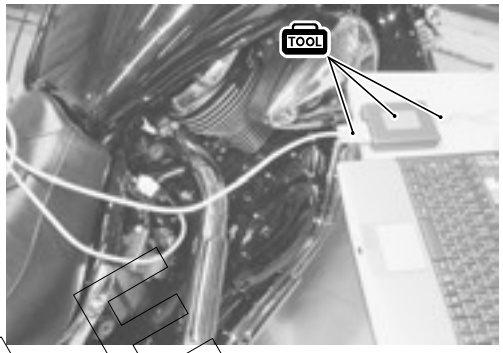


USE OF SDS DIAGNOSTIC PROCEDURES

** Don't disconnect couplers from ECM, the battery cable from the battery, ECM ground wire harness from the engine or main fuse before confirming the malfunction code (self-diagnostic trouble code) stored in memory. Such disconnection will erase the memorized information in ECM memory.*

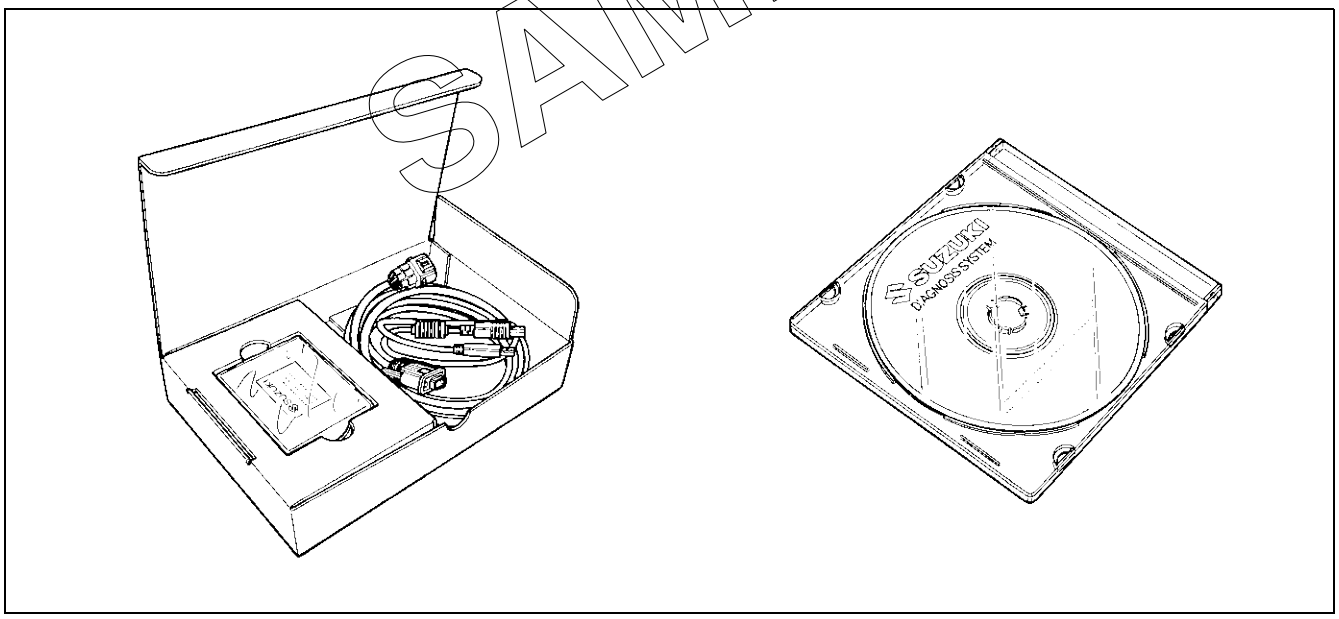
** Malfunction code stored in ECM memory can be checked by the SDS.*

** Be sure to read "PRECAUTIONS IN SERVICING" (☞5-3) before inspection and observe what is written there.*

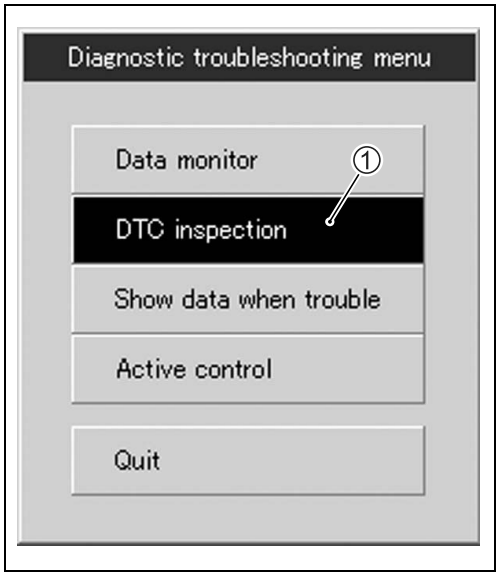


- Remove the right frame cover. (☞8-4)
- Set up the SDS tool. (Refer to the SDS operation manual for further details)
- Read the DTC (Diagnostic Trouble Code) and show data when trouble (displaying data at the time of DTC) according to instructions displayed on SDS.
- Not only is SDS used for detecting Diagnostic Trouble Codes but also for reproducing and checking on screen the failure condition as described by customers using the trigger.
- How to use trigger. (Refer to the SDS operation manual for further details.)

TOOL 09904-41010: SDS set tool
99565-01010-005: CD-ROM Ver. 5



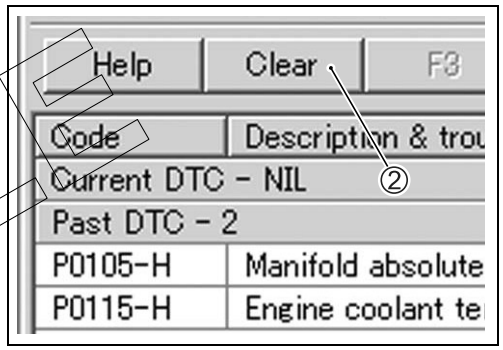
USE OF SDS DIAGNOSIS RESET PROCEDURE



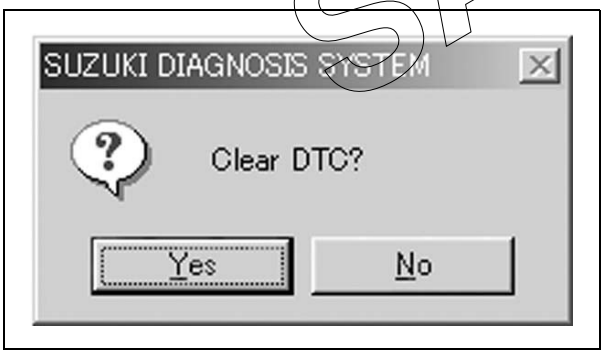
- After repairing the trouble, turn OFF the ignition switch and turn ON again.
- Click the DTC inspection button ①.
- Check the DTC.
- The previous malfunction history code (Past DTC) still remains stored in the ECM. Therefore, erase the history code memorized in the ECM using SDS tool.

NOTE:
The malfunction code is memorized in the ECM also when the wire coupler of any sensor is disconnected. Therefore, when a wire coupler has been disconnected at the time of diagnosis, erase the stored malfunction history code using SDS.

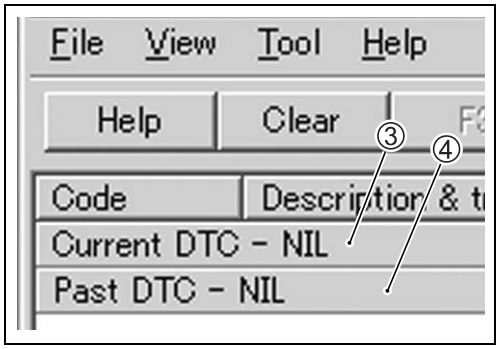
- Click "Clear" ② to delete history code (Past DTC).



- Follow the displayed instructions.

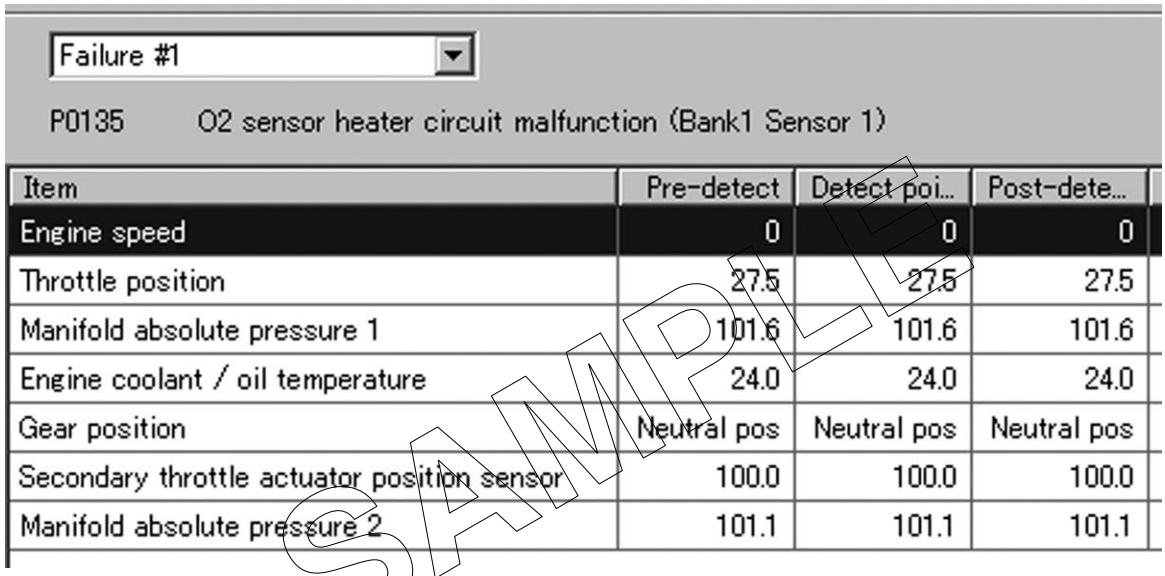


- Check that both "Current DTC" ③ and "Past DTC" ④ are deleted (NIL).

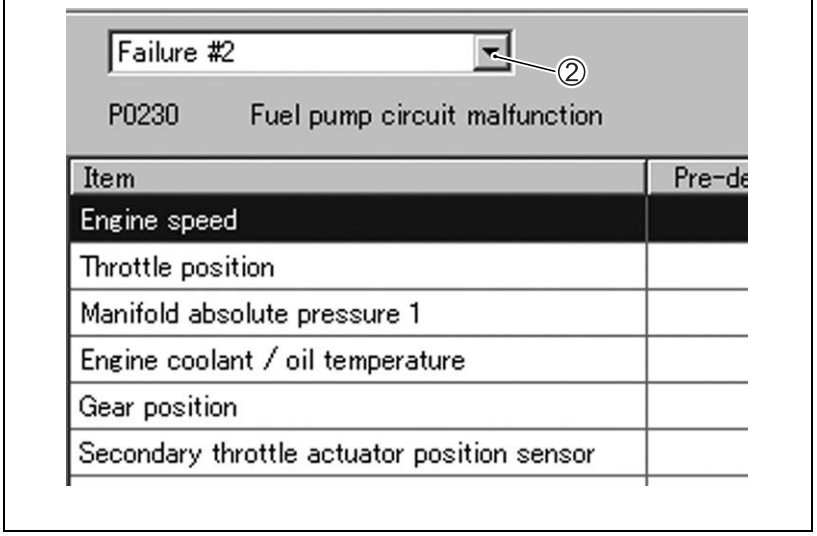


SHOW DATA WHEN TROUBLE (DISPLAING DATA AT THE TIME OF DTC)

ECM stores the engine and driving conditions (in the form of data as shown in the figure) at the moment of the detection of a malfunction in its memory. This data is called “Show data when trouble”.
Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, where the motorcycle was running or stopped) when a malfunction was detected by checking the show data when trouble. This show data when trouble function can record the maximum of two Diagnostic Trouble Codes in the ECM.
Also, ECM has a function to store each show data when trouble for two different malfunctions in the order as the malfunction is detected. Utilizing this function, it is possible to know the order of malfunctions that have been detected. Its use is helpful when rechecking or diagnosing a trouble.



- Click “Show data when trouble” ① to display the data. By clicking the drop down button ②, either “Failure #1” or “Failure #2” can be selected.



MALFUNCTION CODE AND DEFECTIVE CONDITION

DTC No.		DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C00		NO FAULT	————	————
C12		CKP sensor	The signal does not reach ECM for 3 sec. or more, after receiving the starter signal.	CKP sensor wiring and mechanical parts CKP sensor, lead wire/coupler connection
P0335				
C13/C17		IAP sensor	The sensor should produce following voltage. 0.1 V ≦ sensor voltage < 4.8 V In other than the above range, C13 (P1750) or C17 (P0105) is indicated.	IAP sensor, lead wire/coupler connection
P1750/P0105				
C14		TP sensor	The sensor should produce following voltage. 0.1 V ≦ sensor voltage < 4.8 V In other than the above range, C14 (P0120) is indicated.	TP sensor, lead wire/coupler connection
P0120	H		Sensor voltage is higher than specified value.	TP sensor circuit shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	TP sensor circuit open or shorted to ground or VCC circuit open
C15		ECT sensor	The sensor voltage should be the following. 0.1 V ≦ sensor voltage < 4.6 V In other than the above range, C15 (P0115) is indicated.	ECT sensor, lead wire/coupler connection
P0115	H		Sensor voltage is higher than specified value.	ECT sensor circuit open or ground circuit open
	L		Sensor voltage is lower than specified value.	ECT sensor circuit shorted to ground

DTC No.		DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C21		IAT sensor	The sensor voltage should be the following. 0.1 V ≦ sensor voltage < 4.6 V In other than the above range, C21 (P0110) is indicated.	IAT sensor, lead wire/coupler connection
P0110	H		Sensor voltage is higher than specified value.	IAT sensor circuit open or ground circuit open
	L		Sensor voltage is lower than specified value.	IAT sensor circuit shorted to ground
C23		TO sensor	The sensor voltage should be the following for 2 sec. and more, after ignition switch is turned ON. 0.2 V ≦ sensor voltage ≦ 4.6 V In other than the above value, C23 (P1651) is indicated.	TO sensor, lead wire/coupler connection
P1651	H		Sensor voltage is higher than specified value.	TO sensor circuit open or shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	TO sensor circuit shorted to ground or VCC circuit open
C24/C25		Ignition signal	CKP sensor (pick-up coil) signal is produced, but signal from ignition coil is interrupted 8 times or more continuously. In this case, the code C24 (P0351) or C25 (P0352) is indicated.	Ignition coil, lead wire/coupler connection, power supply from the battery
P0351/P0352				
C28		Secondary throttle valve actuator	When no actuator control signal is supplied from the ECM, communication signal does not reach ECM or operation voltage does not reach STVA motor, C28 (P1655) is indicated. STVA can not operate.	STVA motor, STVA lead wire/coupler
P1655				
C29		STP sensor	The sensor should produce following voltage. 0.1 V ≦ sensor voltage < 4.8 V In other than the above range, C29 is indicated.	STP sensor, lead wire/coupler connection
P1654	H		Sensor voltage is higher than specified value.	STP sensor circuit shorted to VCC or ground circuit open
	L		Sensor voltage is lower than specified value.	STP sensor circuit open or shorted to ground or VCC circuit open

DTC No.	DETECTED ITEM	DETECTED FAILURE CONDITION	CHECK FOR
C31 P0705	Gear position signal	Gear position signal voltage should be higher than the following for 3 seconds and more. Gear position sensor voltage > 0.6 V If lower than the above value, C31 (P0705) is indicated.	GP switch, lead wire/coupler connection, Gearshift cam, etc.
C32/C33 P0201/P0202	Fuel injector	CKP sensor (pickup coil) signal is produced, but fuel injector signal is interrupted 4 times or more continuously. In this case, the code C32 (P0201) or C33 (P0202) is indicated.	Fuel injector, wiring/coupler connection, power supply to the injector
C41 P0230	Fuel pump relay	No voltage is applied to the fuel pump, although fuel pump relay is turned ON, or voltage is applied to fuel pump, although fuel pump relay is turned OFF.	Fuel pump relay, lead wire/coupler connection. power source to the fuel pump relay and fuel injectors
C42 P1650	Ignition switch	Ignition switch signal is not input to ECM.	Ignition switch, lead wire/coupler
C44 P0130	HO2 sensor (E-02, 19, 24)	HO2 sensor output voltage is not input to ECM during engine operation and running condition. (Sensor voltage $\leq$ 0.1 V) In other than the above value, C44 (P0130) is indicated.	HO2 sensor circuit open or shorted to ground
C44 P0135		The Heater can not operate so that heater operation voltage is not supply to the oxygen heater circuit, C44 (P0135) is indicated.	HO2 sensor lead wire/coupler connection Battery voltage supply to the HO2 sensor
C49 P1656	PAIR control solenoid valve	PAIR control solenoid valve voltage is not input to ECM.	PAIR control solenoid valve, lead wire/coupler

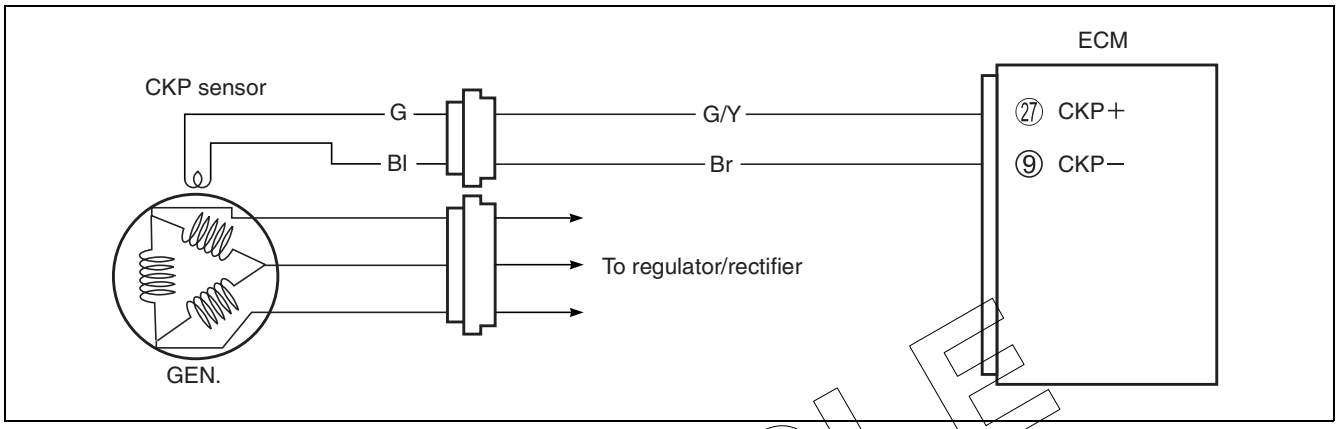
NOTE:

HO2 SENSOR VOLTAGE MEASURING CONDITION

1. 10 minutes after the engine start (Idling) or 100 sec. after the engine start (Engine revolution is over 2 000 r/min).
2. Coolant temperature is upper 45 °C (113 °F).

"C12" (P0335) CKP SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
The signal does not reach ECM for 3 sec. or more, after receiving the starter signal.	• Metal particles or foreign material being stuck on the CKP sensor and rotor tip • CKP sensor circuit open or short • CKP sensor malfunction • ECM malfunction

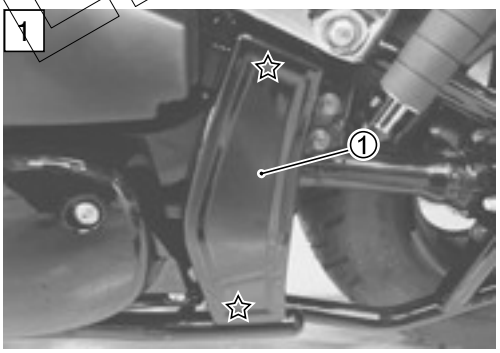


INSPECTION

Step 1

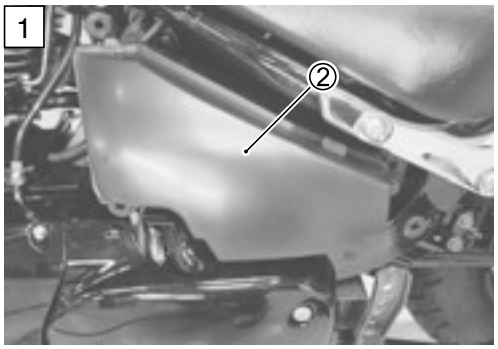
1) Remove the left frame cover (☞8-3)

2) Remove the left frame lower cover ①.

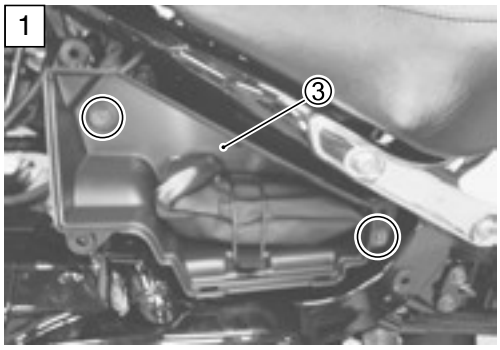


☆: Hooked part

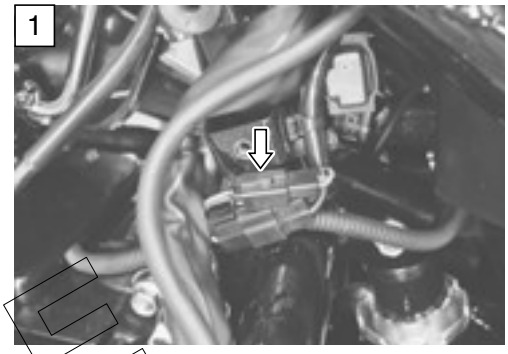
3) Remove the tool box cover ②.



4) Remove the tool box ③.

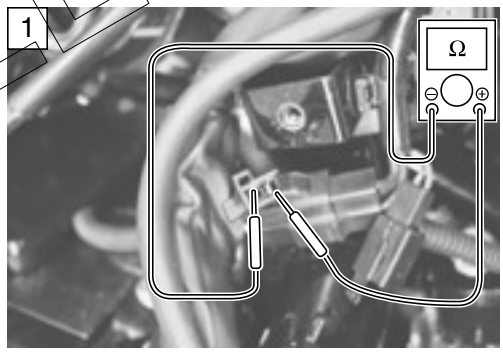


5) Turn the ignition switch OFF.
6) Check the CKP sensor coupler for loose or poor contacts.
If OK, then measure the CKP sensor resistance.



7) Disconnect the CKP sensor coupler and measure the resistance.

DATA CKP sensor resistance: 184 – 276 Ω
(Green – Blue)

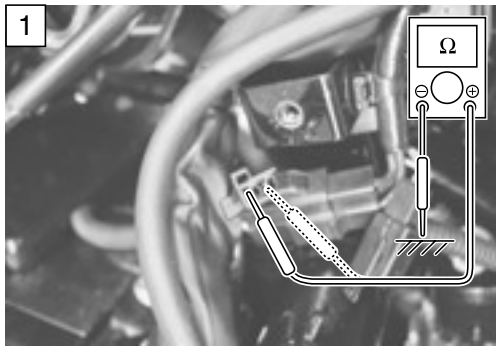


8) If OK, then check the continuity between each terminal and ground.

DATA CKP sensor continuity: ∞ Ω (Infinity)
(Blue – Ground)
(Green – Ground)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



Are the resistance and continuity OK?

YES	Go to Step 2.
NO	Replace the CKP sensor with a new one.

9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

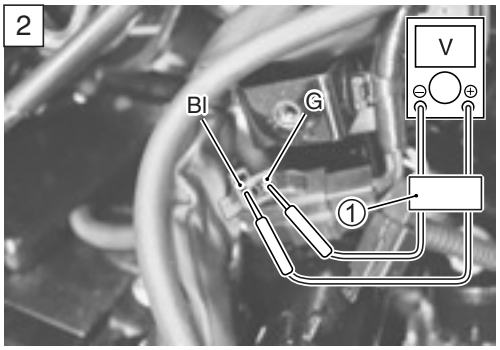
1) Crank the engine a few seconds with the starter motor, and measure the CKP sensor peak voltage at the coupler.
2) Repeat the above test procedure a few times and measure the highest peak voltage.

DATA CKP sensor peak voltage: 4.0 V and more (⊕ Green – ⊖ Blue)

① Peak volt adaptor

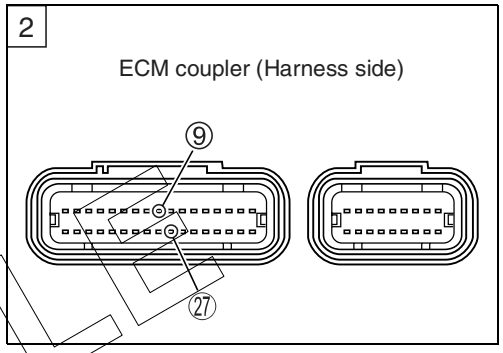
TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

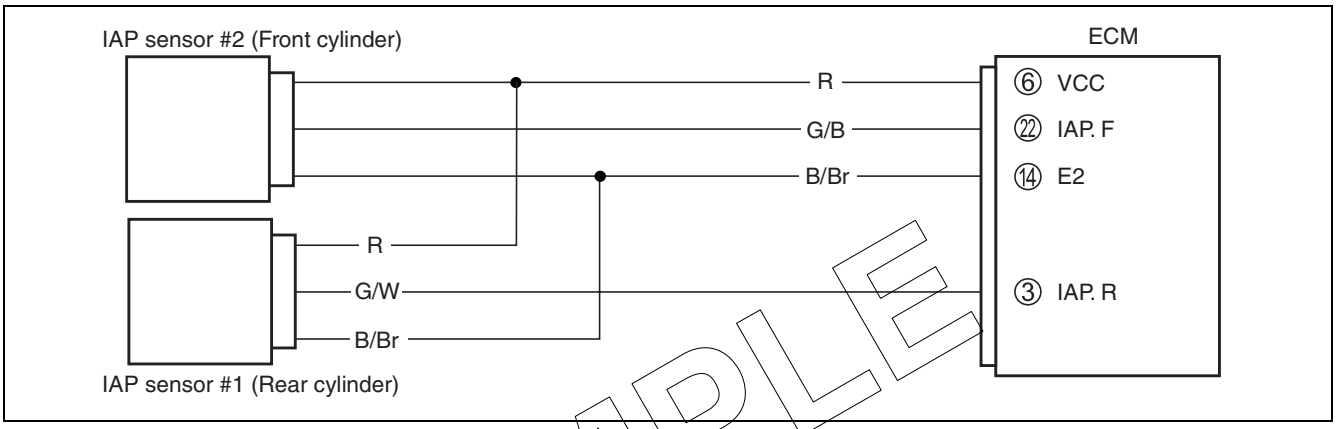
YES	• G/Y or Brown wire open or shorted to ground • Loose or poor contacts on the CKP sensor coupler or ECM coupler (terminal ⑨ or ㉗) • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	• Inspect that metal particles or foreign material stuck on the CKP sensor and rotor tip. • If there are no metal particles and foreign material, then replace the CKP sensor with a new one.



3) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C13" (P1750) or "C17" (P0105) IAP SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
IAP sensor voltage low or high (0.1 V ≦ Sensor voltage < 4.8 V) *NOTE:* *Note that atmospheric pressure varies depending on weather conditions as well as altitude.* *Take that into consideration when inspecting voltage.*	• Clogged vacuum passage between throttle body and IAP sensor • Air being drawn from vacuum passage between throttle body and IAP sensor • IAP sensor circuit open or shorted to ground • IAP sensor malfunction • ECM malfunction



INSPECTION

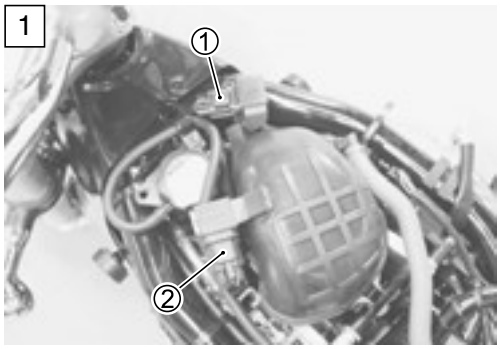
Step 1

(When indicating C13/P1750 for IAP sensor #2)

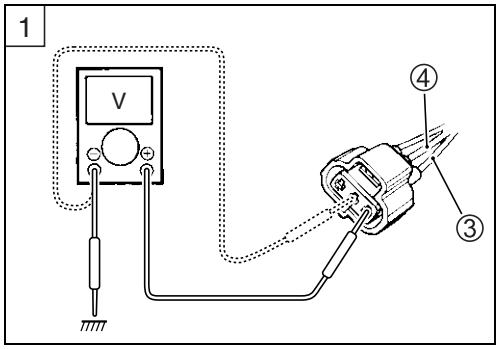
1) For the other inspection procedures are the same as C17/P0105.

(When indicating C17/P0105 for IAP sensor #1)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the IAP sensor coupler (Front cylinder side ① or Rear cylinder side ②) for loose or poor contacts.
   If OK, then measure the IAP sensor input voltage.



4) Disconnect the IAP sensor coupler.
5) Turn the ignition switch ON.
6) Measure the voltage at the Red wire ③ and ground.
7) Also, measure the voltage at the Red wire ③ and B/Br wire ④.



DATA IAP sensor input voltage: 4.5 – 5.5 V
(⊕ Red – ⊖ Ground)
(⊕ Red – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

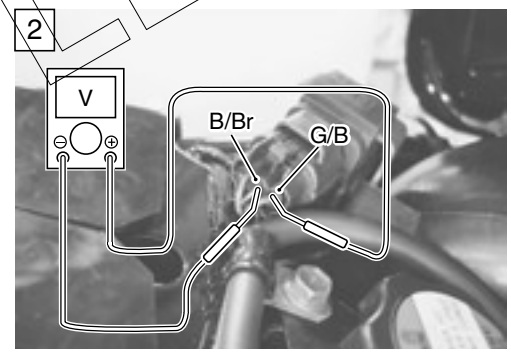
YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ⑥ or ⑭) • Open or short circuit in the Red wire or B/Br wire

8) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

1) Connect the IAP sensor coupler.
2) Reinstall the fuel tank and lift up the fuel tank.

3) Insert the needle pointed probes to the lead wire coupler.
4) Start the engine at idle speed and measure the IAP sensor output voltage at the wire side coupler.
   (Front cylinder side: between G/B and B/Br wires)
   (Rear cylinder side: between G/W and B/Br wires)



DATA IAP sensor output voltage: Approx. 2.6 V at idle speed
(Front cylinder side: ⊕ G/B – ⊖ B/Br)
(Rear cylinder side: ⊕ G/W – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

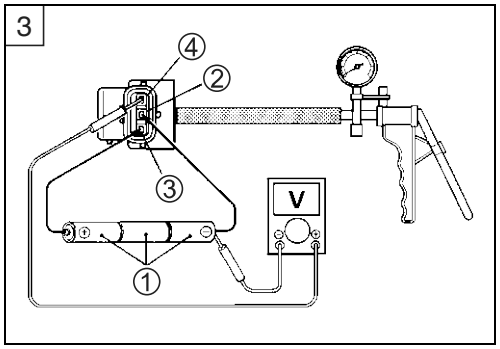
Is the voltage OK?

YES	Go to Step 3.
NO	• Check the vacuum hose for crack or damage. • Open or short circuit in the G/B wire (Front cylinder side) • Open or short circuit in the G/W wire (Rear cylinder side) • If vacuum hose and wire are OK, replace the IAP sensor with a new one.

5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 3

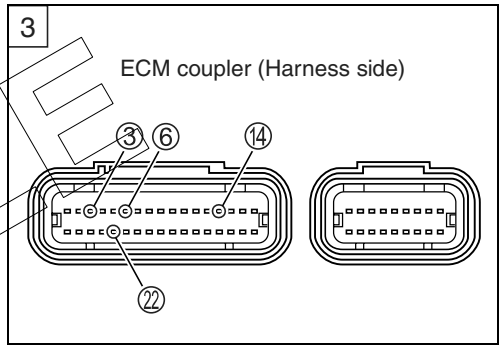
1) Turn the ignition switch OFF.
2) Remove the IAP sensor. (☞5-75)
3) Connect the vacuum pump gauge to the vacuum port of the IAP sensor.
4) Arrange 3 new 1.5 V batteries in series ① (check that total voltage is 4.5 – 5.0 V) and connect ⊖ terminal to the ground terminal ② and ⊕ terminal to the VCC terminal ③.
5) Check the voltage between Vout ④ and ground. Also, check if voltage reduces when vacuum is applied up to 400 mmHg by using vacuum pump gauge. (☞5-36)



TOOL 09917-47011: Vacuum pump gauge
09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)

Is the voltage OK?



YES	• Red, B/Br or G/B wire open or shorted to ground, or poor ⑥, ⑭ or ㉒ connection (Front cylinder side) • G/W, Red or B/Br wire open or shorted to ground, or poor ③, ⑥ or ⑭ connection (Rear cylinder side) • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	If check result is not satisfactory, replace the IAP sensor with a new one.

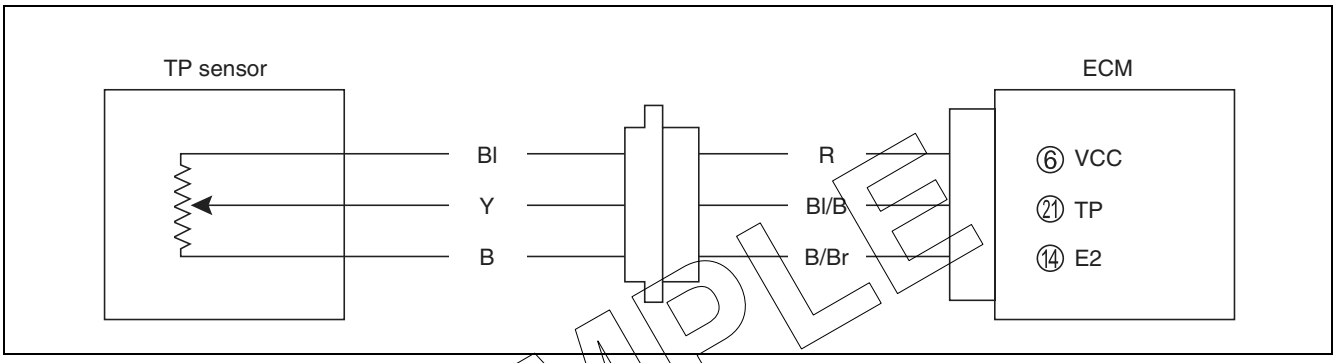
6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Output voltage (VCC voltage 4.5 – 5.0 V, ambient temp. 20 – 30 °C, 68 – 86 °F)

ALTITUDE (Reference)		ATMOSPHERIC PRESSURE		OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	kPa	(V)
0 | 2 000	0 | 610	760 | 707	100 | 94	3.4 – 4.0
2 001 | 5 000	611 | 1 524	707 | 634	94 | 85	2.8 – 3.7
5 001 | 8 000	1 525 | 2 438	634 | 567	85 | 76	2.6 – 3.4
8 001 | 10 000	2 439 | 3 048	567 | 526	76 | 70	2.4 – 3.1

"C14" (P0120-H/L) TP SENSOR CIRCUIT MALFUNCTION

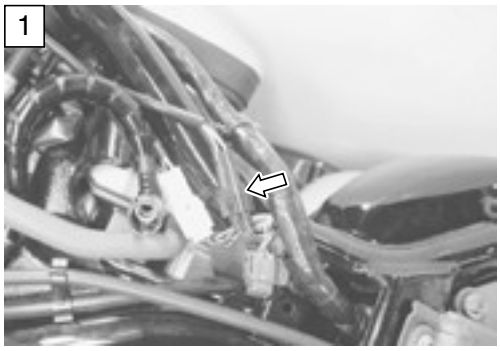
DETECTED CONDITION			POSSIBLE CAUSE
C14		Output voltage is not within the following range. Difference between actual throttle opening and opening calculated by ECM is larger than specified value. 0.1 V ≦ Sensor voltage < 4.8 V	• TP sensor maladjusted • TP sensor circuit open or short • TP sensor malfunction • ECM malfunction
P0120	H	Sensor voltage is higher than specified value.	• TP sensor circuit shorted to VCC or ground circuit open
	L	Sensor voltage is lower than specified value.	• TP sensor circuit open or shorted to ground or VCC circuit open



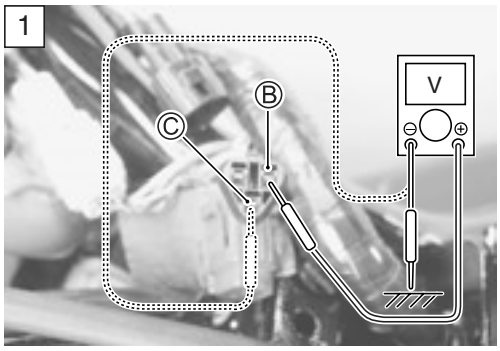
INSPECTION

Step 1 (When indicating C14:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the TP sensor coupler for loose or poor contacts.
   If OK, then measure the TP sensor input voltage.
4) Disconnect the TP sensor coupler.
5) Turn the ignition switch ON.
6) Measure the voltage at the Red wire Ⓑ and ground.
7) Also, measure the voltage at the Red wire Ⓑ and B/Br wire Ⓒ.



DATA TP sensor input voltage: 4.5 – 5.5 V
(⊕ Red – ⊖ Ground)
(⊕ Red – ⊖ B/Br)



TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

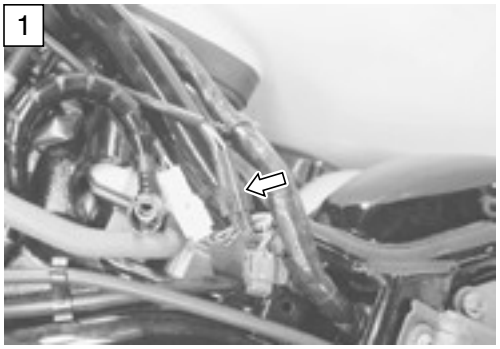
Tester knob indication: Voltage (⎓)

Is the voltage OK?

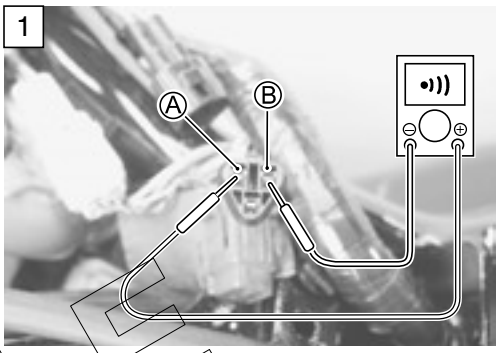
YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ⑥ or ⑭) • Open or short circuit in the Red wire or B/Br wire

Step 1 (When indicating P0120-H:)

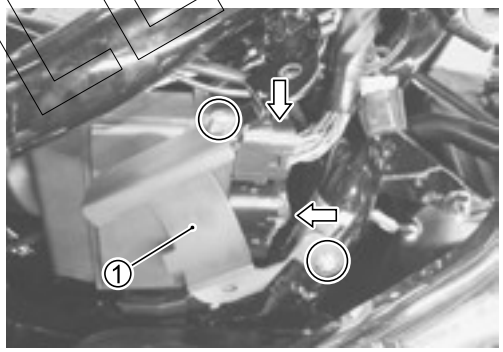
1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the TP sensor coupler for loose or poor contacts.
   If OK, then check the TP sensor lead wire continuity.



4) Disconnect the TP sensor coupler.
5) Check the continuity between BI/B wire Ⓐ and Red wire Ⓑ.
   If the sound is not heard from the tester, the circuit condition is OK.



6) Remove the right frame cover (☞8-4), ECM bracket ① and disconnect the ECM coupler.

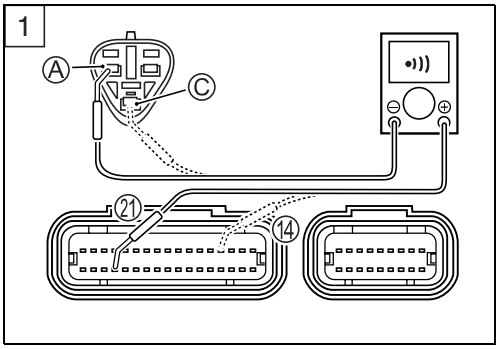


7) Check the continuity between BI/B wire Ⓐ and terminal ㉑.
8) Also, check the continuity between B/Br wire Ⓒ and terminal ⑭.

DATA TPS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



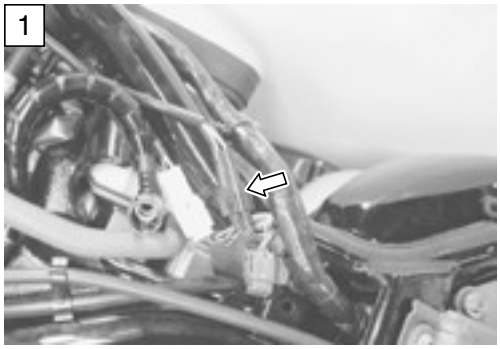
Is the continuity OK?

YES	Go to Step 2.
NO	BI/B wire shorted to VCC, or B/Br wire open

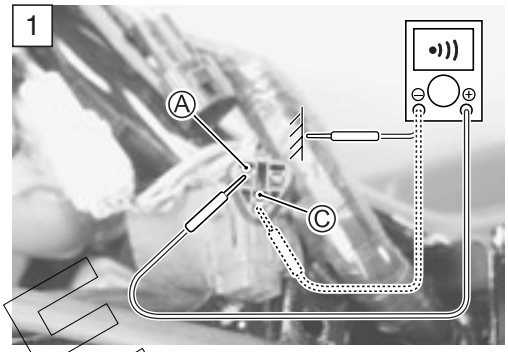
9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 1 (When indicating P0120-L:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the TP sensor coupler for loose or poor contacts.
   If OK, then measure the TP sensor lead wire continuity.



4) Disconnect the TP sensor coupler.
5) Check the continuity between BI/B wire Ⓐ and ground.
6) Also, check the continuity between BI/B wire Ⓐ and B/Br wire Ⓒ. If the sound is not heard from the tester, the circuit condition is OK.

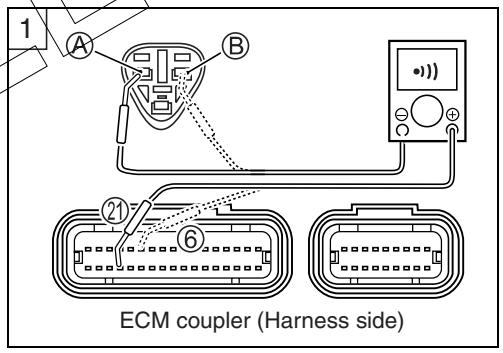


7) Remove the right frame cover. (☞8-4), ECM bracket (☞5-38) and disconnect the ECM coupler.
8) Check the continuity between BI/B wire Ⓐ and terminal ㉑.
9) Also, check the continuity between Red wire Ⓑ and terminal ⑥.

DATA TPS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



Is the continuity OK?

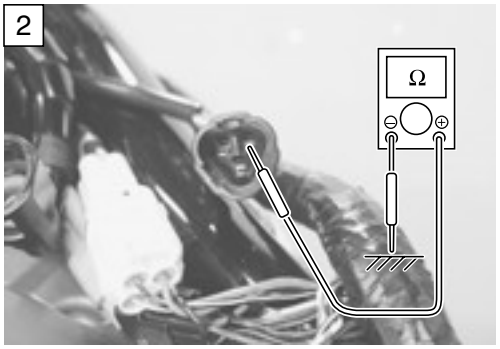
YES	Go to Step 1 (☞5-38) and go to Step 2.
NO	Red wire or BI/B wire open, or BI/B wire shorted to ground

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

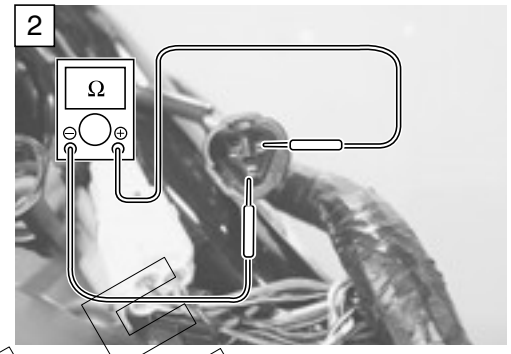
1) Turn the ignition switch OFF.
2) Disconnect the TP sensor coupler.
3) Check the continuity between Yellow wire and ground.

DATA **TP sensor continuity: ∞ Ω (Infinity)**
(Yellow – Ground)



4) If OK, then measure the TP sensor resistance at the terminals (between Yellow wire and Black wire).
5) Turn the throttle grip and measure the resistance.

DATA **TP sensor resistance**
Throttle valve is closed : Approx. 1.1 kΩ
Throttle valve is opened: Approx. 4.4 kΩ



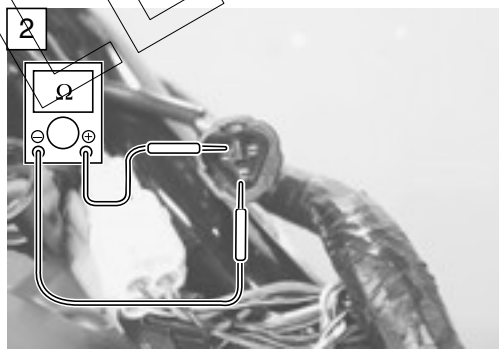
6) If OK, then measure the TP sensor resistance at the terminals (between Blue wire and Black wire).

DATA **TP sensor resistance: Approx. 4.66 kΩ**
(Blue wire – Black wire)

TOOL **09900-25008: Multi-circuit tester set**

Tester knob indication: Resistance (Ω)

Are the continuity and resistance OK?

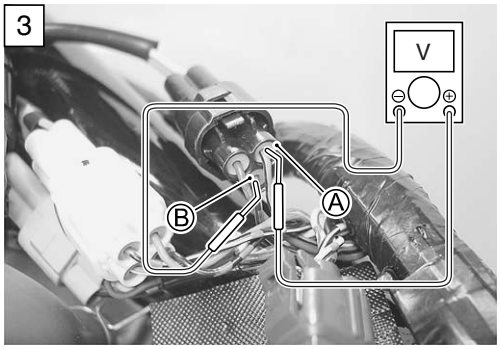


YES	Go to Step 3.
NO	• Reset the TP sensor position correctly. • Replace the TP sensor with a new one.

7) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 3

1) Connect the TP sensor coupler.
2) Insert the needle pointed probes to the lead wire coupler.
3) Turn the ignition switch ON.
4) Measure the TP sensor output voltage at the coupler (between Bl/B wire Ⓐ and B/Br wire Ⓑ) by turning the throttle grip.

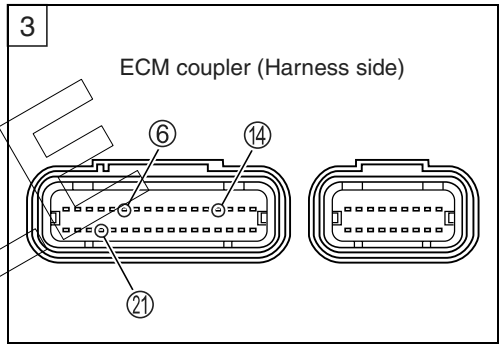


DATA TP sensor output voltage
Throttle valve is closed: Approx. 1.1 V
Throttle valve is opened: Approx. 4.4 V

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

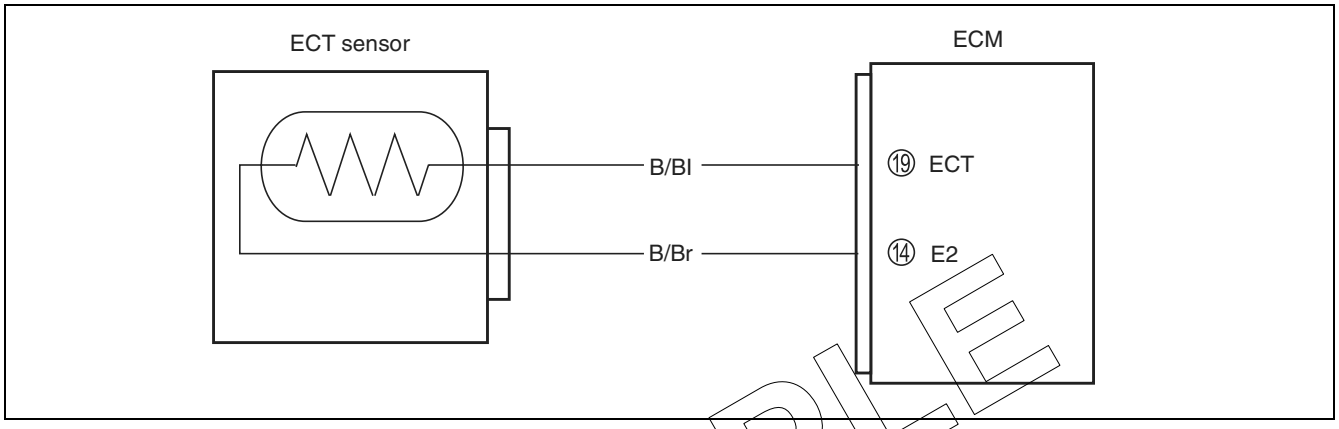


YES	• R, B/Br or Bl/B wire open or shorted to ground, or poor ⑥, ⑭ or ㉑ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	If check result is not satisfactory, replace TP sensor with a new one.

5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C15" (P0115-H/L) ECT SENSOR CIRCUIT MALFUNCTION

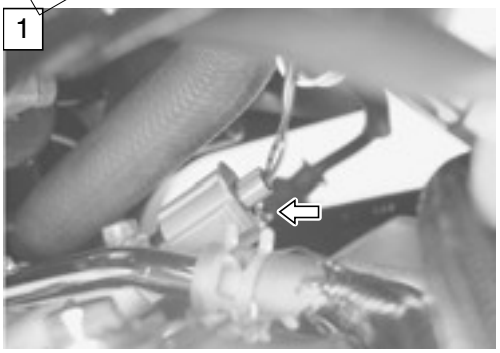
DETECTED CONDITION			POSSIBLE CAUSE
C15		Output voltage is not within the following range. 0.1 ≦ Sensor voltage < 4.6 V	• ECT sensor circuit open or short • ECT sensor malfunction • ECM malfunction
P0115	H	Sensor voltage is higher than specified value.	• ECT sensor circuit open or ground circuit open
	L	Sensor voltage is lower than specified value.	• ECT sensor circuit shorted to ground

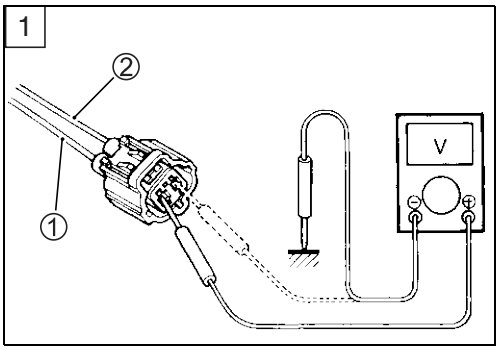


INSPECTION

Step 1 (When indicating C15:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the ECT sensor coupler for loose or poor contacts.
   If OK, then measure the ECT sensor voltage at the wire side coupler.
4) Disconnect the ECT sensor coupler and turn the ignition switch ON.
5) Measure the voltage between B/Bl wire terminal ① and ground.
6) Also, measure the voltage between B/Bl wire terminal ① and B/Br wire terminal ②.





DATA ECT sensor input voltage: 4.5 – 5.5 V
(⊕ B/Bl – ⊖ Ground)
(⊕ B/Bl – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set

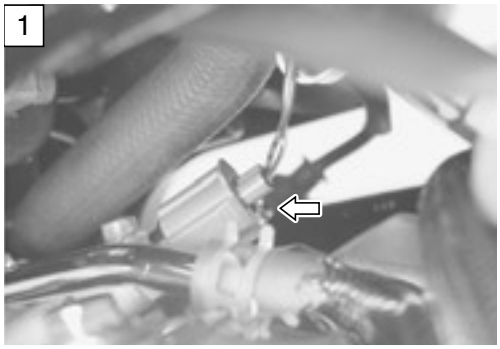
Tester knob indication: Voltage (⎓)

Is the voltage OK?

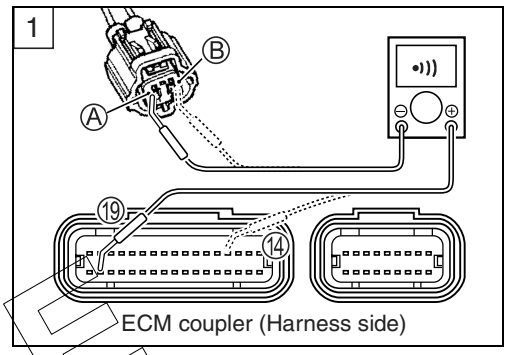
YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ⑭ or ⑲) • Open or short circuit in the B/Bl wire or B/Br wire

Step 1 (When indicating P0115-H:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the ECT sensor coupler for loose or poor contacts.
   If OK, then check the ECT sensor lead wire continuity.



4) Remove the right frame cover. (☞8-4)
5) Disconnect the ECT sensor coupler.
6) Remove the ECM bracket (☞5-38) and ECM coupler.
7) Check the continuity between B/Bl wire Ⓐ and terminal ⑲.
8) Also, check the continuity between B/Br wire Ⓑ and terminal ⑭.



DATA ECTS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))

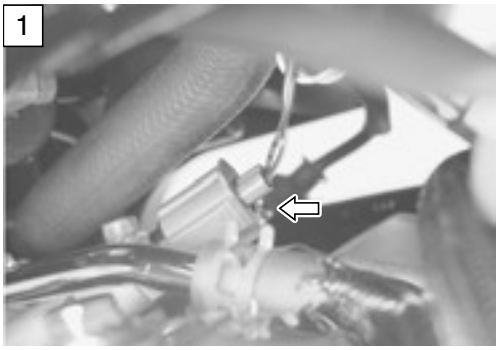
Is the continuity OK?

YES	Go to Step 2.
NO	B/Bl or B/Br wire open

9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

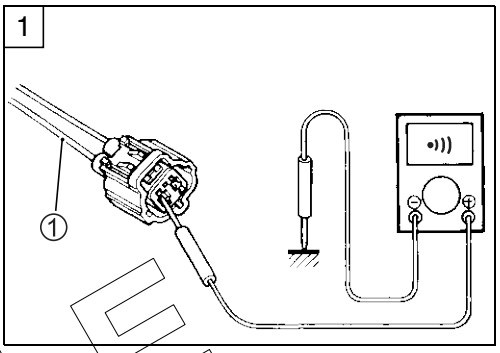
Step 1 (When indicating P0115-L:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the ECT sensor coupler for loose or poor contacts.
   If OK, then check the ECT sensor lead wire continuity.



4) Disconnect the ECT sensor coupler.
5) Check the continuity between B/Bl wire ① and ground.
6) If the sound is not heard from the tester, the circuit condition is OK.

Tester knob indication: Continuity test (•))))

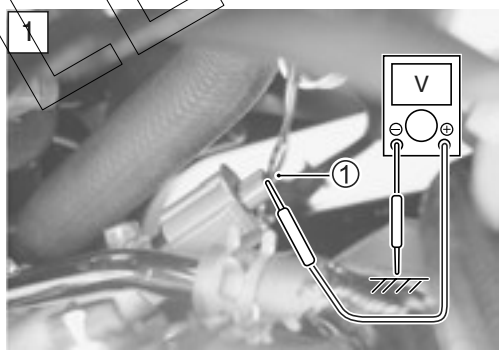


7) Connect the ECT sensor coupler.
8) Turn the ignition switch ON.
9) Measure the voltage between B/Bl wire ① and ground.

Output voltage: 0.1 – 4.6 V (⊕ B/Bl – ⊖ Ground)

09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)



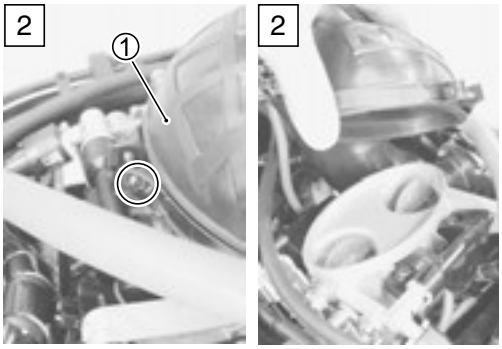
Are the continuity and voltage OK?

YES	Go to Step 2.
NO	B/Bl wire shorted to ground.

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

1) Turn the ignition switch OFF.
2) Loosen the inlet pipe screw.
3) Lift up the inlet pipe ①.



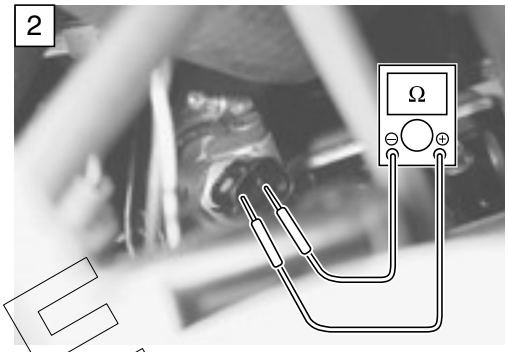
4) Disconnect the ECT sensor coupler.
5) Measure the ECT sensor resistance.

DATA ECT sensor resistance:
Approx. 2.3 – 2.6 kΩ at 20 °C (68 °F)
(Terminal – Terminal)

TOOL 09900-25008: Multi-circuit tester set

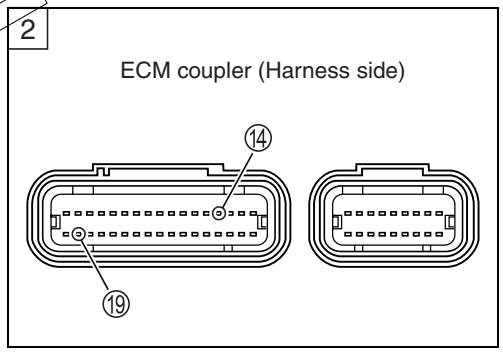
Tester knob indication: Resistance (Ω)

Refer to next page for details.



Is the resistance OK?

YES	• B/Bl or B/Br wire open or shorted to ground, or poor ⑭ or ⑲ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Replace the ECT sensor with a new one.



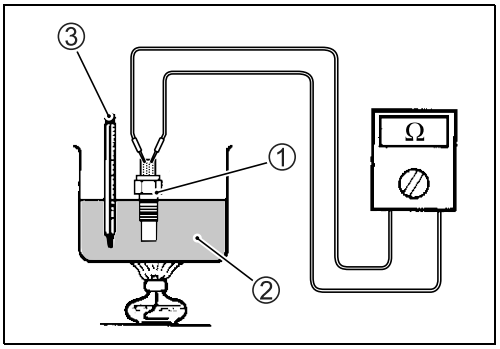
6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

DATA ECT sensor specification

Engine Coolant Temp.	Resistance
20 °C (68 °F)	Approx. 2.45 kΩ
40 °C (104 °F)	Approx. 1.148 kΩ
60 °C (140 °F)	Approx. 0.587 kΩ
80 °C (176 °F)	Approx. 0.322 kΩ

ECT SENSOR INSPECTION

- Remove the ECT sensor. (☞5-77)
- Check the ECT sensor by testing it at the bench as shown in the figure. Connect the ECT sensor ① to a circuit tester and place it in the oil ② contained in a pan, which is placed on a stove.
- Heat the oil to raise its temperature slowly and read the column thermometer ③ and the ohmmeter.
- If the ECT sensor ohmic value does not change in the proportion indicated, replace it with a new one.



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80 °C (176 °F)	Approx. 0.322 kΩ

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

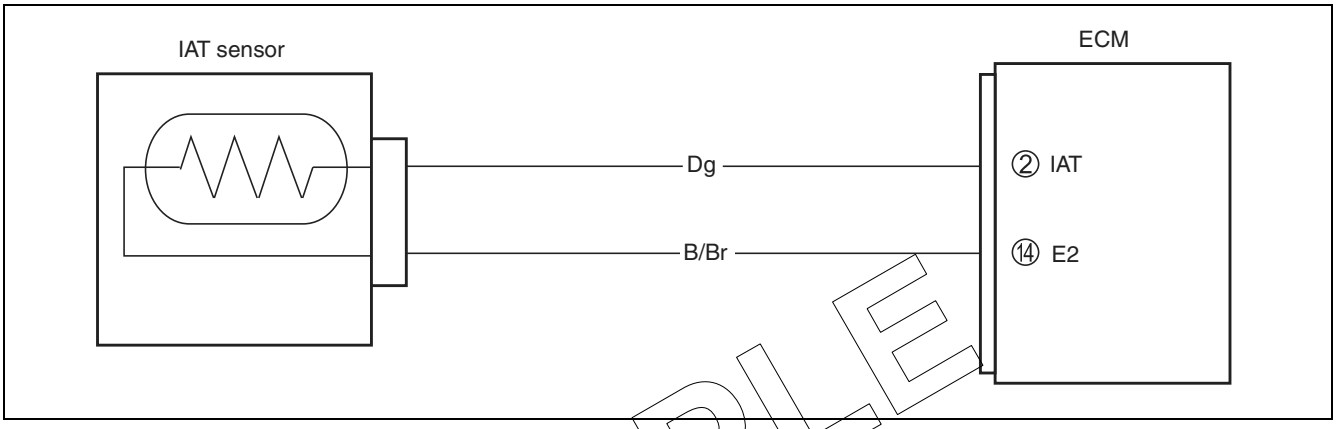
If the resistance is noted to show infinity or too much different resistance value, replace the ECT sensor with a new one.

CAUTION

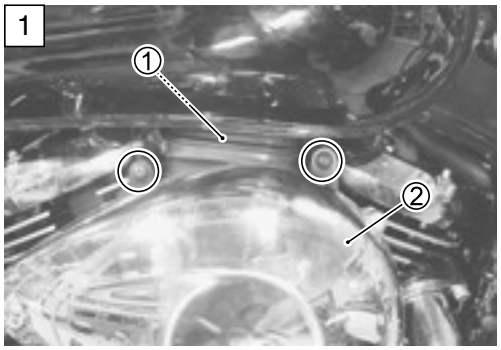
*** Take special care when handling the ECT sensor. It may cause damage if it gets a sharp impact.**
*** Do not contact the ECT sensor and the column thermometer with a pan.**

"C21" (P0110-H/L) IAT SENSOR CIRCUIT MALFUNCTION

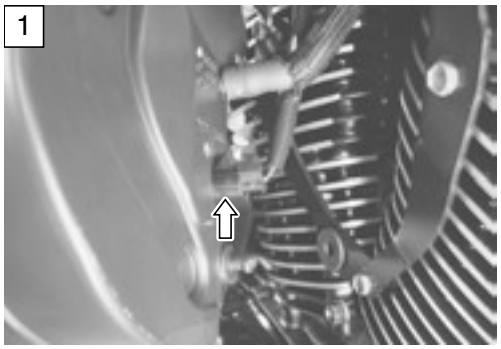
DETECTED CONDITION			POSSIBLE CAUSE
C21		Output voltage is not within the following range. 0.1 ≦ Sensor voltage < 4.6 V	• IAT sensor circuit open or short • IAT sensor malfunction • ECM malfunction
P0110	H	Sensor voltage is higher than specified value.	• IAT sensor circuit open or ground circuit open
	L	Sensor voltage is lower than specified value.	• IAT sensor circuit shorted to ground



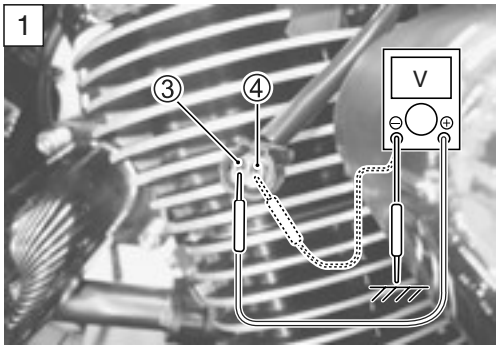
INSPECTION
Step 1 (When indicating C21:)
1) Loosen the inlet pipe screw ①.
2) Remove the air cleaner box ②.



3) Turn the ignition switch OFF.
4) Check the IAT sensor coupler for loose or poor contacts.
   If OK, then measure the IAT sensor voltage at the wire side coupler.
5) Disconnect the IAT sensor coupler and turn the ignition switch ON.



6) Measure the voltage between Dg wire terminal ③ and ground.
7) Also, measure the voltage between Dg wire terminal ③ and B/Br wire terminal ④.



DATA IAT sensor input voltage: 4.5 – 5.5 V
(⊕ Dg – ⊖ Ground)
(⊕ Dg – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set

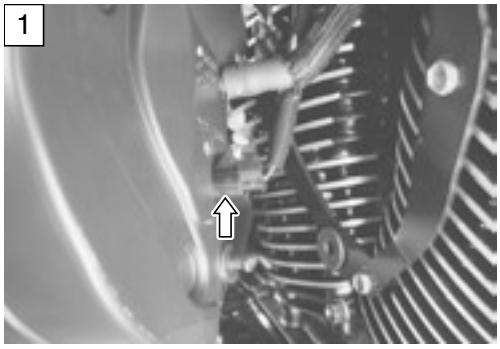
Tester knob indication: Voltage (⎓)

Is the voltage OK?

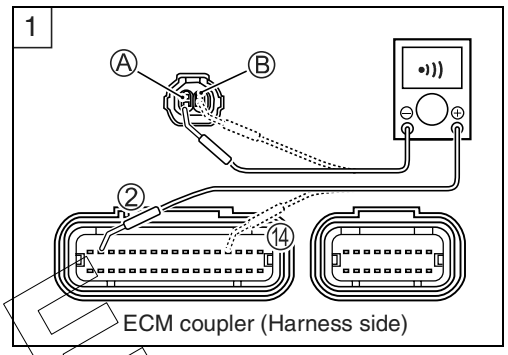
YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ② or ⑭) • Open or short circuit in the Dg wire or B/Br wire

Step 1 (When indicating P0110-H:)

1) Loosen the inlet pipe screw. (☞5-47)
2) Remove the air cleaner box. (☞6-13)
3) Turn the ignition switch OFF.
4) Check the IAT sensor coupler for loose or poor contacts.
   If OK, then check the IAT sensor lead wire continuity.



5) Remove the right frame cover. (☞8-4)
6) Disconnect the IAT sensor coupler.
7) Remove the ECM bracket (☞5-38) and ECM coupler.
8) Check the continuity between Dg wire Ⓐ and terminal ②.
9) Also, check the continuity between B/Br wire Ⓑ and terminal ⑭.



DATA IATS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))

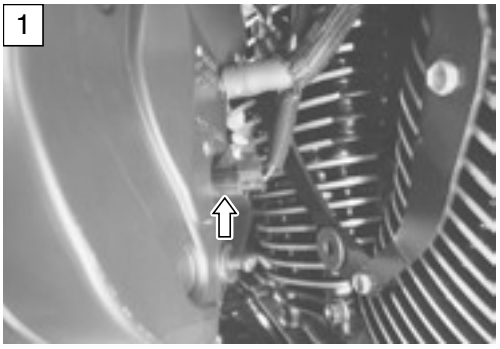
Is the continuity OK?

YES	Go to Step 2.
NO	Dg wire or B/Br wire open

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

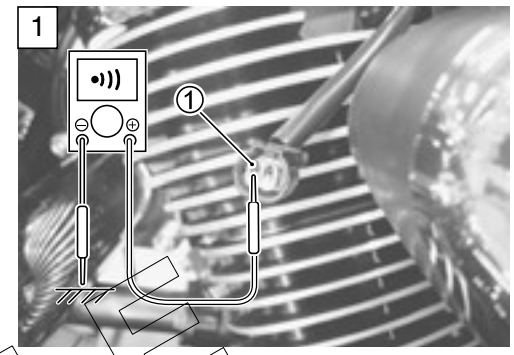
Step 1 (When indicating P0110-L:)

1) Loosen the inlet pipe screw. (☞5-47)
2) Remove the air cleaner box. (☞6-13)
3) Turn the ignition switch OFF.
4) Check the IAT sensor coupler for loose or poor contacts.
   If OK, then check the IAT sensor lead wire continuity.



5) Disconnect the IAT sensor coupler.
6) Check the continuity between Dg wire ① and ground. If the sound is not heard from the tester, the circuit condition is OK.

Tester knob indication: Continuity test (•))))

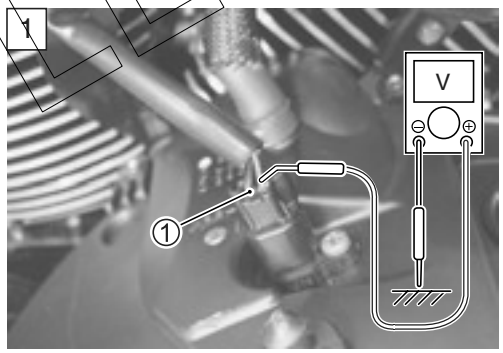


7) Connect the IAT sensor coupler and turn the ignition switch ON.
8) Measure the voltage between Dg wire ① and ground.

DATA IAT sensor output voltage: 0.1 – 4.6 V
(⊕ Dg – ⊖ Ground)

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)



Are the continuity and voltage OK?

YES	Go to Step 2.
NO	• Dg wire shorted to ground • If wire is OK, go to Step 2.

9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

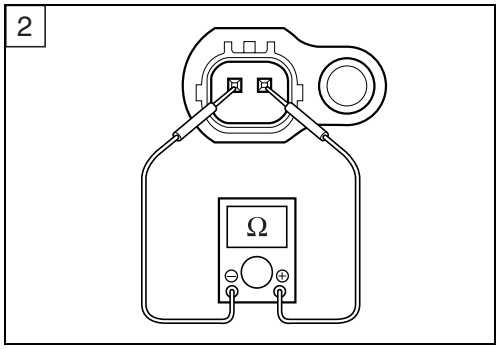
Step 2

1) Turn the ignition switch OFF.
2) Disconnect the IAT sensor coupler.
3) Measure the IAT sensor resistance.

DATA IAT sensor resistance: Approx. 2.6 kΩ at 20 °C (68 °F) (Terminal – Terminal)

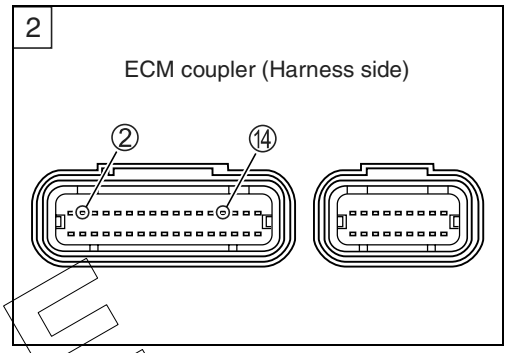
TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



Is the resistance OK?

YES	• Dg or B/Br wire open or shorted to ground, or poor ② or ⑭ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Replace the IAT sensor with a new one.



DATA IAT sensor specification

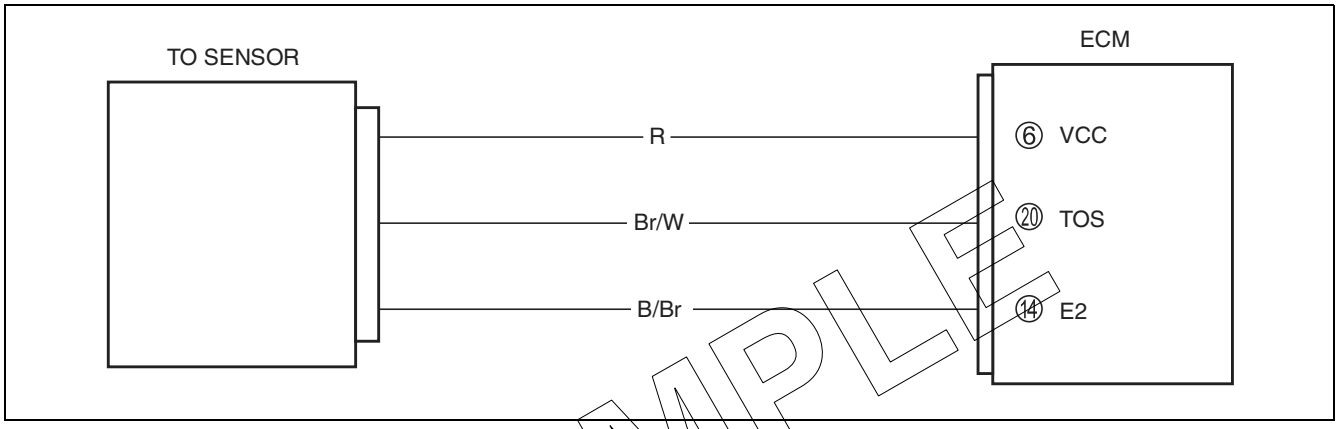
Intake Air Temp.	Resistance
20 °C (68 °F)	Approx. 2.6 kΩ
50 °C (122 °F)	Approx. 0.8 kΩ
80 °C (176 °F)	Approx. 0.3 kΩ
110 °C (230 °F)	Approx. 0.2 kΩ

NOTE:
IAT sensor resistance measurement method is the same way as that of the ECT sensor. Refer to 5-46 for details.

4) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C23" (P1651-H/L) TO SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION			POSSIBLE CAUSE
C23		The sensor voltage should be the following for 2 sec. and more, after ignition switch is turned ON. 0.2 ≦ Sensor voltage < 4.6 V	• TO sensor circuit open or short • TO sensor malfunction • ECM malfunction
P1651	H	Sensor voltage is higher than specified value.	• TO sensor circuit open or shorted to VCC or ground circuit open
	L	Sensor voltage is lower than specified value.	• TO sensor circuit shorted to ground or VCC circuit open

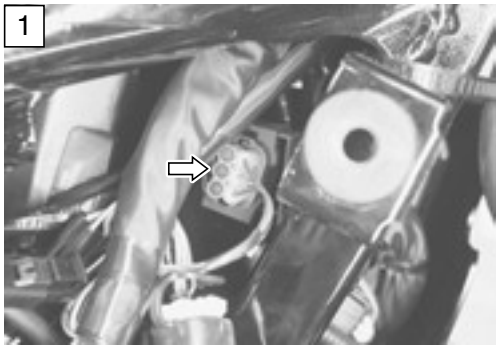


INSPECTION

Step 1 (When indicating C23:)

1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the TO sensor coupler for loose or poor contacts.
   If OK, then measure the TO sensor resistance.
4) Disconnect the TO sensor coupler.

1



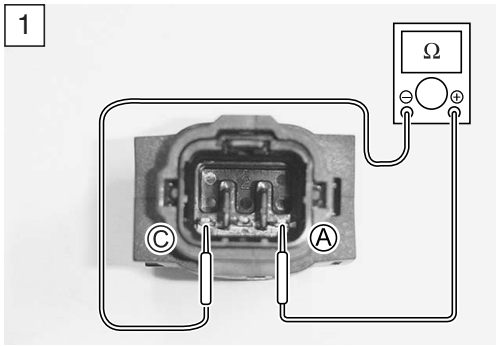
5) Measure the resistance between terminal Ⓐ and terminal Ⓒ.

DATA TO sensor resistance: 19.1 – 19.7 kΩ
(Terminal Ⓐ – Terminal Ⓒ)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

1

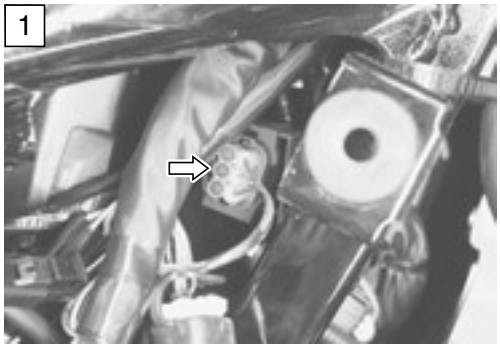


Is the resistance OK?

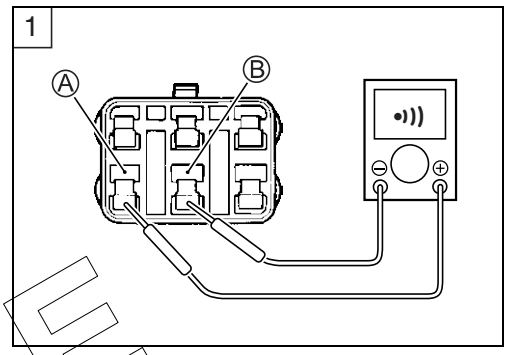
YES	Go to Step 2.
NO	Replace the TO sensor with a new one.

Step 1 (When indicating P1651-H:)

1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the TO sensor coupler for loose or poor contacts.
   If OK, then check the TO sensor lead wire continuity.



4) Disconnect the TO sensor coupler.
5) Check the continuity between Red wire Ⓐ and Br/W wire Ⓑ.
   If the sound is not heard from the tester, the circuit condition is OK.

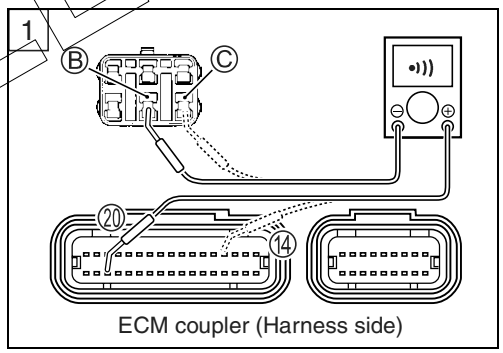


6) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
7) Check the continuity between Br/W wire Ⓑ and terminal ⑳.
8) Also, check the continuity between B/Br wire Ⓒ and terminal ⑭.

DATA TOS lead wire continuity: Continuity (•)))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•)))



ECM coupler (Harness side)

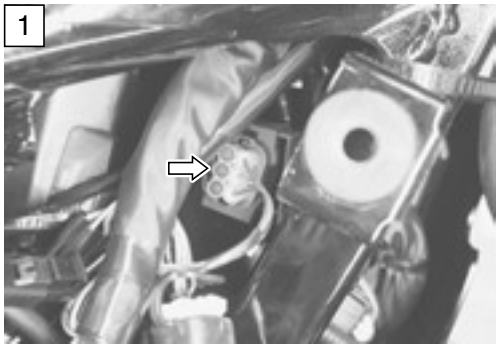
Is the continuity OK?

YES	Go to Step 2.
NO	Br/W wire shorted to VCC, or B/Br wire open

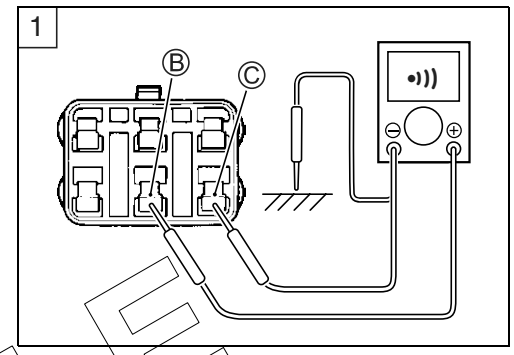
9) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 1 (When indicating P1651-L:)

1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the TO sensor coupler for loose or poor contacts.
   If OK, then check the TO sensor lead wire continuity.



4) Disconnect the TO sensor coupler.
5) Check the continuity between Br/W wire Ⓑ and ground.
6) Also, check the continuity between Br/W wire Ⓑ and B/Br wire Ⓒ. If the sound is not heard from the tester, the circuit condition is OK.

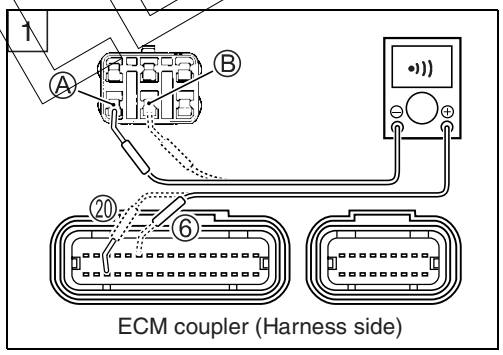


7) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
8) Check the continuity between Red wire Ⓐ and terminal ⑥.
9) Also, then check the continuity between Br/W wire Ⓑ and terminal ⑳.

DATA TOS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



Is the continuity OK?

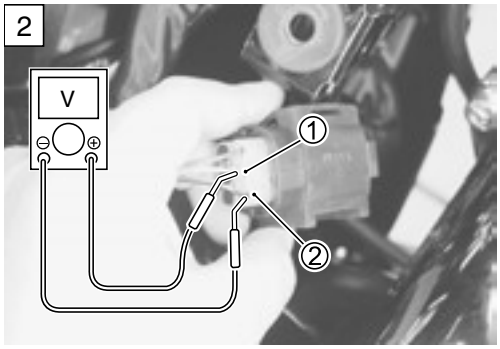
YES	Go to Step 2.
NO	Red or Br/W wire open, or Br/W wire shorted to ground

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

1) Connect the TO sensor coupler.
2) Insert the needle pointed probes to the lead wire coupler.
3) Turn the ignition switch ON.
4) Measure the voltage at the wire side coupler between Br/W ① and B/Br ② wires.
   Also, measure the voltage when leaning the motorcycle.

DATA TO sensor voltage (Normal): 0.4 – 1.4 V
(⊕ Br/W – ⊖ B/Br)

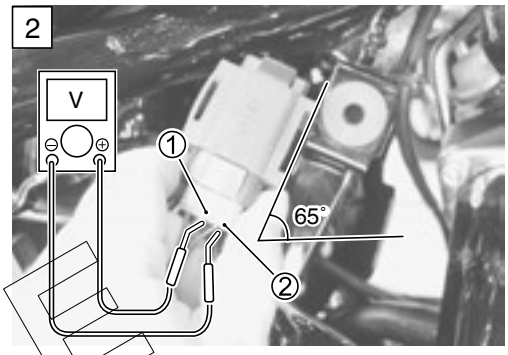


5) Dismount the TO sensor from its bracket and measure the voltage when it is leaned 65° and more, left and right, from the horizontal level.

DATA TO sensor voltage (Leaning): 3.7 – 4.4 V
(⊕ Br/W – ⊖ B/Br)

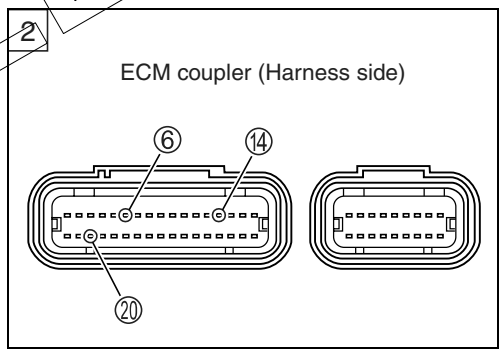
TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

YES	• Red, Br/W or B/Br wire open or shorted to ground, or poor ⑥, ⑭ or ⑳ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	• Loose or poor contacts on the ECM coupler • Open or short circuit • Replace the TO sensor with a new one.



6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

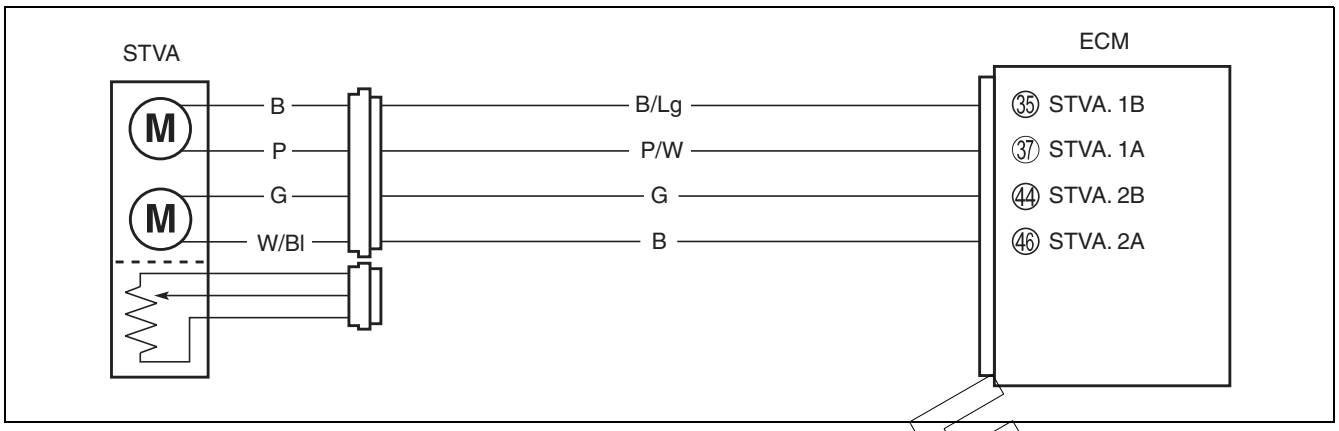
"C24" (P0351) or "C25" (P0352) IGNITION SYSTEM MALFUNCTION

(When indicating C24/P0351 for IG coil #1)
(When indicating C25/P0352 for IG coil #2)

*** Refer to the IGNITION SYSTEM for details. (☞9-20)**

"C28" (P1655) STV ACTUATOR CIRCUIT MALFUNCTION

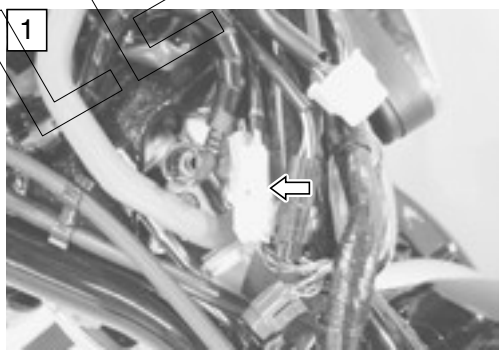
DETECTED CONDITION	POSSIBLE CAUSE
The operation voltage does not reach the STVA. ECM does not receive communication signal from the STVA.	• STVA malfunction • STVA circuit open or short • STVA motor malfunction



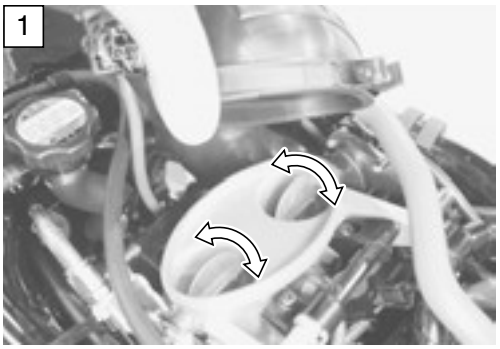
INSPECTION

Step 1

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the STVA lead wire coupler for loose or poor contacts.



4) Loosen the inlet pipe screw. (☞2-7)
   Lift up the inlet pipe. (☞5-45)
5) Turn the ignition switch ON to check the STV operation.
   (STV operating order: 95% open → Full open → 95% open)



Is the operating OK?

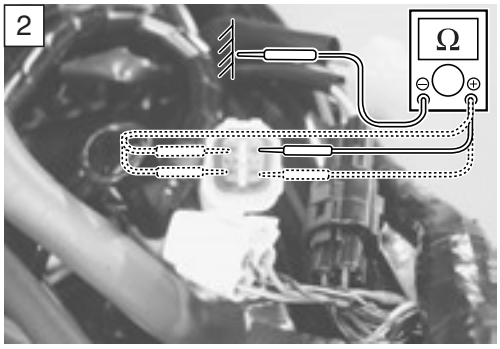
YES	Go to Step 2.
NO	• Loose or poor contacts on the STVA coupler • Open or short circuit in the B/Lg, P/W, Black or Green wires • If wire and connection are OK, go to Step 2.

6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

1) Turn the ignition switch OFF.
2) Disconnect the STVA lead wire coupler.
3) Check the continuity between each terminal and ground.

DATA **STVA continuity: ∞ Ω (Infinity)**
(Terminal – Ground)

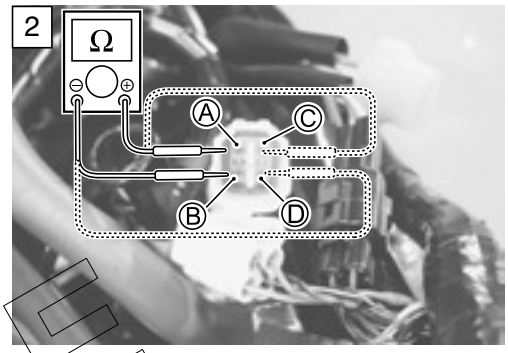


4) If OK, then measure the STVA resistance (between Black wire Ⓐ and Pink wire Ⓑ) and (between Green wire Ⓒ and W/Bl wire Ⓓ).

DATA **STVA resistance: Approx. 6.5 Ω**
(Black Ⓐ – Pink Ⓑ)
(Green Ⓒ – W/Bl Ⓓ)

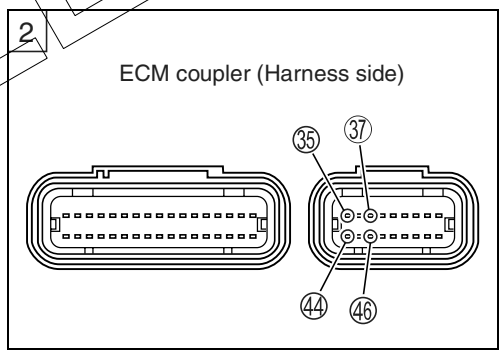
TOOL **09900-25008: Multi-circuit tester set**

Tester knob indication: Resistance (Ω)



Is the resistance OK?

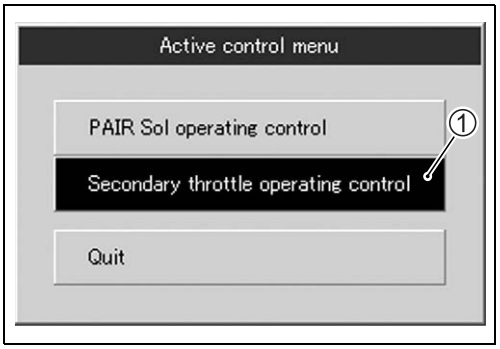
YES	• B/Lg, P/W, Green and Black wire open or shorted to ground, or poor ㉟, ㊲, ㊹ and ㊻ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	• Loose or poor contacts on the ECM coupler • Replace the STVA with a new one.



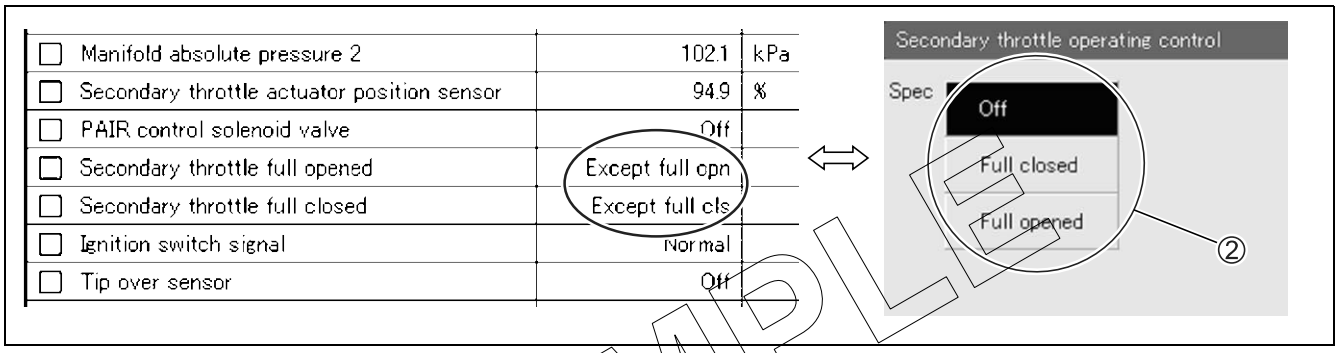
5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

ACTIVE CONTROL INSPECTION

1) Set up the SDS tool. (Refer to the SDS operation manual for further details)
2) Turn the ignition switch ON.
3) Click “Secondary throttle operating control” ①.

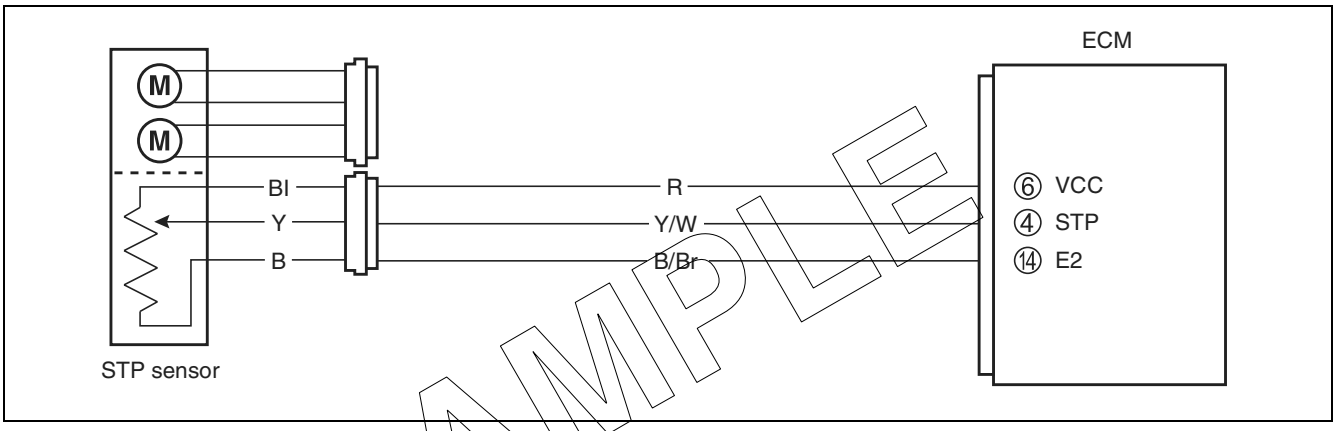


4) Click each button ②.
   At this time, if an operation sound is heard from the STVA, the function is normal.



"C29" (P1654-H/L) STP SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION			POSSIBLE CAUSE
C29		Signal voltage is not within the following range. Difference between actual throttle opening and opening calculated by ECM is larger than specified value. 0.1 V ≦ Sensor voltage < 4.8 V	• STP sensor maladjusted • STP sensor circuit open or short • STP sensor malfunction • ECM malfunction
P1654	H	Sensor voltage is higher than specified value.	• STP sensor circuit shorted to VCC or ground circuit open
	L	Sensor voltage is lower than specified value.	• STP sensor circuit open or shorted to ground or VCC circuit open

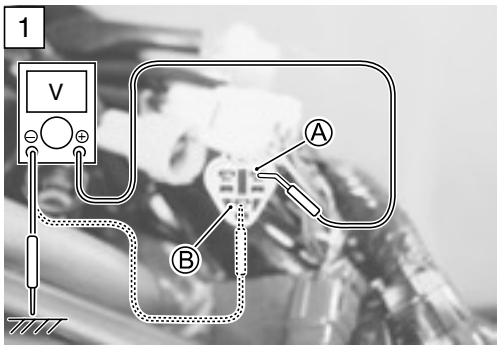


INSPECTION

Step 1 (When indicating C29:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the STP sensor coupler for loose or poor contacts.
   If OK, then measure the STP sensor input voltage.
4) Disconnect the STP sensor coupler.
5) Turn the ignition switch ON.
6) Measure the voltage at the Red wire Ⓐ and ground.
7) Also, measure the voltage at the Red wire Ⓐ and B/Br wire Ⓑ.

DATA STP sensor input voltage: 4.5 – 5.5 V
(⊕ Red – ⊖ Ground)
(⊕ Red – ⊖ B/Br)



TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)

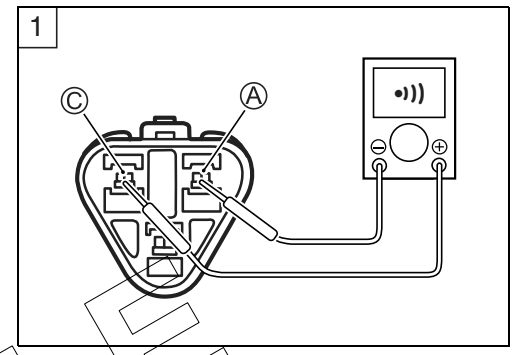
Is the voltage OK?

YES	Go to Step 2.
NO	• Loose or poor contacts on the ECM coupler (terminal ⑥ or ⑭) • Open or short circuit in the Red wire or B/Br wire

Step 1 (When indicating P1654-H:)

1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the STP sensor coupler for loose or poor contacts.
   If OK, then check the STP sensor lead wire continuity.

4) Disconnect the STP sensor coupler.
5) Check the continuity between Y/W wire Ⓒ and Red wire Ⓐ.
   If the sound is not heard from the tester, the circuit condition is OK.

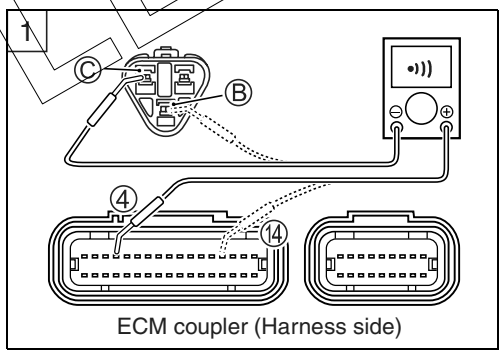


6) Remove the right frame cover. (☞8-4)
7) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
8) Check the continuity between Y/W wire Ⓒ and terminal ④.
9) Also, check the continuity between B/Br wire Ⓑ and terminal ⑭.

DATA STPS lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))



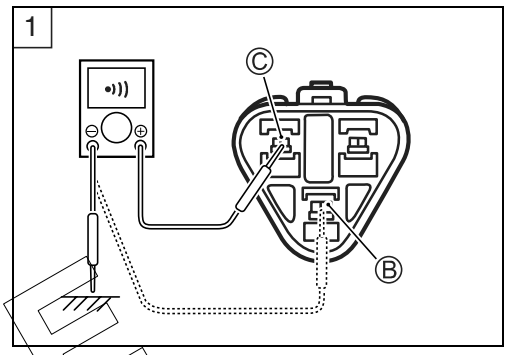
Is the continuity OK?

YES	Go to Step 2.
NO	Y/W wire shorted to VCC, or B/Br wire open

10) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 1 (When indicating P1654-L:)
1) Remove the fuel tank. (☞6-3)
2) Turn the ignition switch OFF.
3) Check the STP sensor coupler for loose or poor contacts.
If OK, then check the STP sensor lead wire continuity.

4) Disconnect the TO sensor coupler.
5) Check the continuity between Y/W wire Ⓒ and ground.
6) Also, check the continuity between Y/W wire Ⓒ and B/Br wire Ⓑ. If the sound is not heard from the tester, the circuit condition is OK.

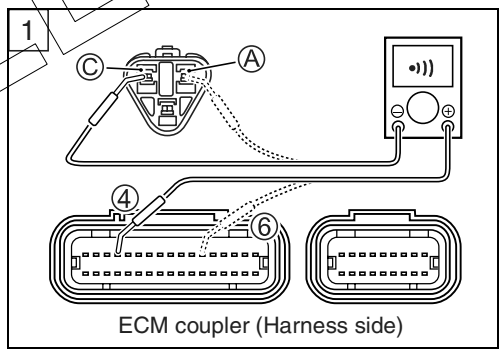


7) Remove the right frame cover. (☞8-4)
8) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
9) Check the continuity between Y/W wire Ⓒ and terminal ④.
10) Also, check the continuity between Red wire Ⓐ and terminal ⑥.

DATA STPS lead wire continuity: Continuity (•)))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•)))



Is the continuity OK?

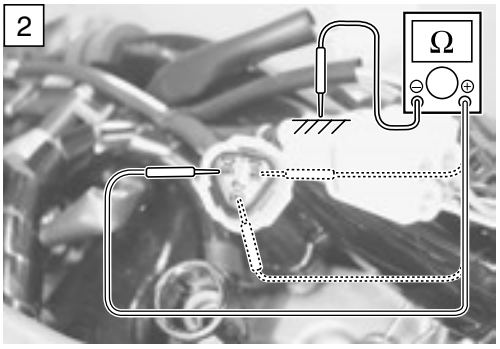
YES	Go to Step 1 (☞5-60) and go to Step 2.
NO	Red or Y/W wire open, or Y/W wire shorted to ground

11) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

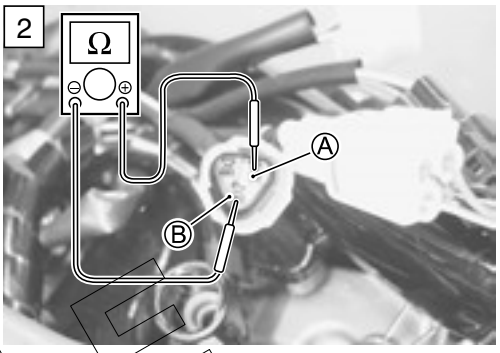
Step 2

1) Turn the ignition switch OFF.
2) Disconnect the STP sensor coupler.
3) Check the continuity between each terminal and ground.

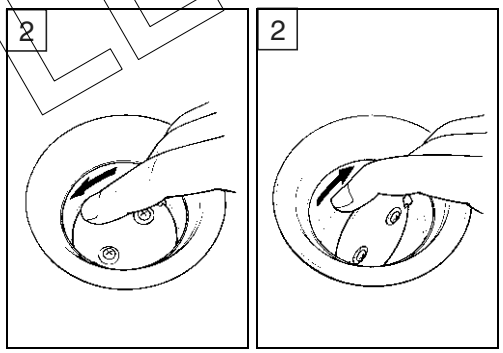
DATA STP sensor continuity: ∞ Ω (Infinity)
(Terminal – Ground)



4) If OK, then measure the STP sensor resistance at the wire terminals (between Yellow wire Ⓐ and Black wire Ⓑ).
5) Loosen the inlet pipe screw. (☞2-7)
Lift up the inlet pipe. (☞5-45)
6) Close and open the secondary throttle valve by finger, and measure the valve closing and opening resistance.



DATA STP sensor resistance
Secondary throttle valve is closed : Approx. 0.5 kΩ
Secondary throttle valve is opened: Approx. 3.9 kΩ
(Yellow Ⓐ – Black Ⓑ)

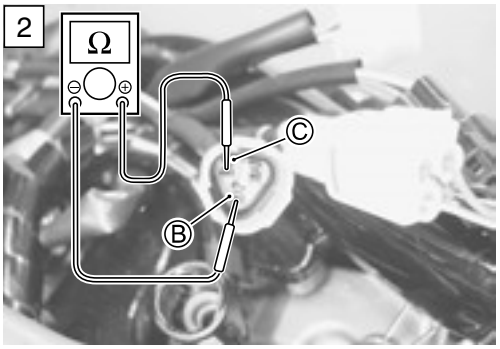


7) If OK, then measure the STP sensor resistance at the wire terminals (between Blue wire Ⓒ and Black wire Ⓑ).

DATA STP sensor resistance: Approx. 4.69 kΩ

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



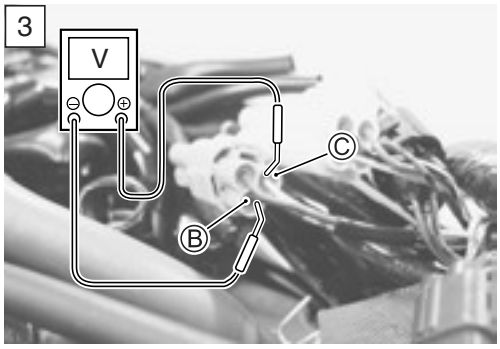
Are the continuity and resistance OK?

YES	Go to Step 3.
NO	• Reset the STP sensor position correctly. • Replace the STP sensor with a new one.

8) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 3

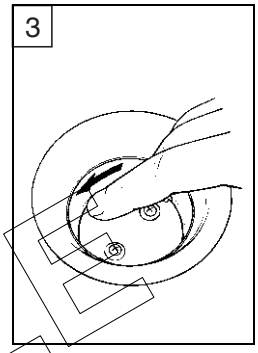
1) Turn the ignition switch OFF.
2) Connect the STP sensor coupler.
3) Insert the needle pointed probes to the STP sensor coupler.
4) Disconnect the STVA lead wire coupler.
5) Loosen the inlet pipe screw. (☞2-7)
   Lift the inlet pipe. (☞5-45)
6) Turn the ignition switch ON.
7) Measure the STP sensor output voltage at the coupler (between ⊕ Y/W Ⓒ wire and ⊖ B/Br Ⓑ wire) by turning the secondary throttle valve (close and open) with a finger.

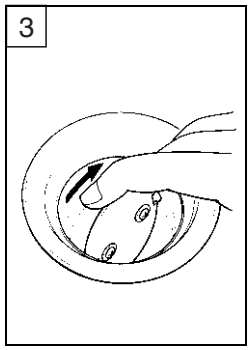


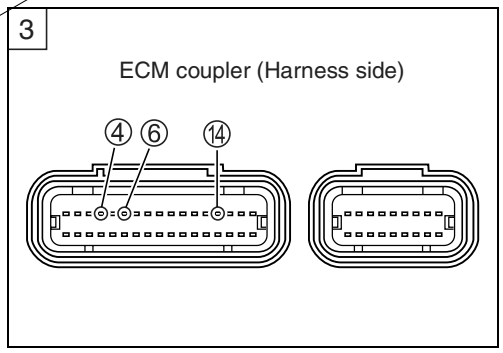
DATA STP sensor output voltage
Secondary throttle valve is closed: Approx. 0.5 V
Secondary throttle valve is opened: Approx. 3.9 V

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)







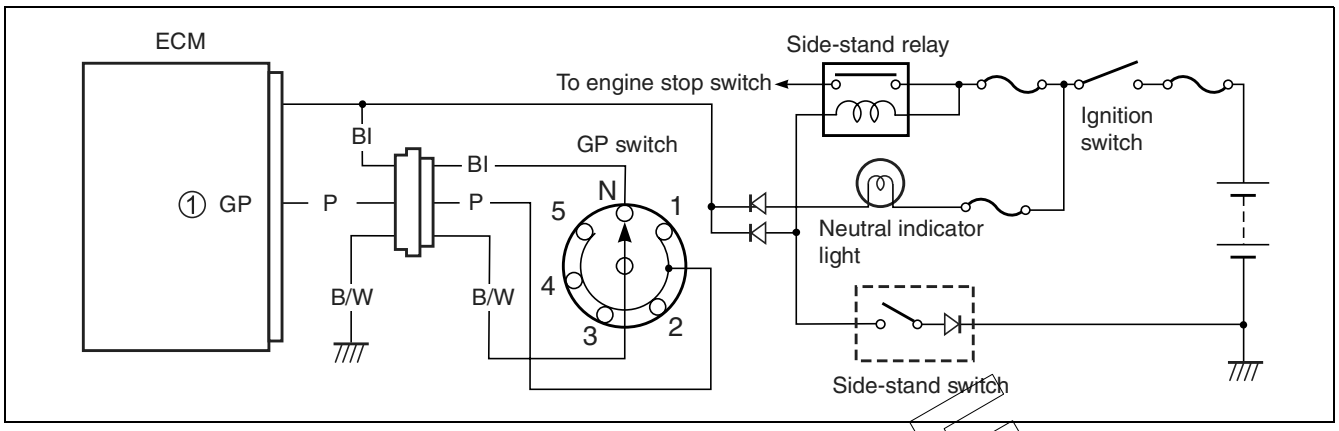
Is the voltage OK?

YES	• Red, Y/W or B/Br wire open or shorted to ground, or poor ④, ⑥ or ⑭ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	If check result is not satisfactory, replace STP sensor with a new one.

8) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C31" (P0705) GP SWITCH CIRCUIT MALFUNCTION

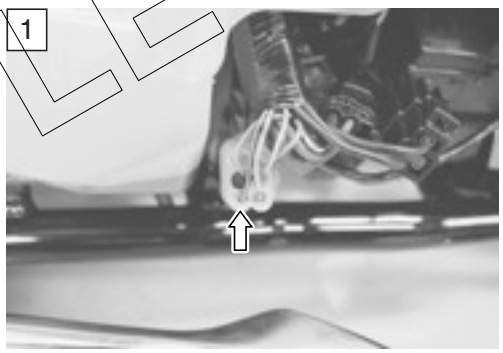
DETECTED CONDITION	POSSIBLE CAUSE
No Gear Position switch voltage. Switch voltage is not within the following range. Switch voltage > 0.6 V	• Gear Position switch circuit open or short • Gear Position switch malfunction • ECM malfunction



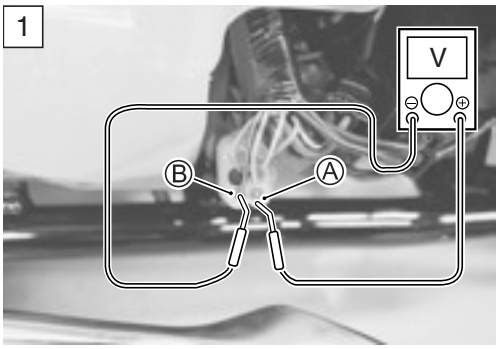
INSPECTION

Step 1

1) Remove the secondary gear case cover. (☞2-16)
2) Turn the ignition switch OFF.
3) Check the GP switch coupler for loose or poor contacts. If OK, then measure the GP switch voltage.



4) Support the motorcycle with a jack.
5) Fold the side-stand to up position.
6) Make sure the engine stop switch is in the "RUN" position.
7) Insert the needle pointed probe to the lead wire coupler.
8) Turn the ignition switch ON.
9) Measure the voltage at the wire side coupler between Pink wire Ⓐ and B/W wire Ⓑ, when shifting the gearshift lever from 1st to Top.



DATA GP switch voltage: 0.6 V and more
(⊕ P Ⓐ – ⊖ B/W Ⓑ)

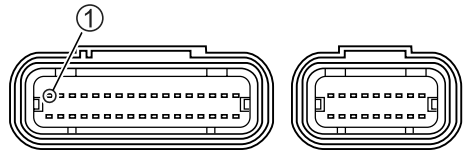
TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	• Pink wire open or shorted to ground • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	• P or B/W wire open, or Pink wire shorted to ground • Loose or poor contacts on the ECM coupler (terminal ①) • If wire and connection are OK, replace the GP switch with a new one.

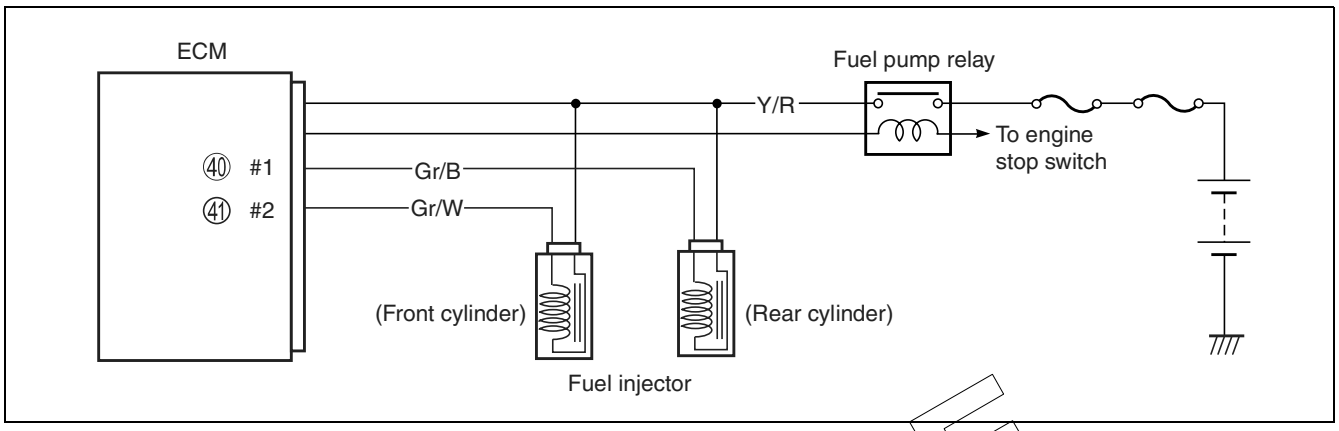
1



10)After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

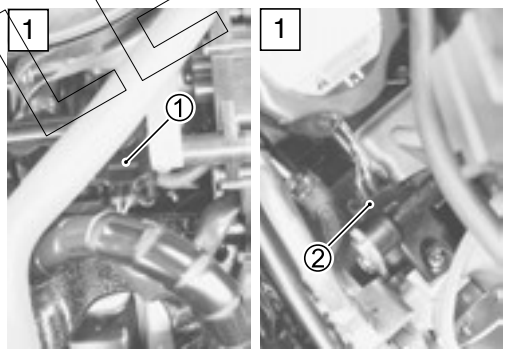
"C32" (P0201) or "C33" (P0202) FUEL INJECTOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
CKP signals produced but fuel injector signal is interrupted continuous by 4 times or more.	• Injector circuit open or short • Injector malfunction • ECM malfunction



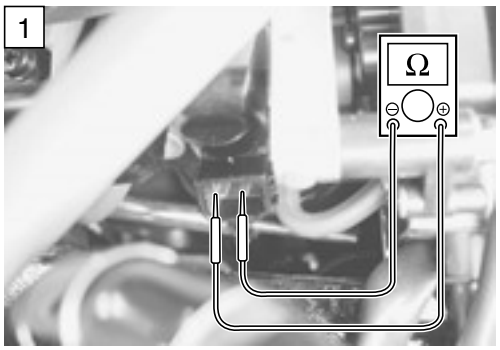
INSPECTION
(When indicating C32/P0201 for fuel injector #1)
(When indicating C33/P0202 for fuel injector #2)

Step 1
1) Remove the fuel tank. (☞6-3)
2) Loosen the inlet pipe screw. (☞2-7)
   Lift up the inlet pipe. (☞5-45)
3) Turn the ignition switch OFF.
4) Check the injector coupler (Front cylinder side ① or Rear cylinder side ②) for loose or poor contacts.
   If OK, then measure the injector resistance.



5) Disconnect the injector coupler and measure the resistance between terminals.

DATA **Injector resistance: Approx. 11.7 Ω at 20 °C (68 °F)**
(Terminal – Terminal)

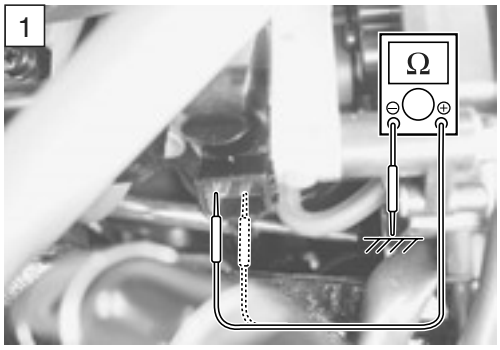


6) If OK, then check the continuity between each terminal and ground.

DATA STP sensor continuity: ∞ Ω (Infinity)

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)



Are the resistance and continuity OK?

YES	Go to Step 2.
NO	Replace the injector with a new one. (☞6-22)

7) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2

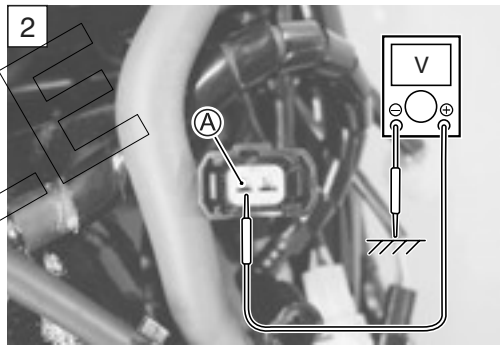
1) Turn the ignition switch ON.
2) Measure the injector voltage between Y/R wire Ⓐ and ground.

DATA Injector voltage: Battery voltage
(⊕ Y/R Ⓐ – ⊖ Ground)

NOTE:
Injector voltage can be detected only 3 seconds after ignition switch is turned ON.

TOOL 09900-25008: Multi-circuit tester set

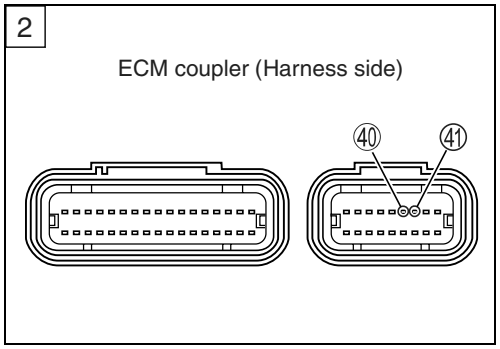
Tester knob indication: Voltage (⎓)



Is the voltage OK?

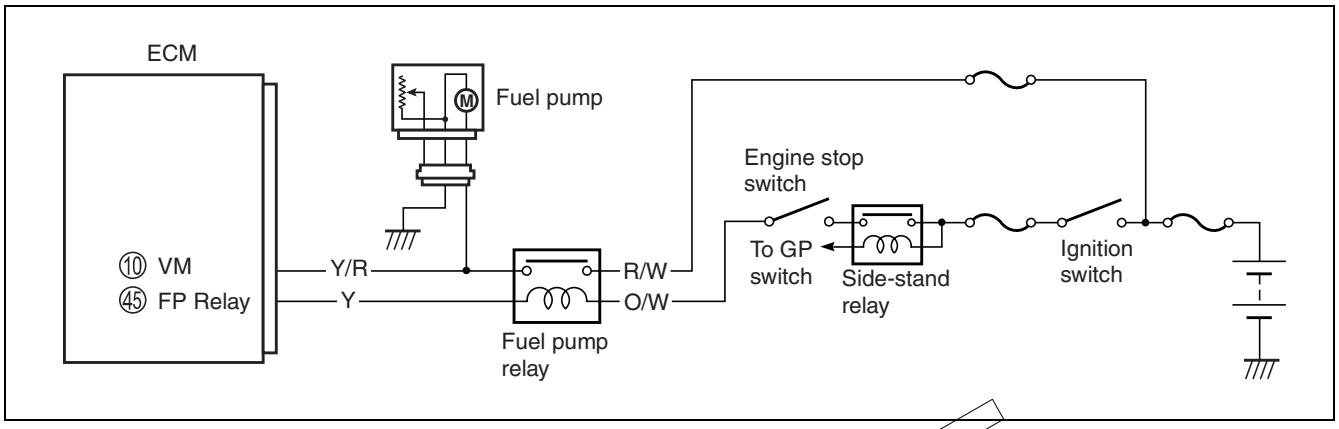
YES	• Gr/W wire open or shorted to ground, or poor ㊶ connection (Front cylinder side) • Gr/B wire open or shorted to ground, or poor ㊵ connection (Rear cylinder side) • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Open circuit in the Y/R wire

3) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

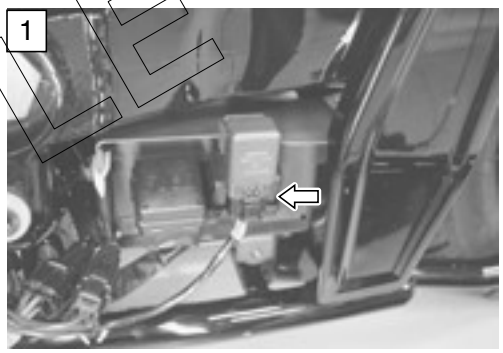


"C41" (P0230) FP RELAY CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
No voltage is applied to fuel pump although fuel pump relay is turned ON, or voltage is applied to fuel pump, although fuel pump relay is turned OFF.	• Fuel pump relay circuit open or short • Fuel pump relay malfunction • ECM malfunction

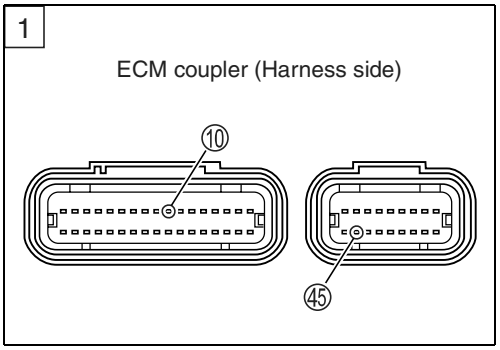


INSPECTION
Step 1
1) Remove the secondary gear case cover. (☞2-16)
2) Turn the ignition switch OFF.
3) Check the FP relay coupler for loose or poor contacts.
   If OK, then check the FP relay.
   (Refer to page 6-6 for details.)



Is the FP relay OK?

YES	• Yellow or O/W wire open or shorted to ground, or poor ㊺ connection • Y/R or R/W wire open or poor ⑩ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Replace the FP relay with a new one.



4)After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

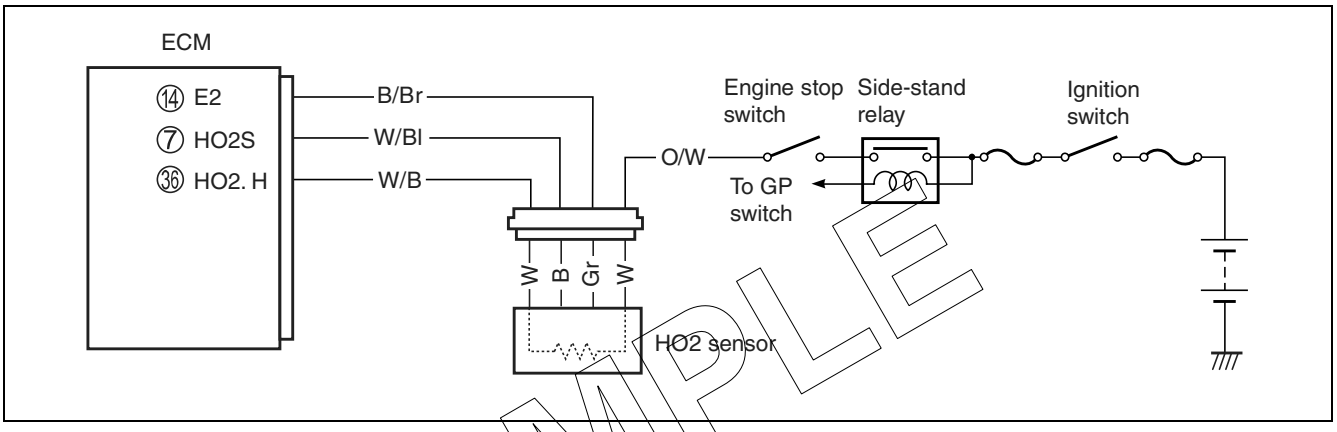
"C42" (P01650) IG SWITCH CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
Ignition switch signal is not input in the ECM.	• Ignition system circuit open or short • ECM malfunction

INSPECTION
*** Refer to the IGNITION SWITCH INSPECTION for details. (☞9-36)**

"C44" (P0130/P0135) HO2 SENSOR (HO2S) CIRCUIT MALFUNCTION (FOR E-02, 19, 24)

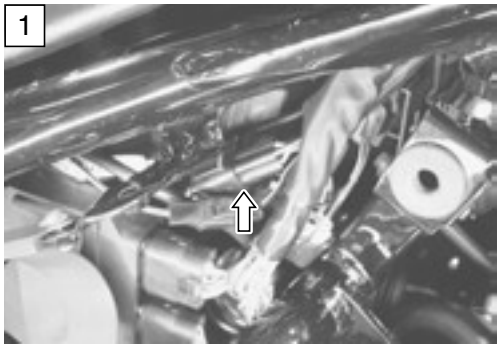
DETECTED CONDITION		POSSIBLE CAUSE
C44 (P0130)	HO2 sensor output voltage is not input to ECM during engine operation and running condition. (Sensor voltage $\leqq$ 0.1 V)	• HO2 sensor circuit open or shorted to ground • Fuel system malfunction • ECM malfunction
C44 (P0135)	The heater can not operate so that heater operation voltage is not supply to the oxygen heater circuit.	• Battery voltage supply to the HO2 sensor



INSPECTION

Step 1 (When indicating C44/P0130:)

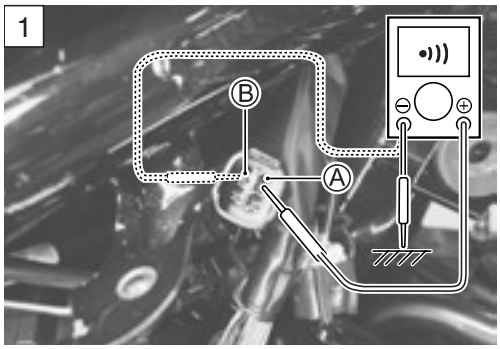
1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the HO2 sensor for loose or poor contacts.
   If OK, then check the HO2 sensor lead wire continuity.



4) Disconnect the HO2 sensor coupler
5) Check the continuity between W/Bl wire Ⓐ and ground.
6) Also, check the continuity between W/Bl wire Ⓐ and B/Br wire Ⓑ. If the sound is not heard from the tester, the circuit condition is OK.

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Continuity test (•))))

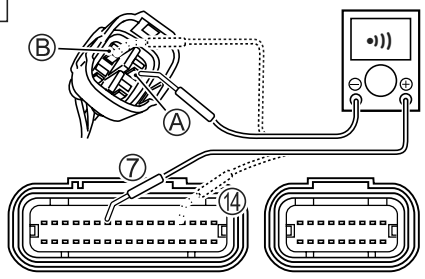


7) Remove the right frame cover. (☞8-4)
8) Remove the ECM bracket (☞5-38) and disconnect the ECM coupler.
9) Check the continuity between W/Bl wire Ⓐ and terminal ⑦.
10) Also, check the continuity between B/Br wire Ⓑ and terminal ⑭.

DATA HO2S lead wire continuity: Continuity (•))))

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Continuity test (•))))

1


ECM coupler (Harness side)

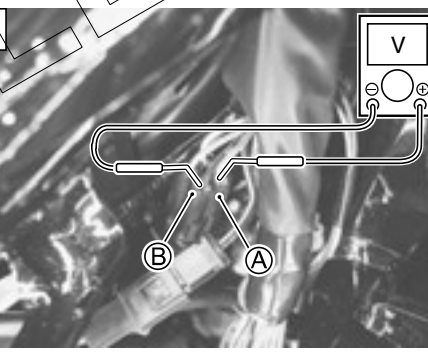
Is the continuity OK?

YES	Go to Step 2. (When indicating C44/P0130:)
NO	W/Bl wire shorted to ground, or W/Bl or B/Br wire open

11) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2 (When indicating C44/P0130:)
1) Connect the ECM coupler and HO2 sensor coupler.
2) Warm up the engine enough.
3) Insert the needle pointed probes to the HO2 sensor coupler.
4) Measure the HO2 sensor output voltage between W/Bl wire Ⓐ and B/Br wire Ⓑ, when idling condition.

DATA HO2 sensor output voltage at idle speed:
0.2 V and less (⊕ W/Bl Ⓐ – ⊖ B/Br Ⓑ)

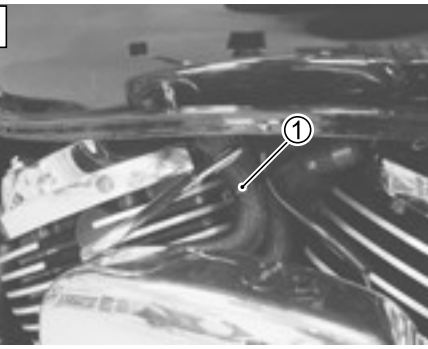
2


5) If OK, then pinch the PAIR hose ① with a proper hose clamp.
6) Measure the HO2 sensor output voltage while holding the engine speed at 5 000 r/min.

DATA HO2 sensor output voltage at 5 000 r/min:
0.7 V and more (⊕ W/Bl – ⊖ B/Br)

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

2


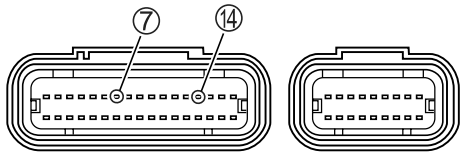
NOTE:
HO2 SENSOR VOLTAGE MEASURING CONDITION
1. 10 minutes after the engine start (Idling) or 100 sec. after the engine start (Engine revolution is over 2 000 r/min).
2. Coolant temperature is upper 45 °C (113 °F).

Is the voltage OK?

YES	• W/Bl wire or B/Br wire open or shorted to ground, or poor ⑦ or ⑭ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Replace the HO2 sensor with a new one.

3) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

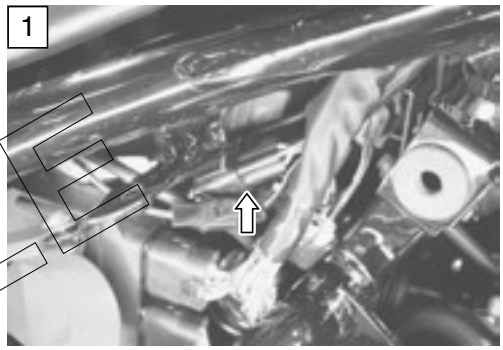
2



Step 1 (When indicating C44/P0135:)

1) Remove the right frame cover. (☞8-4)
2) Turn the ignition switch OFF.
3) Check the HO2 sensor for loose or poor contacts.
   If OK, then measure the HO2 sensor resistance.

1



4) Disconnect the HO2 sensor coupler and measure the resistance between terminals.

DATA HO2 heater resistance: 6.5 – 8.9 Ω at 23 °C (73.4 °F)
(White – White)

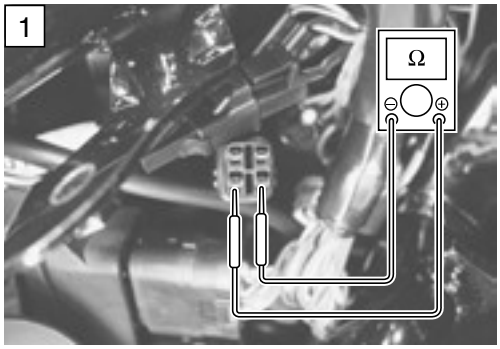
NOTE:

** Temperature of the sensor affects resistance value largely.*
** Make sure that the sensor heater is at correct temperature.*

TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

1



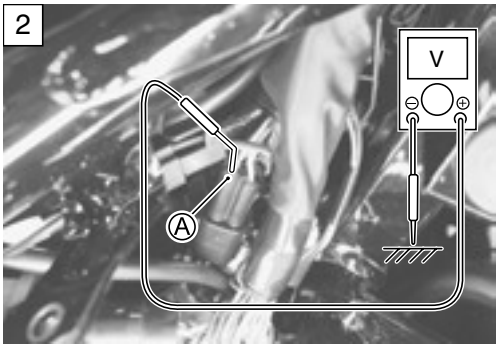
Is the voltage OK?

YES	Go to Step 2.
NO	Replace the HO2 sensor with a new one.

5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

Step 2 (When indicating C44/P0135:)

1) Connect the HO2 sensor coupler.
2) Insert the needle pointed probes to the HO2 sensor coupler.
3) Turn the ignition switch ON and measure the heater voltage between W/B wire Ⓐ and ground.
4) If the tester voltage indicates the battery voltage, it is good condition.



DATA Heater voltage: Battery voltage
(⊕ W/B Ⓐ – ⊖ Ground)

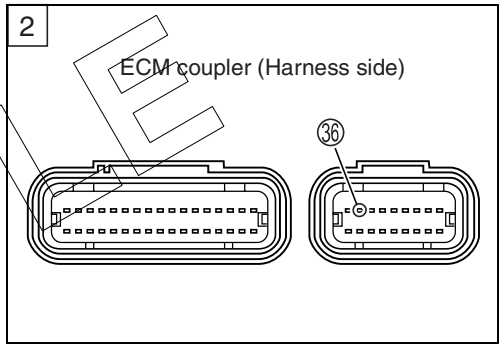
NOTE:
Battery voltage can be detected only before starting the engine.

TOOL 09900-25008: Multi-circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

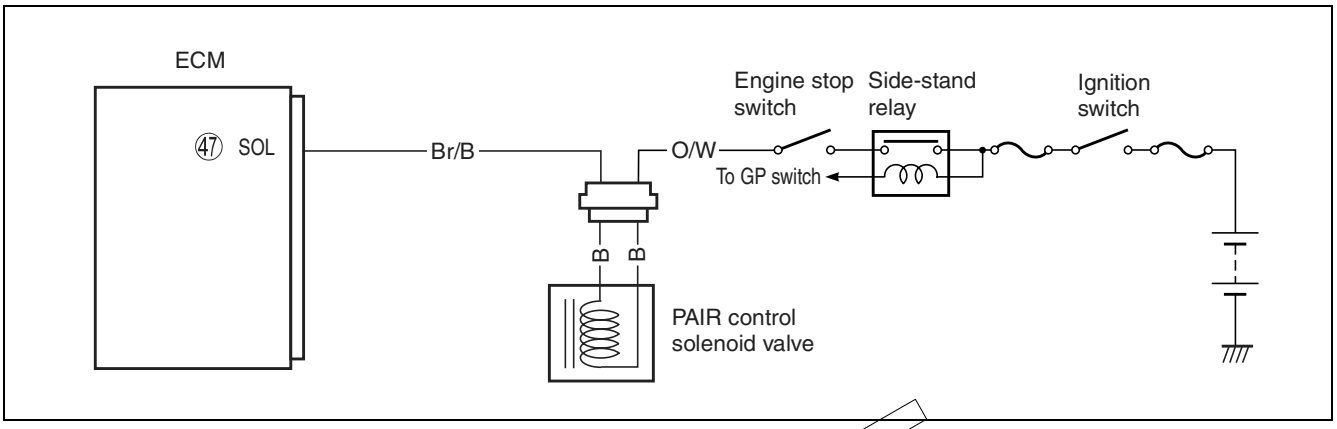
YES	• O/W or W/B wire open or shorted to ground, or poor ㊱ connection • Recheck each terminal and wire harness for open circuit and poor connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Replace the ECM with a known good one, and inspect it again.
NO	• Open or short circuit in the W/B wire or O/W wire • Loose or poor contacts on the ECM coupler (terminal ㊱) or HO2 sensor coupler



5) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

"C49" (P1656) PAIR CONTROL SOLENOID VALVE CIRCUIT MALFUNCTION

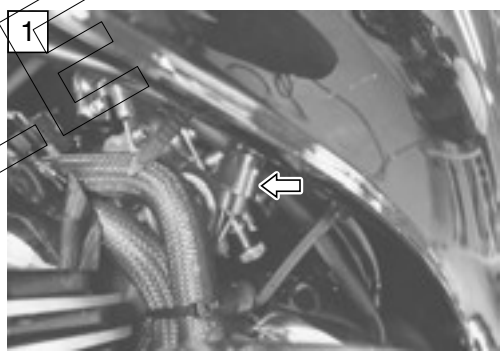
DETECTED CONDITION	POSSIBLE CAUSE
PAIR control solenoid valve voltage is not input to ECM.	• PAIR valve circuit open or short • PAIR valve malfunction • ECM malfunction



INSPECTION

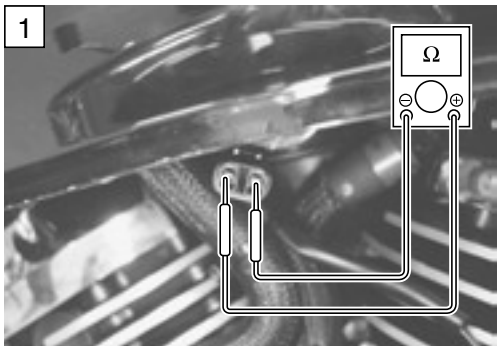
Step 1

1) Turn the ignition switch OFF.
2) Check the PAIR control solenoid valve coupler for loose or poor contacts.
   If OK, then measure the PAIR control solenoid valve resistance.



3) Disconnect the PAIR control solenoid valve coupler.
4) Measure the resistance between Black and Black wire terminals.

DATA PAIR valve resistance:
20 – 24 Ω at 20 – 30 °C (68 – 86 °F)
(Black – Black)

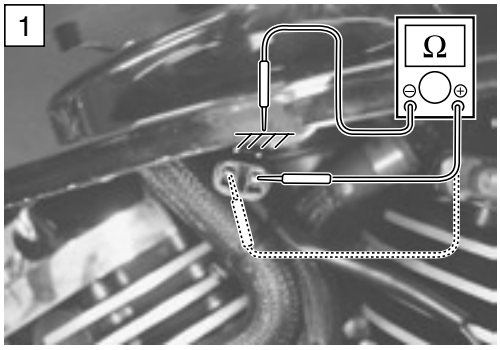


TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Resistance (Ω)

5) If OK, then check the continuity between each terminal and ground.

DATA PAIR valve resistance: ∞ Ω (Infinity)
(Terminal – Ground)



Tester knob indication: Resistance (Ω)

Is the resistance OK?

YES	Go to Step 2.
NO	Replace the PAIR valve with a new one.

6) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

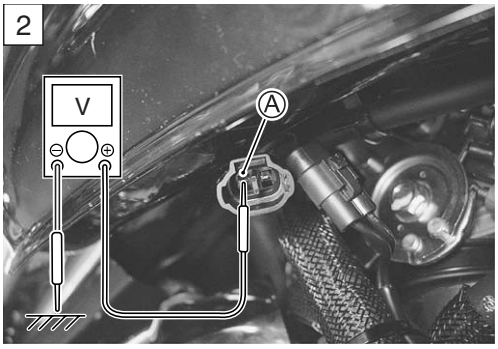
Step 2

1) Turn the ignition switch ON.
2) Measure the voltage between O/W wire Ⓐ and ground.

DATA PAIR valve voltage: Battery voltage
(⊕ O/W Ⓐ – ⊖ Ground)

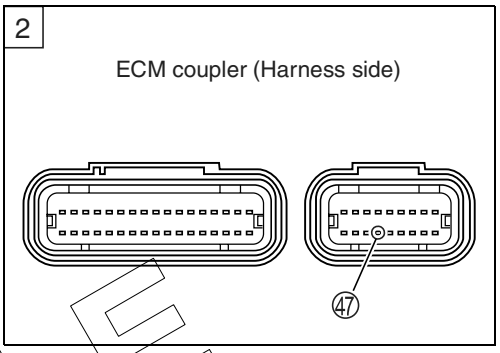
TOOL 09900-25008: Multi-circuit tester set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

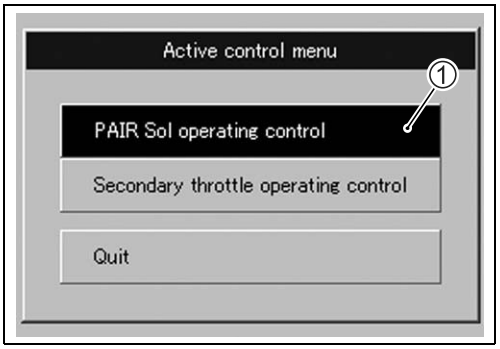
YES	• Br/B wire open or shorted to ground, or poor ㊼ connection • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Replace the ECM with a known good one, and inspect it again.
NO	Open or short circuit in the O/W wire



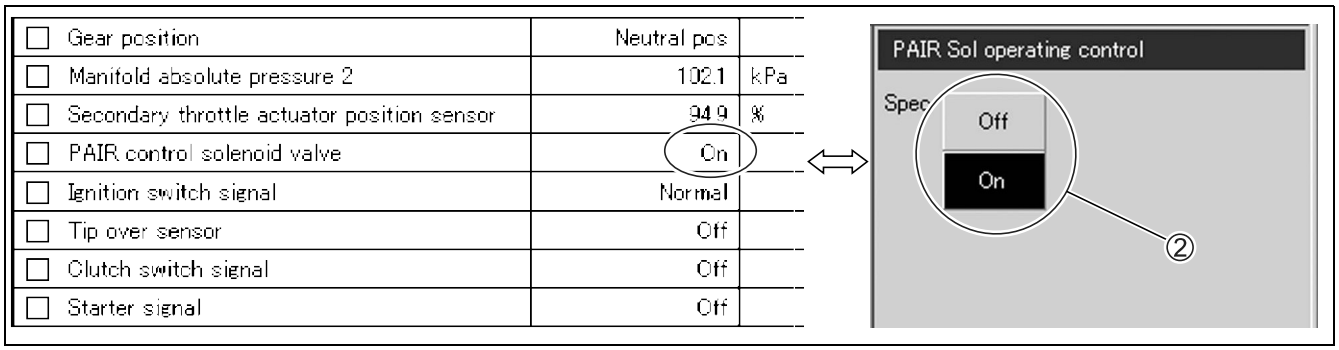
3) After repairing the trouble, clear the DTC using SDS tool. (☞5-25)

ACTIVE CONTROL INSPECTION

1) Set up the SDS tool. (Refer to the SDS operation manual for further details)
2) Turn the ignition switch ON.
3) Click “PAIR Sol operating control” ①.



4) Click each button ②.
At this time, if an operation sound is heard from the PAIR control solenoid valve, the function is normal.



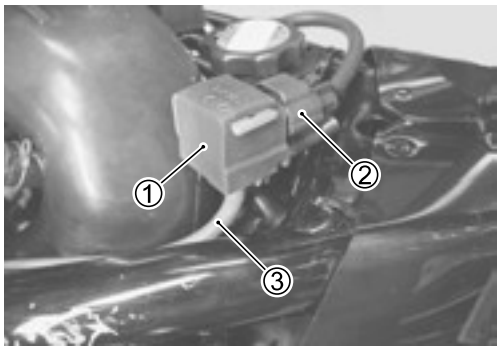
SENSORS

IAP SENSOR INSPECTION

The intake air pressure sensor is located on the air inlet pipe. (☞5-33)

IAP SENSOR REMOVAL/INSTALLATION

- Remove the fuel tank. (☞6-3)
- Remove the IAP sensors ① and disconnect the couplers ② and vacuum hoses ③.
- Installation is in the reverse order of removal.

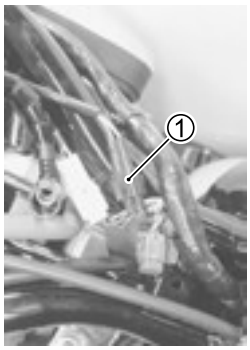


TP SENSOR INSPECTION

The throttle position sensor is installed on the No. 2 throttle body. (☞5-37)

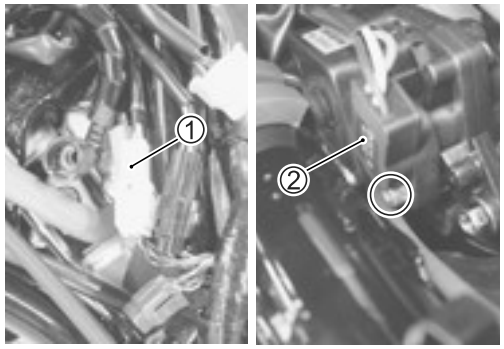
TP SENSOR REMOVAL/INSTALLATION

- Remove the fuel tank. (☞6-3)
- Loosen the inlet pipe screws. (☞5-47)
- Move the inlet pipe. (☞5-19)
- Disconnect the coupler ①.
- Remove the screw with a torx wrench (T25) and TP sensor ②.
- Install the TP sensor to the No. 2 throttle body. (☞6-18)
- TP sensor setting procedure. (☞5-19)



STP SENSOR INSPECTION

The secondary throttle position sensor is installed on the No. 2 throttle body. (☞5-59)

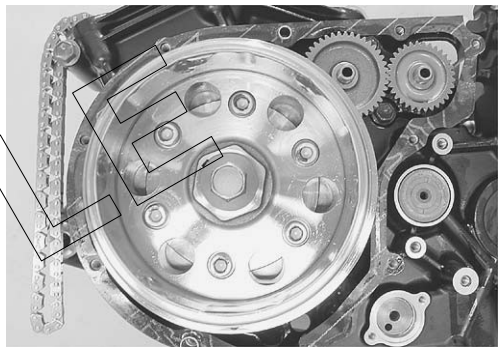


STP SENSOR REMOVAL/INSTALLATION

- Remove the fuel tank. (☞6-3)
- Disconnect the coupler ①.
- Remove the screw with a torx wrench (T25) and STP sensor ②.
- Install the STP sensor to the No. 2 throttle body. (☞6-18)
- STP sensor setting procedure. (☞6-21)

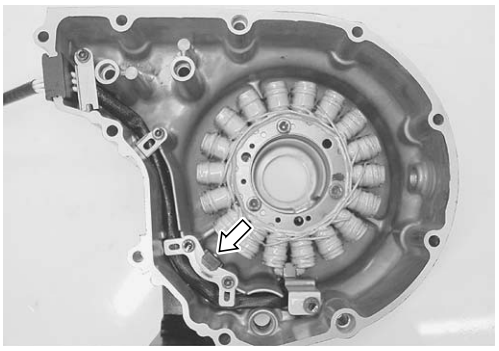
CKP SENSOR INSPECTION

The signal rotor is mounted on the generator rotor and crankshaft position sensor is installed at the inside of the generator cover. (☞5-30)



CKP SENSOR REMOVAL/INSTALLATION

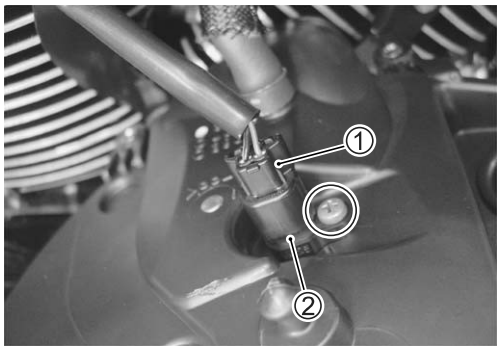
- Remove the generator cover. (☞3-22)
- Remove the CKP sensor.
- Installation is in the reverse order of removal.



IAT SENSOR INSPECTION

The intake air temperature sensor is installed at the back side of the air cleaner box. (☞5-47)

IAT SENSOR REMOVAL/INSTALLATION

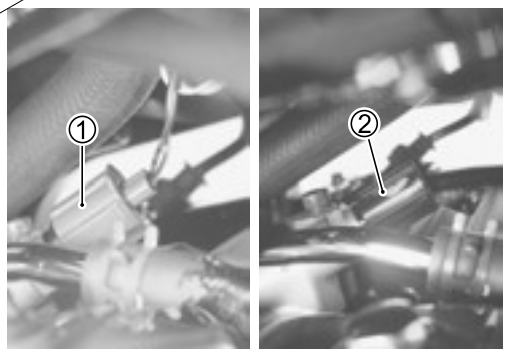


- Remove the air cleaner box. (☞5-47)
- Disconnect the IAT sensor coupler ① and remove the IAT sensor ②.
- Installation is in the reverse order of removal.

ECT SENSOR INSPECTION

The engine coolant temperature sensor is installed at the No. 2 cylinder head cover. (☞5-42)

ECT SENSOR REMOVAL/INSTALLATION



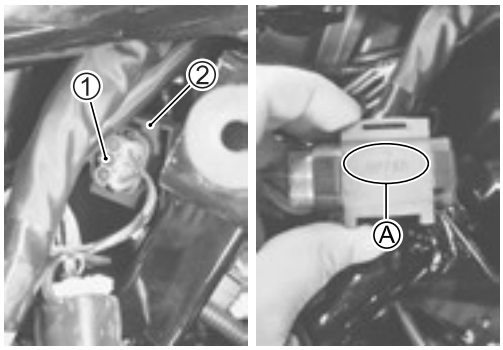
- Remove the fuel tank. (☞6-3)
- Disconnect the ECT sensor coupler ① and remove the ECT sensor ②.
- Installation is in the reverse order of removal.

ECT sensor: 18 N·m (1.8 kgf-m, 13.0 lb-ft)

TO SENSOR INSPECTION

The tip-over sensor is located under the front seat. (☞5-52)

TO SENSOR REMOVAL/INSTALLATION



- Remove the right frame cover. (☞8-4)
- Disconnect the coupler ① and remove the TO sensor ②.
- Installation is in the reverse order of removal.

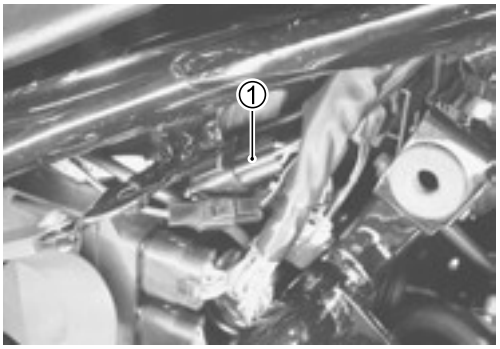
NOTE:
When installing the TO sensor, bring the "UPPER" letter Ⓐ on it to the top.

HO2 SENSOR INSPECTION (FOR E-02, 19, 24)

The heated oxygen sensor is installed on the pre-muffler.
(☞5-69)

HO2 SENSOR REMOVAL/INSTALLATION

- Remove the right frame cover. (☞8-4)
- Disconnect the coupler ① and remove the HO2 sensor unit.

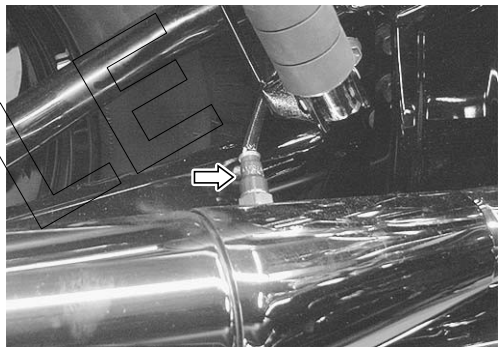


⚠ WARNING

Do not remove the HO2 sensor while it is hot.

CAUTION

Be careful not to expose it to excessive shock.
Do not use an impact wrench while removing or installing the HO2 sensor unit.
Be careful not to twist or damage the sensor lead wire.



- Installation is in the reverse order of removal.

CAUTION

Do not apply oil or other materials to the sensor air hole.

- Tighten the sensor unit to the specified torque.

HO2 SENSOR: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

- Route the HO2 sensor lead wire properly.