SUZUKI

SV650/S

SERVICE MANUAL

99500-36120-03E

IMPORTANT

All street-legal Suzuki motorcycles with engine displacement of 50 cc or greater are subject to Environmental Protection agency emission regulations. These regulations set specific standards for exhaust emission output levels as well as particular servicing requirements. This manual includes specific information required to properly inspect and service SV650/S in accordance with all EPA regulations. It is strongly recommended that the chapter on Emission Control, Periodic Servicing and FUEL SYSTEM be thoroughly reviewed before any type of service work is performed.
Further information concerning the EPA emission regulations and U.S. Suzuki's emission control program can be found in the U.S. SUZUKI EMISSION CONTROL PROGRAM MANUAL/SERVICE BULLETIN.

FOREWORD

This manual contains an introductory description on the SUZUKI SV650/S 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.

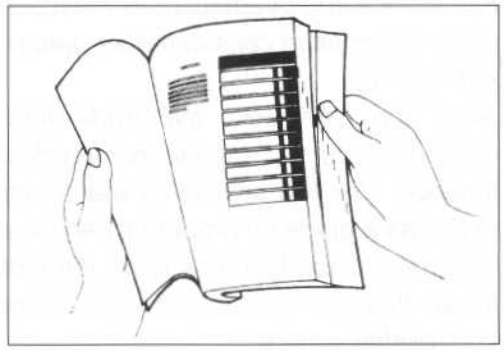
GROUP INDEX

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.



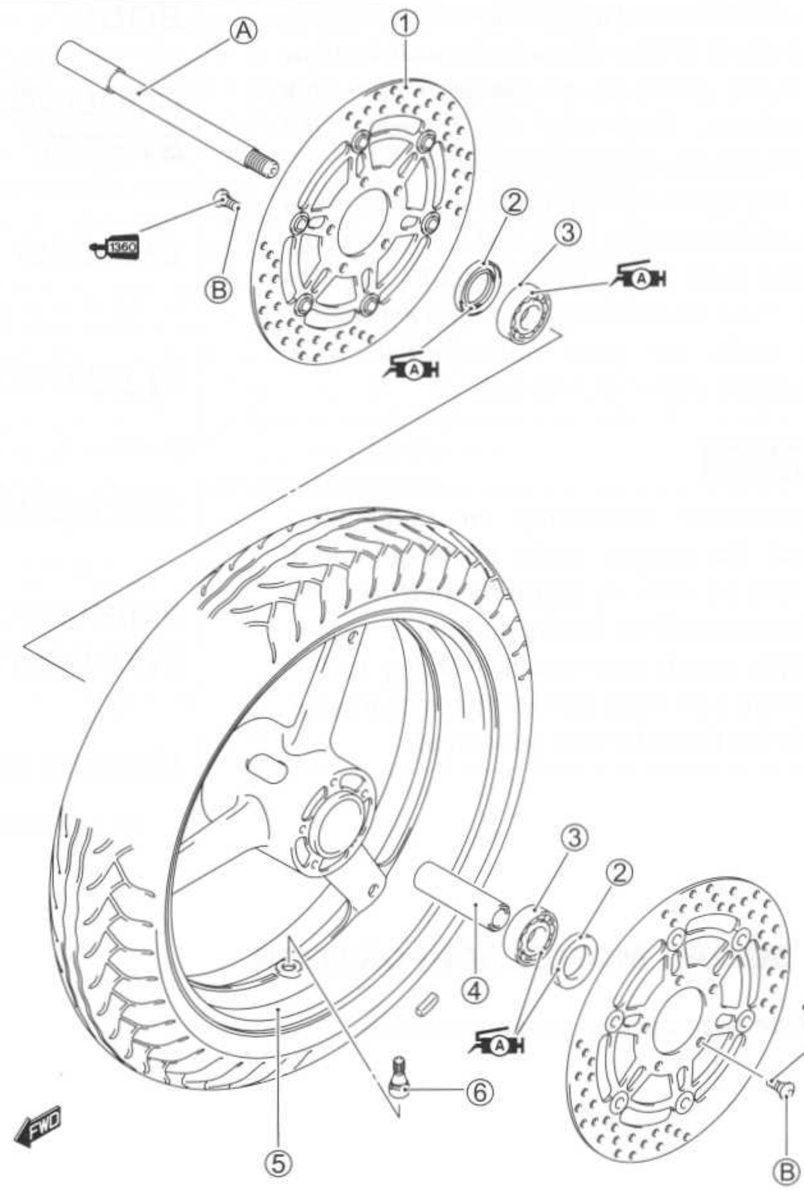
COMPONENT PARTS AND WORK TO BE DONE

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 Brake disc
② Dust seal
③ Bearing
④ Center spacer
⑤ Front wheel
⑥ Tire valve

Ⓐ Front axle
Ⓑ Brake disc 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.	1360	Apply THREAD LOCK SUPER "1360". 99000-32130
OIL	Apply oil. Use engine oil unless otherwise specified.	LLC	Use engine coolant.
M/O	Apply molybdenum oil solution. (Mixture of engine oil and SUZUKI MOLY PASTE in a ratio of 1:1)	FORK	Use fork oil. 99000-99001-SS8
A	Apply SUZUKI SUPER GREASE "A". 99000-25030 (USA) 99000-25010 (Others)	BF	Apply or use brake fluid.
M	Apply SUZUKI MOLY PASTE. 99000-25140	V	Measure in voltage range.
S	Apply SUZUKI SILICONE GREASE. 99000-25100	A	Measure in current range.
1215	Apply SUZUKI BOND "1215". 99000-31110 (Except USA)	Ω	Measure in resistance range.
1207B	Apply SUZUKI BOND "1207B". 99104-31140 (USA) 99000-31140 (Others)		Measure in diode test range.
1303	Apply THREAD LOCK SUPER "1303". 99000-32030		Measure in continuity test range.
1322	Apply THREAD LOCK SUPER "1322". 99000-32110 (Except USA)	TOOL	Use special tool.
1342	Apply THREAD LOCK "1342". 99000-32050	DATA	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)
CMP Sensor	: Camshaft Position Sensor (CMPS)
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)
ECT Sensor	: Engine Coolant Temperature Sensor (ECTS), Water Temp. Sensor (WTS)
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

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
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)

V

VD : Vacuum Damper

SAE-TO-FORMER SUZUKI TERM

This table lists SAE (Society of Automotive Engineers) J1930 terms and abbreviations which may be used in this manual in compliance with SAE recommendations, as well as their former SUZUKI names.

SAE TERM		FORMER SUZUKI TERM
FULL TERM	ABBREVIATION	
A		
Air Cleaner	ACL	Air Cleaner, Air Cleaner Box
B		
Barometric Pressure	BARO	Barometric Pressure, Atmospheric Pressure (APS, AP Sensor)
Battery Positive Voltage	B+	Battery Voltage, +B
C		
Camshaft Position Sensor	CMP Sensor	Camshaft Position Sensor (CMPS)
Crankshaft Position Sensor	CKP Sensor	Crankshaft Position Sensor (CKPS), Crank Angle
D		
Data Link Connector	DLC	Dealer Mode Coupler
Diagnostic Test Mode	DTM	—
Diagnostic Trouble Code	DTC	Diagnostic Code, Malfunction Code
E		
Electronic Ignition	EI	—
Engine Control Module	ECM	Engine Control Module (ECM) FI Control Unit, Engine Control Unit (ECU)
Engine Coolant Level	ECL	Coolant Level
Engine Coolant Temperature	ECT	Coolant Temperature, Engine Coolant Temperature Water Temperature
Engine Speed	RPM	Engine Speed (RPM)
Evaporative Emission	EVAP	Evaporative Emission
Evaporative Emission Canister	EVAP Canister	— (Canister)
F		
Fan Control	FC	—
Fuel Level Sensor	—	Fuel Level Sensor, Fuel Level Gauge
Fuel Pump	FP	Fuel Pump (FP)
G		
Generator	GEN	Generator
Ground	GND	Ground (GND, GRD)

SAE TERM		FORMER SUZUKI TERM
FULL TERM	ABBREVIATION	
I		
Idle Speed Control	ISC	——
Ignition Control	IC	Electronic Spark Advance (ESA)
Ignition Control Module	ICM	——
Intake Air Temperature	IAT	Intake Air Temperature (IAT), Air Temperature
M		
Malfunction Indicator Lamp	MIL	LED Lamp Malfunction Indicator Lamp (MIL)
Manifold Absolute Pressure	MAP	Intake Air Pressure (IAP), Intake Vacuum
Mass Air Flow	MAF	Air Flow
O		
On-Board Diagnostic	OBD	Self-Diagnosis Function Diagnostic
Open Loop	OL	——
P		
Programmable Read Only Memory	PROM	——
Pulsed Secondary Air Injection	PAIR	Pulse Air Control (PAIR)
Purge Valve	Purge Valve	Purge Valve (SP Valve)
R		
Random Access Memory	RAM	——
Read Only Memory	ROM	ROM
S		
Secondary Air Injection	AIR	——
Secondary Throttle Control System	STCS	STC System (STCS)
Secondary Throttle Valve	STV	ST Valve (STV)
Secondary Throttle Valve Actuator	STVA	STV Actuator (STVA)
T		
Throttle Body	TB	Throttle Body (TB)
Throttle Body Fuel Injection	TBI	Throttle Body Fuel Injection (TBI)
Throttle Position Sensor	TP Sensor	TP Sensor (TPS)
V		
Voltage Regulator	VR	Voltage Regulator
Volume Air Flow	VAF	Air Flow

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/O	: Black with Orange 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/R	: Green with Red 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
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/W	: Red with White 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

GENERAL INFORMATION

1

CONTENTS

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 in 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 not require use of battery power, disconnect the negative cable the battery.
* When tightening the cylinder head and case bolts and 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 SV650 ('03-MODEL)

RIGHT SIDE

LEFT SIDE

- Difference between photographs and actual motorcycles depends on the markets.

SUZUKI SV650S ('03-MODEL)

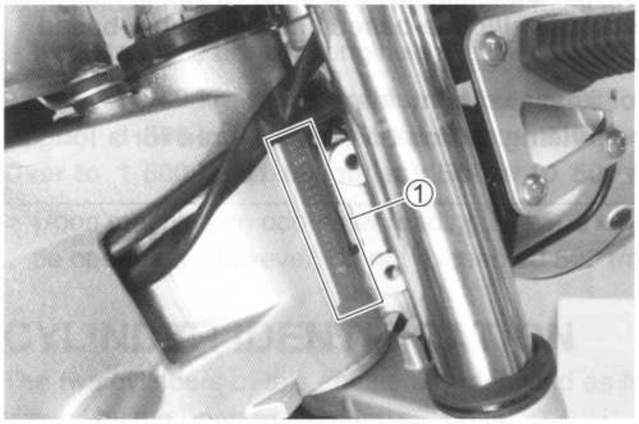
RIGHT SIDE

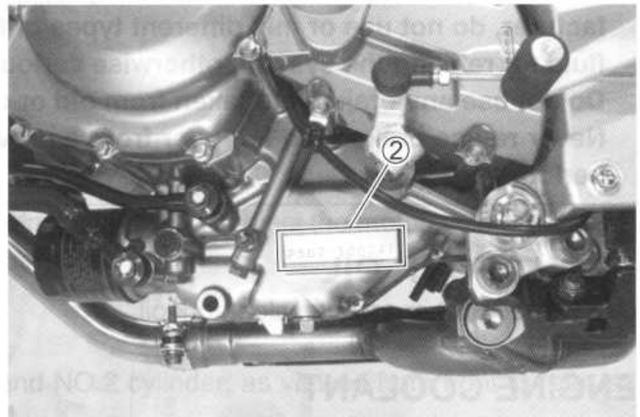
LEFT SIDE

- Difference between photographs and actual motorcycles depends 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. The engine serial number ② is located on the left 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 ($\frac{R+M}{2}$) 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)

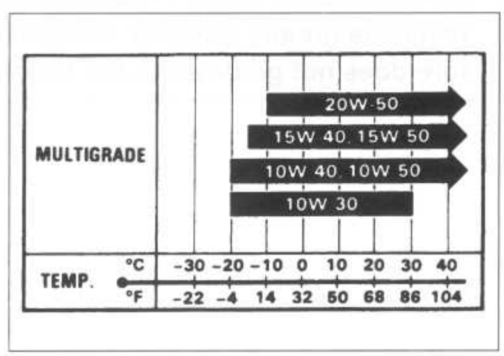
Gasoline used should be graded 91 octane (Research Method) or higher. Unleaded gasoline is recommended.

ENGINE OIL (FOR USA)

SUZUKI recommends the use of SUZUKI PERFORMANCE 4 MOTOR OIL or an oil which is rated SF or SG under the API (American Petroleum Institute) service classification. The recommended viscosity is SAE 10W-40. If an SAE 10W-40 oil is not available, select and alternative according to the following chart.

ENGINE OIL (FOR OTHER COUNTRIES)

Use a premium quality 4-stroke motor oil to ensure longer service life of your motorcycle. Use only oils which are rated SF or SG under the API service classification. The recommended viscosity is SAE 10W-40. If an SAE 10W-40 motor 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 SS8 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 perform 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

For engine coolant mixture information, refer to cooling system section, page 6-2

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 manufacture only the best possible materials are used and all machined parts are finished to a very high standard but 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. The general rules are as follows.

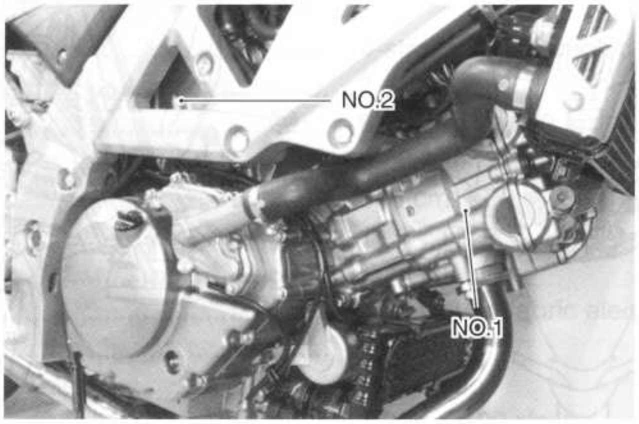
- Keep to these break-in engine speed limits:

Initial 800 km (500 miles): Below 5 000 r/min
Up to 1 600 km (1 000 miles): Below 8 000 r/min
Over to 1 600 km (1 000 miles): Below 10 500 r/min

- Upon reaching an odometer reading of 1 600 km (1 000 miles) you can subject the motorcycle to full throttle operation. However, do not exceed 10 500 r/min at any time.

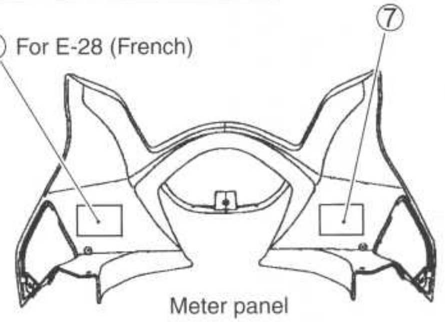
CYLINDER IDENTIFICATION

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

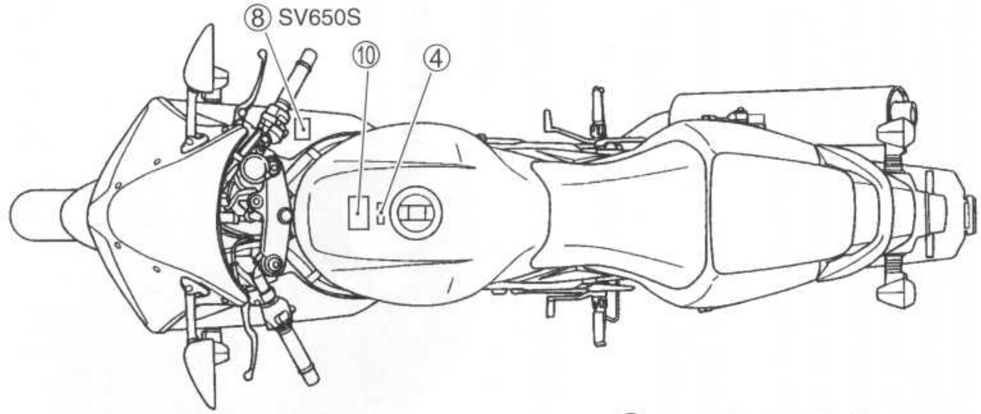


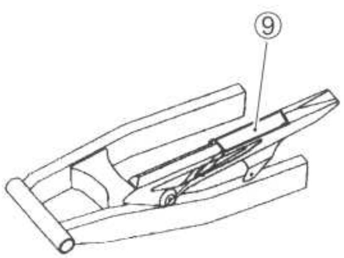
INFORMATION LABELS

① Noise label (For E-03, 24, 33)
② Information label (For E-03, 28, 33)
③ Vacuum hose routing label (For E-33)
④ Fuel caution label (For E-02, 24)
⑤ Manual notice label (For E-03, 33)
⑥ Frame caution label
⑦ Screen warning label (SV650S)
⑧ Steering warning label (SV650S)
⑨ Tire information label
⑩ Warning safety label
⑪ ICES Canada label (For E-28)
⑫ ID plate (Except for E-03, 28, 33)
⑬ Safety plate (For E-03, 28, 33)

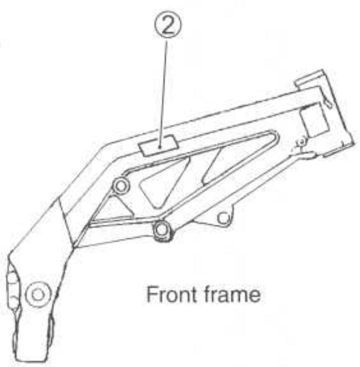


Meter panel
SV650S

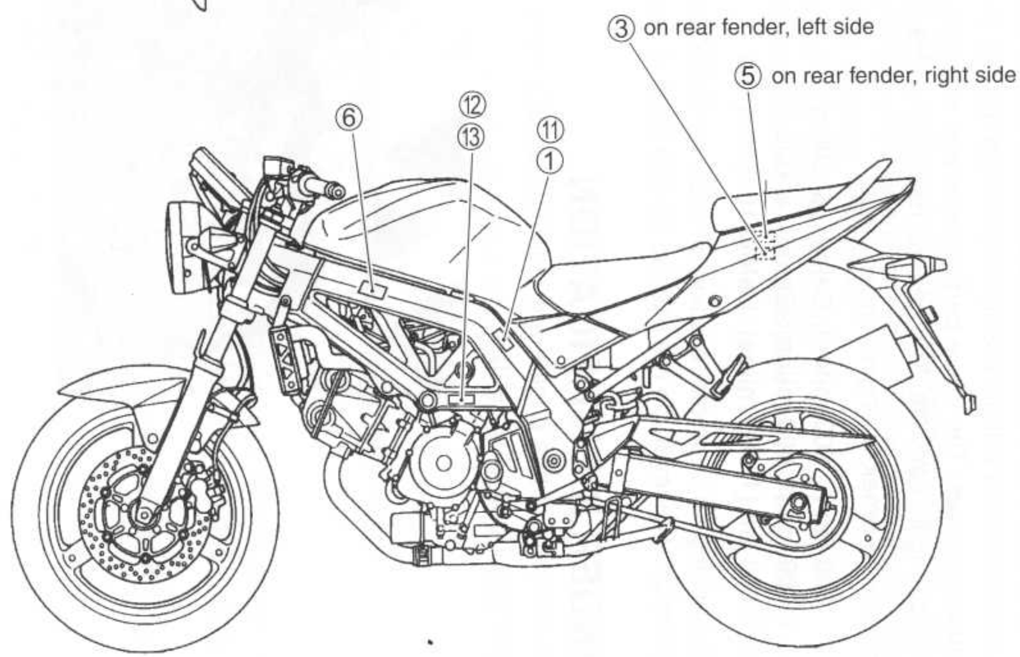




Swingarm



Front frame



SPECIFICATIONS

DIMENSIONS AND DRY MASS

Overall length	2 125 mm (83.7 in) SV650
	2 130 mm (83.9 in) SV650S
Overall width	745 mm (29.3 in) SV650
	730 mm (28.7 in) SV650S
Overall height	1 085 mm (42.7 in) SV650
	1 175 mm (46.3 in) SV650S
Wheelbase	1 440 mm (56.7 in) SV650
	1 430 mm (56.3 in) SV650S
Ground clearance	150 mm (5.9 in) SV650
	155 mm (6.1 in) SV650S
Seat height	800 mm (31.5 in)
Dry mass	167 kg (368 lbs) SV650
	171 kg (376 lbs) SV650S

ENGINE

Type	4-stroke, liquid-cooled, DOHC, 90 °-degree V-twin
Number of cylinders	2
Bore	81.0 mm (3.189 in)
Stroke	62.6 mm (2.465 in)
Displacement	645 cm^3 (39.4 cu.in)
Compression ratio	11.5 : 1
Carburetion	Fuel injection
Air cleaner	Non-woven fabric element
Starter system	Electric
Lubrication system	Wet sump
Idle speed	1 300 ± 100 r/min

DRIVE TRAIN

Clutch	Wet multi-plate type
Transmission	6-speed constant mesh
Gearshift pattern	1-down, 5-up
Primary reduction ratio	2.088 (71/34)
Final reduction ratio	3.000 (45/15) SV650
	2.933 (44/15) SV650S
Gear ratios, Low	2.461 (32/13)
2nd	1.777 (32/18)
3rd	1.380 (29/21)
4th	1.125 (27/24)
5th	0.961 (25/26)
Top	0.851 (23/27)
Drive chain	DID 525 V8, 110 links SV650
	DID 525 V8, 108 links SV650S

CHASSIS

Front suspension	Telescopic, coil spring, oil damped
Rear suspension	Link type, coil spring, oil damped
Front fork stroke	130 mm (5.1 in)
Rear wheel travel	134 mm (5.3 in)
Caster	25 °
Trail	102 mm (4.02 in) SV650
	100 mm (3.94 in) SV650S
Steering angle	32 ° (right & left)............ SV650
	30 ° (right & left)............ SV650S
Turning radius	3.0 m (9.8 ft) SV650
	3.2 m (10.5 ft) SV650S
Front brake	Disc brake, twin
Rear brake	Disc brake
Front tire size	120/60 ZR17 MC (55 W), tubeless
Rear tire size	160/60 ZR17 MC (69 W), tubeless

ELECTRICAL

Ignition type	Electronic ignition (Transistorized)
Ignition timing	7 ° B.T.D.C. at 1 300 r/min
Spark plug	NGK CR8E, or DENSO U24ESR-N
Battery	12V 36.0 kC (10 Ah)/10 HR
Generator	Three-phase A.C. generator
Main fuse	30 A
Fuse	15/10/10/10/10/10 A SV650
	15/15/15/10/10/10 A SV650S
Headlight	12 V 60/55 W (H4)........ SV650
	12 V 60/55 W (H4) × 2.. SV650S
Position light	12 V 5 W...................... SV650 (Except E-03, 24, 33)
	12 V 5 W × 2................ SV650S
Brake light/Taillight	LED
License plate light	12 V 5 W
Turn signal light	12 V 21 W
Speedometer 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
Fuel injection light	LED

CAPACITIES

Fuel tank, including reserve	16 L (4.2/3.5 US/Imp gal) E-33
	17 L (4.5/3.7 US/Imp gal) ....Others
Engine oil, oil change	2 300 ml (2.4/2.0 US/Imp qt)
with filter change	2 700 ml (2.9/2.4 US/Imp qt)
overhaul	3 100 ml (3.3/2.7 US/Imp qt)
Coolant	1.7 L (1.8/1.5 US/Imp qt)

These specifications are subject to change without notice.

COUNTRY AND AREA CODES

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

CODE	COUNTRY or AREA
E-02	U.K.
E-03	U.S.A. (Except for california)
E-19	EU
E-24	Australia
E-28	Canada
E-33	California (U.S.A.)

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.

IMPORTANT: The periodic maintenance intervals and service requirements have been established in accordance with EPA regulations. Following these instructions will ensure that the motorcycle will not exceed emission standards and it will also ensure the reliability and performance of the motorcycle.

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

PERIODIC MAINTENANCE CHART

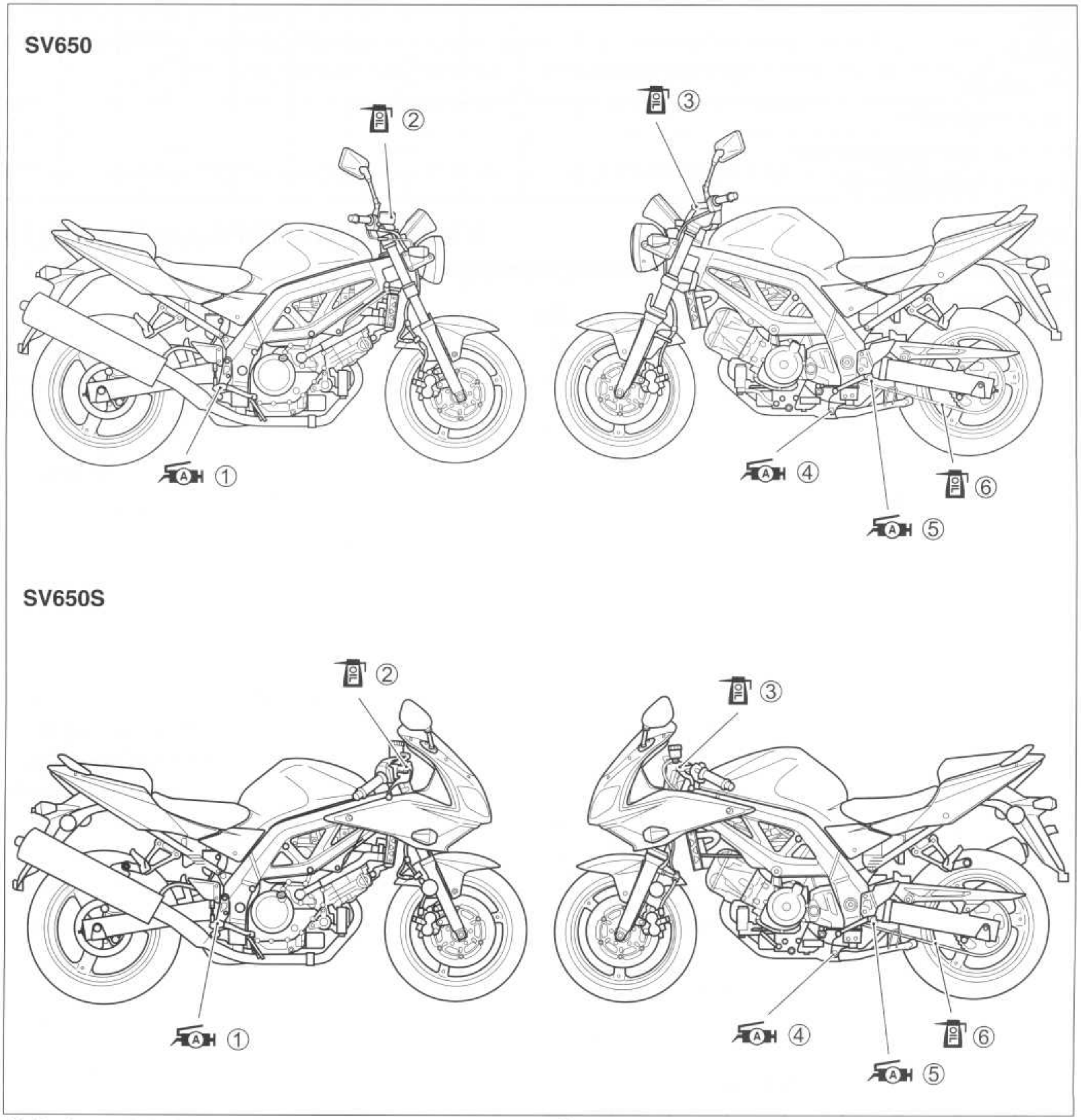
Item \ Interval		1 000	6 000	12 000	18 000	24 000
	km	1 000	6 000	12 000	18 000	24 000
	miles	600	4 000	7 500	11 000	14 500
	months	1	6	12	18	24
Air cleaner		—	I	I	R	I
Spark plugs		—	I	R	I	R
Tappet clearance		—	—	—	—	I
Engine oil		R	R	R	R	R
Engine oil filter		R	—	—	R	—
Fuel line		—	I	I	I	I
		Replace every 4 years.				
Engine idle speed		I	I	I	I	I
Throttle valve synchronization		I E-33 only	—	I	—	I
Evaporative emission control system		—	—	I	—	I
E-33 (California) model only		Replace vapor hose every 4 years.				
PAIR (air supply) system		—	—	I	—	I
Throttle cable play		I	I	I	I	I
Clutch		—	I	I	I	I
Radiator hoses		—	I	I	I	I
		Replace every 4 years.				
Engine coolant		Replace every 2 years.				
Drive chain		I	I	I	I	I
		Clean and lubricate every 1 000 km (600 miles).				
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.				

Item	Interval	km	1 000	6 000	12 000	18 000	24 000
		miles	600	4 000	7 500	11 000	14 500
		months	1	6	12	18	24
Tires			—	I	I	I	I
Steering			I	—	I	—	I
Front forks			—	—	I	—	I
Rear suspension			—	—	I	—	I
Exhaust pipe bolts and nuts			T	—	T	—	T
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.



① Brake pedal pivot and footrest pivot
② Brake lever holder and throttle cables
③ Clutch lever holder and clutch cable
④ Side-stand pivot and spring hook
⑤ Footrest pivot
⑥ Drive chain

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

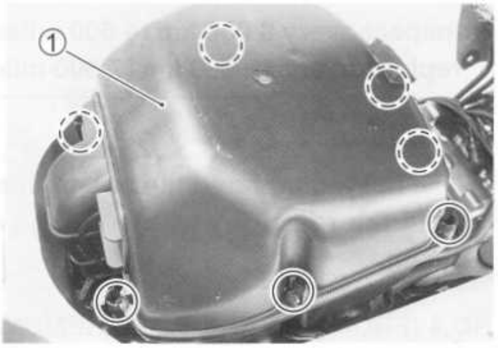
This section describes the servicing procedures for each item of the Periodic Maintenance requirements.

AIR CLEANER

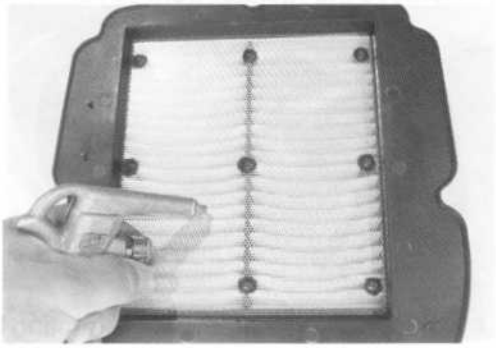
Inspect every 6 000 km (4 000 miles, 6 months) and replace every 18 000 km (11 000 miles, 18 months).

- Lift and support the fuel tank. (☞5-6)

- Remove the air cleaner box cap ①.



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



CAUTION

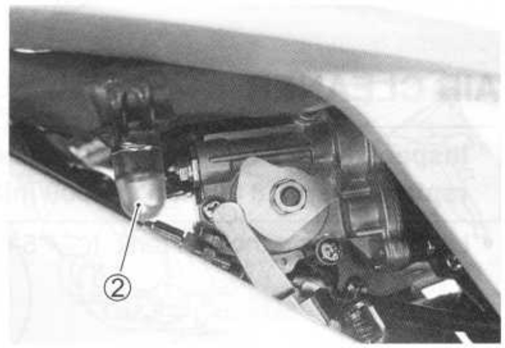
Always use air pressure on the throttle body side of the air cleaner element. If air pressure is used on the other side, dirt will be forced into the pores of the air cleaner element thus restricting air flow through the air cleaner element.

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

CAUTION

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

- Remove the drain plugs ② from the air cleaner drain hose and air cleaner box to allow any water to drain out.



SPARK PLUG

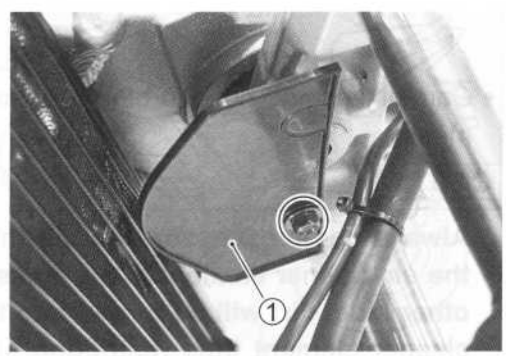
Inspect every 6 000 km (4 000 miles, 6 months) and replace every 12 000 km (7 500 miles, 12 months).

⚠ WARNING

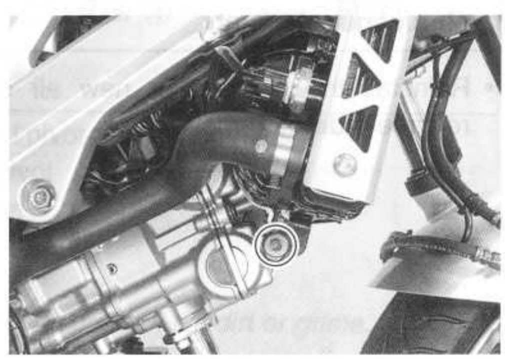
The hot radiator and the hot engine can burn you. Wait until the radiator and the engine are cool enough to touch.

NO.1 (FRONT) SPARK PLUG REMOVAL

- Remove the radiator front cover ①. (SV650)

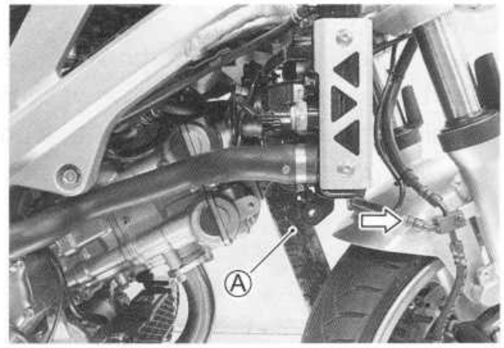


- Remove the radiator lower mounting bolt.



• Move the radiator lower side to forward.

NOTE:
** Do not extract the radiator hoses.*
** Place a wooden block Ⓐ between the radiator and the front cylinder to facilitate spark plug removal.*



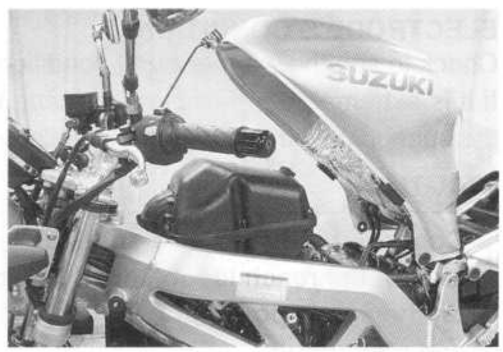
• Disconnect the spark plug cap and remove the spark plug.

TOOL 09930-10121: Spark plug socket wrench set

NOTE:
Be careful not to damage the radiator fins.

NO.2 (REAR) SPARK PLUG REMOVAL

• Lift and support the fuel tank. (☞5-6)



• Disconnect the spark plug cap.
• Remove the spark plug with a spark plug wrench.

TOOL 09930-10121: Spark plug socket wrench set

HEAT RANGE

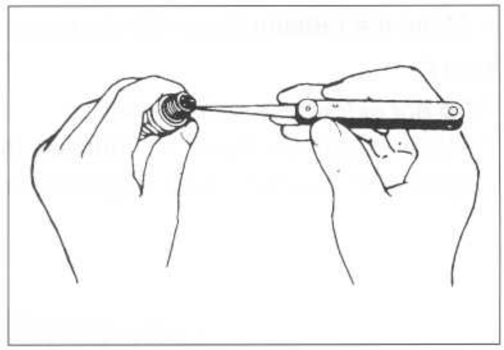
Check to see the heat range of the plug.

	Standard	Cold type	Hot type
NGK	CR8E	CR9E	CR7E
ND	U24ESR-N	U27ESR-N	U22ESR-N

CARBON DEPOSITS

Check to see if there are carbon deposits on the spark plug.

If carbon is deposited, remove it with a spark plug cleaner machine or carefully use a tool with a pointed end.



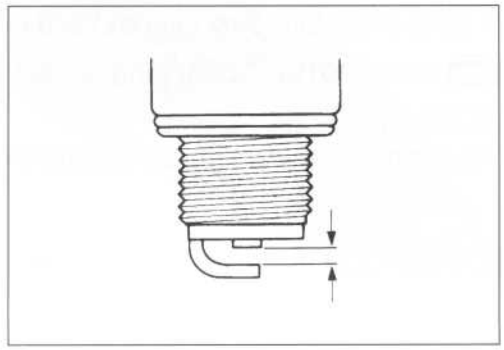
SPARK PLUG GAP

Measure the spark plug gap with a thickness gauge.

If out of specification, regap the spark plug.

DATA **Spark plug gap**
Standard: 0.7 – 0.8 mm (0.028 – 0.031 in)

TOOL **09900-20803: Thickness gauge**



ELECTRODE'S CONDITION

Check to see the worn or burnt condition of the electrodes.

If it is extremely worn or burnt, replace the spark plug. Replace the spark plug if it has a broken insulator, damaged thread, etc.

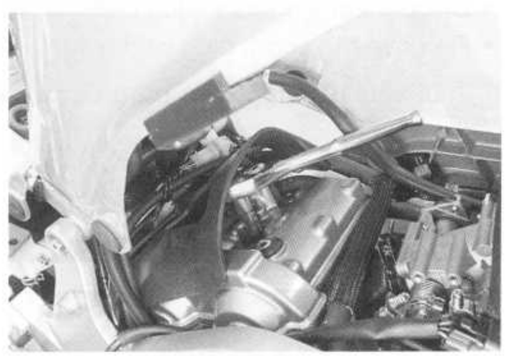
CAUTION

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 INSTALLATION

CAUTION

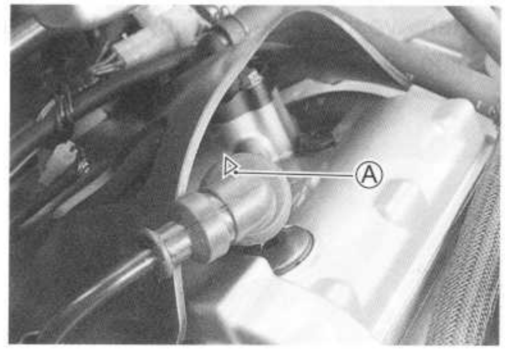
Before tightening the spark plug to the specified torque, carefully turn the spark plug by finger into the threads of the cylinder head to prevent damage the aluminum threads.



- First, finger tighten the spark plugs, and then tighten them to the specified torque.

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

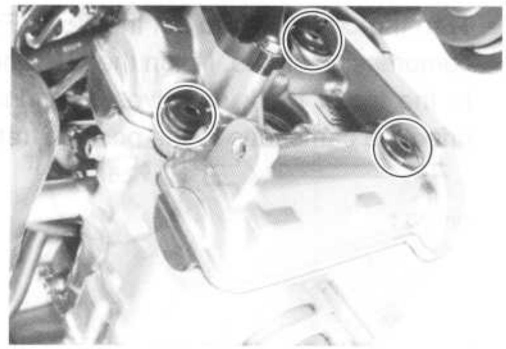
NOTE:
When fitting the spark plug caps, front and rear, face the triangle marks Ⓐ on the water-proof covers to each cylinder exhaust side.



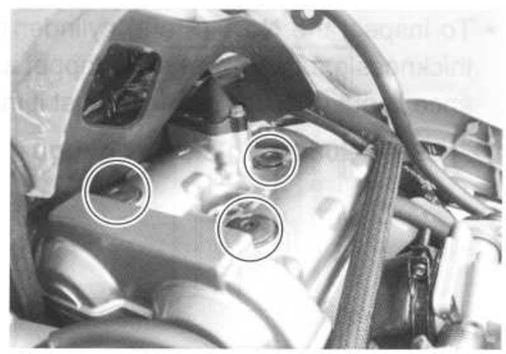
TAPPET CLEARANCE

Inspect every 24 000 km (14 500 miles, 24 months).

- Lift and support the fuel tank. (☞5-6)
- Remove the spark plugs, front and rear. (☞2-6)
- Remove the cylinder head covers, front and rear.

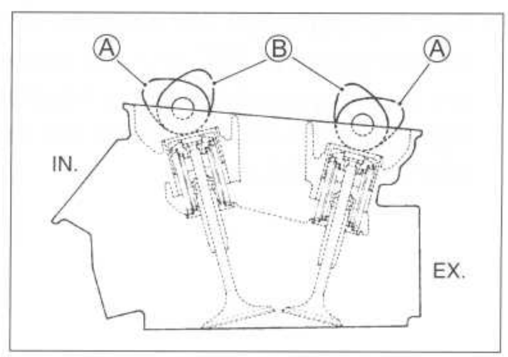


The tappet clearance specification is different for intake and exhaust valves.
Tappet clearance must be checked and adjusted, 1) at the time of periodic inspection, 2) when the valve mechanism is serviced, and 3) when the camshafts are disturbed by removing them for servicing.

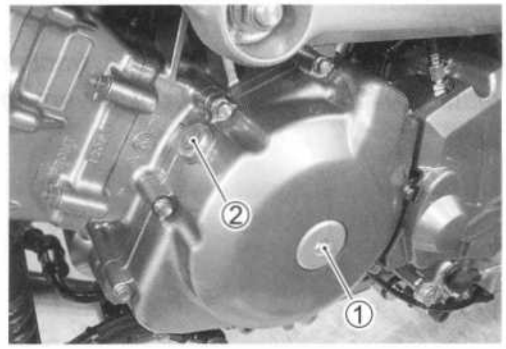


DATA **Tappet clearance (when cold):**
IN. : 0.10 – 0.20 mm (0.004 – 0.008 in)
EX.: 0.20 – 0.30 mm (0.008 – 0.012 in)

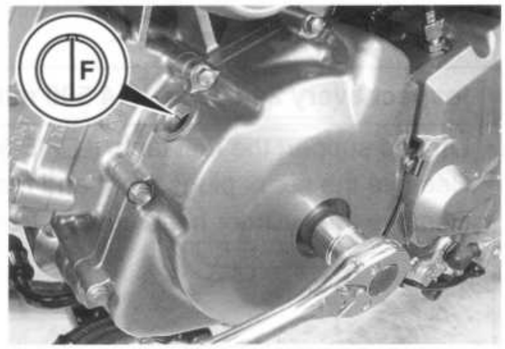
NOTE:
* *The tappet clearance should be taken when each cylinder is at Top Dead Center (TDC) of compression stroke.*
* *The cams (IN & EX) on the front cylinder at position Ⓐ show the front cylinder at TDC of compression stroke.*
* *The cams (IN & EX) on the rear cylinder at position Ⓑ show the rear cylinder at TDC of compression stroke.*
* *The clearance specification is for COLD state.*
* *To turn the crankshaft for clearance checking, be sure to use a wrench, and rotate in the normal running direction. All spark plugs should be removed.*



- Remove the generator cover plug ① and the timing inspection plug ②.



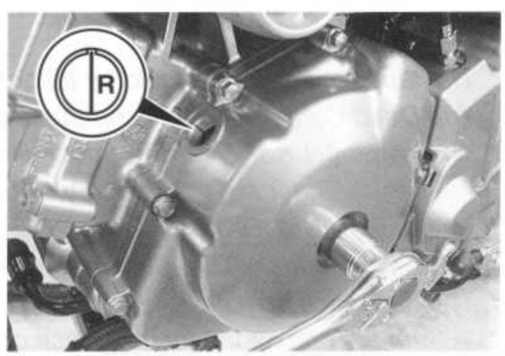
- Turn the crankshaft to set the No.1 (Front) cylinder at TDC of compression stroke. (Align the "| F" line on the generator rotor to the index mark of valve timing inspection hole and also bring the camshafts to the position, refer to page 2-9.)



- To inspect the No.1 (Front) cylinder tappet clearance, use a thickness gauge between the tappet and the cam. If the clearance is out of specification, adjust it into the specified range.

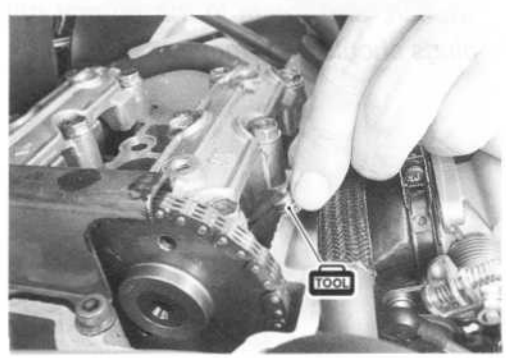
09900-20803: Thickness gauge

- Turn the crankshaft 270 degrees (3/4 turns) to set the No.2 (Rear) cylinder at TDC of compression stroke. (Align the "| R" line on the generator rotor to the index mark of valve timing inspection hole and also bring the camshafts to the position, refer to page 2-9.)



- Inspect the No.2 (Rear) cylinder tappet clearance as the same manner of No.1 (Front) cylinder and adjust the clearance if necessary.

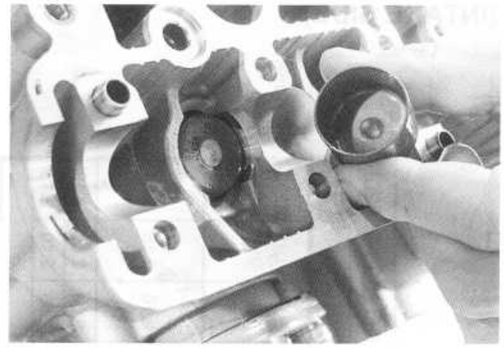
09900-20803: Thickness gauge



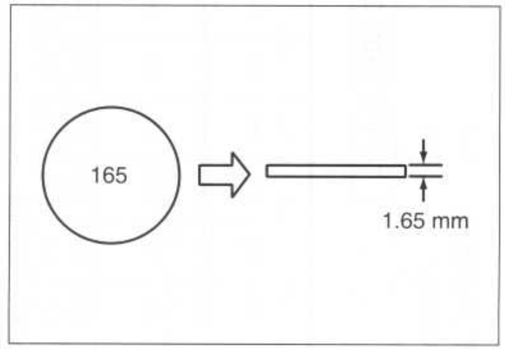
TAPPET CLEARANCE ADJUSTMENT

The clearance is adjusted by replacing the existing tappet shim by a thicker or thinner shim.

- Remove the intake or exhaust camshafts. (☞3-26, 28)
- Remove the tappet and shim by fingers or magnetic hand.

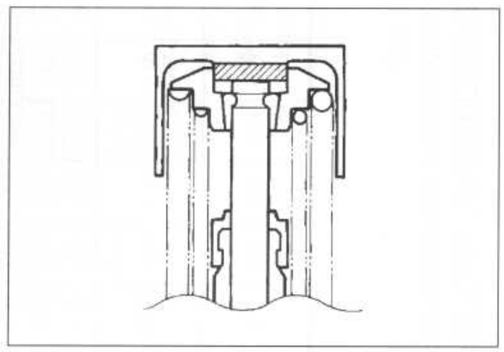


- Check the figures printed on the shim. These figures indicate the thickness of the shim, as illustrated.
- Select a replacement shim that will provide a clearance within the specified range. For the purpose of this adjustment, a total of 21 sizes of tappet shim are available ranging from 1.20 to 2.20 mm in steps of 0.05 mm. Fit the selected shim to the valve stem end, with numbers toward tappet. Be sure to check shim size with micrometer to ensure its size. Refer to the tappet shim selection table (☞2-12, 13) for details.



NOTE:

* *Be sure to apply engine oil to tappet shim top and bottom faces.*
* *When seating the tappet shim, be sure to face figure printed surface to the tappet.*



CAUTION

Reinstall the camshafts as the specified manner. (☞3-102)

- After replacing the tappet shim and camshafts, rotate the engine so that the tappet is depressed fully. This will squeeze out oil trapped between the shim and the tappet that could cause an incorrect measurement, then check the clearance again to confirm that it is within the specified range.

- After finishing the tappet clearance adjustment, reinstall the following items.

* Cylinder head cover (☞3-109)
* Spark plug and plug cap (☞2-8)
* Valve timing inspection plug (☞3-111)
* Generator cover plug (☞3-111)
* Air cleaner box (☞5-16)

(INTAKE SIDE)

TAPPET SHIM SELECTION TABLE [INTAKE]
TAPPET SHIM NO. (12892-05C00-XXX)

TAPPET SHIM SET (12800-05820)

MEASURED TAPPET CLEARANCE (mm) \ SUFFIX NO.	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
PRESENT SHIM SIZE (mm)	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20
0.00-0.04			1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10
0.05-0.09		1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15
0.10-0.20	SPECIFIED CLEARANCE/NO ADJUSTMENT REQUIRED																				
0.21-0.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.20	
0.26-0.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20			
0.31-0.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20				
0.36-0.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20					
0.41-0.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20						
0.46-0.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20							
0.51-0.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20								
0.56-0.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20									
0.61-0.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20										
0.66-0.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20											
0.71-0.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20												
0.76-0.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20													
0.81-0.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20														
0.86-0.90	1.95	2.00	2.05	2.10	2.15	2.20															
0.91-0.95	2.00	2.05	2.10	2.15	2.20																
0.96-1.00	2.05	2.10	2.15	2.20																	
1.01-1.05	2.10	2.15	2.20																		
1.06-1.10	2.15	2.20																			
1.11-1.15	2.20																				

HOW TO USE THIS CHART:

I. Measure tappet clearance. "ENGINE IS COLD"

II. Measure present shim size.

III. Match clearance in vertical column with present shim size in horizontal column.

EXAMPLE

Tappet clearance is	0.23 mm
Present shim size	1.65 mm
Shim size to be used	1.75 mm

TAPPET SHIM SELECTION TABLE [EXHAUST]
TAPPET SHIM NO. (12892-05C00-XXX)

TAPPET SHIM SET (12800-05820)

MEASURED TAPPET CLEARANCE (mm) / SUFFIX NO.	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
PRESENT SHIM SIZE (mm)	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20
0.05-0.09				1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05
0.10-0.14			1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10
0.15-0.19		1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15
0.20-0.30	SPECIFIED CLEARANCE/NO ADJUSTMENT REQUIRED																				
0.31-0.35	1.30	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20	2.20	
0.36-0.40	1.35	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20			
0.41-0.45	1.40	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20				
0.46-0.50	1.45	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20					
0.51-0.55	1.50	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20						
0.56-0.60	1.55	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20							
0.61-0.65	1.60	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20								
0.66-0.70	1.65	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20									
0.71-0.75	1.70	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20										
0.76-0.80	1.75	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20											
0.81-0.85	1.80	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20												
0.86-0.90	1.85	1.90	1.95	2.00	2.05	2.10	2.15	2.20													
0.91-0.95	1.90	1.95	2.00	2.05	2.10	2.15	2.20														
0.96-1.00	1.95	2.00	2.05	2.10	2.15	2.20															
1.01-1.05	2.00	2.05	2.10	2.15	2.20																
1.06-1.10	2.05	2.10	2.15	2.20																	
1.11-1.15	2.10	2.15	2.20																		
1.16-1.20	2.15	2.20																			
1.21-1.25	2.20																				

HOW TO USE THIS CHART:

I. Measure tappet clearance. "ENGINE IS COLD"

II. Measure present shim size.

III. Match clearance in vertical column with present shim size in horizontal column.

EXAMPLE

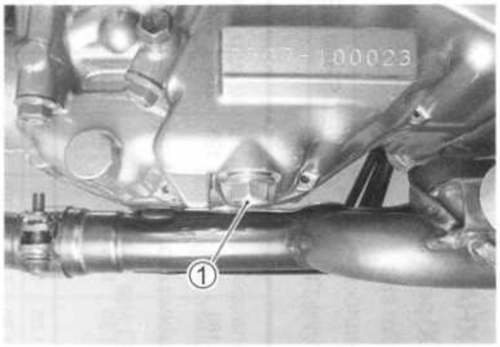
Tappet clearance is	0.33 mm
Present shim size	1.65 mm
Shim size to be used	1.75 mm

ENGINE OIL AND OIL FILTER

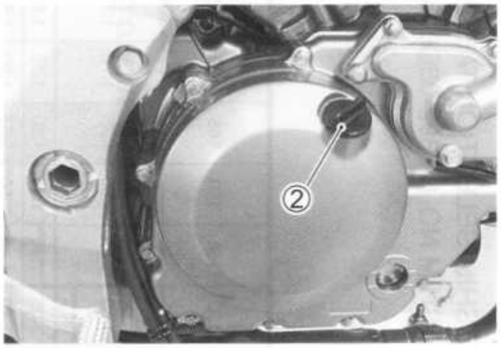
(ENGINE OIL)   **Replace initially at 1 000 km (600 miles, 1 month) and every 6 000 km (4 000 miles, 6 months) thereafter.**

(OIL FILTER)   **Replace initially at 1 000 km (600 miles, 1 month) and every 18 000 km (11 000 miles, 18 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.

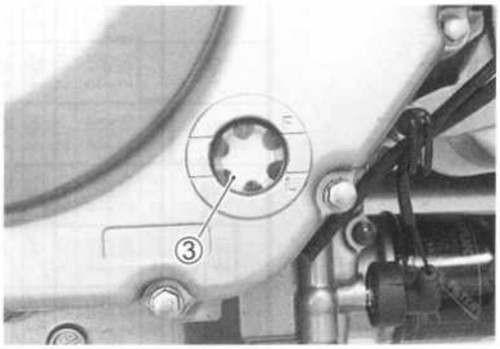


ENGINE OIL REPLACEMENT
- Keep the motorcycle upright.
- Place an oil pan below the engine, and drain oil by removing the oil drain plug ① and filler cap ②.



- Tighten the drain plug ① to the specified torque, and pour fresh oil through the oil filler. The engine will hold about 2.3 L (2.4/2.0 US/Imp qt) of oil. Use an API classification of SF or SG oil with SAE 10 W – 40 viscosity.

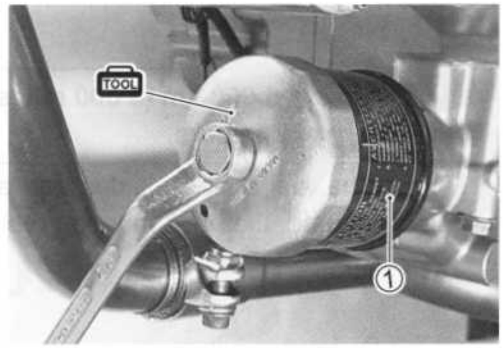
Oil drain plug (M12): 21 N·m (2.1 kgf-m, 15.0 lb-ft)



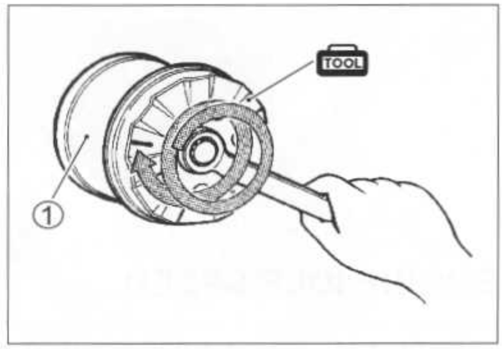
- Start up the engine and allow it to run for few minutes at idling speed.
- Turn off the engine and wait about three minute, then check the oil level through the inspection window ③. If the level is below mark "L" add oil to "F" level. If the level is above mark "F" drain oil to "F" level.

OIL FILTER REPLACEMENT

- Drain the engine oil as described in the engine oil replacement procedure.
- Remove the oil filter ① with the special tool.
- Apply engine oil lightly to the gasket of the new oil filter before installation.



- Install the new oil filter. Turn it by hand until you feel that the oil filter gasket has contacted the oil filter mounting surface. Then, tighten the oil filter two turns using the special tool.



TOOL 09915-40610: Oil filter wrench

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

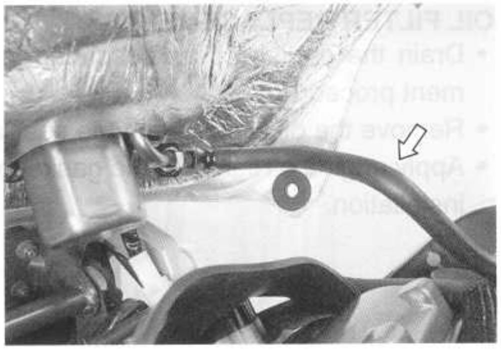
- Add new engine oil and check the oil level as described in the engine oil replacement procedure.

NECESSARY AMOUNT OF ENGINE OIL
Oil change: Approx. 2 300 ml (2.4/2.0 US/Imp qt)
Oil and filter change: Approx. 2 700 ml (2.9/2.4 US/Imp qt)
Engine overhaul: Approx. 3 100 ml (3.3/2.7 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.

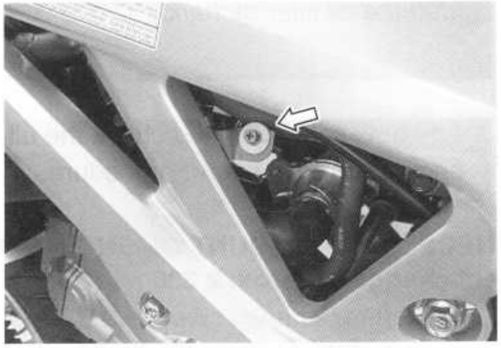
FUEL HOSE



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

- Inspect the fuel hoses for damage and fuel leakage. If any defect is found, the hose must be replaced.

ENGINE IDLE SPEED



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

NOTE:
Make this adjustment when the engine is warmed up.

- Start the engine, turn the throttle stop screw and set the engine idle speed as follows.

DATA **Engine idle speed: 1 300 ± 100 r/min**

THROTTLE VALVE SYNCHRONIZATION

Inspect initially at 1 000 km (600 miles, 1 month) (E-33 only) and every 12 000 km (7 500 miles, 12 months). (☞5-33)

EVAPORATIVE EMISSION CONTROL SYSTEM (E-33 ONLY)

Inspect every 12 000 km (7 500 miles, 12 months).
Replace vapor hose every 4 years. (☞10-8)

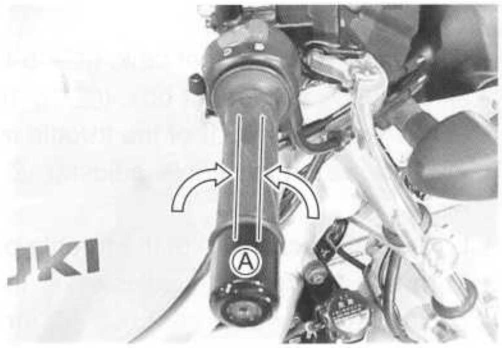
PAIR (AIR SUPPLY) SYSTEM

Inspect every 12 000 km (7 500 miles, 12 months).
(☞10-5)

THROTTLE CABLE PLAY

Inspect every at 1 000 km (600 miles, 1 month).

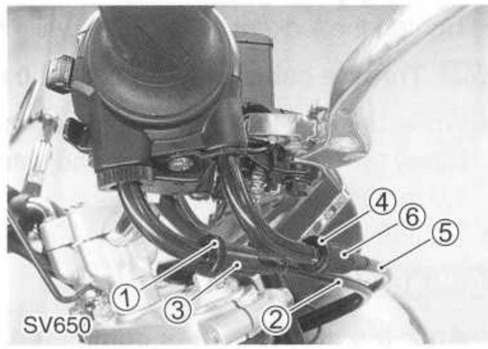
Adjust the throttle cable play Ⓐ as follows.



MINOR ADJUSTMENT

First step:

- Loosen the locknut ① of the throttle returning cable ② and fully turn in the adjuster ③.

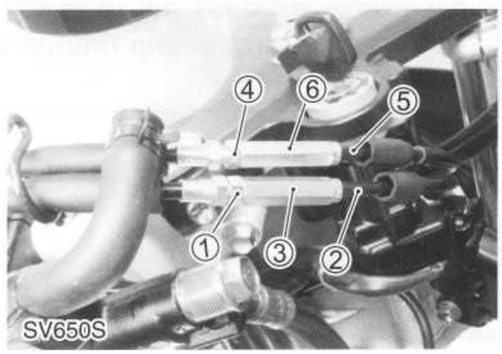


Second step:

- Loosen the locknut ④ of the throttle pulling cable ⑤.
- Turn the adjuster ⑥ in or out until the throttle cable play (at the throttle grip) Ⓐ is between 2.0 – 4.0 mm (0.08 – 0.16 in).
- Tighten the locknut 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 until resistance is felt.
- Tighten the locknut ① while holding the adjuster ③.



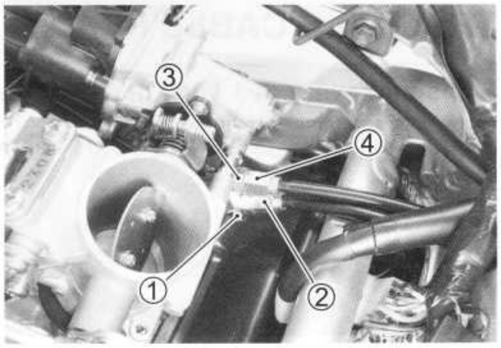
DATA **Throttle cable play Ⓐ: 2.0 – 4.0 mm (0.08 – 0.16 in)**

⚠ 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 at the throttle body side adjuster.

MAJOR ADJUSTMENT



- Lift and support the fuel tank. (☞5-6)
- Remove the air cleaner box. (☞5-16)
- Loosen the locknut ① of the throttle returning cable.
- Turn the returning cable adjuster ② to obtain proper cable play.
- Loosen the locknut 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 locknut 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 locknut ① securely.

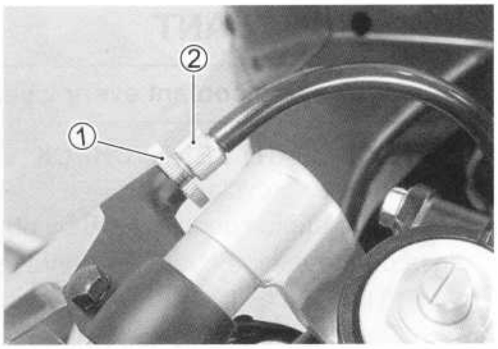
⚠ WARNING

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.

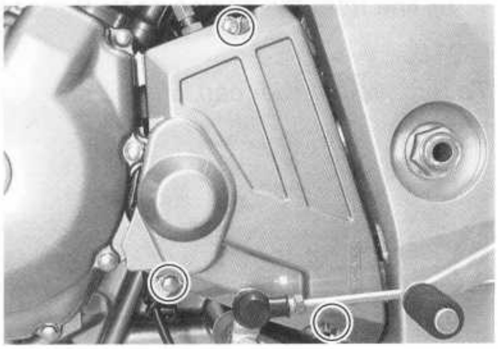
CLUTCH

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

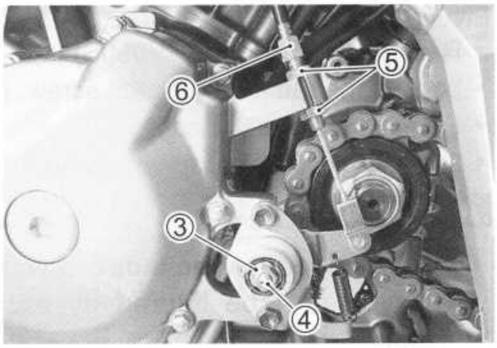
- Loosen the locknut ① and turn the adjuster ② all the way into the clutch lever assembly.



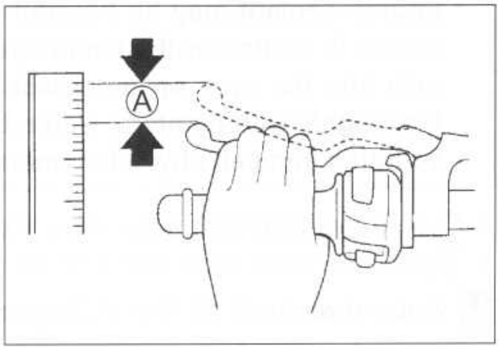
- Remove the engine sprocket cover.



- Loosen the locknut ③ and turn out the adjusting screw ④ two or three rotations.
- From that position, slowly turn the adjuster screw ③ in until it stops.
- Turn the adjuster screw ③ out 1/4 rotation, and tighten the locknut ④.



- Loosen the locknuts ⑤, 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 locknuts ⑤.



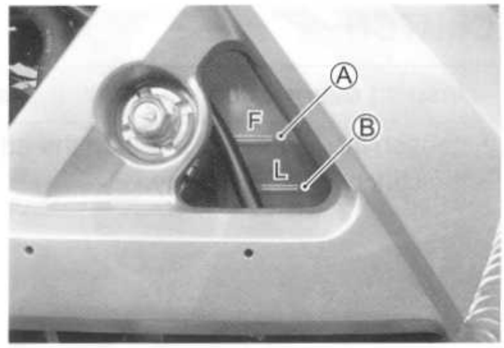
DATA **Clutch cable play Ⓐ: 10 – 15 mm (0.4 – 0.6 in)**
Clutch release screw: 1/4 turn out.

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, lift and support the fuel tank. (☞5-6)

ENGINE COOLANT CHANGE

- Remove the cowling. (SV650S) (☞7-6)
- Loosen the radiator cap stop screw. (SV650)
- Remove the radiator cap ①.
- Drain engine coolant by removing the drain bolt ②.

⚠ 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!**

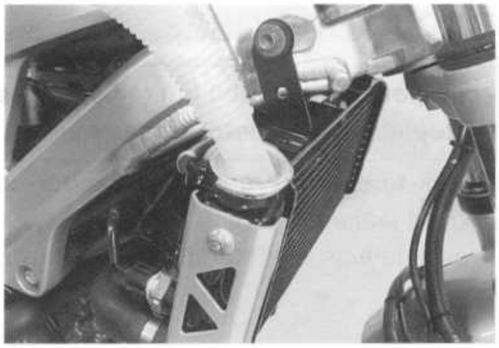
- Flush the radiator with fresh water if necessary.
- Tighten the water drain bolt ② to the specified torque.

Water drain bolt: 13 N·m (1.3 kgf-m, 9.5 lb-ft)

- 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 6-2.

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 ① securely.
- Tighten the radiator cap stop screw. (SV650)
- After warming up and cooling down the engine several times, add the engine coolant up to the full level of the reserve tank.
- Install the cowling. (SV650S ☞7-7)

CAUTION

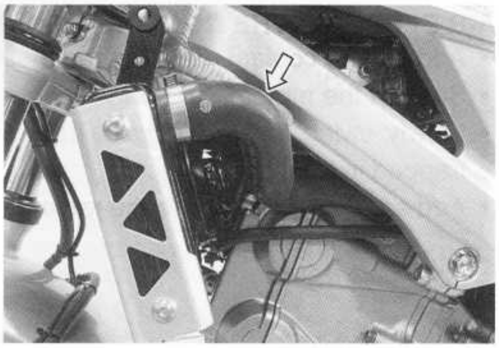
Repeat the above procedure several times and make sure that the radiator is filled with engine coolant up to the reserve tank full level.

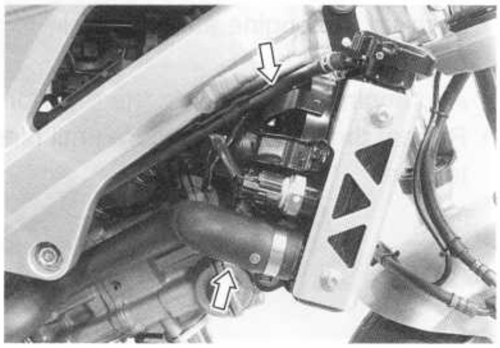
LLC **Engine coolant capacity: 1 730 ml (1.8/1.5 US/Imp qt)**

RADIATOR HOSES

Inspect every 6 000 km (4 000 miles, 6 months).
Replace the radiator hoses every 4 years.

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.





DRIVE CHAIN

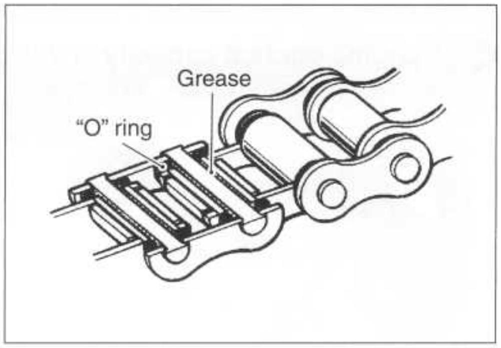
Inspect initially at 1 000 km (600 miles, 1 month) and every 6 000 km (4 000 miles, 6 months) thereafter.
Clean and lubricate every 1 000 km (600 miles).

Visually check the drive chain for the possible defects listed below. (Support the motorcycle by a jack and a wooden block, turn the rear wheel slowly by hand with the transmission shifted to Neutral.)

* Loose pins
* Damaged rollers
* Dry or rusted links
* Kinked or binding links
* Excessive wear
* Improper chain adjustment
* Missing O-ring seals

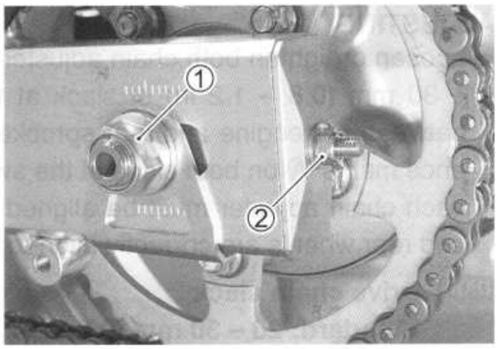
- If any defect is found, the drive chain must be replaced.

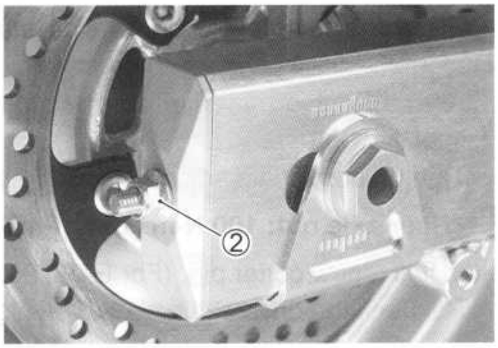
NOTE:
When replacing the drive chain, replace the drive chain and sprockets as a set.



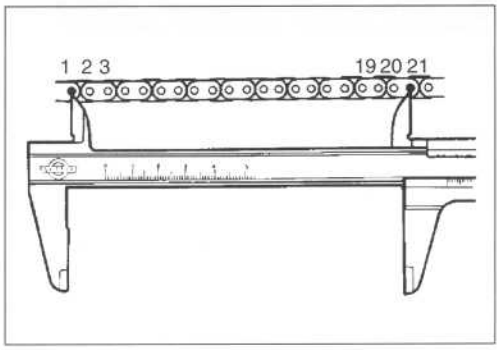
CHECKING

- Remove the axle cotter pin. (For E-03, 28, 33)
- Loosen the axle nut ①.
- Tense the drive chain fully by turning both chain adjuster nuts ②.





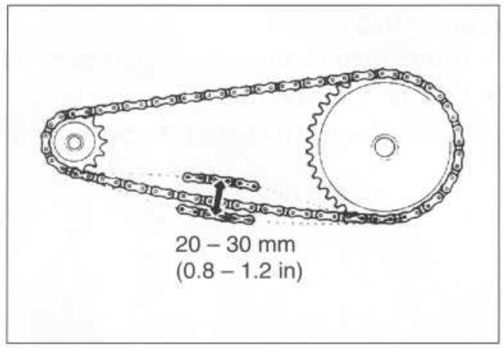
- Count out 21 pins (20 pitches) on the chain and measure the distance between the two points. If the distance exceeds the service limit, the chain must be replaced.



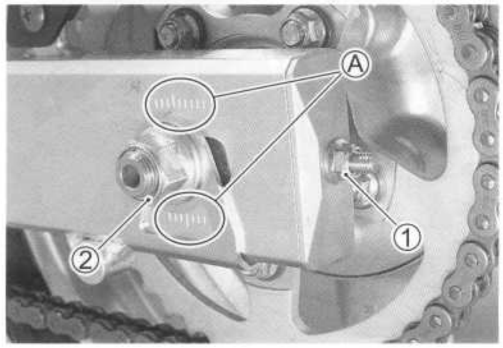
DATA **Drive chain 20-pitch length**
Service limit: 319.4 mm (12.6 in)

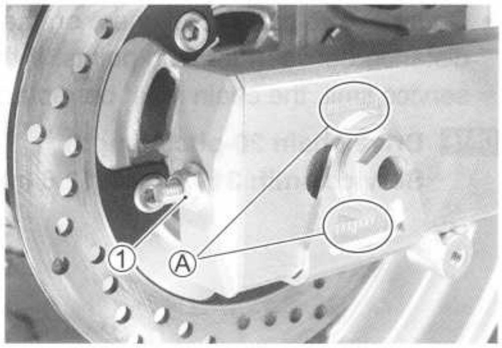
ADJUSTING

- Loosen or tighten both chain adjuster nuts ① until there is 20 – 30 mm (0.8 – 1.2 in) of slack at the middle of the chain between the engine and rear sprockets as shown. The reference marks Ⓐ on both sides of the swingarm and the edge of each chain adjuster must be aligned to ensure that the front and rear wheels are correctly aligned.



DATA **Drive chain slack**
Standard: 20 – 30 mm (0.8 – 1.2 in)





- Place the motorcycle on its side stand for accurate adjustment.
- After adjusting the drive chain, tighten the axle nut ② to the specified torque.
- Tighten both chain adjuster nuts ① securely.

Rear axle nut: 100 N·m (10 kgf-m, 725 lb-ft)

- Install a new cotter pin. (For E-03, 28, 33)
- Recheck the drive chain slack after tightening the axle nut.

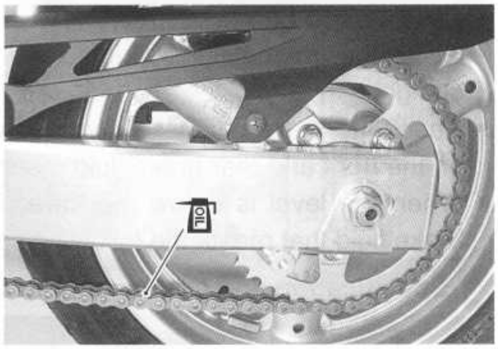
CLEANING AND LUBRICATING

Wash the chain with kerosene. If the chain tends to rust quickly, the intervals must be shortened.

CAUTION

Do not use trichlene, gasoline or any similar fluids: These fluids have too great a dissolving power for this chain and what is more important, they can damage the "O"-rings (or seals) confining the grease in the bush to pin clearance. Remember, high durability comes from the presence of grease in that clearance.

After washing and drying the chain, oil it with a heavyweight motor oil.



CAUTION

* **Do not use any oil sold commercially as "drive chain oil". Such oil can damage the O-rings (or seals).**
* **The standard drive chain is DID525V8 Suzuki recommends to use this standard drive chain as a replacement.**

BRAKE

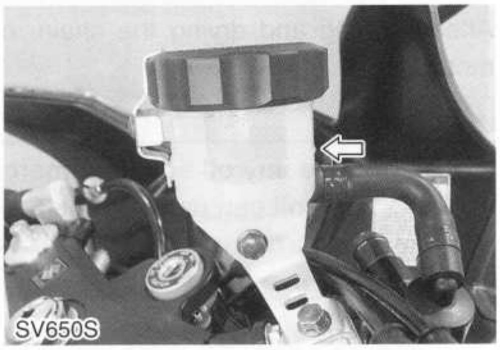
BRAKE
Inspect initially at 1 000 km (600 miles, 1 month) and every 6 000 km (4 000 miles, 6 months) thereafter.

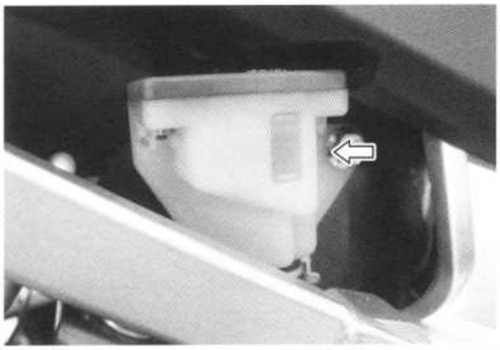
BRAKE HOSE AND BRAKE FLUID
Inspect every 6 000 km (4 000 miles, 6 months). Replace hoses every 4 years. Replace fluid every 2 years.

BRAKE FLUID LEVEL CHECK

- Keep the motorcycle upright and place the handlebars straight.
- Check the brake fluid level by observing the lower limit lines on the front and rear brake fluid reservoirs.
- 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.

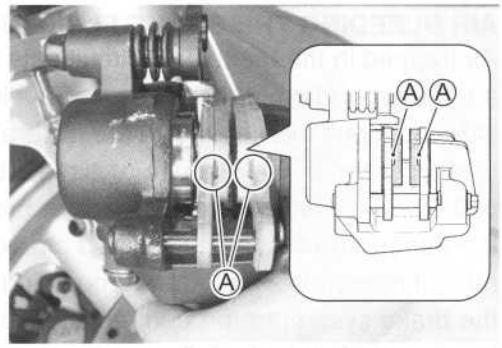
⚠ WARNING

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.

BRAKE PADS

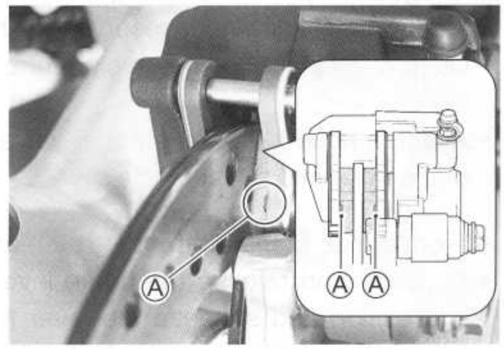
- Remove the brake caliper. (Front ☞7-64)

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. (☞7-64, 79)



CAUTION

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

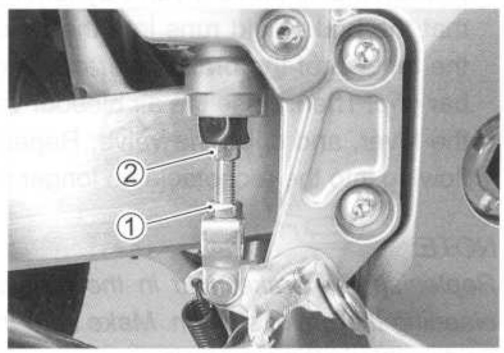


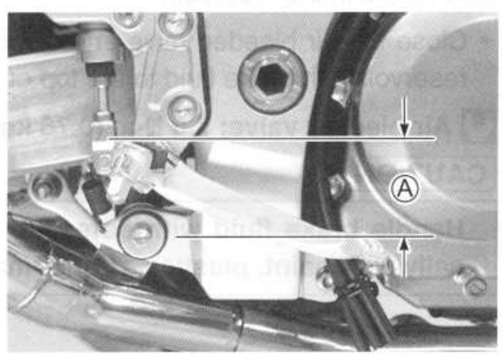
BRAKE PEDAL HEIGHT

- Loosen the locknut ①.
- Turn the push rod ② until the brake pedal is specified height Ⓐ below the top of the footrest.
- Tighten the locknut ① securely.

Rear brake master cylinder rod locknut:
18 N·m (1.8 kgf-m, 13.0 lb-ft)

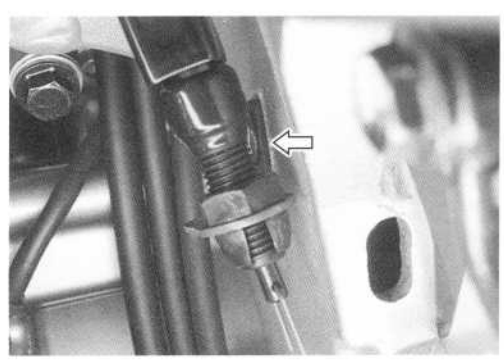
DATA **Brake pedal height Ⓐ**
Standard: 50 – 60 mm (2.0 – 2.4 in) for SV650
60 – 70 mm (2.4 – 2.8 in) for SV650S





BRAKE LIGHT SWITCH

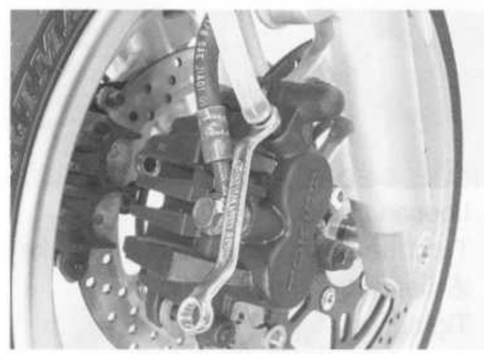
- Adjust the rear brake light switch so that the brake light will come on just before pressure is felt when the brake pedal is depressed.



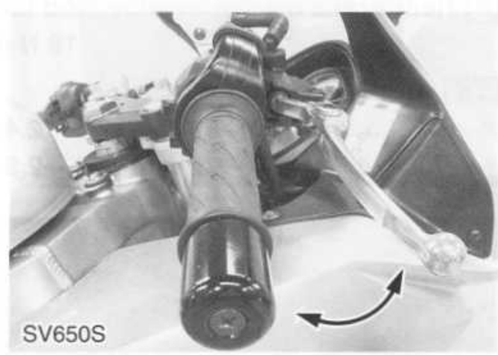
AIR BLEEDING THE BRAKE FLUID CIRCUIT

Air trapped in the brake 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 the master cylinder reservoir to the top of the inspection window. Replace the reservoir cap to prevent dirt from entering.
- Attach a hose to the air bleeder valve and insert the free end of the hose into a receptacle.



- Front brake: Bleed air from the air bleeder valve.
- Squeeze and release the brake lever several times in rapid succession and squeeze the lever fully without releasing it. Loosen the air 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 air bleeder valve, pump and squeeze the lever, and open the valve. Repeat this process until 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.

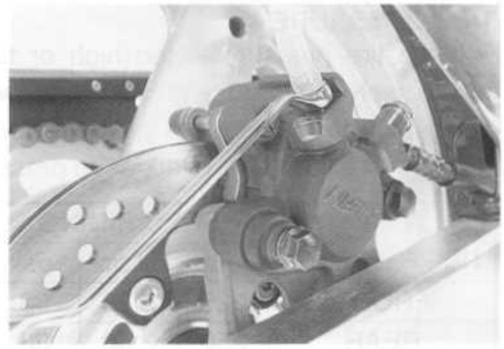
- Close the air bleeder valve and disconnect the hose. Fill the reservoir with brake fluid to the top of the inspection window.

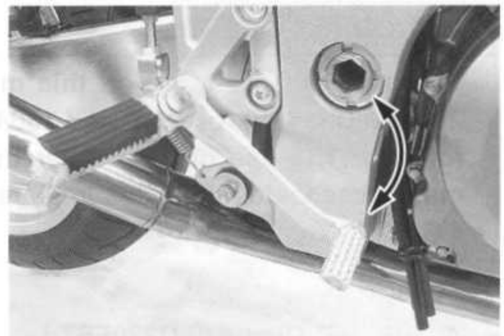
Air bleeder valve: 7.5 N·m (0.75 kgf-m, 5.5 lb-ft)

CAUTION

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

Rear brake: The only difference between bleeding the front and rear brakes is that the rear master cylinder is actuated by a pedal.



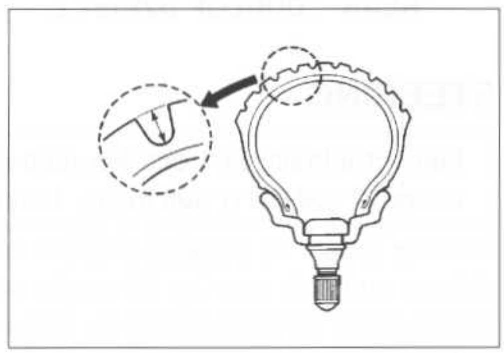


TIRE

Inspect every 6 000 km (4 000 miles, 6 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.

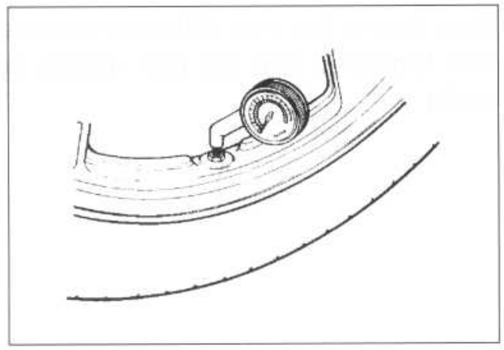


TOOL 09900-20805: Tire depth gauge

DATA Tire tread depth (Recommend 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 will increase. Therefore, maintain the correct tire pressure for good roadability and a longer tire life. Cold inflation tire pressure is as follows.



COLD INFLATION	SOLD RIDING			DUAL RIDING		
TIRE PRESSURE	kPa	kgf/cm²	psi	kPa	kgf/cm²	psi
FRONT	225	2.25	33	225	2.25	33
REAR	250	2.50	36	250	2.50	36

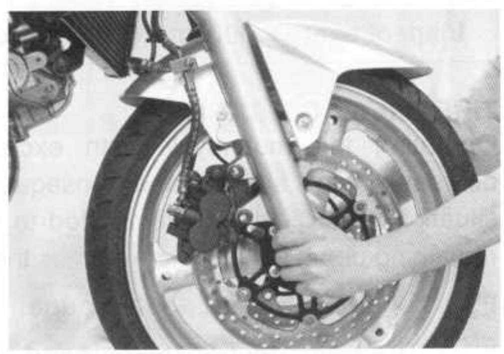
CAUTION

The standard tire fitted on this motorcycle is 120/60 ZR17 M/C (55 W) for front and 160/60 ZR17 M/C (69 W) for rear. The use of tires other than those specified may cause instability. It is highly recommended to use a SUZUKI Genuine Tire.

DATA **TIRE TYPE**
FRONT: DUNLOP D220FST L
REAR : DUNLOP D220ST L

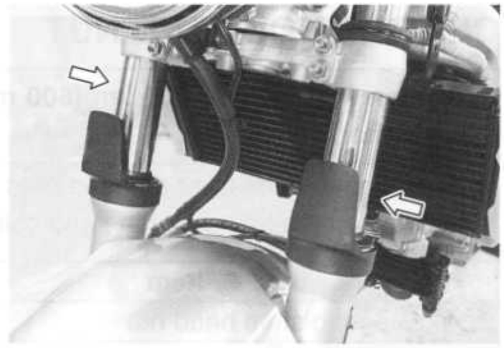
STEERING

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



Steering should be adjusted properly for smooth turning of handlebars and safe running. Overtight 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. (☞7-40)

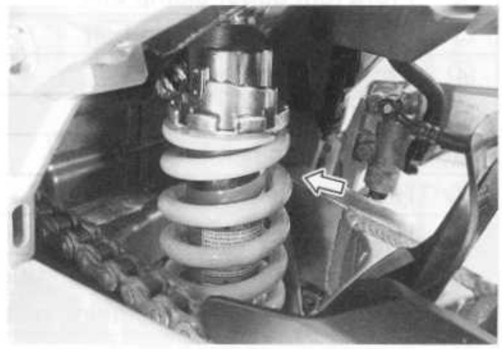
FRONT FORK



Inspect every 12 000 km (7 500 miles, 12 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. (☞ 7-17)

REAR SUSPENSION



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

Inspect the rear shock absorber for oil leakage and check that there is no play in the swingarm. Replace any defective parts, if necessary. (☞ 7-51)

EXHAUST PIPE BOLT AND NUT

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

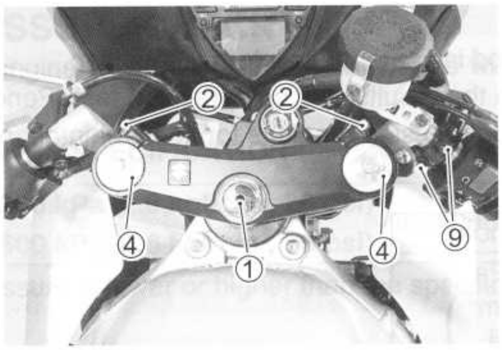
- Tighten the exhaust pipe bolts, nuts and muffler mounting bolts to the specified torque. (☞3-20)

CHASSIS BOLT AND NUT

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

- Check that all chassis bolts and nuts are tightened to their specified torque. (Refer to page 2-33 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 Front fork upper clamp bolt	23	2.3	16.5
③ Front fork lower clamp bolt	23	2.3	16.5
④ Front fork cap bolt	23	2.3	16.5
⑤ Front axle	65	6.5	47.0
⑥ Front axle pinch bolt	23	2.3	16.5
⑦ Handlebar clamp bolt	23	2.3	16.5
⑧ Handlebar holder nut (SV650)	45	4.5	32.5
⑨ Front brake master cylinder mounting bolt	10	1.0	7.0
⑩ Front brake caliper mounting bolt	39	3.9	28.0
⑪ Brake hose union bolt	23	2.3	16.5
⑫ Front caliper air bleeder valve	7.5	0.75	5.5
⑬ Brake disc bolt (Front and Rear)	23	2.3	16.5
⑭ Rear brake caliper mounting bolt	23	2.3	16.5
⑮ Rear brake caliper sliding pin	27	2.7	19.5
⑯ Rear brake master cylinder mounting bolt	10	1.0	7.0
⑰ Rear brake master cylinder rod lock nut	18	1.8	13.0
⑱ Front footrest bracket mounting bolt	23	2.3	16.5
⑲ Front footrest bolt	39	3.9	28.0
⑳ Swingarm pivot shaft nut	100	10.0	72.5
㉑ Swingarm pivot shaft lock nut	90	9.0	65.0
㉒ Rear shock absorber mounting upper nut	50	5.0	36.0
㉓ Rear shock absorber mounting bolt	50	5.0	36.0
㉔ Cushion lever mounting nut	78	7.8	56.5
㉕ Cushion rod mounting nut	78	7.8	56.5
㉖ Rear axle nut	100	10.0	72.5
㉗ Rear sprocket nut	60	6.0	43.5
㉘ Seat rail mounting bolt	50	5.0	36.0
㉙ Rear caliper air bleeder valve	6.0	0.6	4.3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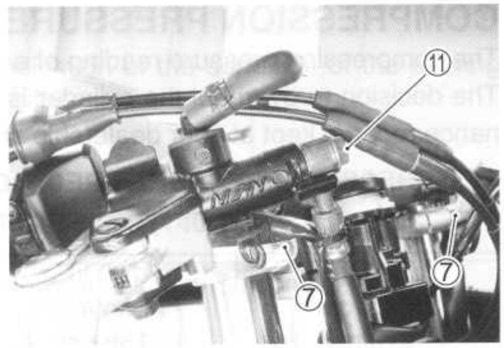
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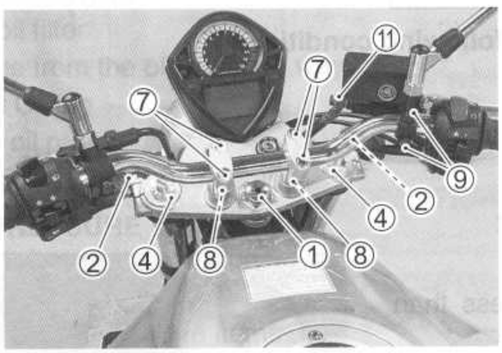
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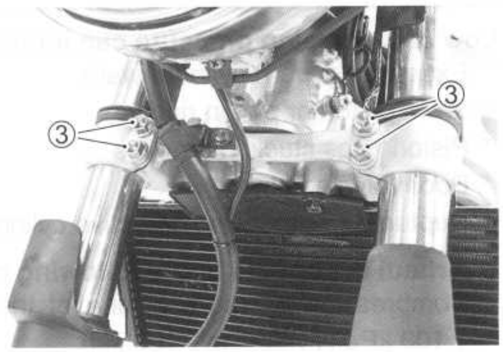
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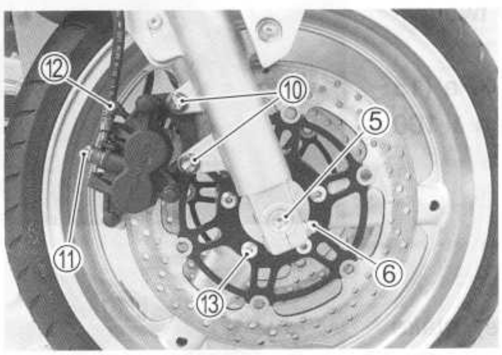
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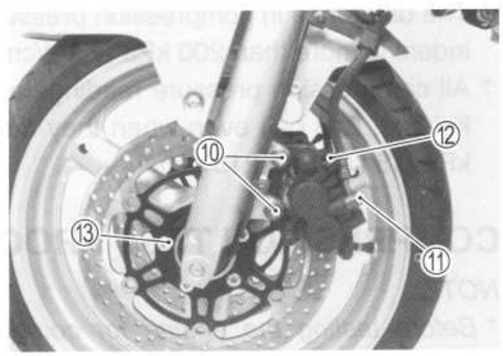
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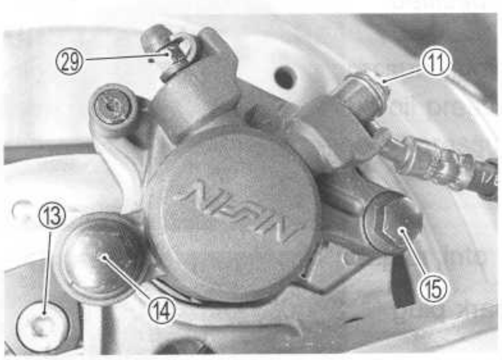
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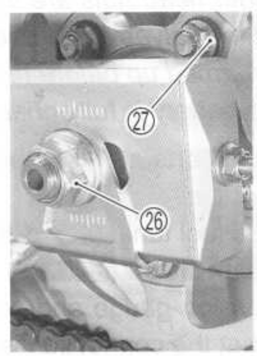
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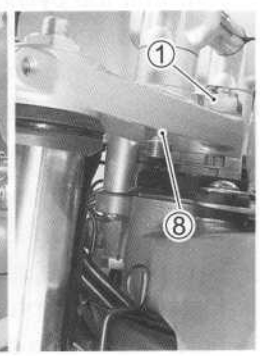
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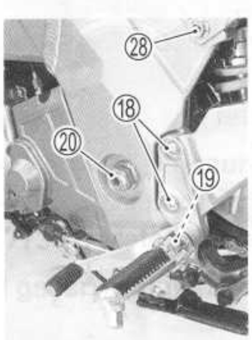
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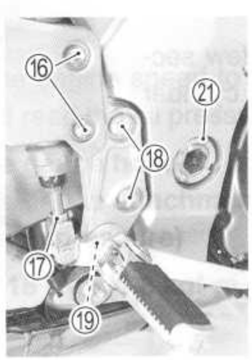
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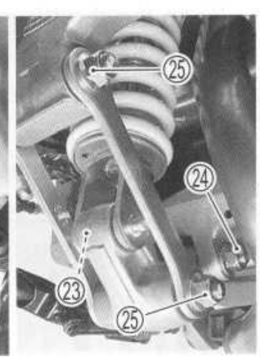
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COMPRESSION PRESSURE CHECK

The compression pressure reading 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

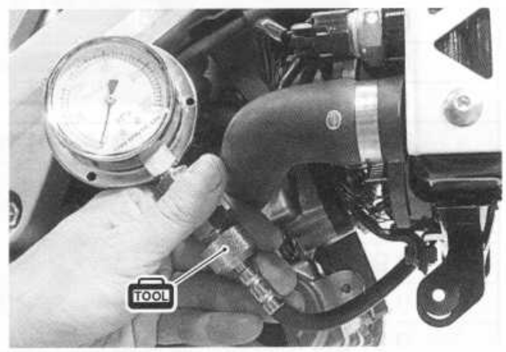
Standard	Limit	Difference
1 500 kPa (15 kgf/cm^2 213 psi)	1 100 kPa (11 kgf/cm^2 156 psi)	200 kPa 2 kgf/cm^2 28 psi)

Low compression pressure can indicate any of the following conditions:

* Excessively worn cylinder walls
* Worn piston or piston rings
* Piston rings stuck in grooves
* Poor valve seating
* Ruptured or otherwise defective cylinder head gasket

Overhaul the engine in the following cases:

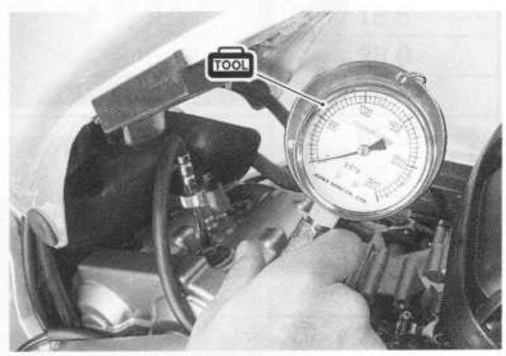
* Compression pressure in one of the cylinders is less than 1 100 kPa (11 kgf/cm^2, 156 psi).
* The difference in compression pressure between any two cylinders is more than 200 kPa (2 kgf/cm^2, 28 psi).
* All compression pressure readings are nearly 1 100 kPa (15 kgf/cm^2, 213 psi) even when they measure more than 1 100 kPa (15 kgf/cm^2, 213 psi).



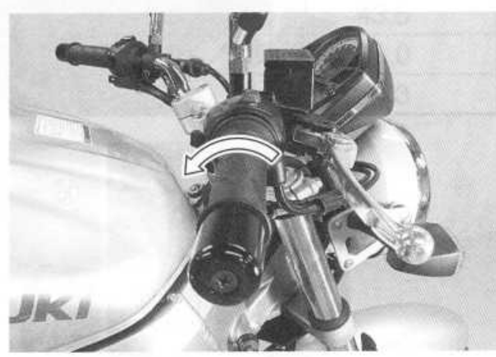
COMPRESSION TEST PROCEDURE

NOTE:

* *Before testing the engine for compression pressure, make sure that the cylinder head nuts are tightened to the specified torque values and the valves are properly adjusted.*
* *Have the engine warmed up before testing.*
* *Make sure that the battery is fully-charged.*



- Remove the related parts and test the compression pressure in the following manner.
- Lift and support the fuel tank. (☞5-6)
- Remove all the spark plugs. (☞2-6)
- Install the compression gauge and adaptor in the spark plug hole. Make sure that the connection is tight.
- Keep the throttle grip in the fully opened position.
- Press the starter button and crank the engine for a few seconds. Record the maximum gauge reading as the cylinder compression.
- Repeat this procedure with the other cylinder.



TOOL **09915-64512: Compression gauge set**
09913-10750: Adaptor

OIL PRESSURE CHECK

Check the engine oil pressure periodically. This will give a good indication of the condition of the moving parts.

OIL PRESSURE SPECIFICATION

Above 200 kPa (2.0 kgf/cm², 28 psi) **Below 600 kPa (6.0 kgf/cm², 85 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.

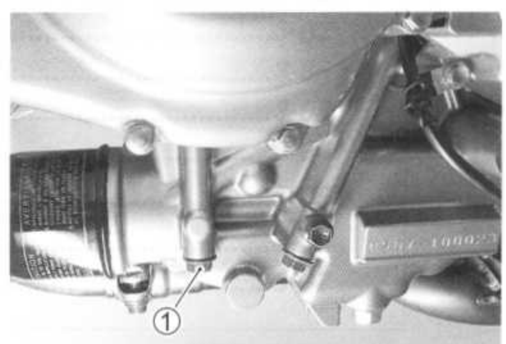
LOW OIL PRESSURE

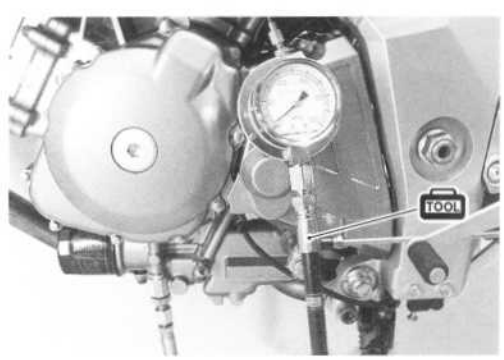
- Clogged oil filter
- Oil leakage from the oil passage way
- Damaged O-ring
- Defective oil pump
- Combination of the above items

HIGH OIL PRESSURE

- Engine oil viscosity is too high
- 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 the light stays on, check the oil pressure indicator light circuit. If the circuit is OK, check the oil pressure in the following manner.

- Remove the main oil gallery plug ①.
- Install the oil pressure gauge and adaptor into the main oil gallery.
- 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. (observe the tachometer), and read the oil pressure gauge.

TOOL **09915-74521: Oil pressure gauge hose**
09915-74532: Oil pressure gauge attachment
09915-77331: Meter (for high pressure)

Main oil gallery plug (M8): 18 N·m (1.8 kgf-m, 13.0 lb-ft)

ENGINE

3

CONTENTS

ENGINE COMPONENTS REMOVABLE WITH THE ENGINE IN PLACE

Engine components which can be removed while the engine is installed on the chassis are listed below. For the installing and removing procedures, refer to respective paragraphs describing each component.

ENGINE LEFT SIDE

PARTS	REMOVAL	INSTALLATION
Engine sprocket	3-8	3-18
Generator	3-30, 3-36	3-89, 3-96
Gear position switch	3-37	3-88
Clutch release	3-7	3-19
Starter idle gear	3-30	3-96

ENGINE RIGHT SIDE

PARTS	REMOVAL	INSTALLATION
Clutch	3-31	3-93
Primary driven gear	3-33, 3-73	3-73, 3-93
Primary drive gear	3-35	3-90
Oil pump	3-33	3-92
Gearshift shaft	3-34	3-91
Water pump	6-14	6-17

ENGINE CENTER

PARTS	REMOVAL	INSTALLATION
Throttle body	5-17	5-29
Cylinder head covers	3-24	3-109
Camshafts	3-25, 3-27	3-102, 3-105
Cylinder heads	3-26, 3-29	3-100
Cylinders	3-27, 3-29	3-99
Pistons	3-27, 3-30	3-97
Cam chain tension adjusters	3-26, 3-28	3-104, 3-107
Thermostat	6-12	6-13
Oil filter	2-15	2-15
Oil pressure switch	3-61	3-61
Starter motor	3-30	3-97

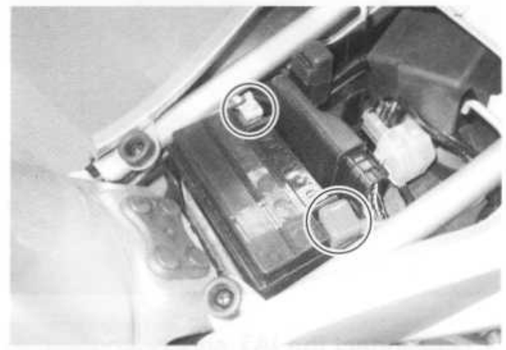
ENGINE REMOVAL AND INSTALLATION

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.

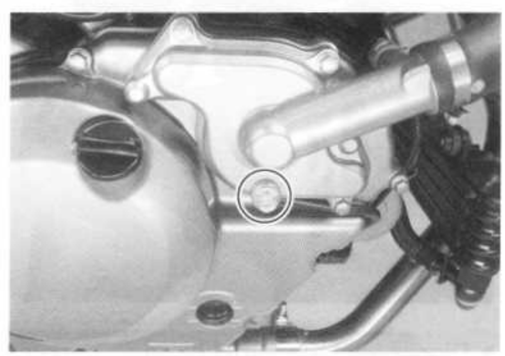
- Remove the cowling. (SV650S) (☞7-6)
- Remove the front and rear seat. (☞7-4)
- Lift and support the fuel tank with the prop stay. (☞5-6)

- Disconnect the battery ⊖ lead wire and ⊕ lead wire.

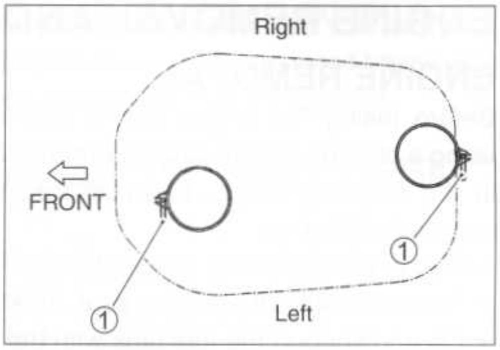


- Drain engine oil. (☞2-14)

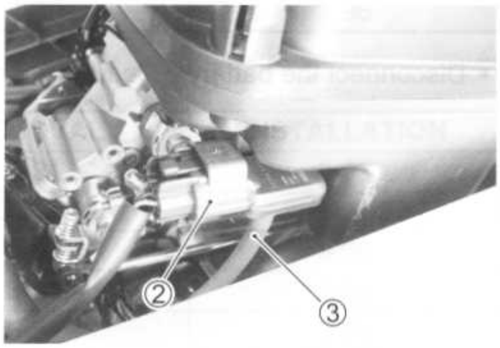
- Drain engine coolant. (☞2-20)



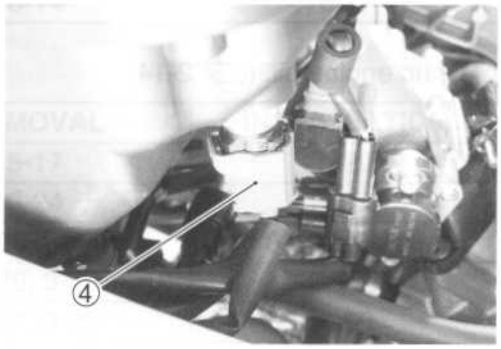
• Loosen the throttle body clamp screws ① at the air cleaner box side.



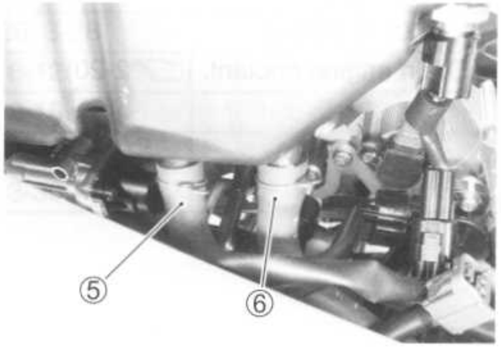
• Disconnect the IAP sensor coupler ② and hose ③.



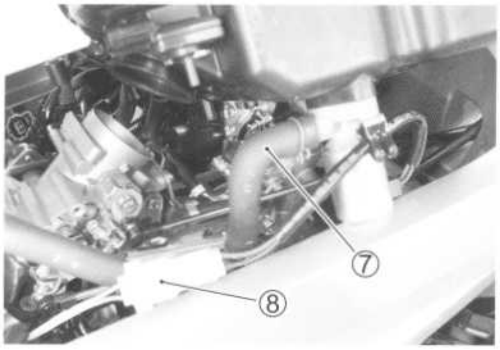
• Disconnect the IAT sensor coupler ④.



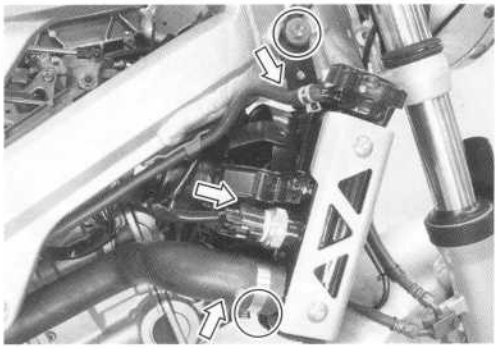
• Disconnect the front side of crankcase breather hose ⑤ and rear side of crankcase breather hose ⑥.



• Disconnect the PAIR hose ⑦ and coupler ⑧.

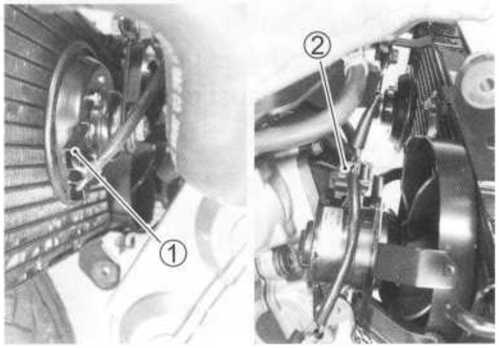


- Disconnect the cooling fan thermo-switch lead wire coupler.
- Disconnect the radiator outlet hose.
- Disconnect the reserve tank hose.
- Remove the radiator mounting bolts.



- Disconnect the radiator inlet hose.

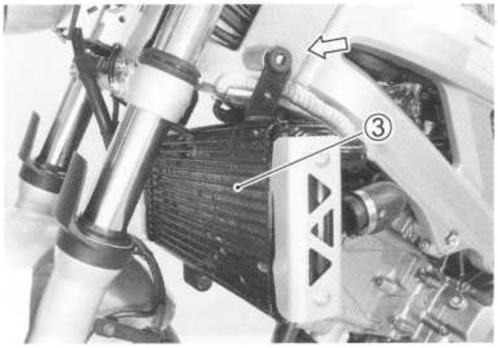
- Disconnect the horn coupler ① and cooling fan coupler ②.



- Remove the radiator ③.

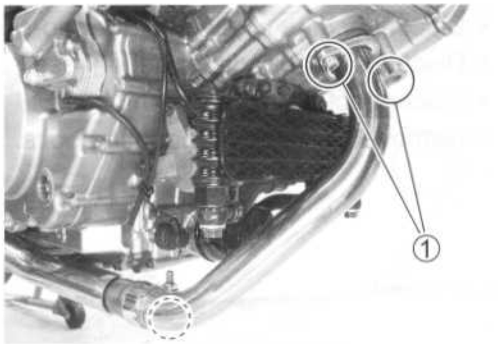
CAUTION

Be careful not to bent the radiator fin.



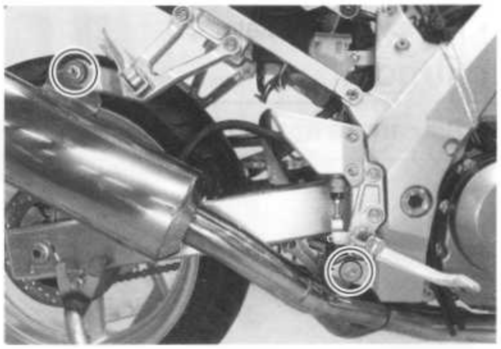
- Remove the throttle body. (☞5-17)

- Loosen the No.1 (Front) cylinder exhaust pipe connector bolt.
- Remove the No.1 (Front) cylinder exhaust pipe bolts ①.

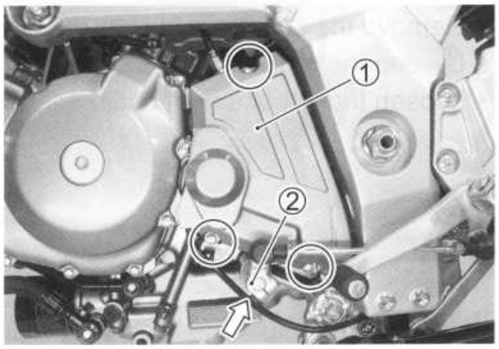


- Loosen the No.2 (Rear) cylinder exhaust pipe connector bolt.

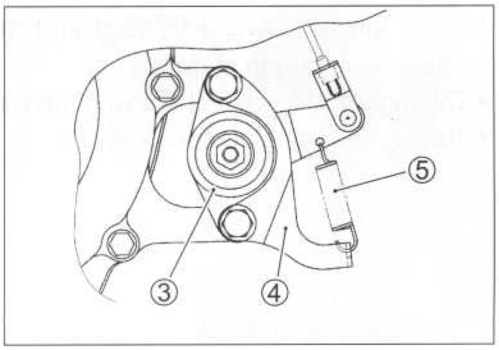
- Remove the muffler mounting bolt and nut.
- Remove the exhaust pipe mounting bolts and nut.
- Remove the exhaust pipe/muffler.



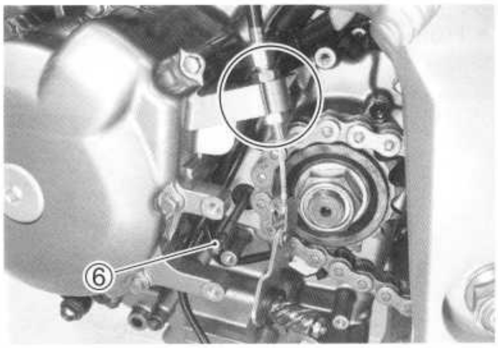
- Remove the engine sprocket cover ①.
- Remove the gearshift lever ②.



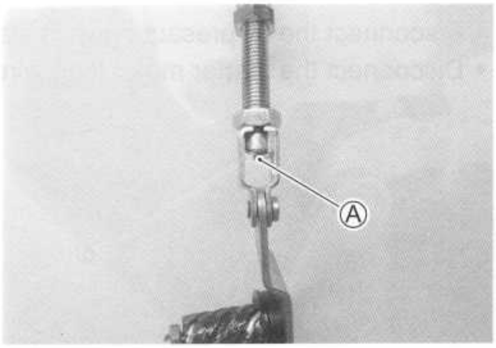
- Remove the clutch release assembly ③, its support plate ④ and spring ⑤.



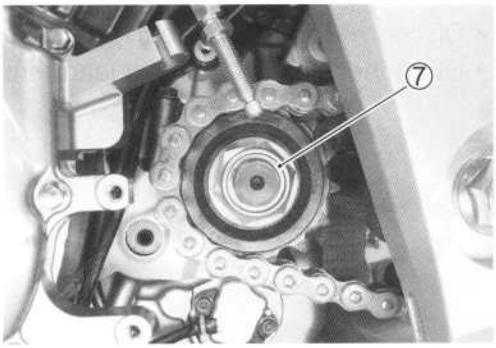
- Remove the clutch push rod ⑥.
- Remove the clutch cable from the generator cover.



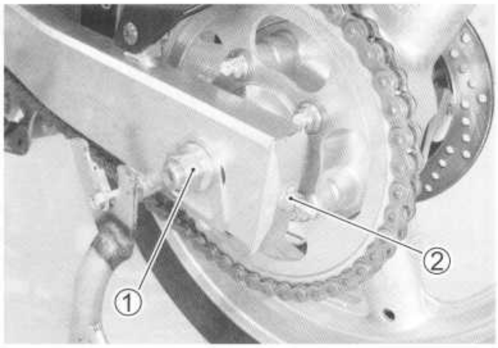
NOTE:
If it is necessary to replace the clutch cable or clutch release lever, pry up and bend down the stopper Ⓐ of the clutch release lever.



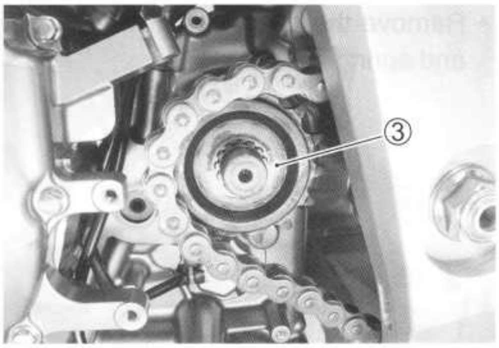
- Flatten the lock washer
- Remove the engine sprocket nut ⑦ and lock washer.



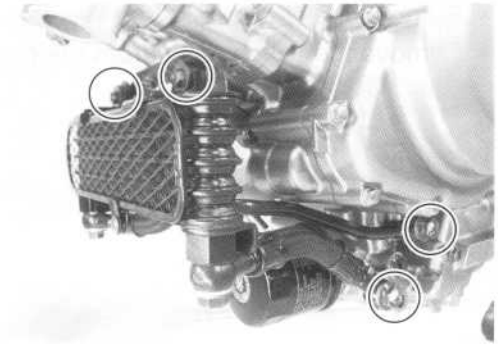
- Remove the cotter pin. (For E-03, 28, 33)
- Loosen the rear axle nut ①.
- Loosen the left and right chain adjusters ②.



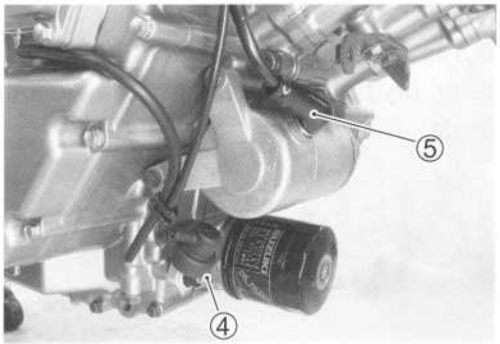
- Push the rear wheel forward and make sure that the drive chain has enough slack.
- Disengage the drive chain with the rear sprocket.
- Remove the engine sprocket ③.



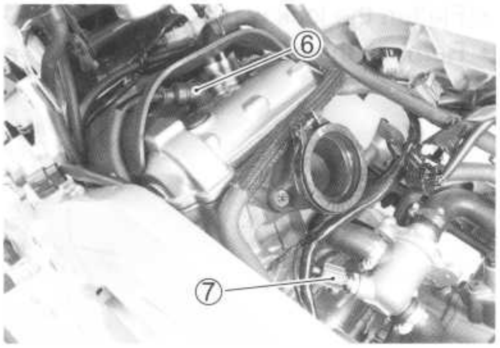
- Remove the oil cooler.



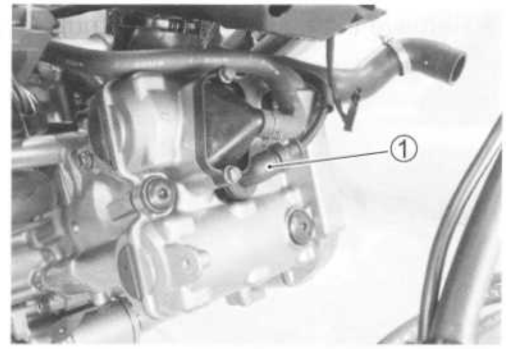
- Disconnect the oil pressure switch lead wire ④.
- Disconnect the starter motor lead wire ⑤.



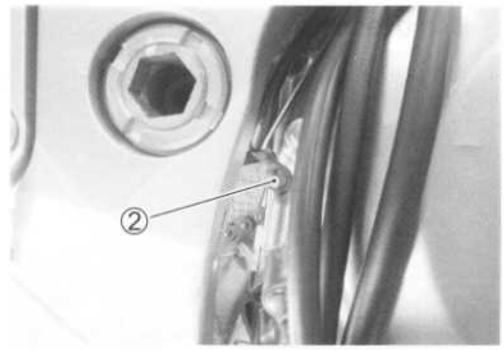
- Disconnect the No.2 (Rear) spark plug cap ⑥.
- Disconnect the ECT sensor lead wire ⑦.



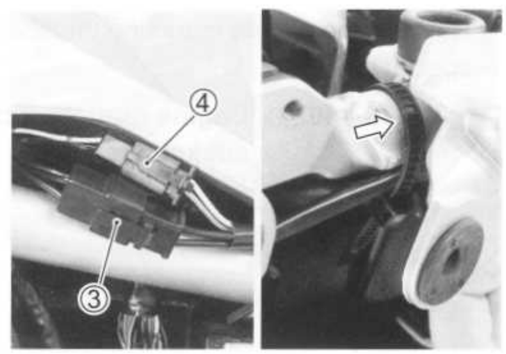
- Disconnect the No.1 (Front) spark plug cap ①.



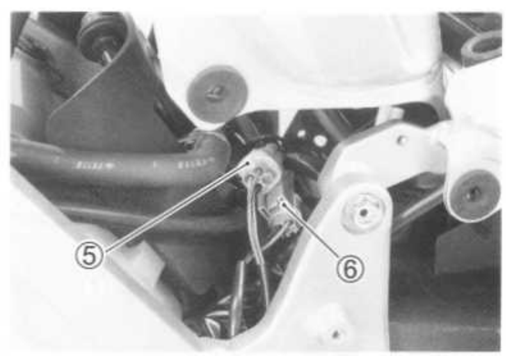
- Disconnect the ground lead wire ②.



- Disconnect the generator lead wire coupler ③.
- Disconnect the CKP sensor lead wire coupler ④.
- Disconnect the clamp.



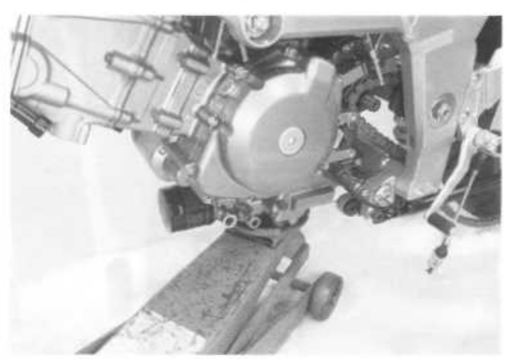
- Disconnect the GP sensor lead wire coupler ⑤.
- Remove the side-stand switch lead wire coupler ⑥.



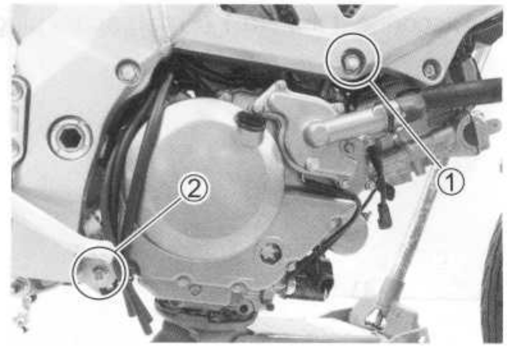
- Support the engine using an engine jack.

CAUTION

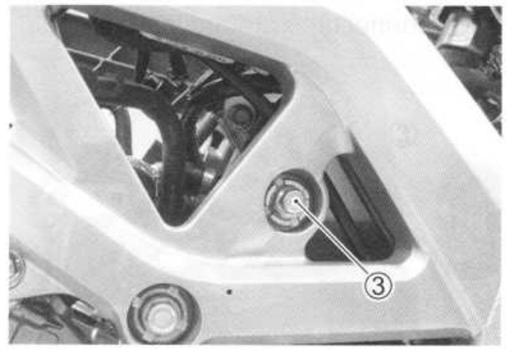
Do not support at the oil filter.



- Remove the engine mounting nuts ① and ②.

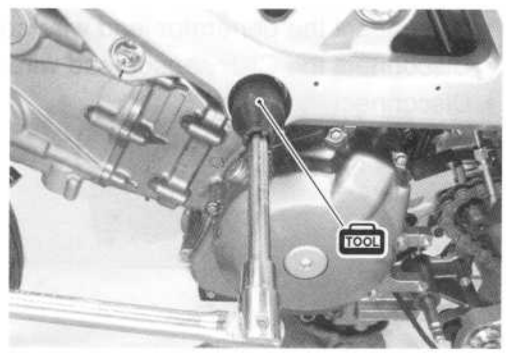


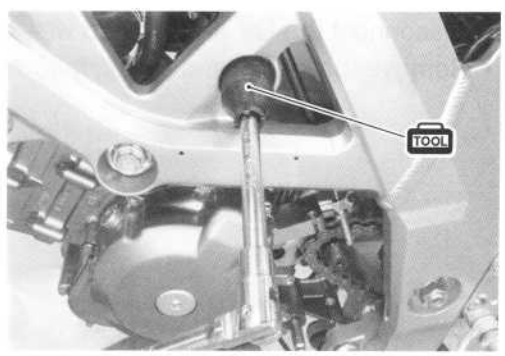
- Remove the engine mounting bolt ③.

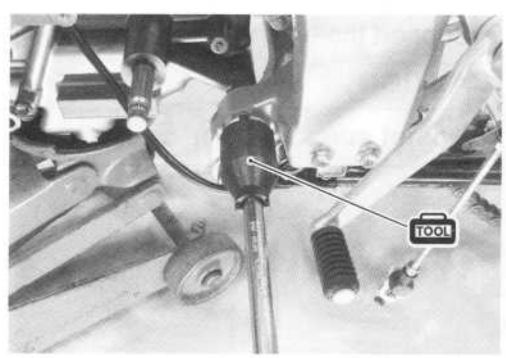


- Remove the engine mounting thrust adjuster locknuts with the special tool.

09940-14990: Engine mounting thrust adjuster socket wrench

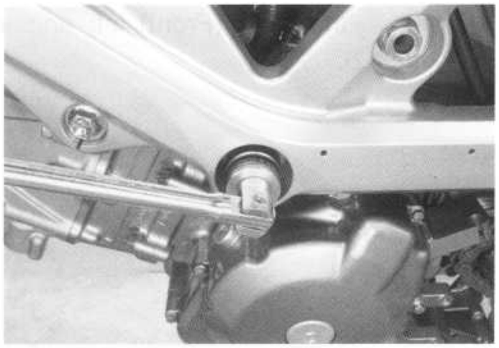


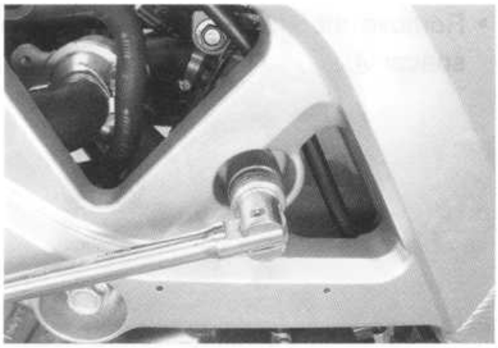


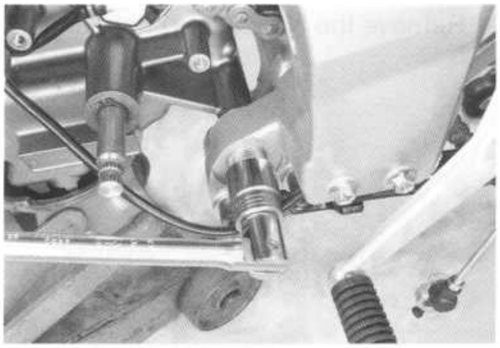


- Loosen the engine mounting thrust adjusters fully.

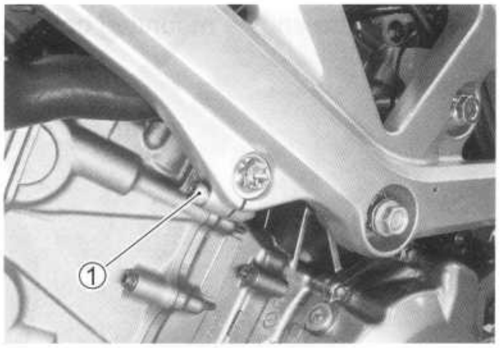
NOTE:
Do not remove the engine mounting bolts at this stage.

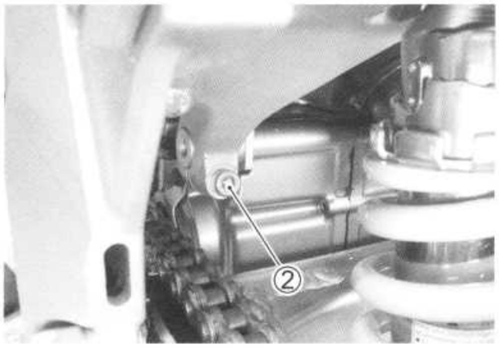




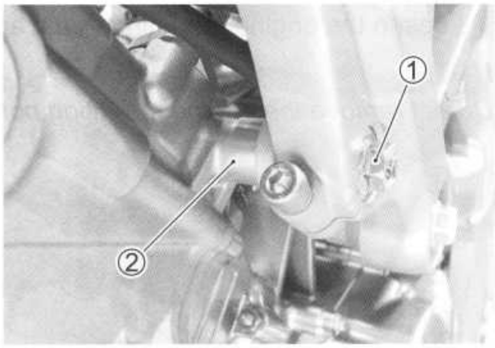


- Loosen the engine mounting clamp bolts ① and ②.

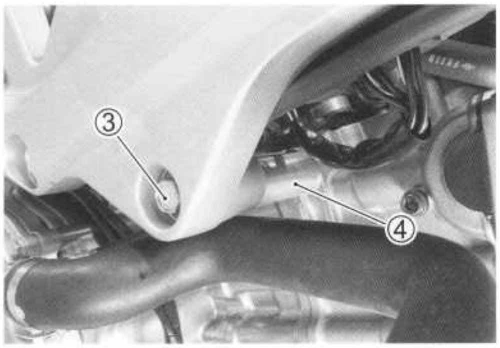




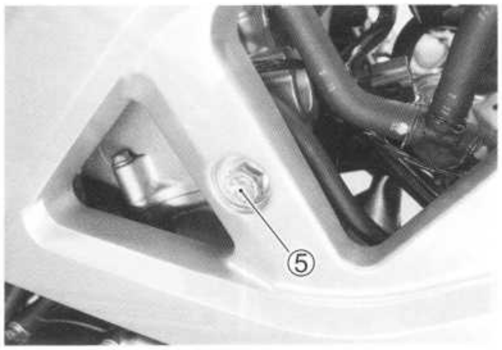
- Remove the No.1 (Front) left engine mounting bolt ① and spacer ②.



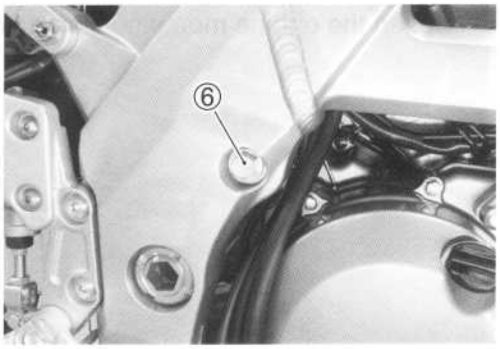
- Remove the No.1 (Front) right engine mounting bolt ③ and spacer ④.



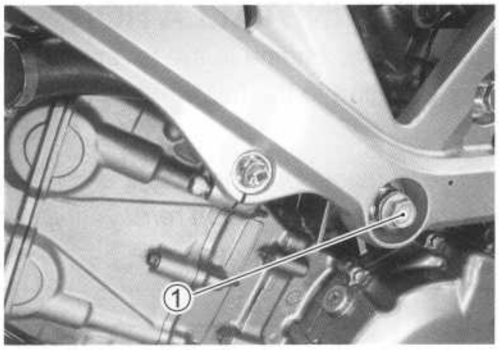
- Remove the No.2 (Rear) right engine mounting bolt ⑤.

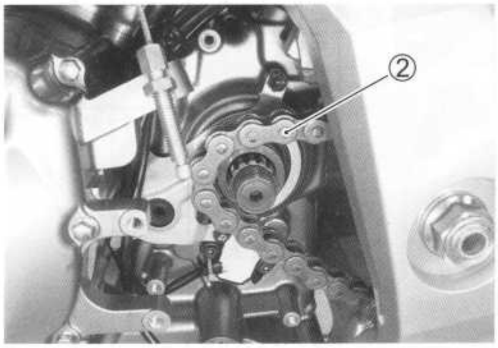


- Remove the engine mounting bolt ⑥.



- Remove the engine mounting bolt ① and gradually lower the front side of the engine. Then take the drive chain ② off the driveshaft.

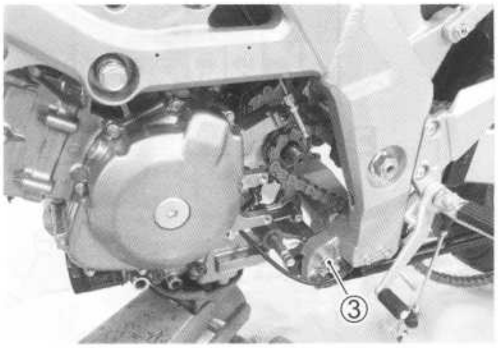


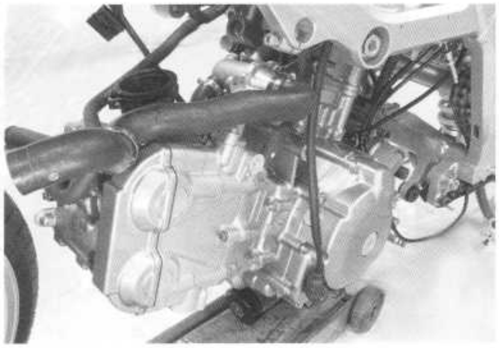


- Remove the engine mounting bolt ③ and lower the engine.

CAUTION

Be careful not to contact the No.2 (Rear) exhaust pipe with the frame and swingarm.





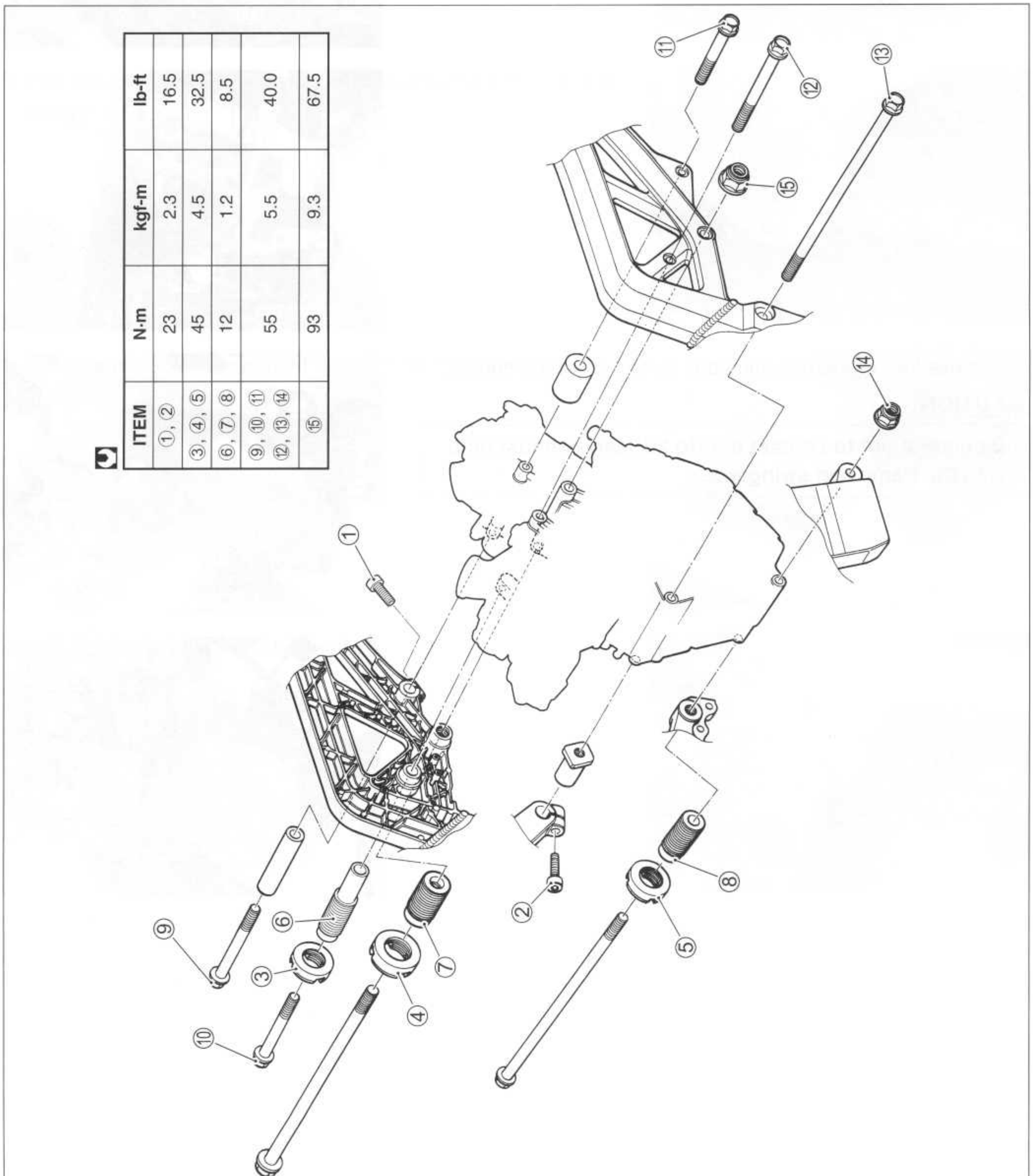
ENGINE INSTALLATION

Remount the engine in the reverse order of engine removal.

Pay attention to the following points:

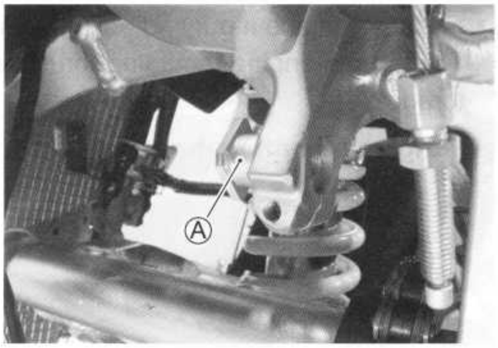
NOTE:

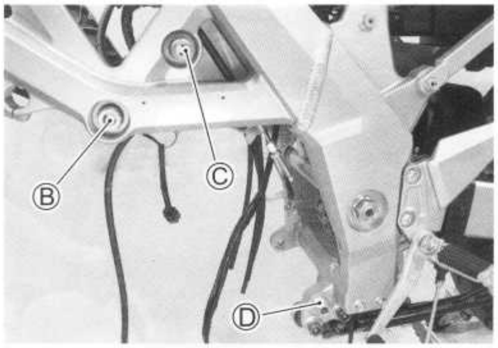
* *The engine mounting nuts are self-locking.*
* *Once the nut has been removed, it is no longer of any use. Be sure to use new nuts, and then tighten them to the specified torque.*



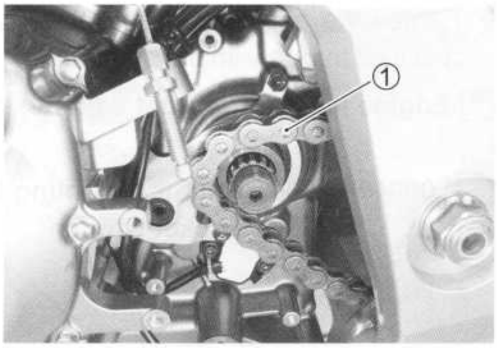
ITEM	N·m	kgf-m	lb-ft
①, ②	23	2.3	16.5
③, ④, ⑤	45	4.5	32.5
⑥, ⑦, ⑧	12	1.2	8.5
⑨, ⑩, ⑪ ⑫, ⑬, ⑭	55	5.5	40.0
⑮	93	9.3	67.5

- Before installing the engine assembly, install the collar Ⓐ and engine thrust adjusters Ⓑ, Ⓒ, Ⓓ.



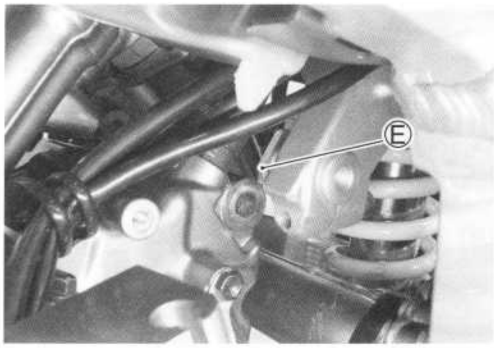


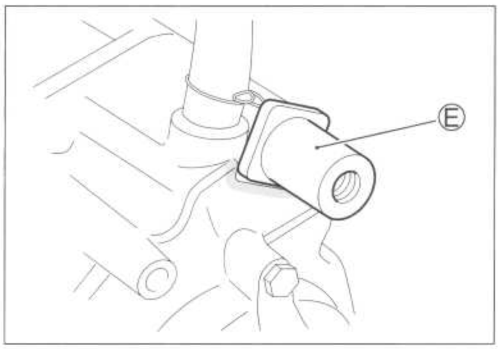
- Gradually raise the rear side of the engine assembly, and then put the drive chain ① on the driveshaft.



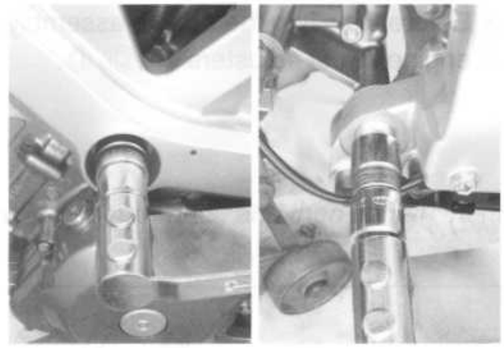
- Align the collar Ⓔ to the crankcase groove.
- Install all engine mounting bolts and tighten them temporarily.

NOTE:
Install the collar Ⓔ onto the crankcase properly as shown in the illustration.



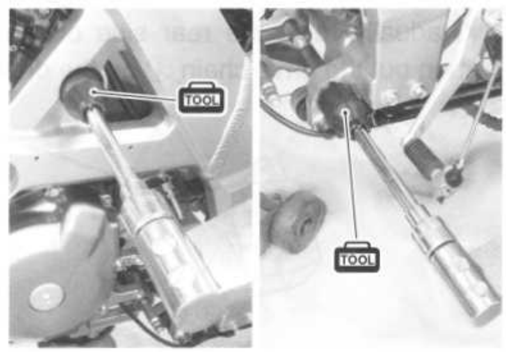


- Install all engine mounting bolts and spacers temporarily.
- Tighten the engine mounting thrust adjusters to the specified torque.



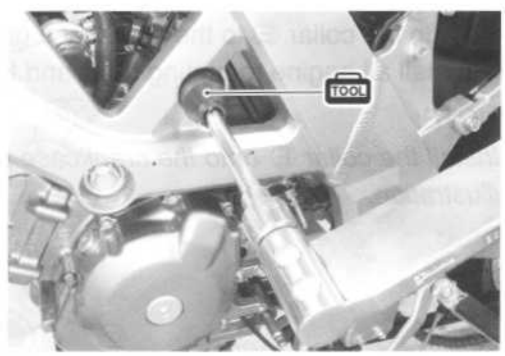
Engine mounting thrust adjuster: 12 N·m (1.2 kgf-m, 8.5 lb-ft)

- Tighten the engine mounting thrust adjuster locknuts to the specified torque with the special tool.



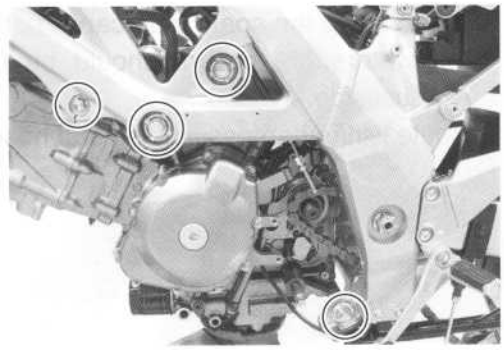
Engine mounting thrust adjuster locknut: 45 N·m (4.5 kgf-m, 32.5 lb-ft)

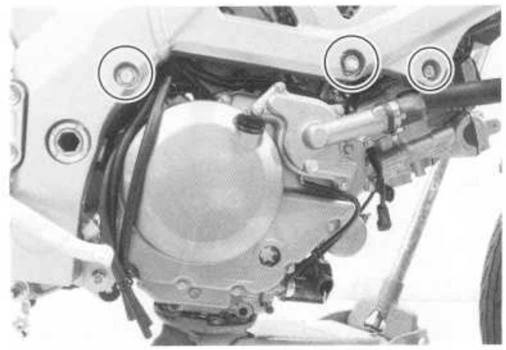
TOOL 09940-14990: Engine mounting thrust adjuster socket wrench



- Tighten all engine mounting bolts or nuts to the specified torque. (☞3-14)

NOTE:
The engine mounting nuts are self-locking. Once the nuts have been removed, they are no longer of any use.

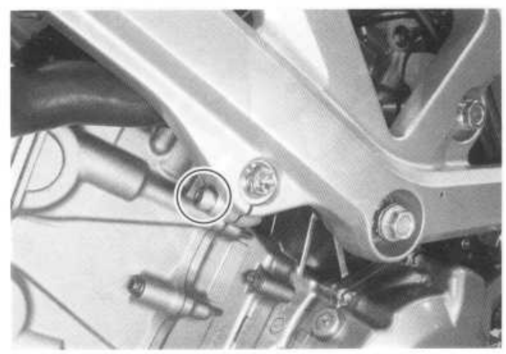


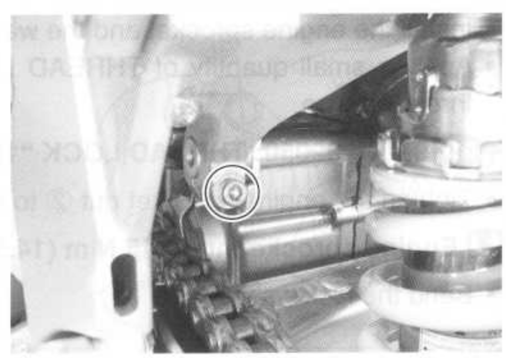


- Tighten all engine mounting clamp bolts to the specified torque. (☞3-14)

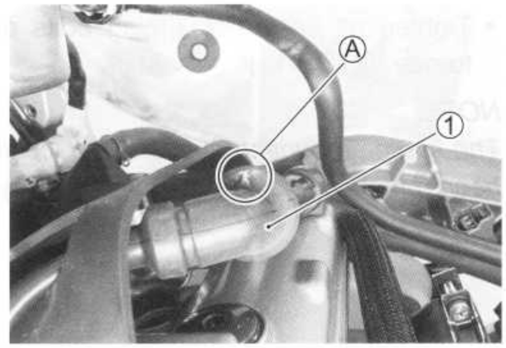
NOTE:
After tightening the engine mounting bolt or nut to the specified torque, tighten its clamp bolt.

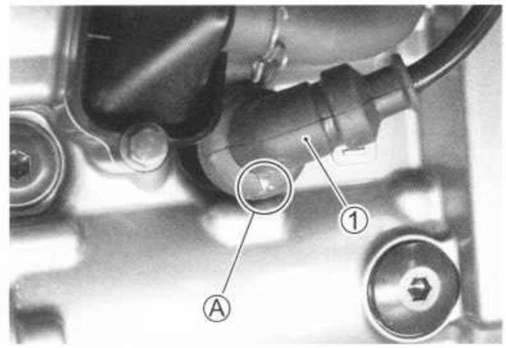
Engine mounting clamp bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



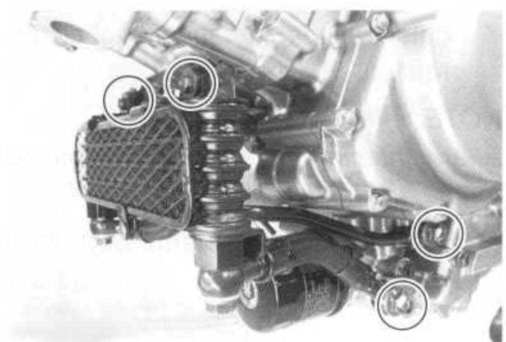


- When fitting the spark plug caps ①, the triangle marks Ⓐ on the water-proof covers should be faced to each cylinder exhaust side.
- Route wiring harness, cables and hoses properly. (☞9-14)





- Install the oil cooler. (☞6-22)



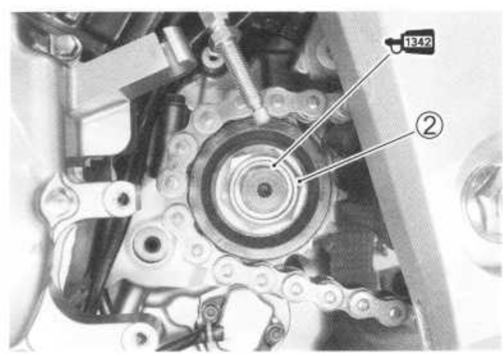
- Install the engine sprocket and the washer.
- Apply a small quantity of THREAD LOCK to the drive shaft thread portion.

1342 99000-32050: THREAD LOCK "1342"

- Tighten the engine sprocket nut ② to the specified torque.

Engine sprocket nut: 145 N·m (14.5 kgf-m, 105 lb-ft)

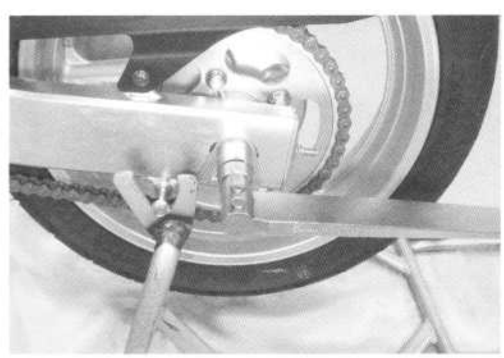
- Bend the lock washer.



- Adjust the drive chain slack. (☞2-24)
- Tighten the rear axle nut to the specified torque.

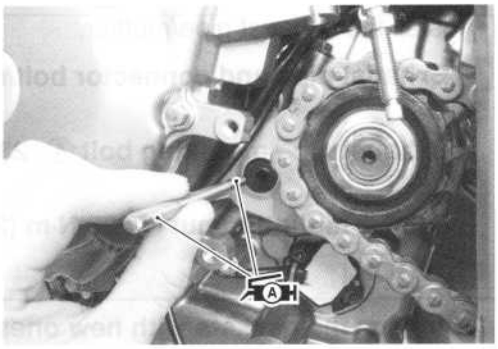
Rear axle nut: 100 N·m (10.0 kgf-m, 72.5 lb-ft)

- Install the cotter pin. (For E-03, 28, 33)



- Apply SUZUKI SUPER GREASE to the clutch push rod and install it.

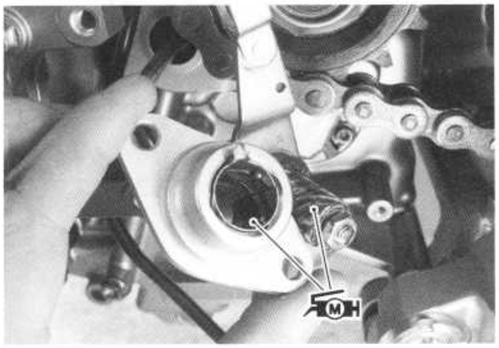
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



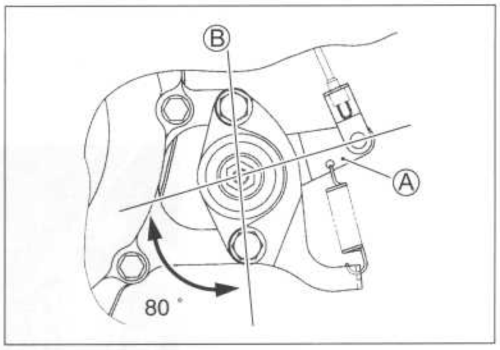
- Install the clutch cable to the generator cover temporarily.

- Apply SUZUKI MOLY PASTE to the clutch release.

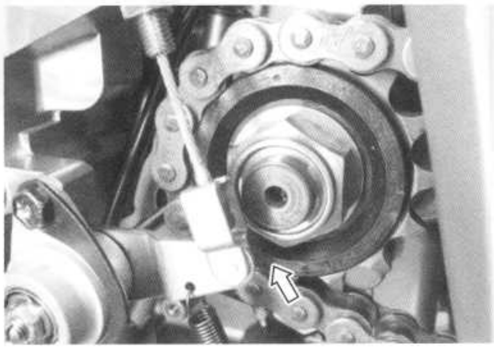
99000-25140: SUZUKI MOLY PASTE



- Assemble the clutch release so that the lever arm Ⓐ will be angle of 80 degree with axle Ⓑ.
- Adjust the clutch cable play. (☞2-19)



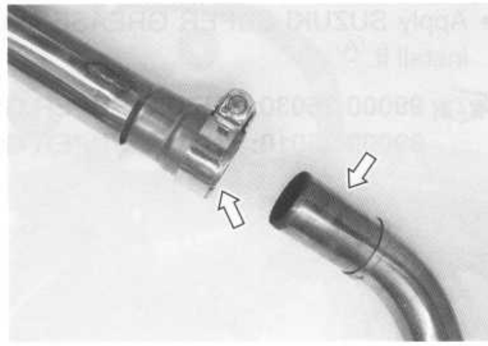
NOTE:
After installing the clutch release, make sure that there is clearance between the clutch cable end and the driveshaft end.



- Adjust the gearshift lever height. (☞2-19)

• Install the exhaust pipe/muffler.

Exhaust pipe and connector bolt/nut ③: 23 N·m (2.3 kgf-m, 16.5 lb-ft)
Exhaust pipe mounting bolt ④: 23 N·m (2.3 kgf-m, 16.5 lb-ft)
Muffler mounting nut ⑤: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

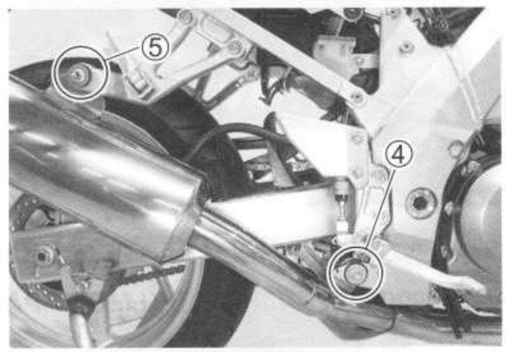


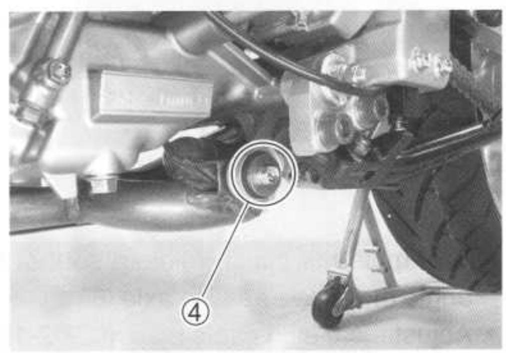
CAUTION

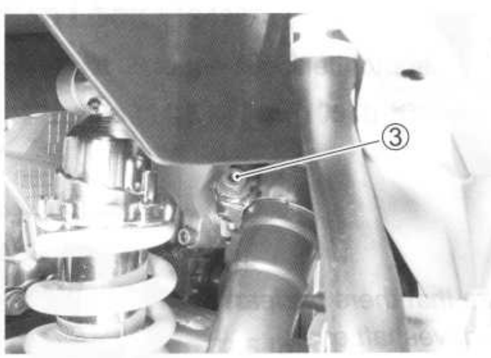
Replace the gaskets with new ones.

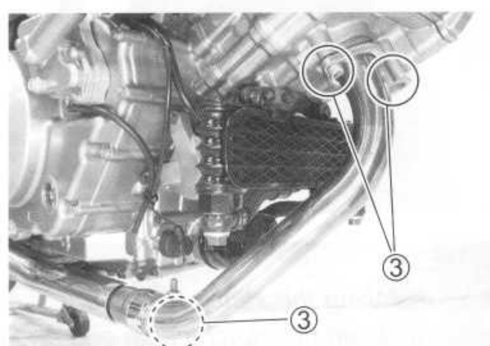
NOTE:
Apply gas sealer to inside and outside of the exhaust pipe connector.

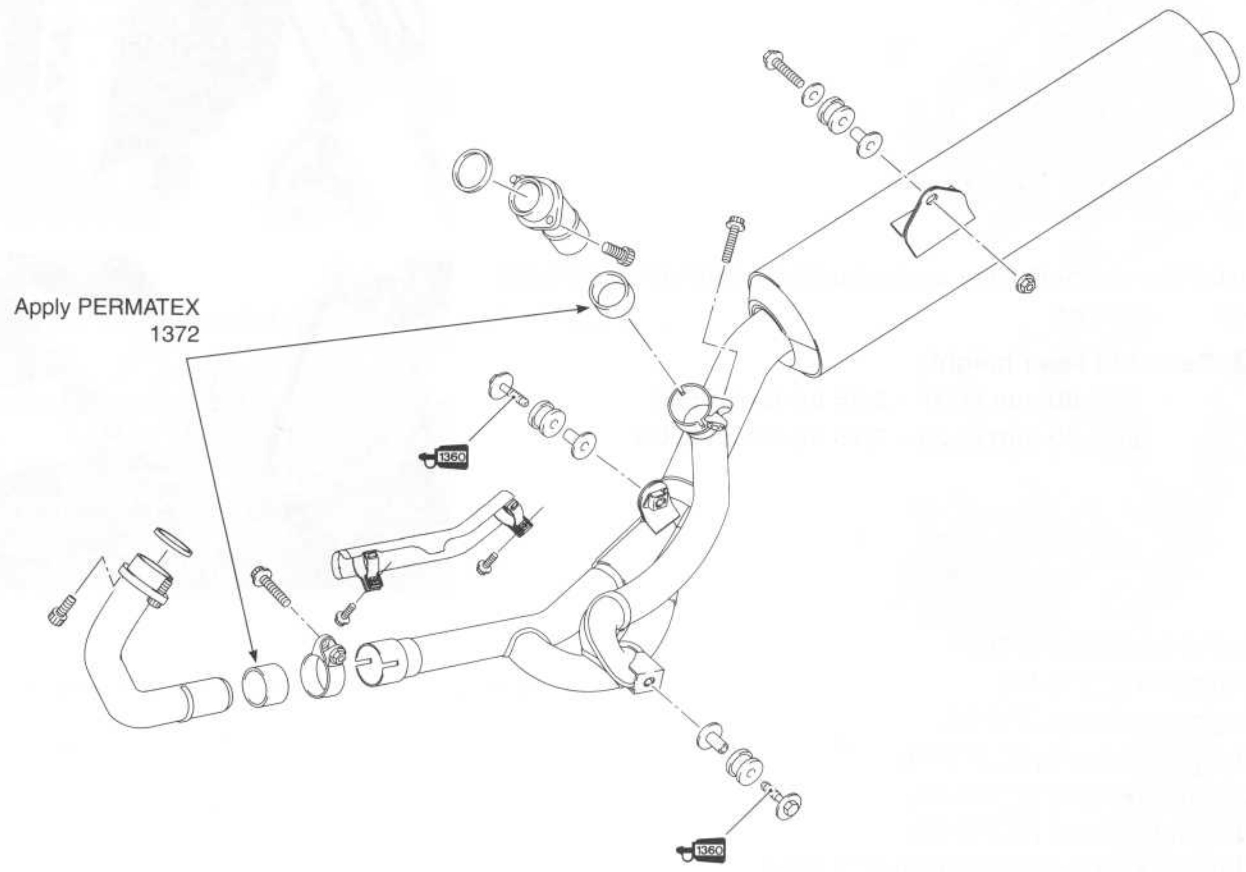
EXHAUST GAS SEALER: PERMATEX 1372





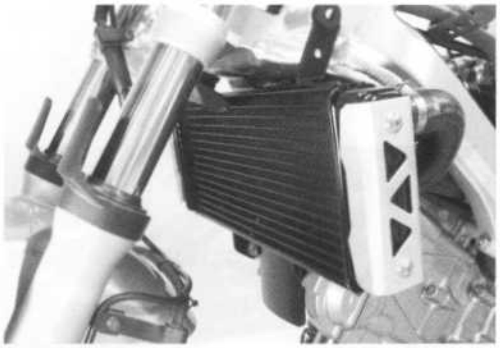




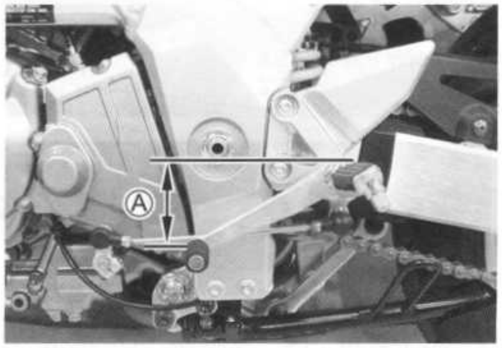

Apply PERMATEX
1372
1360
1360

• Install the throttle body. (☞5-29)

• Install the radiator. (☞6-6)



• Install the gearshift lever and adjust the gearshift lever height Ⓐ.



DATA **Gearshift lever height:**
50 – 60 mm (1.97 – 2.36 in) for SV650
60 – 70 mm (2.36 – 2.76 in) for SV650S

• Adjust the following items.
* Engine oil (☞2-14)
* Engine coolant (☞2-20)
* Throttle cable play (☞2-17)
* Clutch cable play (☞2-19)
* Idling adjustment (☞2-16)
* Throttle body synchronization (☞5-33)
* Drive chain slack (☞2-22)

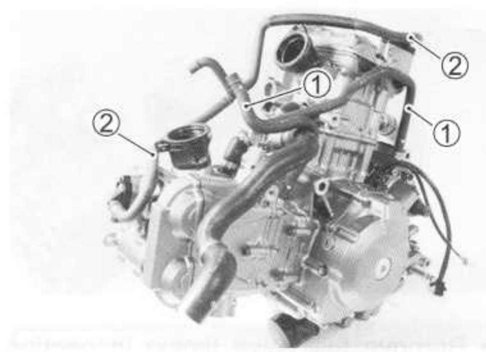
ENGINE DISASSEMBLY

ENGINE TOP SIDE

CAUTION

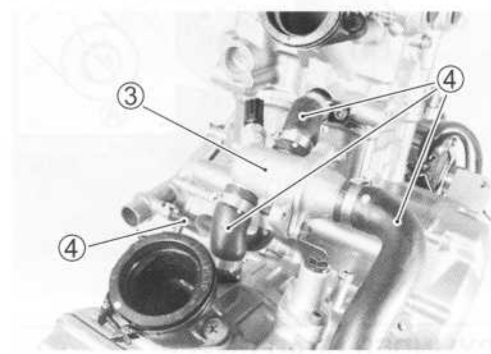
Identify the position of each removed part. Organize the parts in their respective groups (e.g., intake, exhaust) so that they can be reinstalled in their original positions.

- Remove the spark plugs. (☞2-6)
- Disconnect the crankcase breather hoses ①.
- Disconnect the PAIR hoses ②.

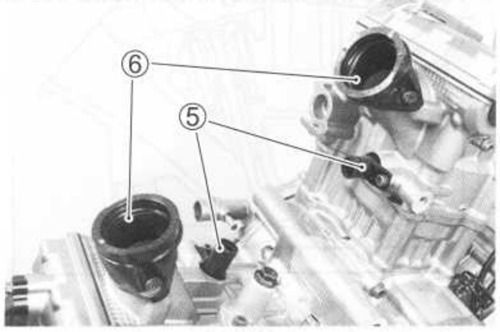


- Remove the thermostat case ③ along with the hoses ④.

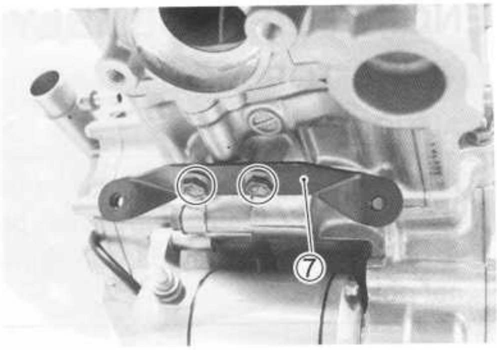
NOTE:
Refer to the section 5 for their servicing.



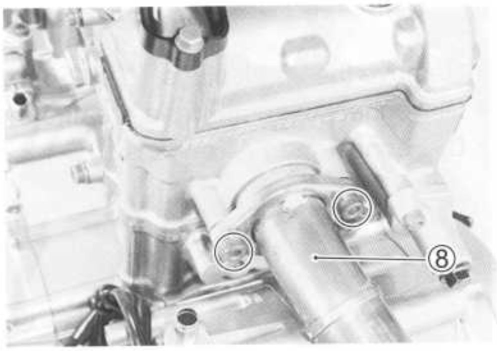
- Remove the water unions ⑤ and intake pipes ⑥.



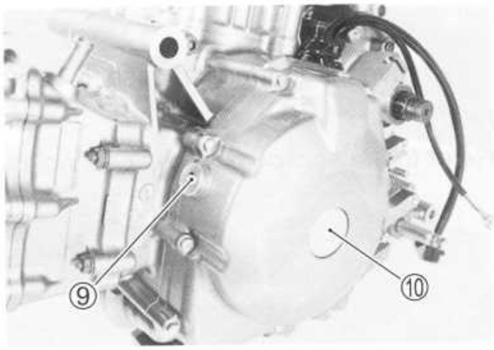
• Remove the oil cooler bracket ⑦.



• Remove the rear exhaust pipe ⑧ and gasket.

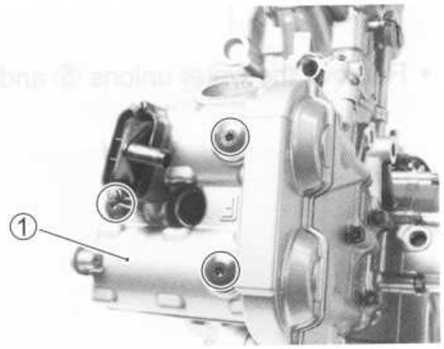


• Remove the valve timing inspection plug ⑨ and generator cover plug ⑩.

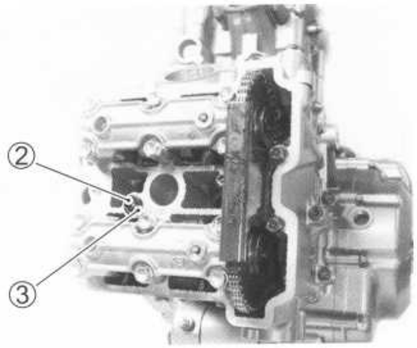


CYLINDER HEAD COVER

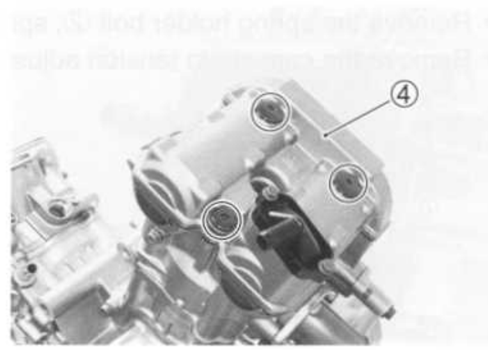
• Remove the front cylinder head cover ①.



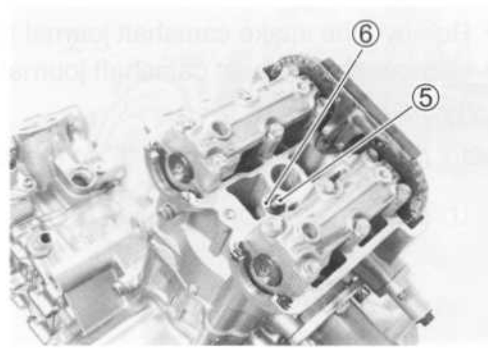
• Remove the dowel pin ② and O-ring ③.



- Remove the rear cylinder head cover ④.

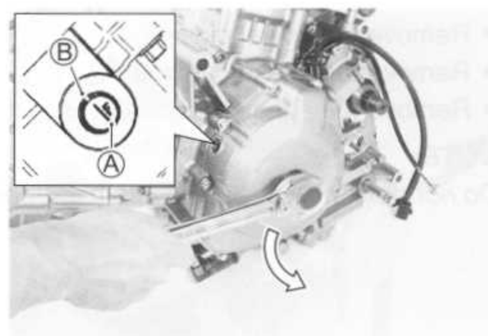


- Remove the dowel pin ⑤ and O-ring ⑥.



FRONT CAMSHAFTS

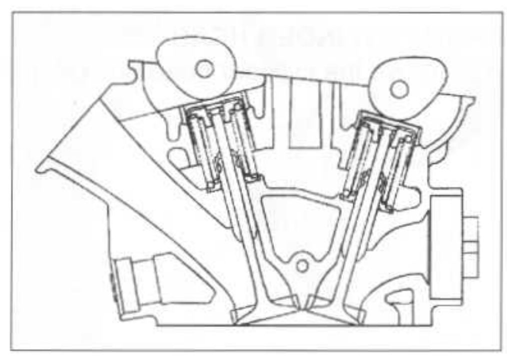
- Turn the crankshaft to bring the "|F" line Ⓐ on generator rotor to the index mark Ⓑ of the valve inspection hole and also to bring the cams to the position as shown in illustration.



NOTE:

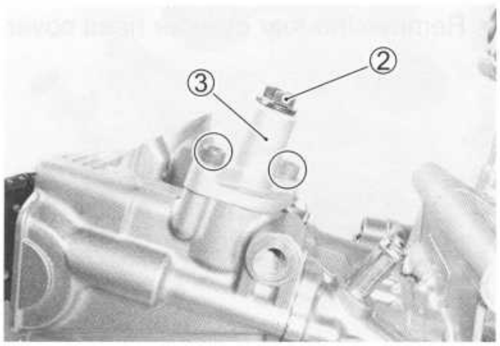
** At the above condition, the front cylinder is at TDC of compression stroke.*

** Before removing the camshafts, inspect the tappet clearance. (☞2-9)*



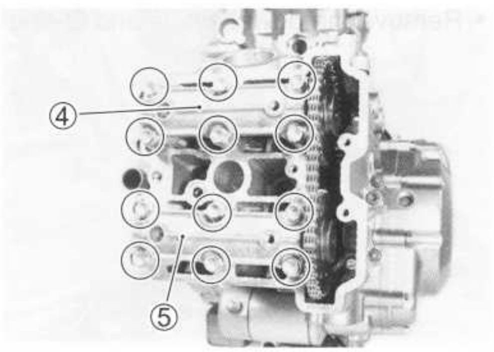
- Remove the cam chain guide ①.

- Remove the spring holder bolt ②, spring and gasket.
- Remove the cam chain tension adjuster ③.



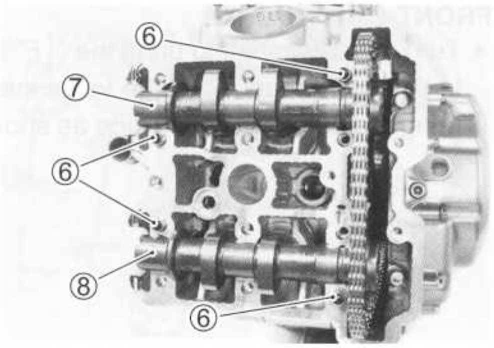
- Remove the intake camshaft journal holder ④.
- Remove the exhaust camshaft journal holder ⑤.

NOTE:
Mark the cylinder location as "F" to the camshaft journal holders.



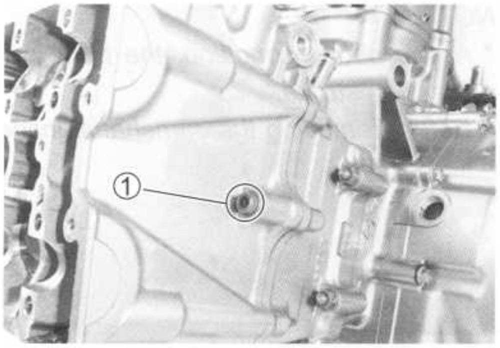
- Remove the dowel pins ⑥.
- Remove the intake camshaft ⑦.
- Remove the exhaust camshaft ⑧.

NOTE:
Do not drop the dowel pins into the crankcase.



FRONT CYLINDER HEAD

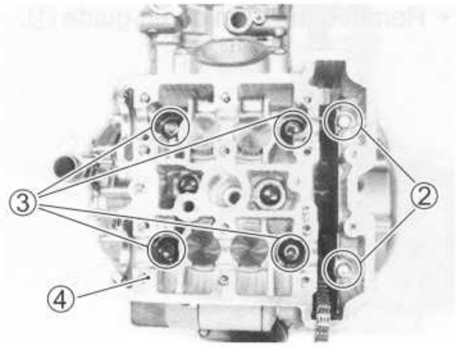
- Remove the cylinder head bolt (M6) ①.



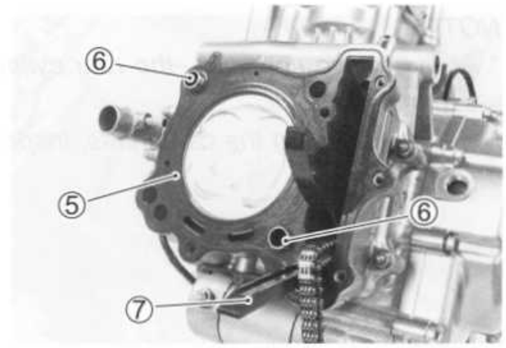
- Remove the cylinder head bolts (M6) ②.
- Remove the cylinder head bolts ③ and washers.

NOTE:
When loosening the cylinder head bolts, loosen each bolt little by little diagonally.

- Remove the cylinder head ④.

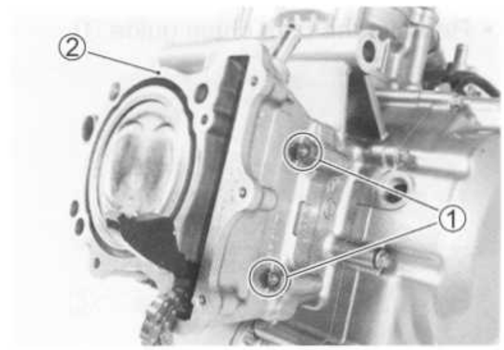


- Remove the cylinder head gasket ⑤, dowel pins ⑥ and cam chain guide ⑦.



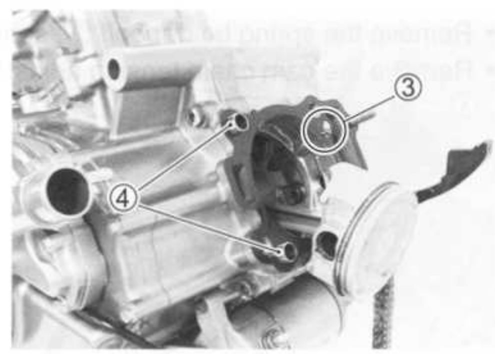
FRONT CYLINDER

- Remove the cylinder nuts ①.
- Remove the cylinder ②.



- Remove the cylinder base gasket ③ and dowel pins ④.

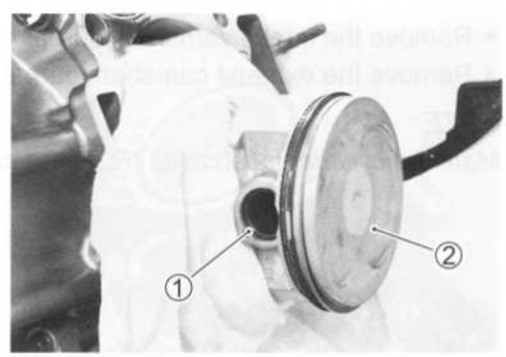
NOTE:
Make sure that the oil jet is inserted in the crankcase.



FRONT PISTON

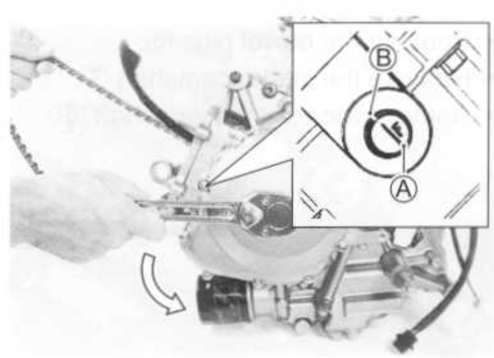
- Place a clean rag over the cylinder base so as not to drop the piston pin circlip into the crankcase.
- Remove the piston pin circlip ①.
- Remove the piston ② by driving out the piston pin.

NOTE:
Scribe the cylinder number on the head of the piston.

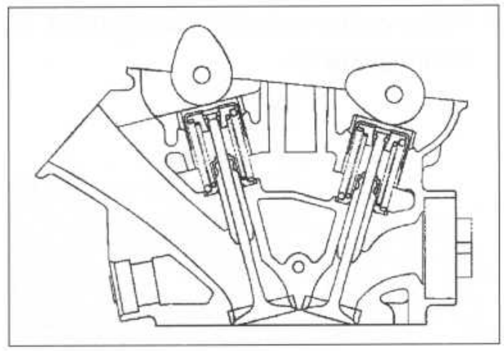


REAR CAMSHAFTS

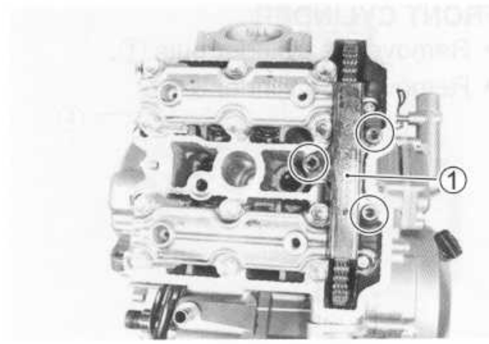
- Rotate the generator 360 degrees (1 turn) counterclockwise and align the "|F" line Ⓐ on the generator rotor with the index mark Ⓑ of the valve timing inspection hole.



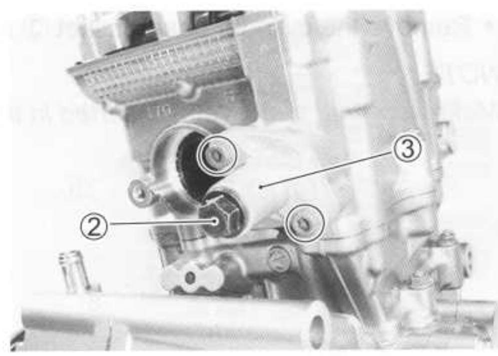
NOTE:
* *At the above condition, the rear cylinder is at ATDC 90 ° on expansion stroke.*
* *Before removing the camshafts, inspect the tappet clearance.* *(☞2-9)*



- Remove the cam chain guide ①.

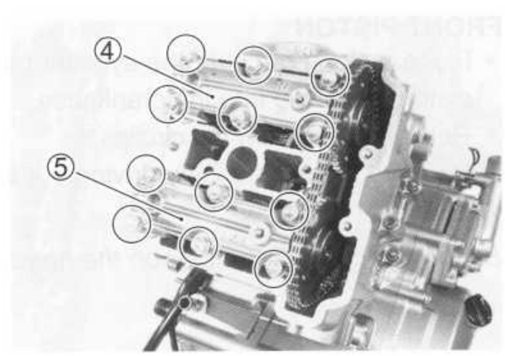


- Remove the spring holder bolt ②, spring and gasket.
- Remove the cam chain tension adjuster ③.

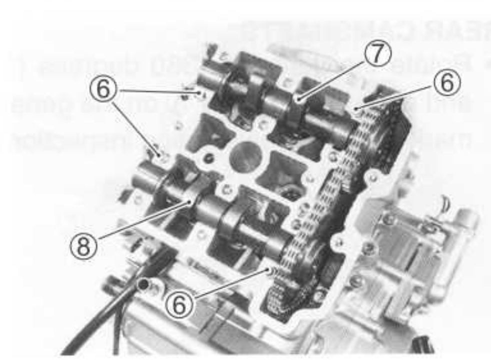


- Remove the intake camshaft journal holder ④.
- Remove the exhaust camshaft journal holder ⑤.

NOTE:
Mark the cylinder location as "R" to the camshaft journal holders.

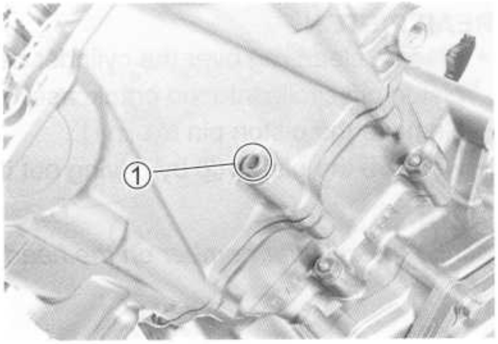


- Remove the dowel pins ⑥.
- Remove the intake camshaft ⑦.
- Remove the exhaust camshaft ⑧.



REAR CYLINDER HEAD

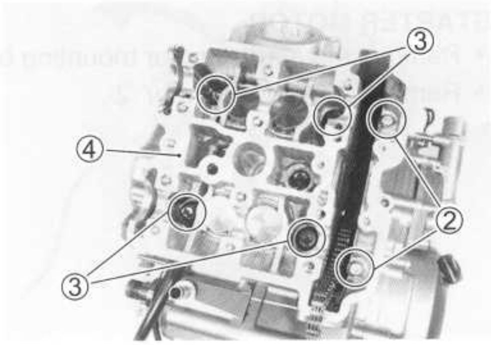
- Remove the cylinder head bolt (M6) ①.



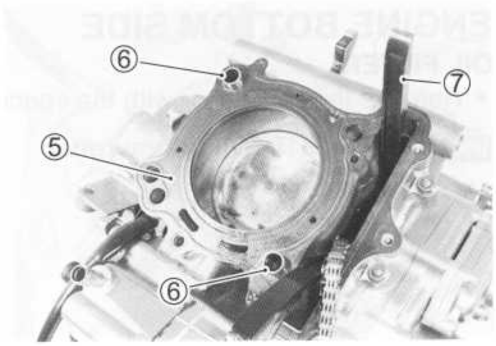
- Remove the cylinder bolts (M6) ②.
- Remove the cylinder head bolts ③ and washers.

NOTE:
When loosening the cylinder head bolts, loosen each bolt little by little diagonally.

- Remove the cylinder head ④.

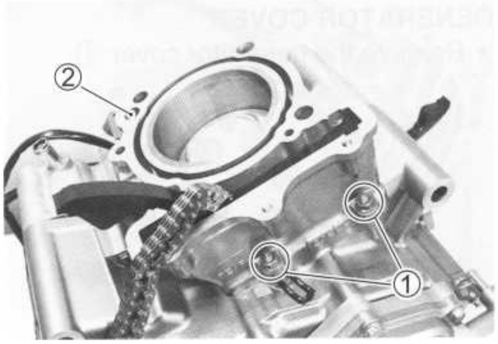


- Remove the cylinder head gasket ⑤, dowel pins ⑥ and cam chain guide ⑦.



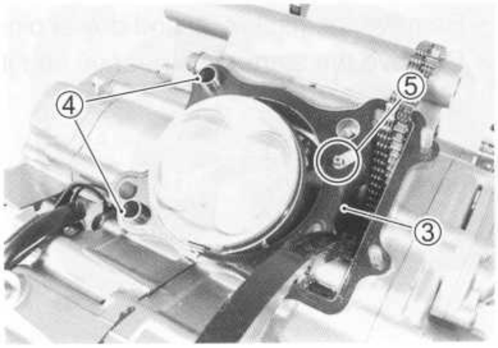
REAR CYLINDER

- Remove the cylinder nuts ① and clamp.
- Remove the cylinder ②.



- Remove the cylinder base gasket ③ and dowel pins ④.

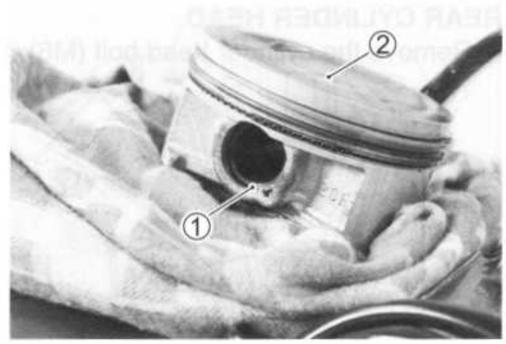
NOTE:
Make sure that the oil jet ⑤ is inserted in the crankcase.



REAR PISTON

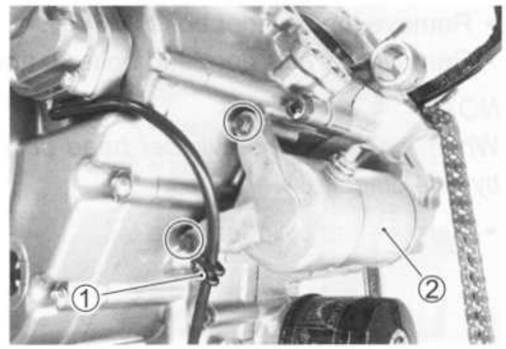
- Place a clean rag over the cylinder base so as not to drop the piston pin circlip into the crankcase.
- Remove the piston pin circlip ①.
- Remove the piston ② by driving out the piston pin.

NOTE:
Scribe the cylinder number on the head of the piston.



STARTER MOTOR

- Remove the starter motor mounting bolts and the clamp ①.
- Remove the starter motor ②.

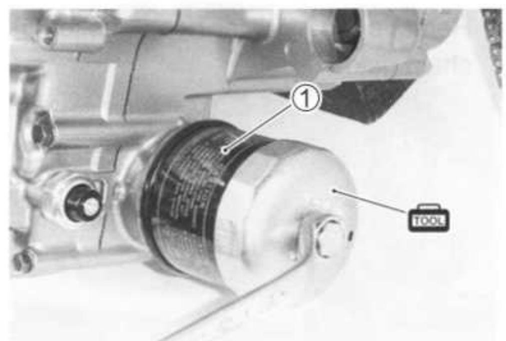


ENGINE BOTTOM SIDE

OIL FILTER

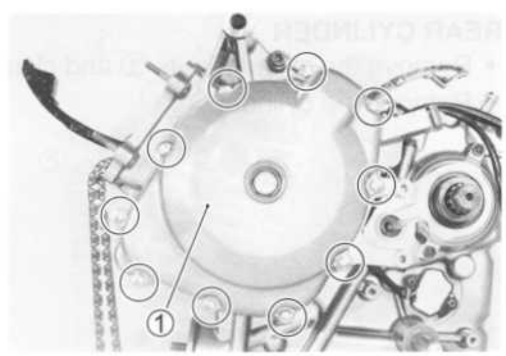
- Remove the oil filter ① with the special tool.

TOOL 09915-40610: Oil filter wrench

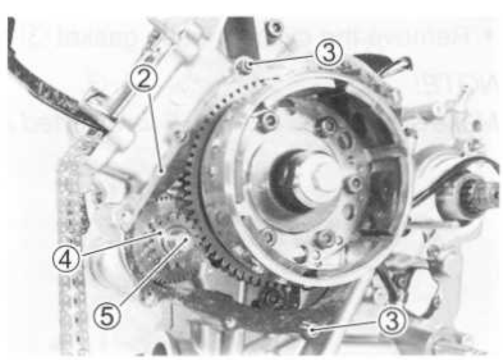


GENERATOR COVER

- Remove the generator cover ①.

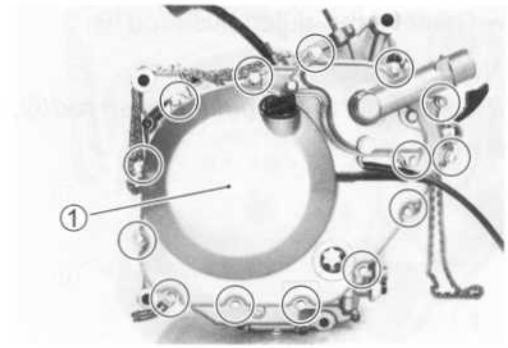


- Remove the gasket ② and dowel pins ③.
- Remove the starter idle gear ④ and its shaft ⑤.

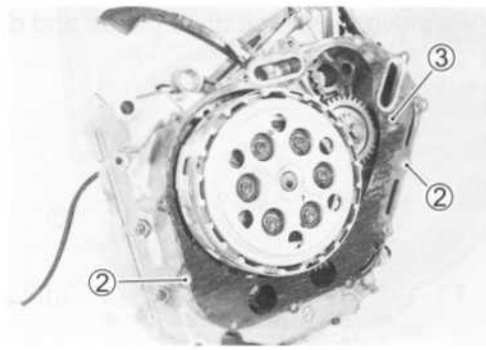


CLUTCH COVER

- Remove the clutch cover ①.



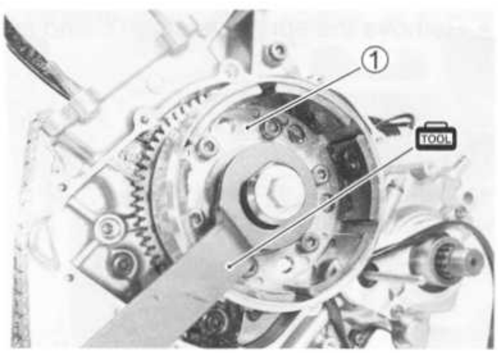
- Remove the dowel pins ② and gasket ③.



CLUTCH

- Hold the generator rotor ① with the special tool.

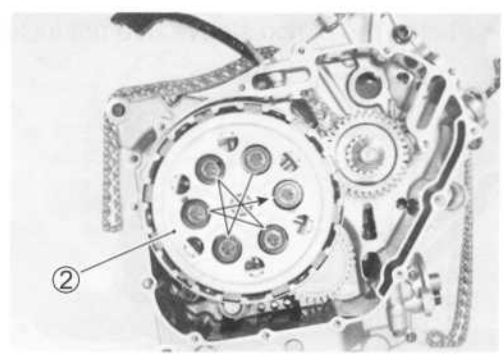
TOOL **09930-44530: Rotor holder**



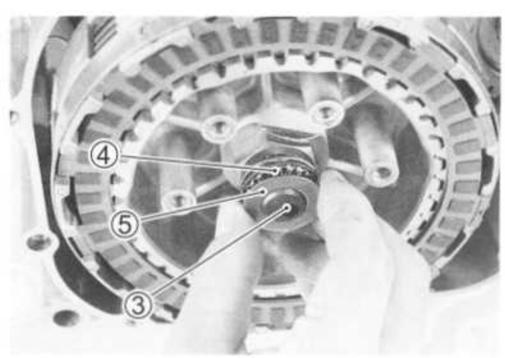
- Remove the clutch springs.

NOTE:
Loosen the clutch spring set bolts little by little and diagonally.

- Remove the pressure plate ②.

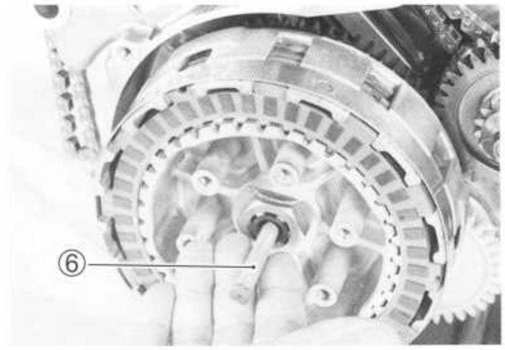


- Remove the clutch push piece ③, the bearing ④ and thrust washer ⑤.

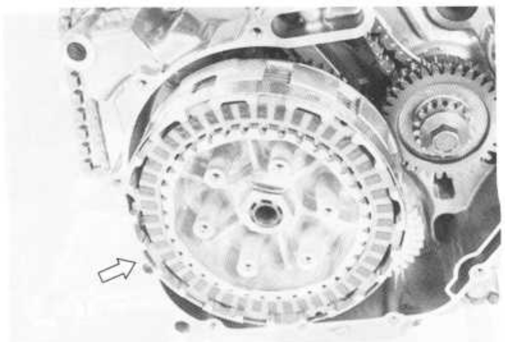


• Remove the clutch push rod ⑥.

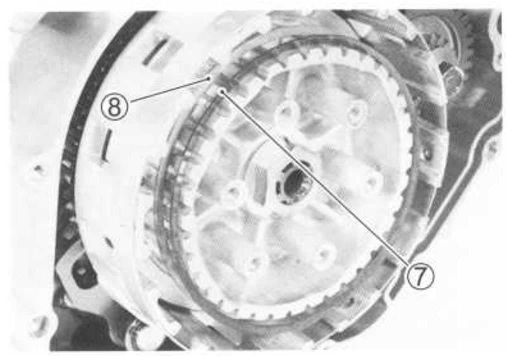
NOTE:
If it is difficult to pull out the push rod ⑥, use a magnetic hand or a wire.



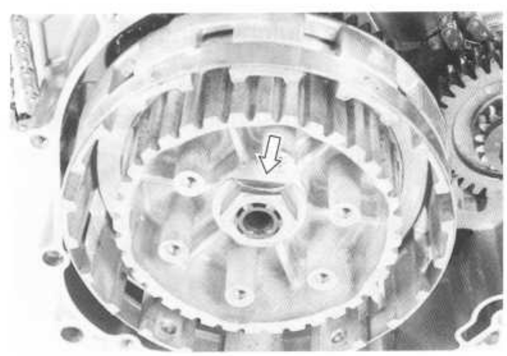
• Remove the clutch drive plates and driven plates.



• Remove the spring washer ⑦ and spring washer seat ⑧.



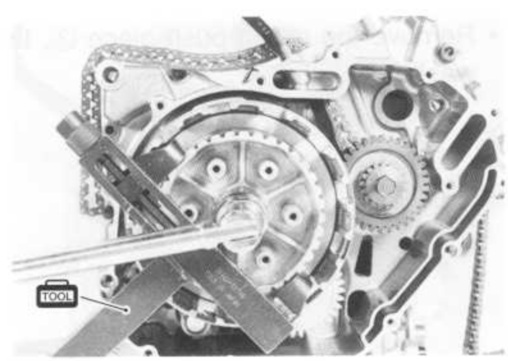
• Flatten the clutch sleeve hub nut lock washer.



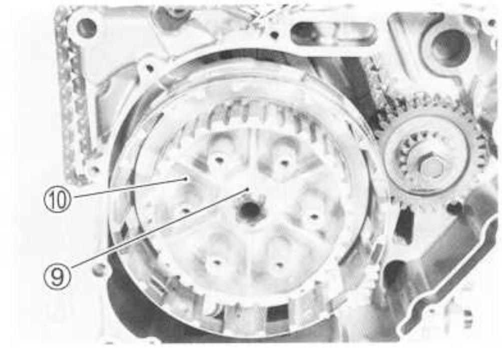
• Hold the clutch sleeve hub with the special tool.

TOOL **09920-53740: Clutch sleeve hub holder**

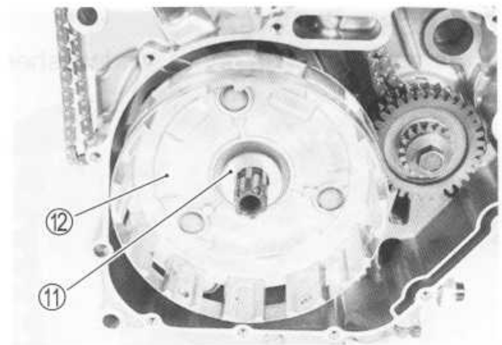
• Remove the clutch sleeve hub nut.



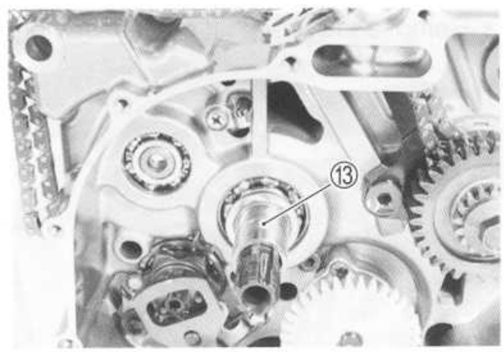
- Remove the lock washer ⑨.
- Remove the clutch sleeve hub ⑩.



- Remove the thrust washer ⑪.
- Remove the primary driven gear assembly ⑫.



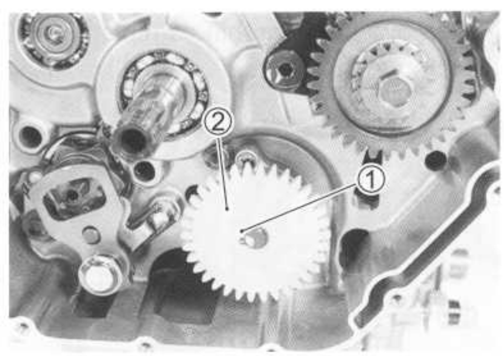
- Remove the spacer ⑬.



OIL PUMP

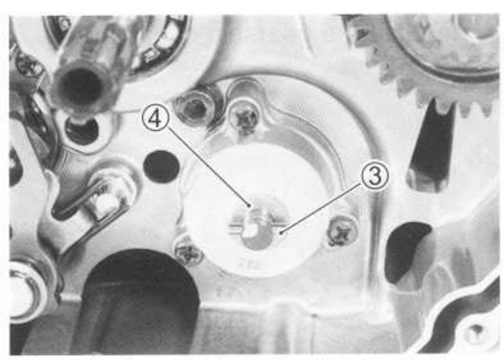
- Remove the snap ring ①.
- Remove the oil pump driven gear ②.

NOTE:
Do not drop the snap ring ① into the crankcase.

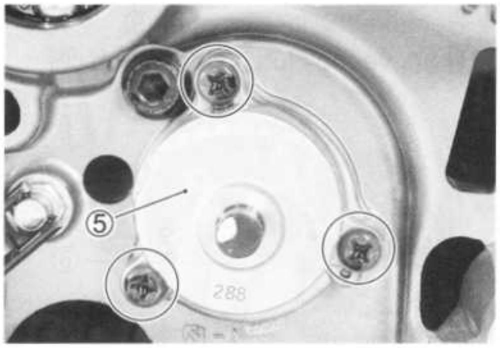


- Remove the pin ③ and the washer ④.

NOTE:
Do not drop the pin ③ and washer ④ into the crankcase.

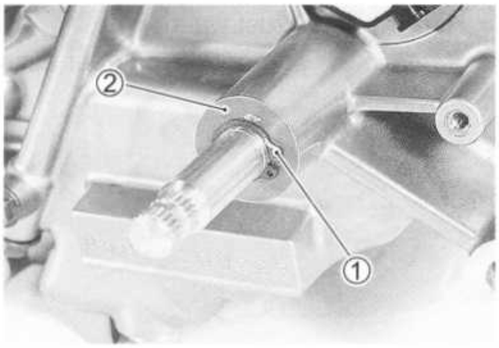


- Remove the oil pump ⑤.

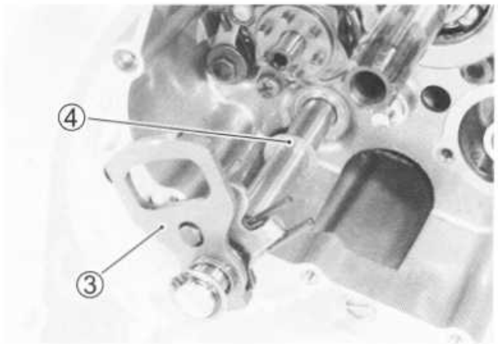


GEARSHIFT SYSTEM

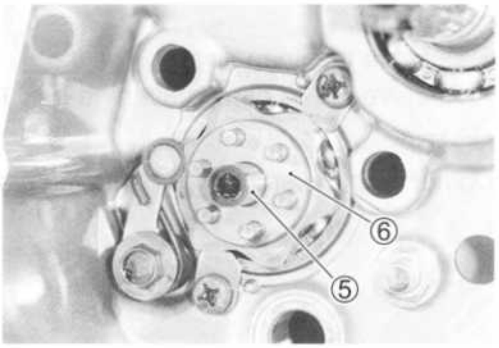
- Remove the snap ring ① and washer ②.



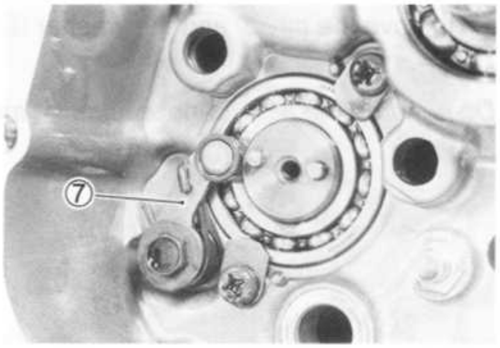
- Remove the gearshift shaft assembly ③ and washer ④.



- Remove the gearshift cam plate bolt ⑤.
- Remove the gearshift cam plate ⑥.

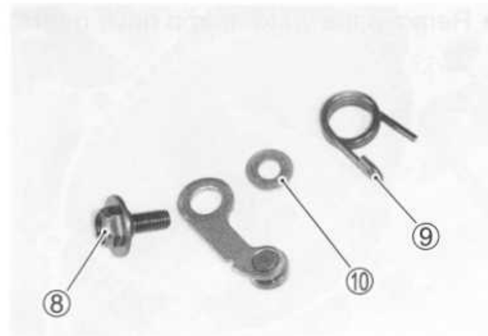


- Remove the gearshift cam stopper ⑦.



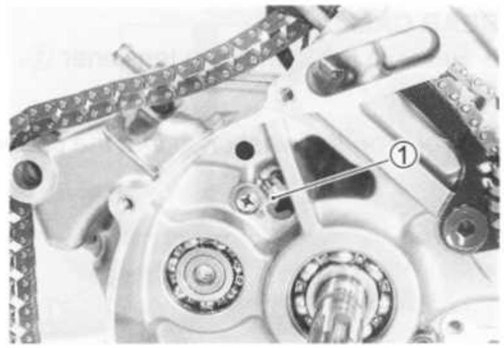
* Remove the following parts.

⑧ Gearshift cam stopper bolt
⑨ Gearshift cam stopper spring
⑩ Washer

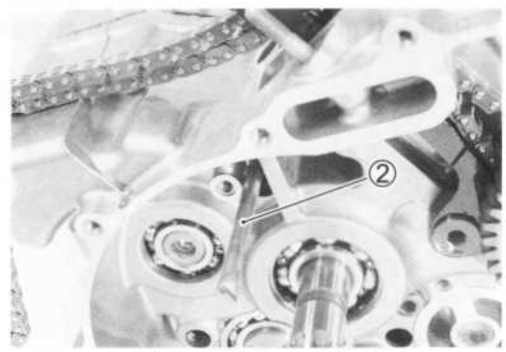


OIL PIPE

* Remove the oil pipe stopper ①.



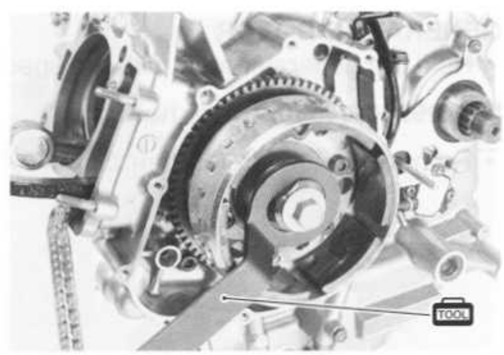
* Remove the oil pipe ②.



PRIMARY DRIVE GEAR

* Hold the generator rotor with the special tool.

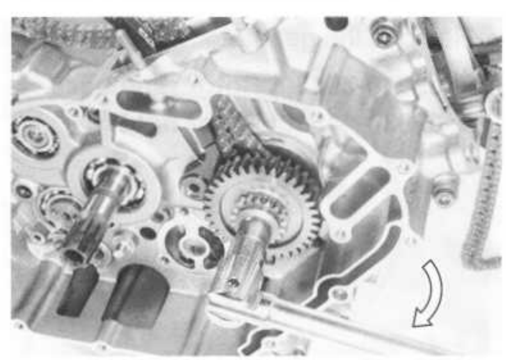
TOOL **09930-44530: Rotor holder**



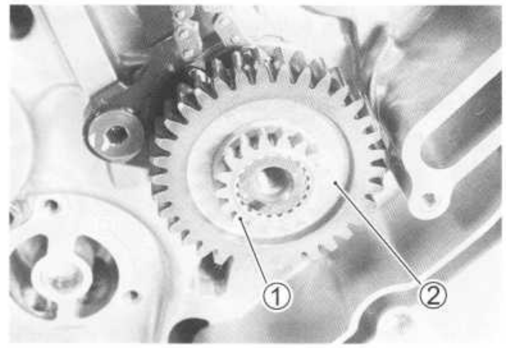
* Remove the primary drive gear bolt.

CAUTION

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



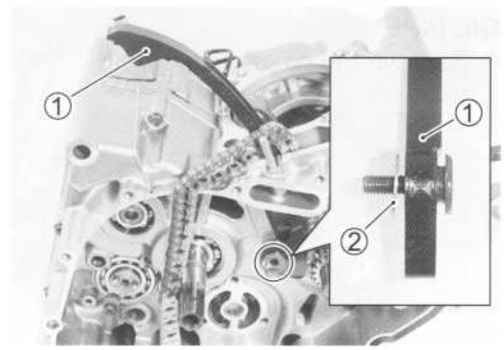
* Remove the water pump drive gear ① and primary drive gear ②.



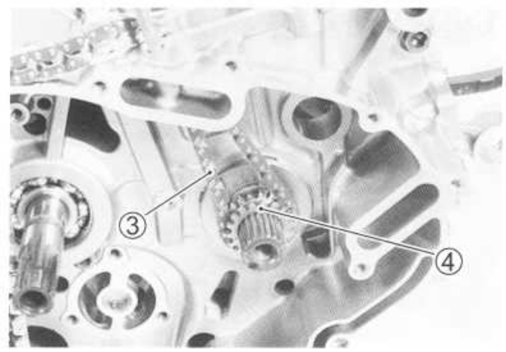
REAR CAM CHAIN

* Remove the cam chain tensioner ①.

NOTE:
Do not drop the washer ② into the crankcase.



* Remove the rear cam chain ③ and cam chain drive sprocket ④.

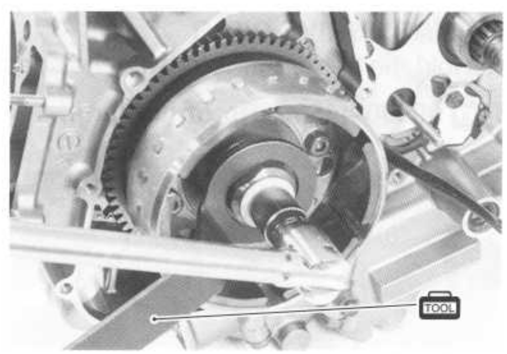


GENERATOR ROTOR

* Hold the generator rotor with the special tool.

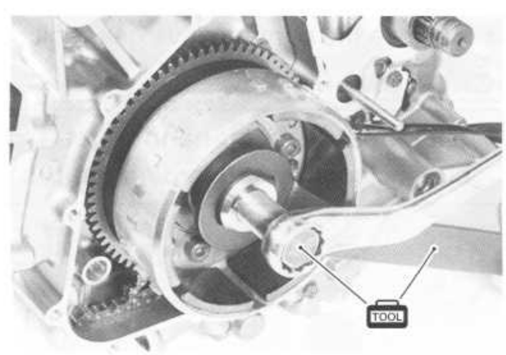
TOOL **09930-44530: Rotor holder**

* Remove the generator rotor bolt ①.

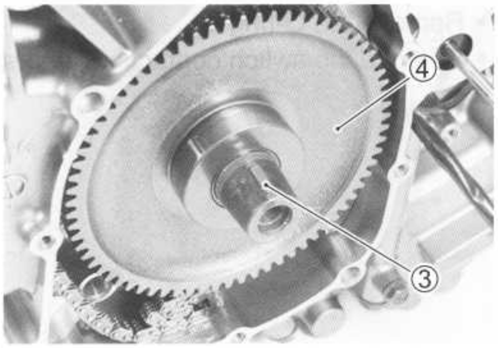


* Remove the generator rotor ② with the special tools.

TOOL **09930-30450: Rotor remover**
09930-44530: Rotor holder



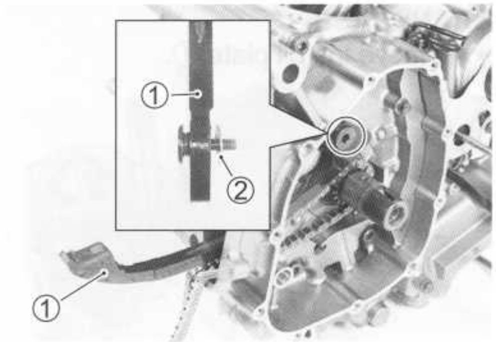
- Remove the key ③.
- Remove the starter driven gear ④.



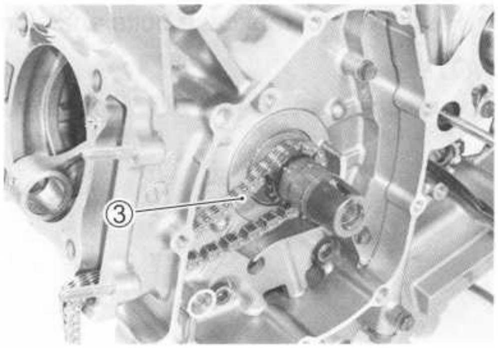
FRONT CAM CHAIN

- Remove the cam chain tensioner ①.

NOTE:
Do not drop the washer ② into the crankcase.

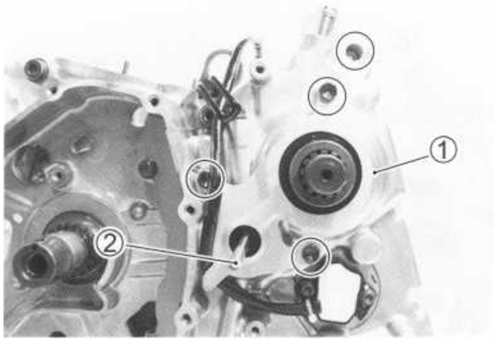


- Remove the front cam chain ③.

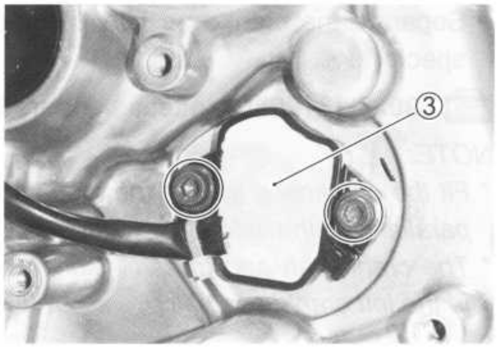


GEAR POSITION SWITCH

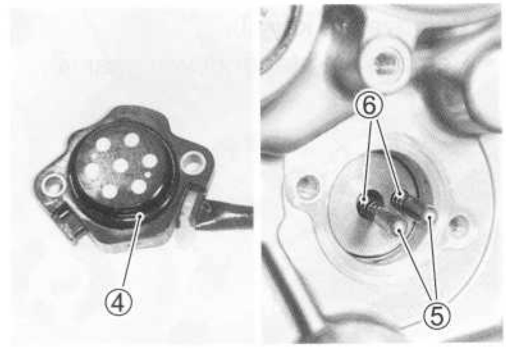
- Remove the driveshaft oil seal retainer ①.
- Remove the push rod ②.



- Remove the gear position switch ③.

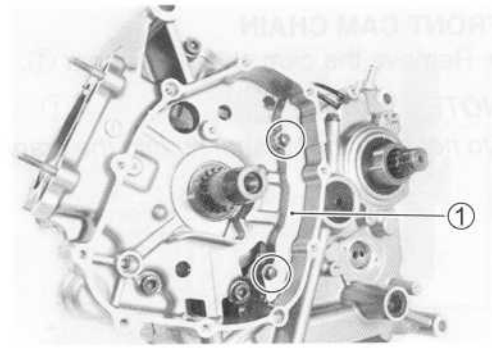


* Remove the O-ring ④.
* Remove the switch contacts ⑤ and springs ⑥.



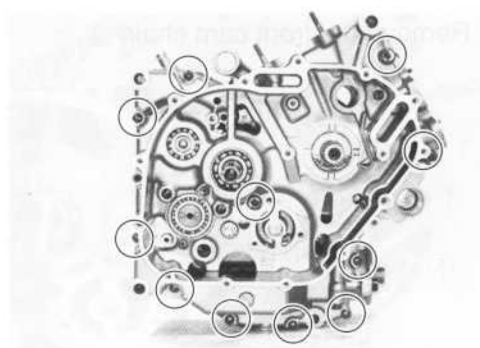
CRANKCASE

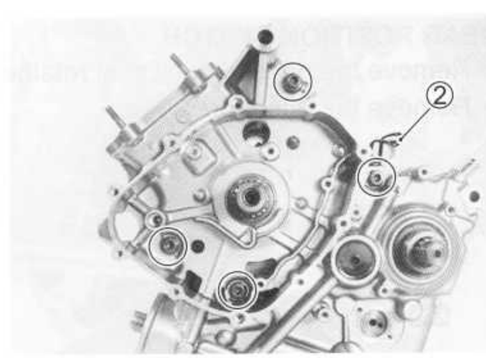
* Remove the oil plate ①.



* Remove the crankcase bolts and clamp ②.

NOTE:
Loosen the crankcase bolts diagonally and smaller sizes first.

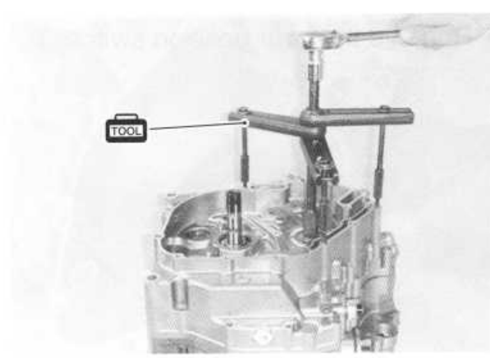




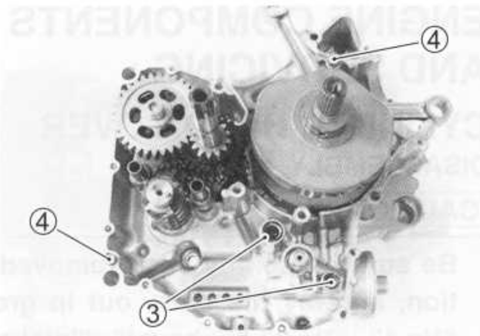
* Separate the crankcase into 2 parts, right and left with the special tool.

TOOL 09920-13120: Crankcase separating tool

NOTE:
* *Fit the crankcase separating tool, so that the tool arms are in parallel with the side of crankcase.*
* *The crankshaft and transmission components should remain in the left crankcase half.*

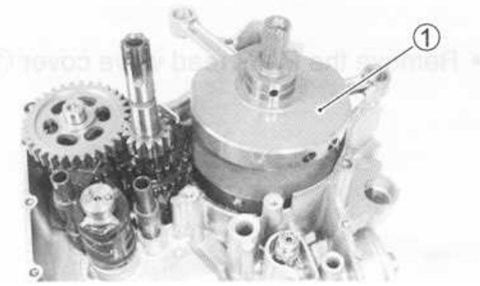


• Remove the O-rings ③ and dowel pins ④.



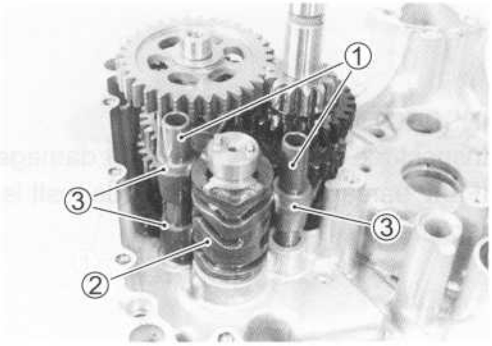
CRANKSHAFT

• Remove the crankshaft ①.

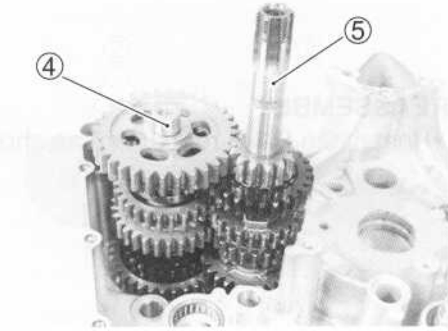


TRANSMISSION

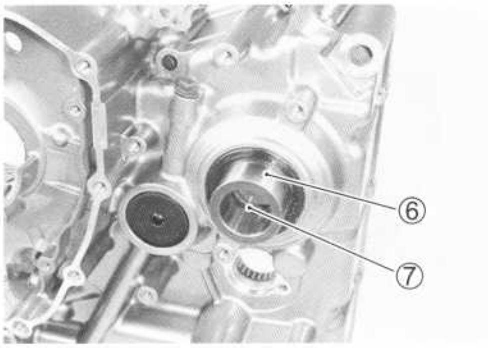
• Remove the gearshift fork shafts ①.
• Remove the gearshift cam ②.
• Remove the gear shift forks ③.



• Remove the driveshaft assembly ④ and countershaft assembly ⑤.



• Remove the engine sprocket spacer ⑥ and O-ring ⑦.



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", "No.2" "Exhaust", "Intake", so that each will be restored to the original location during assembly.**

- Remove the PAIR reed valve cover ①.

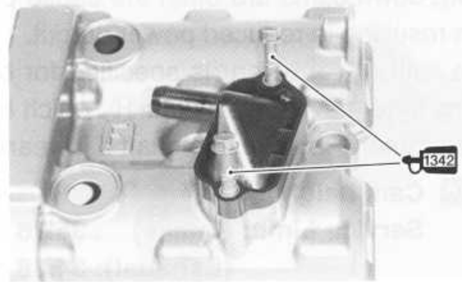
INSPECTION

Inspect the PAIR reed valve for damage and the carbon deposit. If any damage or the carbon deposit is found in the reed valve, replace it with a new one.

REASSEMBLY

- Install the PAIR reed valve as shown.

- Apply THREAD LOCK to the bolts and then install the PAIR reed valve cover.



1342 99000-32050: THREAD LOCK "1342"

NOTE:
The inlet pipe of the PAIR reed valve cover must face left side of the engine.

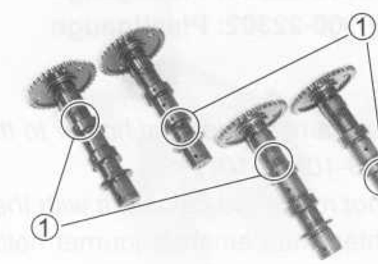
CAMSHAFT/CAMSHAFT JOURNAL

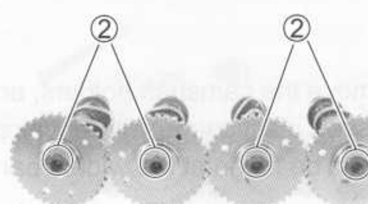
CAUTION

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

CAMSHAFT

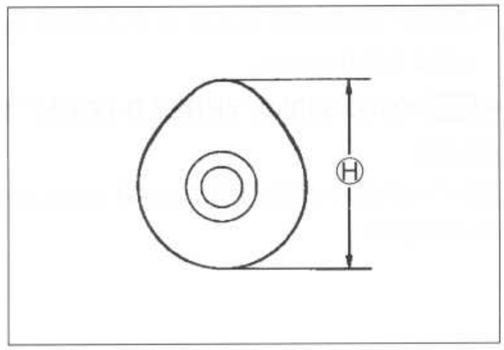
- All camshafts should be checked for runout and also for wear of cams and journals if the engine has been noted as giving abnormal noise, vibration or lack power output. Any of these conditions may be caused by camshafts worn down or distorted to the service limit.
- The camshafts can be identified by the embossed letters ① and cords ② stamped on the camshaft ends.





	Letter ①	Cord ②
No.1 (Front) intake camshaft	INF	F
No.1 (Front) exhaust camshaft	EXF	G
No.2 (Rear) intake camshaft	INR	H
No.2 (Rear) exhaust camshaft	EXR	J

CAM WEAR

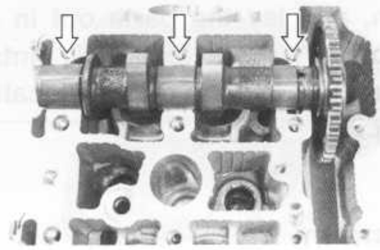


Worn-down cams are often the cause of mistimed valve operation resulting in reduced power output.
The limit of cam wear is specified for both intake and exhaust cams in terms of cam height Ⓗ, which is to be measured with a micrometer. Replace camshaft if it wears worn down to the limit.

DATA **Cam height Ⓗ**
Service Limit: (Intake) : 35.76 mm (1.408 in)
(Exhaust): 34.38 mm (1.354 in)

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

CAMSHAFT JOURNAL WEAR



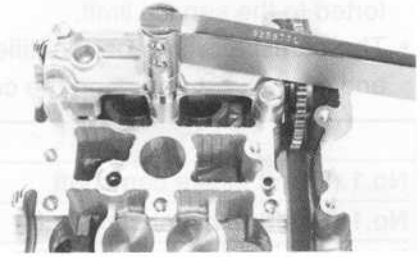
Determine whether or not each journal is worn down to the limit by measuring the oil clearance with the camshaft installed in place.

- Use the plastigauge to read the clearance at the widest portion, which is specified as follows:

DATA **Camshaft journal oil clearance**
Service Limit (IN & EX): 0.150 mm (0.0059 in)

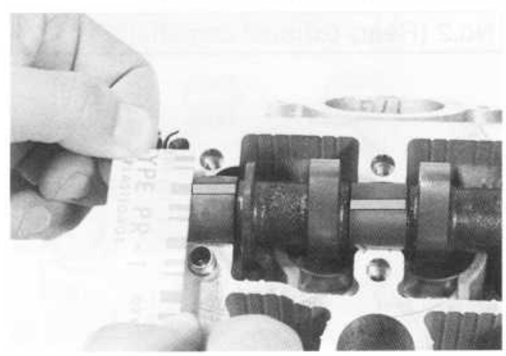
TOOL **09900-22301: Plastigauge**
09900-22302: Plastigauge

NOTE:
* *Install camshaft journal holder to their original positions.*
(☞3-103, 3-107)
* *Do not rotate the camshaft with the plastigauge in place.*



- Tighten the camshaft journal holder bolts evenly and diagonally to the specified torque.

Camshaft journal holder bolt: 10 N·m
(1.0 kgf-m, 7.0 lb-ft)



- Remove the camshaft holders, and read the width of the compressed plastigauge with envelope scale. This measurement should be taken at the widest part.

If the camshaft journal oil clearance measured exceeds the limit, measure the inside diameter of the camshaft journal holder and outside diameter of the camshaft journal. Replace the camshaft or the cylinder head depending upon which one exceeds the specification.

DATA **Journal holder I.D.**
Standard (IN & EX): 22.012 – 22.025 mm (0.8666 – 0.8671 in)

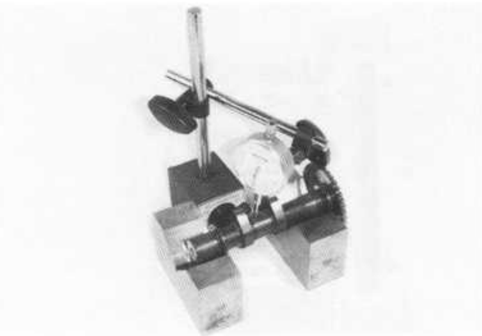
TOOL **09900-20602: Dial gauge (1/1000, 1 mm)**
09900-22403: Small bore gauge (18 – 35 mm)

DATA **Camshaft journal O.D.**
Standard (IN & EX): 21.959 – 21.980 mm (0.8645 – 0.8654 in)

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

CAMSHAFT RUNOUT

Measure the runout using the dial gauge. Replace the camshaft if the runout exceeds the limit.



DATA **Camshaft runout**
Service Limit (IN & EX): 0.1 mm (0.004 in)

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

CAM CHAIN TENSION ADJUSTER

Check that the push rod ① can slide smoothly with the lock ② of the ratchet mechanism released. If it does not slide smoothly or the ratchet mechanism is worn or damaged, replace the cam chain tension adjuster with a new one.

CAM CHAIN TENSIONER

Check the contacting surface of the cam chain tensioner.
If it is worn or damaged, replace it with a new one.

CAM CHAIN GUIDE

Check the contacting surface of the cam chain guide.

If it is worn or damaged, replace it with a new one.

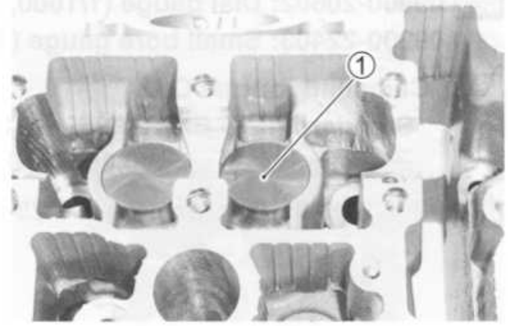
CYLINDER HEAD AND VALVE

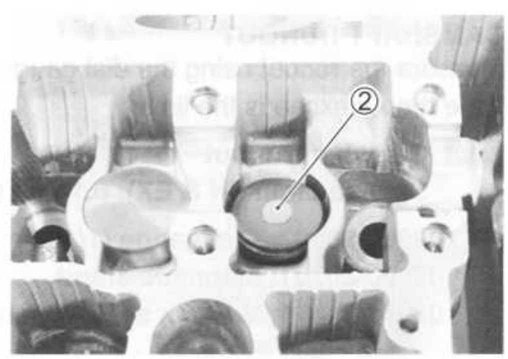
VALVE AND VALVE SPRING DISASSEMBLY

- Remove the tappets ① and shims ② by fingers or magnetic hand.

CAUTION

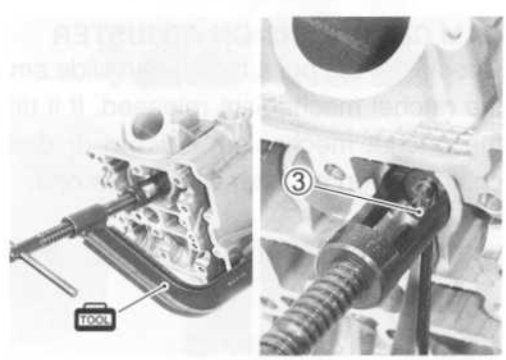
Identify the position of each removed part.





- Using special tools, compress the valve springs and remove the two cotter halves ③ from valve stem.

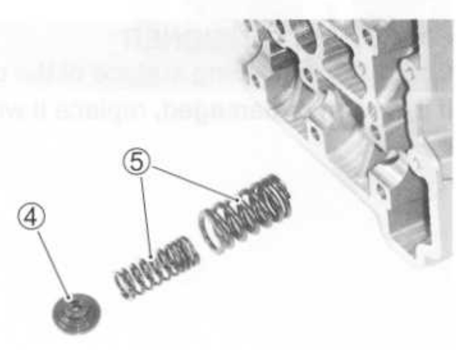
TOOL **09916-14510: Valve lifter**
09916-14521: Valve lifter attachment
09916-84511: Tweezers



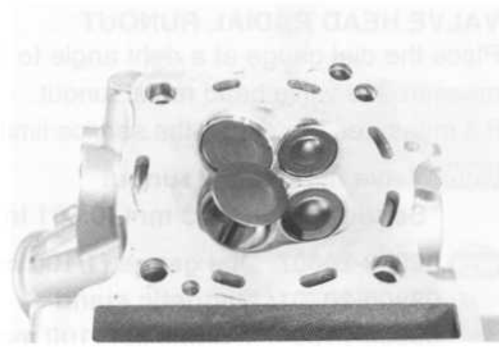
- Remove the valve spring retainer ④ and valve springs ⑤.

CAUTION

Be careful not to damage the tappet sliding surface with the special tool.



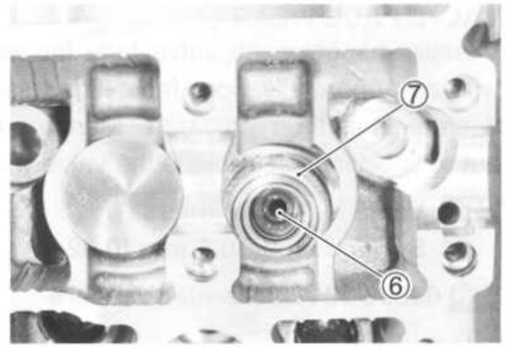
• Pull out the valve from the other side.



• Remove the oil seals ⑥ and spring seats ⑦.

CAUTION

Do not reuse the removed oil seals.

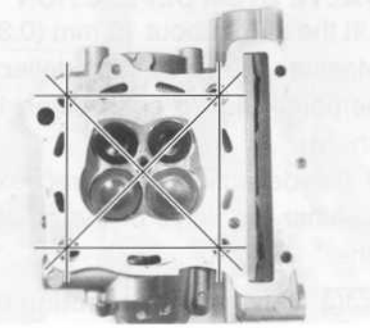


CYLINDER HEAD DISTORTION

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.



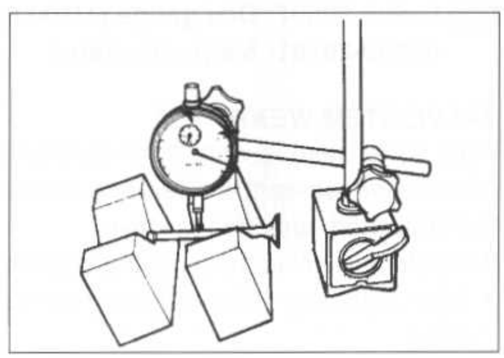
DATA **Cylinder head distortion**
Standard: 0.05 mm (0.002 in)

TOOL **09900-20803: Thickness gauge**

VALVE STEM RUNOUT

Support the valve using V-blocks and check its runout using the dial gauge as shown.

If the runout exceeds the service limit, replace the valve.

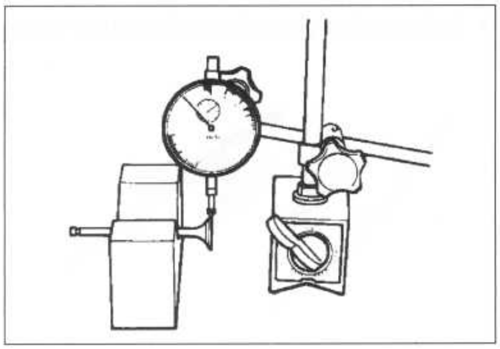


DATA **Valve stem runout**
Service Limit: 0.05 mm (0.002 in)

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

VALVE HEAD RADIAL RUNOUT

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

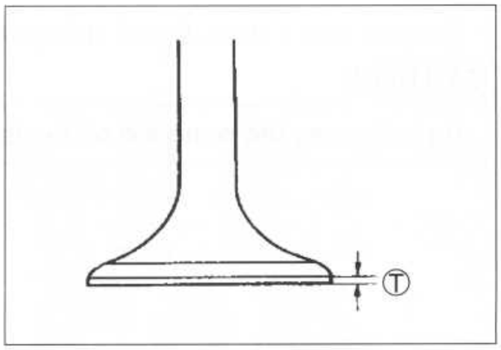


DATA **Valve head radial runout**
Service Limit: 0.03 mm (0.001 in)

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

VALVE FACE WEAR

Visually inspect each valve face for wear. Replace any valve with an abnormally worn face. The thickness of the valve face decreases as the face wears. Measure the valve face Ⓣ. If it is out of specification, replace the valve with a new one.

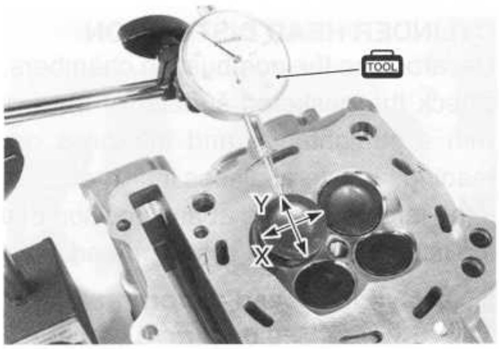


DATA **Valve head thickness Ⓣ**
Service Limit: 0.5 mm (0.02 in)

TOOL **09900-20102: Vernier calipers**

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, then determine whether the valve or the guide should be replaced with a new one.



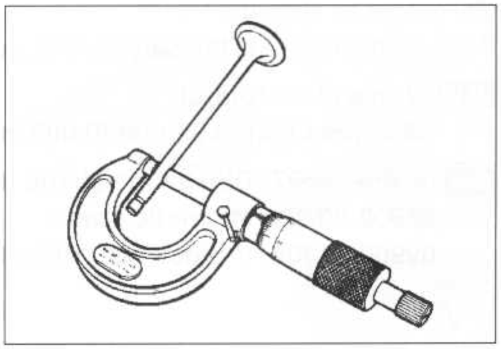
DATA **Valve stem deflection (IN & EX)**
Service Limit: 0.35 mm (0.014 in)

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 recheck the clearance.



DATA **Valve stem O.D.**
Standard (IN): 4.465 – 4.480 mm (0.1758 – 0.1764 in)
(EX): 4.455 – 4.470 mm (0.1754 – 0.1760 in)

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

NOTE:
If valve guides have to be removed for replacement after inspecting related parts, carry out the steps shown in valve guide servicing.

VALVE GUIDE SERVICING

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

TOOL 09916-43210: Valve guide remover/installer

NOTE:
** Discard the removed valve guide subassemblies.*
** Only oversized valve guides are available as replacement parts. (Part No. 11115-18D72)*

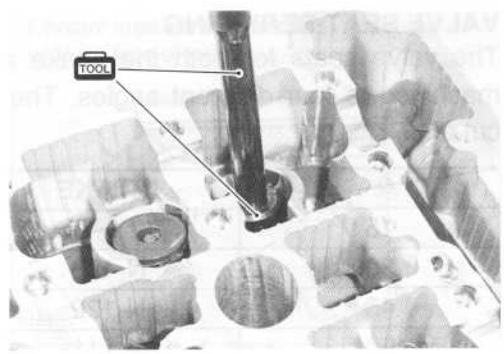
- Re-finish the valve guide holes in cylinder head with the reamer and handle.

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

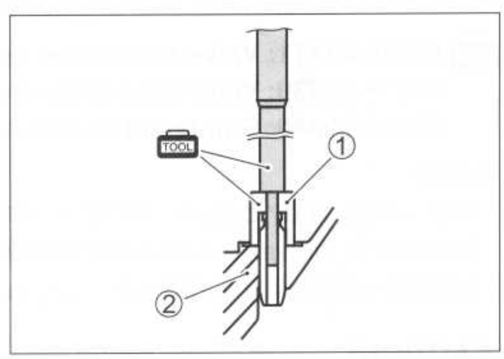
CAUTION

When refinishing or removing the reamer from the valve guide hole, always turn it clockwise.

- Apply engine oil to the valve guide hole, and valve guide.
- Drive the valve guide into the hole with the special tools.



TOOL 09916-43210: Valve guide installer/remover
09916-53330: Attachment



NOTE:
Install the valve guide until the attachment ① contacts with the cylinder head ②.

CAUTION

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

- After installing the valve guides, re-finish their guiding bores using the reamer.
- Clean and oil the guides after reaming.

TOOL 09916-33210: Valve guide reamer
09916-34542: Valve guide reamer handle

NOTE:
Insert the reamer from the combustion chamber and always turn the reamer handle clockwise.

VALVE SEAT WIDTH INSPECTION

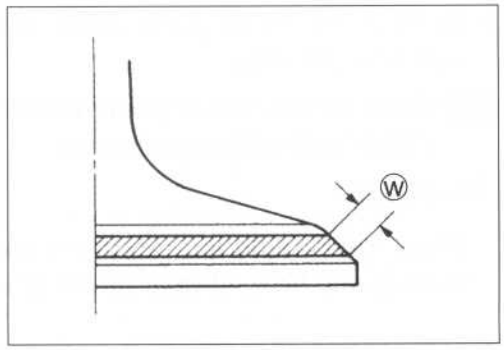
Visually check for valve seat width on each valve face.

If the valve face has worn abnormally, replace the valve.

- Coat the valve seat with Prussian Blue and set the valve in place.Rotate the valve with light pressure.
- Check that the transferred blue on the valve face is uniform all around and in center of the valve face.

TOOL **09916-10911: Valve lapper set**

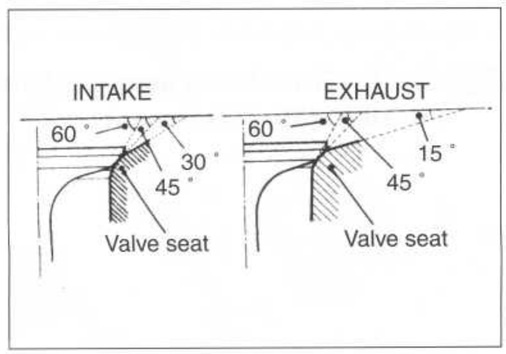
If the seat width Ⓦ measured exceeds the standard value, or seat width is not uniform reface the seat using the seat cutter.



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

VALVE SEAT SERVICING

The valve seats for both the 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-126	
45 °	N-122	N-122
60 °	N-111	N-111

TOOL **09916-21111: Valve seat cutter set**
09916-20630: Valve seat cutter (N-126)
09916-20640: Solid pilot (N-100-4.5)

NOTE:

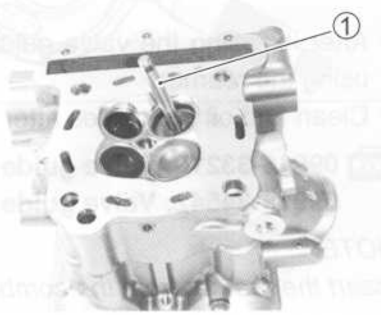
** The valve seat cutters (N-121), (N-122) and (N-111) are included in the valve seat cutter set (09916-21111).*

** Use the solid pilot (N-100-4.5) along with the valve seat cutter.*

CAUTION

The valve seal contact area must be inspected after each cut.

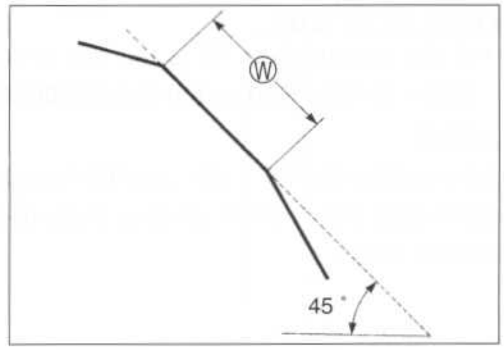
- When installing the solid pilot ①, rotate it slightly. Seat the pilot snugly. Install the 45 ° cutter, attachment and T-handle.



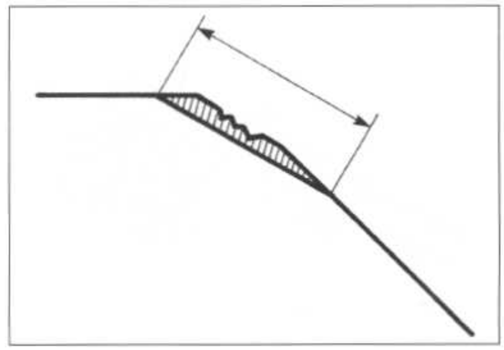
INITIAL SEAT CUT

- 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.

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

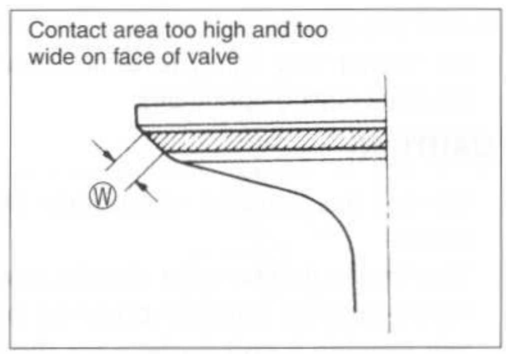


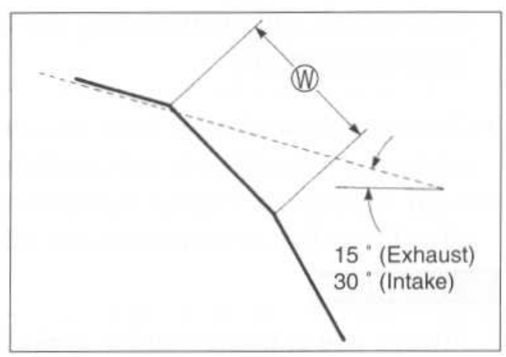
- If the valve seat is pitted or burned, use the 45 ° cutter to condition the seat some more.



TOP NARROWING CUT

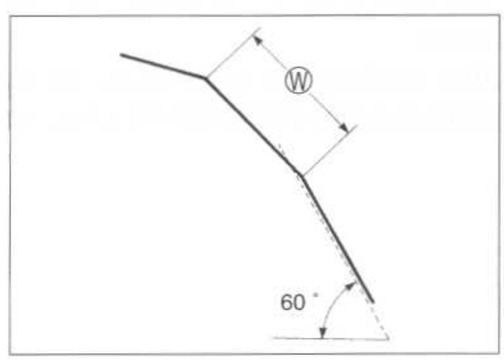
- If the contact area Ⓦ is too high on the valve, or if it is too wide, use the 15 ° (for the exhaust side) and the 30 ° (for the intake side) to lower and narrow the contact area.





BOTTOM NARROWING CUT

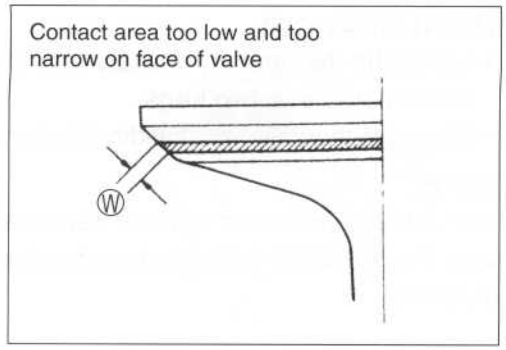
- If the contact area Ⓦ is too wide or too low, use the 60 ° cutter to narrow and raise the contact area.

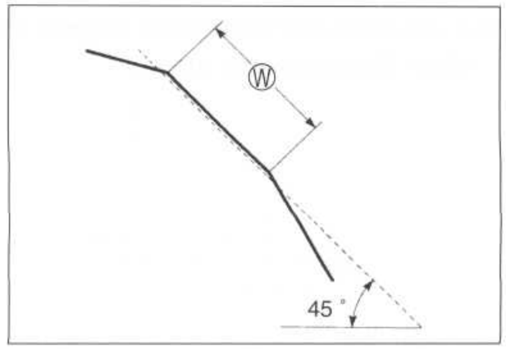


FINAL SEAT CUT

- 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.



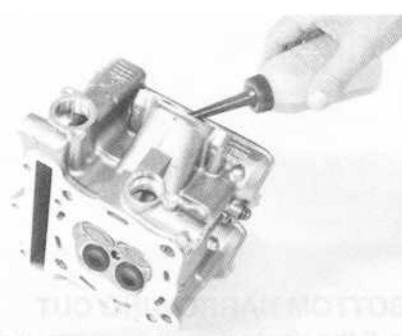


- After the desired seat position and width is achieved, use the 45 ° cutter very lightly to clean up any burrs caused by the previous cutting operations.

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.

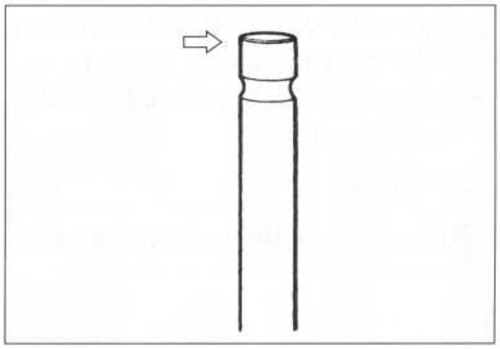
- Clean and assemble the head and valve components. Fill the intake and exhaust ports with gasoline to check for leaks.
- If any leaks occur, inspect the valve seat and face for burrs or other things that could prevent the valve from sealing.



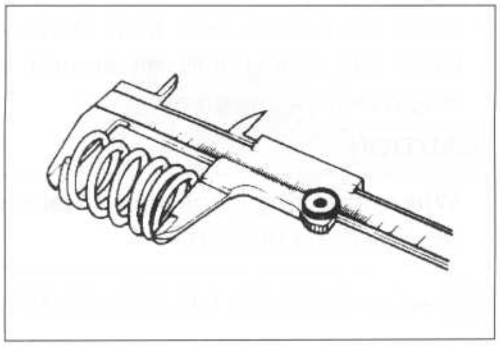
⚠ WARNING

Always use extreme caution when handling gasoline.

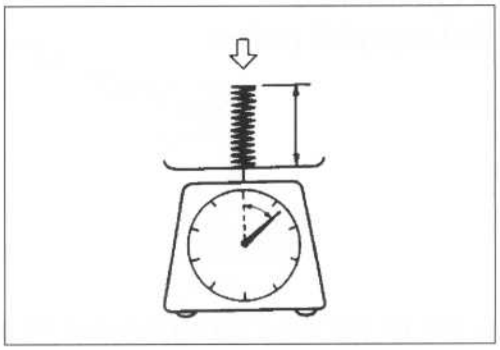
NOTE:
After servicing the valve seats, be sure to check the tappet clearance after the cylinder head has been reinstalled. (☞2-9)



VALVE STEM END CONDITION
- Check the valve stem end face for pitting and wear.



VALVE SPRING
The force of the coil springs keeps the valve seat tight. Weakened springs 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.



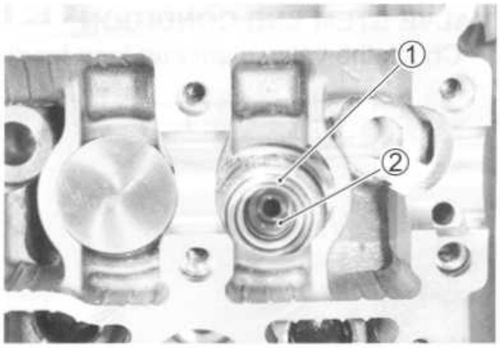
DATA **Valve spring free length (IN & EX)**
Service limit: INNER : 36.8 mm (1.45 in)
OUTER: 39.8 mm (1.57 in)

DATA **Valve spring tension**
Standard: (IN & EX) INNER : 4.1 – 4.7 kgf/29.9 mm (9.03 – 10.36 lbs/1.18 in)
OUTER: 16.6 – 19.2 kgf/33.4 mm (36.60 – 42.33 lbs/1.31 in)

TOOL **09900-20102: Vernier calipers**

VALVE AND VALVE SPRING INSTALLATION

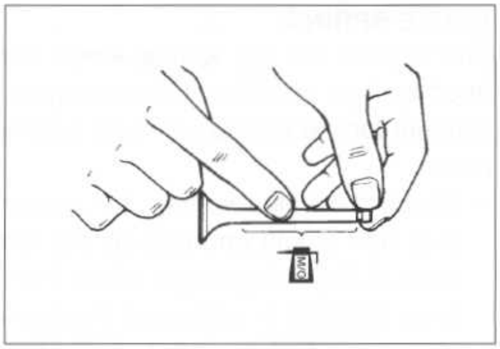
- Install the valve spring seats ①.
- Apply engine oil to each oil seal ②.
- Install the oil seal.



CAUTION

Do not reuse the removed oil seals.

- Insert the valves, with their stems coated with MOLYBDENUM OIL SOLUTION all around and along the full stem length without any break.



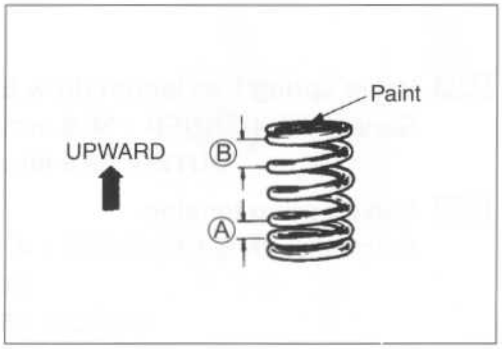
CAUTION

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

MOLYBDENUM OIL SOLUTION

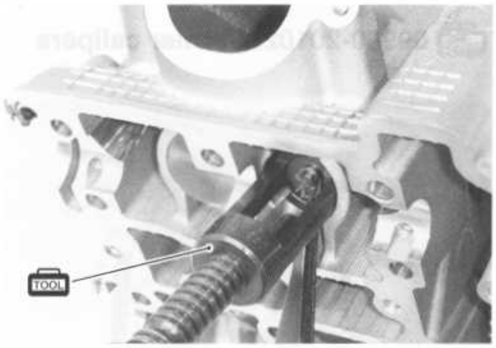
- Install the valve springs with the small-pitch portion Ⓐ facing cylinder head.

Ⓑ: Large-pitch portion



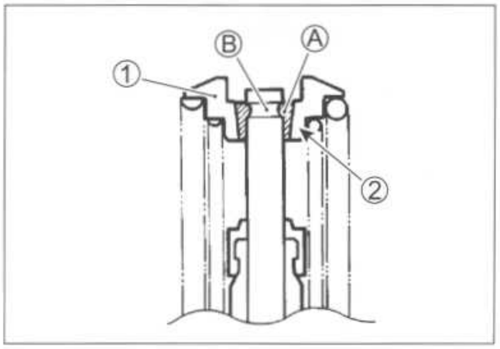
- Put on the valve spring retainer ①, and using the valve lifter, press down the springs, fit the cotter halves to the stem end, and release the lifter to allow the cotter ② to wedge in between retainer and stem. Be sure that the rounded lip Ⓐ of the cotter fits snugly into the groove Ⓑ in the stem end.

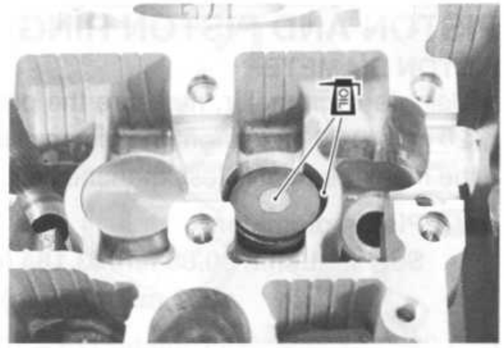
09916-14510: Valve lifter
09916-14521: Valve lifter attachment
09916-84511: Tweezers



CAUTION

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





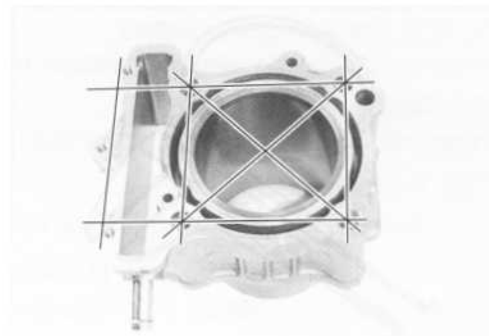
- Install the tappet shim and the tappet to their original position.

NOTE:

* *Before installing them, apply engine oil to the shims and tappets all over, also to the tappet chambers on the cylinder head.*
* *When seating the tappet shim, be sure the figure printed surface faces the tappet.*

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)

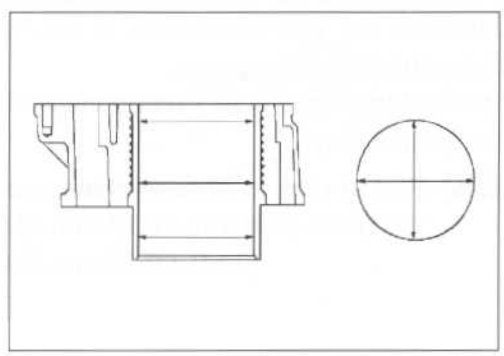
TOOL **09900-20803: Thickness gauge**

CYLINDER BORE

Inspect the cylinder wall for any scratches, nicks or other damage. Measure the cylinder bore diameter at six places.

DATA **Cylinder bore**
Standard: 81.000 – 81.015 mm (3.1890 – 3.1896 in)

TOOL **09900-20508: Cylinder gauge set**



PISTON AND PISTON RING

PISTON DIAMETER

- Using a micrometer, measure the piston outside diameter at 20 mm (0.79 in) Ⓐ from the piston skirt end.

If the measurement is less than the limit, replace the piston.

DATA **Piston diameter**
Service Limit: 80.88 mm (3.184 in)
at 20 mm (0.79 in) from the skirt end

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

PISTON-TO CYLINDER CLEARANCE

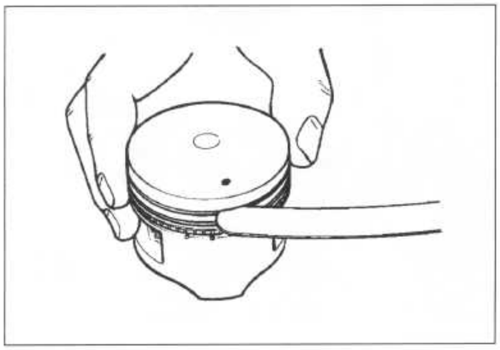
As a result of the previous measurement, if the piston-to-cylinder clearance exceeds the service limit, rebore the cylinder and use an oversize piston or replace both the cylinder and piston.

DATA **Piston-to-cylinder clearance**
Standard: 0.055 – 0.065 mm (0.0022 – 0.0026 in)

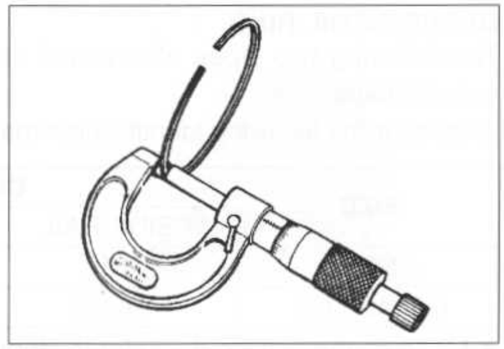
PISTON-RING-TO-GROOVE CLEARANCE

Measure the side clearances of the 1st and 2nd piston rings using the thickness gauge.

If any of the clearances exceed the limit, replace both the piston and piston rings.



DATA **Piston-ring-to-groove clearance**
Service Limit (1st) : 0.18 mm (0.0071 in)
(2nd) : 0.15 mm (0.0059 in)

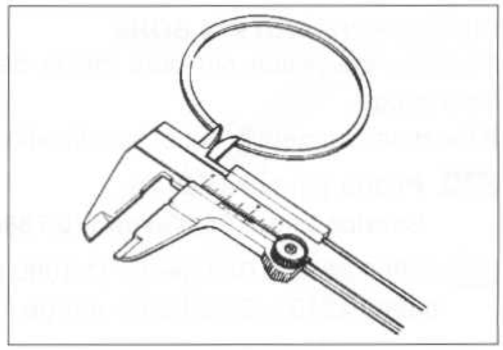


DATA Piston ring groove width
Standard (1st): 1.21 – 1.23 mm (0.0476 – 0.0484 in)
(2nd): 1.01 – 1.03 mm (0.0398 – 0.0406 in)
(Oil): 2.01 – 2.03 mm (0.0791 – 0.0799 in)

DATA Piston ring thickness
Standard (1st): 1.17 – 1.19 mm (0.0461 – 0.0469 in)
(2nd): 0.97 – 0.99 mm (0.0382 – 0.0390 in)

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

PISTON RING FREE END GAP AND PISTON RING END GAP



- Measure the piston ring free end gap using vernier calipers.
- Next, fit the piston ring squarely into the cylinder and measure the piston ring end gap using the thickness gauge.

If any of the measurements exceed the service limit, replace the piston ring with a new one.

DATA Piston ring free end gap
Service Limit (1st): 7.6 mm (0.30 in)
(2nd): 8.8 mm (0.35 in)

TOOL 09900-20102: Vernier calipers

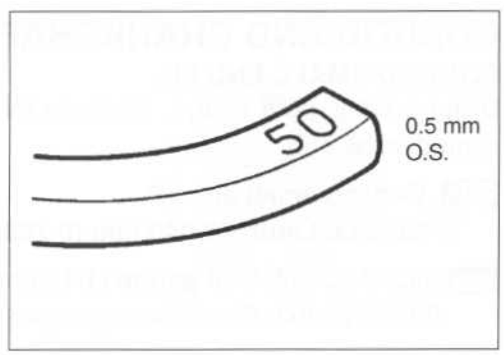
DATA Piston ring end gap
Service Limit (1st): 0.70 mm (0.028 in)
(2nd): 0.70 mm (0.028 in)

TOOL 09900-20803: Thickness gauge

OVERSIZE PISTON RING

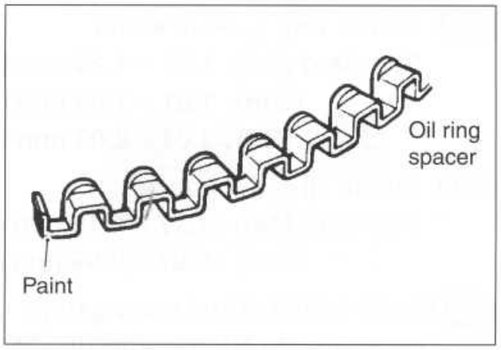
The following two types of oversize piston rings are used. They bear the following identification numbers.

SIZE	1st	2nd
STD	NIL	NIL
0.5 mm O.S.	50	50



OVERSIZE OIL RING

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

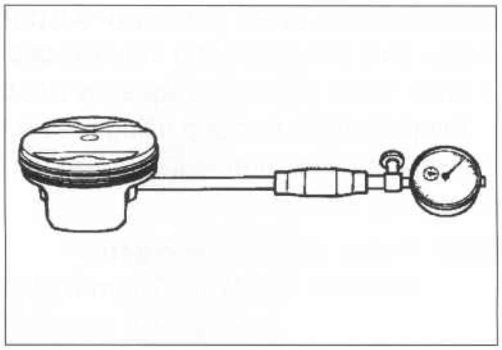


SIZE	COLOR	
	SIDE RAIL	SPACER
STD	NIL	RED
0.5 mm O.S.	BLUE	BLUE

- Measure the outside diameter to identify the size.

PISTON PINS AND PIN BORE

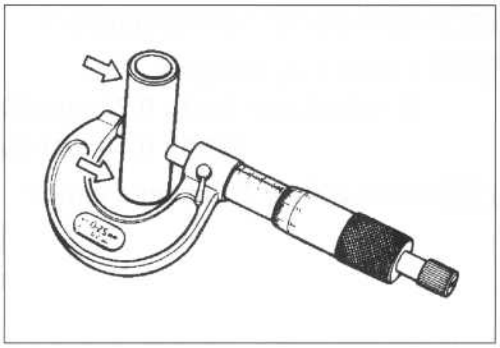
Measure the piston pin bore inside diameter using the small bore gauge.
If the measurement is out of specifications replace the piston.



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

TOOL **09900-20602: Dial gauge (1/1000 mm)**
09900-22403: Small bore gauge (18 – 35 mm)

Measure the piston pin outside diameter at three positions using the micrometer.
If any of the measurements are out of specification, replace the piston pin.



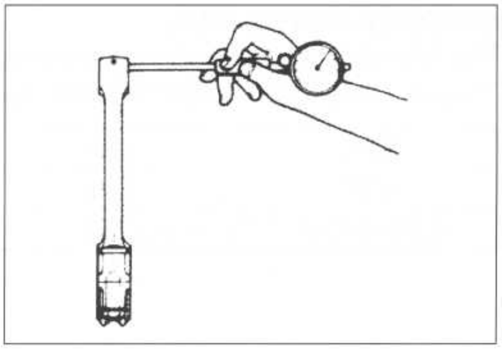
DATA **Piston pin O.D.**
Service Limit: 19.980 mm (0.7866 in)

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

CONROD AND CRANKSHAFT

CONROD SMALL END I.D.

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



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

TOOL **09900-20602: Dial gauge (1/1000 mm, 1 mm)**
09900-22403: Small bore gauge (18 – 35 mm)

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

CONROD BIG END SIDE CLEARANCE

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

DATA **Conrod big end side clearance**
Service Limit: 0.50 mm (0.020 in)

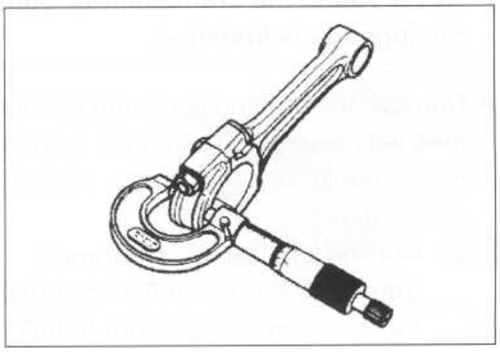
TOOL **09900-20803: Thickness gauge**

CONROD BIG END WIDTH

Check the conrod big end width.

DATA **Conrod big end width**
Standard: 20.95 – 21.00 mm (0.825 – 0.827 in)

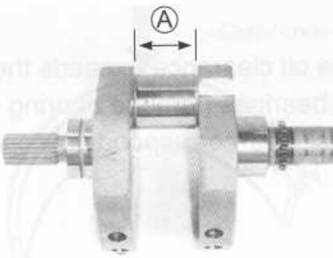
TOOL **09900-20205: Micrometer (0 – 25 mm)**



CRANK PIN WIDTH

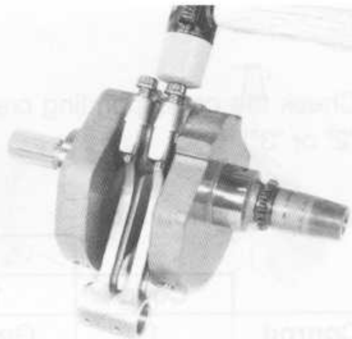
Check the crank pin width Ⓐ.

DATA **Crank pin width**
Standard: 42.17 – 42.22 mm (1.660 – 1.662 in)



CONROD REMOVAL AND BEARING INSPECTION

- Loosen the bearing cap bolts, and tap the bearing cap bolt lightly with plastic hammer to remove the bearing cap.



- Remove the conrods, 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.

CONROD-CRANK PIN BEARING SELECTION

- Place the plastigauge axially along the crank pin, avoiding the oil hole, at TDC or BDC side as shown.

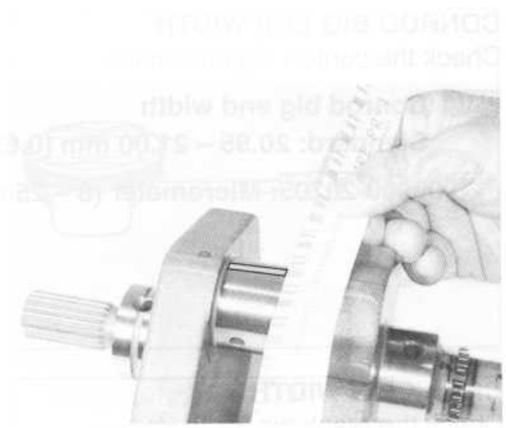
TOOL **09900-22301: Plastigauge**
09900-22302: Plastigauge

- Tighten the conrod cap bolts to the specified torque, in two stages. (☞3-60)

CAUTION

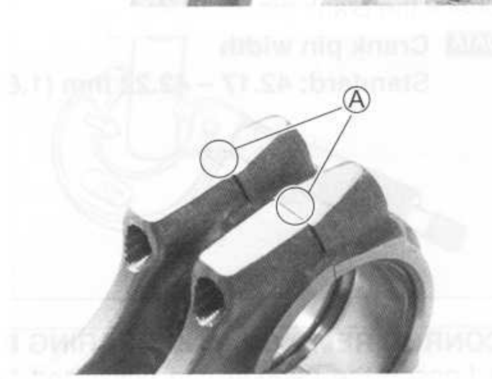
Never rotate the crankshaft or conrod when a piece of plastigauge is installed.

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

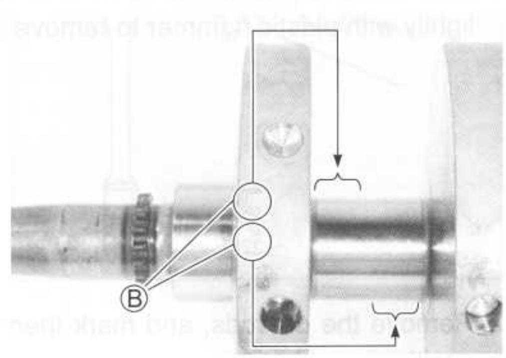


DATA **Conrod big end oil clearance**
Standard: 0.032 – 0.056 mm (0.0013 – 0.0022 in)
Service Limit: 0.080 mm (0.0031 in)

- If the oil clearance exceeds the service limit, select the specified bearings from the bearing selection table.
- Check the corresponding conrod I.D. code numbers ("1" or "2") Ⓐ.



- Check the corresponding crank pin O.D. code numbers ("1", "2" or "3") Ⓑ.



Bearing selection table

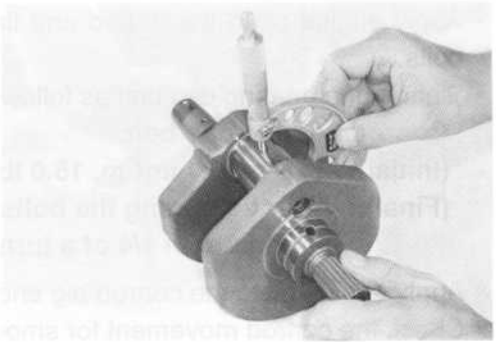
		Crank pin O.D. Ⓑ		
	Code	1	2	3
Conrod I.D. Ⓐ	1	Green	Black	Brown
	2	Black	Brown	Yellow

Conrod I.D.

Code	I.D. specification
1	41.000 – 41.008 mm (1.6142 – 1.6145 in)
2	41.008 – 41.016 mm (1.6145 – 1.6148 in)

Crank pin O.D.

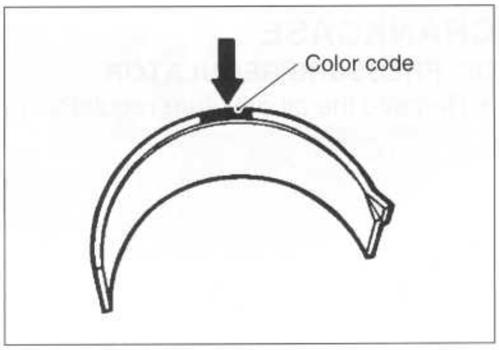
Code	O.D. specification
1	37.992 – 38.000 mm (1.4957 – 1.4961 in)
2	37.984 – 37.992 mm (1.4954 – 1.4957 in)
3	37.976 – 37.984 mm (1.4951 – 1.4954 in)



09900-20202: Micrometer (25 – 50 mm)

Bearing thickness

Color (Part No.)	Thickness
Green (12164 – 46E01-0A0)	1.480 – 1.484 mm (0.0583 – 0.0584 in)
Black (12164 – 46E01-0B0)	1.484 – 1.488 mm (0.0584 – 0.0586 in)
Brown (12164 – 46E01-0C0)	1.488 – 1.492 mm (0.0586 – 0.0587 in)
Yellow (12164 – 46E01-0D0)	1.492 – 1.496 mm (0.0587 – 0.0589 in)

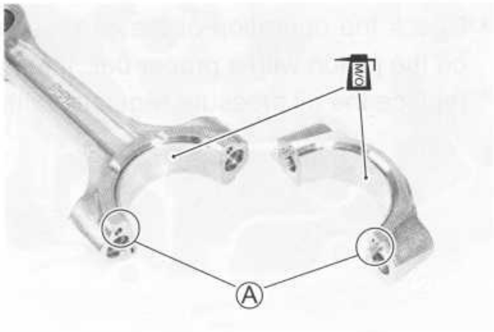


CAUTION

The bearings must be replaced as a set.

CONROD AND BEARING REASSEMBLY

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



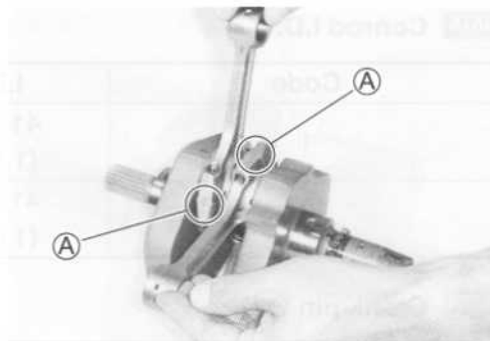
CAUTION

Be sure to clean the conrod big end.

- Apply MOLYBDENUM OIL SOLUTION to the crank pin and bearing surface.

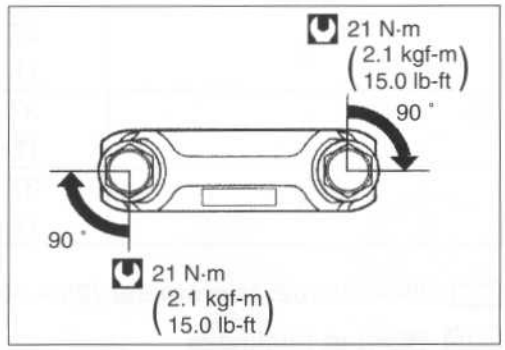
MOLYBDENUM OIL SOLUTION

- When fitting the conrods on the crankshaft, make sure that I.D. codes Ⓐ of the conrods face each cylinder intake valve sides.



- Apply engine oil to the thread and flange of the bearing cap bolts.
- Tighten the bearing cap bolt as following two steps.

Conrod bearing cap bolt
(Initial): 21 N·m (2.1 kgf-m, 15.0 lb-ft)
(Final) : After tightening the bolts to the above torque, tighten them 1/4 of a turn (90 °).

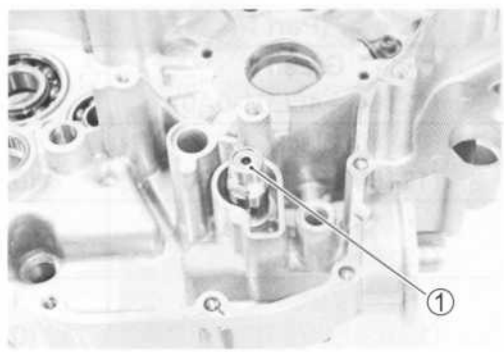


- Apply engine oil to the conrod big end side surfaces.
- Check the conrod movement for smooth turning.

CRANKCASE

OIL PRESSURE REGULATOR

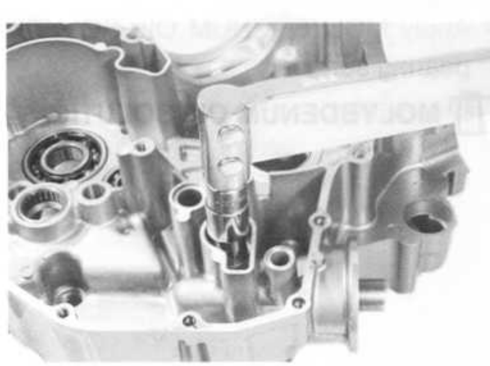
- Remove the oil pressure regulator ①.



- Check the operation of the oil pressure regulator by pushing on the piston with a proper bar. If the piston does not operate, replace the oil pressure regulator with a new one.

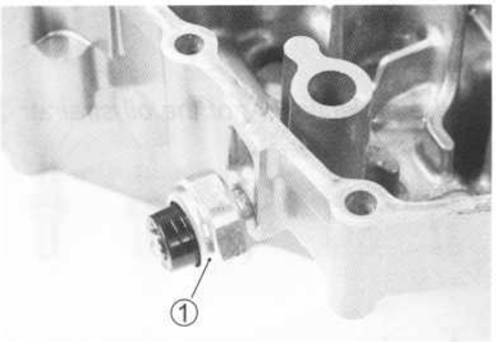
- Tighten the oil pressure regulator to the specified torque.

Oil pressure regulator: 27 N·m (2.7 kgf-m, 19.5 lb-ft)



OIL PRESSURE SWITCH

- Remove the oil pressure switch ①.
- Inspect the oil pressure switch. (☞8-36)

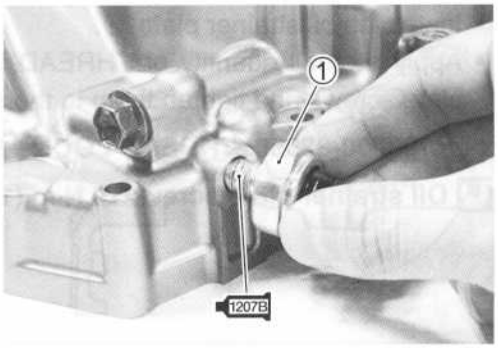


- Apply SUZUKI BOND to the thread part of the oil pressure switch ① and tighten it to the specified torque.

1207B 99104-31140: SUZUKI BOND "1207B" (USA)
99000-31140: SUZUKI BOND "1207B" (Others)

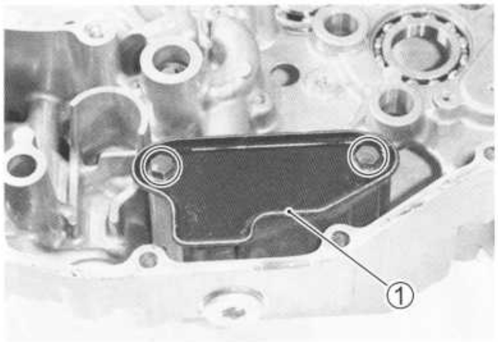
Oil pressure switch: 14 N·m (1.4 kgf-m, 10.0 lb-ft)

NOTE:
Be careful not to apply SUZUKI BOND to the hole of the thread end.

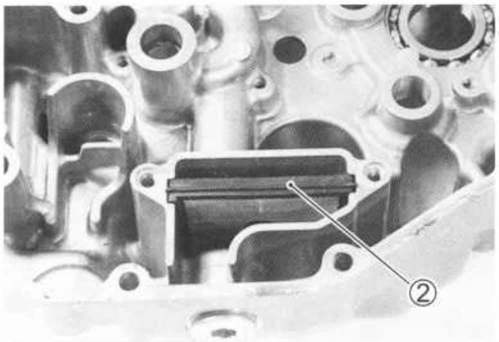


OIL STRAINER

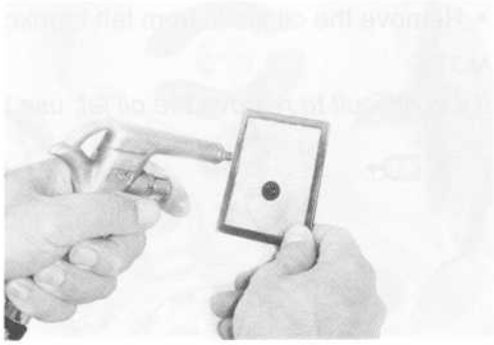
- Remove the oil strainer plate ①.



- Remove the oil strainer ②.

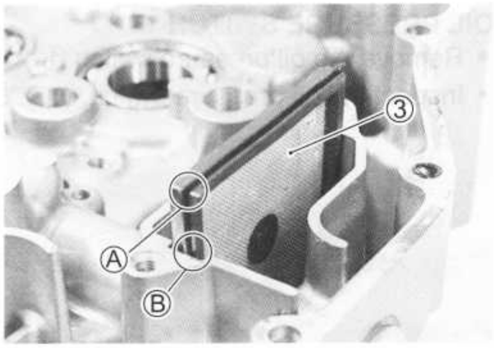


- Clean the oil strainer with a compressed air.



- Install the oil strainer ③.

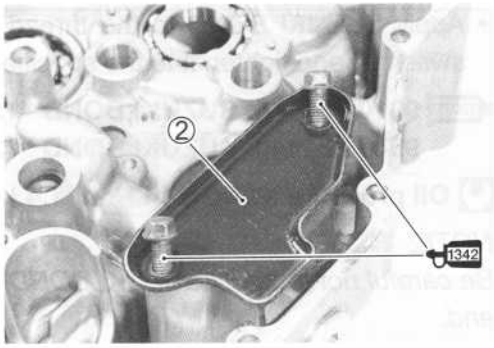
NOTE:
Fit the projection Ⓐ of the oil strainer ③ in the concave portion of the crankcase.



- Install the oil strainer plate ②.
- Apply a small quantity of THREAD LOCK to the oil strainer plate screws and tighten them to the specified torque.

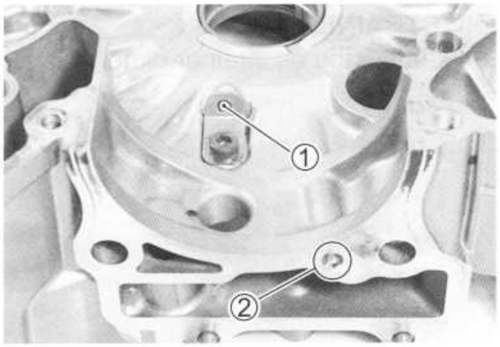
1342 99000-32050: THREAD LOCK "1342"

Oil strainer plate screw: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

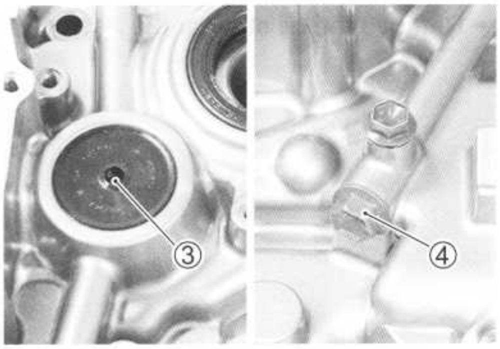


OIL JET
Removal

- Remove the oil jets ①, ② from the left and right crankcase halves.

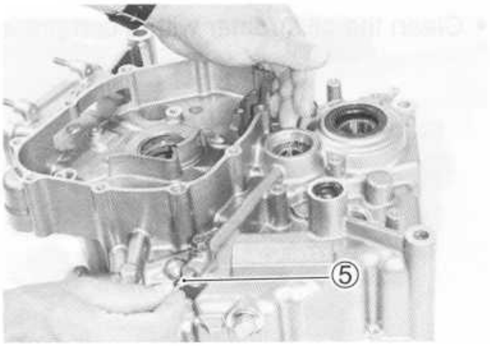


- Remove the oil seal ③ and oil gallery plug ④.



- Remove the oil jet ⑤ from left crankcase half.

NOTE:
If it is difficult to remove the oil jet, use a sting.



Inspection and cleaning

- Check the oil jets for clogging.
- If they are clogged, clean their oil passage with a proper wire and compressed air.

① Piston cooling oil jet
② Oil jet (#14) (For transmission)
③ Oil jet (#14) (For each cylinder head)

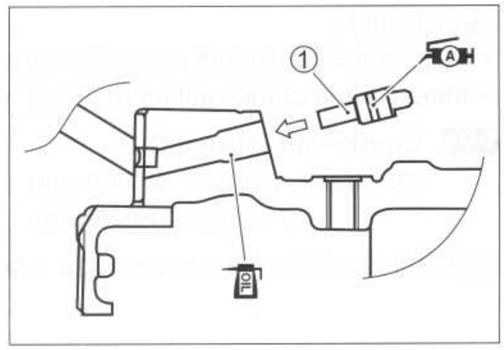
Installation

- Fit the new O-rings to each oil jets.

CAUTION

Use the new O-rings to prevent oil leakage.

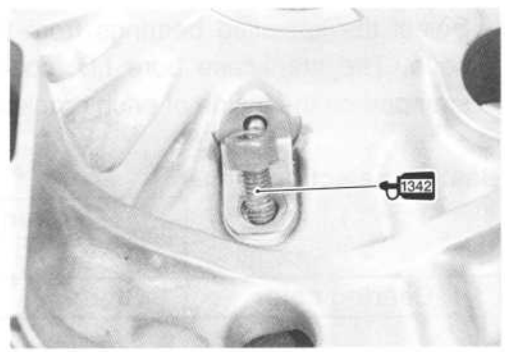
NOTE:
** Apply grease to the O-rings when installing the oil jets.*
** Apply engine oil to the oil jet holes on the crankcase.*



- Install the piston cooling oil jets ① to the left and right crankcase halves.
- Apply a small quantity of THREAD LOCK to the bolts and tighten them to the specified torque.

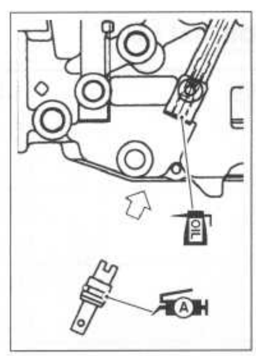
1342 99000-32050: THREAD LOCK "1342"

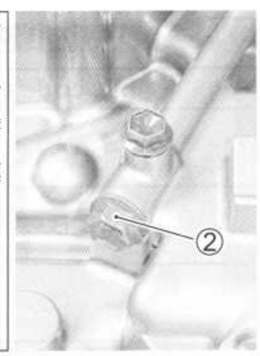
Piston cooling oil jet bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



- Push the oil jet into the left crankcase half until it stops.
- Tighten the oil gallery plug ② to the specified torque.

Oil gallery plug (M8): 18 N·m (1.8 kgf-m, 13.0 lb-ft)



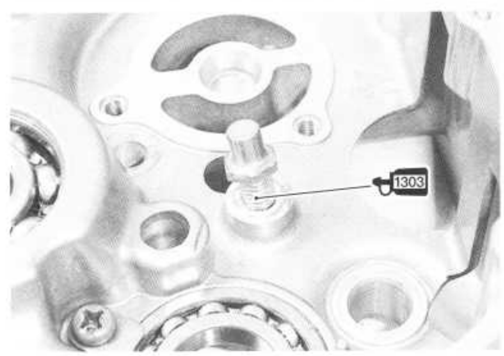


GEARSHIFT ARM STOPPER

- When installing the gearshift arm stopper bolt ①, apply a small quantity of THREAD LOCK to its thread and tighten it to the specified torque.

1303 99000-32030: THREAD LOCK SUPER "1303"

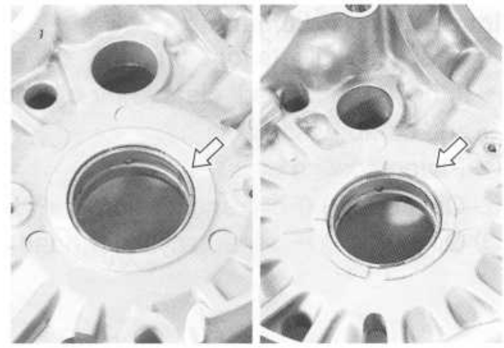
Gearshift arm stopper bolt: 19.0 N·m (1.9 kgf-m, 13.5 lb-ft)



CRANKSHAFT JOURNAL BEARING

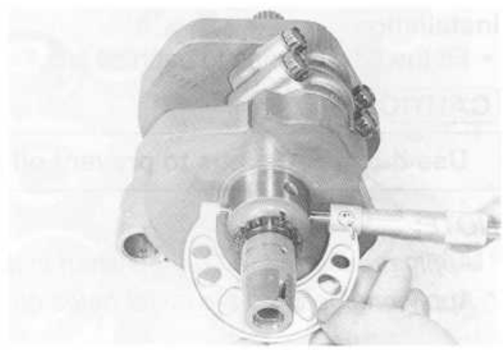
INSPECTION

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



SELECTION

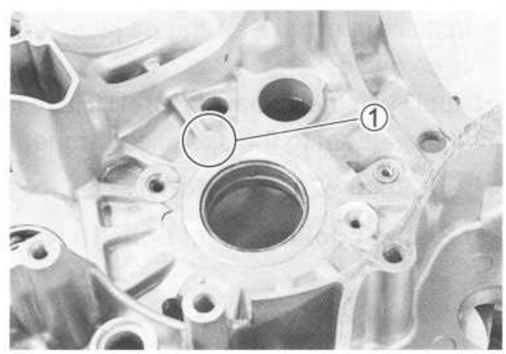
- Inspect the crankshaft journal for any damage.
- Measure the crankshaft journal O.D. with the special tool.



DATA **Crankshaft journal O.D.**
Standard: 41.985 – 42.000 mm
(1.6529 – 1.6535 in)

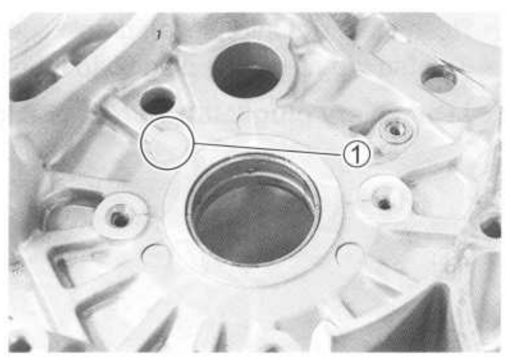
TOOL **09900-20202: Micrometer (25 – 50 mm)**

- Select the specified bearings from the crankcase bore I.D. code. The crankcase bore I.D. code ① "A", "B" or "C", is stamped on the inside of each crankcase half.



Bearing selection table

	Crankcase I.D. ①		
	A	B	C
Bearing color	Green	Black	Brown

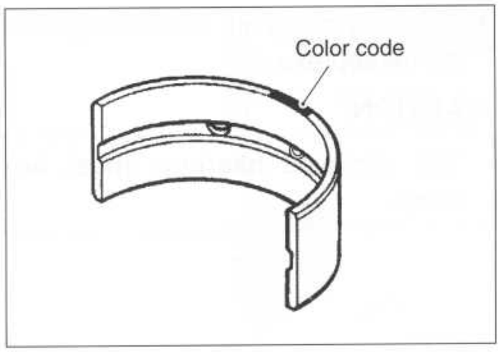


DATA **Crank shaft journal I.D.**

I.D. code ①	I.D. specification
A	46.000 – 46.006 mm (1.8110 – 1.8113 in)
B	46.006 – 46.012 mm (1.8113 – 1.8115 in)
C	46.012 – 46.018 mm (1.8115 – 1.8117 in)

DATA Bearing thickness

Color (Part No.)	Thickness
Green (12229 – 19F10-0A0)	1.993 – 1.996 mm (0.0785 – 0.0786 in)
Black (12229 – 19F10-0B0)	1.996 – 1.999 mm (0.0786 – 0.0787 in)
Brown (12229 – 19F10-0C0)	1.999 – 2.002 mm (0.0787 – 0.0788 in)



CAUTION

Bearing must be replaced as a set.

REPLACEMENT

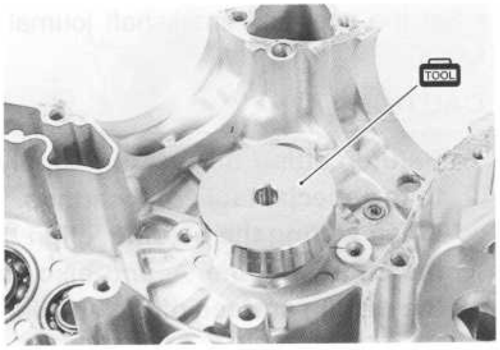
Use the special tool to replace the crankshaft journal bearings. The replacement procedure is as follows.

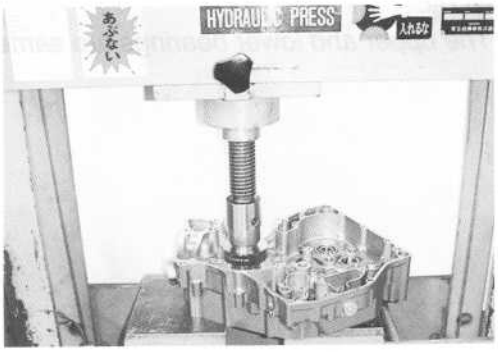
- Set the special tool as shown to remove the crankshaft journal bearings with the special tool.

TOOL 09913-60221: Journal bearing remover/installer

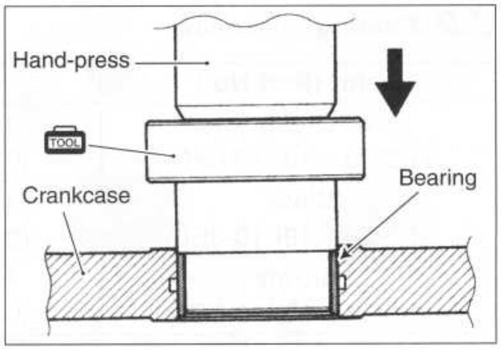
NOTE:

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





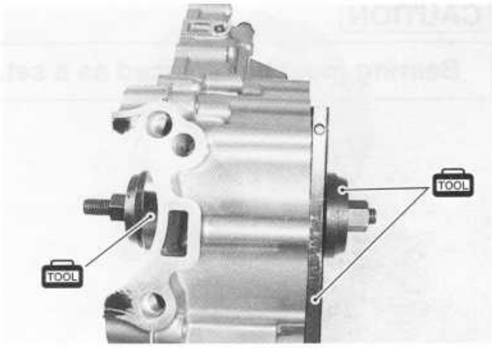
* Gradually press out the bearing with the special tool by using the hand-press.



CAUTION

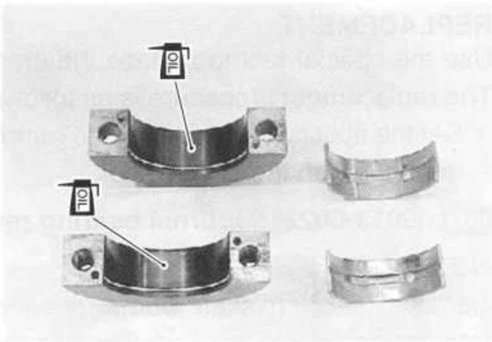
The removed bearings must be replaced with new ones.

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.



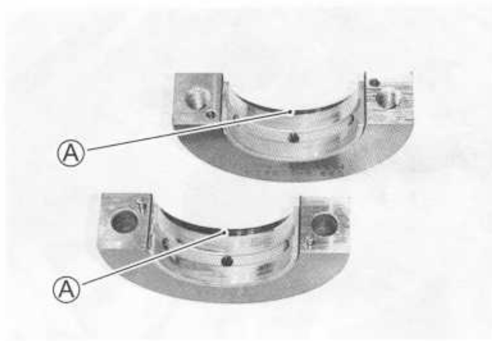
09924-84510: Bearing installer set
09910-20116: Conrod holder
09913-60221: Journal bearing remover/installer

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

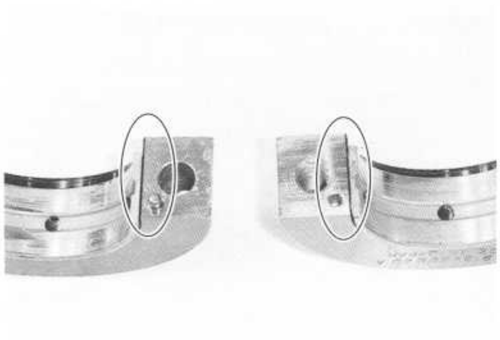


CAUTION

* **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 end with the mating surface of the special tool.**



NOTE:
The upper and lower bearings are same.

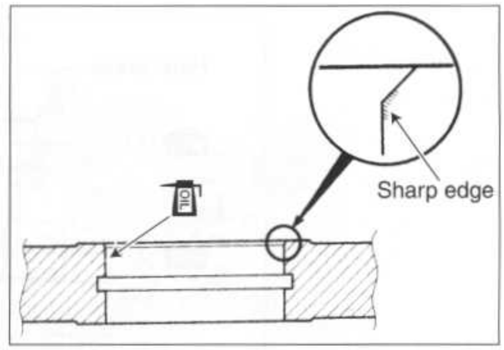


- Tighten the special tool bolts to the specified torque.

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

CAUTION

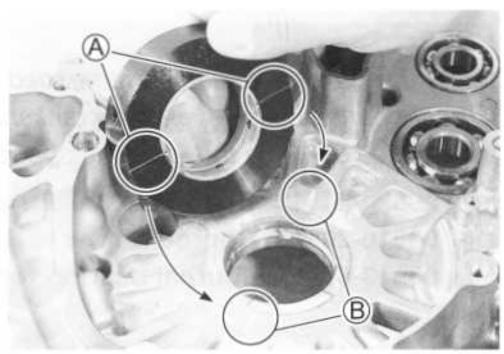
Before installing the bearings, lightly shave off the sharp edge part of the crankcase chamfer by using an oilstone and wash the crankcase bore with enough engine oil.



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

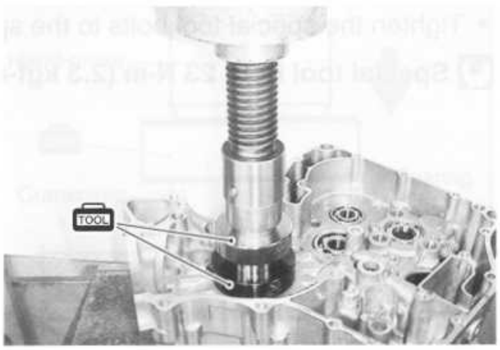
CAUTION

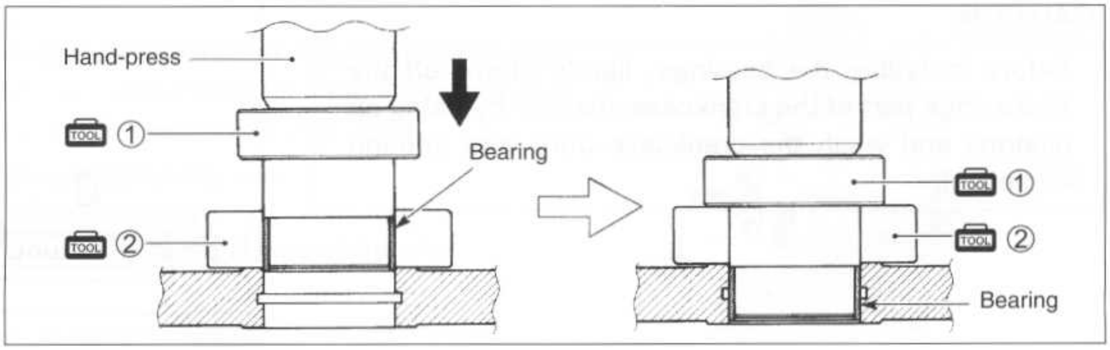
*** Be sure the bearing protruded side Ⓐ faces the crankcase bore.**
*** Align the bearing/special tool mating surface with the line Ⓑ on the crankcase.**



NOTE:
Install the bearing from inside to outside of each crankcase halves.

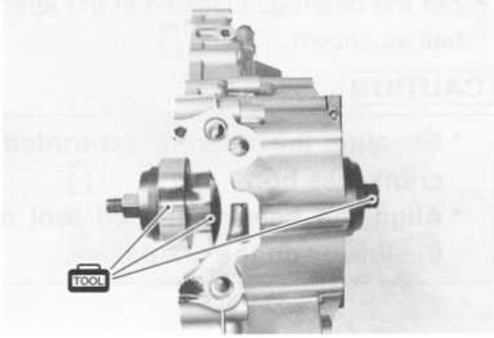
- Apply enough engine oil to the special tool and the bearings and then set the special tool carefully.
- Gradually press in the bearing into the main journal bore by using the hand-press until the special tool ① contacts the special tool ②.



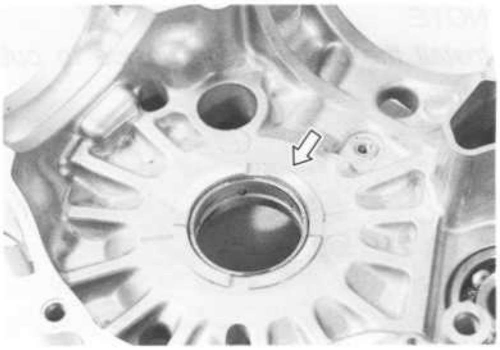


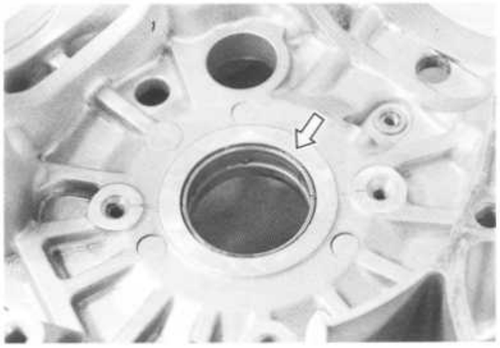
NOTE:
Using the hand-press is recommended to install the crankshaft journal bearings. However, the crankshaft journal bearings can be installed by using the following special tools.

TOOL **09924-84510: Bearing installer set**
09910-20116: Conrod holder
09913-60221: Journal bearing remover/installer



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

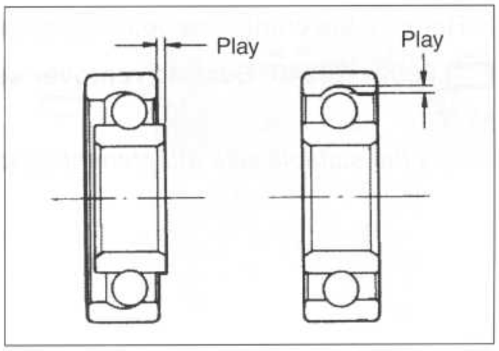




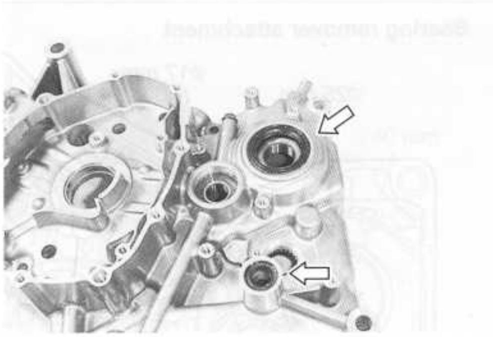
CRANKCASE BEARING AND OIL SEAL

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 with new ones, if there is anything unusual.



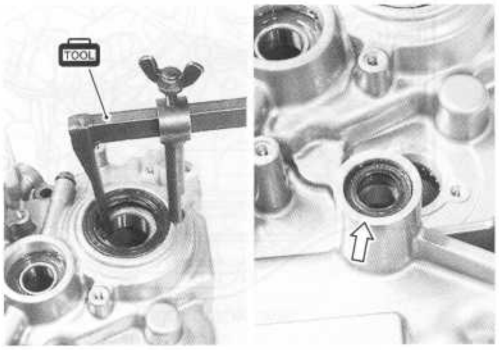
Inspect the oil seals for any damage.



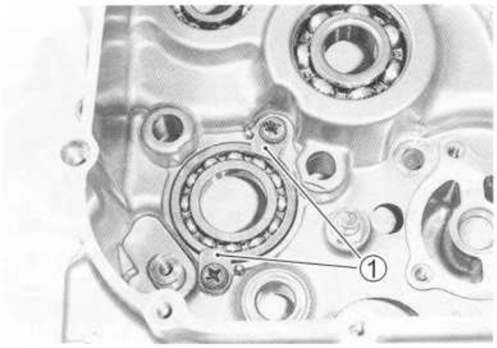
REMOVAL

- Remove the oil seals using the special tool or a suitable bar.

TOOL **09913-50121: Oil seal remover**



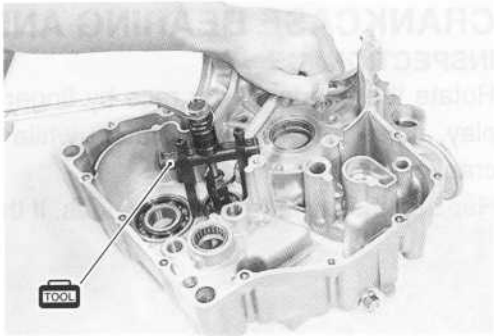
- Remove the bearing retainers ①.

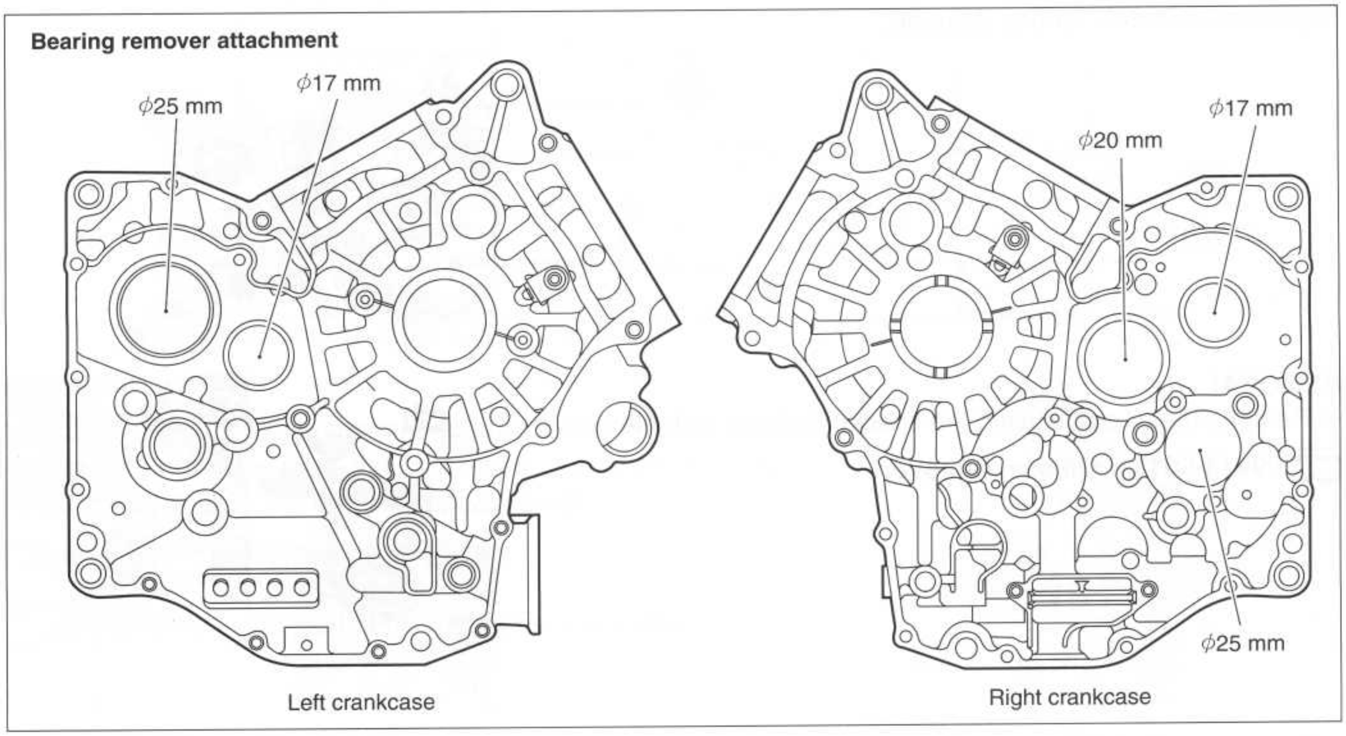


- Remove the crankcase bearings by using the special tool.

09921-20240: Bearing remover set

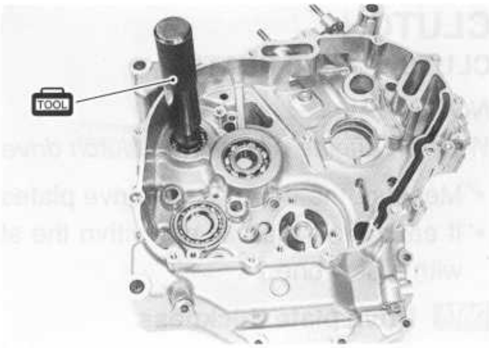
NOTE:
Select the suitable size attachment as following illustration.





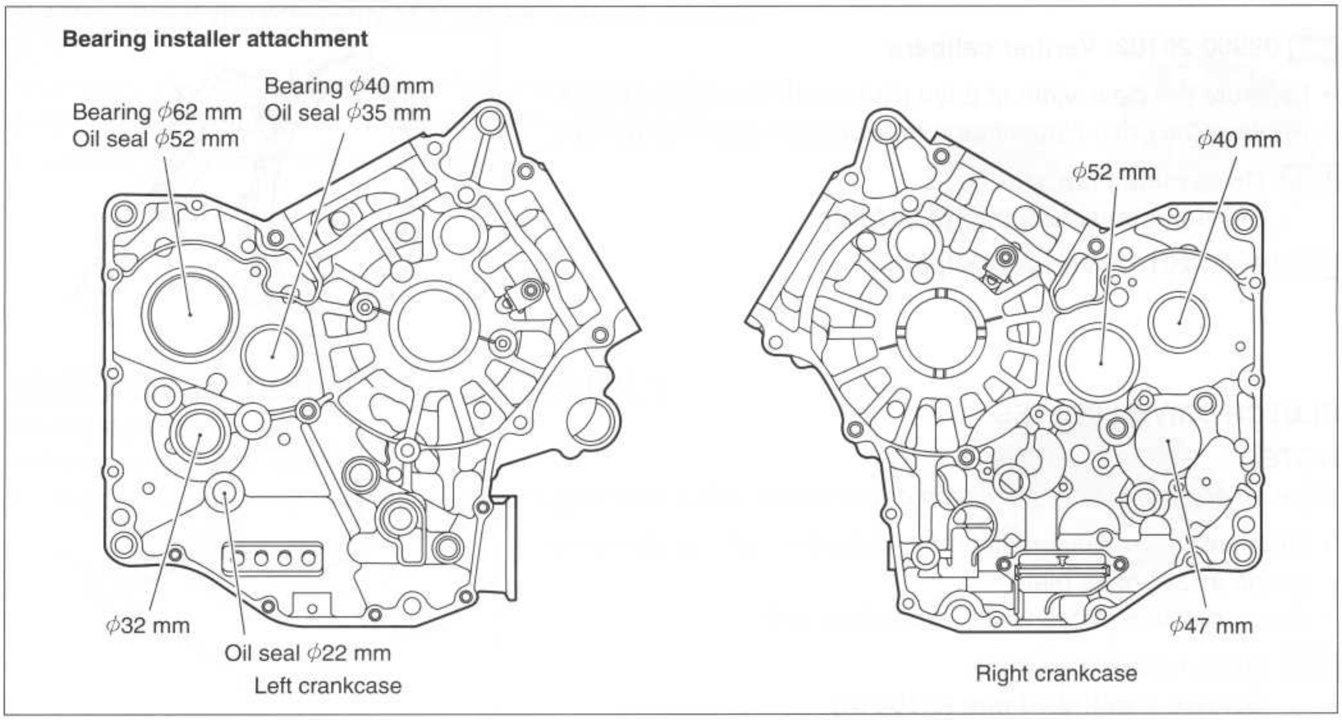
INSTALLATION

- Install the crankcase bearings and oil seals using the special tool.



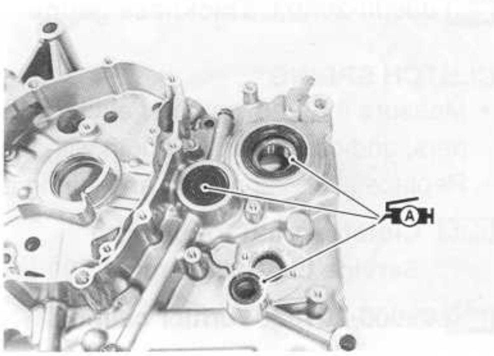
TOOL 09913-70210: Bearing installer set

NOTE:
Select the suitable size attachment as following illustration.



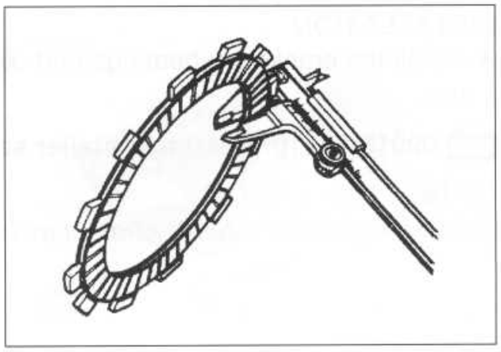
- Apply SUZUKI SUPER GREASE to the oil seal lip.

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



CLUTCH

CLUTCH DRIVE PLATES



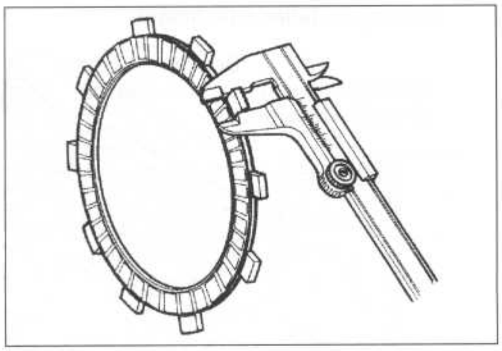
NOTE:

Wipe off engine oil from the clutch drive 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 **Drive plate thickness**
Standard: 2.92 – 3.08 mm (0.115 – 0.121 in)

TOOL **09900-20102: Vernier calipers**

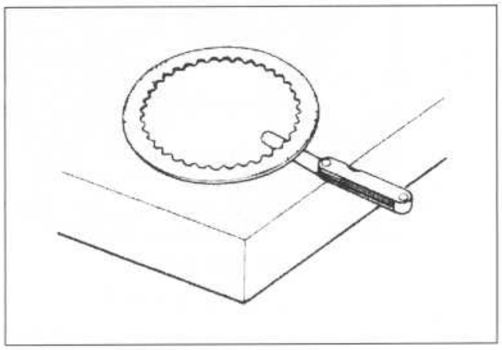


- Measure the claw width of drive plates with a vernier calipers.
- Replace the drive plates found to have worn down to the limit.

DATA **Drive plate claw width**
Service Limit: 12.9 mm (0.507 in)

TOOL **09900-20102: Vernier calipers**

CLUTCH DRIVEN PLATES



NOTE:

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

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

DATA **Driven plate distortion**
Service Limit: 0.10 mm (0.004 in)

TOOL **09900-20803: Thickness gauge**

CLUTCH SPRING

- Measure the free length of each coil spring with a vernier calipers, and compare the length with the specified limit.
- Replace all the springs if any spring is not within the limit.

DATA **Clutch spring free length**
Service Limit: 50.5 mm (1.99 in)

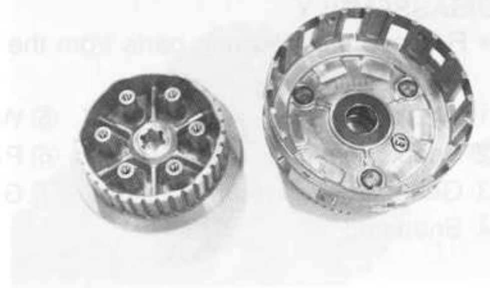
TOOL **09900-20102: Vernier calipers**

CLUTCH BEARING INSPECTION

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

CLUTCH SLEEVE HUB/PRIMARY DRIVEN GEAR ASSEMBLY

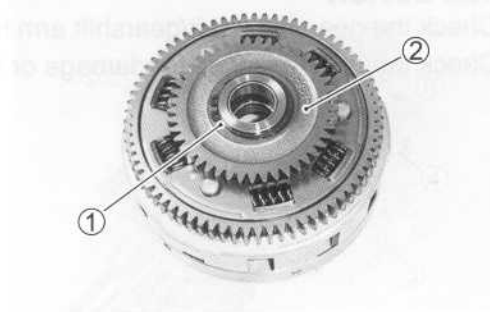
Inspect the slot of the clutch sleeve hub and primary driven gear assembly for damage or wear caused by the clutch plates.
If necessary, replace it with a new one.



PRIMARY DRIVEN GEAR ASSEMBLY

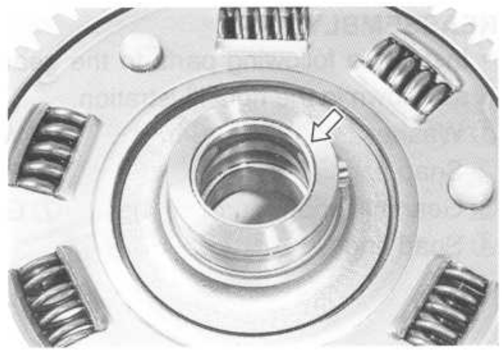
DISASSEMBLY

- Remove the snap ring ①.
- Remove the oil pump drive gear ② and pin.



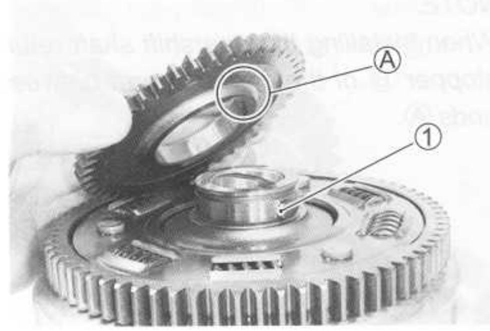
INSPECTION

Inspect the primary driven gear bushing for any damage.
Inspect the spring of primary driven gear for any damages.
If necessary, replace it with a new one.



REASSEMBLY

- Install the pin ①.
- Align the oil pump drive gear slot Ⓐ with the pin ①.



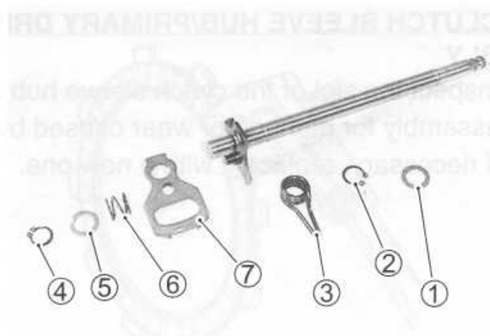
- Install the oil pump drive gear with the letter Ⓑ faced upward.
- Install the snap ring ②.

GEARSHIFT SHAFT/GEARSHIFT ARM

DISASSEMBLY

- Remove the following parts from the gearshift shaft/gearshift arm.

① Washer
② Snap ring
③ Gearshift shaft return spring
④ Snap ring
⑤ Washer
⑥ Plate return spring
⑦ Gearshift cam drive plate



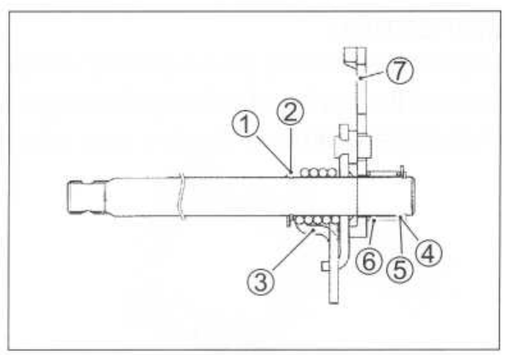
INSPECTION

Check the gearshift shaft/gearshift arm for wear or bend.
Check the return springs for damage or fatigue.

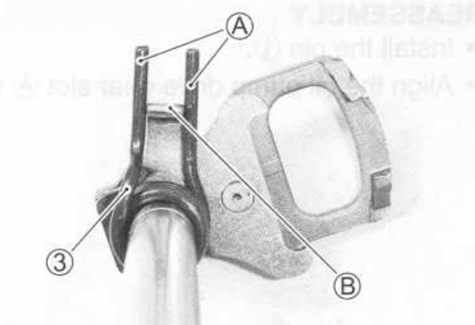
REASSEMBLY

- Install the following parts to the gearshift shaft/gearshift arm as shown in the right illustration.

① Washer
② Snap ring
③ Gearshift shaft return spring
④ Snap ring
⑤ Washer
⑥ Plate return spring
⑦ Gearshift cam drive plate



NOTE:
When installing the gearshift shaft return spring ③, position the stopper Ⓑ of the gearshift arm between the shaft return spring ends Ⓐ.



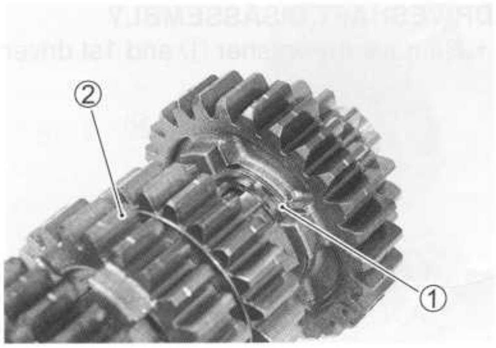
TRANSMISSION

COUNTERSHAFT DISASSEMBLY

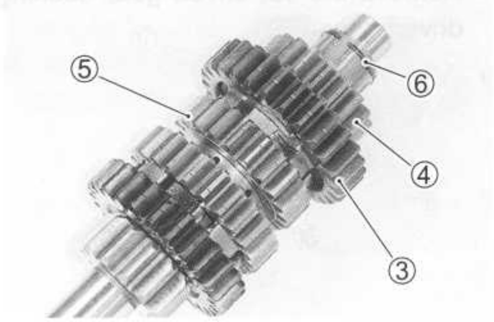
CAUTION

Be sure to identify each removed part as to its location, and lay the parts out in groups designated as "Drive" and "Driven", so that each will be restored to the original location during assembly.

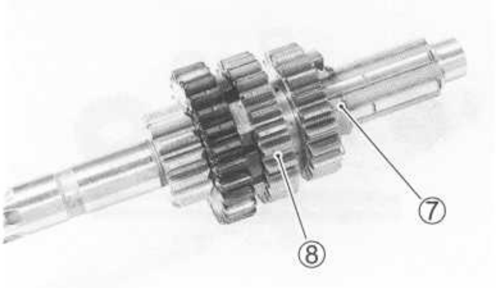
- Remove the 6th drive gear snap ring ① from its groove and slide it towards the 3rd/4th drive gears ②.



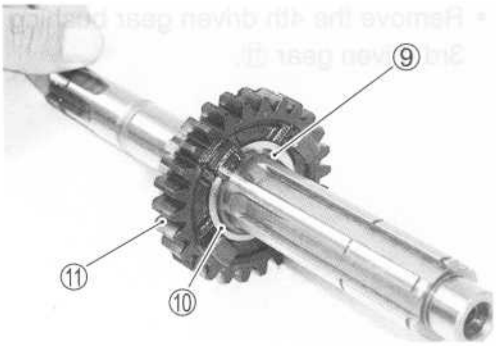
- Slide the 6th ③ and 2nd drive gears ④ toward the 3rd/4th drive gears ⑤, then remove the 2nd drive gear circlip ⑥.
- Remove the 2nd drive gear ④, 6th drive gear ③, bushing and washer.



- Remove the snap ring ⑦ and 3rd/4th drive gears ⑧.



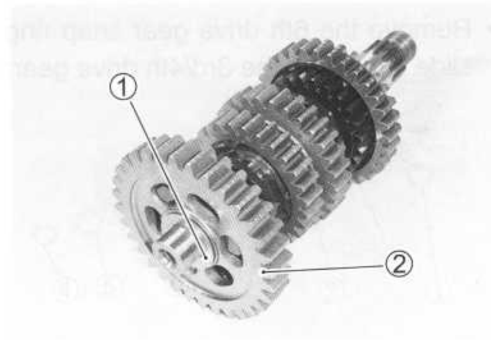
- Remove the snap ring ⑨, washer ⑩ and 5th drive gear ⑪.



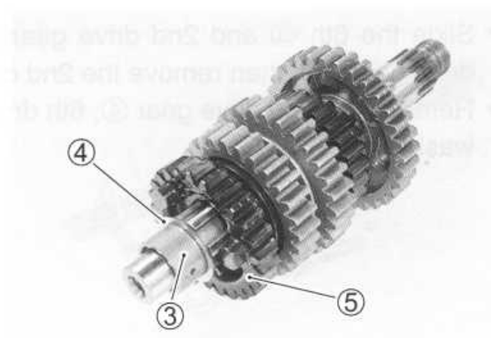
- Remove the 5th drive gear bushing ⑫.

DRIVESHAFT DISASSEMBLY

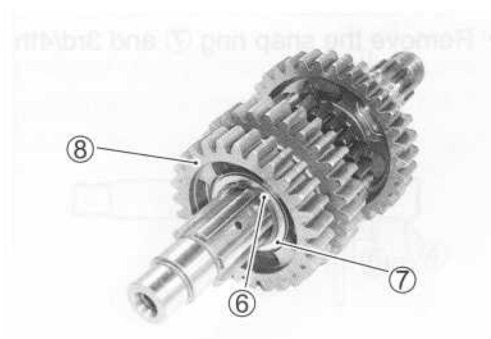
- Remove the washer ① and 1st driven gear ②.



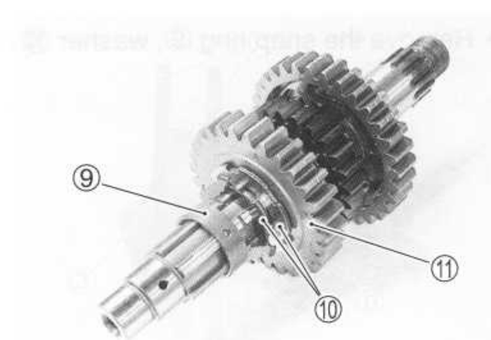
- Remove the 1st driven gear bushing ③, washer ④ and 5th driven gear ⑤.



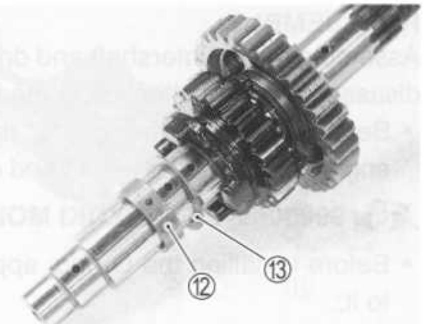
- Remove the snap ring ⑥, washer ⑦ and 4th driven gear ⑧.



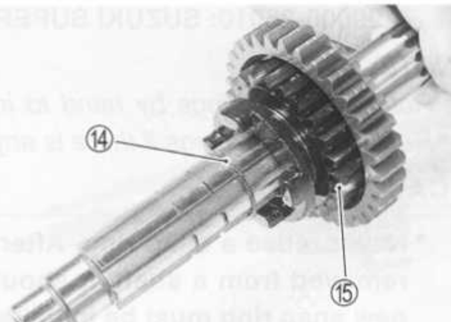
- Remove the 4th driven gear bushing ⑨, lock washers ⑩ and 3rd driven gear ⑪.



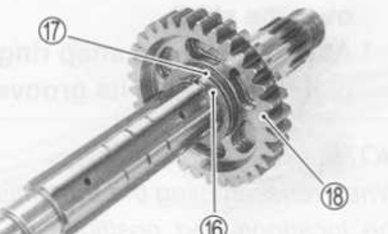
* Remove the 3rd driven gear bushing ⑫ and washer ⑬.



* Remove the snap ring ⑭ and 6th driven gear ⑮.



* Remove the snap ring ⑯ and 2nd driven gear bushing ⑰.
* Remove the 2nd driven gear ⑱.



INSPECTION

Inspect the each gear and bushing for wear and damage.

If they are found to be damaged, replace them with the new ones.

REASSEMBLY

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

- Before installing the gears, lightly coat MOLY PASTE or engine oil to the driveshaft and countershaft.

99000-25140: SUZUKI MOLY PASTE

- Before installing the O-ring, apply SUZUKI SUPER GREASE to it.

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

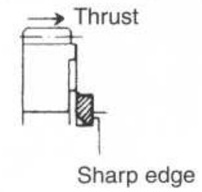
NOTE:
** Rotate the bushings by hand to inspect for smooth rotation. Replace the bushings if there is anything unusual.*

CAUTION

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

NOTE:
When reassembling the transmission, attention must be given to the locations and positions of washers and snap rings. The cross sectional view shows the correct position of the gears, bushings, washers and snap rings. *(☞3-80)*

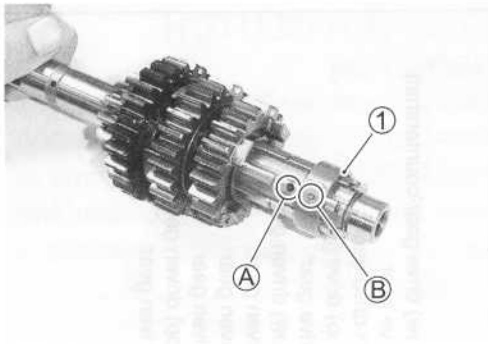
When installing a new snap ring, pay attention to the direction of the snap ring. Fit it to the side where the thrust is as shown in the illustration.

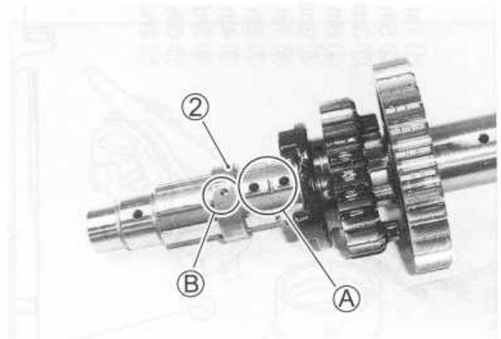


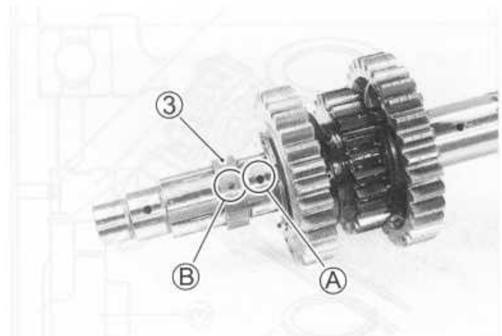
CAUTION

When installing the 6th drive gear, 3rd driven gear and 4th driven gear bushings onto the shaft, align the shaft oil hole Ⓐ with the bushing oil hole Ⓑ.

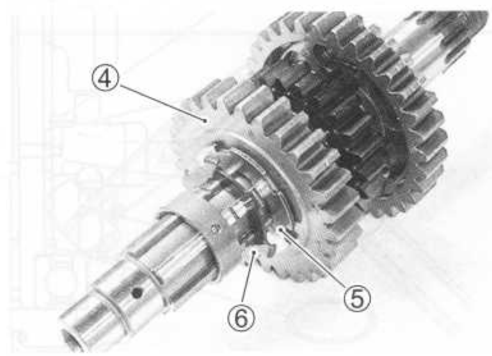
① 6th drive gear bushing
② 3rd driven gear bushing
③ 4th driven gear bushing

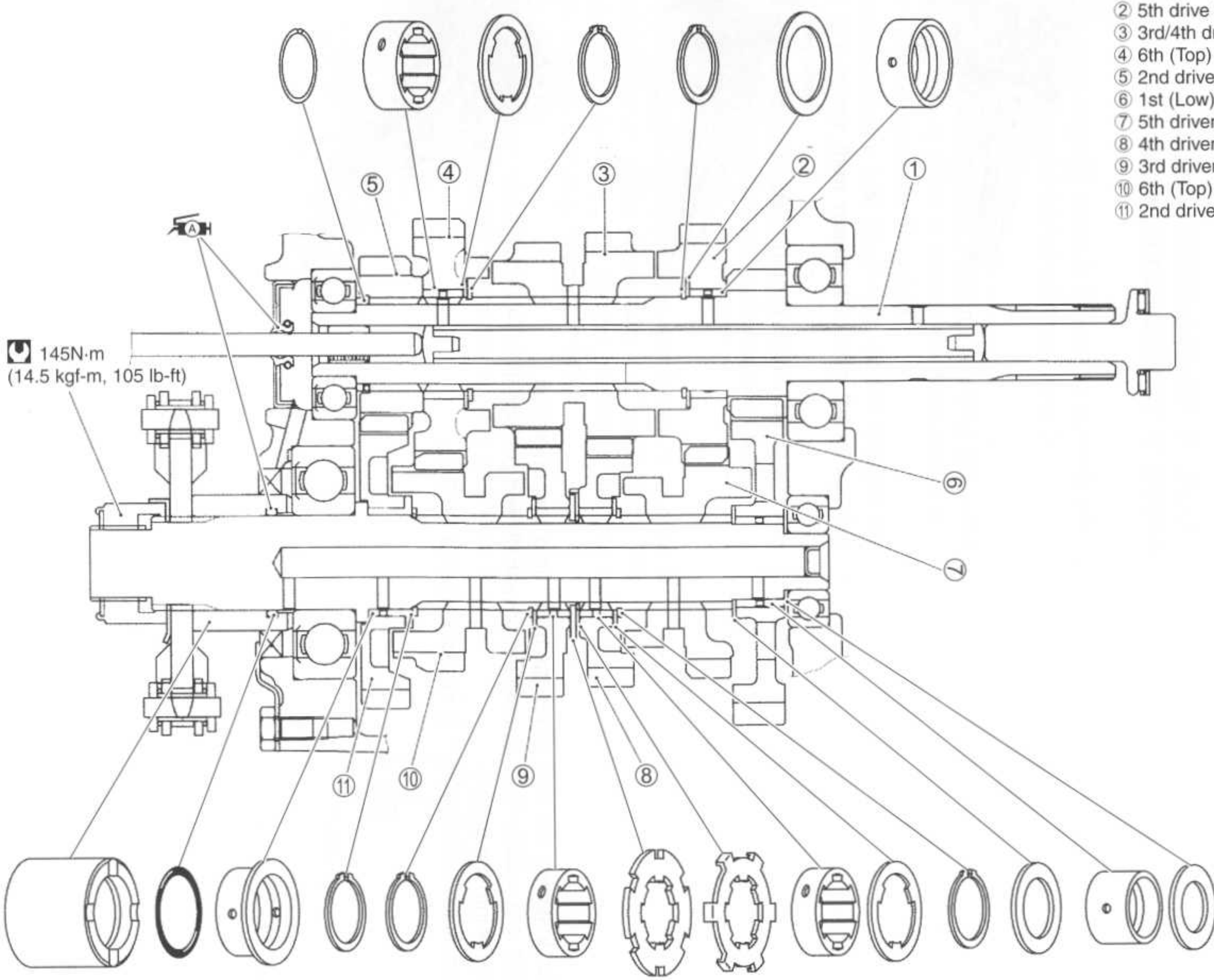






* After installing the 3rd driven gear ④ onto the driveshaft, install lock washer No.2 ⑤ onto the driveshaft, and position it so it fits into the groove.
* Then, fit lock washer No.1 ⑥ into lock washer No.2 ⑤.





① 1st (Low) drive gear/countershaft
② 5th drive gear
③ 3rd/4th drive gear
④ 6th (Top) drive gear
⑤ 2nd drive gear
⑥ 1st (Low) driven gear
⑦ 5th driven gear
⑧ 4th driven gear
⑨ 3rd driven gear
⑩ 6th (Top) driven gear
⑪ 2nd driven gear

GEARSHIFT FORK TO GROOVE CLEARANCE

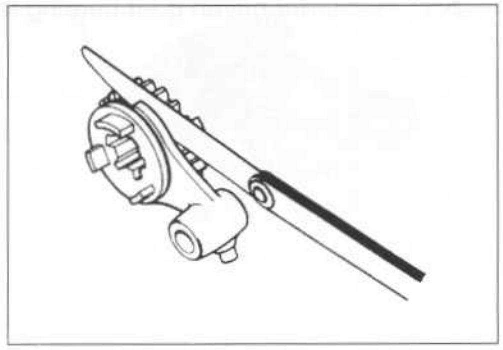
Using a thickness gauge, check the gearshift fork clearance in the groove of its gear.

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

DATA **Shift fork to groove clearance**
Service Limit: 0.50 mm (0.020 in)

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

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

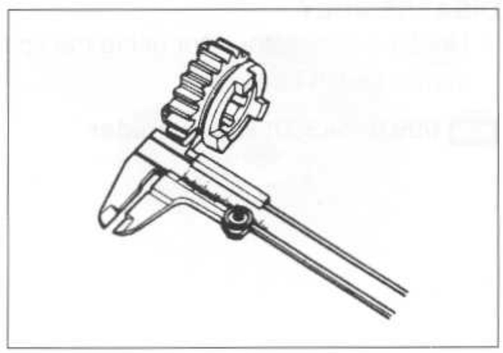


GEARSHIFT FORK GROOVE WIDTH

- Measure the gearshift fork groove width using the vernier calipers.

DATA **Shift fork groove width**
Standard: 5.5 – 5.6 mm (0.217 – 0.220 in)

TOOL **09900-20102: Vernier calipers**

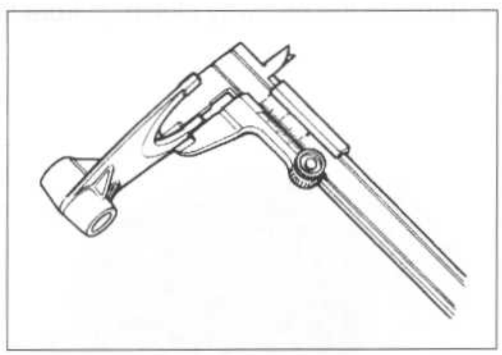


GEARSHIFT FORK THICKNESS

- Measure the gearshift fork thickness using the vernier calipers.

DATA **Shift fork thickness**
Standard: 5.3 – 5.4 mm (0.209 – 0.213 in)

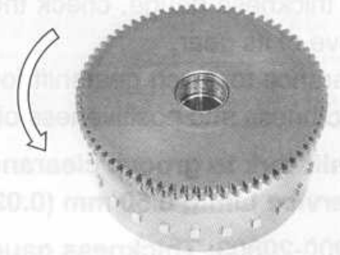
TOOL **09900-20102: Vernier calipers**



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 in one direction only. If a large resistance is felt for rotation, inspect the starter clutch or the starter clutch contacting surface on the starter driven gear for wear and damage.
If they are found to be damaged, replace them with new ones.

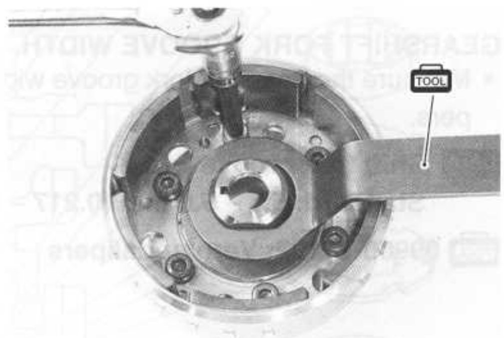


Inspect the starter driven gear bearing for any damage.

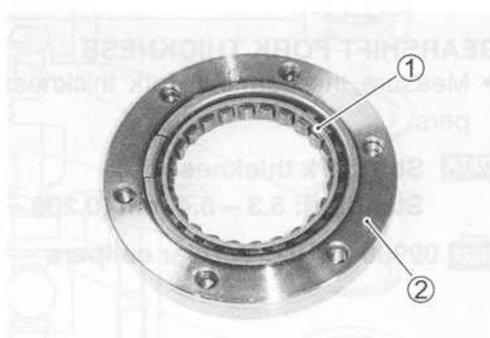
DISASSEMBLY

- Hold the generator rotor using the special tool and remove the starter clutch bolts.

TOOL 09930-44530: Rotor holder

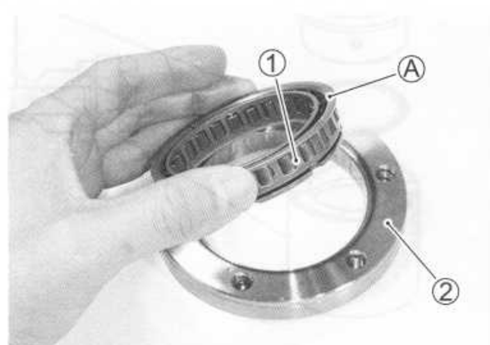


- Remove the one way clutch ① from the guide ②.

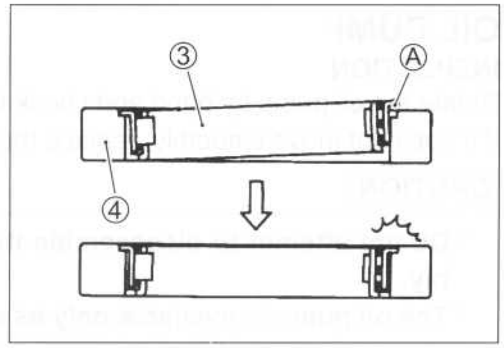


REASSEMBLY

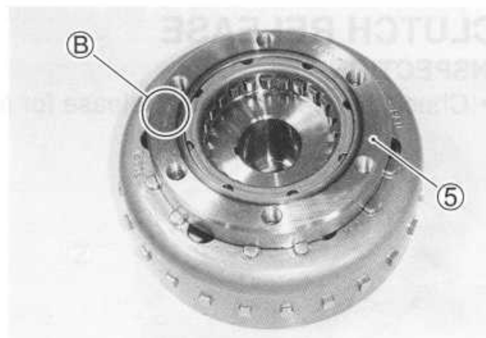
- When inserting the one-way clutch ① into the guide ②, fit the flange Ⓐ in the step of the guide ②.



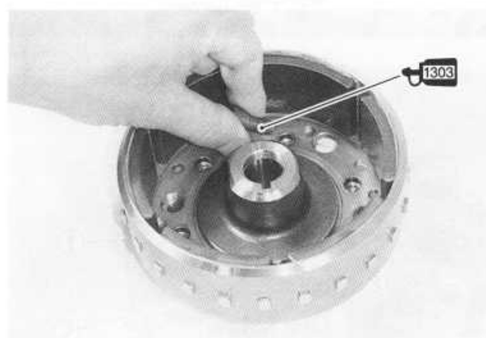
- Be sure to seat the flange Ⓐ of the one way clutch ③ to the guide ④.



- Install the guide ⑤ to the generator rotor with the arrow mark Ⓑ faced upward.



- Apply THREAD LOCK SUPER to the bolts and tighten them to the specified torque.



1303 99000-32030: THREAD LOCK SUPER "1303"

Starter clutch bolt: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

- Apply engine oil to the one way clutch.

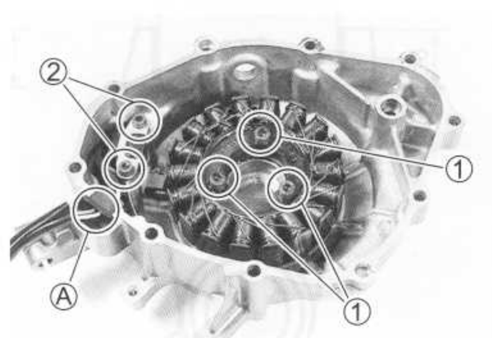
GENERATOR AND SIGNAL GENERATOR

INSPECTION

Refer to pages 8-10, 27 for generator and CKP sensor inspection.

REASSEMBLY

- When installing the generator starter set bolts ① and the CKP sensor set bolts ② tighten them to the specified torque.



Generator stator set bolt: 11 N·m (1.1 kgf-m, 8.0 lb-ft)
CKP sensor set bolt: 6.5 N·m (0.65 kgf-m, 4.7 lb-ft)

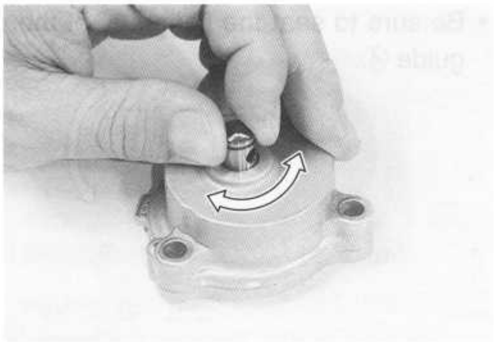
NOTE:
Be sure to install the grommet Ⓐ to the generator cover.

OIL PUMP

INSPECTION

Rotate the oil pump by hand and check that it moves smoothly.

If it does not move smoothly, replace the oil pump assembly.



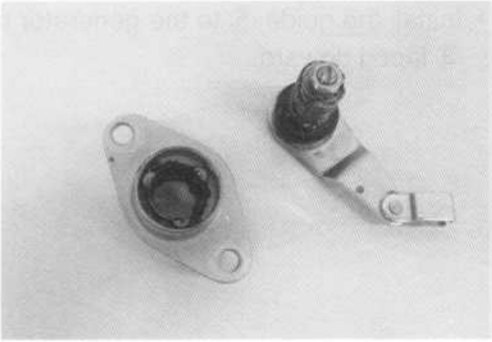
CAUTION

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

CLUTCH RELEASE

INSPECTION

- Check the teeth of clutch release for any damage and wear.



ENGINE REASSEMBLY

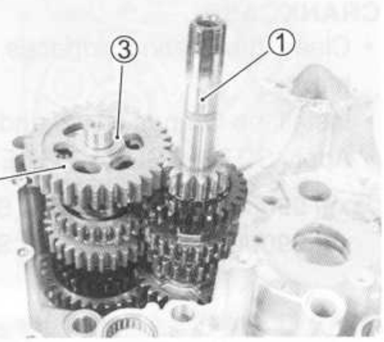
Reassemble the engine in the reverse order of disassembly.
The following steps require special attention or precautionary measures should be taken.

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

ENGINE BOTTOM SIDE

TRANSMISSION

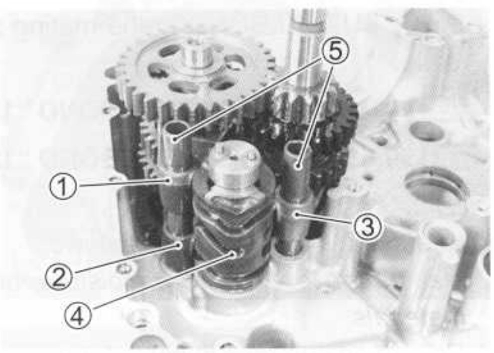
- Install the countershaft assembly ① and the driveshaft assembly ② to the left crankcase half.
- Install the washer ③ onto the driveshaft assembly ②.

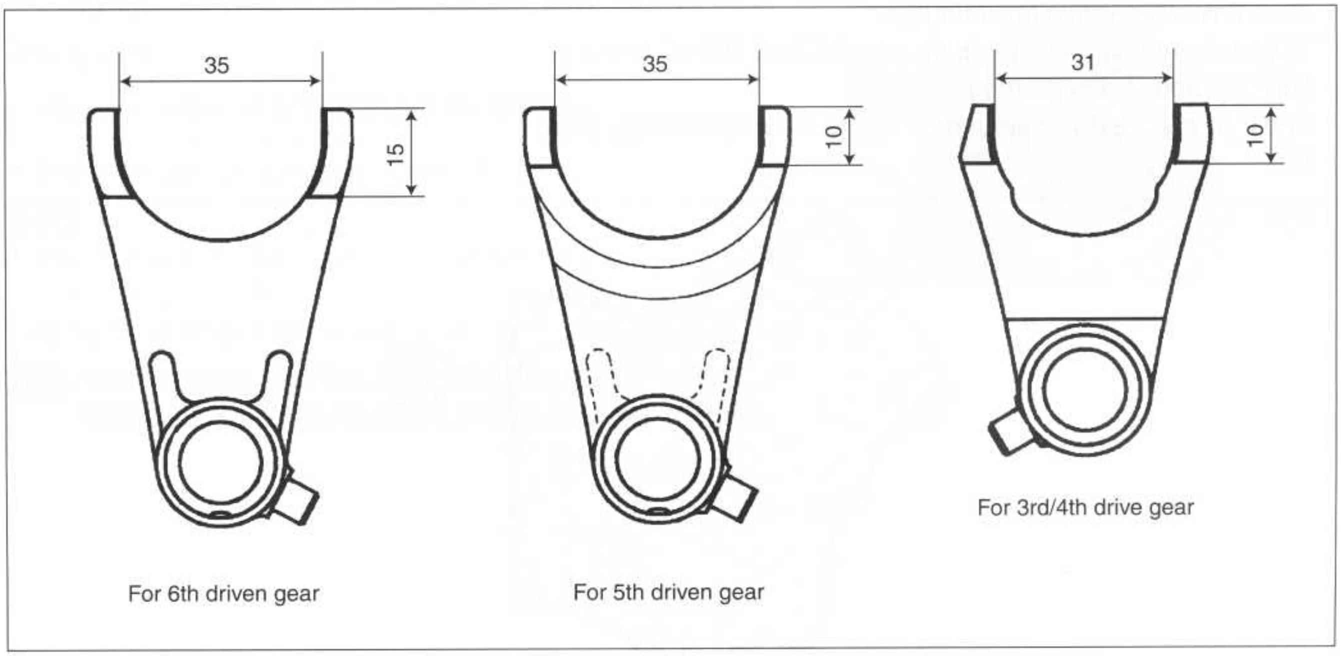


GEARSHIFT

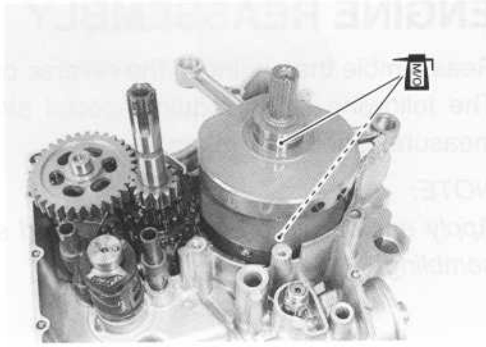
- Install the gearshift forks ①/②/③, gearshift cam ④ and gearshift fork shafts ⑤.

NOTE:
Identify the gearshift forks as follows.
① For 5th driven gear
② For 6th driven gear
③ For 3rd/4th drive gear





CRANKSHAFT



- Coat lightly MOLYBDENUM OIL SOLUTION to the crankshaft journal bearings.

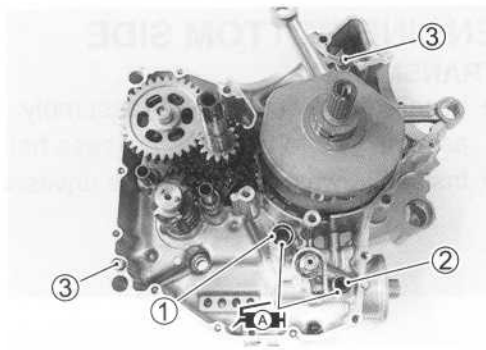
MOLYBDENUM OIL SOLUTION

- Install the crankshaft into the left crankcase half.

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.

CRANKCASE



- Clean the mating surfaces of the left and right crankcase halves.
- Install the O-rings ①, ② and dowel pins ③.
- Apply SUZUKI SUPER GREASE to the O-rings ①, ②.

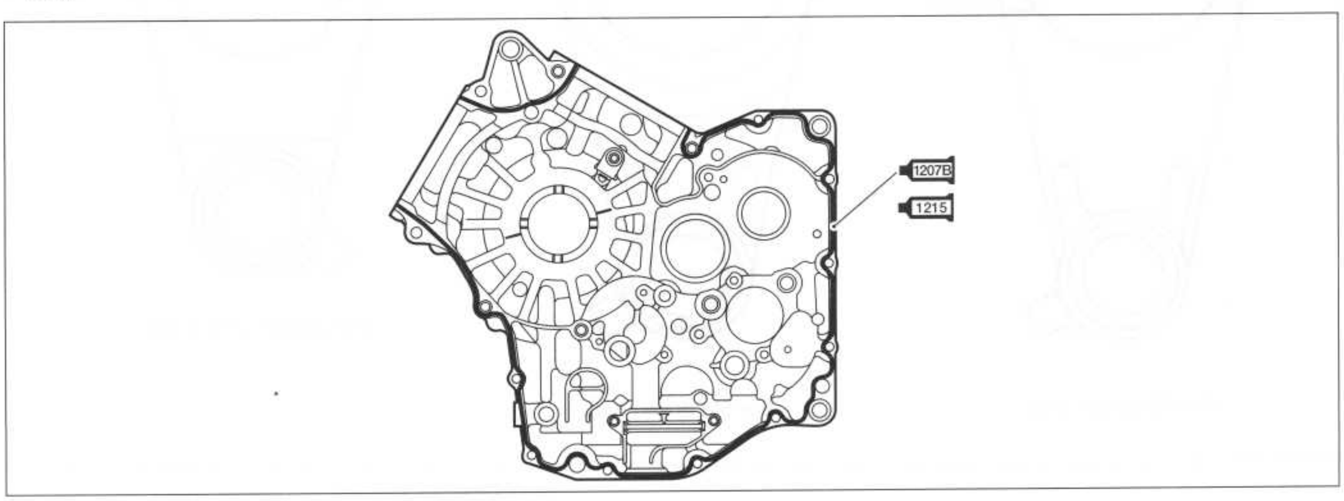
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

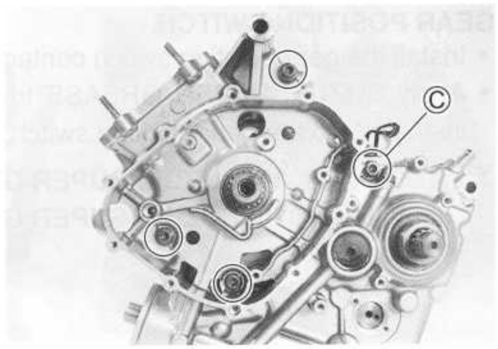
- Apply SUZUKI BOND to the mating surface of the left crankcase.

99104-31140: SUZUKI BOND "1207B" (USA)

99000-31110: SUZUKI BOND "1215" (Others)

NOTE:
Use of SUZUKI BOND 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 SUZUKI BOND to the oil hole, oil groove and bearing.*
- *Apply to distorted surfaces as it forms a comparatively thick film.*



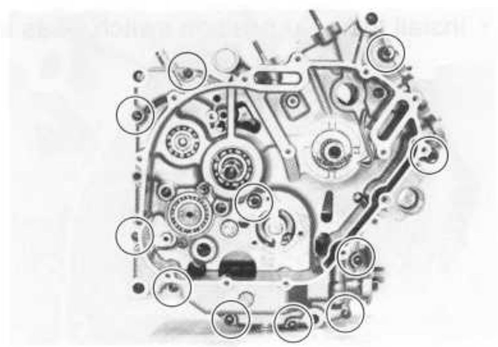


- When securing the right and left crankcase halves, tighten each bolt a little at a time to equalize the pressure. Tighten all the securing bolts to the specified torque values.

Crankcase bolt: (M8) 26 N·m (2.6 kgf-m, 19.0 lb-ft)
(M6) 11 N·m (1.1 kgf-m, 8.0 lb-ft)

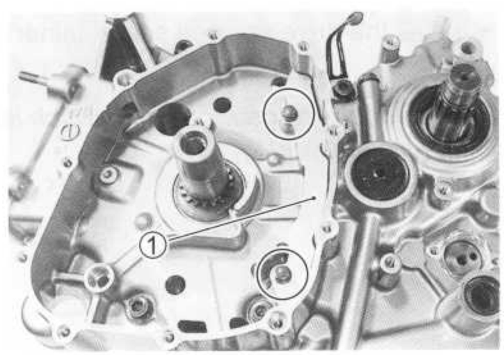
CAUTION

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, the driveshaft and the countershaft rotate smoothly.*
** Fit the clamp to the bolt Ⓒ as shown.*

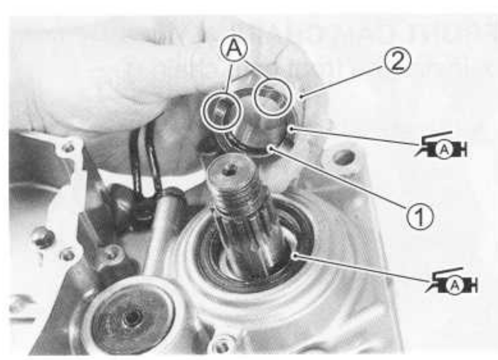
OIL PLATE



- Install the oil plate ① and the oil plate bolts tighten to the specified torque.

Oil plate bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

ENGINE SPROCKET SPACER



- Install the new O-ring ① into the engine sprocket spacer ②.

CAUTION

Use the new O-ring to prevent oil leakage.

- Install the engine sprocket spacer ②.

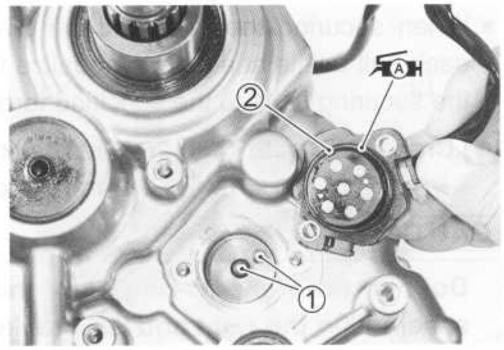
NOTE:
** The grooved Ⓐ side of the engine sprocket spacer ① must face crankcase side.*
** Apply SUZUKI SUPER GREASE to the oil seal lip and O-ring.*

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

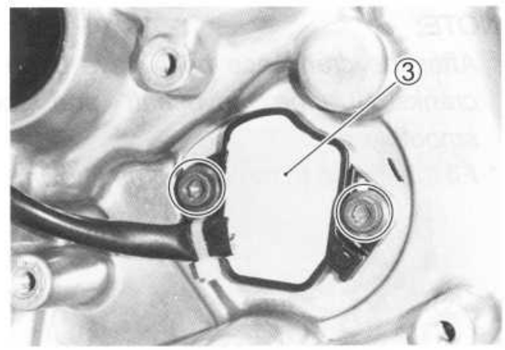
GEAR POSITION SWITCH

- Install the gear position switch contacts ① and springs.
- Apply SUZUKI SUPER GREASE to the O-ring ② and then install it onto the gear position switch.

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

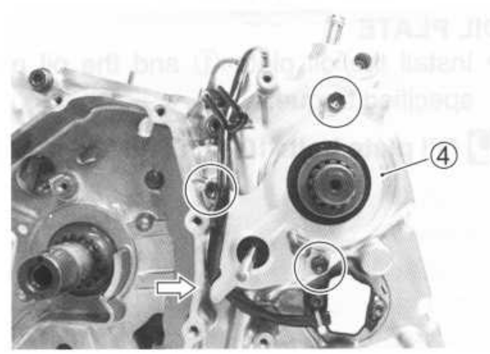


- Install the gear position switch ③ as shown.



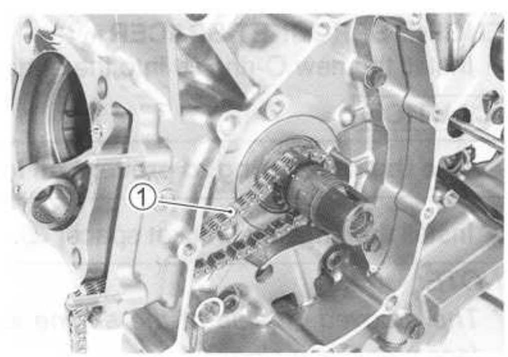
- Install the drive shaft oil seal retainer ④.

NOTE:
Pass through the gear position switch lead wire under the drive-shaft oil seal retainer.



FRONT CAM CHAIN

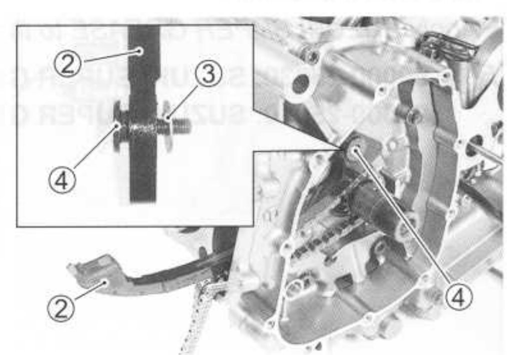
- Install the front cam chain ①.



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

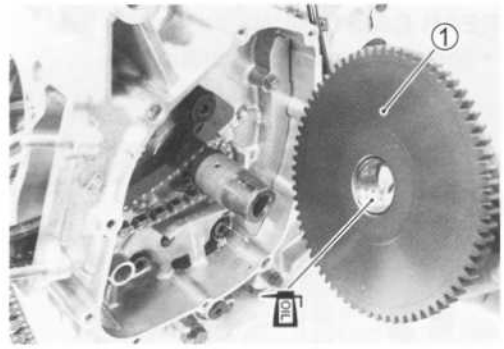
Cam chain tensioner bolt: 10 N·m (1.0 kgf-m, 7.0 lb-f)

NOTE:
The front and rear cam chain tensioners are the same.

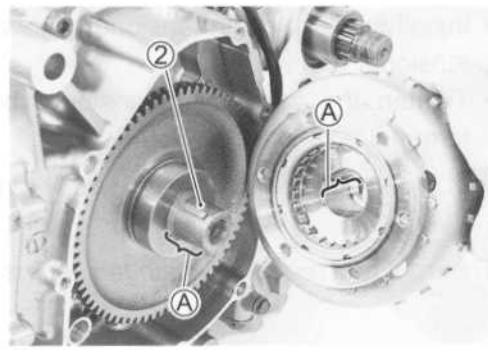


GENERATOR ROTOR

- Install the starter driven gear ①.
- Apply engine oil to the bushing of the starter driven gear.



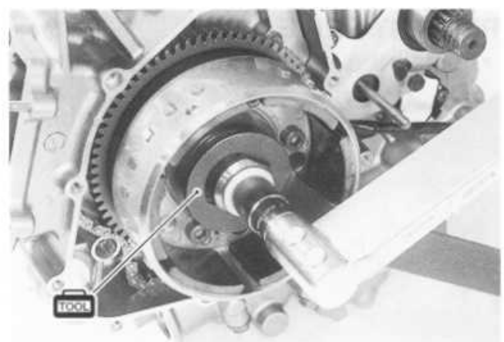
- Degrease the tapered portions Ⓐ of the generator rotor assembly and the crankshaft. Use nonflammable cleaning solvent to wipe off oily or greasy matter and make these surfaces completely dry.
- Fit the key ② in the key slot on the crankshaft completely.
- Install the generator rotor assembly onto the crankshaft.



- While holding the generator rotor with the special tool, tighten its bolt to the specified torque.

TOOL 09930-44530: Rotor holder

Generator rotor bolt: 120 N·m (12.0 kgf-m, 87 lb-ft)



CAM CHAIN DRIVE SPROCKET

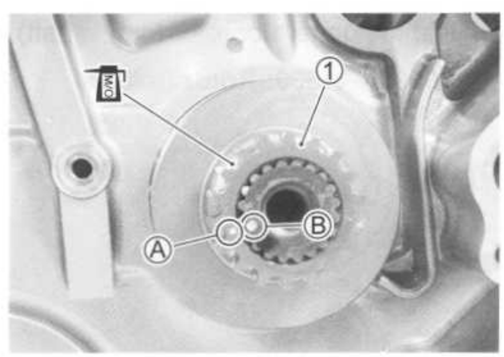
- Install the cam chain drive sprocket ① onto the crankshaft.

NOTE:

** Align the punched mark Ⓐ on the cam chain drive sprocket with the punched mark Ⓑ on the crankshaft.*

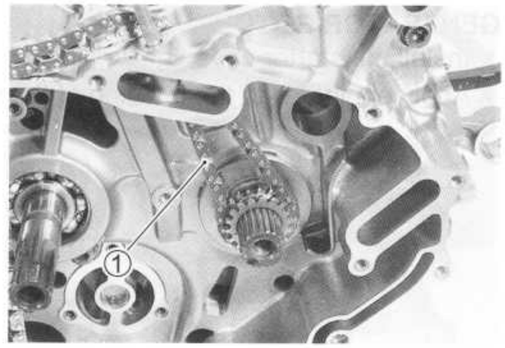
** Apply MOLYBDENUM OIL SOLUTION to the cam chain drive sprocket.*

M/O MOLYBDENUM OIL SOLUTION



REAR CAM CHAIN

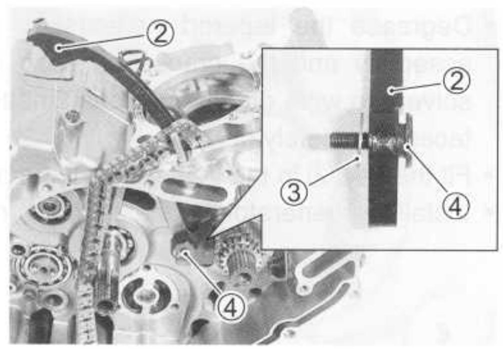
- Install the rear cam chain ①.



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

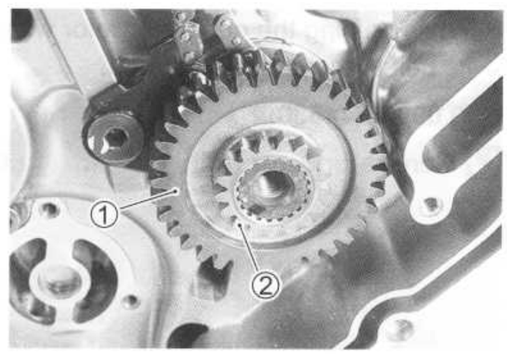
Cam chain tensioner bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

NOTE:
The front and rear cam chain tensioners are the same.



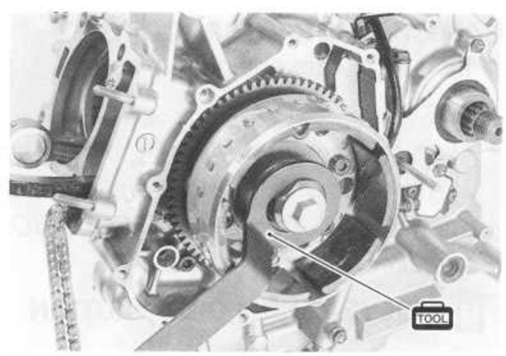
PRIMARY DRIVE GEAR

- Install the primary drive gear ① and water pump drive gear ②.



- Hold the generator rotor (crankshaft) with the special tool.

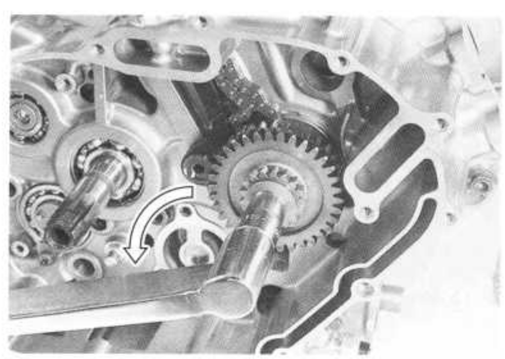
TOOL **09930-44530: Rotor holder**



- Tighten the primary drive gear bolt to the specified torque.

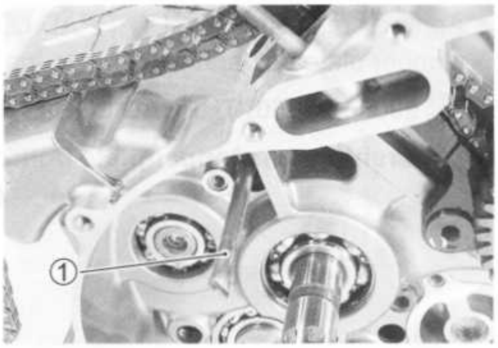
Primary drive gear bolt: 70 N·m (7.0 kgf-m, 50.5 lb-ft)

NOTE:
This bolt has left-hand thread.



OIL PIPE

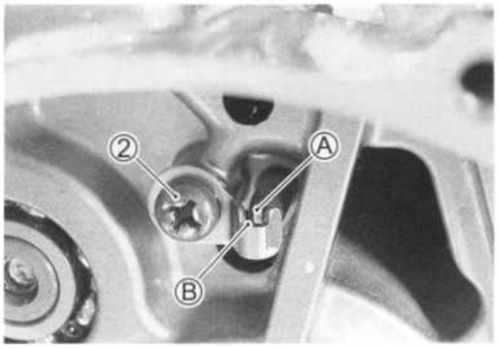
- Install the oil pipe ①.



- Tighten the oil pipe stopper screw ② to the specified torque.

Oil pipe stopper screw: 8 N·m (0.8 kgf-m, 6.0 lb-ft)

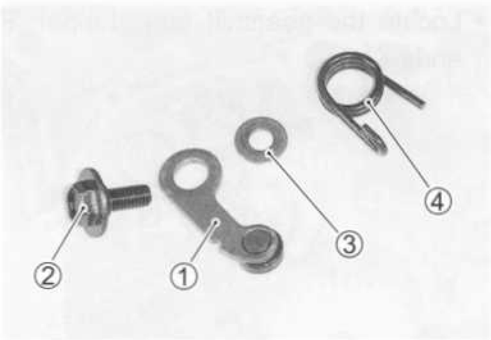
NOTE:
Align the projection Ⓐ of the oil pipe with the groove Ⓑ of its stopper.



GEARSHIFT SYSTEM

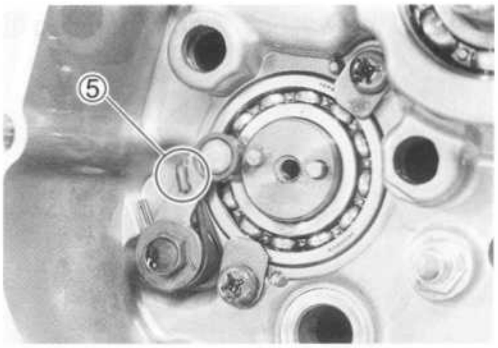
- Install the gearshift cam stopper ①, its bolt ②, washer ③ and return spring ④.

Gearshift cam stopper bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

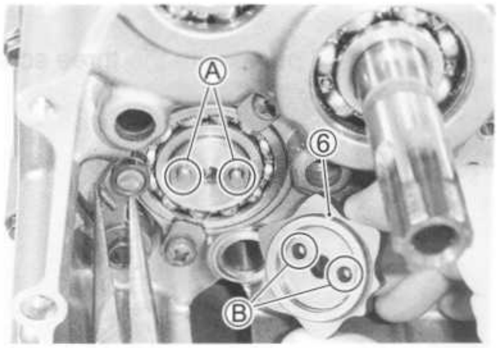


- Confirm the gearshift cam stopper movement.
- Check the neutral position.

NOTE:
Hook the return spring end ⑤ to the stopper.



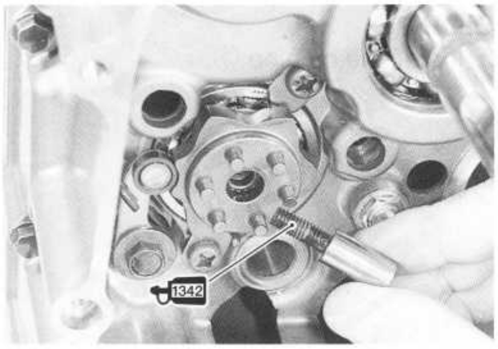
- Install the gearshift cam stopper plate ⑥ with the gearshift cam pins Ⓐ inserted into the gearshift cam stopper plate holes Ⓑ.



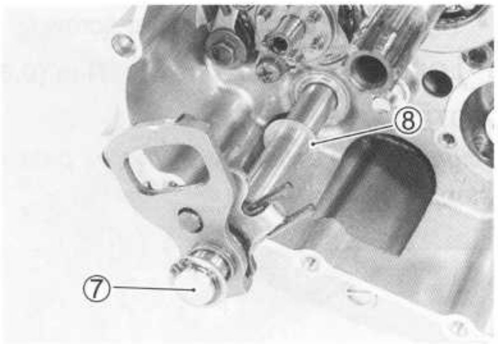
- Apply a small quantity of THREAD LOCK to the gearshift cam stopper plate bolt and tighten it to the specified torque.

1342 99000-32050: THREAD LOCK "1342"

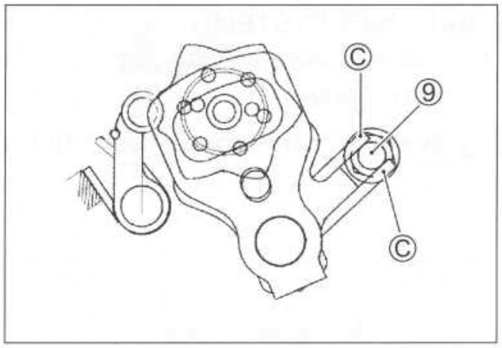
Gearshift cam stopper plate bolt: 13 N·m (1.3 kgf-m, 9.5 lb-ft)



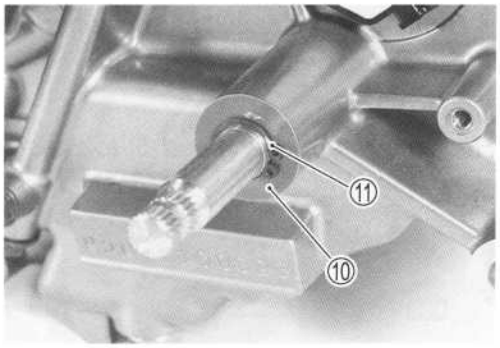
- Install the gearshift shaft/gearshift arm ⑦ with the washer ⑧ as shown.



- Locate the gearshift arm stopper ⑨ between return spring ends Ⓒ.

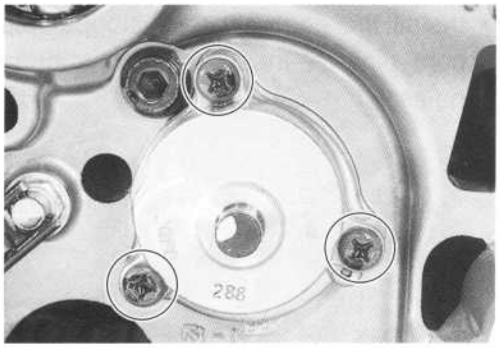


- Install the washer ⑩ and snap ring ⑪.

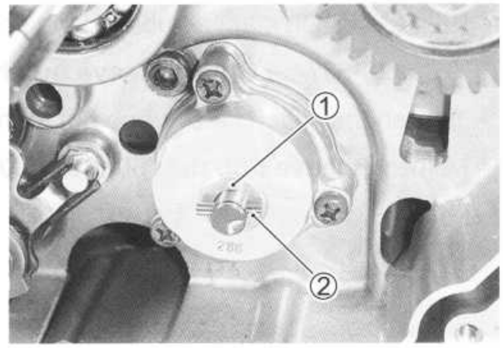


OIL PUMP

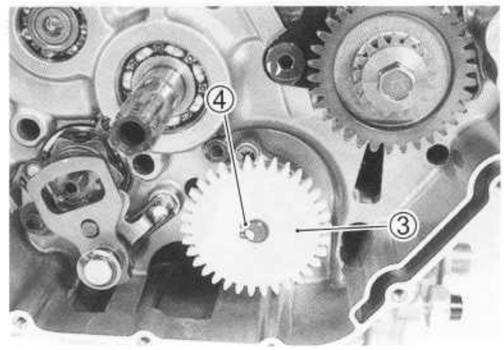
- Install the oil pump with the three screws.



- Install the washer ① and pin ②.

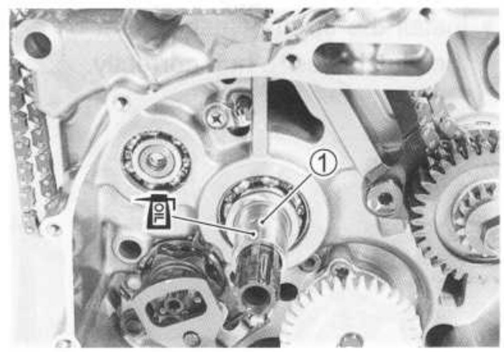


- Install the oil pump driven gear ③.
- Install the snap ring ④.



CLUTCH

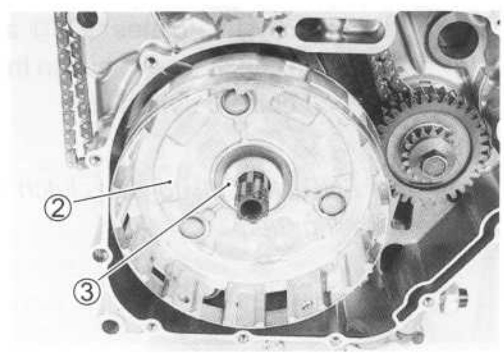
- Install the spacer ① and apply ENGINE OIL to it.



- Install the primary driven gear assembly ② onto the counter-shaft.

NOTE:
Be sure to engage the oil pump drive and driven gears, primary drive and driven gears.

- Install the thrust washer ③.



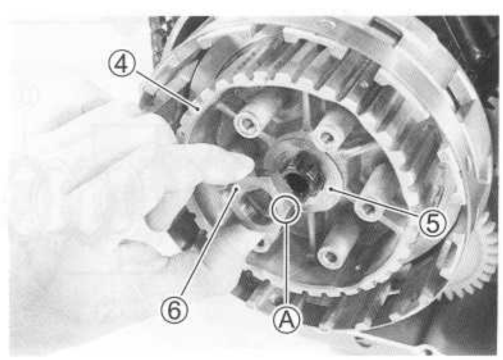
- Install the clutch sleeve hub ④ and lock washer ⑤.

CAUTION

Replace the lock washer ⑤ with a new one.

- Install the clutch sleeve hub nut ⑥.

NOTE:
The chamfer side Ⓐ of the clutch sleeve hub nut faces outward.

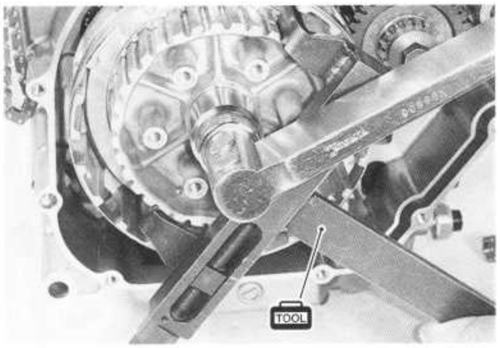


* Hold the clutch sleeve hub with the special tool.

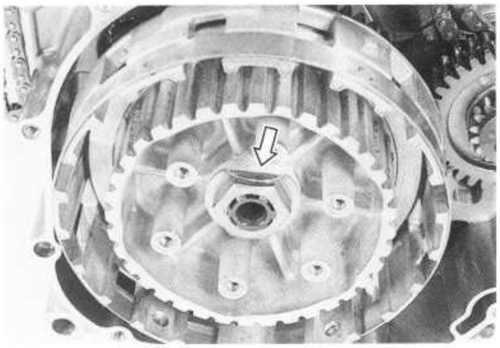
09920-53740: Clutch sleeve hub holder

* Tighten the clutch sleeve hub nut to the specified torque.

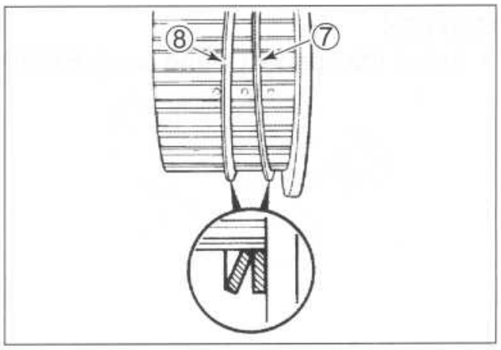
Clutch sleeve hub nut: 50 N·m (5.0 kgf-m, 36.0 lb-ft)



* Bend the lock washer to lock the nut securely.

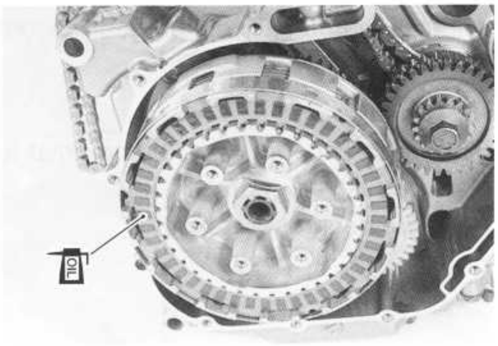


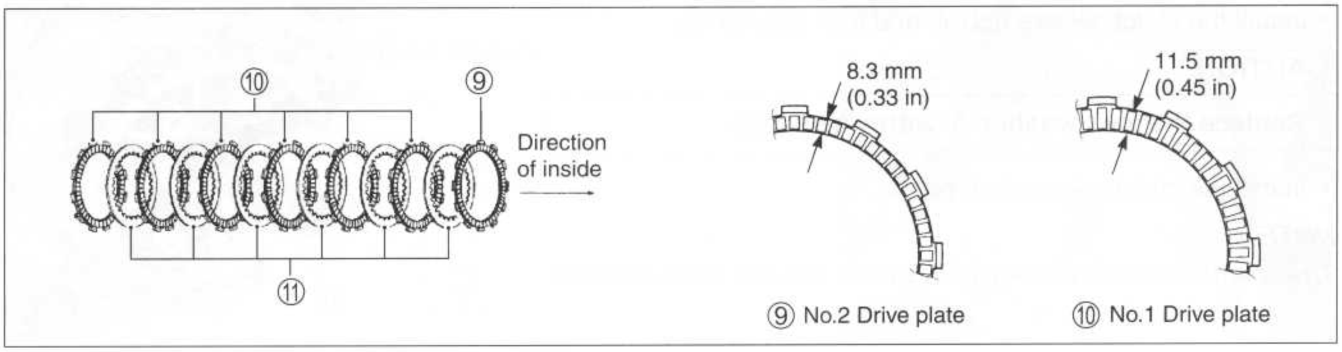
* Install the spring washer seat ⑦ and spring washer ⑧ onto the clutch sleeve hub correctly.



* Insert the clutch drive plates ⑨, ⑩ and driven plates ⑪ one by one into the clutch sleeve hub in the prescribed order, No.2 drive plate ⑨ being inserted first.

NOTE:
Apply the ENGINE OIL to the clutch driven and drive plates before installing them.

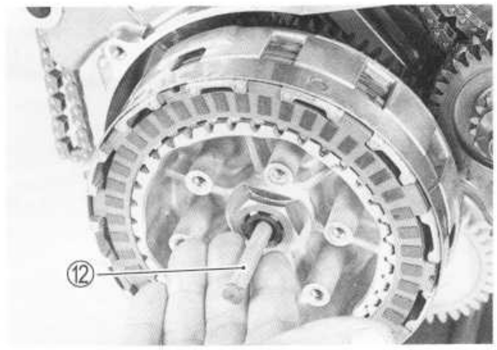




⑨ No.2 Drive plate

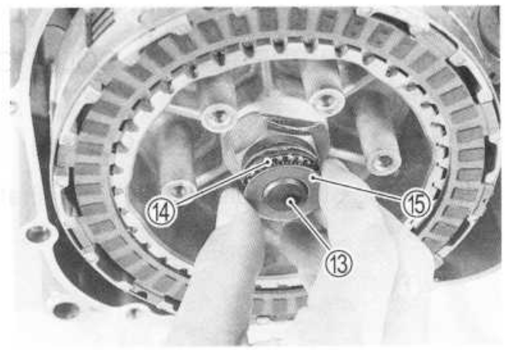
⑩ No.1 Drive plate

- Install the clutch push rod ⑫ into the countershaft.



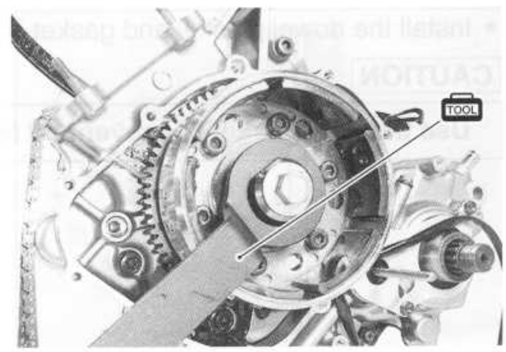
- Install the clutch push piece ⑬, the bearing ⑭ and thrust washer ⑮ to the countershaft.

NOTE:
Thrust washer ⑮ is located between the pressure plate and bearing ⑭.



- Hold the generator rotor (crankshaft) with the special tool.

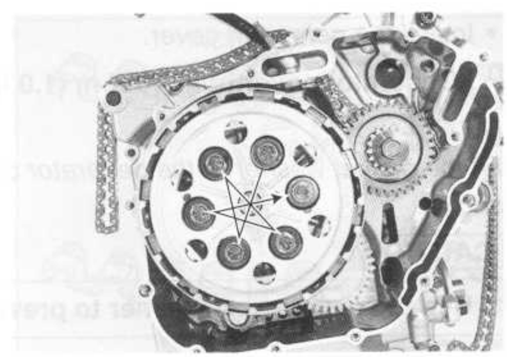
TOOL 09930-44530: Rotor holder



- Install the clutch pressure plate.
- Tighten the clutch spring set bolts to the specified torque.

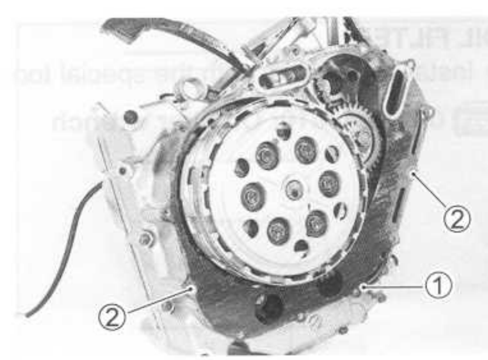
Clutch spring set bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

NOTE:
Tighten the clutch spring set bolts diagonally.

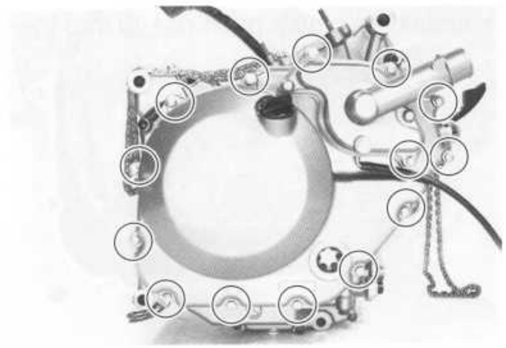


CLUTCH COVER
- Install the gasket ① and dowel pins ②.

CAUTION
Use the new gasket to prevent oil leakage.



- Install the clutch cover.

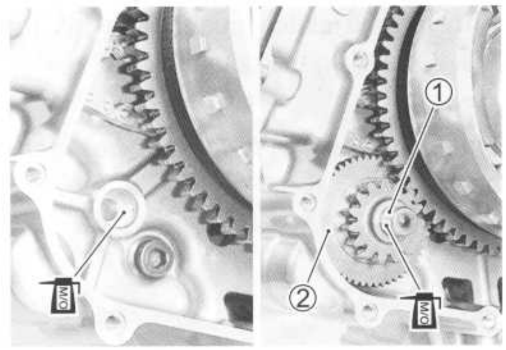


GENERATOR COVER

- Apply MOLYBDENUM OIL SOLUTION to both ends of the shaft ①.

MOLYBDENUM OIL SOLUTION

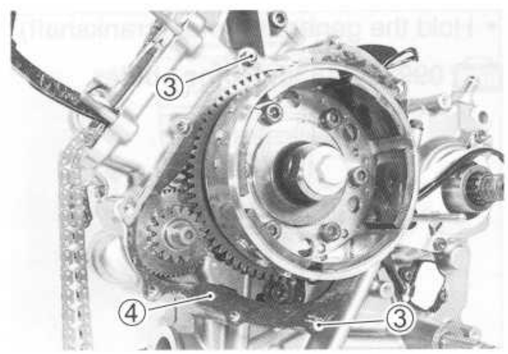
- Install the starter idle gear ② and shaft ①.



- Install the dowel pins ③ and gasket ④.

CAUTION

Use the new gasket to prevent oil leakage.



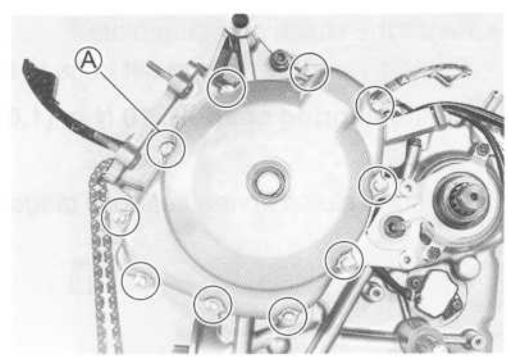
- Install the generator cover.

Generator cover bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

NOTE:
Fit the gasket washer to the generator cover bolt Ⓐ correctly as shown.

CAUTION

Use the new gasket washer to prevent oil leakage.



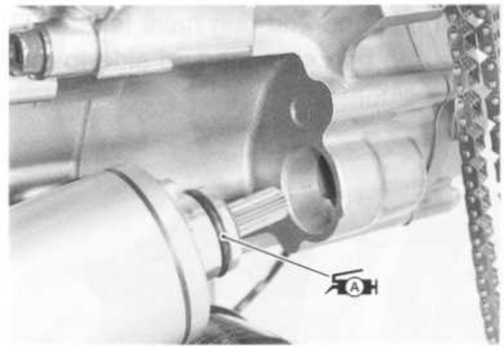
OIL FILTER

- Install the oil filter with the special tool. (☞2-15)

09915-40610: Oil filter wrench

STARTER MOTOR

- Install the new O-ring to the starter motor.



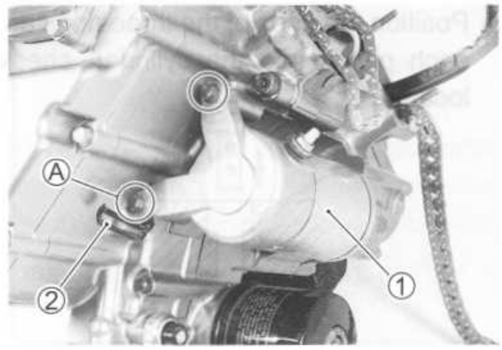
CAUTION

Use the new O-ring to prevent oil leakage.

- Apply SUZUKI SUPER GREASE to the O-ring.

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

- Install the starter motor ①.
- Tighten the starter motor mounting bolts with the clamp ② securely.

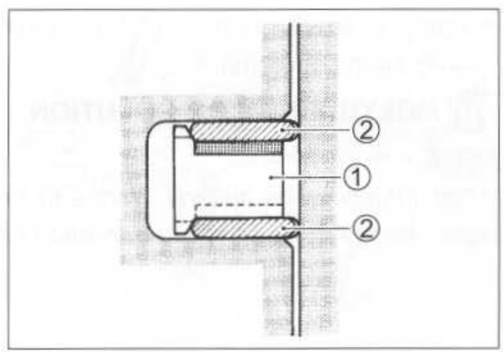


NOTE:
First tighten the starter motor mounting bolt Ⓐ.

ENGINE TOP SIDE

PISTON

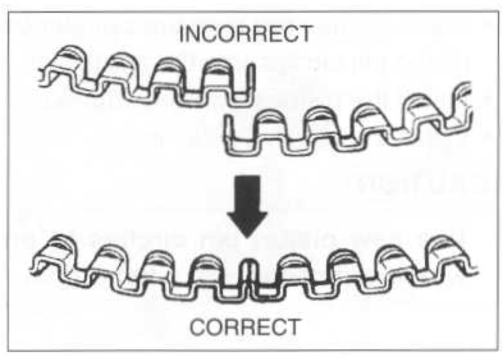
- Install the piston rings in the order of oil ring, 2nd ring and 1st ring.
- The first member to go into the oil ring groove is a spacer ①. After placing the spacer, fit the two side rails ②.



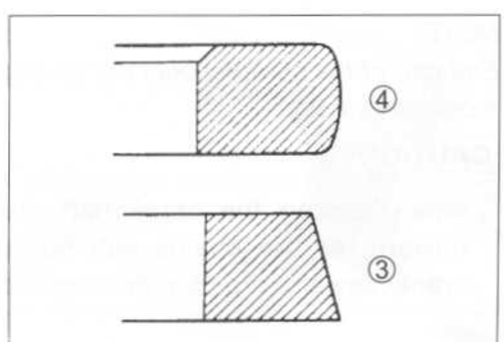
NOTE:
Side designations, top and bottom, are not applied to the spacer and side rails: you can position each either way.

CAUTION

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

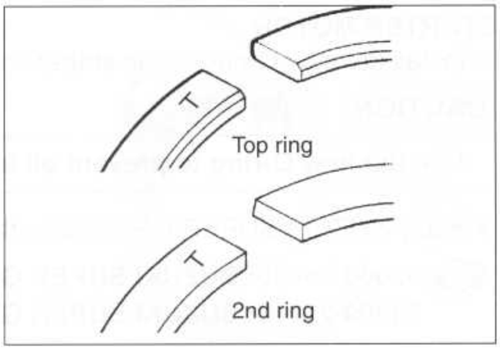


- Install the 2nd ring ③ and 1st ring ④.

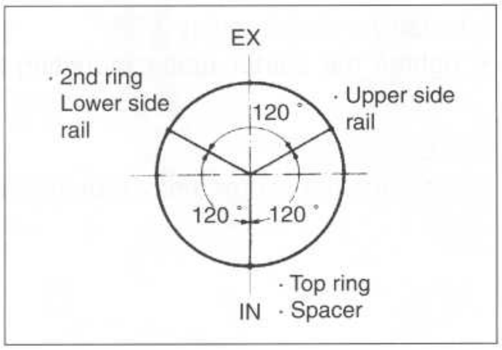


NOTE:
1st ring and 2nd ring differ in shape.

- 1st ring and 2nd ring have letters "T" marked on the side. Be sure to bring the marked side to the top when fitting them to the piston.



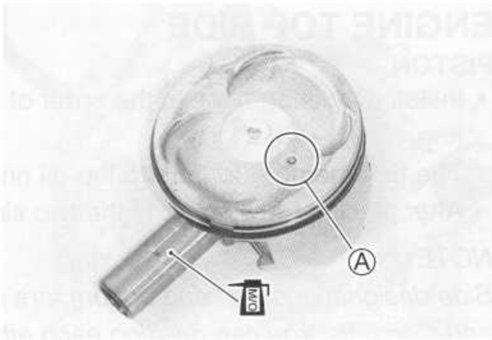
- Position the gaps of the three rings as shown. Before inserting each piston into the cylinder, check that the gaps are so located.



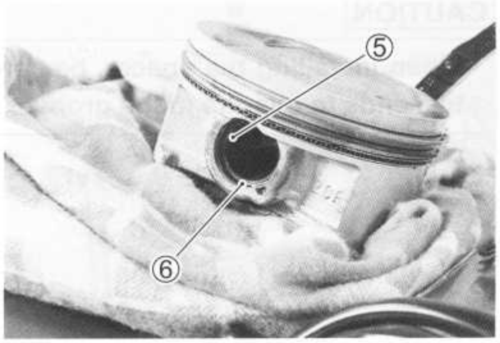
- Apply a small quantity of MOLYBDENUM OIL SOLUTION onto each piston pin.

MOLYBDENUM OIL SOLUTION

NOTE:
When installing the pistons, front and rear, the indents Ⓐ on the piston heads must be located to each exhaust side.



- Place a clean rag over the cylinder base so as not to drop the piston pin circlips into the crankcase.
- Install the pistons ⑤, front and rear.
- Install the piston pin circlips ⑥.



CAUTION

Use new piston pin circlips to prevent circlip failure which will occur with a bend one.

NOTE:
End gap of the circlip should not be aligned with the cutaway in the piston pin bore.

CAUTION

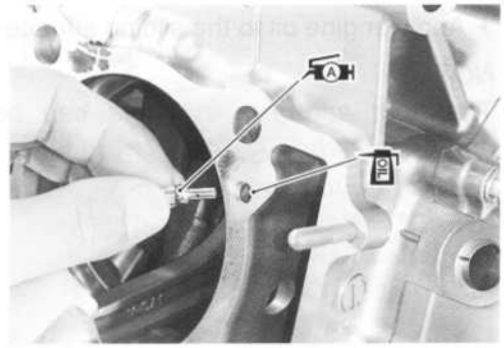
When turning the crankshaft, pull the cam chains upward, or the chains will be caught between the crankcase and the cam drive sprocket.

OIL JET

- Apply SUZUKI SUPER GREASE to the new O-rings.

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

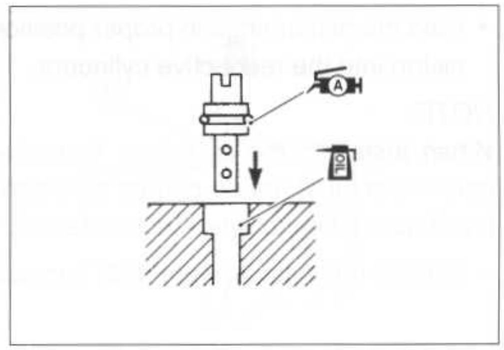
- Apply engine oil to the oil jet holes on the crankcase.



- Install each of the oil jet (#14) to the left and right crankcase, as shown in the illustration.

CAUTION

Use the new O-rings to prevent oil leakage.

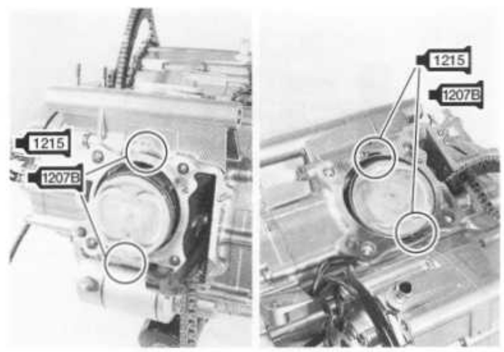


CYLINDER

- Coat SUZUKI BOND lightly to the mating surfaces at the parting line between the right and left crankcases as shown.

99104-31140: SUZUKI BOND "1207B" (USA)

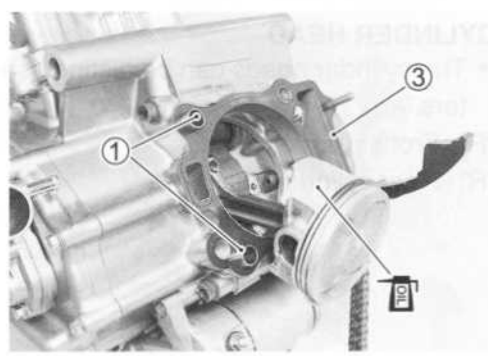
99000-31110: SUZUKI BOND "1215" (Others)

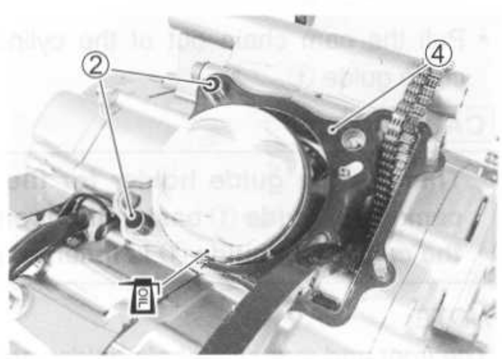


- Apply engine oil to the sliding surface of the pistons.
- Fit the dowel pins ①, ② and new gaskets ③, ④ to the crankcase.

CAUTION

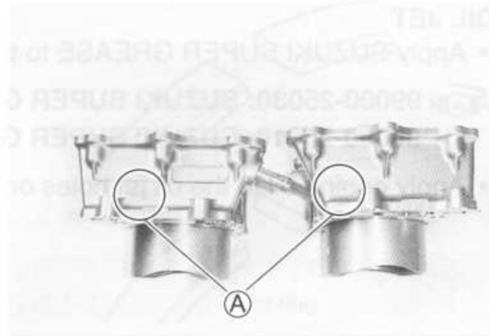
Use the new gaskets to prevent oil leakage.





- Apply engine oil to the sliding surface of the cylinders.

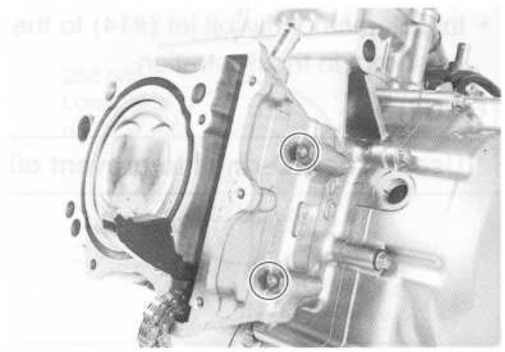
NOTE:
The front and rear cylinders can be distinguished by the embossed-letters Ⓐ.
"FRONT": Front cylinder
"REAR" : Rear cylinder

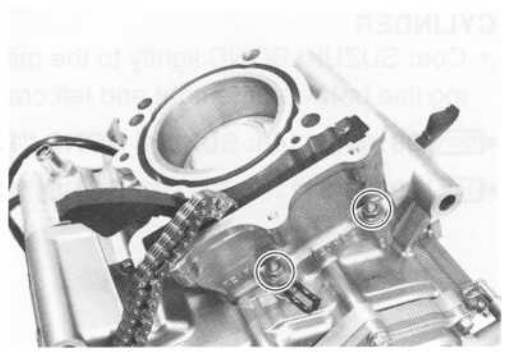


- Hold the piston rings in proper position, and insert each of the piston into the respective cylinders.

NOTE:
When installing the cylinders, keep the cam chains taut. The cam chain must not be caught between cam drive sprocket and crankcase when turning the crankshaft.

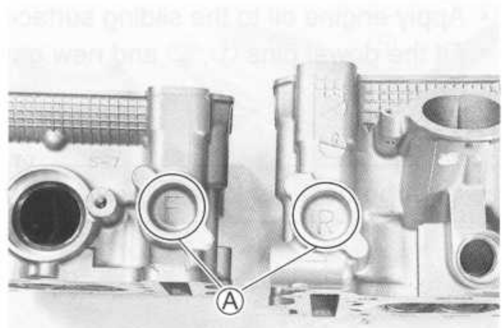
- Tighten the cylinder nuts (M6) temporarily.





CYLINDER HEAD
- The cylinder heads can be distinguished by the embossed-letters Ⓐ.

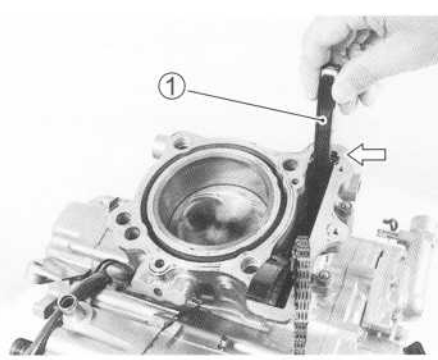
"F" : Front cylinder head
"R": Rear cylinder head



- Pull the cam chain out of the cylinder and install the cam chain guide ①.

CAUTION

There is the guide holder for the bottom end of the cam chain guide ① cast in the crankcase. Be sure that the cam chain guide ① is inserted properly. (☞3-88)

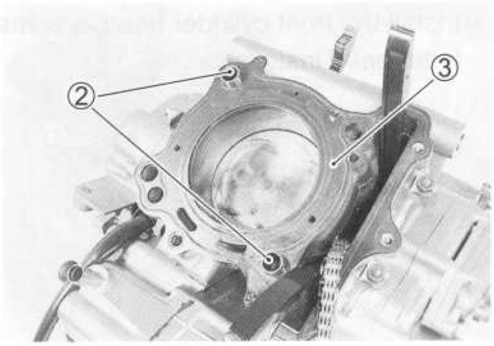


NOTE:
The front and rear cam chain guides are the same.

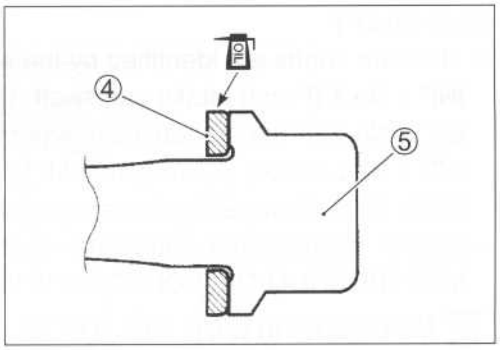
- Fit the dowel pins ② and new cylinder head gasket ③ to the cylinder.

CAUTION

Use the new gasket to prevent gas leakage.



- Install the washers ④ to the cylinder head bolts (M10) ⑤ as shown.
- Apply engine oil to the washers and thread portion of the bolts before installing the cylinder head bolts.

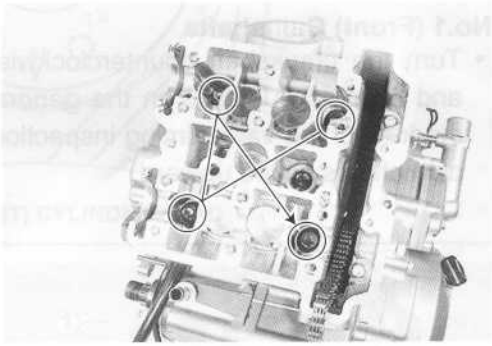


- Place the rear cylinder head on the cylinder.

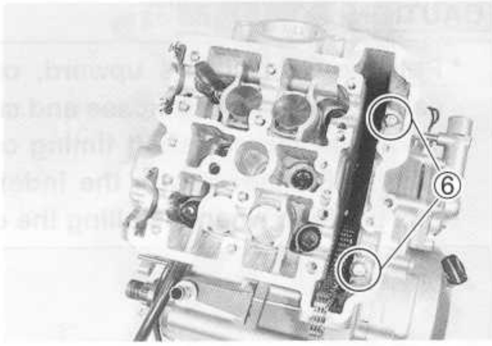
NOTE:
When installing the cylinder head, keep the cam chain taut.

- Tighten the cylinder head bolts (M10) to the specified two-step torque with a torque wrench sequentially and diagonally.

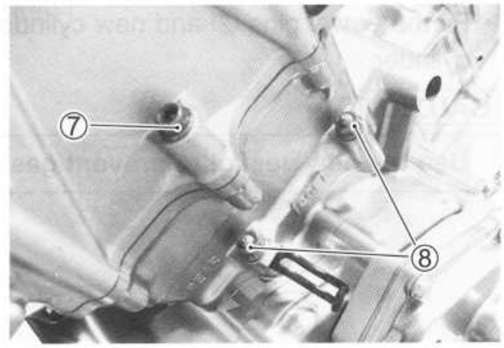
Cylinder head bolt (M10):
Initial 25 N·m (2.5 kgf-m, 18.0 lb-ft)
Final 42 N·m (4.2 kgf-m, 30.5 lb-ft)



- After firmly tightening the cylinder head bolts (M10), install the cylinder head bolts (M6) ⑥, ⑦.
- Tighten the cylinder head bolts ⑥, ⑦, and cylinder nuts ⑧.

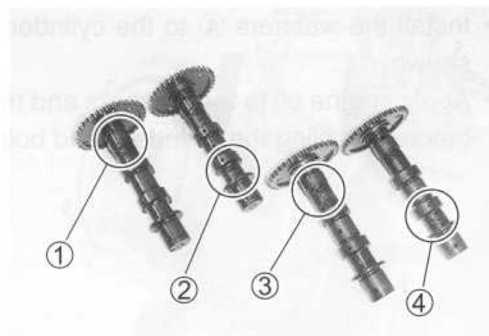


- Install the front cylinder head in same manner as the rear cylinder head installation.



CAM SHAFT

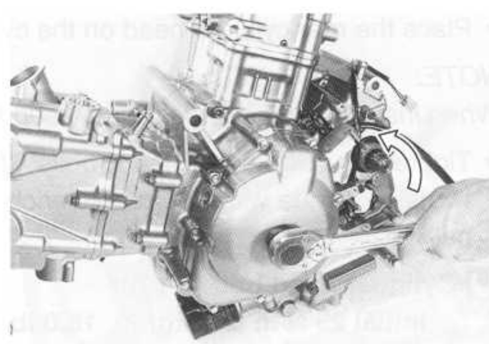
- The cam shafts are identified by the embossed letters.
  INF : No.1 (Front) intake camshaft ①
  EXF : No.1 (Front) exhaust camshaft ②
  INR : No.2 (Rear) intake camshaft ③
  EXR: No.2 (Rear) exhaust camshaft ④
- Before installing the camshafts to the cylinder head, apply MOLYBDENUM OIL SOLUTION to their journals.



M/O MOLYBDENUM OIL SOLUTION

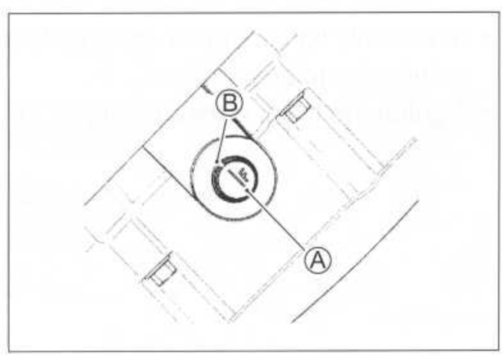
No.1 (Front) Camshafts

- Turn the crankshaft counterclockwise with the box wrench and align "|F" line Ⓐ on the generator rotor with the index mark Ⓑ of the valve timing inspection hole while keeping the cam chains pulled upward.



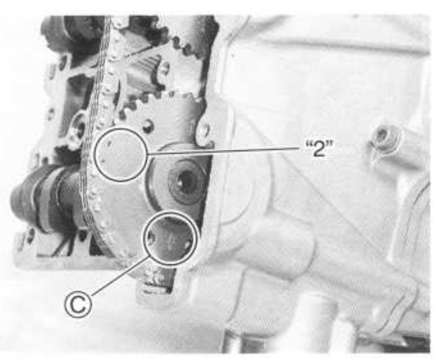
CAUTION

> * **Pull the cam chains upward, or the chain will be caught between crankcase and cam drive sprocket.**
> * **To adjust the camshaft timing correctly, be sure to align "|F" line Ⓐ with the index mark Ⓑ and hold this position when installing the camshafts.**

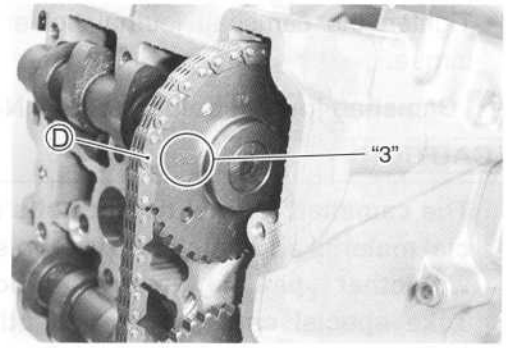


- Pull the cam chain lightly.
- The No.1 exhaust camshaft sprocket has an arrow mark "1F" Ⓒ. Install the exhaust camshaft so that the arrow Ⓒ is aligned with the mating surface of the cylinder head. (☞3-103)
- Engage the cam chain with the exhaust camshaft sprocket.

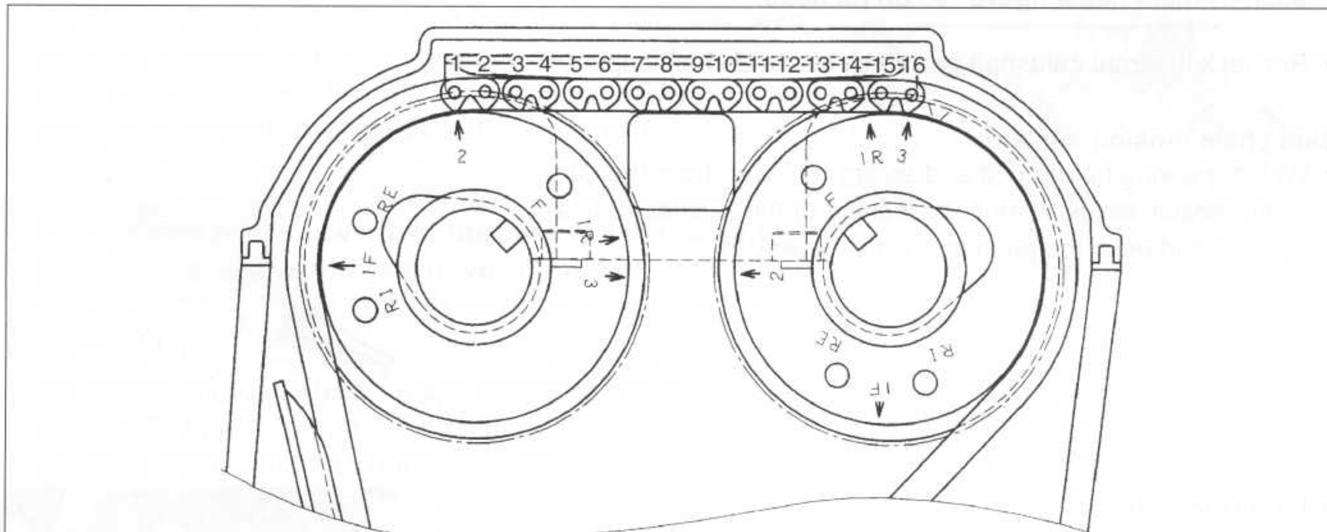
NOTE:
Before installing the camshaft, check that the tappets are installed correctly.



- The other arrow mark "2" on the exhaust camshaft sprocket should now be pointing straight up. Starting from the roller pin that is directly above the arrow mark "2" count out 16 roller pins (from the exhaust camshaft side going towards the intake camshaft side). Engage the 16 roller pin Ⓓ on the cam chain with the arrow mark "3" on the intake sprocket. (☞3-103)

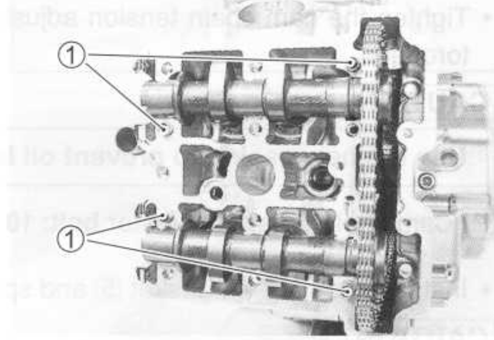


NOTE:
The cam chain should now be on all three sprockets. Be careful not to move the crankshaft until the camshaft journal holders and cam chain tension adjuster is secured.

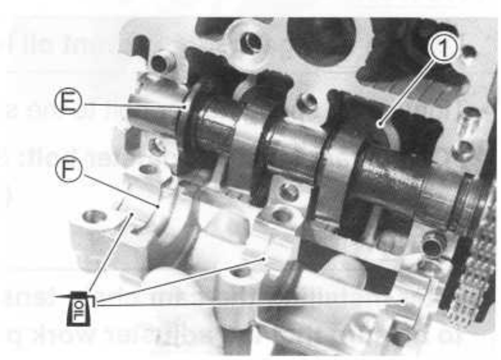


No.1 (FRONT) CYLINDER HEAD

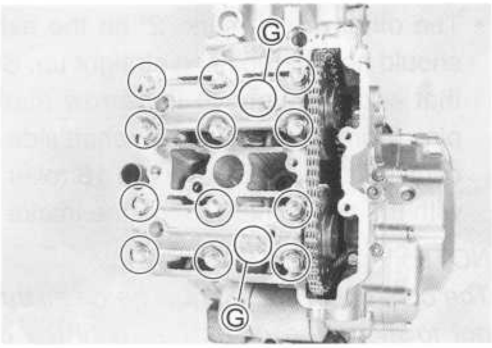
- Install the dowel pins ①.



- Apply engine oil to the camshaft journal holders.
- Install the camshaft journal holders, intake and exhaust.
- Fasten the camshaft journal holders evenly by tightening the crankshaft journal holder bolts sequentially and diagonally.



NOTE:
* *Align the flange Ⓔ of the camshafts with the groove Ⓕ of the camshaft journal holders.*
* *Damage to head or camshaft journal holder thrust surfaces may result if the camshaft journal holders are not drawn down evenly.*
* *Each camshaft journal holder is identified with a cast-on letters Ⓖ.*



- Tighten the camshaft journal holder bolts to the specified torque.

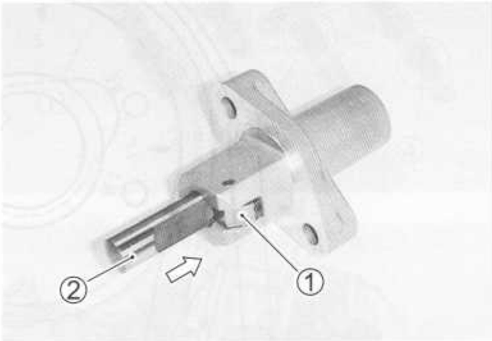
Camshaft journal holder bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

CAUTION

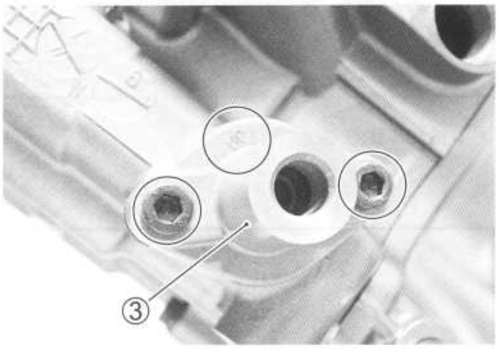
> **The camshaft journal holder bolts are made of a special material and much superior in strength, compared with other types of high strength bolts.**
> **Take special care not to use other types of bolts instead of these special bolts. To identify these bolts, each of them has a figure "9" on its head.**

- Recheck the front camshaft positions, intake and exhaust.

Cam chain tension adjuster



- With the spring holder bolt and spring removed from the cam chain tension adjuster, release locking of the ratchet mechanism ① and push the push rod ② all the way in.

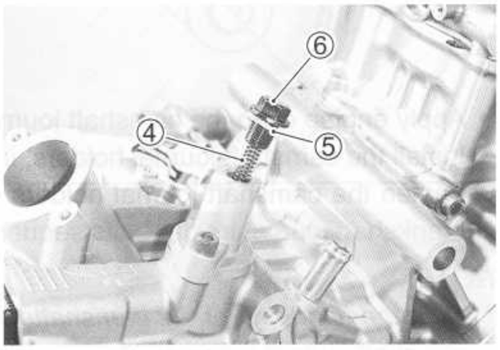


- Install the gasket.
- Install the cam chain tension adjuster ③ with "UP" mark faced to the top of cylinder head.
- Tighten the cam chain tension adjuster bolts to the specified torque.

CAUTION

> **Use the new gasket to prevent oil leakage.**

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



- Install the spring ④, gasket ⑤ and spring holder bolt ⑥.

CAUTION

> **Use the new gasket to prevent oil leakage.**

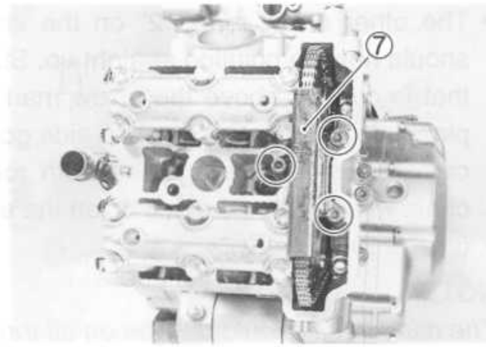
- Tighten the spring holder bolt to the specified torque.

Cam chain tension adjuster bolt: 35 N·m (3.5 kgf-m, 25.5 lb-ft)

CAUTION

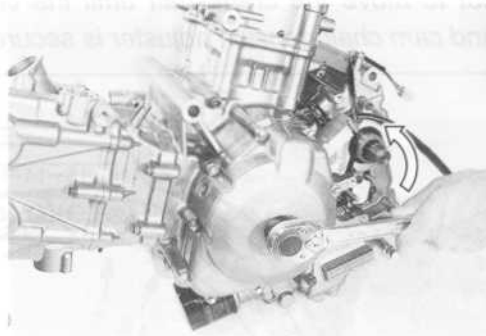
> **After installing the cam chain tension adjuster, check to be sure that the adjuster work properly by checking the slack of cam chain.**

- Install the cam chain guide ⑦.



No.2 (Rear) Camshafts

- From the position where the front camshafts have now been installed, rotate the generator rotor 360 degrees (1 turn) counterclockwise and align the "|F" line Ⓐ on the generator rotor with the index mark Ⓑ of the valve timing inspection hole.



CAUTION

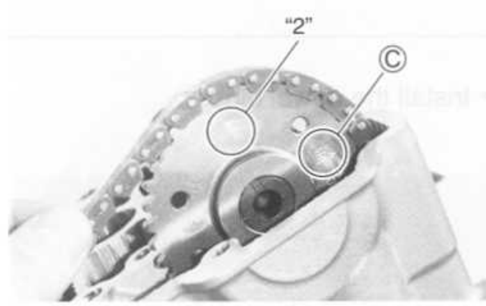
Pull the cam chain upward, or the chain will be caught between crankcase and cam drive sprocket.

CAUTION

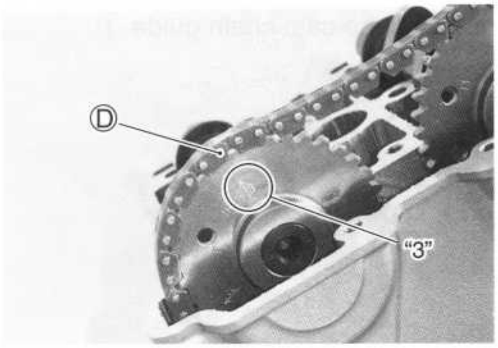
To adjust the camshaft timing correctly, be sure to align "|F" line Ⓐ with the index mark Ⓑ and hold this position when installing the camshafts.

- Pull the cam chain lightly.
- The No.2 intake camshaft sprocket has an arrow mark "1R" Ⓒ. Install the intake camshaft so that the arrow Ⓒ is aligned with the mating surface of the cylinder head. (☞3-106)
- Engage the cam chain with the intake camshaft sprocket.

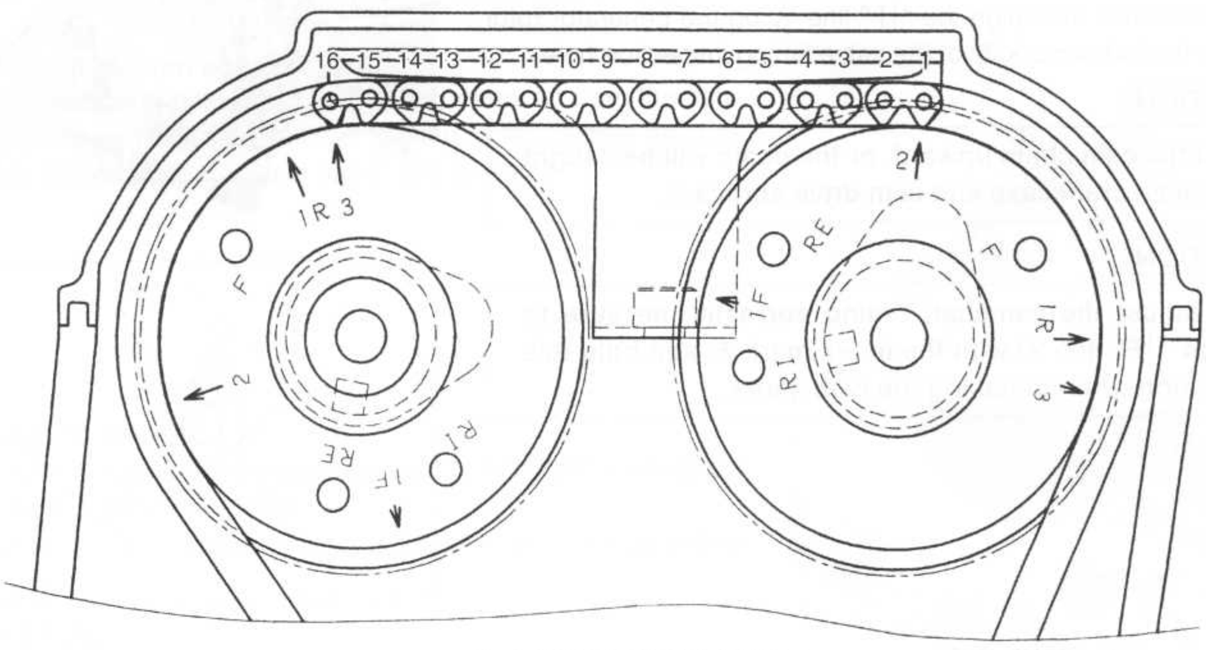
NOTE:
Before installing the camshaft, check that the tappets are installed correctly.



- The other arrow mark "2" on the intake camshaft sprocket should now be pointing straight up. Starting from the roller pin that is directly above the arrow mark "2" count out 16 roller pins (from the intake camshaft side going towards the exhaust camshaft side). Engage the 16th roller pin Ⓓ on the cam chain with the arrow mark "3" on the exhaust sprocket. (☞3-106)

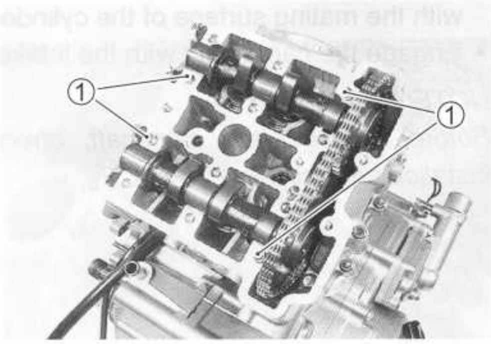


NOTE:
The cam chain should now be on all three sprockets. Be careful not to move the crankshaft until the camshaft journal holders and cam chain tension adjuster is secured.

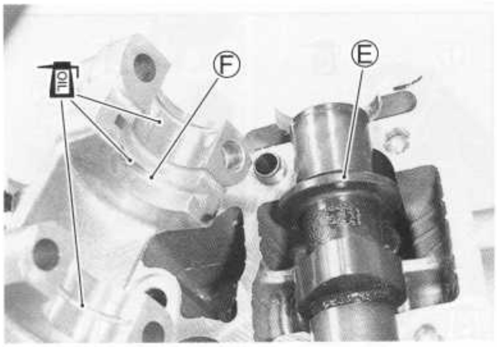


No.2 (REAR) CYLINDER HEAD

- Install the dowel pins ①.

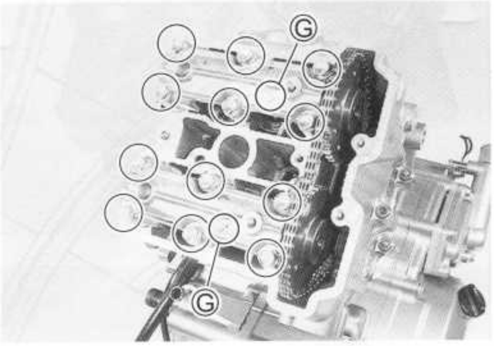


• Apply engine oil to the camshaft journal holders.
• Install the camshaft journal holders, intake and exhaust.
• Fasten the camshaft journal holders evenly by tightening the camshaft journal holder bolts sequentially and diagonally.



NOTE:
* *Align the flange Ⓔ of the camshafts with the groove Ⓕ of the camshaft journal holders.*
* *Damage to head or camshaft journal holder thrust surfaces may result if the camshaft journal holders are not drawn down evenly.*
* *Each camshaft journal holder is identified with a cast-on letter Ⓖ.*

• Tighten the camshaft journal holder bolts to the specified torque.



Camshaft journal holder bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

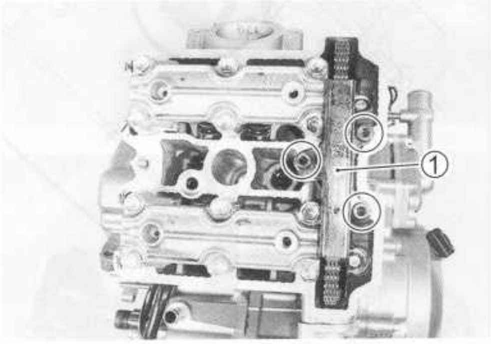
CAUTION

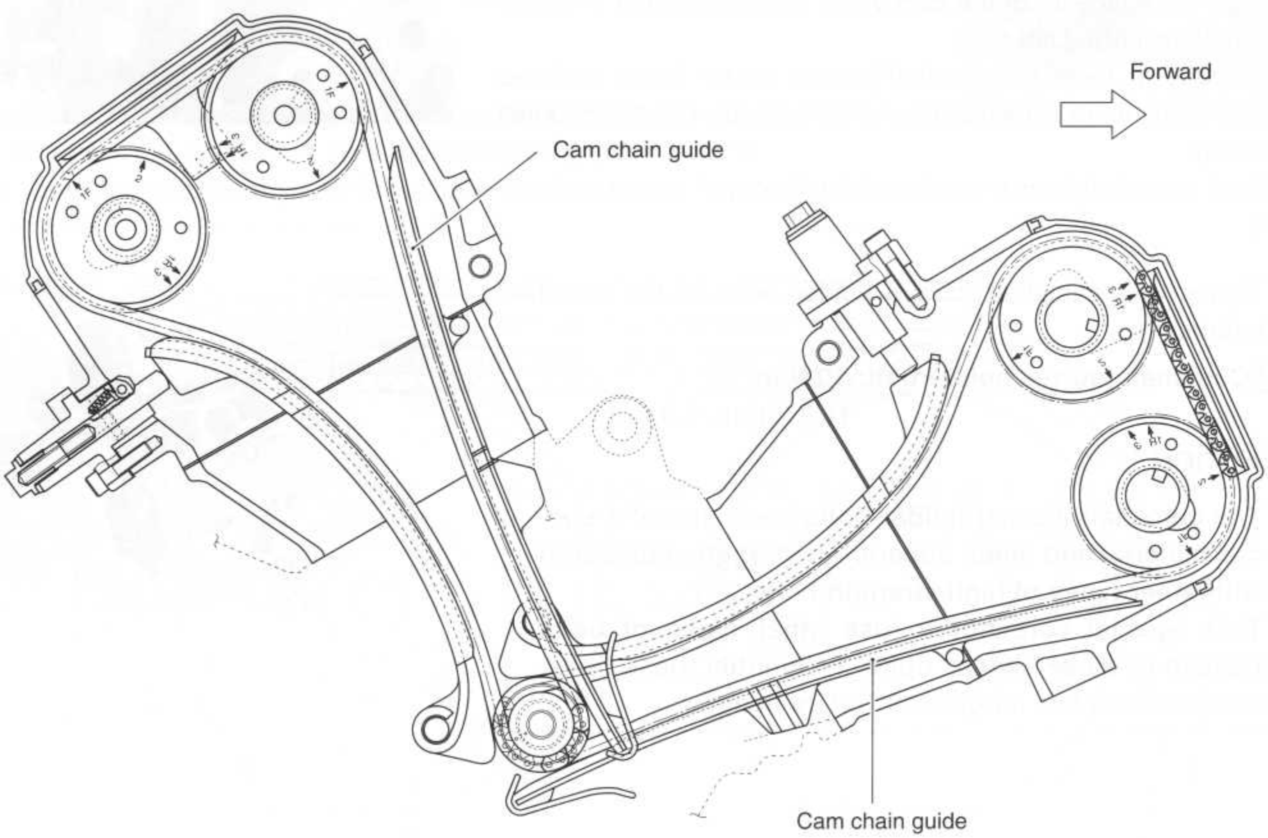
The camshaft journal holder bolts are made of a special material and much superior in strength, compared with other types of high strength bolts.
Take special care not to use other types of bolts instead of these special bolts. To identify these bolts, each of them has a figure "9" on its head.

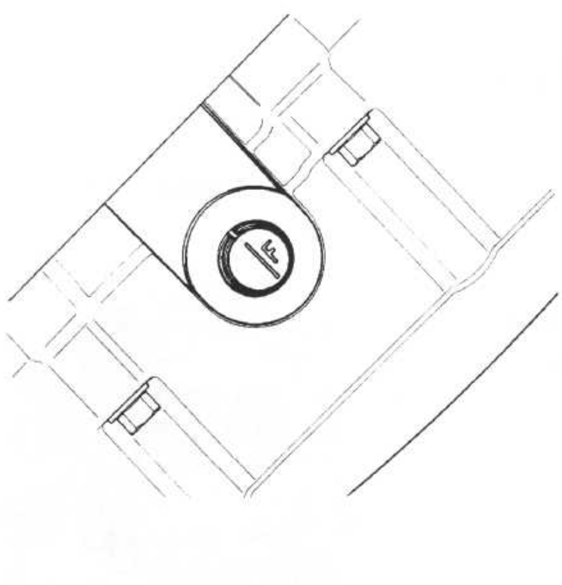
• Recheck the rear camshaft positions, intake and exhaust.

Camchain tension adjuster
• Install the camchain tension adjuster. (3-104)

• Install the cam chain guide ①.
• After installing the rear camshafts, rotate the generator rotor (same turns), and recheck the positions of the camshafts.







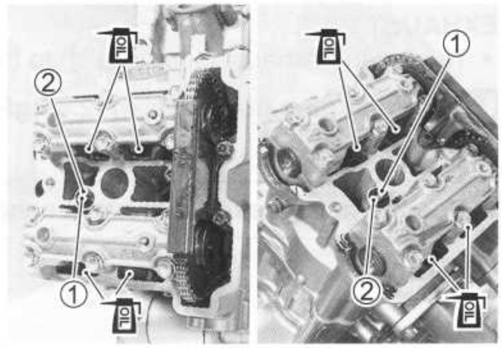
No.1 (Front) cylinde TDC of compression stroke

CYLINDER HEAD COVER

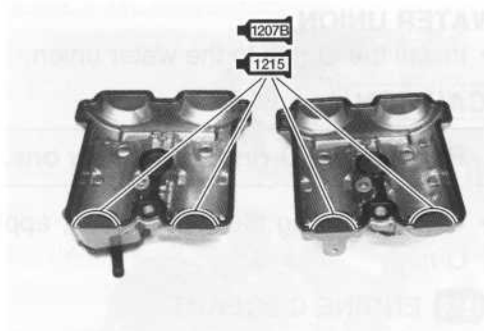
- Pour engine oil in each oil pocket in the front and rear cylinder heads.

NOTE:
Be sure to check the tappet clearance. (☞2-11)

- Install the dowel pins ① and O-rings ②.



- Install the new gaskets to each cylinder head cover.
- Apply SUZUKI BOND to the cam end caps of the gaskets.



1207B 99104-31140: SUZUKI BOND "1207B" (USA)

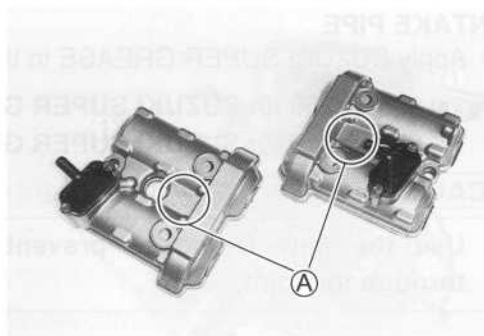
1215 99000-31110: SUZUKI BOND "1215" (Others)

CAUTION

Use the new gaskets to prevent oil leakage.

- The cylinder head covers can be distinguished by the embossedletters Ⓐ.

"F": Front cylinder head cover
"R": Rear cylinder head cover



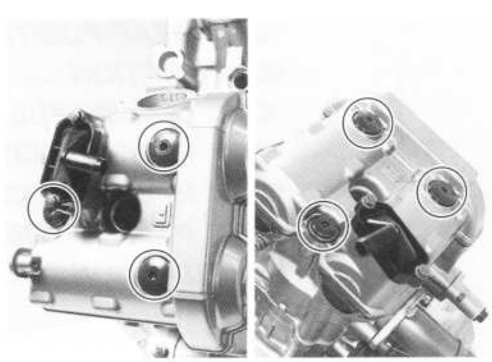
- Install the cylinder head covers on each cylinder head.
- Fit the gaskets ③, ④ to each head cover bolt.

CAUTION

Use the new gaskets to prevent oil leakage.

NOTE:
The metal side of the gasket ③ must face to the bolt flange.

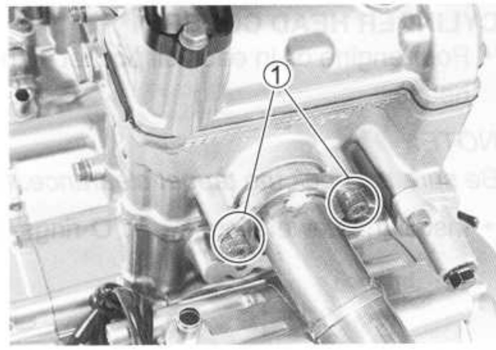
- After applying engine oil to the gaskets tighten the head cover bolts to the specified torque.



Head cover bolt: 14 N·m (1.4 kgf-m, 10.0 lb-ft)

EXHAUST PIPE

- Tighten the exhaust pipe bolts ① to the specified torque.



Exhaust pipe bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

CAUTION

Use the new gasket to prevent exhaust gas leakage.

WATER UNION

- Install the O-ring to the water union.

CAUTION

Replace the O-ring with a new one.

- When installing the water union, apply engine coolant to the O-ring.

LLC ENGINE COOLANT

INTAKE PIPE

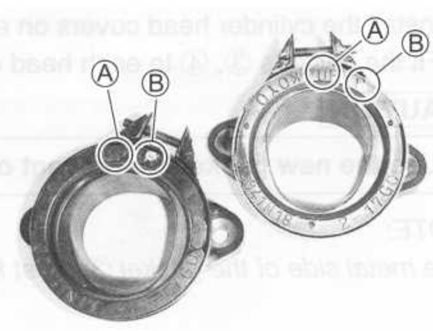
- Apply SUZUKI SUPER GREASE to the O-ring.

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

CAUTION

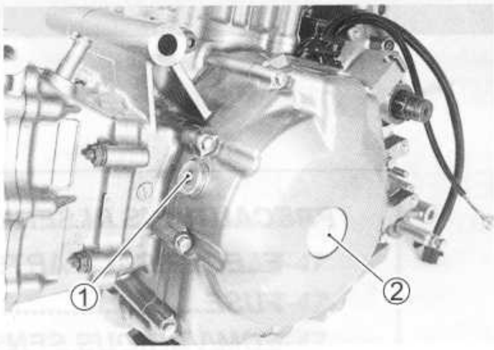
Use the new O-ring to prevent air from sucking through the joint.

- Make sure that the "UP" mark Ⓐ faces upward.
- Install the intake pipes.



NOTE:
The intake pipe can be identified by the mark Ⓑ.
F: Front cylinder head intake pipe
R: Rear cylinder head intake pipe

GENERATOR COVER PLUG



- Apply engine oil to the O-ring of the generator cover plug.
- Tighten the valve timing inspection plug ① and generator cover plug ② to the specified torque.

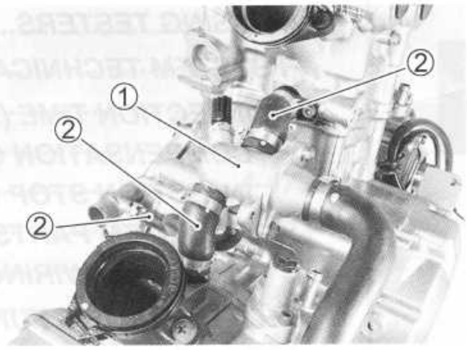
Valve timing inspection plug: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

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

CAUTION

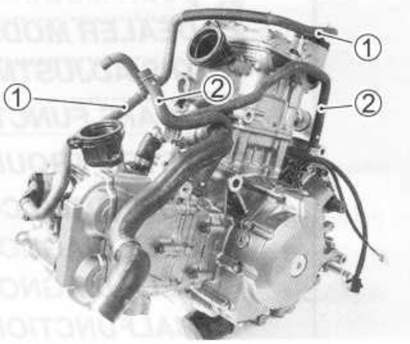
Use the new O-ring to prevent oil leakage.

THERMOSTAT CASE AND WATER HOSE



- Install the thermostat case ① along with the water hoses ② and tighten the clamp screws securely. (☞9-22)

SPARK PLUG AND HOSES



- Connect the PAIR hoses ①.
- Connect the crankcase breather hoses ②.
- Install the spark plugs. (☞2-8)

FI SYSTEM DIAGNOSIS

CONTENTS

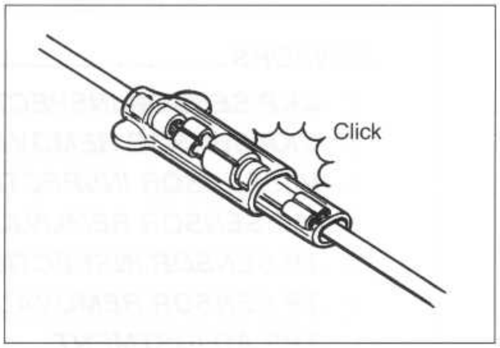
PRECAUTIONS IN SERVICING

When handling the component parts or servicing the FI system, observe the following points for the safety of the system.

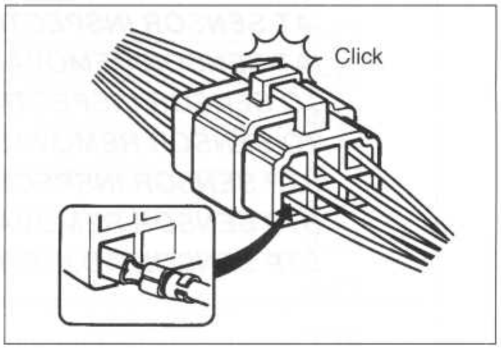
ELECTRICAL PARTS

CONNECTOR/COUPLER

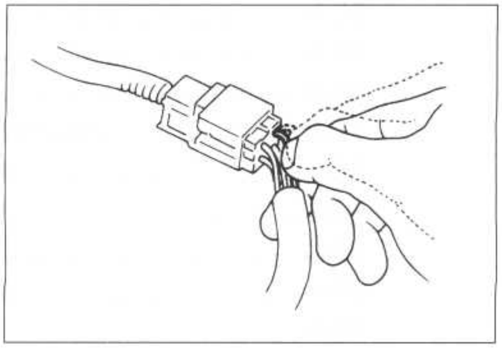
- When connecting a connector, be sure to push it in until a click is felt.
- With a lock type coupler, be sure to release the lock when disconnecting, and push it in fully till the works when connecting it.
- When disconnecting the coupler, be sure to hold the coupler body and do not pull the lead wires.
- Inspect each terminal on the connector/coupler for looseness or bending.



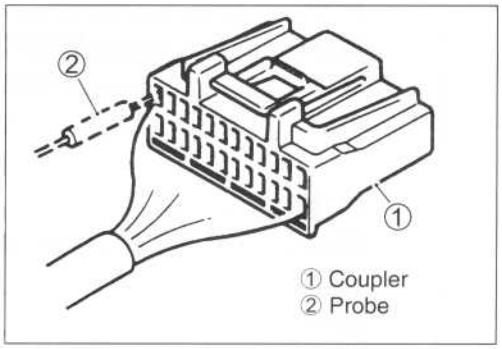
- Inspect each terminal for corrosion and contamination.
  The terminals must be clean and free of any foreign material which could impede proper terminal contact.



- Inspect each lead wire circuit for poor connection by shaking it by hand lightly. If any abnormal condition is found, repair or replace.

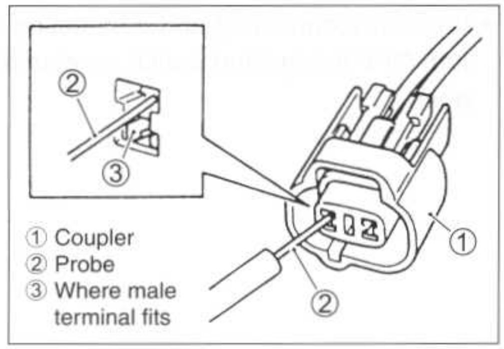


- When taking measurements at electrical connectors using a tester probe, be sure to insert the probe from the wire harness side (backside) of the connector/coupler.



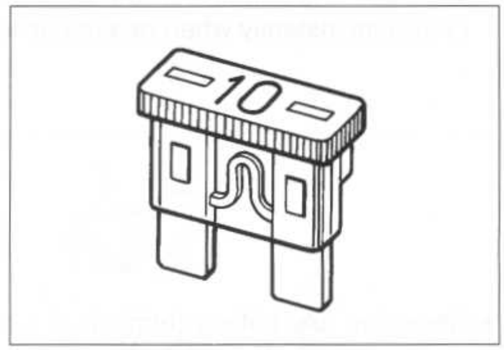
① Coupler
② Probe

- When connecting meter probe from the terminal side of the coupler (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.



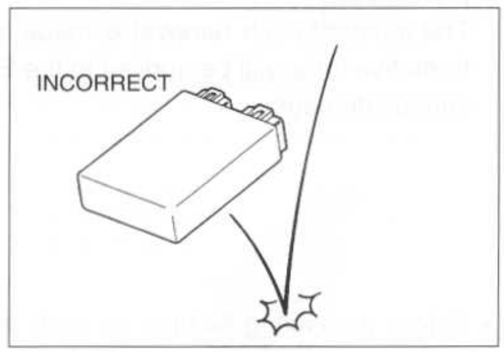
FUSE

- When a fuse blows, always investigate the cause 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.

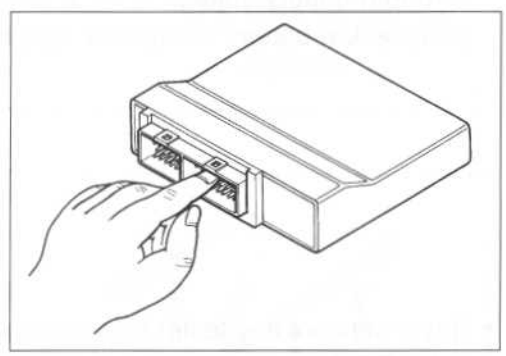


ECM/VARIOUS SENSORS

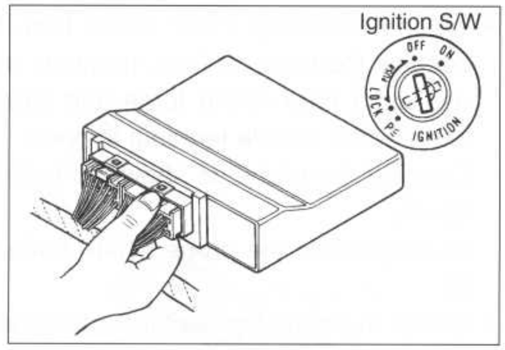
- Since each component is a high-precision part, great care should be taken not to apply any sharp impacts during removal and installation.



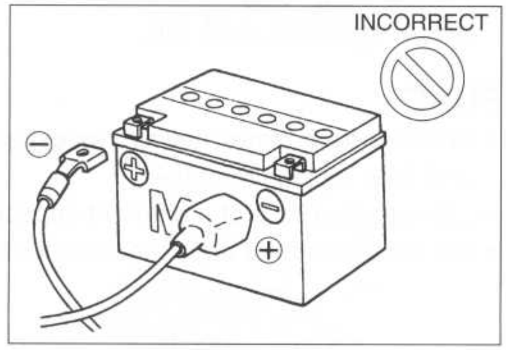
- Be careful not to touch the electrical terminals of the ECM. The static electricity from your body may damage this part.



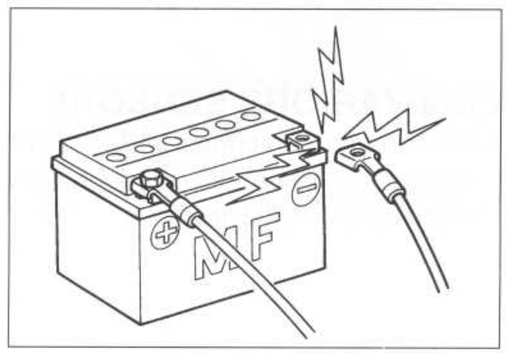
- When disconnecting and connecting the ECM, make sure to turn OFF the ignition switch, or electronic parts may get damaged.



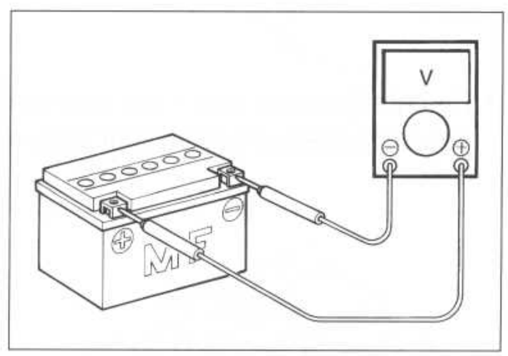
- Battery connection in reverse polarity is strictly prohibited. Such a wrong connection will damage the components of the FI system instantly when reverse power is applied.



- 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 at low battery voltage will lead to erroneous diagnosis.



- Never connect any tester (voltmeter, ohmmeter, or whatever) to the ECM when its coupler is disconnected. Otherwise, damage to ECM may result.
- Never connect an ohmmeter to the ECM with its coupler connected. If attempted, damage to 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

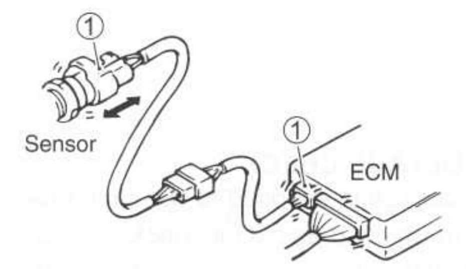
While there are various methods for electrical circuit inspection, described here is a general method to check for open and short circuit using an ohmmeter and a voltmeter.

OPEN CIRCUIT CHECK

Possible causes for the open circuits are as follows. As the cause can exist in the connector/coupler or terminal, they need to be checked carefully.

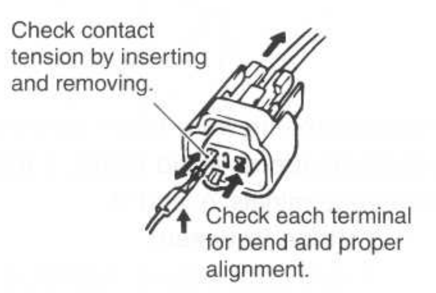
- Loose connection of connector/coupler.
- Poor contact of terminal (due to dirt, corrosion or rust, poor contact tension, entry of foreign object etc.).
- Wire harness being open.
- Poor terminal-to-wire connection.

- 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.

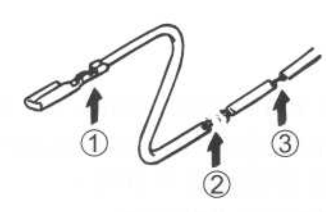


① Check for loose connection

- 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.



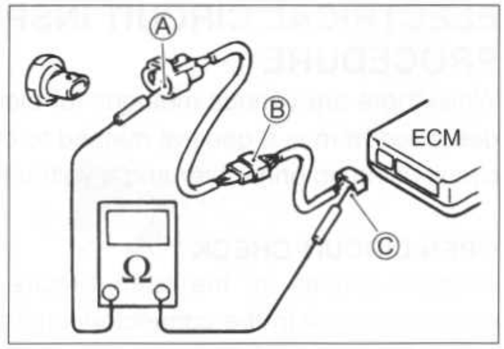
- Using continuity inspect or voltage check procedure as described below, inspect the wire harness terminals for open circuit and poor connection. Locate abnormality, if any.



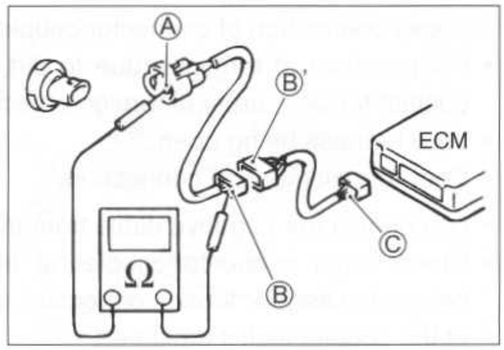
① Looseness of crimping
② Open
③ Thinwire (a few strands left)

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 Ⓒ.



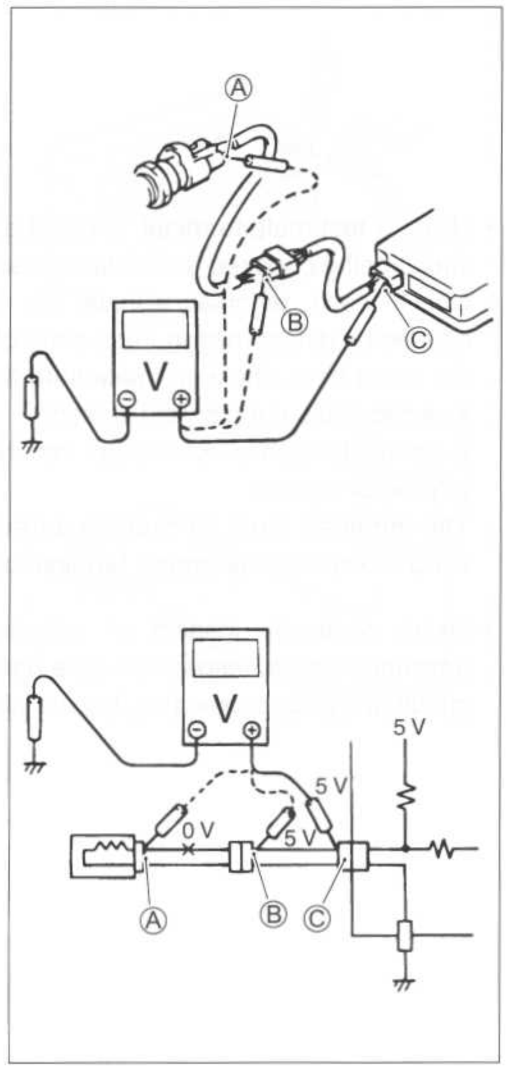
- Disconnect the coupler Ⓑ and measure resistance between couplers Ⓐ and Ⓑ.
  If no continuity is indicated, the circuit is open between couplers Ⓐ and Ⓑ. If continuity is indicated, there is an open circuit between couplers Ⓑ' and Ⓒ or an abnormality in coupler Ⓑ' or coupler Ⓒ.



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:

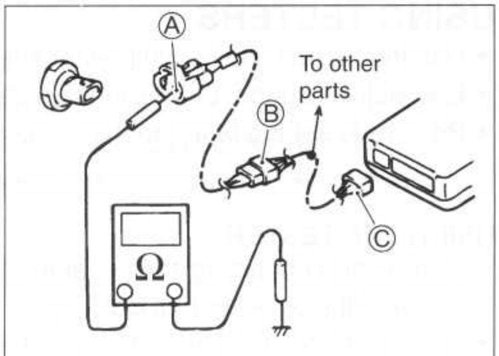
Ⓒ and body ground: Approx. 5 V
Ⓑ and body ground: Approx. 5 V — 2 V voltage drop
Ⓐ and body ground: 3 V

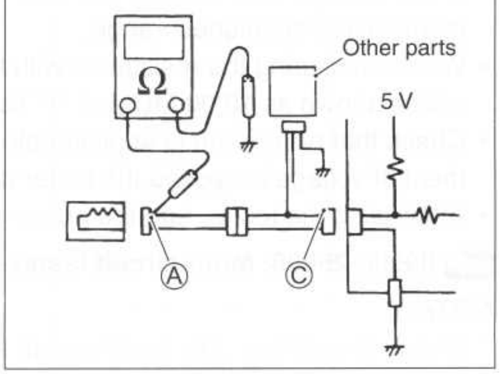
SHORT CIRCUIT CHECK (WIRE HARNESS TO GROUND)

- Disconnect the negative cable from the battery.
- Disconnect the connectors/couplers at both ends of the circuit to be checked.

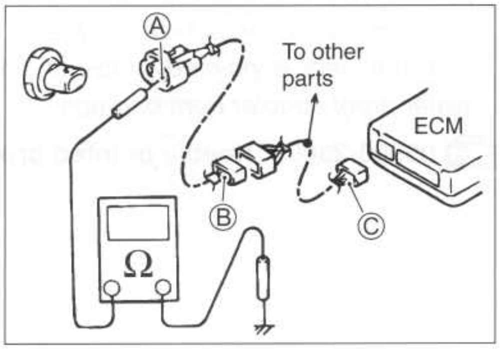
NOTE:
If the circuit to be checked branches to other parts as shown, disconnect all connectors/couplers of those parts. Otherwise, diagnosis will be misled.

- 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 TESTERS

- Use the Suzuki multi-circuit tester set (09990-25008).
- 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.

MULTI-CIRCUIT TESTER

TOOL 09900-25008: Multi-circuit tester set

NOTE:

** When connecting the multi-circuit tester, use the needle pointed probe to the back side of the lead wire coupler and connect the probes of tester to them.*

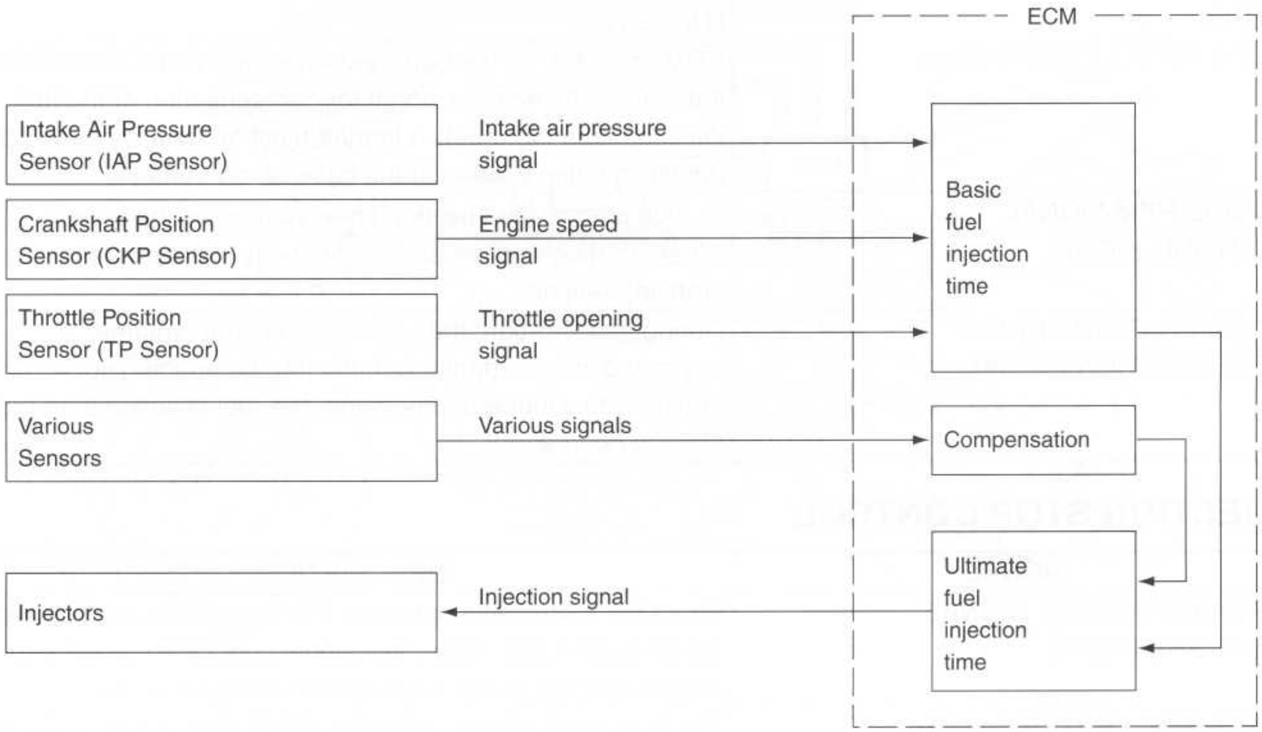
** Use the needle pointed probe to prevent the rubber of the water proof coupler from damage.*

TOOL 09900-25009: 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 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)

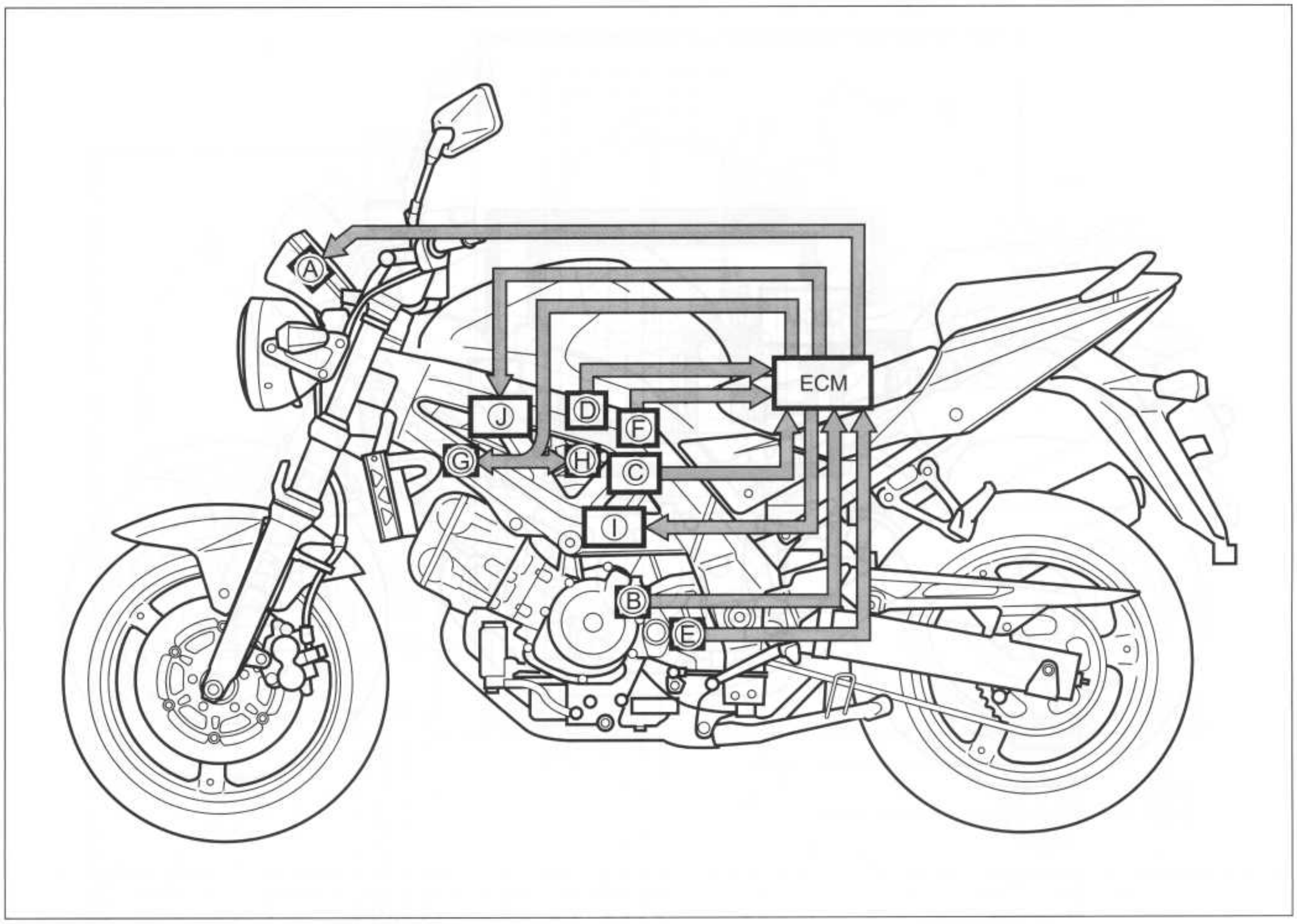
The following different signals are output from the respective sensors for compensation of the fuel injection time (volume).

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.
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.

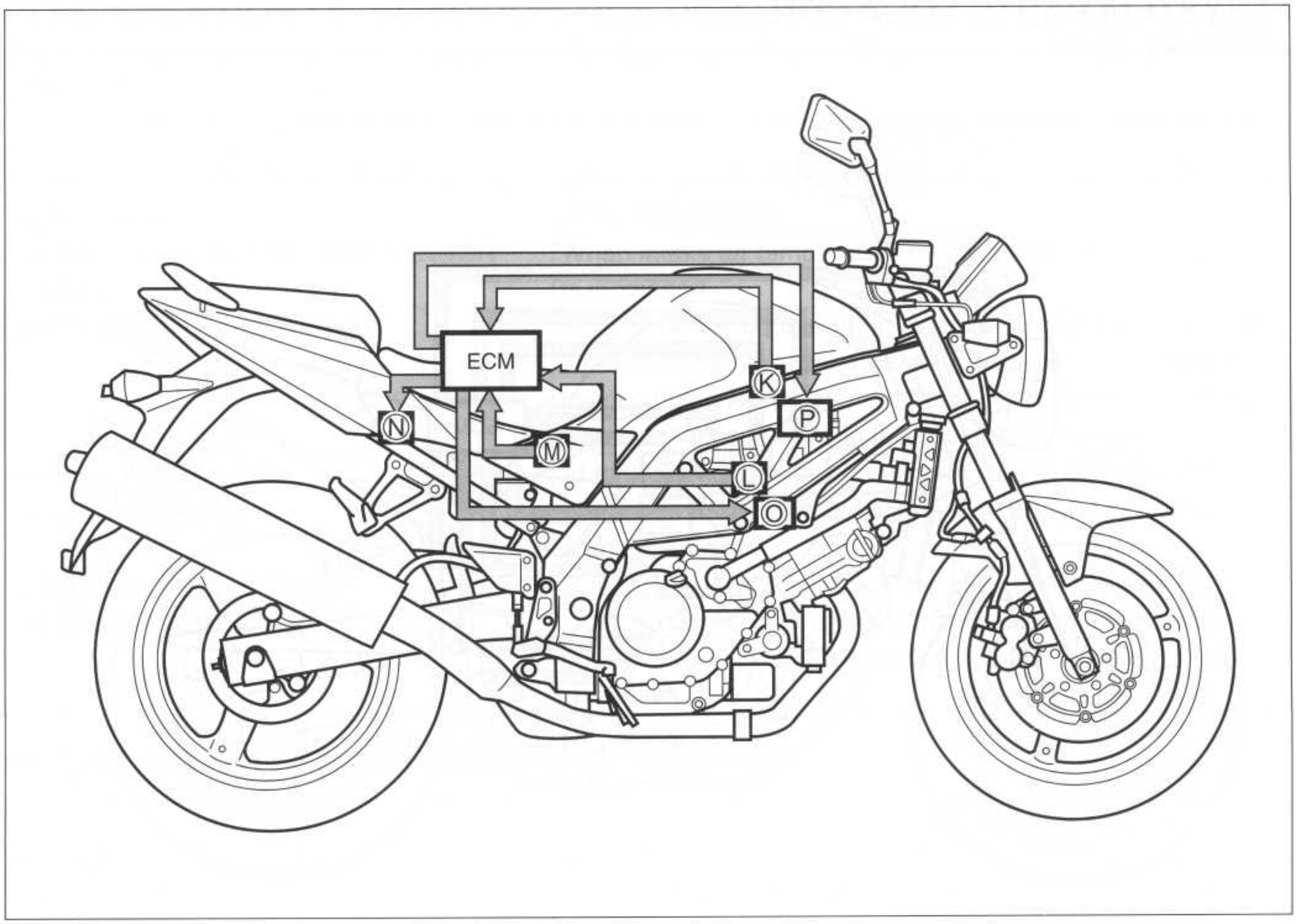
INJECTION STOP CONTROL

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 injector and ignition coil.
OVER-REV. LIMITER SIGNAL	The fuel injectors stop operation when engine rpm reaches rev. limit rpm.

FI SYSTEM PARTS LOCATION

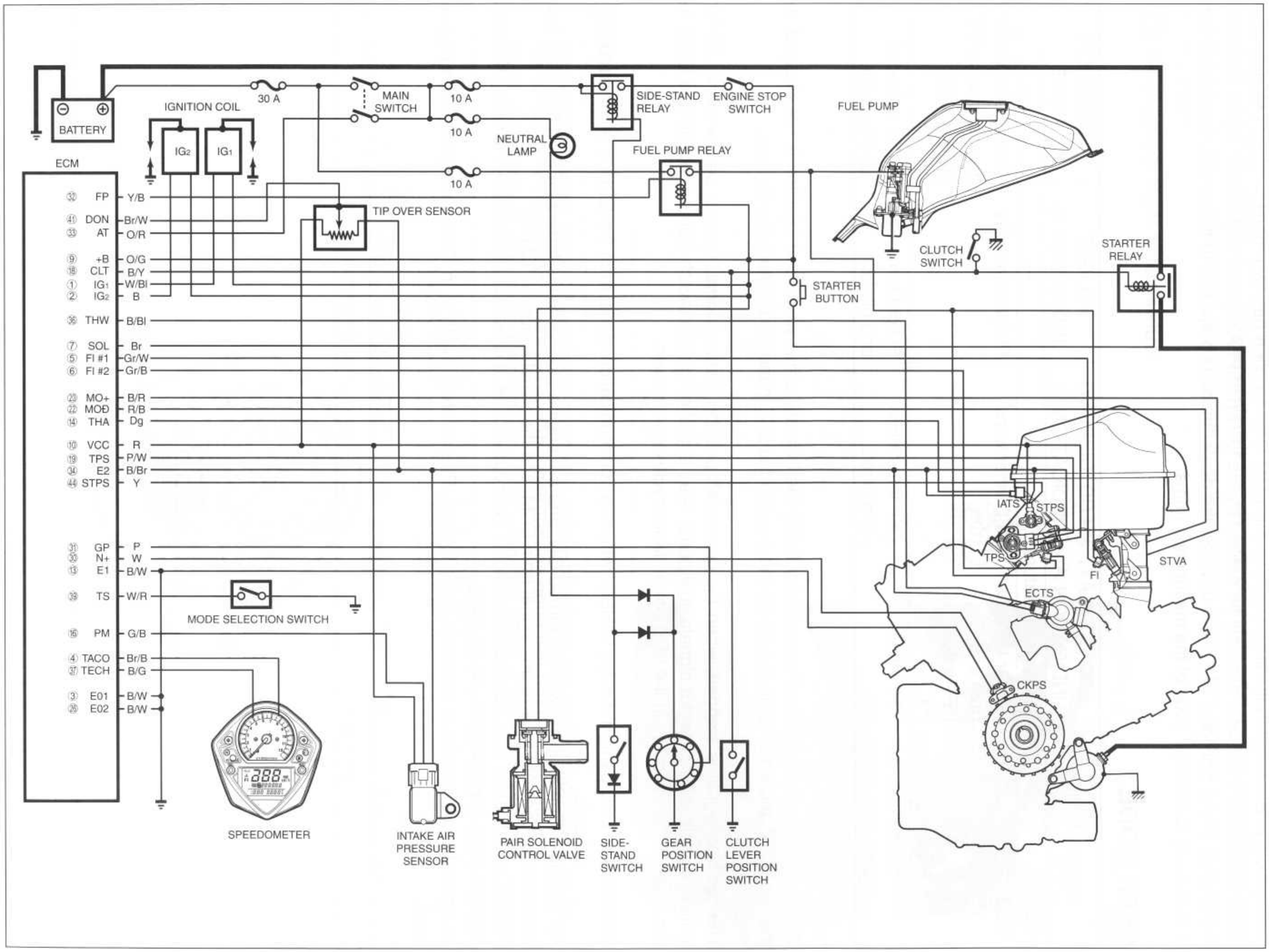


Ⓐ Speedometer
Ⓑ CKP sensor
Ⓒ TP sensor
Ⓓ IAT sensor
Ⓔ Gear position sensor
Ⓕ STP sensor
Ⓖ Fuel injector, No.1
Ⓗ Fuel injector, No.2
Ⓘ Ignition coil, No.1
Ⓙ STVA



Ⓚ IAP sensor
Ⓛ ECT sensor
Ⓜ TO sensor
Ⓝ Fuel pump relay
Ⓞ Ignition coil, No.2
Ⓟ PAIR control valve

FI SYSTEM WIRING DIAGRAM



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 Ⓐ	LCD (DISPLAY) INDICATION Ⓑ	FI LIGHT INDICATION Ⓒ	INDICATION MODE
"NO"		Water temperature	—	—	—
"YES"	Engine can start	Water temperature and "FI" letters *1	"FI" letter turns ON.	FI light turns ON.	Each 2 sec. Water temperature or "FI" is indicated.
	Engine can not start	"FI" letters *2	"FI" letter turns and blinks.	FI light turns ON and blinks.	"FI" is indicated continuously.

*1

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 water temperature are indicated in the LCD panel and motorcycle can run.

*2

The injection signal is stopped, when the crankshaft position sensor signal, tip over sensor signal, #1/#2 ignition signals, #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 speed-meter does not receive any signal from ECM, and the panel indicates "CHEC".

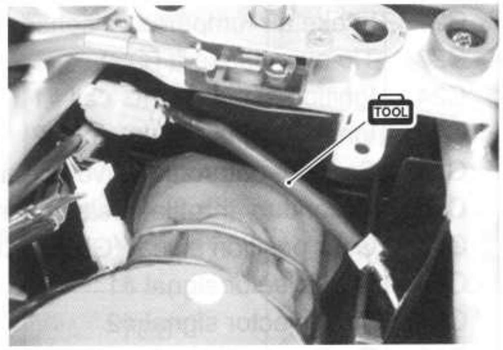
If CHEC is indicated, the LCD does not indicate the trouble code. It is necessary to check the wiring harness between ECM and speedometer couplers.

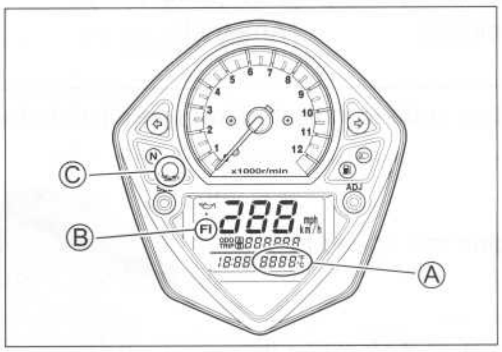
The possible cause of this indication is as follows, Engine stop switch is in OFF position. Ignition fuse is burnt.

DEALER MODE

The defective function is memorized in the computer. Use the special tool's coupler to connect to the dealer mode coupler. (☞4-20) The memorized malfunction code is displayed on LCD (DISPLAY) panel. Malfunction means that the ECM does not receive signal from the devices. These affected devices are indicated in the code form.

TOOL 09930-82720: Mode select switch





CAUTION

* **Do not disconnect the ECM lead wire couplers, before checking the malfunction code, or the malfunction code memory is erased and the malfunction code can not be checked.**
* **Confirm the malfunction code after ignition ON or cranking the engine for few seconds.**

MALFUNCTION	LCD (DISPLAY) INDICATION Ⓐ	LCD (DISPLAY) INDICATION Ⓑ	INDICATION MODE
"NO"	C00	"FI" letter turns OFF.	—
"YES"	C**code is indicated from small numeral to large one.		For each 2 sec., code is indicated.

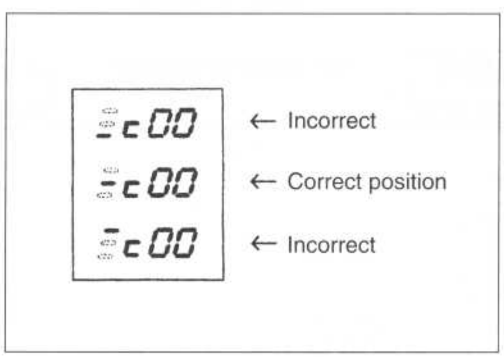
CODE	MALFUNCTION PART	REMARKS
C00	None	No defective part
C12	Crankshaft position sensor (CKPS)	Pick-up coil signal, signal generator
C13	Intake air position sensor (IAPS)	
C14	Throttle position sensor (TPS)	
C15	Engine coolant temperature sensor (ECTS)	
C21	Intake air temperature sensor (IATS)	
C23	Tip over sensor (TOS)	
C24	Ignition signal #1 (IG coil #1)	For #1 cylinder
C25	Ignition signal #2 (IG coil #2)	For #2 cylinder
C28	Secondary throttle valve actuator (STVA)	
C29	Secondary throttle position sensor (STPS)	
C31	Gear position signal (GP switch)	
C32	Fuel injector signal #1	For #1 cylinder
C33	Fuel injector signal #2	For #2 cylinder
C41	Fuel pump control system (FP control system)	Fuel pump relay
C42	Ignition switch signal (IG switch signal)	Anti-theft
C49	PAIR control solenoid valve	

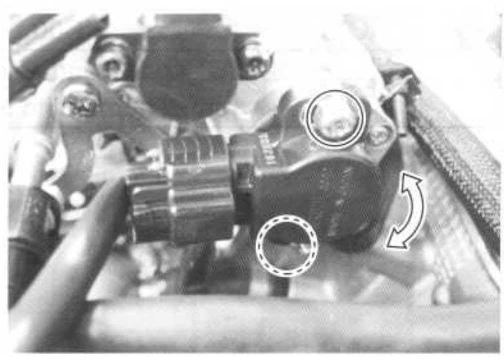
In the LCD (DISPLAY) panel, the malfunction code is indicated from small code to large code.

TPS ADJUSTMENT

1. Warm up the engine and adjust the engine idle speed to 1 300 ± 100 rpm. (☞2-16)
2. Stop the engine.
3. Connect the special tool (Mode select switch) and select the dealer mode.
4. If the throttle position sensor adjustment is necessary, loosen the screws and turn the throttle position sensor and bring the line to middle.
5. Then, tighten the screw to fix the throttle position sensor.

TP sensor mounting screw: 3.5 N·m (0.35 kgf-m, 2.5 lb-ft)





09930-11950: Torx wrench
09930-82720: Mode select switch

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
Intake air pressure sensor		Intake air pressure and atmospheric pressure are fixed to 760 mmHg.	"YES"	"YES"
Throttle position sensor		The throttle opening signal is fixed to full open position, and STV is fixed at 1/2 open position. Ignition timing is also fixed.	"YES"	"YES"
Engine coolant temperature sensor		Engine coolant temperature value is fixed to 80 °C (176 °F).	"YES"	"YES"
Intake air temperature sensor		Intake air temperature value is fixed to 40 °C (104 °F).	"YES"	"YES"
Ignition signal	#1	#1 Ignition-off	"YES"	"YES"
			#2 cylinder can run.	
	#2	#2 Ignition-off	"YES"	"YES"
			#1 cylinder can run.	
Injection signal	#1	#1 Fuel-cut	"YES"	"YES"
			#2 cylinder can run.	
	#2	#2 Fuel-cut	"YES"	"YES"
			#1 cylinder can run.	
Secondary throttle valve actuator		ECM stops controlling STV.	"YES"	"YES"
Secondary throttle position sensor		ECM stops controlling STV.	"YES"	"YES"
Gear position signal		Gear position signal is fixed to 4th gear.	"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.

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 such an inspection form will facilitate collecting information to the point 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 (°F/ °C) ☐ 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:

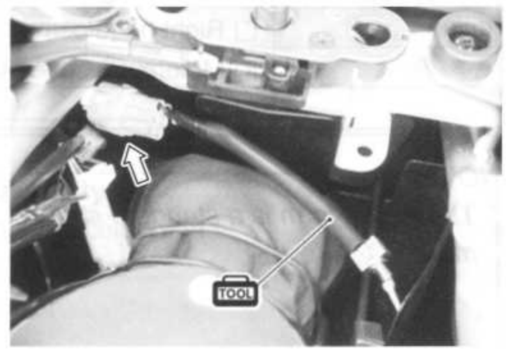
* *The above form is a standard sample. It should be modified according to conditions characteristic of each market.*

SELF-DIAGNOSTIC PROCEDURES

Don't disconnect couplers from ECM, battery cable from battery, ECM ground wire harness from engine or main fuse before confirming malfunction code (self-diagnostic trouble code) stored in memory. Such disconnection will erase 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" (☞4-14, 15) carefully to have good understanding as to what functions are available and how to use it.

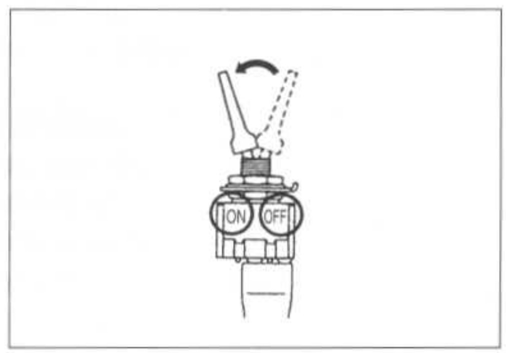
Be sure to read "PRECAUTIONS for Electrical Circuit Service" (☞4-2) before inspection and observe what is written there.

- Remove the seat tail cover. (☞7-5)
- 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

NOTE:
The dealer mode coupler is located inside of the left seat tail cover.



SELF-DIAGNOSIS RESET PROCEDURE

- After repairing the trouble, turn OFF the ignition switch and turn ON again.
- If C00 is indicates, the malfunction codes are cleared.
- Disconnect the special tool from the dealer mode coupler.

MALFUNCTION CODE AND DEFECTIVE CONDITION

MALFUNCTION CODE	DETECTED ITEM	DETECTED FAILURE CONDITION / CHECK FOR
C00	NO FAULT	——
C12	Crankshaft position sensor	The signal does not reach ECM for more than 3 sec. after receiving the IAP signal.
		The crankshaft position sensor wiring and mechanical parts. (Crankshaft position sensor, lead wire/coupler connection)
C13	Intake air pressure sensor	The sensor should produce following voltage. 0.1 V $\leqq$ sensor voltage $\leqq$ 4.8 V Without the above range for 4 sec. and more, C13 is indicated.
		Intake air pressure sensor, lead wire/coupler connection.
C14	Throttle position sensor	The sensor should produce following voltage. 0.1 V $\leqq$ sensor voltage < 4.8 V Without the above range for 4 sec. and more, C14 is indicated.
		Throttle position sensor, lead wire/coupler connection.
C15	Engine coolant temperature sensor	The sensor voltage should be the following. 0.1 V $\leqq$ sensor voltage < 4.6 V Without the above range for 4 sec. and more, C15 is indicated.
		Engine coolant temperature sensor, lead wire/coupler connection.
C21	Intake air temperature sensor	The sensor voltage should be the following. 0.1 V $\leqq$ sensor voltage < 4.6 V Without the above range for 4 sec. and more, C21 is indicated.
		Intake air temperature sensor, lead wire/coupler connection.
C23	Tip over sensor	The sensor voltage should be the following for more than 2 sec. after ignition switch turns ON. 0.2 V $\leqq$ sensor voltage $\leqq$ 4.6 V Without the above value for 2 sec. and more, C23 is indicated.
		Tip over sensor, lead wire/coupler connection.

MALFUNCTION CODE	DETECTED ITEM	DETECTED FAILURE CONDITION / CHECK FOR
C24/C25	Ignition signal #1/#2	Crankshaft position sensor (pick-up coil) signal is produced, but signal from ignition coil is interrupted continuous by 4 times or more. In this case, the code C24 or C25 is indicated.
		Ignition coil, wiring/coupler connection, power supply from the battery.
C28	Secondary throttle valve actuator	When no actuator control signal is supplied from the ECM or communication signal does not reach ECM or operation voltage does not reach STVA motor, C28 is indicated. STVA can not operate.
		STVA lead wire/coupler.
C29	Secondary throttle position sensor	The sensor should produce following voltage. 0.1 V $\leqq$ sensor voltage $\leqq$ 4.8 V Without the above range for 4 sec. and more, C29 is indicated.
		Secondary throttle position sensor, lead wire/coupler connection.
C31	Gear position signal	It judges from gear position voltage, engine speed and throttle position by ECM, when the gear position voltage is 0.2 V and less.
		Gear position sensor, wiring/coupler connection. Gearshift cam etc.
C32/C33	Fuel injector #1/#2	When fuel injector voltage gets 1.3 V and less, C32 or C33 is indicated.
		Injector, wiring/coupler connection, power supply to the injector.
C41	Fuel pump relay	No voltage is applied to the both injectors #1/#2 for 3 sec. after the contact of fuel pump relay is turned ON. Or voltage is applied to the both injectors #1/#2, when the contact of fuel pump is OFF.
		Fuel pump relay, connecting lead wire, power source to fuel pump relay, fuel injectors.
C42	Ignition switch	Ignition switch signal is not input in ECM.
		Ignition switch, lead wire/coupler.
C49	PAIR control solenoid valve	PAIR control solenoid valve voltage is not input in ECM.
		PAIR control solenoid valve, lead wire/coupler.

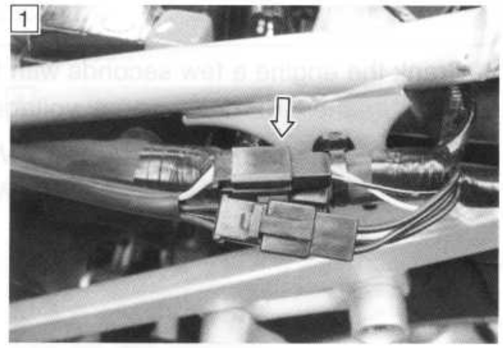
"C12" CKP SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
The signal does not reach ECM for more than 3 sec. after receiving the IAP signal.	• Metal particles or foreign materiel being attached on the CKP sensor and rotor tip. • CKP sensor circuit open or short. • CKP sensor malfunction. • ECM malfunction.

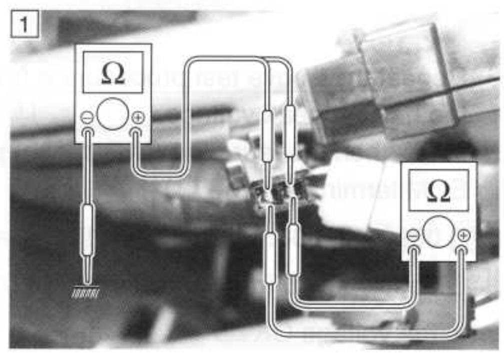
INSPECTION

Step1

1) Remove the seat tail cover. (☞7-5)
2) Turn the ignition switch OFF.
3) Check the CKP sensor coupler ① for loose or poor contacts. If OK, then measure the CKP sensor resistance.



4) Disconnect the CKP sensor coupler ① and measure the resistance.



DATA CKP sensor resistance: 130 – 240 Ω (White – Green)

5) If OK, then check the continuity between each terminal and ground.

DATA CKP sensor continuity: ∞ Ω (Infinity) (White – Ground) (Green – Ground)

TOOL 09900-25008: Multi circuit tester set

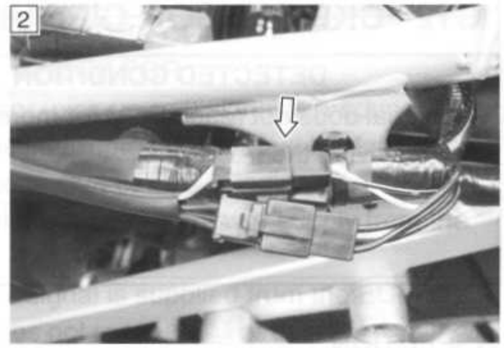
Tester knob indication: Resistance (Ω)

Are the resistance and continuity OK?

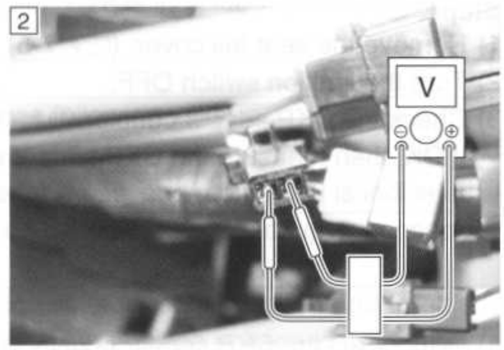
YES	Go to Step 2.
NO	Replace the CKP sensor with a new one.

Step2

1) Disconnect the CKP sensor coupler.

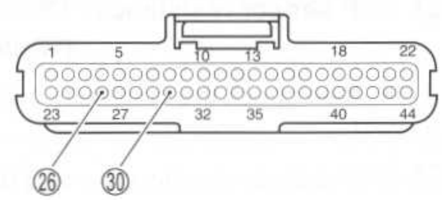


2) Crank the engine a few seconds with the starter motor, and measure the CKP sensor peak voltage at the coupler.



DATA CKP sensor peak voltage: 3.7 V and more
(⊕ White – ⊖ Green)

3) Repeat the above test procedure a few times and measure the highest peak voltage.
If OK, then measure the CKP sensor peak voltage at the ECM terminals. (㉖ – ㉚)



ECM coupler

TOOL 09900-25008: Multi circuit tester set

Tester knob indication: voltage (⎓)

Is the voltage OK?

YES	• B/W or White wire open or shorted to ground, or poor ㉖ or ㉚ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	• Loose or poor contacts on the CKP sensor coupler or ECM coupler. • Replace the CKP sensor with a new one.

"C13" IAP SENSOR CIRCUIT MALFUNCTION

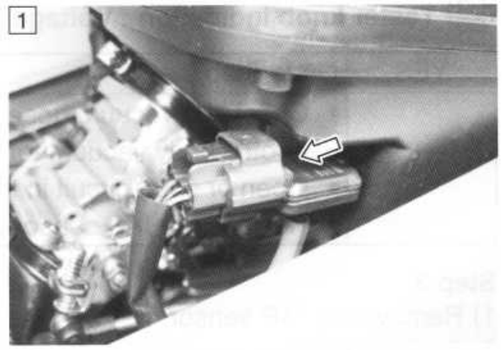
DETECTED CONDITION	POSSIBLE CAUSE
IAP sensor voltage is out of the specified range. 0.1 V ≦ Sensor voltage ≦ 4.8 V *NOTE:* *Note that atmospheric pressure varies depending on weather conditions as well as altitude.* *Take that into consideration when inspecting voltage.*	• Clogged vacuum passage between 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

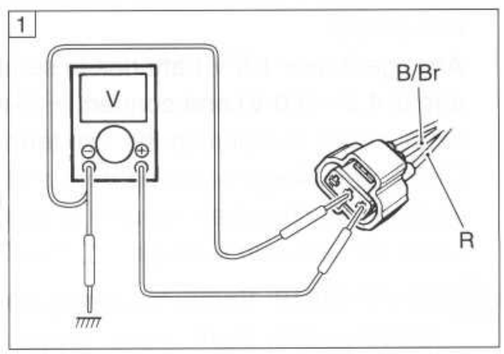
1) Lift and support the fuel tank with its prop stay. (☞5-6)
2) Turn the ignition switch OFF.
3) Check the IAP sensor coupler for loose or poor contacts.
   If OK, then measure the IAP sensor input voltage.

1



4) Disconnect the IAP sensor coupler.
5) Turn the ignition switch ON.
6) Measure the voltage at the Red wire and ground.
   If OK, then measure the voltage at the Red wire and B/Br wire.

1



DATA **IAP sensor input voltage: 4.5 – 5.5 V**
(⊕ Red – ⊖ Ground)
(⊕ Red – ⊖ B/Br)

TOOL **09900-25008: Multi circuit tester set**

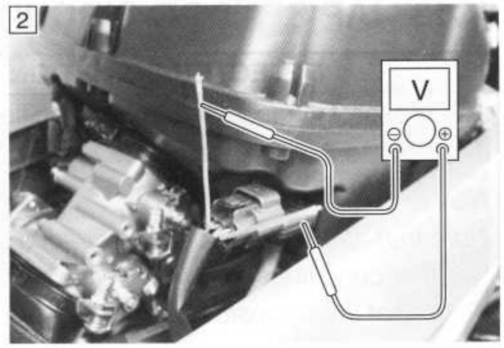
Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	Go to Step 2
NO	• Loose or poor contacts on the ECM coupler. • Open or short circuit in the Red wire or B/Br wire.

Step 2

1) Connect the IAP sensor coupler.
2) Insert the needle pointed probes to the lead wire coupler.
3) Start the engine at idle speed.
4) Measure the IAP sensor output voltage at the wire side coupler (between G/B and B/Br wires).



DATA **IAP sensor output voltage: Approx. 2.7 V at idle speed (⊕ G/B – ⊖ B/Br)**

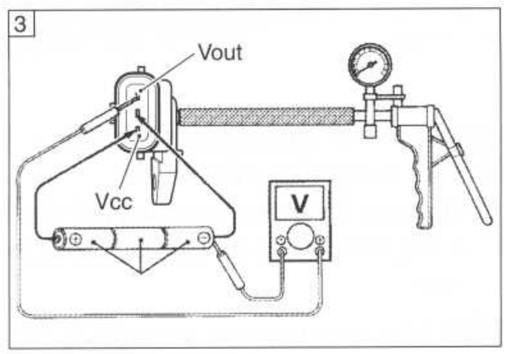
TOOL **09900-25008: Multi circuit tester set**
09900-25009: Needle pointed probe set

Tester knob indication : Voltage (⎓)

YES	Go to Step 3
NO	• Check the vacuum hose and the passage of throttle body vacuum for crack or damage. • Open or short circuit in the G/B wire. • Replace the IAP sensor with a new one.

Step 3

1) Remove the IAP sensor. (☞4-47)
2) Connect the vacuum pump gauge to the vacuum port of the IAP sensor.
   Arrange 3 new 1.5 V batteries in series (check that total voltage is 4.5 – 5.0 V) and connect ⊖ terminal to the ground terminal and ⊕ terminal to the Vcc terminal.
   Check the voltage between Vout and ground. Also, check if voltage reduces when vacuum is applied up to 400 mmHg by using vacuum pump gauge. (☞4-27)

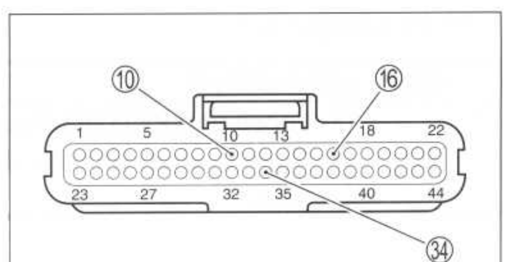


TOOL **09917-47010: Vacuum pump gauge**
09900-25008: Multi circuit tester set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	• Red, Green or B/Br wire open or shorted to ground, or poor ⑩, ⑯ or ㉞ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	If check result is not satisfactory, replace IAP sensor with a new one.



ECM coupler

Output voltage (Vcc voltage 4.5 V, ambient temp. 25 °C, 77 °F)

ALTITUDE (Reference)		ATMOSPHERIC PRESSURE		OUTPUT VOLTAGE
(ft)	(m)	(mmHg)	kPa	(V)
0 – 2 000	0 – 610	760 – 707	100 – 94	Approx. 3.3 – 3.6
2 001 – 5 000	611 – 1 524	707 – 634	94 – 85	Approx. 3.0 – 3.3
5 001 – 8 000	1 525 – 2 438	634 – 567	85 – 76	Approx. 2.7 – 3.0
8 001 – 10 000	2 439 – 3 048	567 – 526	76 – 70	Approx. 2.5 – 2.7

"C14" TP SENSOR CIRCUIT MALFUNCTION

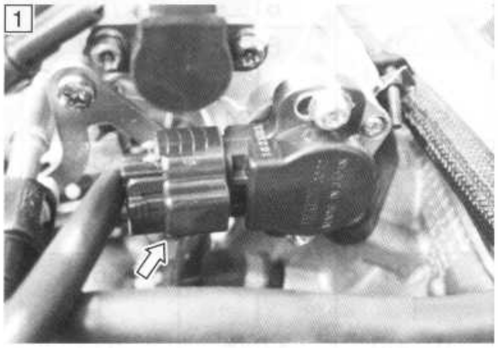
DETECTED CONDITION	POSSIBLE CAUSE
Output voltage is out of the specified range. 0.1 V ≦ Sensor voltage < 4.8 V	• TP sensor maladjusted. • TP sensor circuit open or short. • TP sensor malfunction. • ECM malfunction.

INSPECTION

Step 1

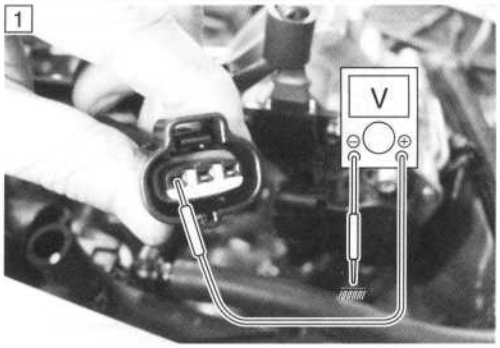
1) Turn the ignition switch OFF.
2) Check the TP sensor coupler for loose or poor contacts.
   If OK, then measure the TP sensor input voltage.
3) Disconnect the TP sensor coupler.

1



4) Turn the ignition switch ON.
5) Measure the voltage at the Red wire and ground.
6) If OK, then measure the voltage at the Red wire and B/Br wire.

1



DATA **TP sensor input voltage: 4.5 – 5.5 V**
(⊕ Red – ⊖ Ground)
(⊕ Red – ⊖ B/Br)

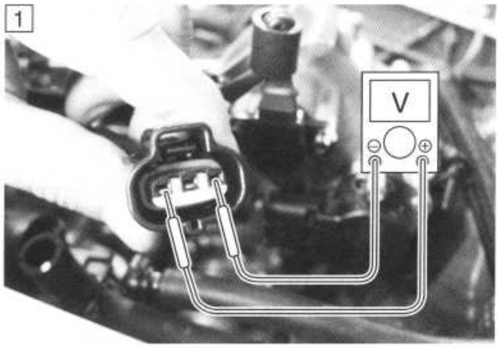
TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Voltage (⎓)

Is the voltage OK?

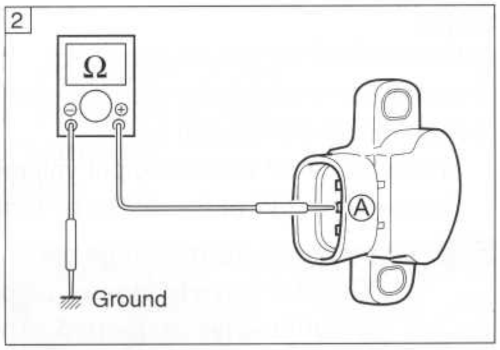
YES	Go to Step 2
NO	• Loose or poor contacts on the ECM coupler. • Open or short circuit in the Red wire or B/Br wire.

1



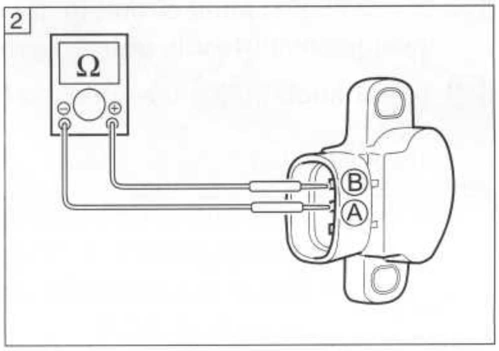
Step 2

1) Remove the air cleaner box. (☞5-16)
2) Turn the ignition switch OFF.
3) Disconnect the TP sensor coupler.
4) Check the continuity between Ⓐ and ground.



DATA **TP sensor continuity: ∞ Ω (Infinity)**
(Ⓐ – Ground)

5) If OK, then measure the TP sensor resistance (between Ⓐ and Ⓑ).
6) Turn the throttle grip and measure the resistance.



DATA **TP sensor resistance**
Throttle valve is closed : Approx. 1.12 kΩ
Throttle valve is opened: Approx. 4.26 kΩ

TOOL **09900-25008: Multi circuit tester set**

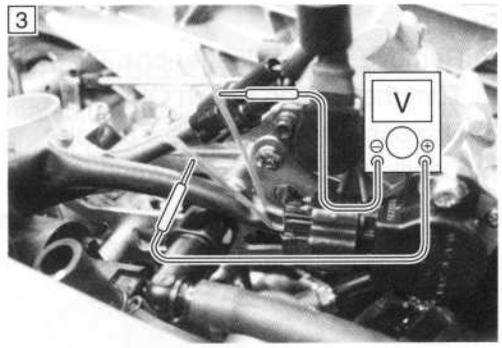
Tester knob indication: Resistance (Ω)

Are the resistance and continuity OK?

YES	Go to Step 3
NO	• Reset the TP sensor position correctly. • Replace the TP sensor with a new one.

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.
   Measure the TP sensor output voltage at the coupler (between ⊕ P/W and ⊖ B/Br) by turning the throttle grip.



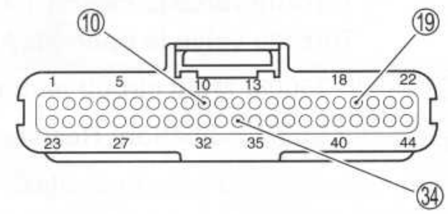
DATA **TP sensor output voltage**
Throttle valve is closed : Approx. 1.12 V
Throttle valve is opened: Approx. 4.26 V

TOOL **09900-25008: Multi circuit tester set**
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	• Red, P/W or B/Br wire open or shorted to ground, or poor ⑩, ⑲ or ㉞ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	If check result is not satisfactory, replace TP sensor with a new one.



ECM coupler

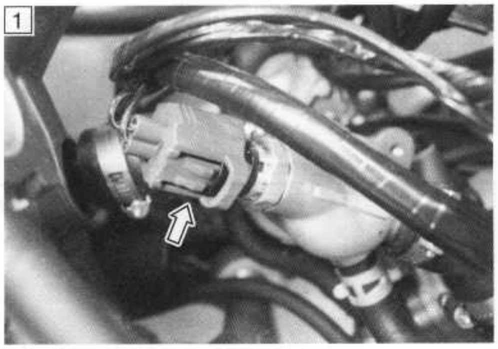
"C15" ECT SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
Output voltage is out of the specified range. 0.1 V ≦ Sensor voltage < 4.6 V	• ECT sensor circuit open or short. • ECT sensor malfunction. • ECM malfunction.

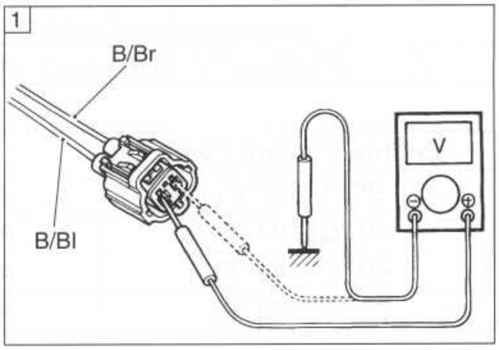
INSPECTION

Step 1

1) Turn the ignition switch OFF.
2) Check the ECT sensor coupler for loose or poor contacts.
   If OK, then measure the ECT sensor voltage at the wire side coupler.
3) Disconnect the coupler and turn the ignition switch ON.



4) Measure the voltage between B/BI wire terminal and ground.
5) If OK, then measure the voltage between B/BI wire terminal and B/Br wire terminal.



DATA **ETC sensor voltage: 4.5 – 5.5 V**
(⊕ B/BI – ⊖ Ground)
(⊕ B/BI – ⊖ 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. • Open or short circuit in the B/BI wire or B/Br wire.

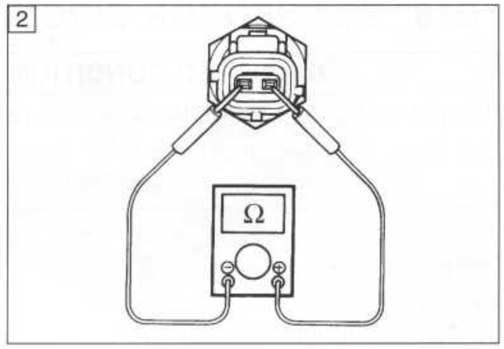
Step 2

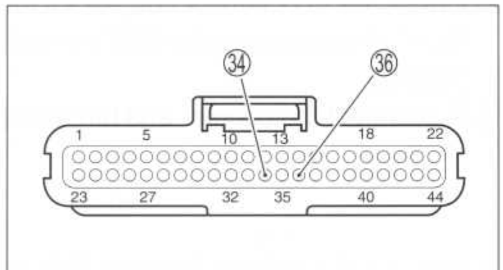
1) Turn the ignition switch OFF.
2) Measure the ECT sensor resistance. (Refer to page 6-10 for details.)

DATA **ECT sensor resistance:**
Approx. 2.45 kΩ at 20 °C (68 °F) (Terminal – Terminal)

TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Resistance (Ω)





ECM coupler

Is the resistance OK?

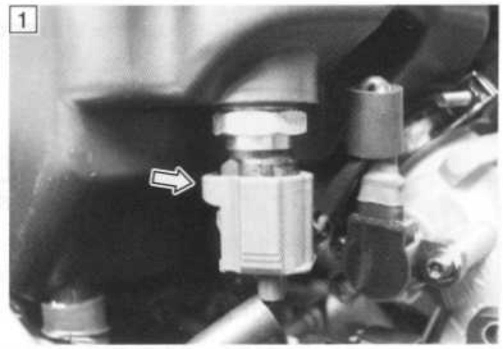
YES	• B/Bl or B/Br wire open or shorted to ground, or poor ㉞ or ㊱ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	Replace the ECT sensor with a new one.

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

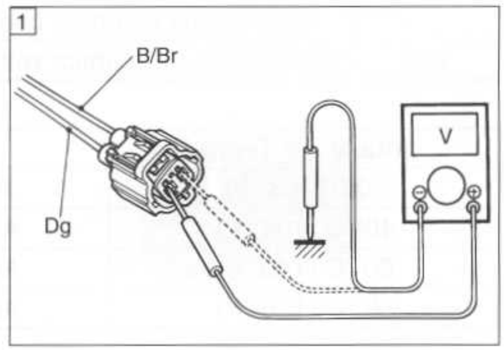
"C21" IAT SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
Output voltage is out of the specified range. 0.1 V $\leq$ Sensor voltage < 4.6 V	• IAT sensor circuit open or short. • IAT sensor malfunction. • ECM malfunction.

INSPECTION
Step 1



1) Lift and support the fuel tank with its prop stay. (☞5-6)
2) Turn the ignition switch OFF.
3) Check the IAT sensor coupler for loose or poor contacts.
   If OK, then measure the IAT sensor voltage at the wire side coupler.
4) Disconnect the coupler and turn the ignition switch ON.



5) Measure the voltage between Dg wire terminal and ground.
6) If OK, then measure the voltage between Dg wire terminal and B/Br wire terminal.

DATA **IAT sensor 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. • Open or short circuit in the Dg wire or B/Br wire.

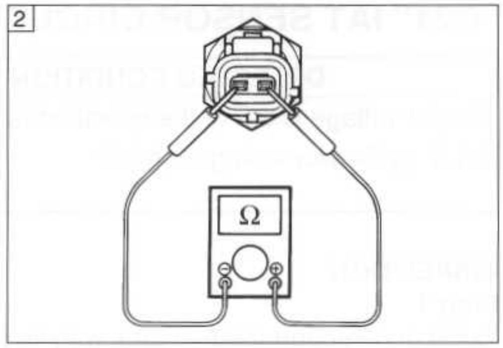
Step 2

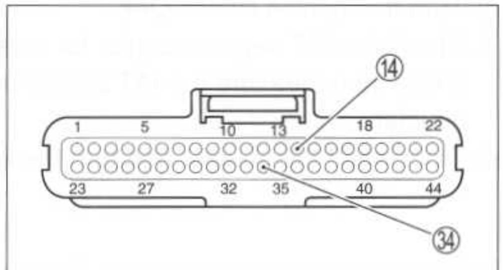
1) Turn the ignition switch OFF.
2) Measure the IAT sensor resistance.

DATA **IAT sensor resistance:**
Approx. 2.45 kΩ at 20 °C (68 °F) (Terminal – Terminal)

TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Resistance (Ω)





ECM coupler

Is the resistance OK?

YES	• Dg or B/Br wire open or shorted to ground, or poor ⑭ or ㉞ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	Replace the IAT sensor with a new one.

Intake Air 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

NOTE:
IAT sensor resistance measurement method is the same way as that of the ECT sensor. Refer to page 6-10 for details.

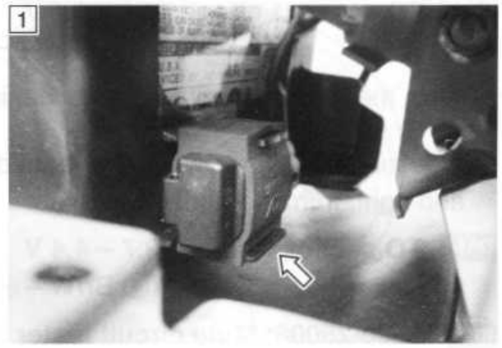
"C23" TO SENSOR CIRCUIT MALFUNCTION

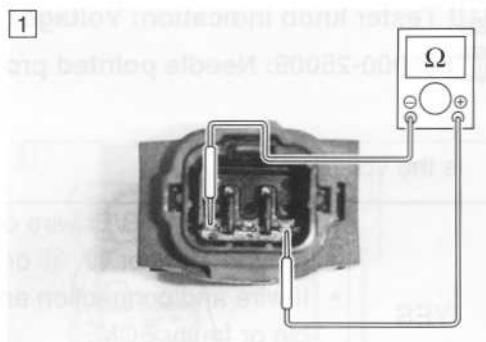
DETECTED CONDITION	POSSIBLE CAUSE
Output voltage is out of the specified range. 0.2 V ≦ Sensor voltage < 4.6 V	• TO sensor circuit open or short. • TO sensor malfunction. • ECM malfunction.

INSPECTION

Step 1

1) Remove the right frame cover. (☞7-4)
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) Remove the TO sensor.
5) Measure the resistance between Red wire and B/Br wire terminals.





DATA **TO sensor resistance: 19.1 – 19.7 kΩ (Red – B/Br)**

TOOL **09900-25008: Multi circuit tester set**

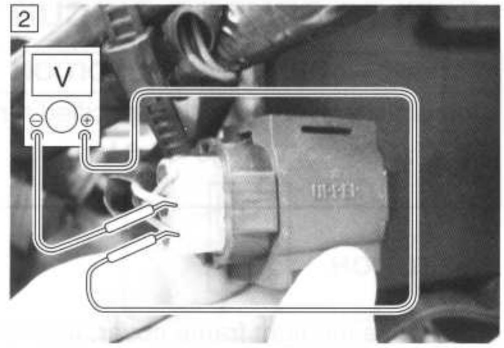
Tester knob indication: Resistance (Ω)

Is the resistance OK?

YES	Go to Step 2
NO	Replace the TO sensor with a new one.

Step 2

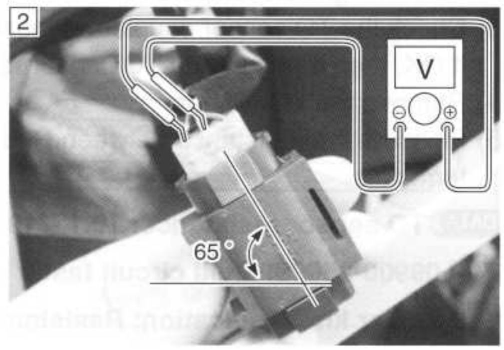
1) Connect the TO sensor coupler.
2) Insert the needle pointed probe to the lead wire coupler.
3) Turn the ignition switch ON.
4) Measure the voltage at the wire side coupler between Br/W and B/Br wires of the TO sensor at horizontal.



DATA **TO sensor voltage: 0.4 – 1.4 V**
(⊕ Br/W – ⊖ B/Br)

Also, measure the voltage when leaning of the motorcycle.

5) Measure the voltage when it is leaned more than 65 °, left and right, from the horizontal level.

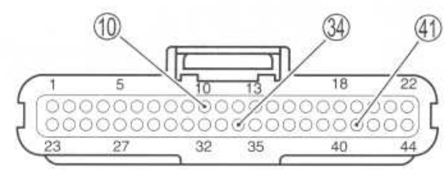


DATA **TO sensor voltage: 3.7 – 4.4 V**
(⊕ Br/W – ⊖ B/Br)

TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Voltage (⎓)

TOOL **09900-25009: Needle pointed probe set**



ECM coupler

Is the voltage OK?

YES	• Red, Br/W or B/Br wire open or shorted to ground, or poor ⑩, ㊶ or ㉞ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	• Loose or poor contacts on the ECM coupler. • Open or short circuit in the Br/W wire or B/Br wire. • Replace the TO sensor with a new one.

"C24" or "C25" IGNITION SYSTEM MALFUNCTION

***Refer to the IGNITION SYSTEM for details. (☞8-23)**

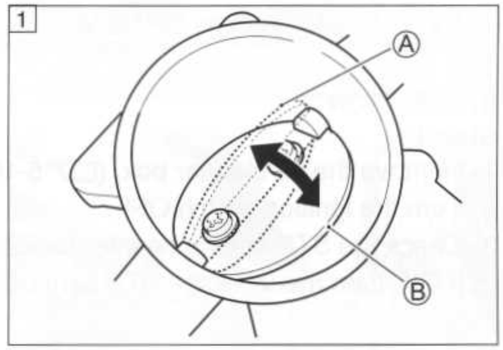
"C28" STV ACTUATOR CIRCUIT MALFUNCTION

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 and air cleaner box. (☞5-16)
2) Turn the ignition switch OFF.
3) Check the STVA coupler for loose or poor contacts.
4) Turn the ignition switch ON to check the STV operation.
   STV operating order: Full open Ⓐ → open Ⓑ
   (Approx. 1 seconds later)
   Is the operation OK?

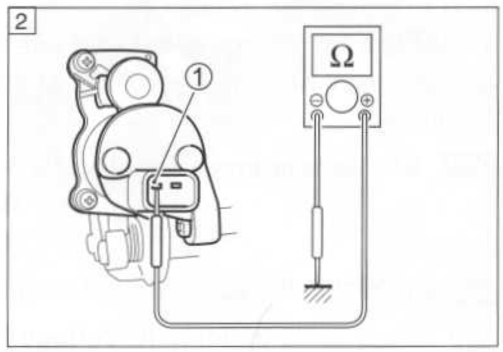


YES	Go to Step 2
NO	• Loose or poor contacts on the STVA coupler. • Open or short circuit in the B/R and R/B wires.

Step 2

1) Turn the ignition switch OFF.
2) Check the STVA coupler for loose or poor contacts.
3) Disconnect the STVA coupler.
4) Check the continuity between terminal ① and ground.

DATA **STVA continuity: ∞ Ω (Infinity)**



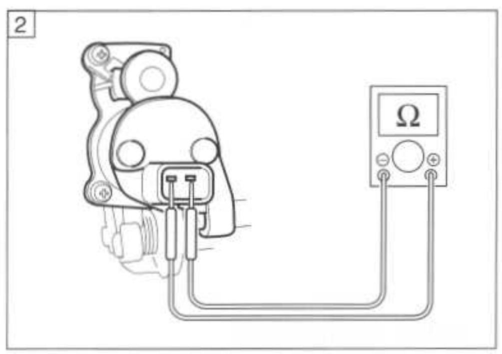
5) If OK, then measure the STVA resistance.

DATA **STVA resistance: Approx. 7 – 14 Ω**

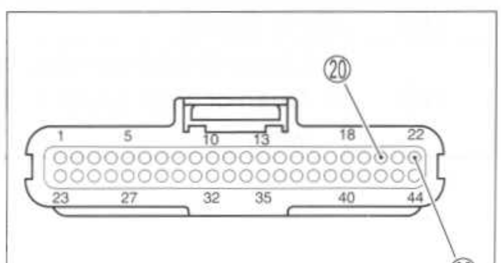
TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Resistance (Ω)

Is the resistance OK?



YES	• Loose or poor contacts on the STVA coupler, or poor ⑳ or ㉒ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. Recheck each terminal and wire harness for open circuit and poor connection.
NO	Replace the STVA with a new one.



ECM coupler

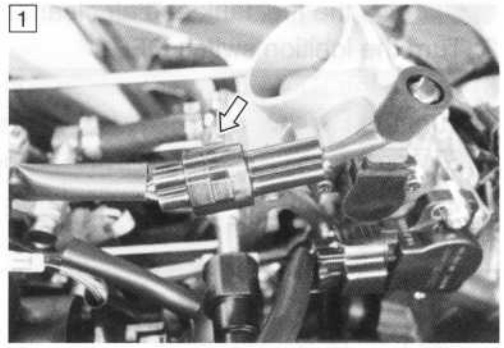
"C29" STP SENSOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
Signal voltage is out of the specified range. Difference between actual throttle opening and opening calculated by ECM in larger than specified value. 0.1 V $\leqq$ Sensor voltage $\leqq$ 4.8 V	• STP sensor maladjusted. • STP sensor circuit open or short. • STP sensor malfunction. • ECM malfunction.

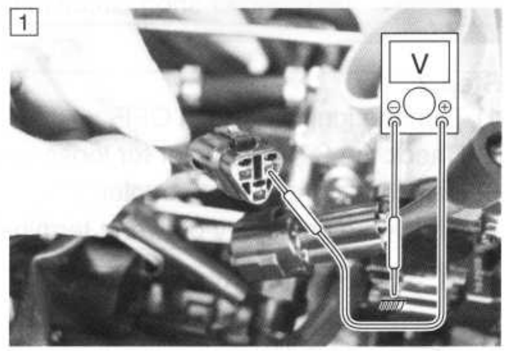
INSPECTION

Step 1

1) Remove the air cleaner box. (☞5-16)
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.



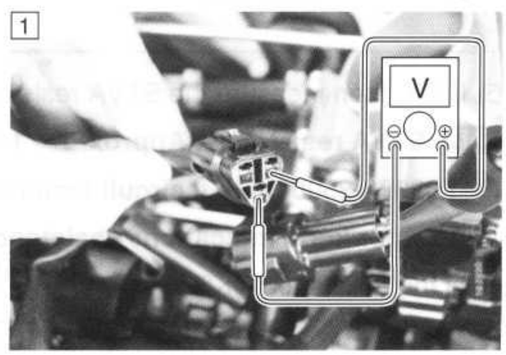
4) Disconnect the STP sensor coupler.
5) Turn the ignition switch ON.
6) Measure the voltage at the Red wire and ground.
7) If OK, then measure the voltage at the Red wire and B/Br wire.



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 (⎓)

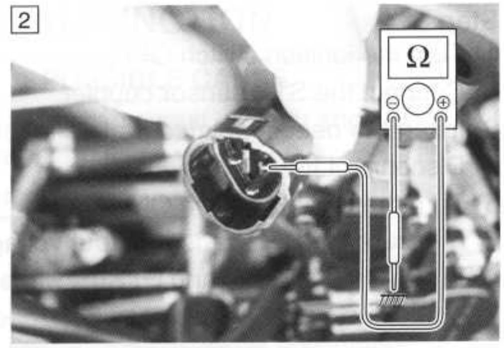


Is the voltage OK?

YES	Go to Step 2
NO	• Loose or poor contacts on the ECM coupler. • Open or short circuit in the Red wire or B/Br wire.

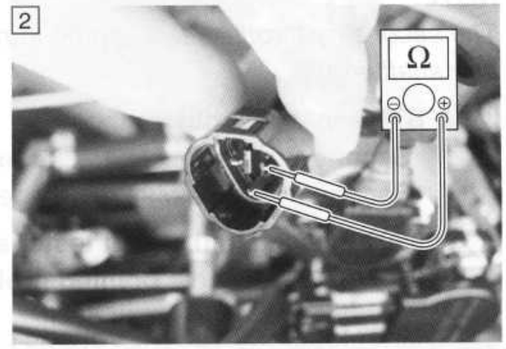
Step 2

1) Turn the ignition switch OFF.
2) Disconnect the STP sensor coupler.
3) Check the continuity between Yellow wire and ground.



DATA **STP sensor continuity: ∞ Ω (Infinity)**
(Yellow – Ground)

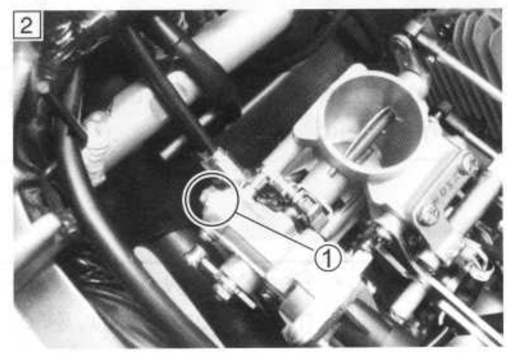
4) If OK, then measure the STP sensor resistance at the coupler (between Yellow and Black wires).
5) Close and open the secondary throttle valve fully by turning the actuator shaft end ①, and measure the STP sensor resistance with both STV positions.



DATA **STP sensor resistance**
Secondary throttle valve is closed: Approx. 0.58 kΩ
Secondary throttle valve is opened: Approx. 4.38 kΩ

TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Resistance (Ω)



CAUTION

Do not use the tool for turning the STVA shaft to prevent breakdown.

Is the resistance OK?

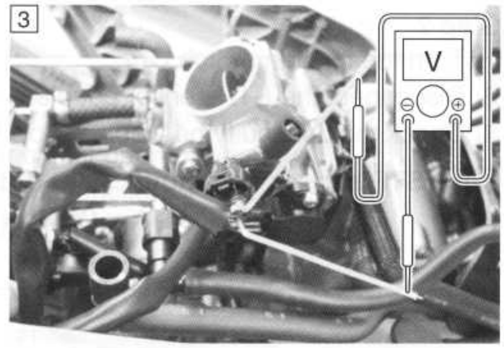
YES	Go to Step 3
NO	• Reset the STP sensor position correctly. (☞5-29) • Replace the STP sensor with a new one.

Step 3

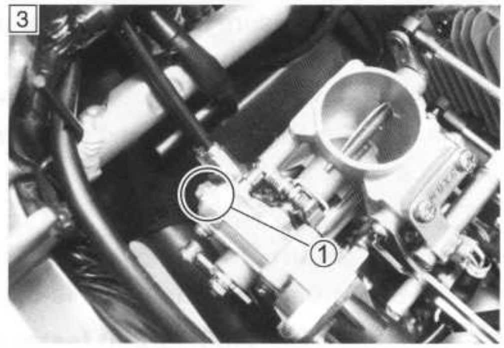
1) Turn the ignition switch OFF.
2) Connect the STP sensor coupler.
3) Insert the needle pointed probes to the STP sensor coupler.
4) Disconnect the STVA coupler.
5) Turn the ignition switch ON.
6) Measure the STP sensor output voltage at the coupler (between ⊕ Yellow and ⊖ B/Br wires) when the secondary throttle valve is full closed and opened.

NOTE:
The secondary throttle valve can be turned by rotating the actuator shaft end ①.

3



3



DATA **STP sensor output voltage**
Secondary throttle valve is closed: Approx. 0.58 V
Secondary throttle valve is opened: Approx. 4.38 V

TOOL **09900-25008: Multi circuit tester set**
09900-25009: Needle pointed probe set

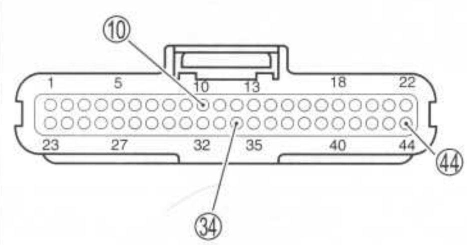
Tester knob indication: Voltage (⎓)

CAUTION

Do not use the tool for turning the STVA shaft to prevent breakdown.

Is the voltage OK?

YES	• Red, Yellow or B/Br wire open or shorted to ground, or poor ⑩, ㊹ or ㉞ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	If check result is not satisfactory, replace STP sensor with a new one.



ECM coupler

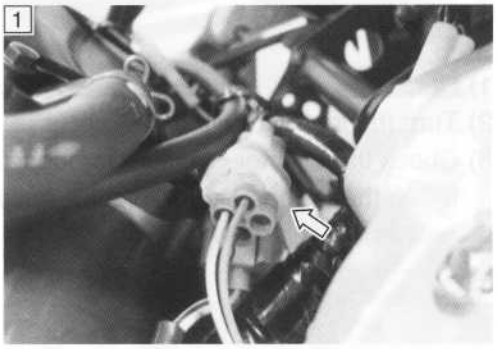
"C31" GEAR POSITION (GP) SWITCH CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
No Gear Position switch voltage Switch voltage is out of the specified range. Switch Voltage ≦ 0.2 V	• Gear Position switch circuit open or short. • Gear Position switch malfunction. • ECM malfunction.

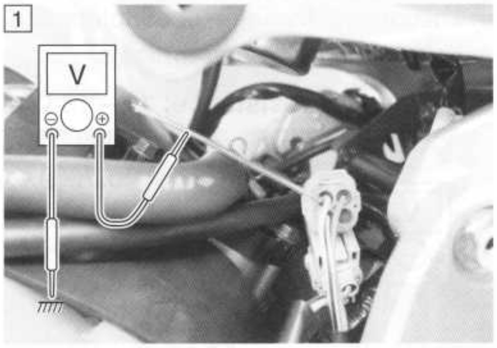
INSPECTION

Step 1

1) Lift and support the fuel tank with its prop stay. (☞5-6)
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) Turn the side-stand to up-right position.
6) Make sure the engine stop switch is in the "RUN" position.
7) Insert the needle pointed probes to the GP switch coupler.
8) Turn the ignition switch ON.
9) Measure the voltage at the wire side coupler between Pink wire and ground, when shifting the gearshift lever from 1st to Top.



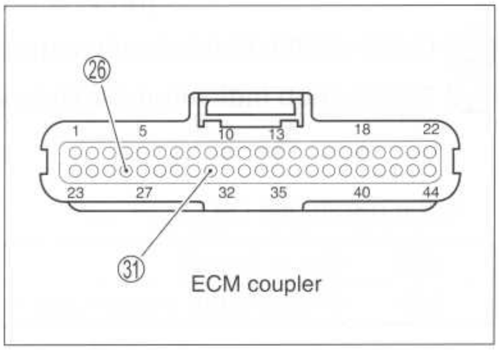
DATA **GP switch voltage: 1.0 V and more (Pink – Ground)**

TOOL **09900-25008: Multi circuit tester set**
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	• Inspect the GP switch voltage. (☞8-21) • Pink wire open or shorted to ground, or poor ㉖, ㉛ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	Open or short circuit in the Pink wire.



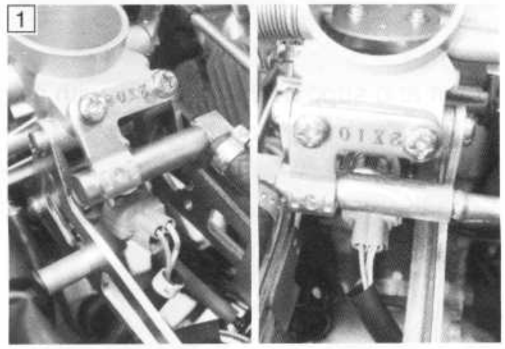
"C32" or "C33" FUEL INJECTOR CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
Fuel injector voltage is 1.3 V and less.	• Injector circuit open or short. • Injector malfunction. • ECM malfunction.

INSPECTION

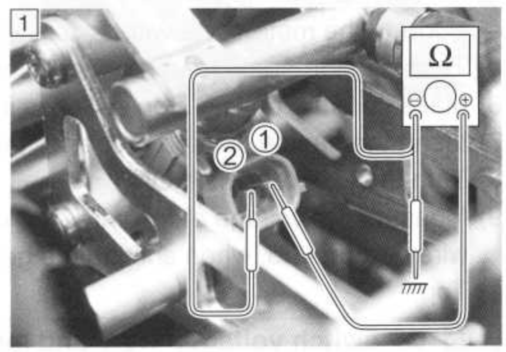
Step 1

1) Remove the air cleaner box. (☞5-16)
2) Turn the ignition switch OFF.
3) Check the injector couplers for loose or poor contacts.
   If OK, then measure the injector resistance.



4) Disconnect the injector couplers and measure the resistance between terminals.

DATA Injector resistance: 11 – 13 Ω at 20 °C (68 °F)
(No.1: ① – ②)
(No.2: ③ – ④)

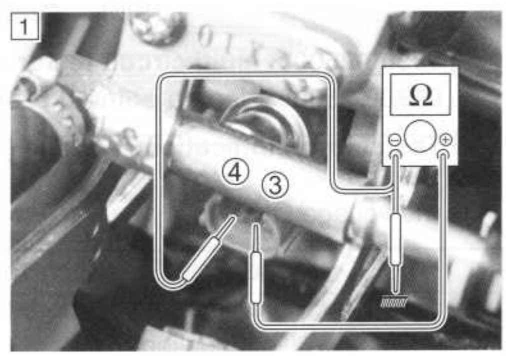


5) If OK, then check the continuity between injector terminals and ground.

DATA Injector continuity: ∞ Ω (Infinity)
(No.1: ① – Ground)
(No.2: ③ – Ground)

TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Resistance (Ω)



Is the resistance OK?

YES	Go to Step 2
NO	Replace the Injector with a new one. (☞5-20)

Step 2

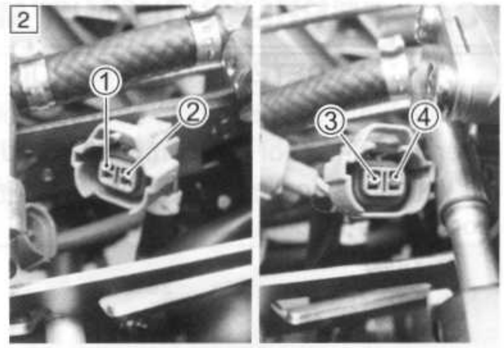
1) Disconnect the STVA/injector coupler.
2) Check the continuity at the injector couplers between STVA /injector coupler. (No.1: ① – ⑦ and ② – ⑤ No.2: ③ – ⑥ and ④ – ⑤)

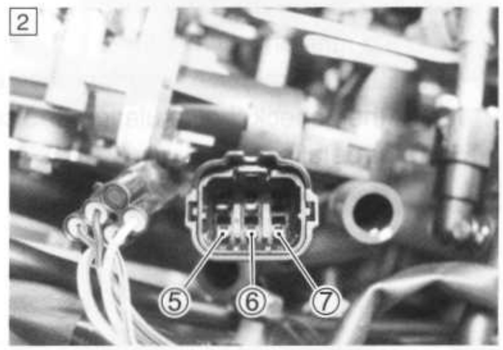
TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•)))

Is the continuity OK?

YES	Go to Step 3
NO	Replace the TP sensor/injector lead wire.





Step 3

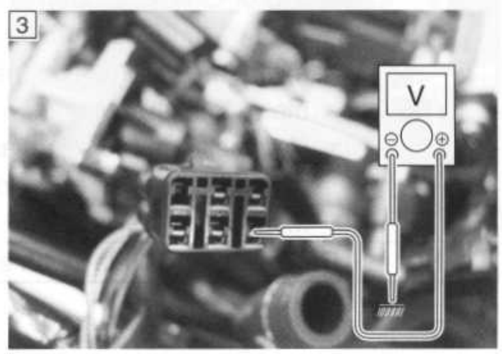
1) Turn the ignition switch ON.
2) Measure the injector voltage between Y/R wire and ground.

DATA Injector voltage: Battery voltage (⊕ Y/R – ⊖ Ground)

NOTE:
Injector voltage can be detected only 3 seconds after ignition switch is turned ON.

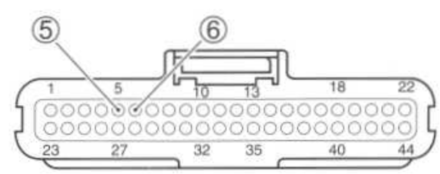
TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Voltage (⎓)



Is the voltage OK?

YES	• Gr/W or Gr/B wire open or shorted to ground, or poor ⑤ or ⑥ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	• Inspect the fuel pump relay. (☞5-10)



ECM coupler

"C41" FP RELAY CIRCUIT MALFUNCTION

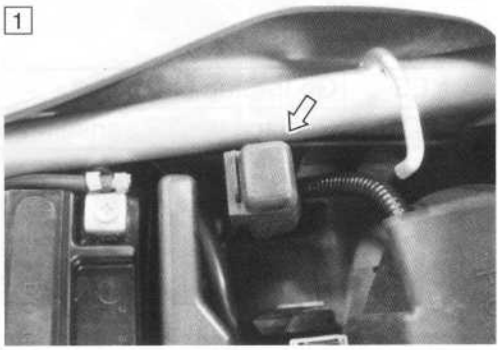
DETECTED CONDITION	POSSIBLE CAUSE
No voltage is applied to the both injectors for 3 sec. after the contact of fuel pump relay is turned ON. Or voltage is applied to the both injectors, when the contact of fuel pump is OFF.	• Fuel pump relay circuit open or short. • Fuel pump relay malfunction. • ECM malfunction.

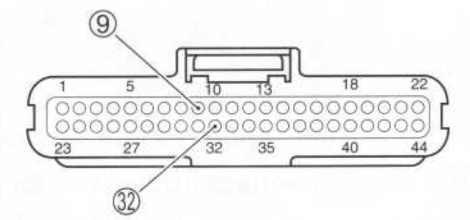
INSPECTION

Step 1

1) Remove the seat. (☞7-4)
2) Turn the ignition switch OFF.
3) Check the FP relay coupler for loose or poor contacts.
   If OK, then check the insulation and continuity. Refer to page 5-10 for details.

1





ECM coupler

Is the FP relay OK?

YES	• Y/B or O/W wire open or shorted to ground, or poor ㉜ or ⑨ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection. • Inspect the fuel injectors. (☞4-42)
NO	Replace the FP relay with a new one.

NOTE:
When the both fuel injectors break down at a time, "C41" is indicated.

"C42" 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. (☞8-47)**

"C49" PAIR CONTROL SOLENOID VALVE CIRCUIT MALFUNCTION

DETECTED CONDITION	POSSIBLE CAUSE
PAIR control solenoid valve voltage is not input in ECM.	• PAIR control solenoid valve circuit open or short. • PAIR control solenoid valve malfunction. • ECM malfunction.

INSPECTION

Step 1

1) Lift and support the fuel tank with its prop stay. (☞5-6)
2) Turn the ignition switch OFF.
3) Check the PAIR control solenoid valve coupler for loose or poor contacts.
   If OK, then measure the PAIR control solenoid valve resistance.

1

4) Disconnect the PAIR control solenoid valve coupler and measure the resistance between terminals.

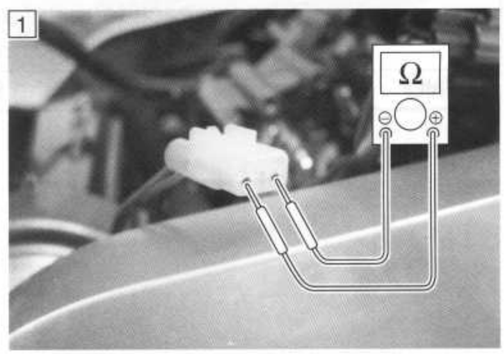
DATA **PAIR control solenoid valve resistance**
: 20 – 24 Ω (Red – Black) at 20 °C/68 °F

TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Resistance (Ω)

Is the resistance OK?

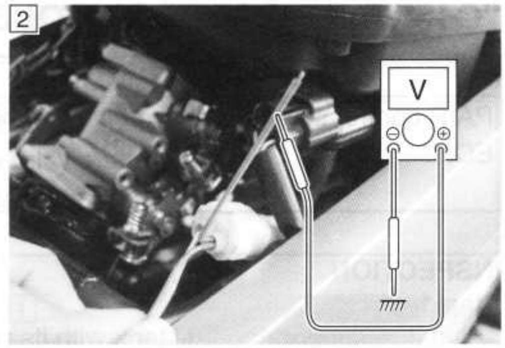
1



YES	Go to Step 2
NO	• Loose or poor contacts on the ECM coupler. • Replace the PAIR control solenoid valve with a new one.

Step 2

1) Connect the PAIR control solenoid valve coupler.
2) Turn the ignition switch ON.
3) Measure the voltage at the wire side coupler between Brown wire and ground.



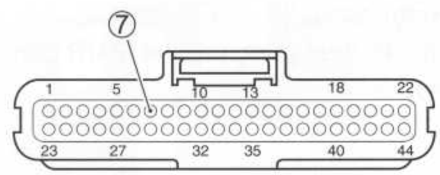
DATA **PAIR control solenoid valve voltage: Battery voltage (⊕ Brown – ⊖ Ground)**

TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Voltage (⎓)

Is the voltage OK?

YES	• Brown wire open or shorted to ground, or ⑦ connection. • If wire and connection are OK, intermittent trouble or faulty ECM. • Recheck each terminal and wire harness for open circuit and poor connection.
NO	Open or short circuit in the Brown wire.

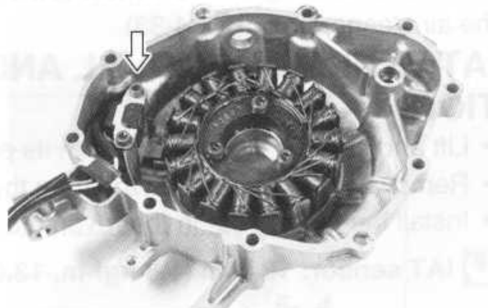


ECM coupler

SENSORS

CKP SENSOR INSPECTION

The crankshaft position sensor is installed in the generator cover. (☞4-23)

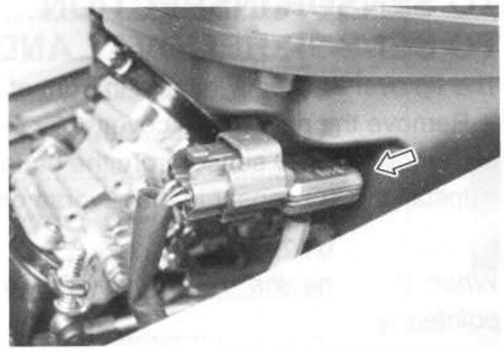


CKP SENSOR REMOVAL AND INSTALLATION

- Remove the generator cover. (☞3-30)
- Install the generator cover in the reverse order of removal.

IAP SENSOR INSPECTION

The intake air pressure sensor is installed at the rear side of the air cleaner box. (☞4-25)

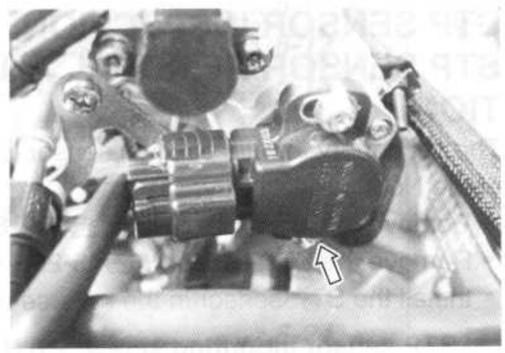


IAP SENSOR REMOVAL AND INSTALLATION

- Lift and support the fuel tank with its prop stay. (☞5-6)
- Remove the IAP sensor from the air cleaner box.
- Install the IAP sensor in the reverse order of removal.

TP SENSOR INSPECTION

The throttle position sensor is installed at the left side of the No.2 throttle body. (☞4-28)



TP SENSOR REMOVAL AND INSTALLATION

- Remove the air cleaner box. (☞5-16)
- Remove the TP sensor. (☞5-20)
- Install the TP sensor in the reverse order of removal.

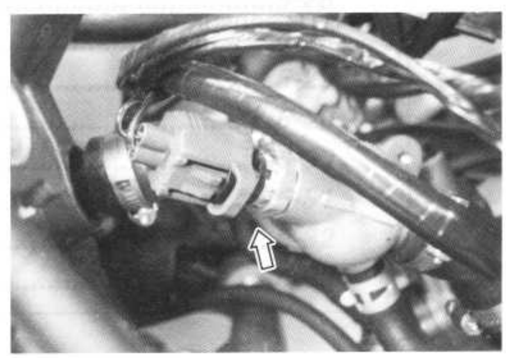
TP sensor mounting screw: 3.5 N·m (0.35 kgf-m, 2.5 lb-ft)

TPS ADJUSTMENT

- Adjust the TP sensor. (☞4-16)

ECT SENSOR INSPECTION

The engine coolant temperature sensor is installed on the thermostat case. (☞4-31)



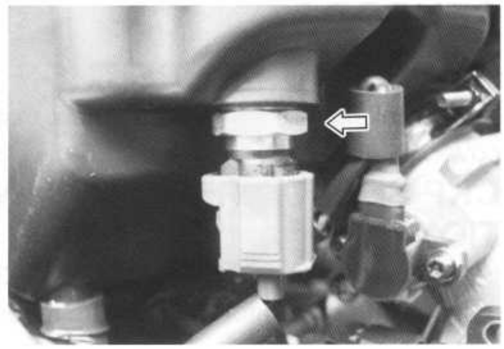
ECT SENSOR REMOVAL AND INSTALLATION

- Remove the ECT sensor. (☞6-10)
- Install the ECT sensor in the reverse order of removal.

ECT sensor: 20 N·m (2.0 kgf-m, 14.5 lb-ft)

IAT SENSOR INSPECTION

The intake air temperature sensor is installed on the right side of the air cleaner box. (☞4-33)



IAT SENSOR REMOVAL AND INSTALLATION

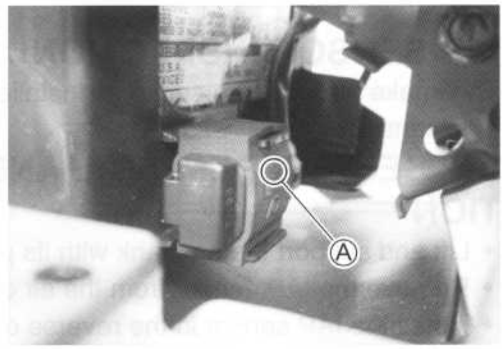
- Lift and support the fuel tank with its prop stay. (☞5-6)
- Remove the IAT sensor in the from the air cleaner box.
- Install the IAT sensor in the reverse order of removal.

IAT sensor: 18 N·m (1.8 kgf-m, 13.0 lb-ft)

TO SENSOR INSPECTION

TO SENSOR REMOVAL AND INSTALLATION

The tip over sensor is located in front of the battery. (☞4-35)



- Remove the right frame cover. (☞7-4)
- Remove the TO sensor from the battery case.
- Install the TO sensor in the reverse order of removal.

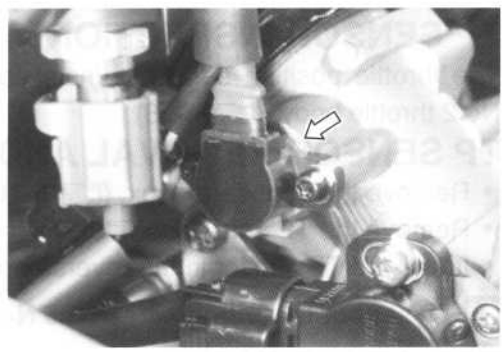
NOTE:

When installing the TO sensor, the arrow mark Ⓐ must be pointed upward.

STP SENSOR INSPECTION

STP SENSOR REMOVAL AND INSTALLATION

The secondary throttle position sensor is installed at the left side of the No.2 throttle body.



- Remove the air cleaner box. (☞5-16)
- Remove the STP sensor. (☞5-20)
- Install the STP sensor in the reverse order of removal.

STP sensor mounting screw: 2.0 N·m (0.2 kgf-m, 1.5 lb-ft)

STP SENSOR ADJUSTMENT

- Adjust the STP sensor. (☞5-29)

FUEL SYSTEM AND THROTTLE BODY

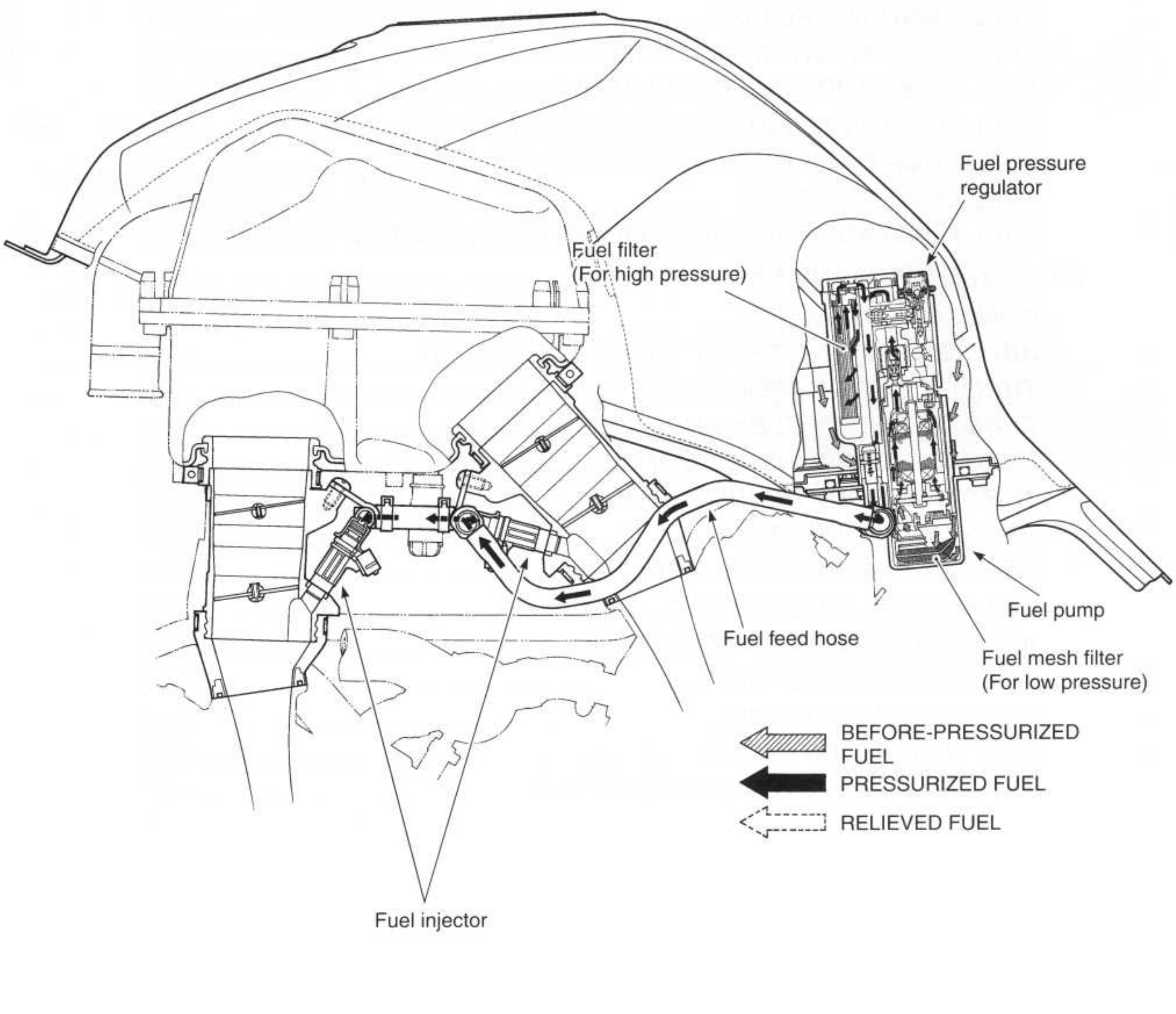
CONTENTS

FUEL SYSTEM

FUEL DELIVERY SYSTEM

The fuel delivery system consists of the fuel tank, fuel pump, fuel filters, fuel feed hose, fuel delivery pipe (including fuel injectors) and fuel pressure regulator. There is no fuel return hose. The fuel in the fuel tank is pumped up by the fuel pump and pressurized fuel flows into the injector installed in the fuel delivery pipe. Fuel pressure is regulated by the fuel pressure regulator. As the fuel pressure applied to the fuel injector (the fuel pressure in the fuel delivery pipe) is always kept at absolute fuel pressure of 300 kPa (3.0 kgf/cm^2, 43 psi), the fuel is injected into the throttle body in conic dispersion when the injector opens according to the injection signal from the ECM.

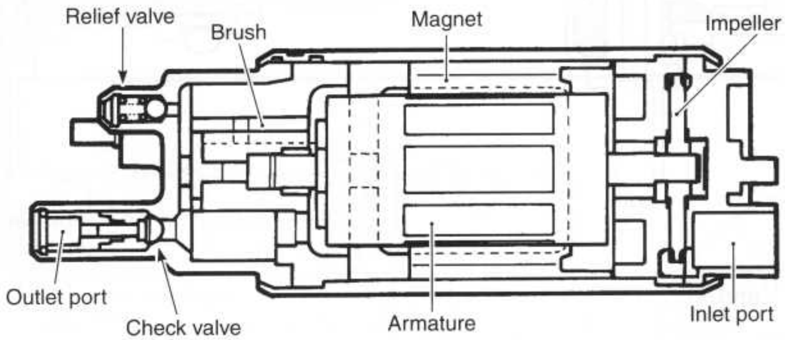
The fuel relieved by the fuel pressure regulator flows back to the fuel tank.



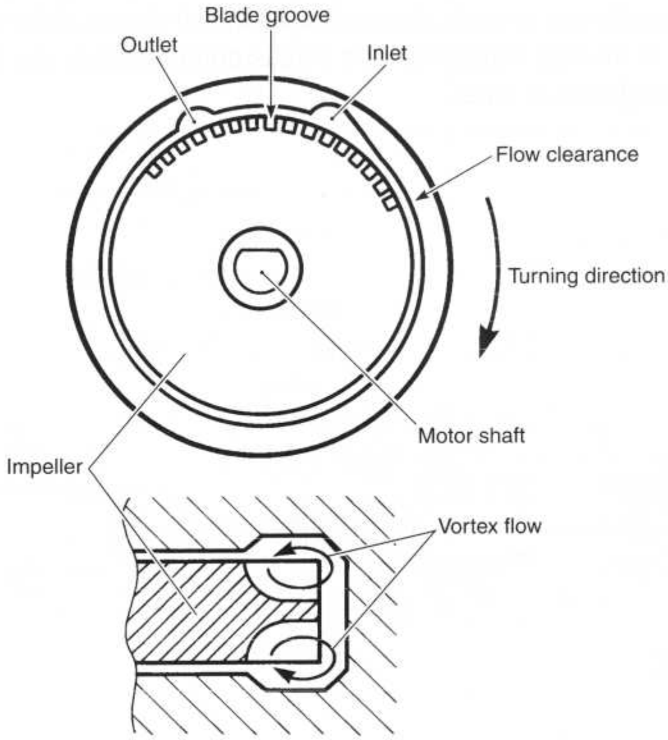
FUEL PUMP

The electric fuel pump is mounted at the bottom of the fuel tank, which consists of the armature, magnet, impeller, brush, check valve and relief valve. The ECM controls its ON/OFF operation as controlled under the FUEL PUMP CONTROL SYSTEM.

When electrical energy is supplied to the fuel pump, the motor in the pump runs and together with the impeller. This causes a pressure difference to occur on both sides of the impeller as there are many grooves around it. Then the fuel is drawn through the inlet port, and with its pressure increased, it is discharged through the outlet port. The fuel pump has a check valve to keep some pressure in the fuel feed hose even when the fuel pump is stopped. Also, the relief valve is equipped in the fuel pump, which releases pressurized fuel to the fuel tank when the outlet of the fuel pressure has increased up to 450 – 600 kPa (4.5 – 6.0 kgf/cm^2, 64 – 85 psi).



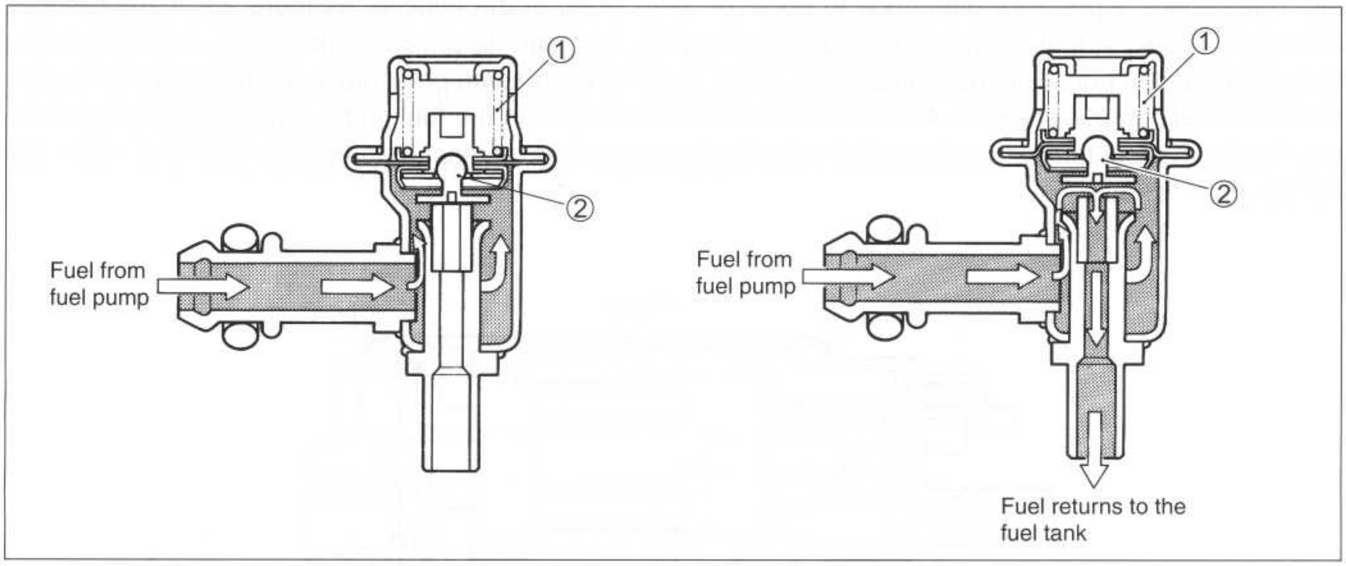
When the impeller is driven by the motor, pressure differential occurs between the front part and the rear part of the blade groove as viewed in angular direction due to fluid friction. This process continuously takes place causing fuel pressure to be built up. The pressurized fuel is then let out from the pump chamber and discharged through the motor section and the check valve.



FUEL PRESSURE REGULATOR

The fuel pressure regulator consists of the spring and valve. It keeps absolute fuel pressure of 300 kPa (3.0 kgf/cm², 43 psi) to be applied to the injector at all times.

When the fuel pressure rises more than 300 kPa (3.0 kgf/cm², 43 psi), the fuel pushes the valve in the regulator open and excess fuel returns to the fuel tank.



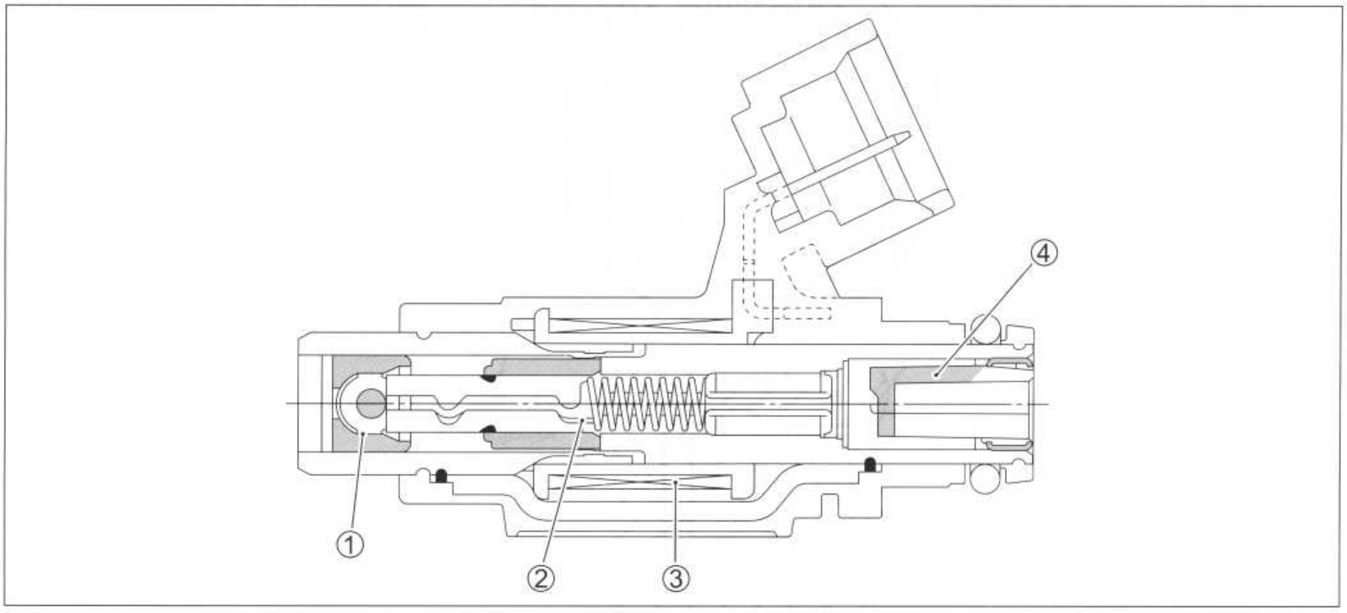
① Spring ② Valve

FUEL INJECTOR

The fuel injector consists of the solenoid coil, plunger, needle valve and filter.

It is an electromagnetic type injection nozzle which injects fuel in the throttle body according to the signal from the ECM.

When the solenoid coil of the injector is energized by the ECM, it becomes an electromagnet and attracts the plunger. At the same time, the needle valve incorporated with the plunger opens and the injector which is under the fuel pressure injects fuel in conic dispersion. As the lift stroke of the needle valve of the injector is set constant, the volume of the fuel injected at one time is determined by the length of time during which the solenoid coil is energized (injection time).



① Needle valve ② Plunger ③ solenoid coil ④ Filter

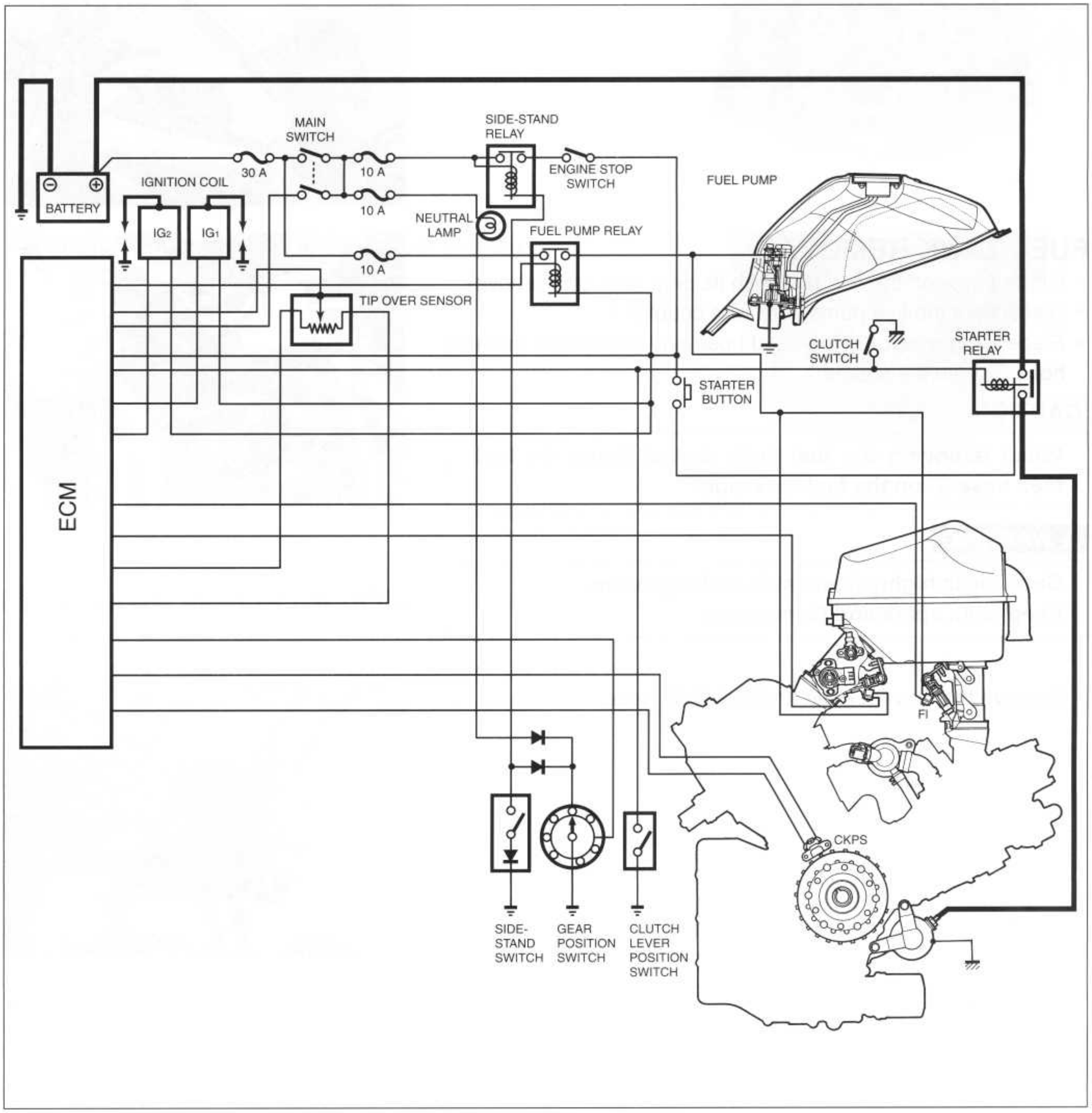
FUEL PUMP CONTROL SYSTEM

When the ignition switch is turned on, current from the battery flows to the fuel pump motor through the side-stand relay and the fuel pump relay causing the motor to turn.

Since the ECM has a timer function, the fuel pump motor stops turning in three seconds after the switch has been turned on.

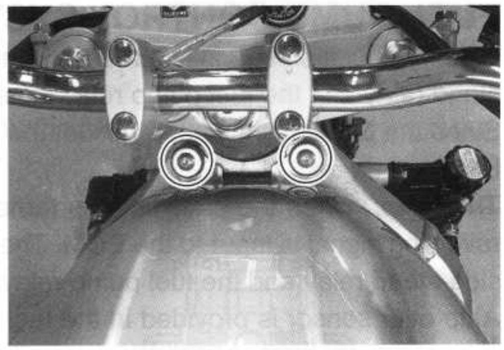
Thereafter, when the crankshaft is turned by the starter motor or the engine has been started, the engine revolving signal is input to the ECM. Then, current flows to the fuel pump motor from the battery through the side-stand relay and the fuel pump relay so that the pump continues to function.

A tip over sensor is provided in the fuel pump control circuit. By this provision, anytime the motorcycle tips over, the tip over sensor sends a signal to the ECM to turn off power to the fuel pump relay, causing the fuel pump motor to stop. At the same time, current to the fuel injectors as well as the ignition coil is interrupted, which then stops the engine.



FUEL TANK LIFT-UP

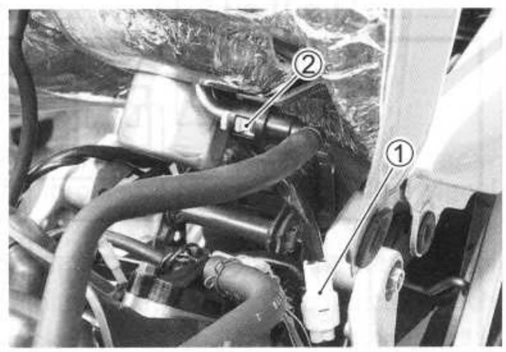
- Remove the front seat. (☞7-4)
- Remove the fuel tank mounting bolts.



- Lift and support the fuel tank with its prop stay.

FUEL TANK REMOVAL

- Lift and support the fuel tank with its prop stay. (☞above)
- Disconnect the fuel pump lead wire coupler ①.
- Place a rag under the fuel feed hose and disconnect the feed hose ② from the fuel tank.



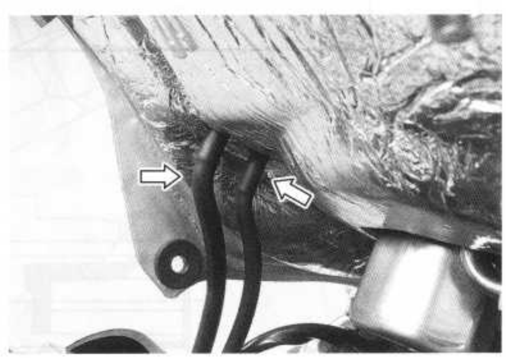
CAUTION

When removing the fuel tank, do not leave the fuel feed hose ② on the fuel tank side.

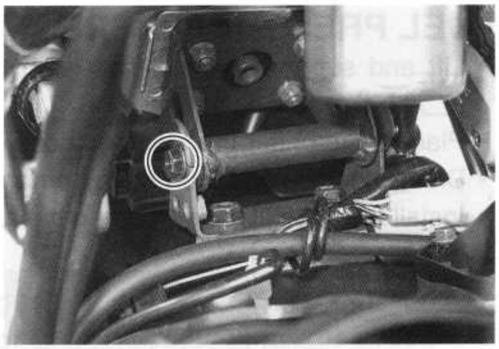
⚠ WARNING

Gasoline is highly flammable and explosive.
Keep heat, spark and flame away.

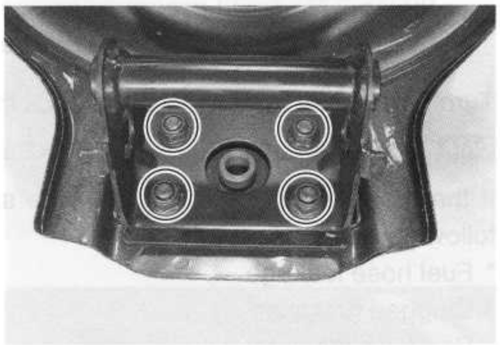
- Remove the air vent hose and fuel drain hose.



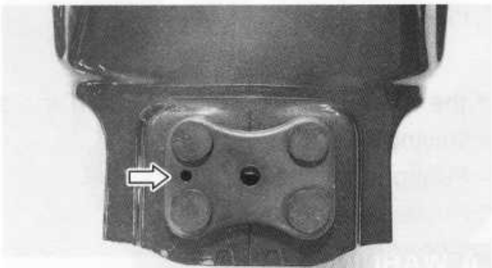
- Remove the fuel tank mounting bolt.
- Remove the fuel tank.



- Remove the fuel tank bracket.



- Remove the fuel tank stay and its rubber cushion.

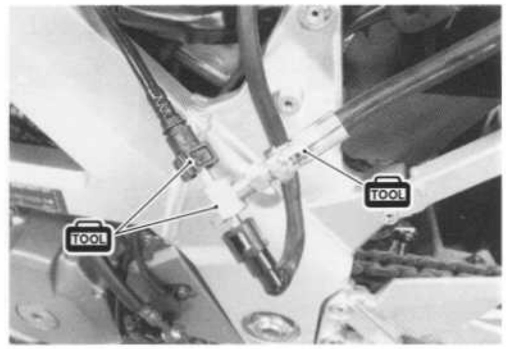


FUEL TANK INSTALLATION

- Installation is in the reverse order of removal.

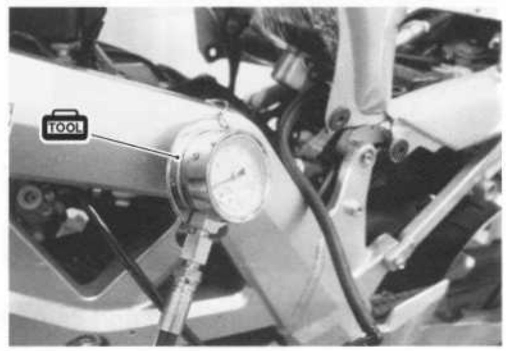
FUEL PRESSURE INSPECTION

- Lift and support the fuel tank with the fuel tank prop stay. (☞7-4)
- Place a rag under the fuel feed hose.
- Disconnect the fuel feed hose from the fuel delivery pipe.
- Install the special tools between the fuel tank and fuel delivery pipe.



09940-40211: Fuel pressure gauge adaptor
09940-40220: Fuel pressure gauge hose attachment
09915-77331: Oil pressure gauge
09915-74521: Oil pressure gauge hose

Turn the ignition switch ON and check the fuel pressure.



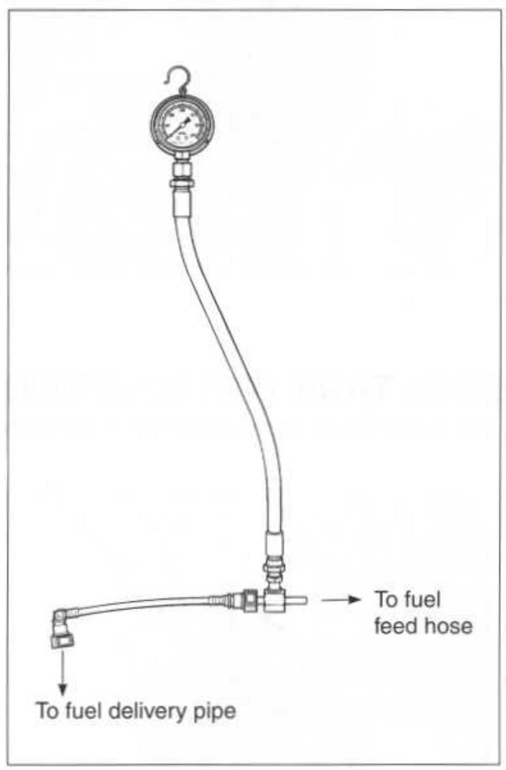
Fuel pressure: Approx. 300 kPa (3.0 kgf/cm², 43 psi)

If the fuel pressure is lower than the specification, inspect the following items:

* Fuel hose leakage
* Clogged fuel filter
* Pressure regulator
* Fuel pump

If the fuel pressure is higher than the specification, inspect the following items:

* Fuel pump check valve
* Pressure regulator



⚠ WARNING

- **Before removing the special tools, turn the ignition switch to OFF position and release the fuel pressure slowly.**
- **Gasoline is highly flammable and explosive. Keep heat, sparks and flame away.**

FUEL PUMP INSPECTION

Turn the ignition switch ON and check that the fuel pump operates for few seconds.

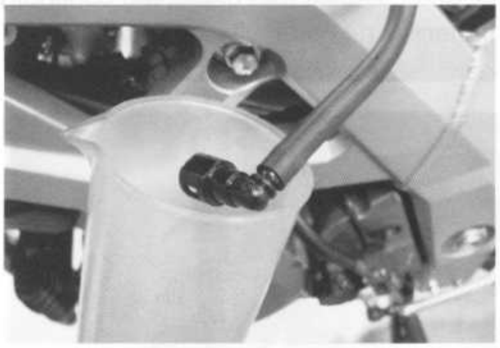
If the fuel pump motor does not make operating sound, replace the fuel pump assembly or inspect the fuel pump relay and tip over sensor.

FUEL DISCHARGE AMOUNT INSPECTION

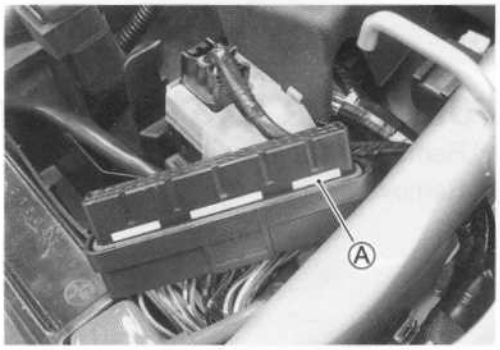
⚠ WARNING

Gasoline is highly flammable and explosive.
Keep heat, spark and flame away.

- Lift and support the fuel tank with the fuel tank prop stay. (☞7-4)
- Disconnect the fuel feed hose from the fuel delivery pipe.
- Place the measuring cylinder and insert the fuel feed hose end into the measuring cylinder.

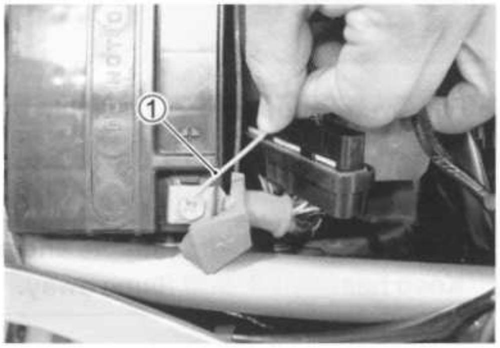


- Disconnect the ECM lead wire coupler.
- Push the lock Ⓐ to pull out the power source lead wire (Yellow with black tracer).



- Apply 12 volts to the fuel pump for 10 seconds and measure the amount of fuel discharged.

  Battery ⊕ terminal —— Power source lead wire ①
  (Yellow with black tracer)



If the pump does not discharge the amount specified, it means that the fuel pump is defective or that the fuel filter is clogged.

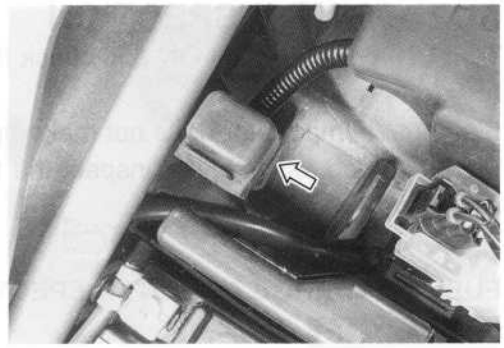
DATA **Fuel discharge amount: MIN. 168 ml/10 sec. (5.7/5.9 US/Imp oz)**

NOTE:
The battery must be in fully charged condition.

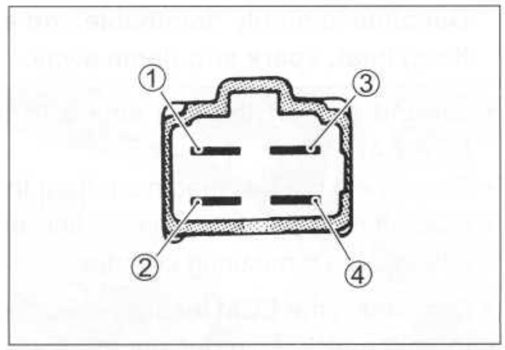
FUEL PUMP RELAY INSPECTION

Fuel pump relay is located behind the ECM.

- Remove the seat.
- Remove the fuel pump relay.

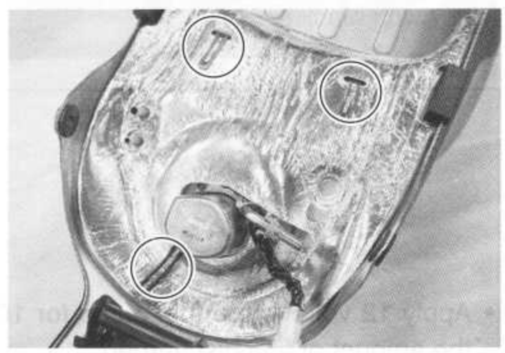


First, check the insulation between ① and ② terminals with pocket tester. Then apply 12 volts to ③ and ④ terminals, ⊕ to ③ and ⊖ to ④, and check the continuity between ① and ②.
If there is no continuity, replace it with a new one.



FUEL PUMP AND FUEL FILTER REMOVAL

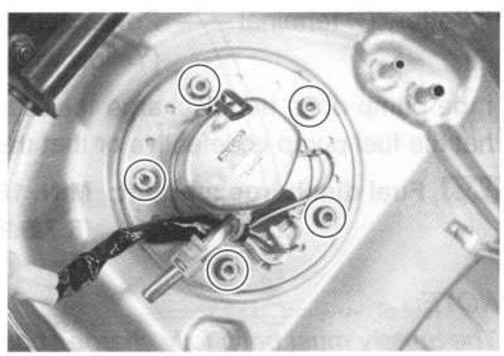
- Remove the fuel tank. (☞5-6)
- Remove the heat shield.



- Remove the fuel pump assembly by removing its mounting bolts diagonally.

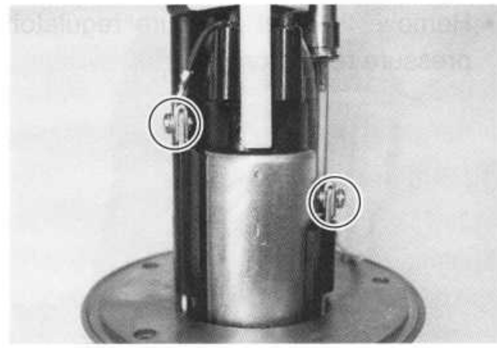
⚠ WARNING

Gasoline is highly flammable and explosive.
Keep heat, spark and flame away.

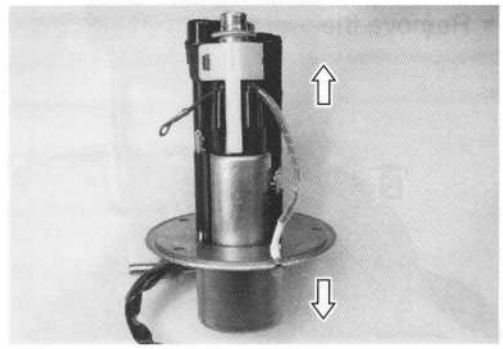


- Disconnect the lead wires.

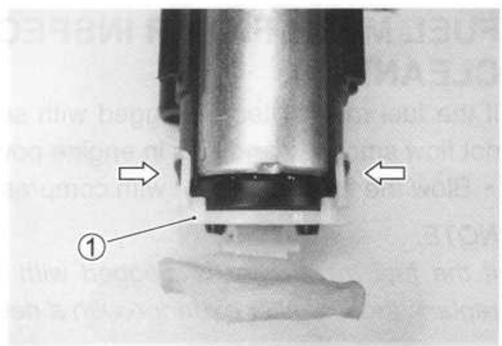
- Remove the screws and fuel level switch.



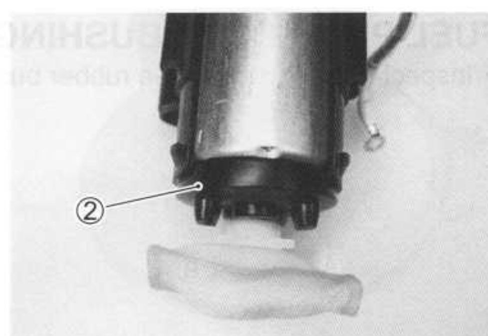
- Remove the fuel pump assembly from the fuel pump plate.



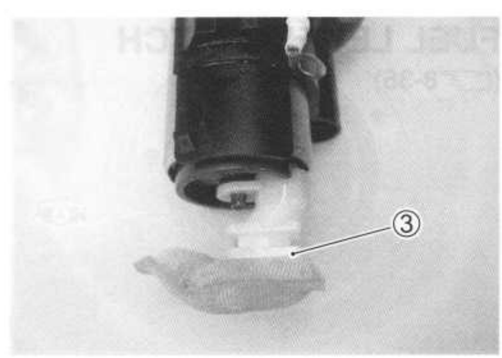
- Remove the fuel pump holder ①.



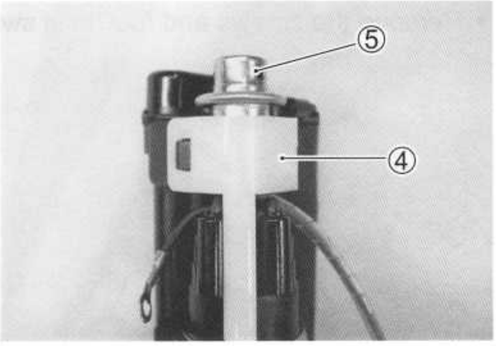
- Remove the rubber cap ②.



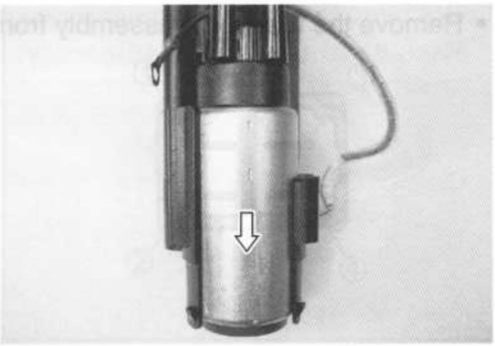
- Remove the fuel mesh filter ③.



- Remove the fuel pressure regulator holder ④ and the fuel pressure regulator ⑤.



- Remove the fuel pump.



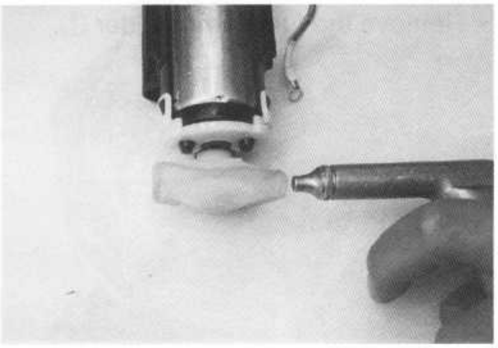
FUEL MESH FILTER INSPECTION AND CLEANING

If the fuel mesh filter is clogged with sediment or rust, fuel will not flow smoothly and loss in engine power may result.

- Blow the fuel mesh filter with compressed air.

NOTE:

If the fuel mesh filter is clogged with many sediment or rust, replace the fuel filter cartridge with a new one.



FUEL PUMP CASE BUSHING INSPECTION

- Inspect the fuel pump case rubber bushing for damage.

FUEL LEVEL SWITCH

(☞8-35)

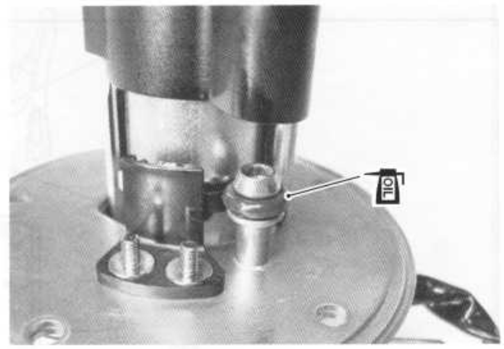
FUEL PUMP AND FUEL MESH FILTER INSTALLATION

Install the fuel pump and fuel mesh filter in the reverse order of removal, and pay attention to the following points:

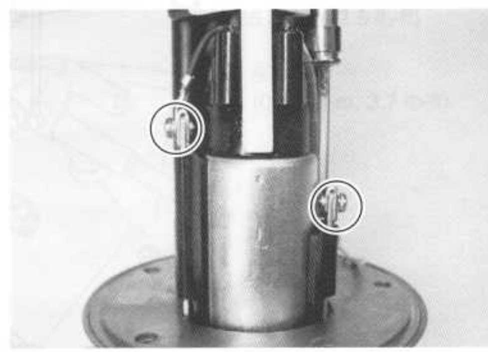
- Install the new O-rings to the fuel pressure regulator and fuel pipe.
- Apply thin coat of the engine oil to the O-rings.

CAUTION

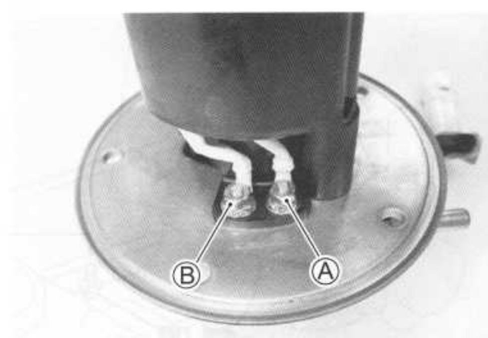
Use the new O-rings to prevent fuel leakage.



- Tighten the screws together with the lead wire terminals and fuel level switch.



- Connect the lead wires as below.
  Ⓐ...... ⊕ terminal for fuel pump
  Ⓑ...... Fuel level switch

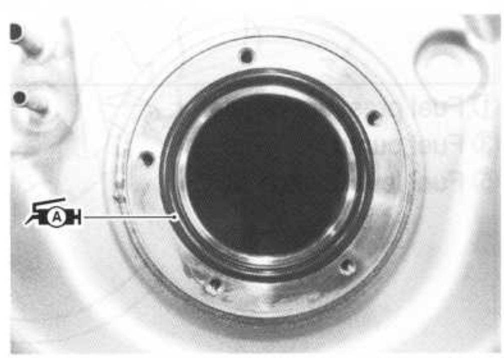


- Install the new O-ring and apply grease to it.

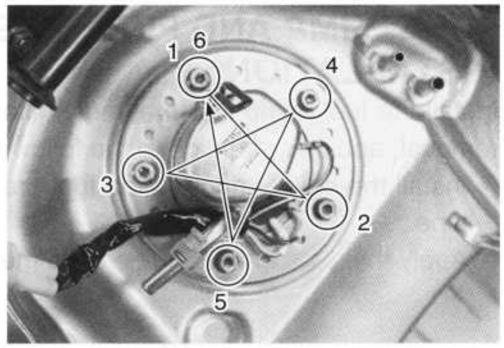
⚠ WARNING

The O-ring must be replaced with a new one to prevent fuel leakage.

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



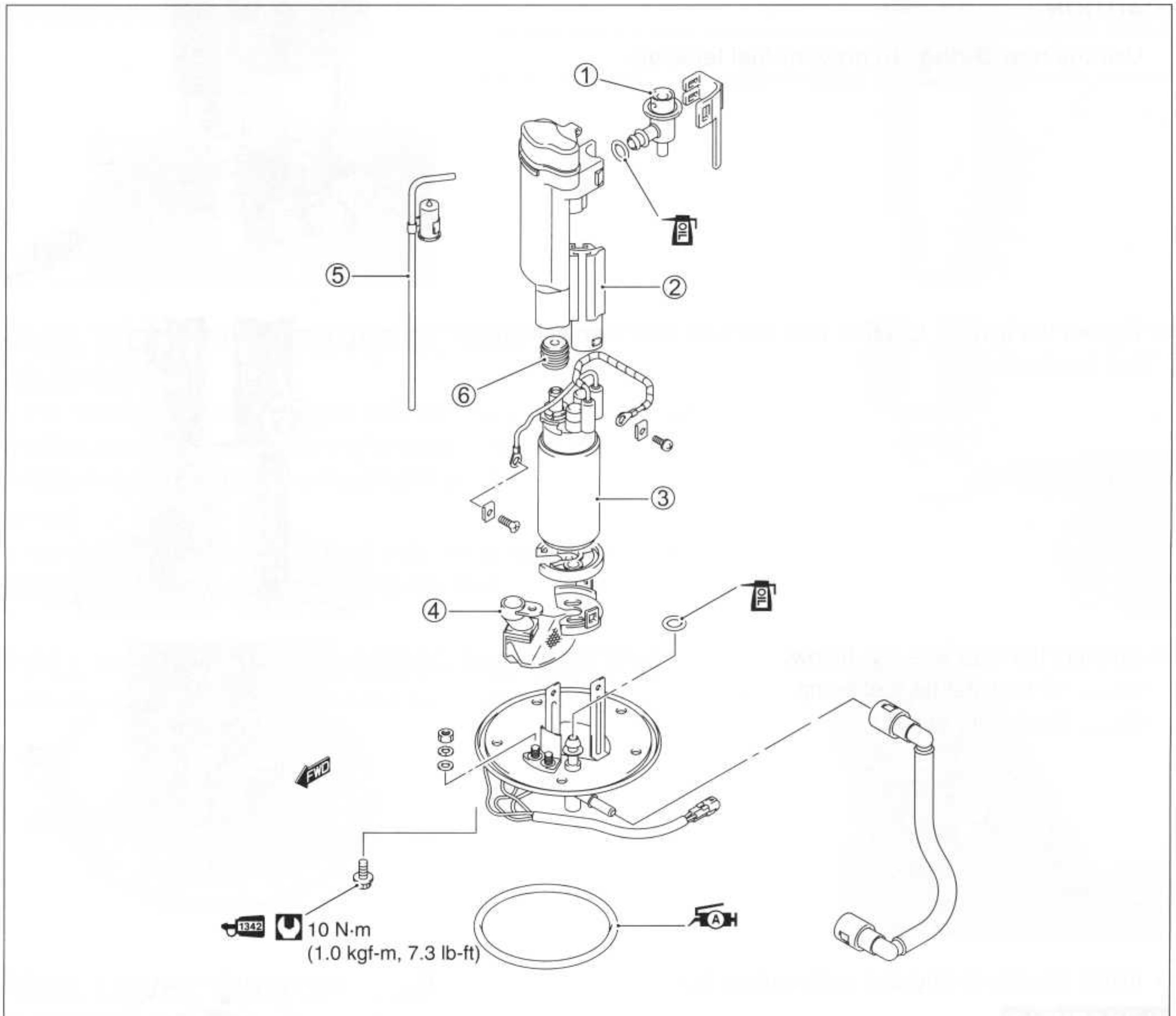
- When installing the fuel pump assembly, first tighten all the fuel pump assembly mounting bolts lightly in the ascending order of numbers, and then tighten them to the specified torque in the above tightening order



Fuel pump mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

NOTE:
Apply a small quantity of the THREAD LOCK to the thread portion of the fuel pump mounting bolt.

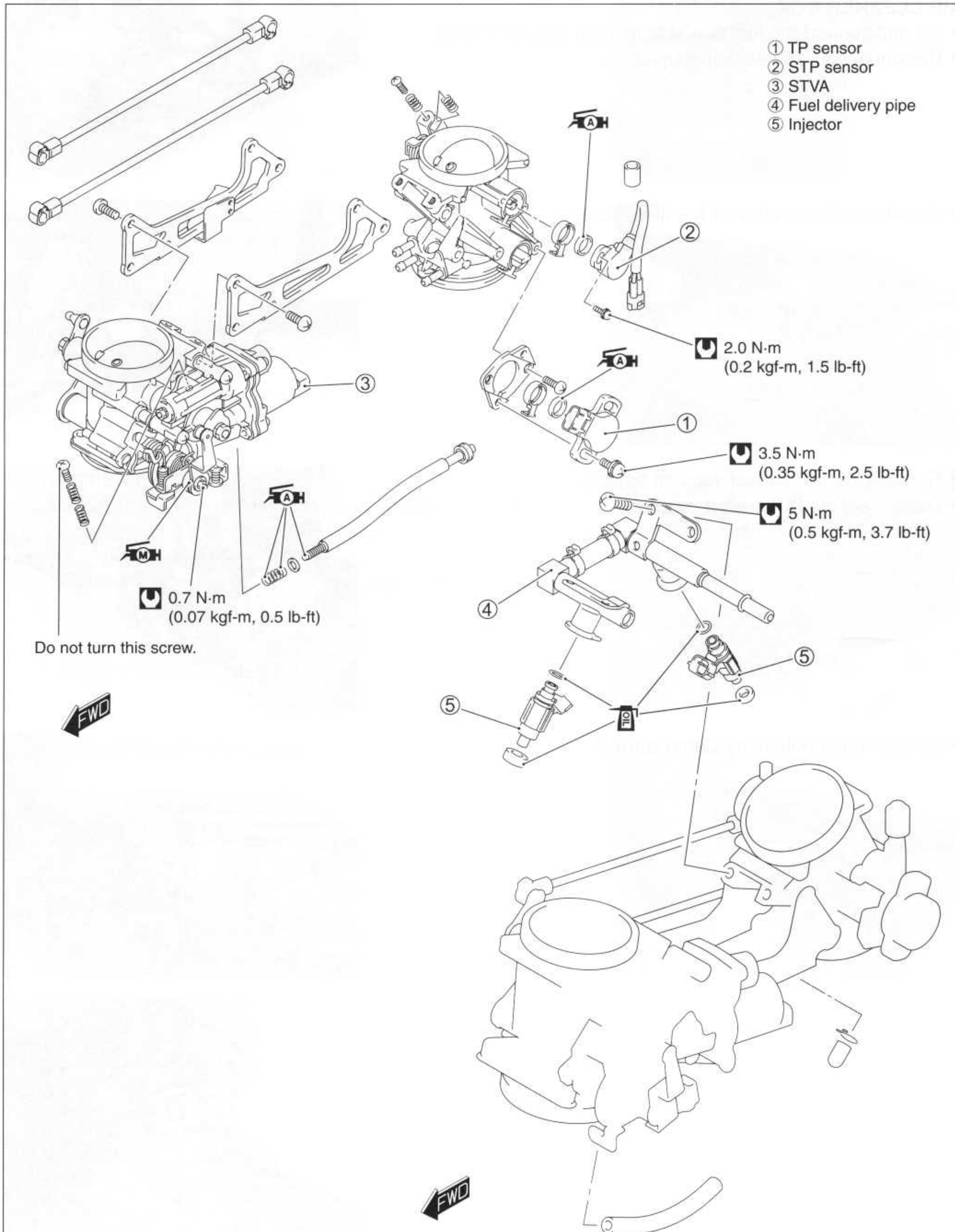
1342 99000-32050: THREAD LOCK "1342"



① Fuel pressure regulator
② Fuel pump case/Fuel filter cartridge (For high pressure)
③ Fuel pump
④ Fuel mesh filter (For low pressure)
⑤ Fuel level switch
⑥ Bushing

THROTTLE BODY AND STV ACTUATOR

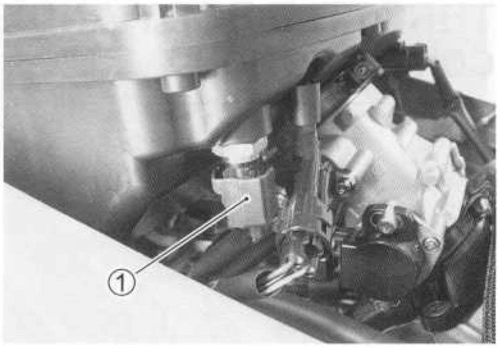
CONSTRUCTION



AIR CLEANER AND THROTTLE BODY REMOVAL

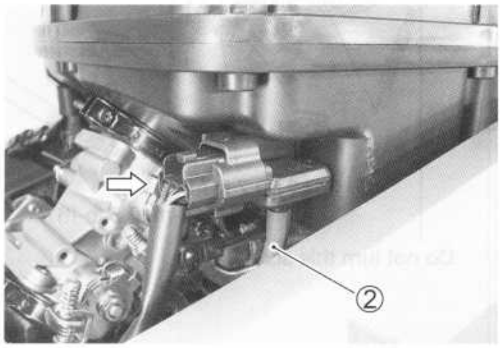
AIR CLEANER BOX

- Lift and support the fuel tank with its prop stay. (☞5-6)
- Disconnect the IAT sensor coupler ①.

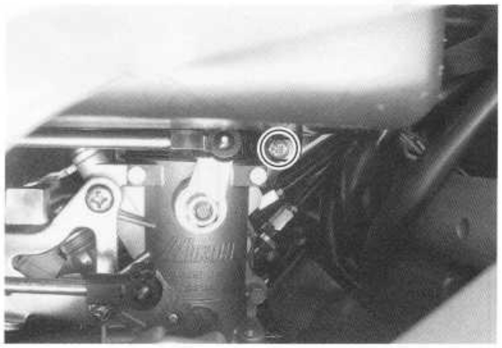


- Disconnect the crankcase breather hoses.

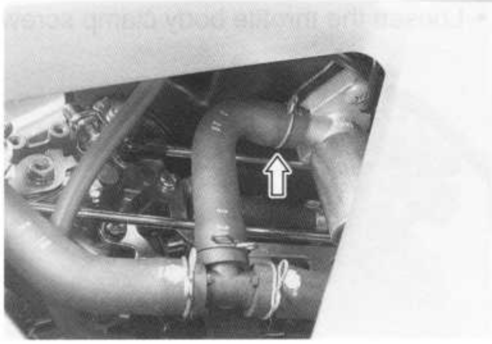
- Remove the IAP sensor vacuum hose ②.
- Disconnect the IAP sensor coupler.



- Loosen the throttle body clamp screws.



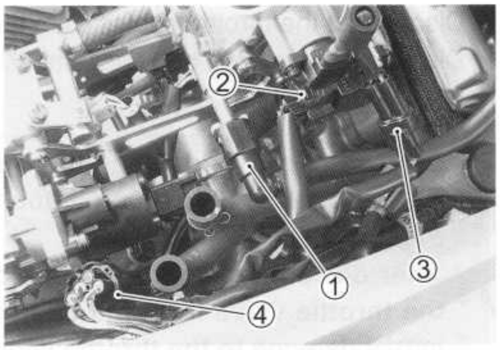
- Disconnect the PAIR hose.



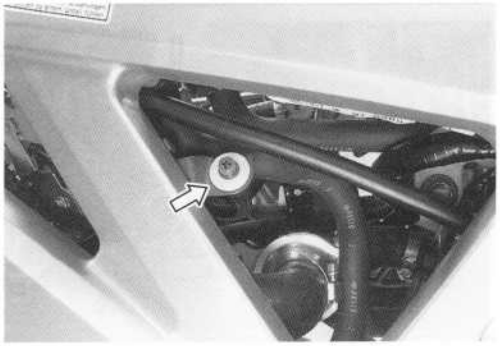
- Disconnect the PAIR coupler.
- Remove the air cleaner box.

THROTTLE BODY

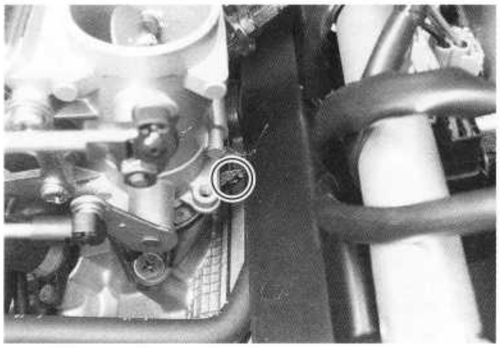
- Lift and support the fuel tank with its prop stay. (☞5-6)
- Remove the air cleaner box. (☞5-16)
- Disconnect the fuel feed hose ①.
- Disconnect the various lead wire couplers.
  ② TP sensor.
  ③ STP sensor.
  ④ STVA motor/injector coupler.

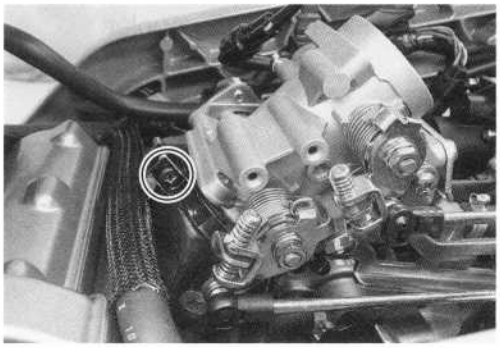


- Disconnect the idle stop screw.

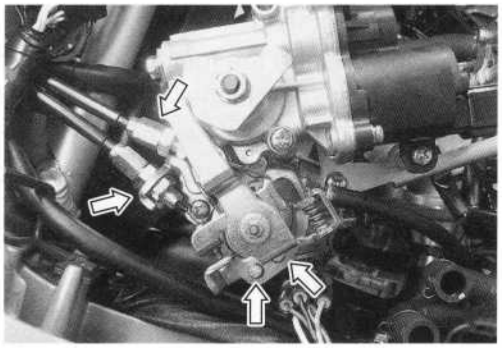


* Loosen the throttle body clamp screws.





* Disconnect the throttle cables from their drum.
* Dismount the throttle body assembly.



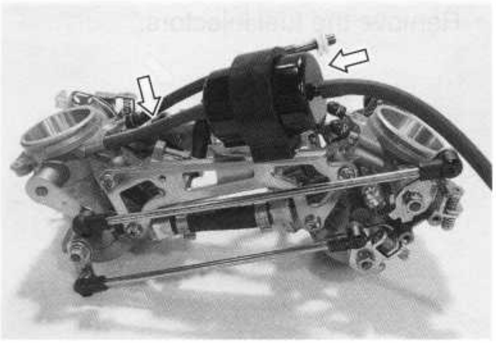
CAUTION

*** Be careful not to damage the throttle cable bracket and fast idle lever when dismounting or remounting the throttle body assembly.**
*** After disconnecting the throttle cables, do not snap the throttle valve from full open to full close. It may cause damage to the throttle valve and throttle body.**

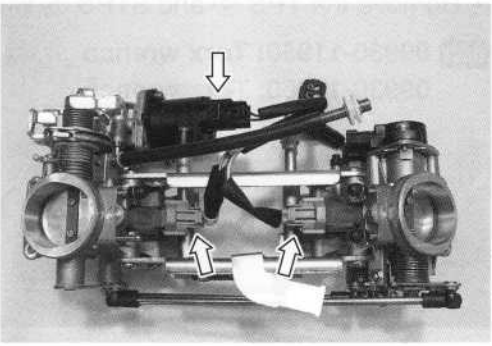
THROTTLE BODY DISASSEMBLY

CAUTION

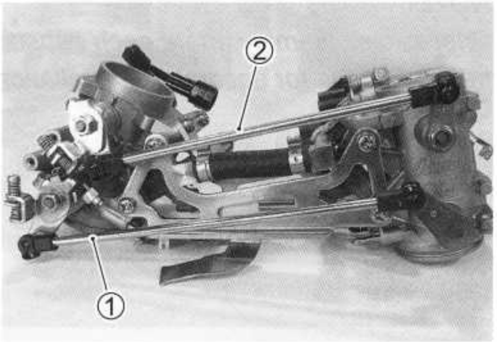
> * **Be careful not to damage the throttle lever when disassembling the throttle body.**
> * **The throttle body is assembled precisely in factory. Do not disassemble it other than shown in this manual.**



- Remove the IAP sensor vacuum damper and its hose.

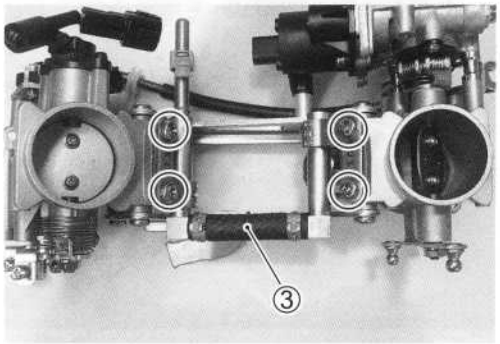


- Disconnect the STVA and injector couplers.



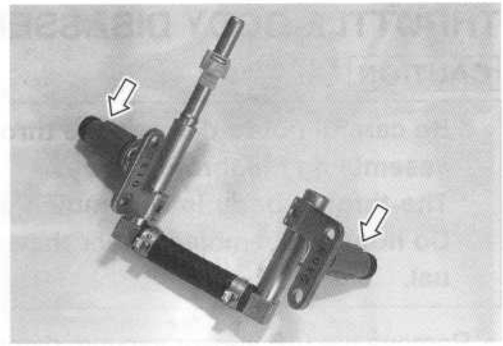
- Remove the throttle link rod ① and secondary throttle link rod ②.

NOTE:
The throttle link rod ① is longer than the secondary throttle link rod ②.



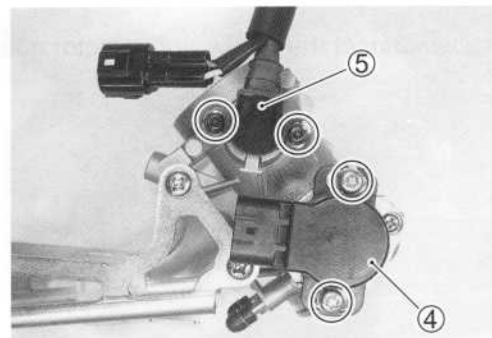
- Remove the fuel delivery pipe ③.

• Remove the fuel injectors.

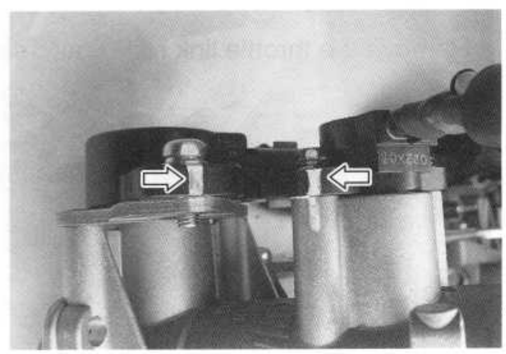


• Remove the TPS ④ and STPS ⑤ with the special tool.

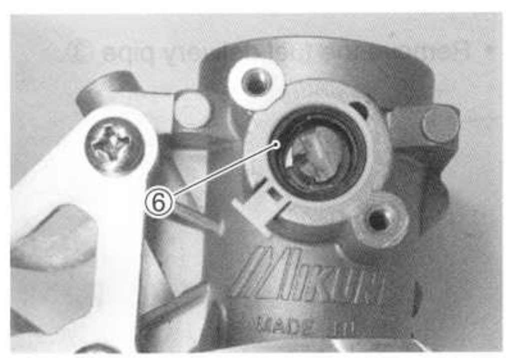
TOOL 09930-11950: Torx wrench
09930-11960: Torx wrench



NOTE:
Prior to disassembly, mark each sensor's original position with a paint or scribe for accurate reinstallation.

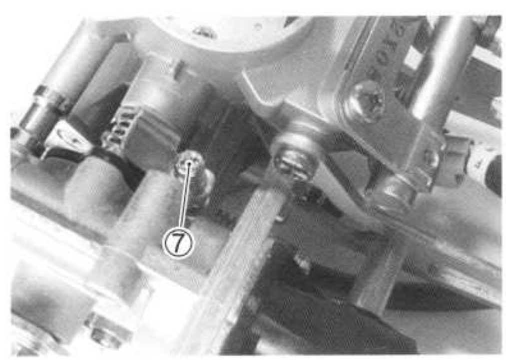


• Remove the seal ⑥.



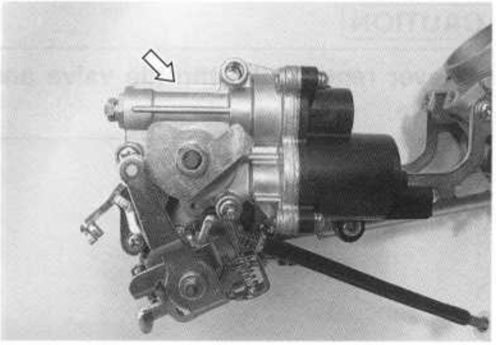
CAUTION

Do not turn the screw ⑦.

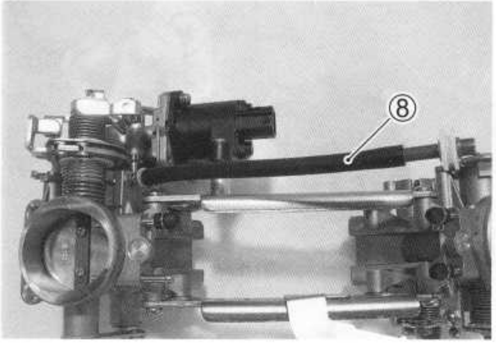


CAUTION

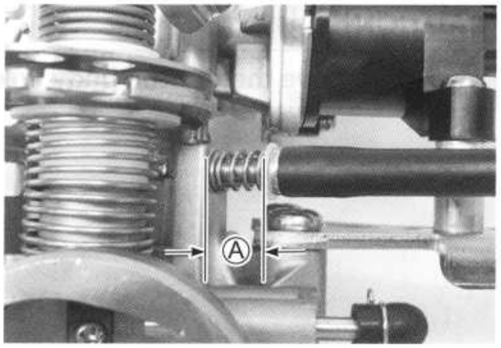
Never remove the STVA.



- Remove the throttle stop screw ⑧.

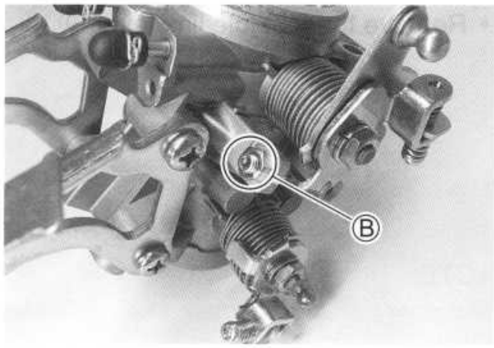


NOTE:
Measure the length Ⓐ for accurate reinstallation.



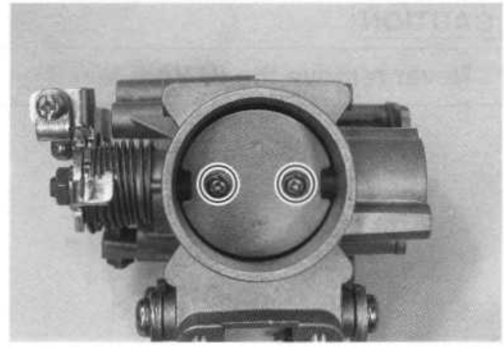
CAUTION

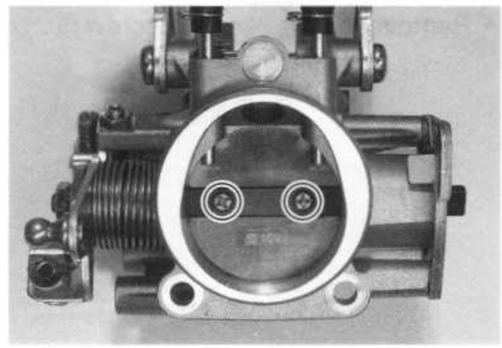
Never loosen the throttle stop screw Ⓑ on the No.2 throttle body.



CAUTION

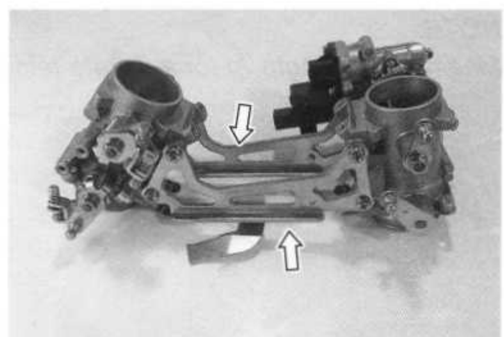
Never remove the throttle valve and secondary throttle valve.



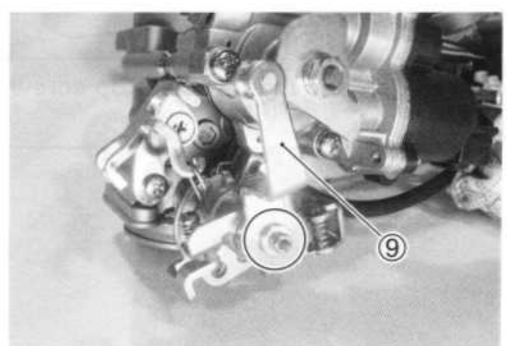


CAUTION

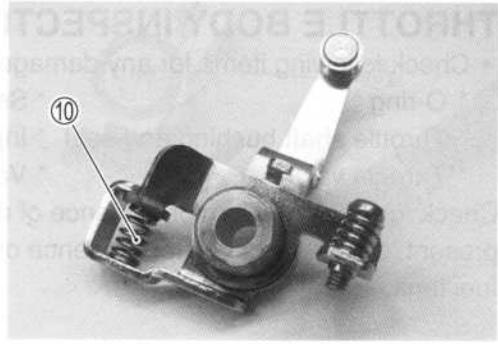
Never remove the throttle body link plates.



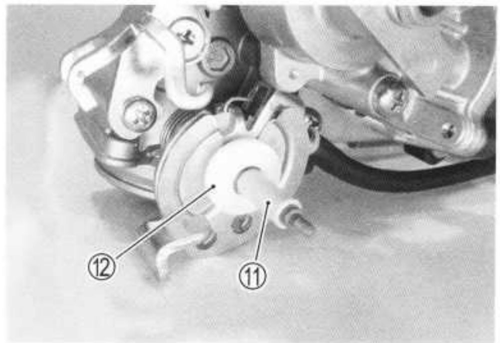
- Remove the fast idle link lever ⑨.



- Remove the spring ⑩.



- Remove the bushing ⑪ and plastic washer ⑫.



THROTTLE BODY CLEANING

⚠ WARNING

Some carburetor cleaning chemicals, especially dip-type soaking solutions, are very corrosive and must be handled carefully. Always follow the chemical manufacturer's instructions on proper use, handling and storage.

- Clean all passageways with a spray type carburetor cleaner and blow dry with compressed air.

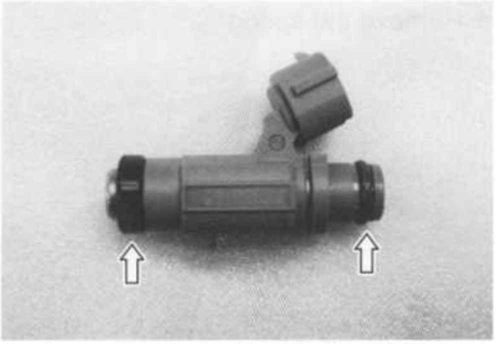
CAUTION

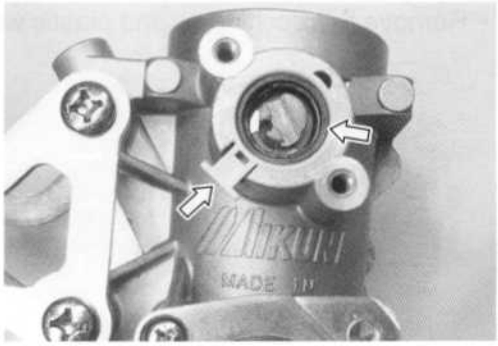
Do not use wire to clean passageways. Wire can damage passageways. If the components cannot be cleaned with a spray cleaner it may be necessary to use a dip-type cleaning solution and allow them to soak. Always follow the chemical manufacturer's instructions for proper use and cleaning of the throttle body components. Do not apply carburetor cleaning chemicals to the rubber and plastic materials.

THROTTLE BODY INSPECTION

- Check following items for any damage or clogging.
  - * O-ring
  - * Throttle shaft bushing and seal
  - * Throttle valve
  - * Secondary throttle valve
  - * Injector cushion seal
  - * Vacuum hose

Check fuel injector filter for evidence of dirt and contamination. If present, clean and check for presence of dirt in the fuel lines and fuel tank.





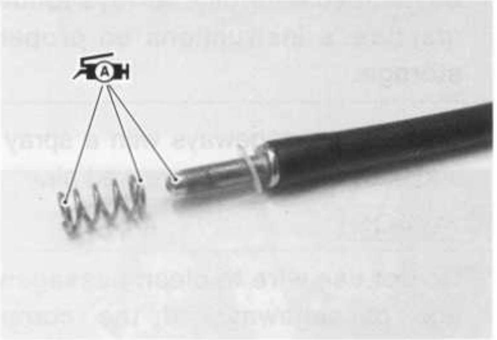
THROTTLE BODY REASSEMBLY

Reassemble the throttle body in the reverse order of disassembly.

Pay attention to the following points:

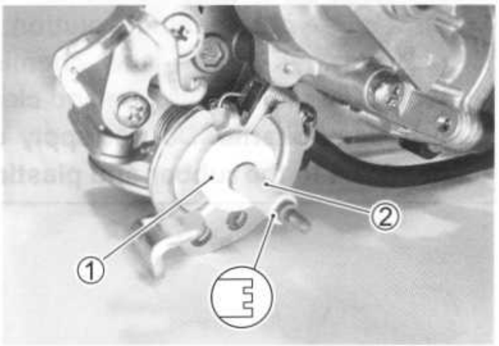
- Apply SUZUKI SUPER GREASE to the throttle stop screw tip and the both ends of a spring.

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



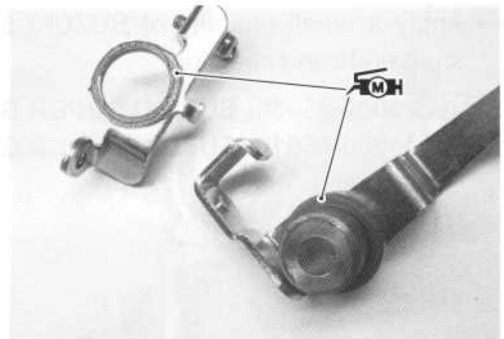
- Install the plastic washer ① and bushing ②.

NOTE:
The concave of a bushing is faced outside.

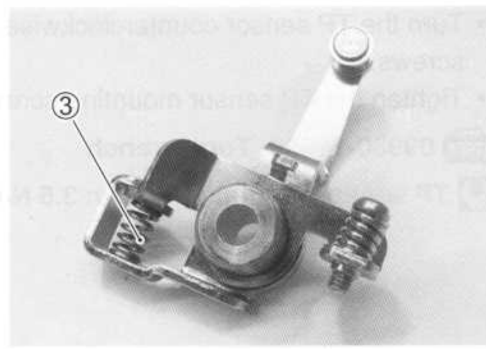


- Apply SUZUKI MOLY PASTE to the fast idle link lever.

99000-25140: SUZUKI MOLY PASTE

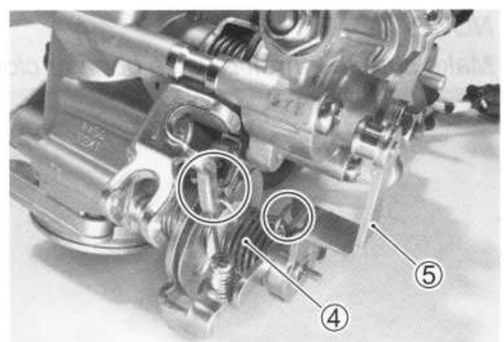


- Install the spring ③.



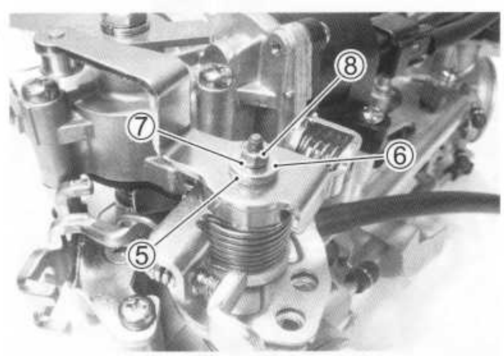
- Install the spring ④ and fast idle link lever ⑤.

NOTE:
Make sure that the spring ends are hooked correctly.



- Install the washers ⑤, ⑥, spring washer ⑦ and nut ⑧.

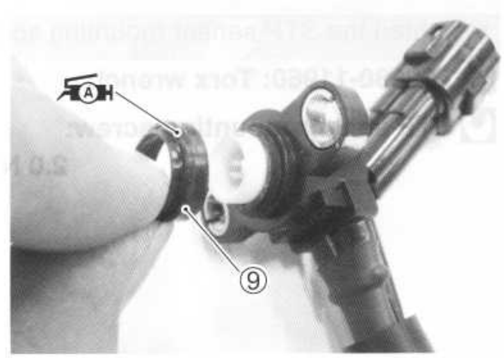
NOTE:
The washer ⑤ is inserting in the axis certainly.



- Apply SUZUKI SUPER GREASE to the seal lips.

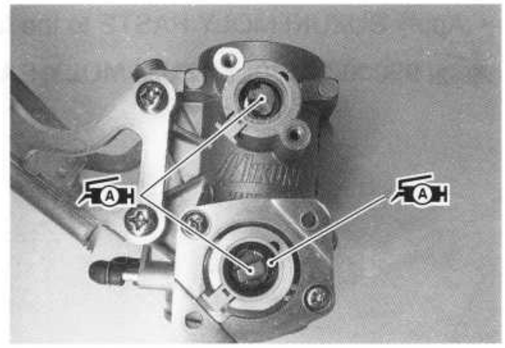
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Install the seal ⑨.



- Apply a small quantity of SUZUKI SUPER GREASE to the shaft ends and seal lips.

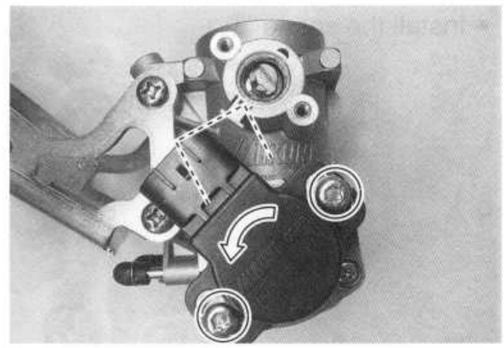
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



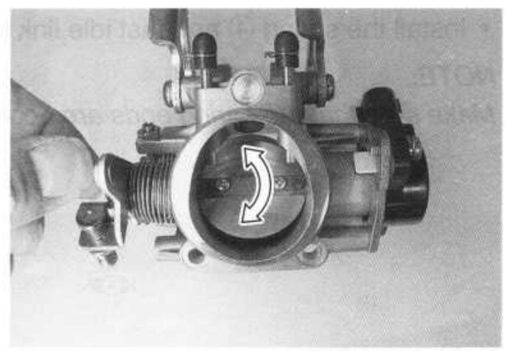
- Turn the TP sensor counterclockwise and install the mounting screws.
- Tighten the TP sensor mounting screws.

09930-11950: Torx wrench

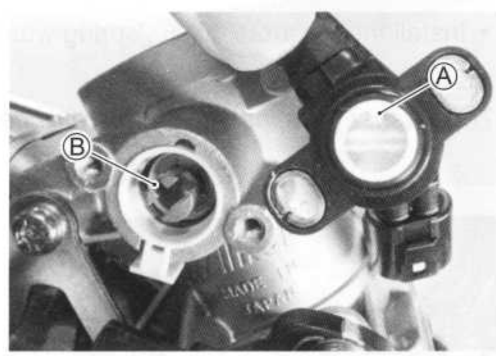
TP sensor mounting screw: 3.5 N·m (0.35 kgf-m, 2.5 lb-ft)



NOTE:
Make sure the throttle valve open or close smoothly.



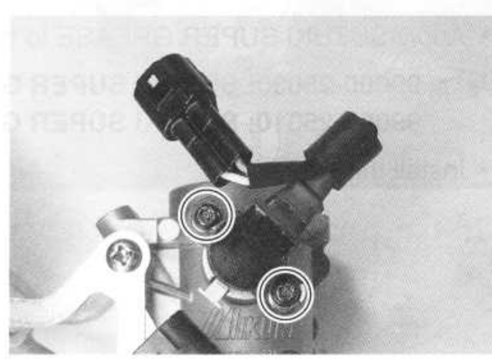
- Align the boss Ⓐ of the STP sensor with the groove Ⓑ of the ST valve shaft.
- Install the STP sensor.



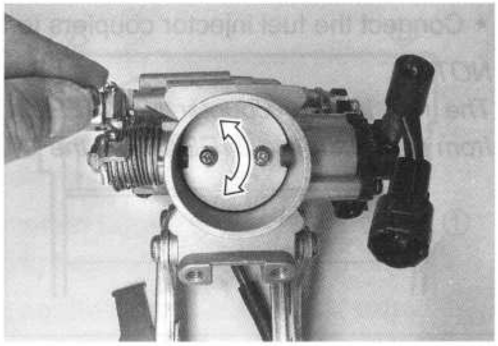
- Tighten the STP sensor mounting screws.

09930-11960: Torx wrench

STP sensor mounting screw: 2.0 N·m (0.2 kgf-m, 1.5 lb-ft)



NOTE:
Make sure the ST valve open or close smoothly.

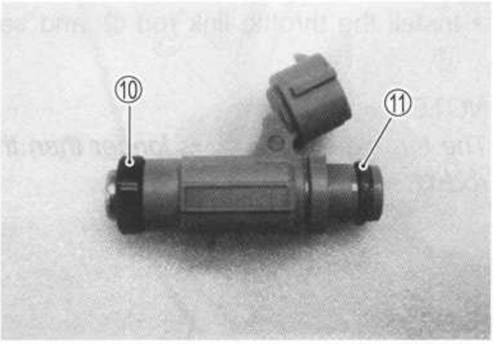


- Apply thin coat of the engine oil to the new fuel injector cushion seal ⑩, and install it to the fuel injector.

CAUTION

Replace the cushion seal and O-ring with a new one.

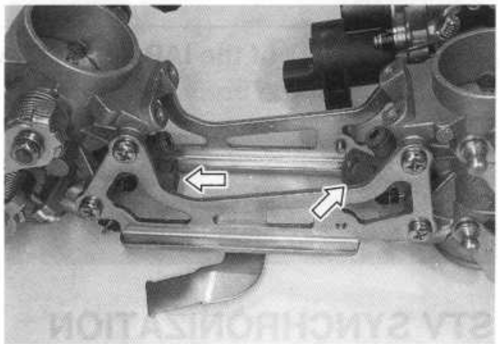
- Install the O-ring ⑪ to the fuel injector.
- Apply thin coat of the engine oil to the new O-ring ⑪.



- Install the fuel injectors by pushing them straight to each throttle body.

CAUTION

Never turn the injector while pushing it.



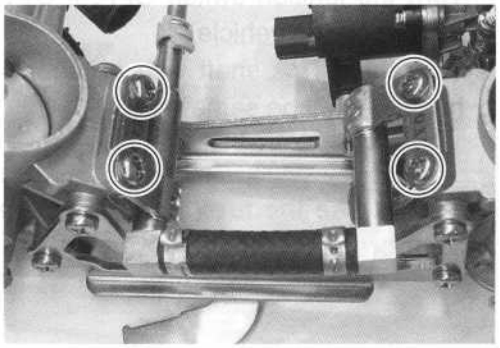
- Install the fuel delivery pipe assembly to the throttle body assembly.

CAUTION

Never turn the fuel injectors while installing them.

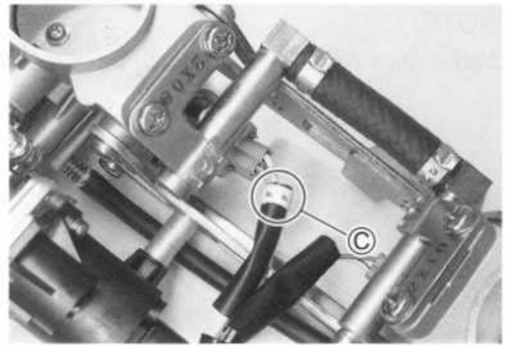
- Tighten the fuel delivery pipe mounting screws.

Fuel delivery pipe mounting screw:
5 N·m (0.5 kgf-m, 3.7 lb-ft)



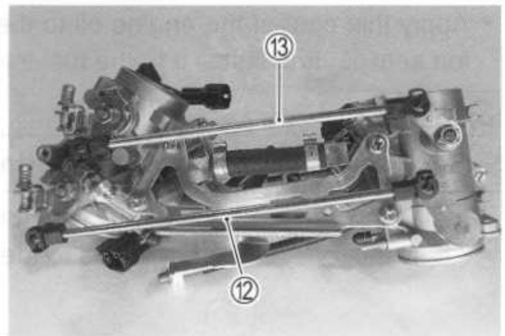
• Connect the fuel injector couplers to the fuel injectors.

NOTE:
The fuel injector coupler No.1 (FRONT) can be distinguished from that of the No.2 (REAR) by the "F" mark Ⓒ.



• Install the throttle link rod ⑫ and secondary throttle link rod ⑬.

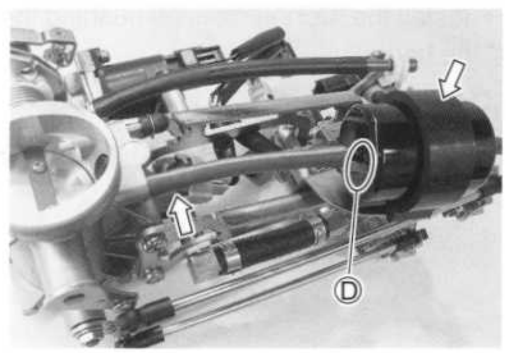
NOTE:
The throttle link rod ⑫ is longer than the secondary throttle link rod ⑬.



• Install the IAP sensor vacuum damper and hose.

CAUTION

The stamp Ⓓ of the IAP sensor vacuum damper faces into the throttle body side.

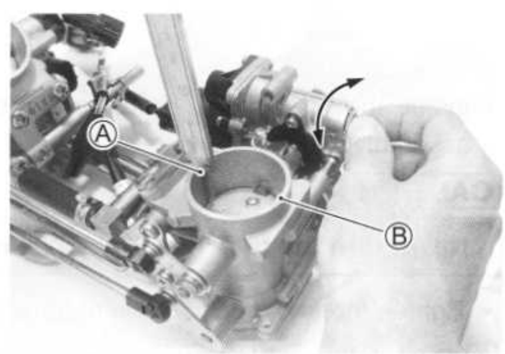


STV SYNCHRONIZATION

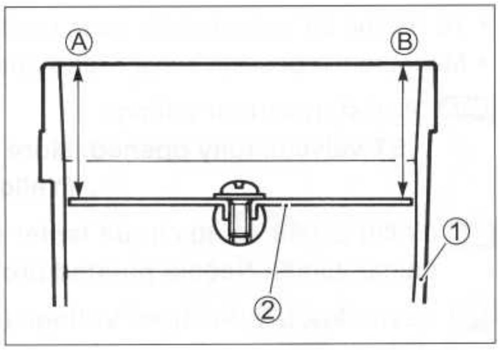
• Turn the ignition switch OFF, if STV synchronization is performed on the vehicle.
• Turn the STVA shaft with a finger so that the throttle valve height Ⓐ will be same as Ⓑ.

CAUTION

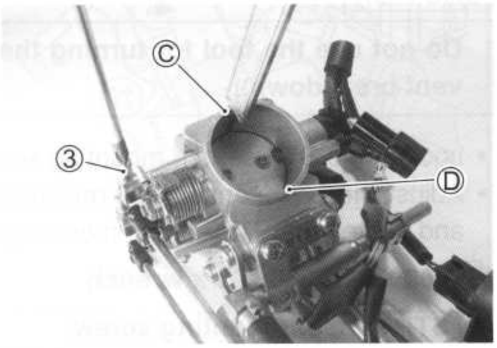
Do not use the tool for turning the STVA shaft to prevent breakdown.



NOTE:
Measure the throttle valve height Ⓐ, Ⓑ from top of the throttle body ① to the throttle valve ②.



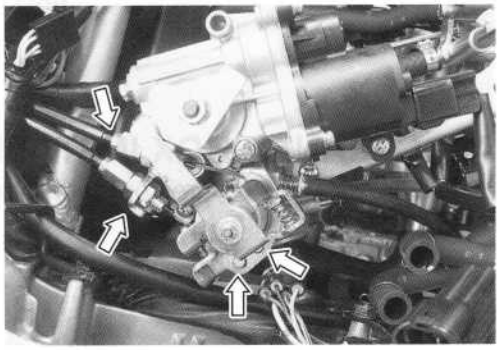
- While holding above No.1 STV position, turn the adjust screw ③ so that the throttle valve height Ⓒ will be same as Ⓓ.



THROTTLE BODY INSTALLATION

Installation is in the reverse order of removal. Pay attention to the following points:

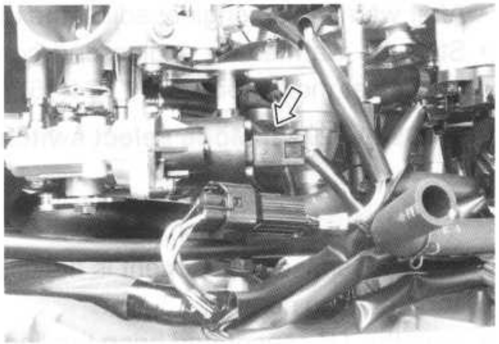
- Connect the throttle pulling cable and throttle returning cable to the throttle cable drum.
- Adjust the throttle cable play with the cable adjusters.
  Refer to page 2-16 for details.



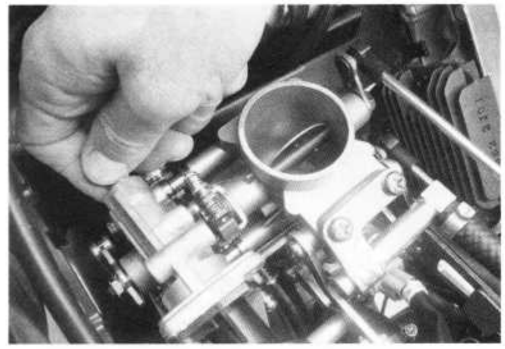
STP SENSOR ADJUSTMENT

If the STP sensor adjustment is necessary, measure the sensor resistance and adjust the STP sensor positioning as follows:

- Disconnect the STVA coupler and turn the ignition switch ON.



- To set the ST valve to fully open position.
- Measure the position sensor resistance at fully open position.



DATA Posision sensor voltage
ST valve is fully opened: More than Approx. 4.38 V (Yellow – Black)

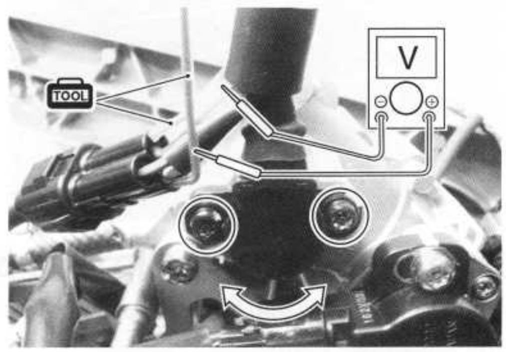
TOOL 09930-25008: Multi circuit tester set
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)

CAUTION

Do not use the tool for turning the STVA shaft to prevent breakdown.

- Loosen the STP sensor mounting screws.
- Adjust the STP sensor until resistance is within specification and tighten the STP sensor mounting screws.



TOOL 09930-11960: Torx wrench

STP sensor mounting screw: 2.0 N·m (0.2 kgf-m, 1.5 lb-ft)

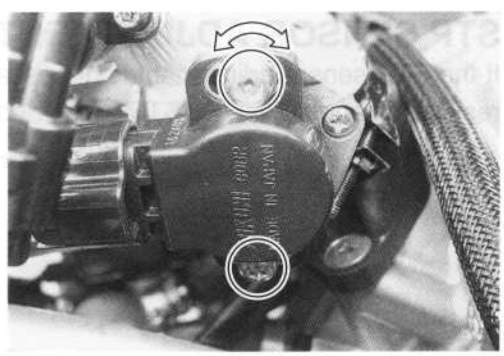
AIR CLEANER BOX INSTALLATION

Installation is in the reveres order of removal.

TP SENSOR ADJUSTMENT

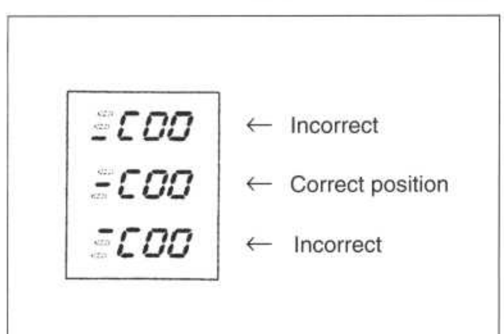
After checking or adjusting the throttle valve synchronization, adjust the TP sensor positioning as follows:

- After warming up engine, adjust the idling speed to 1 300 rpm.
- Stop the warmed-up engine and connect the special tool to the dealer mode coupler. (☞4-15)



TOOL 09930-82720: Mode select switch

- If the TP sensor adjustment is necessary, loosen the TP sensor mounting screws.
- Turn the TP sensor and bring the line to middle.
- Tighten the TP sensor mounting screws.



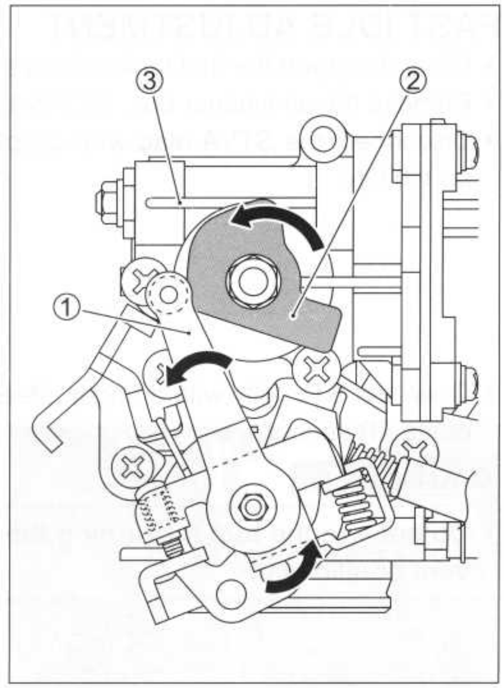
TOOL 09930-11950: Torx wrench

TP sensor mounting screw: 3.5 N·m (0.35 kgf-m, 2.5 lb-ft)

FAST IDLE INSPECTION

The fast idle system is automatic type.

When the fast idle cam is turned by the secondary throttle valve actuator, the cam pushes the lever on the throttle valve shaft causing the throttle valve to open and raise the engine speed. When the engine has warmed up, depending on the water temperature and ambient temperature as shown in the following table, the fast idle is cancelled allowing the engine to resume idle speed.



① Fast idle link lever
② Fast idle cam
③ STVA

NOTE:

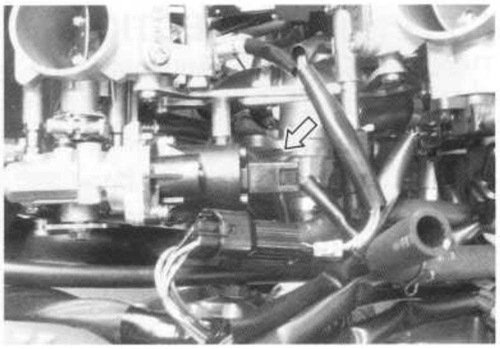
The fast idle link lever opens throttle valve a little to increase the engine speed.

DATA

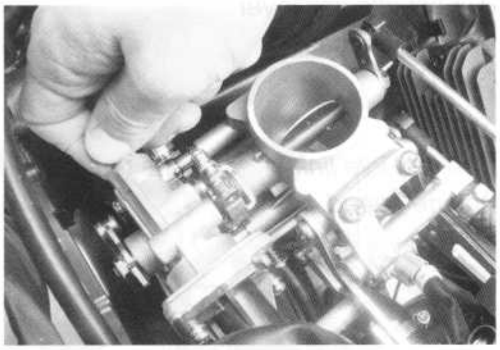
Ambient Temp.	Fast idle rpm	Fast idle cancelling Water Temp.
–5 °C (23 °F)	2 000 – 2 600 rpm	40 – 50 °C (104 – 122 °F)
15 °C (59 °F)	1 900 – 2 500 rpm	
25 °C (77 °F)	1 800 – 2 400 rpm	

If, under the above conditions, the fast idle cannot be cancelled, the cause may possibly be short-circuit in the engine coolant temperature sensor or wiring connections or maladjusted fast idle.

FAST IDLE ADJUSTMENT



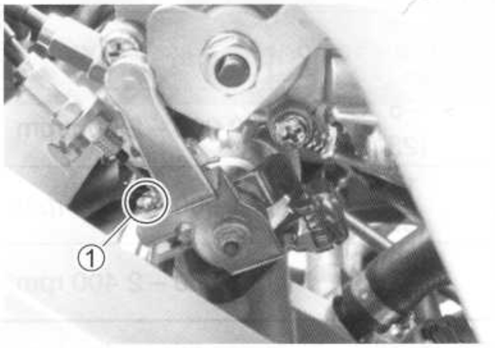
- Lift and support the fuel tank with its prop stay. (☞5-6)
- Remove the air cleaner box. (☞5-16)
- Disconnect the STVA lead wire coupler and turn the ignition switch ON.



- Open the STV fully with a finger. Measure the output voltage of the TP sensor.

CAUTION

Do not use the tool for turning the STVA shaft to prevent breakdown.

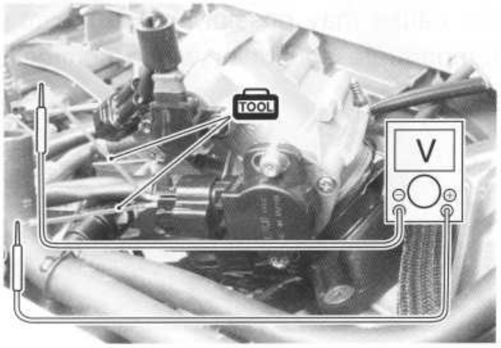


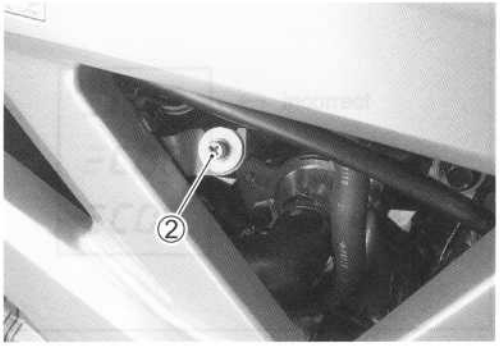
- If the TP sensor output voltage is out of specification, turn the fast idle adjusting screw ① and adjust the output voltage to specification.

DATA **TP sensor output voltage: 1.21 V**

TOOL **09900-25008: Multi circuit tester set**
09900-25009: Needle pointed probe set

Tester knob indication: Voltage (⎓)





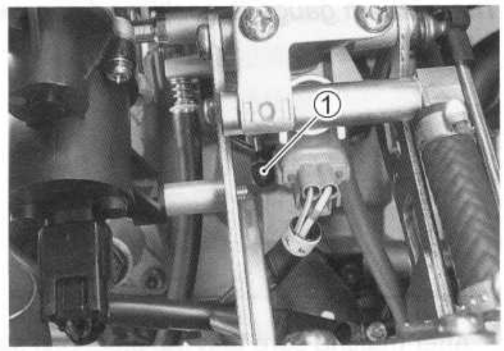
- After adjusting the fast idle speed, set the idle speed to 1 300 rpm by turning the throttle stop screw ②.

THROTTLE VALVE SYNCHRONIZATION

Check and adjust the throttle valve synchronization between two cylinders.

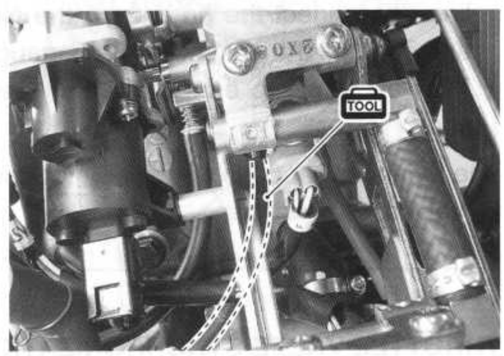
CALIBRATING EACH GAUGE (For vacuum balancer gauge)

- Lift and support the fuel tank. (☞5-6)
- Start up the engine and run it in idling condition for warming up.
- Stop the warmed-up engine.
- Remove the air cleaner box. (☞5-16)
- Connect the IAT and PAIR control valve sensor couplers.
- Connect the IAP sensor coupler and vacuum hose.
- Remove the rubber cap ① from the No.1 throttle body.



- Connect one of the four rubber hoses of the vacuum balancer gauge to the nipple on the No.1 throttle body.

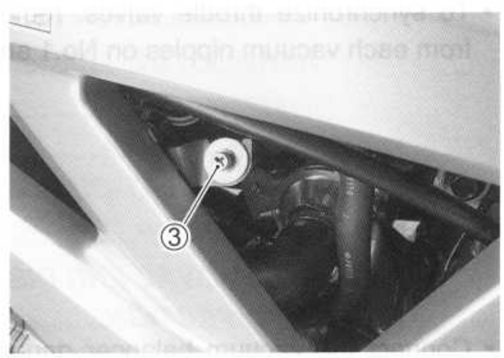
TOOL 09913-13121: Vacuum balancer gauge



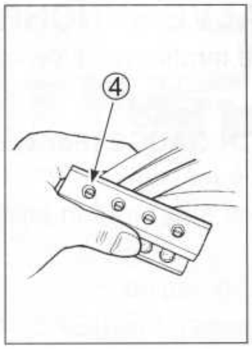
- Start up the engine and keep it running at 1 300 rpm by turning throttle stop screw ③.

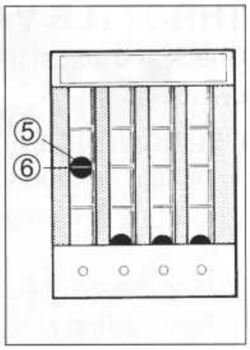
CAUTION

Avoid drawing dirt into the throttle body while running the engine without air cleaner box. Dirt drawn into the engine will damage the internal engine parts.

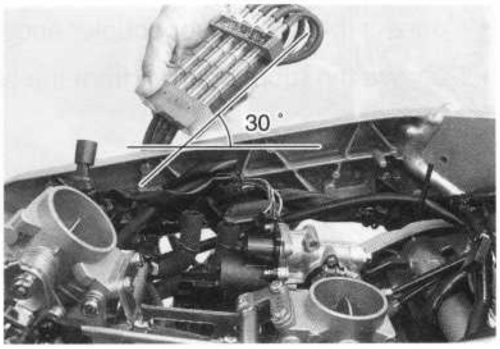


* Turn the air screw ④ of the gauge so that the vacuum acting on the tube of that hose will bring the steel ball ⑤ in the tube to the center line ⑥.

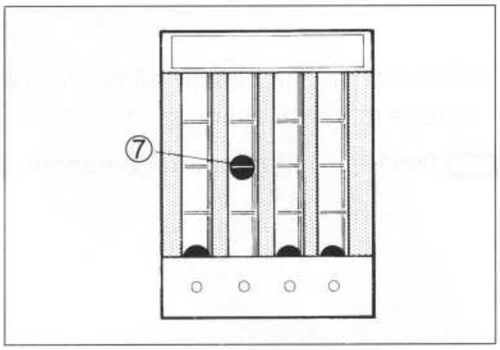




NOTE:
The vacuum gauge is positioned approx. 30 ° from the horizontal level.



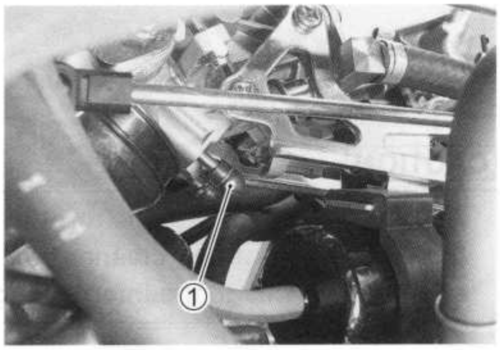
* After making sure that the steel ball stays steady at the center line, disconnect the hose from the No.1 throttle body nipple and connect the next hose of the gauge to this nipple.
* Turn air screw to bring the other steel ball ⑦ to the center line.



The balancer gauge is now ready for use in balancing the throttle valves.

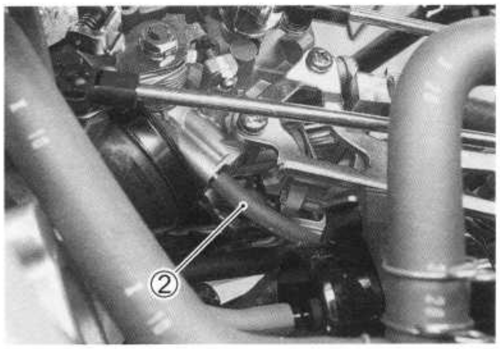
THROTTLE VALVE SYNCHRONIZATION

* To synchronize throttle valves, remove the rubber caps ① from each vacuum nipples on No.1 and No.2 throttle body.

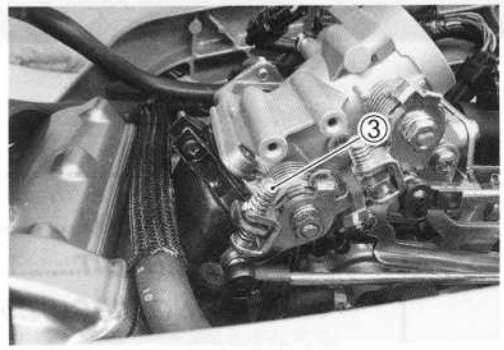


* Connect the vacuum balancer gauge hoses to the vacuum nipples ② respectively.

TOOL 09913-13121: Vacuum balancer gauge



- Connect a tachometer and start up the engine.
- Bring the engine rpm to 1 300 rpm by the throttle step screw.
- Check the vacuum of the two cylinders and balance the two throttle valves with the synchronizing screw ③ on the No.2 throttle body.



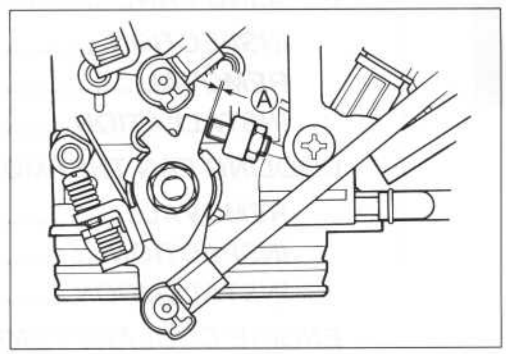
NOTE:
* *During balancing the throttle valves, always set the engine rpm at 1 300 rpm, using throttle stop screw.*
* *After balancing the two valves, set the idle rpm to 1 300 rpm.*

CAUTION

Avoid drawing dirt into the throttle body while running the engine without the air cleaner box. Dirt drawn into the engine will damage the internal engine parts.

NOTE:
Make sure that the throttle lever should have a gap Ⓐ (between the throttle lever and throttle lever stopper screw) during synchronization.

DATA **Throttle lever gap Ⓐ: 0.17 mm (0.007 in)**



COOLING AND LUBRICATION SYSTEM

CONTENTS

6

ENGINE COOLANT

At the time of manufacture, the cooling system is filled with a 50:50 mixture of distilled water and ethylene glycol anti-freeze. This 50:50 mixture will provide the optimum corrosion protection and excellent heat protection, and will protect the cooling system from freezing at temperatures above –31 °C (–24 °F).
If the motorcycle is to be exposed to temperatures below –31 °C (–24 °F), this mixing ratio should be increased up to 55 % or 60 % according to the figure.

Anti-freeze density	Freezing point
50 %	–31 °C (–24 °F)
55 %	–40 °C (–40 °F)
60 %	–55 °C (–67 °F)

CAUTION

* **Use a high quality ethylene glycol base anti-freeze, mixed with distilled water. Do not mix an alcohol base anti-freeze and different brands of anti-freeze.**
* **Do not rut in more than 60 % anti-freeze or less than 50 %. (Refer to Right figure.)**
* **Do not use a radiator anti-leak additive.**

50 % Engine coolant including reserve tank capacity

Anti-freeze	865 ml (1.83/1.52 US/Imp.pt)
Water	865 ml (1.83/1.52 US/Imp.pt)

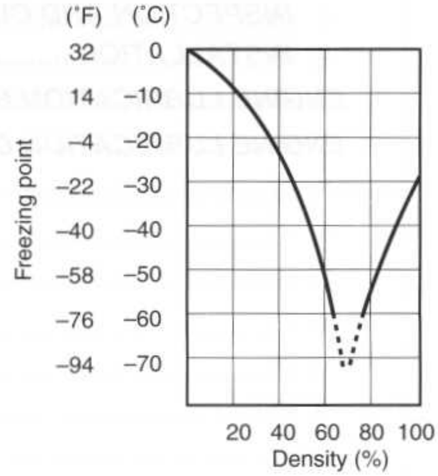


Fig.1 Engine coolant density-freezing point curve.

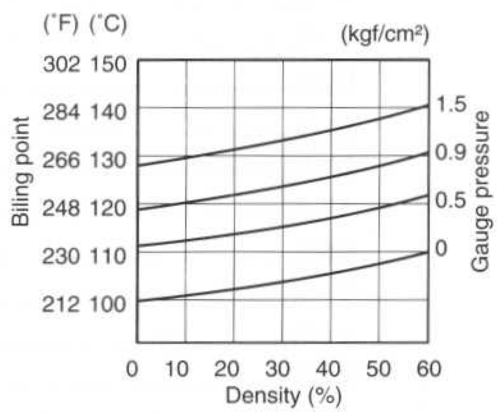
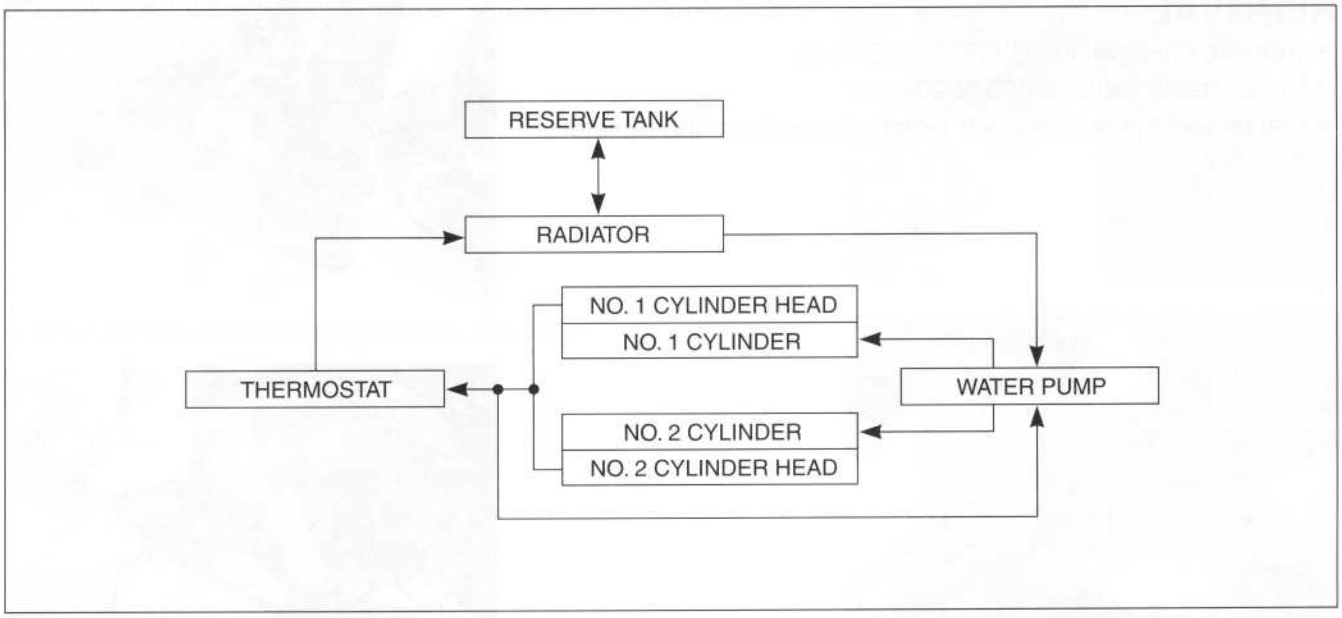


Fig.2 Engine coolant density-boiling point curve.

⚠ WARNING

* **You can be injured by scalding fluid or steam if you open the radiator cap when the engine is hot. After the engine cools, wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow pressure to escape and then turn the cap all the way off.**
* **The engine must be cool before servicing the cooling system.**
* **Coolant is harmful;**
  - **If it comes in contact with skin or eyes, flush with water.**
  - **If swallowed accidentally, induce vomiting and call physician immediately.**
  - **Keep it away from children.**

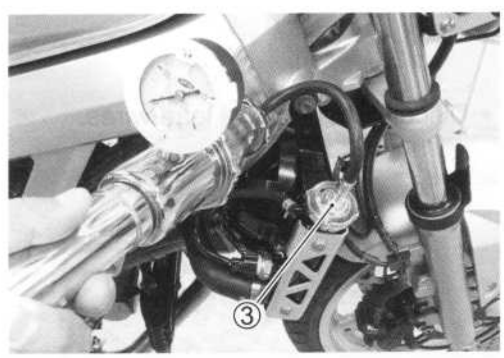
COOLING CIRCUIT



COOLING CIRCUIT INSPECTION

Before removing the radiator and draining the engine coolant, inspect the cooling circuit for tightness.

- Remove the cowling. (SV650S) (☞7-6)
- Loosen the radiator cap stop screw ①. (SV650)
- Remove the radiator cap ② and connect the radiator tester ③ to the filler.



⚠ WARNING

Do not remove the radiator cap when the engine is hot.

- Give a pressure of about 120 kPa (1.2 kgf/cm^2, 17.0 psi) and see if the system holds this pressure for 10 seconds.
- If the pressure should fall during this 10-second interval, it means that there is a leaking point in the system. In such a case, inspect the entire system and replace the leaking component or part.

⚠ WARNING

When removing the radiator cap tester, put a rag on the filler to prevent spouting of engine coolant.

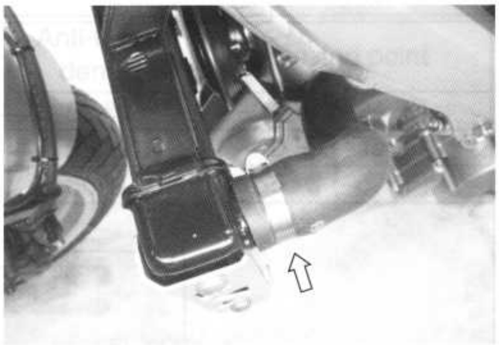
CAUTION

Do not allow the pressure to exceed specified pressure, or the radiator can be damaged.

RADIATOR

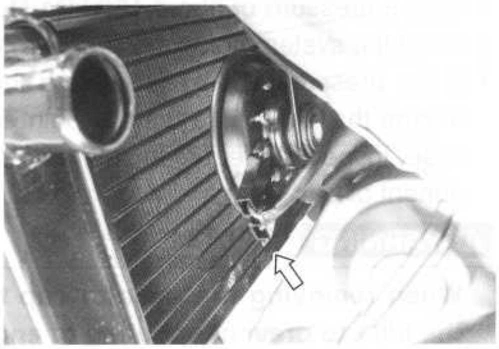
REMOVAL

- Remove the cowling. (SV650S) (☞7-6)
- Drain engine coolant. (☞2-20)
- Disconnect the right and left radiator hoses from the radiator.



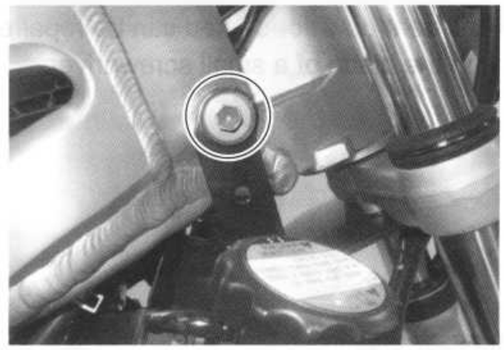
- Disconnect the siphon hose from the radiator.

- Disconnect the horn lead wires.

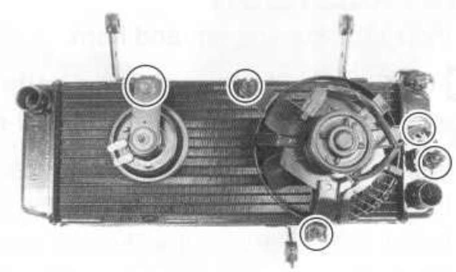


- Remove the radiator lower mounting bolt.
- Disconnect the cooling fan motor and its thermo-switch lead wire coupler ①.


- Remove the radiator by upper mounting bolt.



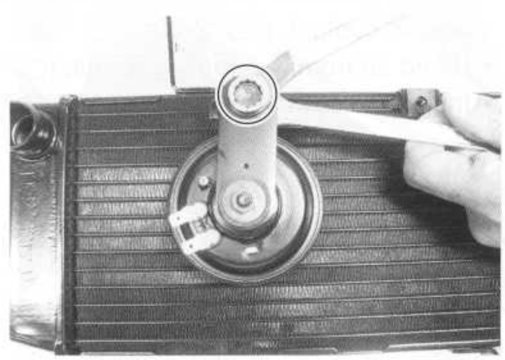
- Remove the cooling fan.
- Disconnect the cooling fan thermo-switch.
- Remove the cooling fan thermo-switch.



- Remove the horn.

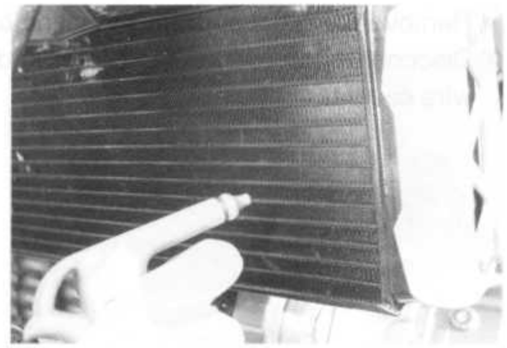
CAUTION

When removing the horn, hold the nut by spanner to prevent the horn bracket distortion.

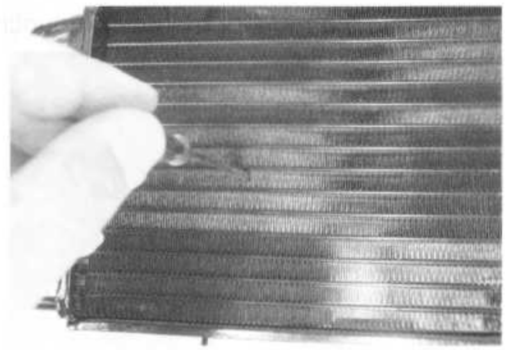


INSPECTION AND CLEANING

Road dirt or trash stuck to the fins must be removed.
Use of compressed air is recommended for this cleaning.



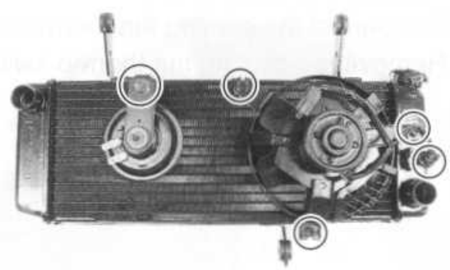
Fins bent down or dented can be repaired by straightening them with the blade of a small screwdriver.



INSTALLATION

- Install the cooling fan and horn.

Cooling fan/horn mounting bolt:
8 N·m (0.8 kgf-m, 6.0 lb-ft)

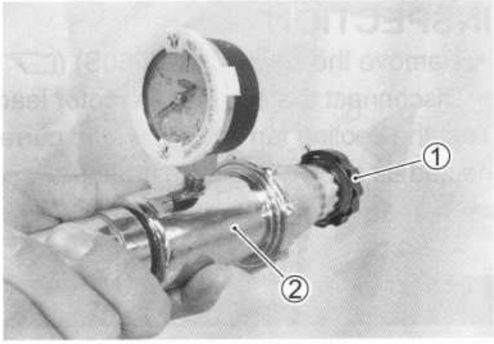


- Install the cooling fan thermo-switch. (☞6-9)
- Install the siphon hose to the radiator.
- Install the radiator in the reverse order of removal.
- Route the radiator hoses properly. (☞9-22)
- Install the drain plug with a new sealing washer and pour engine coolant. (☞2-20)
- Bleed air from the cooling circuit. (☞2-21)
- Install the cowling. (SV650S) (☞7-7)

RADIATOR CAP

INSPECTION

- Remove the radiator cap. (☞6-3)
- Fit the cap ① to the radiator cap tester ②.
- Build up pressure slowly by operating the tester. Make sure that the pressure build-up stops at 95 – 125 kPa (0.95 – 1.25 kgf/cm², 13.5 – 17.8 psi) and that, with the tester held standstill, the cap is capable of holding that pressure for at least 10 seconds.
- Replace the cap if it is found not to satisfy above requirements.



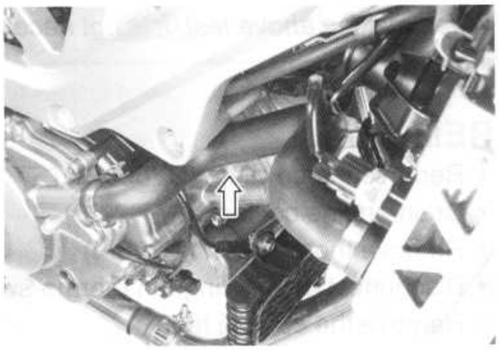
DATA **Radiator cap valve opening pressure**
Standard: 95 – 125 kPa
(0.95 – 1.25 kgf/cm², 13.5 – 17.8 psi)

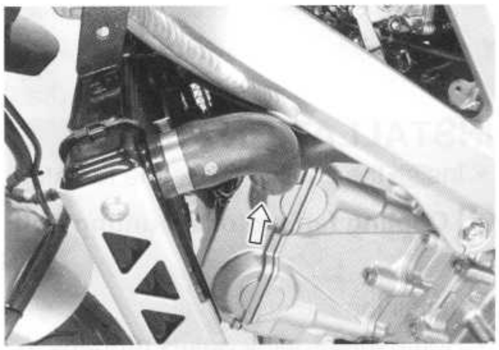
WATER HOSE

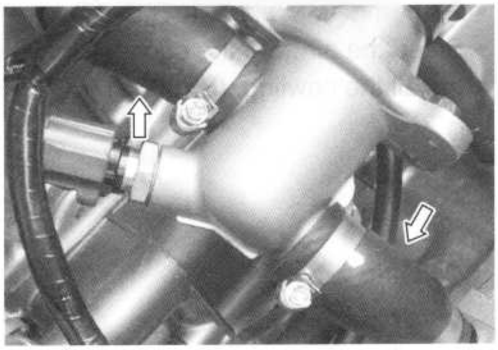
INSPECTION

- Remove the cowling. (SV650S) (☞7-6)

Any water hose found in a cracked condition or flattened or water leaked must be replaced.
Any leakage from the connecting section should be corrected by proper tightening.





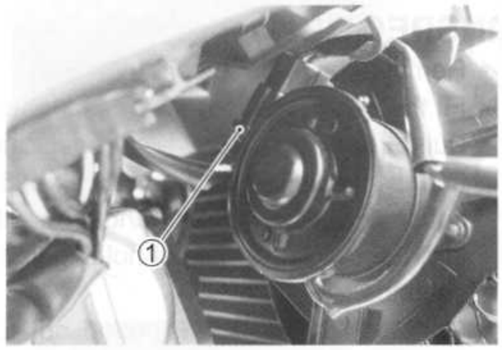


COOLING FAN

INSPECTION

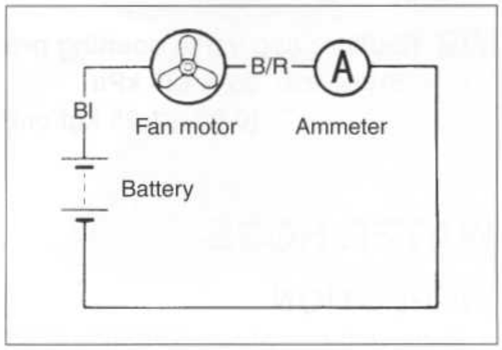
- Remove the cowling. (SV650S) (☞7-6)
- Disconnect the cooling fan motor lead wire coupler ①.

Test the cooling fan motor for load current with an ammeter connected as shown in the illustration.



The voltmeter is for making sure that the battery applies 12 volts to the motor. With the motor with electric motor fan running at full speed, the ammeter should be indicating not more than 5 amperes.

If the fan motor does not turn, replace the motor assembly with a new one.

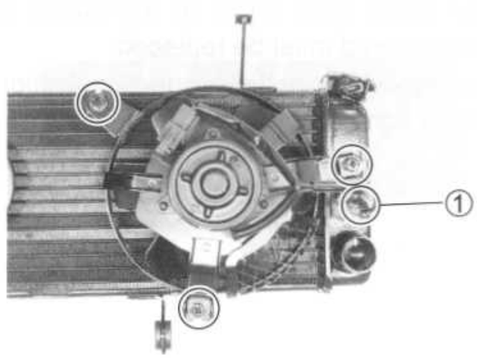


NOTE:

When making above test, it is not necessary to remove the cooling fan.

REMOVAL

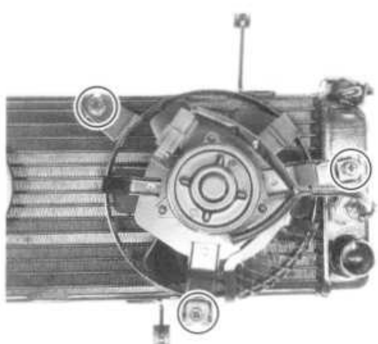
- Remove the cowling. (SV650S) (☞7-6)
- Drain engine coolant. (☞2-20)
- Remove the radiator. (☞6-4)
- Disconnect the cooling fan thermo-switch coupler ①.
- Remove the cooling fan.



INSTALLATION

- Install the cooling fan to the radiator.

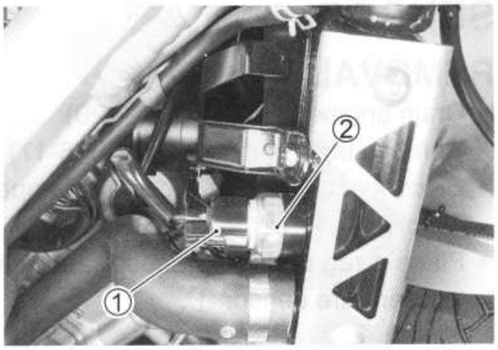
Cooling fan motor mounting bolt:
8 N·m (0.8 kgf-m, 6.0 lb-ft)



- Install the radiator.
- Route the radiator hoses properly. (☞9-22)
- Pour engine coolant. (☞2-20)
- Bleed the air from the cooling circuit. (☞2-21)
- Install the cowling. (SV650S) (☞7-6)

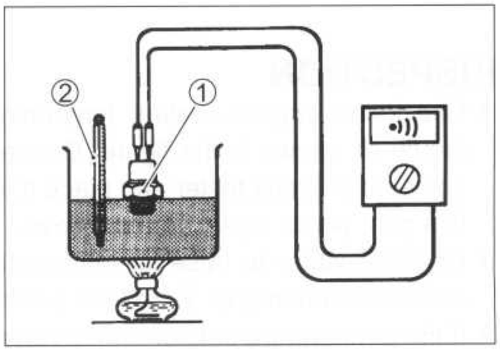
COOLING FAN THERMO-SWITCH

REMOVAL



- Remove the cowling. (SV650S) (☞7-6)
- Drain engine coolant. (☞2-20)
- Disconnect the cooling fan thermo-switch lead wire coupler ①.
- Remove the cooling fan thermo-switch ②.

INSPECTION



- Check the thermo-switch closing or opening temperatures by testing it at the bench as shown in the figure. Connect the thermo-switch ① to a circuit tester and place it in the OIL contained in a pan, which is placed on a stove.
- Heat the oil to raise its temperature slowly and read the column thermometer ② when the switch closes or opens.

TOOL 09900-25008: Multi circuit tester set

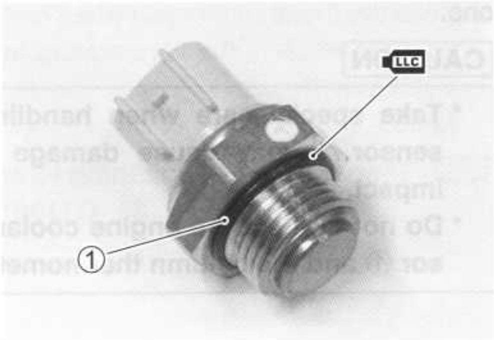
Tester knob indication: Continuity test (•)))

DATA Cooling fan thermo-switch operating temperature
Standard (OFF→ON): Approx. 98 °C (208 °F)
(ON→OFF): Approx. 92 °C (198 °F)

CAUTION

* **Take special care when handling the thermo-switch. It may cause damage if it gets a sharp impact.**
* **Do not contact the cooling fan thermo-switch ① and the column thermometer ② with a pan.**

INSTALLATION



- Install a new O-ring ① and apply engine coolant to the O-ring.
- Tighten the cooling fan thermo-switch to the specified torque.

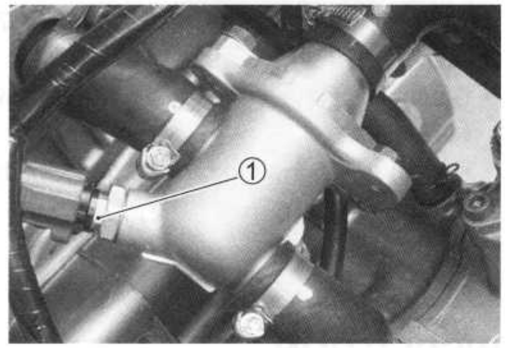
Cooling fan thermo-switch: 13 N·m (1.3 kgf-m, 9.5 lb-ft)

- Pour engine coolant. (☞2-20)
- Bleed air from the cooling circuit. (☞2-21)
- Install the cowling. (☞7-7)

ENGINE COOLANT TEMPERATURE SENSOR

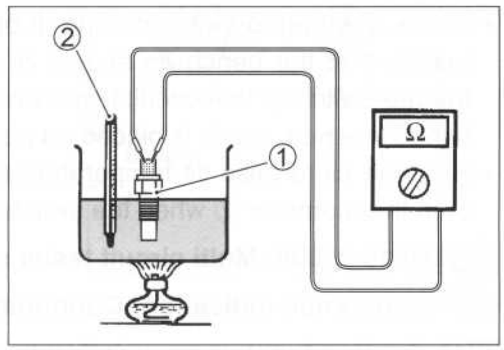
REMOVAL

- Drain engine coolant. (☞2-20)
- Remove the throttle body. (☞5-17)
- Disconnect the engine coolant temperature sensor lead wire coupler.
- Place a rag under the sensor and remove the engine coolant temperature sensor ①.



INSPECTION

- Check the engine coolant temperature by testing it at the bench as shown in the figure. Connect the temperature sensor ① to a circuit tester and place it in the WATER contained in a pan, which is placed on a stove.
- Heat the water to raise its temperature slowly and read the column thermometer ② and the ohmmeter.
- If the temperature sensor ohmic valve does not change in the proportion indicated, replace it with a new one.



DATA Temperature sensor specification

Temperature	Standard 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

If the resistance noted to show infinity or too much different resistance value, replace the temperature sensor with a new one.

CAUTION

- **Take special care when handling the temperature sensor. It may cause damage if it gets a sharp impact.**
- **Do not contact the engine coolant temperature sensor ① and the column thermometer ② with a pan.**

INSTALLATION

- Install a new sealing washer ①.
- Tighten the engine coolant temperature sensor to the specified torque.

Engine coolant temperature sensor:
18 N·m (1.8 kgf-m, 13.0 lb-ft)

CAUTION

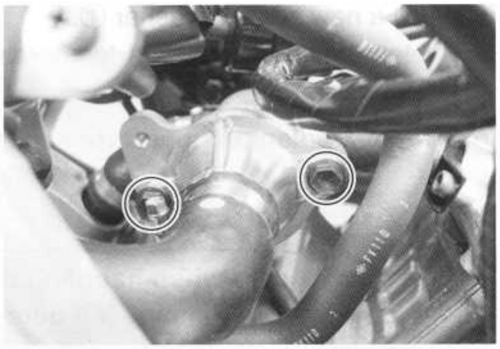
Take special care when handling the temperature sensor. It may cause damage if it gets a sharp impact.

- Pour engine coolant. (☞2-20)
- Bleed air from the cooling circuit. (☞2-21)
- Install the throttle body. (☞5-29)

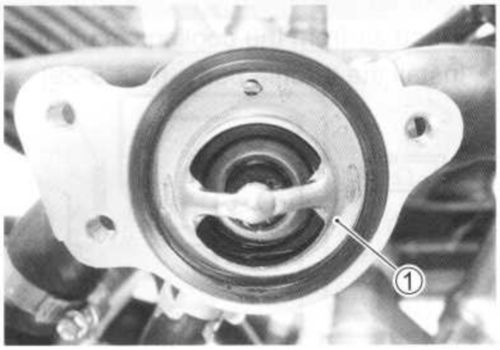
THERMOSTAT

REMOVAL

- Remove the throttle body. (☞5-17)
- Drain engine coolant. (☞2-20)
- Place a rag under the thermostat case.
- Remove the thermostat case cap.

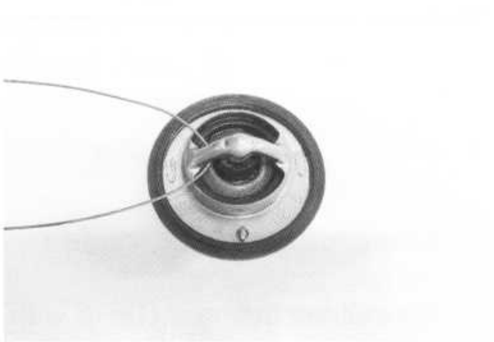


- Remove the thermostat ①.

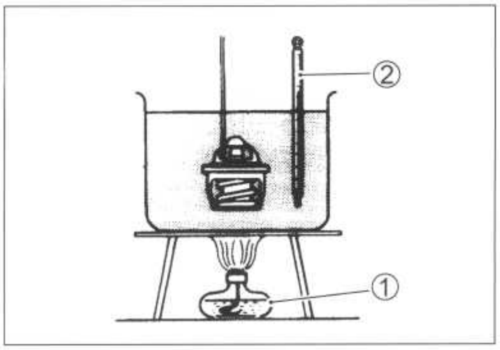


INSPECTION

Inspect the thermostat pellet for signs of cracking.
Test the thermostat at the bench for control action, in the following manner.

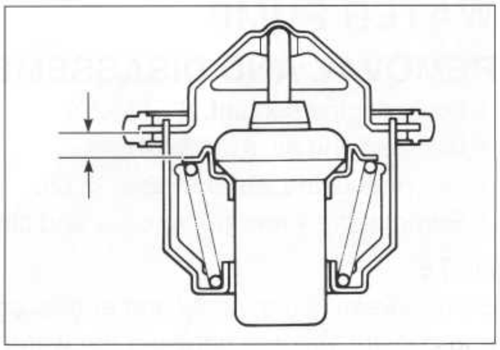


- Pass a string between flange, as shown in the photograph.
- Immerse the thermostat in the WATER contained in a beaker, as shown in the illustration. Note that the immersed thermostat is in suspension. Heat the water by placing the beaker on a stove ① and observe the rising temperature on a thermometer ②.
- Read the thermometer just when opening the thermostat. This reading, which is the temperature level at which the thermostat valve begins to open, should be within the standard value.



DATA **Thermostat valve opening temperature**
Standard: Approx. 88 °C (190 °F)

- Keep on heating the water to raise its temperature.
- Just when the water temperature reaches specified value, the thermostat valve should have lifted by at least 8.0 mm (0.31 in).

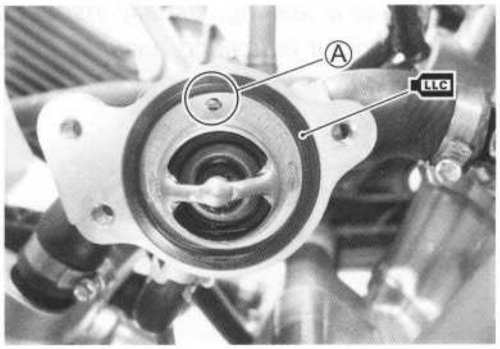


DATA **Thermostat valve lift**
Standard: Over 8.0 mm at 100 °C (Over 0.31 in at 212 °F)

- A thermostat failing to satisfy either of the two requirements, start-to-open temperature and valve lift, must be replaced.

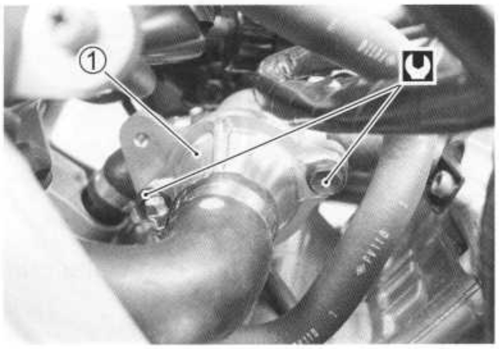
INSTALLATION

- Apply engine coolant to the rubber seal on the thermostat.
- Install the thermostat.



NOTE:
The jiggle valve Ⓐ of the thermostat faces upside.

- Install the thermostat case cap ①.



NOTE:
The rib of the thermostat case cap ① should be faced upward.

- Tighten the thermostat case bolts to the specified torque.

Thermostat case bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

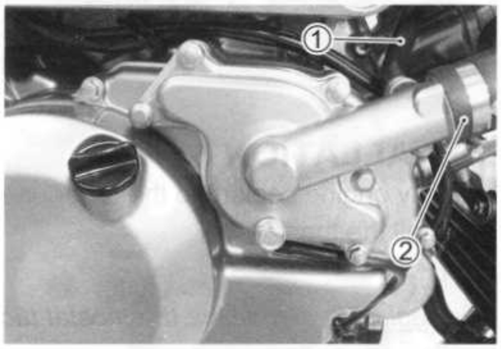
- Pour engine coolant. (☞2-20)
- Bleed air from the cooling circuit. (☞2-21)

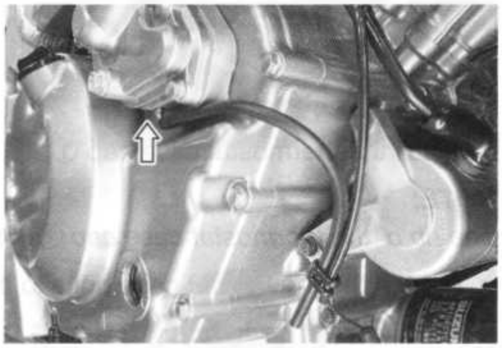
WATER PUMP

REMOVAL AND DISASSEMBLY

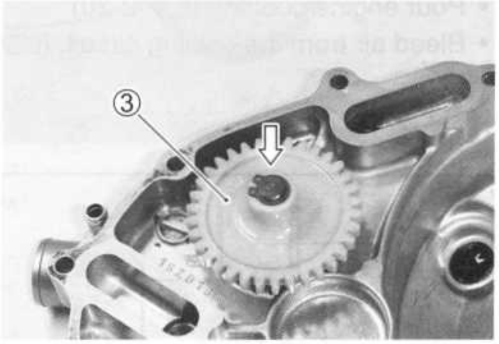
- Drain engine coolant. (☞2-20)
- Drain engine oil. (☞2-14)
- Disconnect the water hoses ①, ②.
- Remove the water pump case and clutch cover. (☞3-31)

NOTE:
Before draining engine oil and engine coolant, inspect engine oil and coolant leakage between the water pump and clutch cover. If engine oil is leaking, visually inspect the oil seal and O-ring. If engine coolant is leaking, visually inspect the mechanical seal and seal ring. (☞6-16)

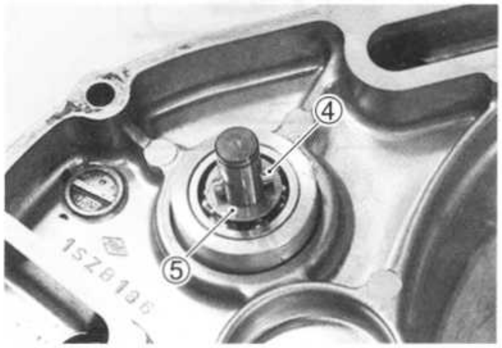




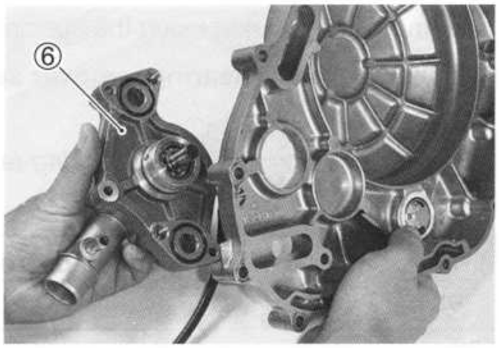
- Remove the snap ring and water pump driven gear ③.



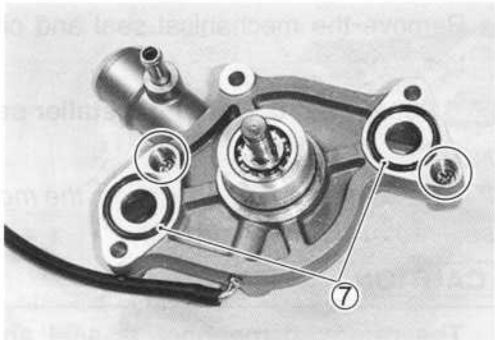
- Remove the pin ④ and washer ⑤.



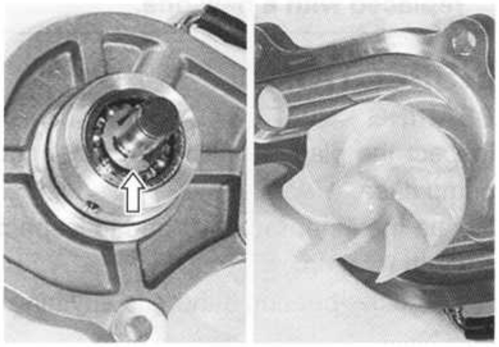
- Remove the water pump ⑥ from the clutch cover.



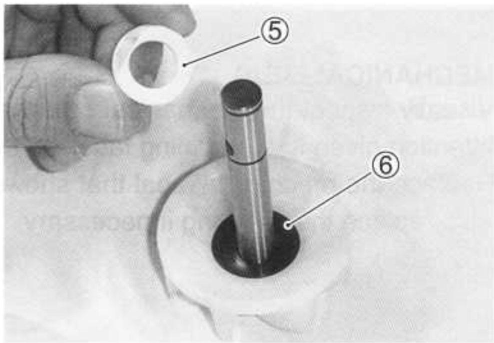
- Remove the screws and separate the water pump.
- Remove the O-rings ⑦.



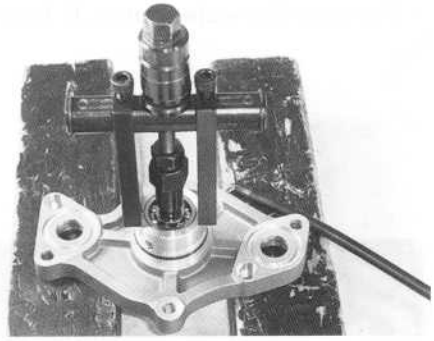
- Remove the E-ring from the impeller shaft.
- Remove the impeller from the other side.



- Remove the mechanical seal ring ⑤ and rubber seal ⑥ from the impeller.



- Remove the bearing using the special tool.



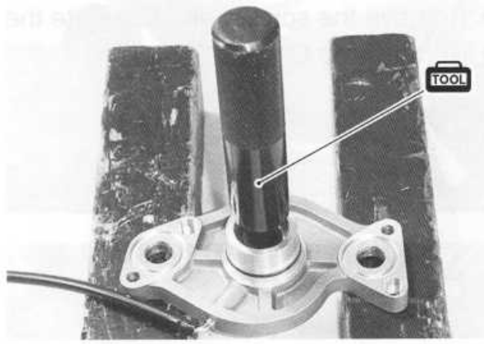
TOOL 09921-20240: Bearing remover set

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

CAUTION

The removed bearing must be replaced with a new one.

- Remove the mechanical seal and oil seal using the special tool.



TOOL 09913-70210: Bearing installer set (20 mm)

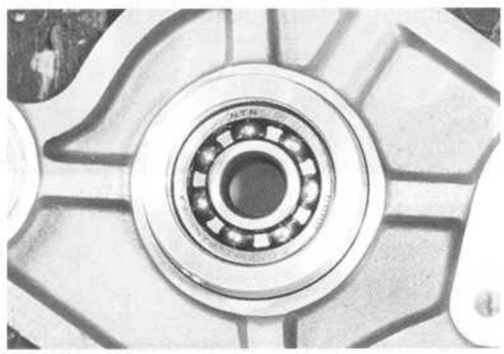
NOTE:
If there is no abnormal condition, the mechanical seal and the oil seal removal is not necessary.

CAUTION

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

INSPECTION

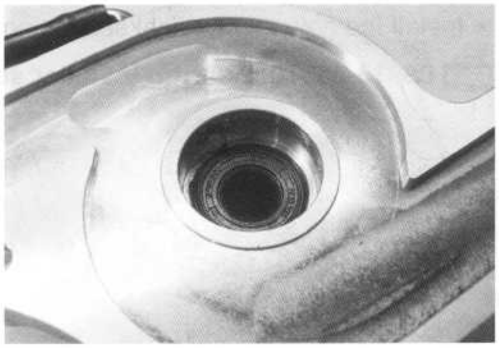
BEARING



Inspect the play of the bearing by hand while it is in the water pump case.
Rotate the inner race by hand to inspect for abnormal noise and smooth rotation.
Replace the bearing if there is anything unusual.

MECHANICAL SEAL

Visually inspect the mechanical seal for damage, with particular attention given to the sealing face.
Replace the mechanical seal that shows indications of leakage.
Also replace the seal ring if necessary.



OIL SEAL

Visually inspect the oil seal for damage, with particular attention given to the lip.
Replace the oil seal that shows indications of oil leakage.

BEARING CASE

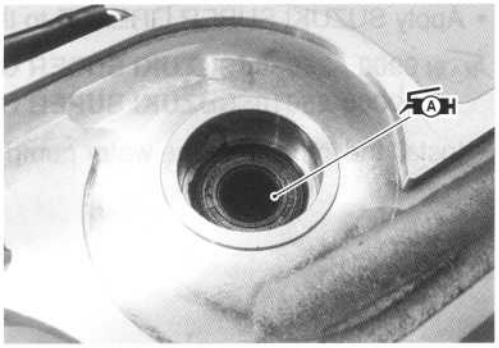
Visually inspect the bearing case for damage.
Replace the water pump body if necessary.

REASSEMBLY AND INSTALLATION

- Install the oil seal using the special tool.

TOOL **09913-70210: Bearing installer set**

NOTE:
The stamped mark on the oil seal faces impeller side.

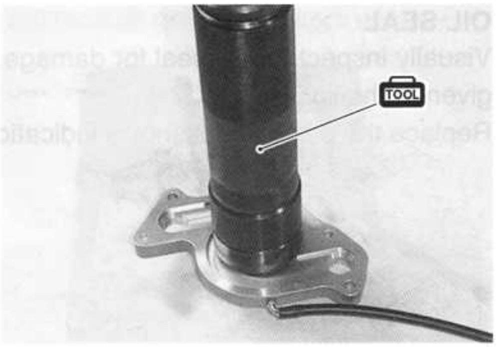


- Apply a small quantity of the SUZUKI SUPER GREASE to the oil seal lip.

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

• Install the new mechanical seal using the special tool.

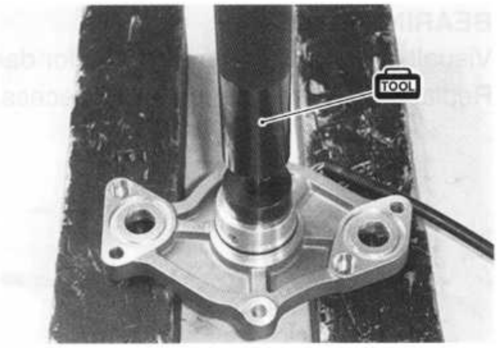
TOOL 09913-70210: Bearing installer set



• Install the new bearings using the special tool.

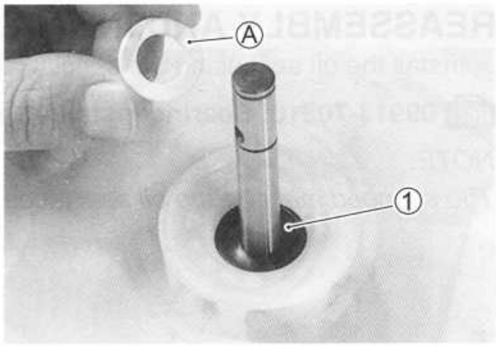
TOOL 09913-70210: Bearing installer set

NOTE:
The stamped mark on the bearing faces to the crankcase side.



• Install the rubber seal ① into the impeller.
• After wiping off the oily or greasy matter from the mechanical seal ring, install it into the impeller.

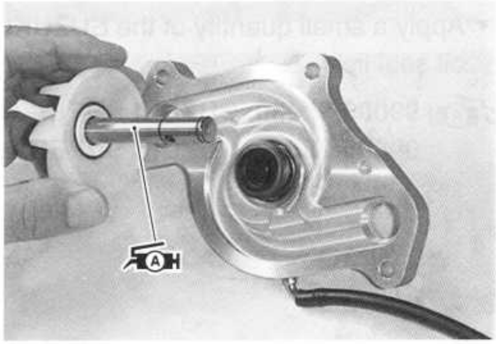
NOTE:
The paint marked side Ⓐ of the mechanical seal ring faces to the impeller.



• Apply SUZUKI SUPER GREASE to the impeller shaft.

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

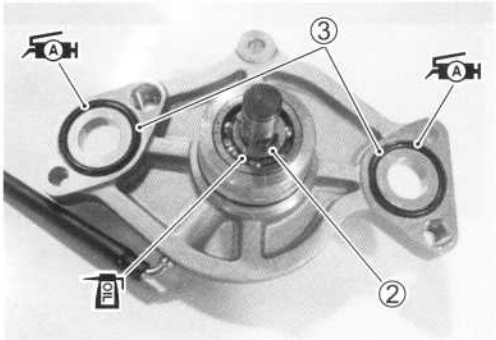
• Install the impeller to the water pump body.

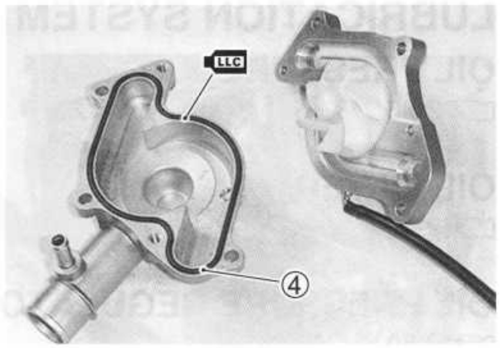


• Fix the impeller shaft with the E-ring ②.
• Apply SUZUKI SUPER GREASE to the O-rings.

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

• Install new O-rings ③.
• Fill the bearing with engine oil until engine oil comes out from the hole of the be bearing housing.



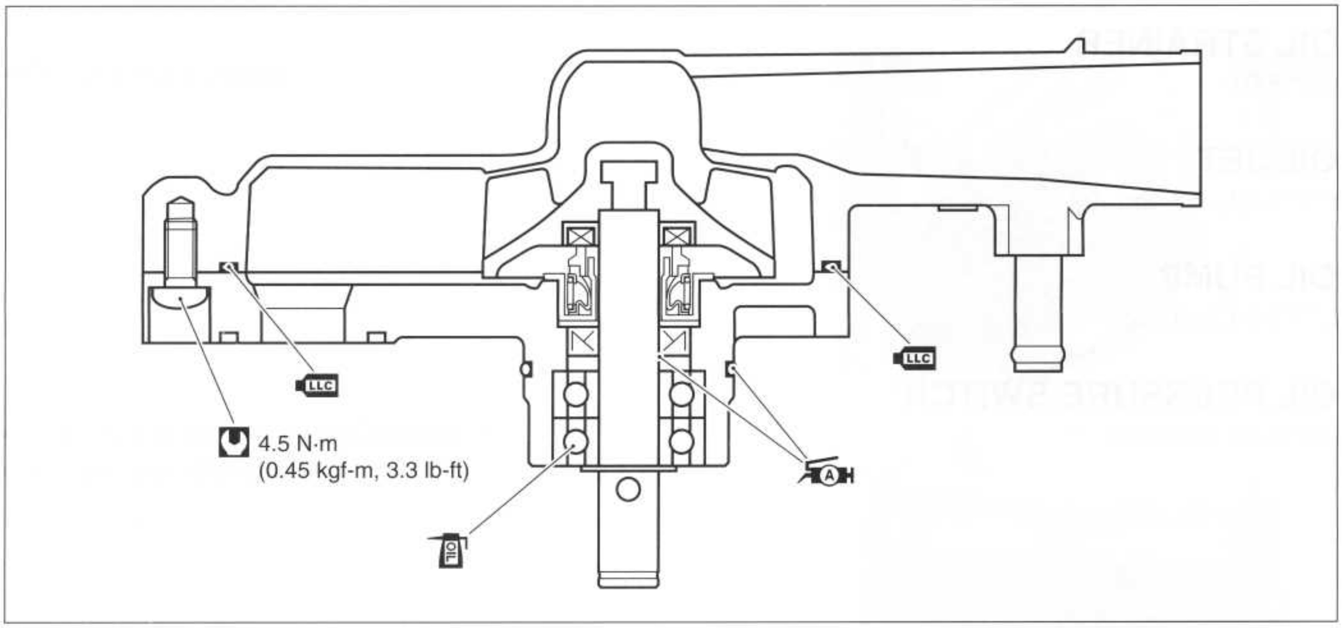


- Apply engine coolant to the O-ring ④.
- Install a new O-ring.

CAUTION

Use a new O-ring to prevent engine coolant leakage.

- Connect the water hoses.
- Pour engine coolant. (☞2-20)
- Pour engine oil. (☞2-14)



LUBRICATION SYSTEM

OIL PRESSURE

☞2-35

OIL FILTER

☞2-15

OIL PRESSURE REGULATOR

☞3-60

OIL STRAINER

☞3-61

OIL JET

☞3-62, -63 and -99

OIL PUMP

☞3-84 and -92

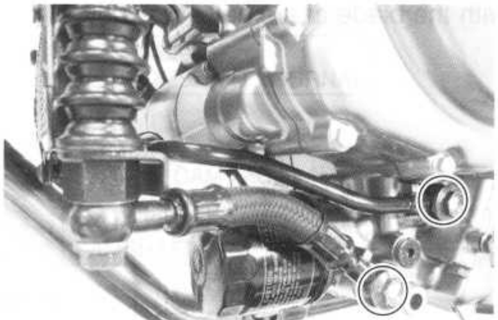
OIL PRESSURE SWITCH

☞3-61 and 8-36

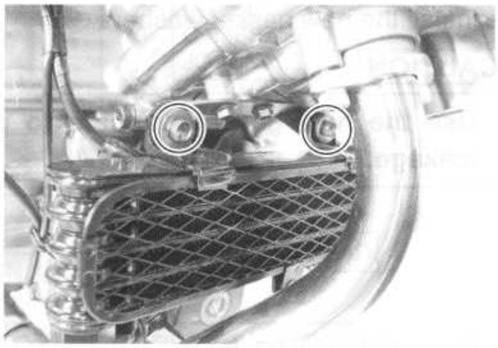
OIL COOLER

REMOVAL

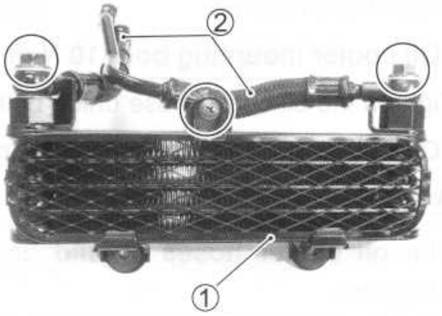
- Drain engine oil. (☞2-14)
- Disconnect the oil cooler hoses.



- Remove the oil cooler.



- Remove the oil cooler fin guard net ①.
- Remove the oil hoses ②.

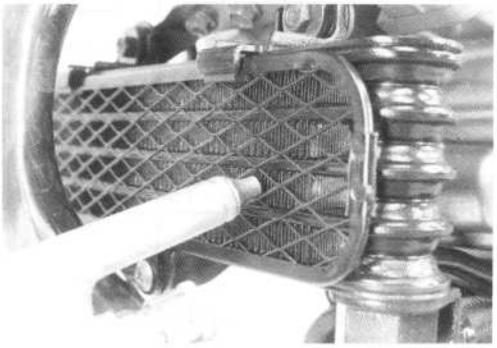


INSPECTION AND CLEANING

Inspect the oil cooler and hose joints for oil leakage. If any defect are found, replace the oil cooler and oil hoses with the new ones.

Road dirt or trash stuck to the fins must be removed.

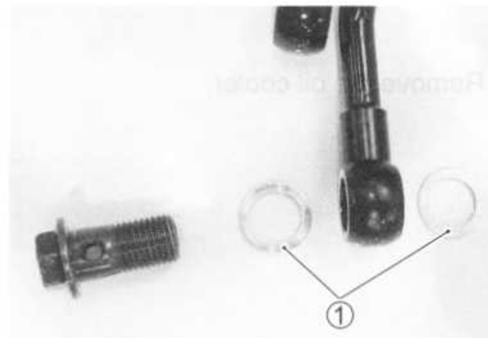
Use of compressed air is recommended for this cleaning.



Fins bent down or dented can be repaired by straightening them with the blade of a small screwdriver.

INSTALLATION

- Install the new gasket washers ①.



CAUTION

Use the new gasket washers to prevent engine oil leakage.

- Connect the oil hoses.
- Install the oil cooler.

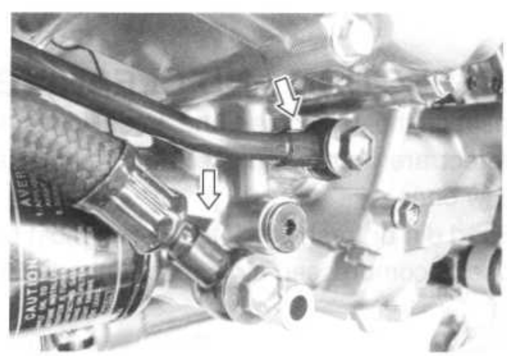
Oil cooler mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

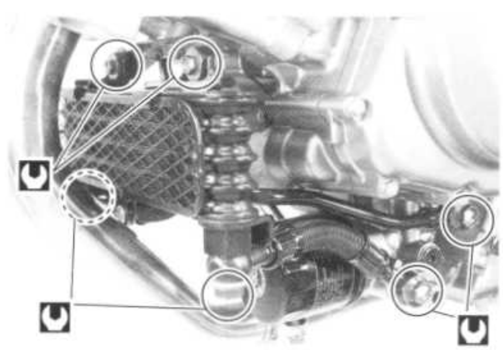
- Tighten the oil cooler hose union bolts to the specified torque.

Oil cooler hose union bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

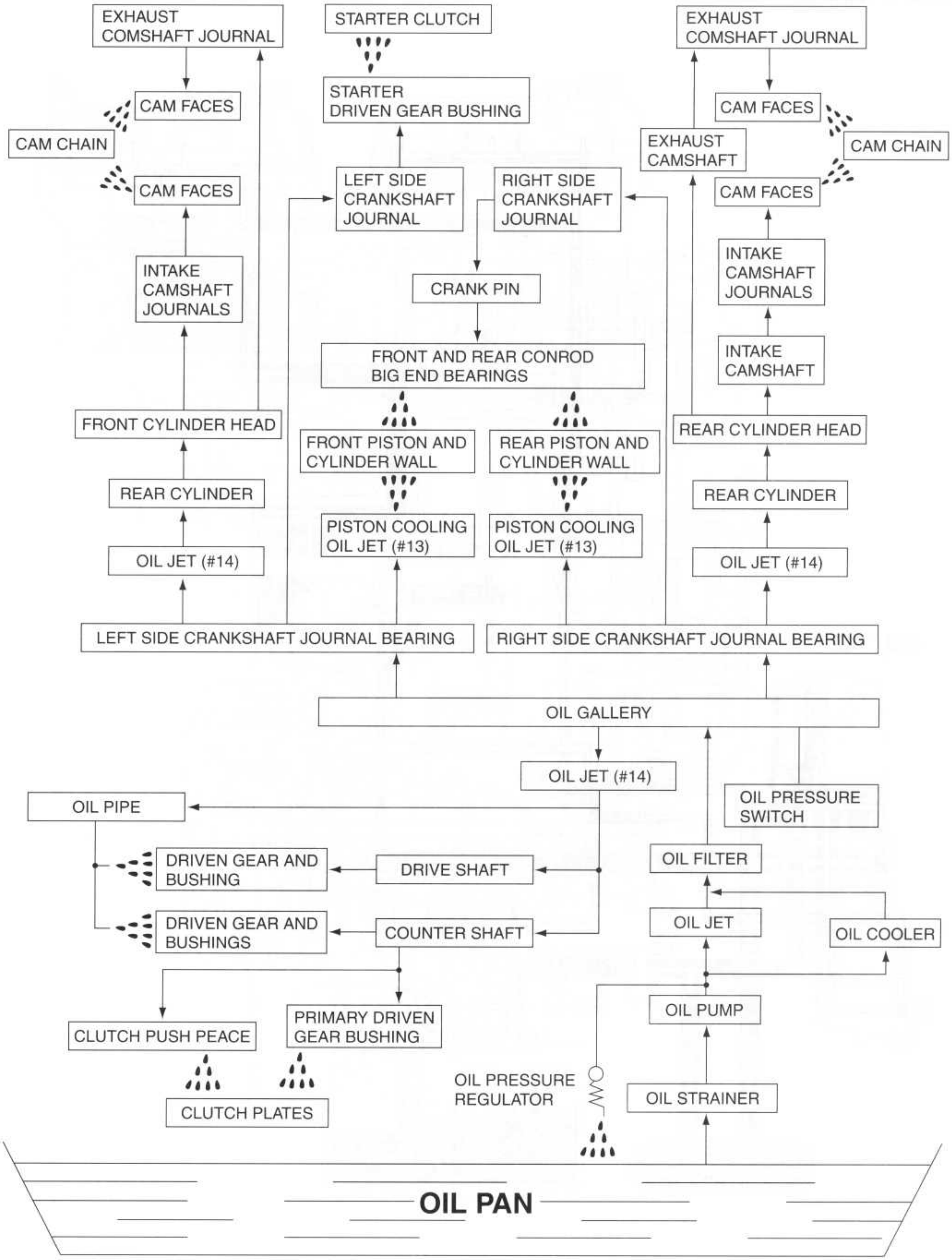
CAUTION

The oil cooler hoses should be contacted with the stoppers.



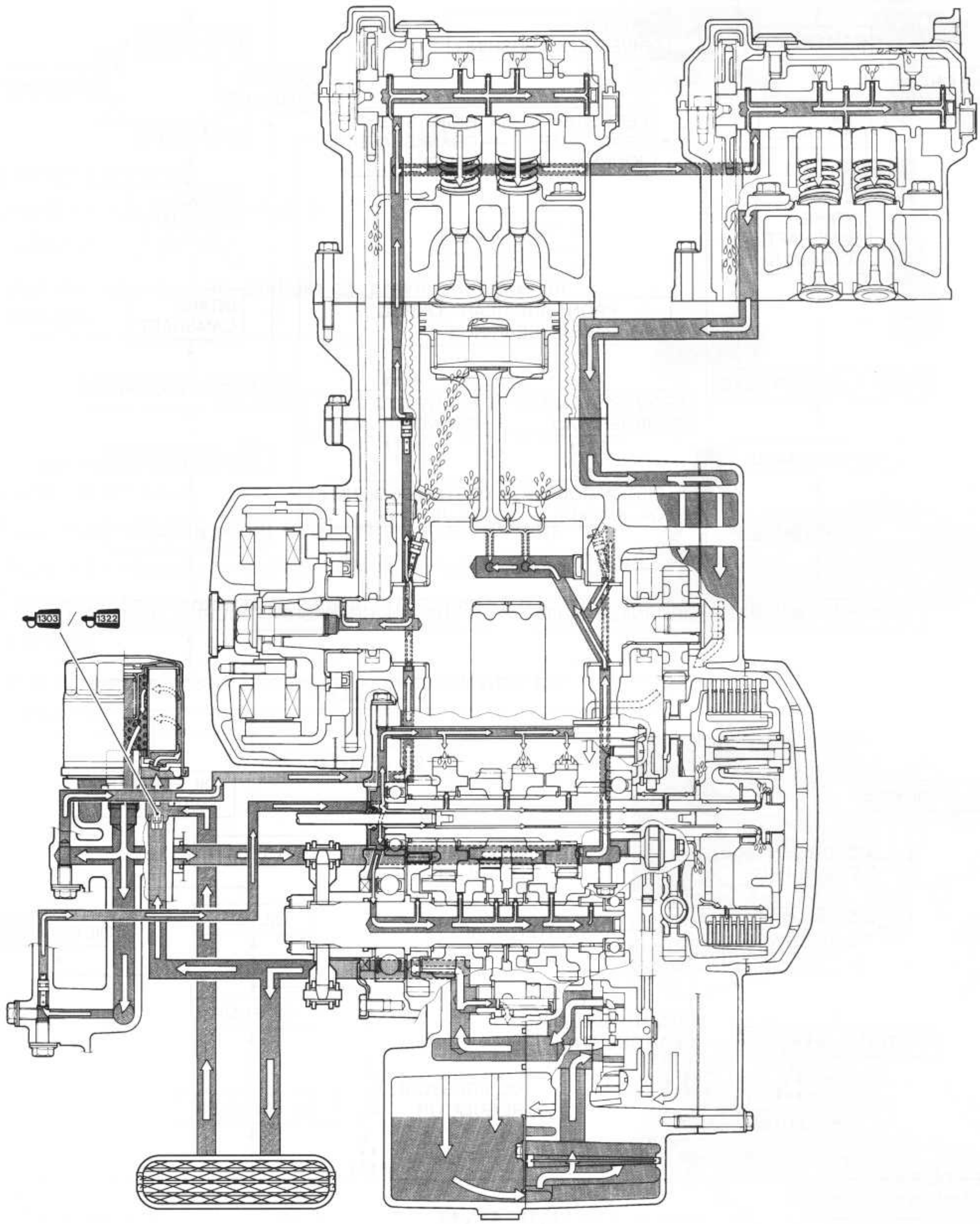


ENGINE LUBRICATION FLOW CHART

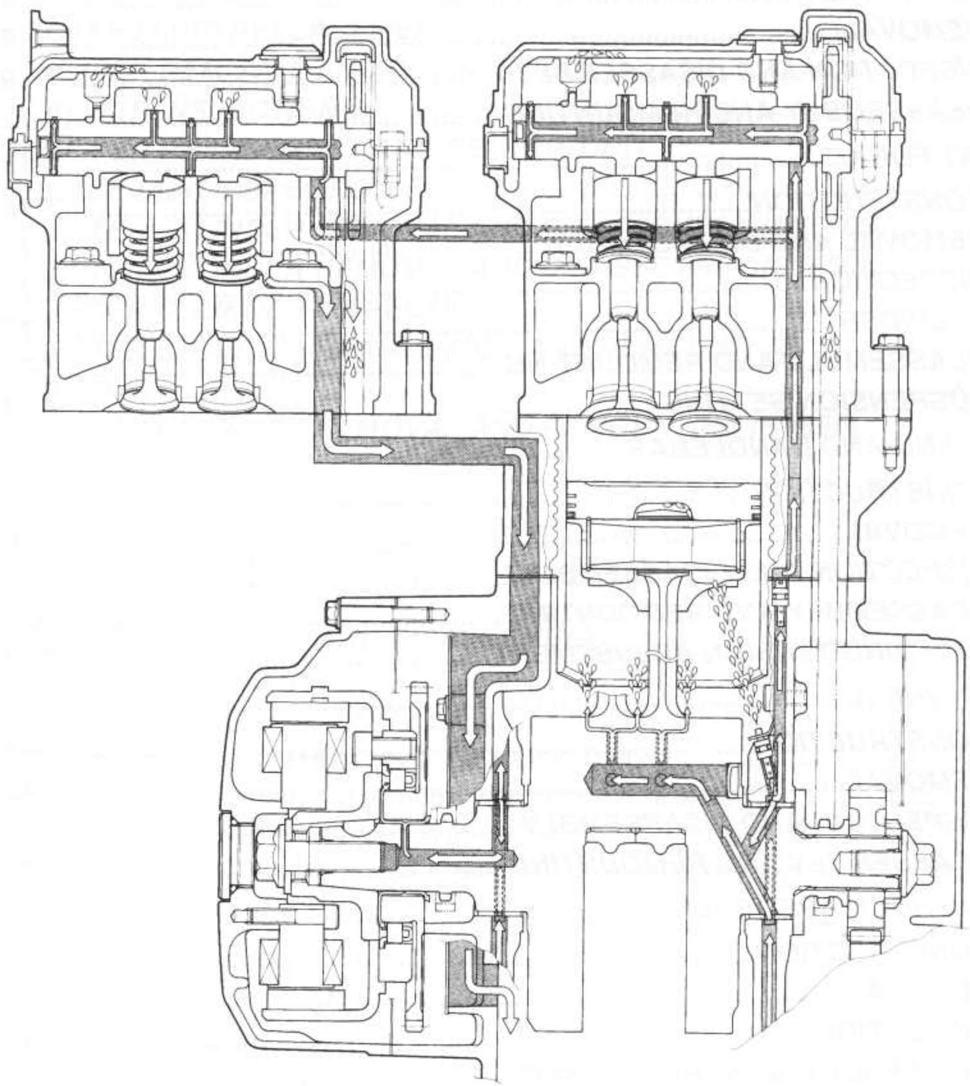


ENGINE LUBRICATION CIRCUIT

FRONT CYLINDER



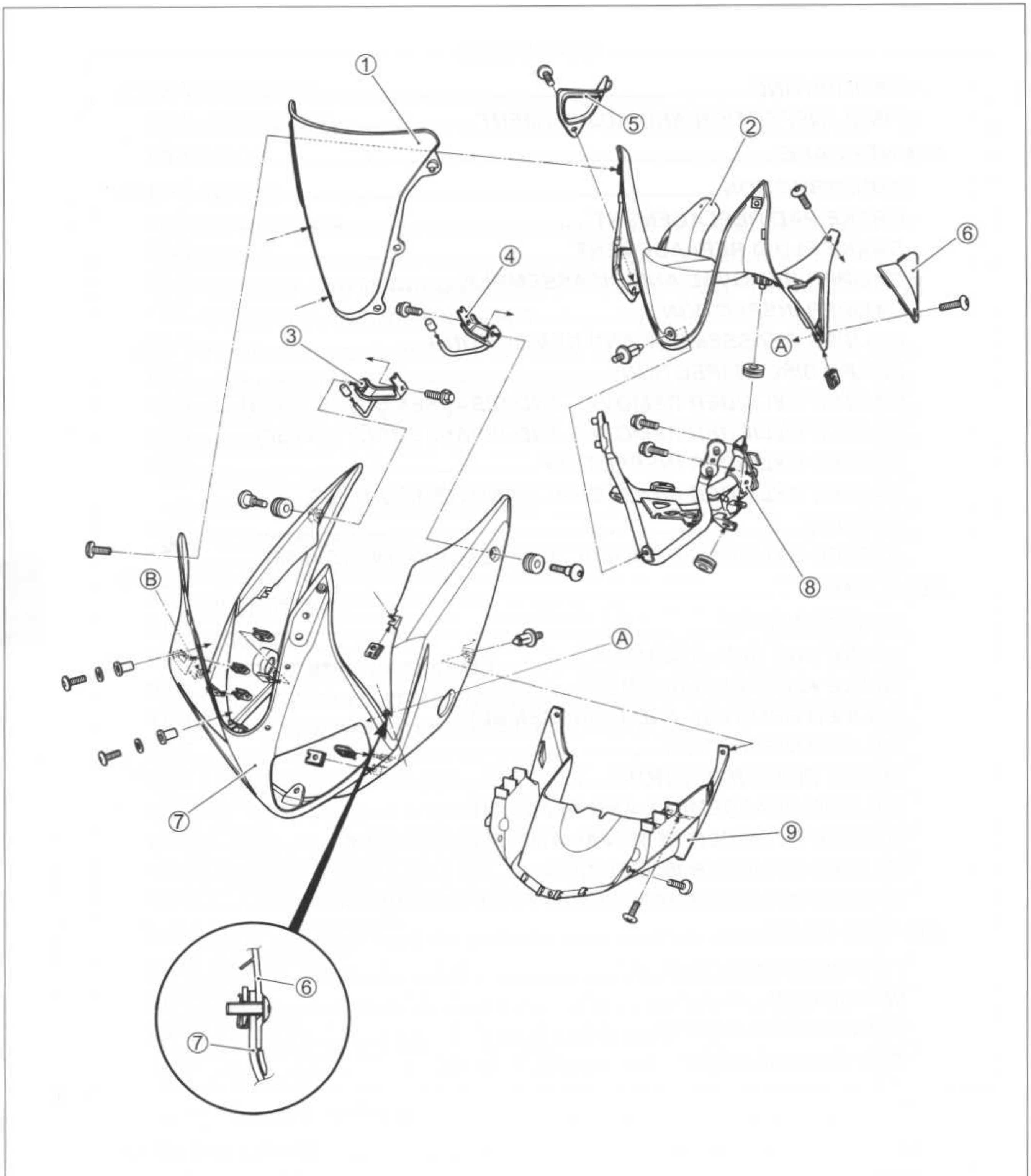
REAR CYLINDER



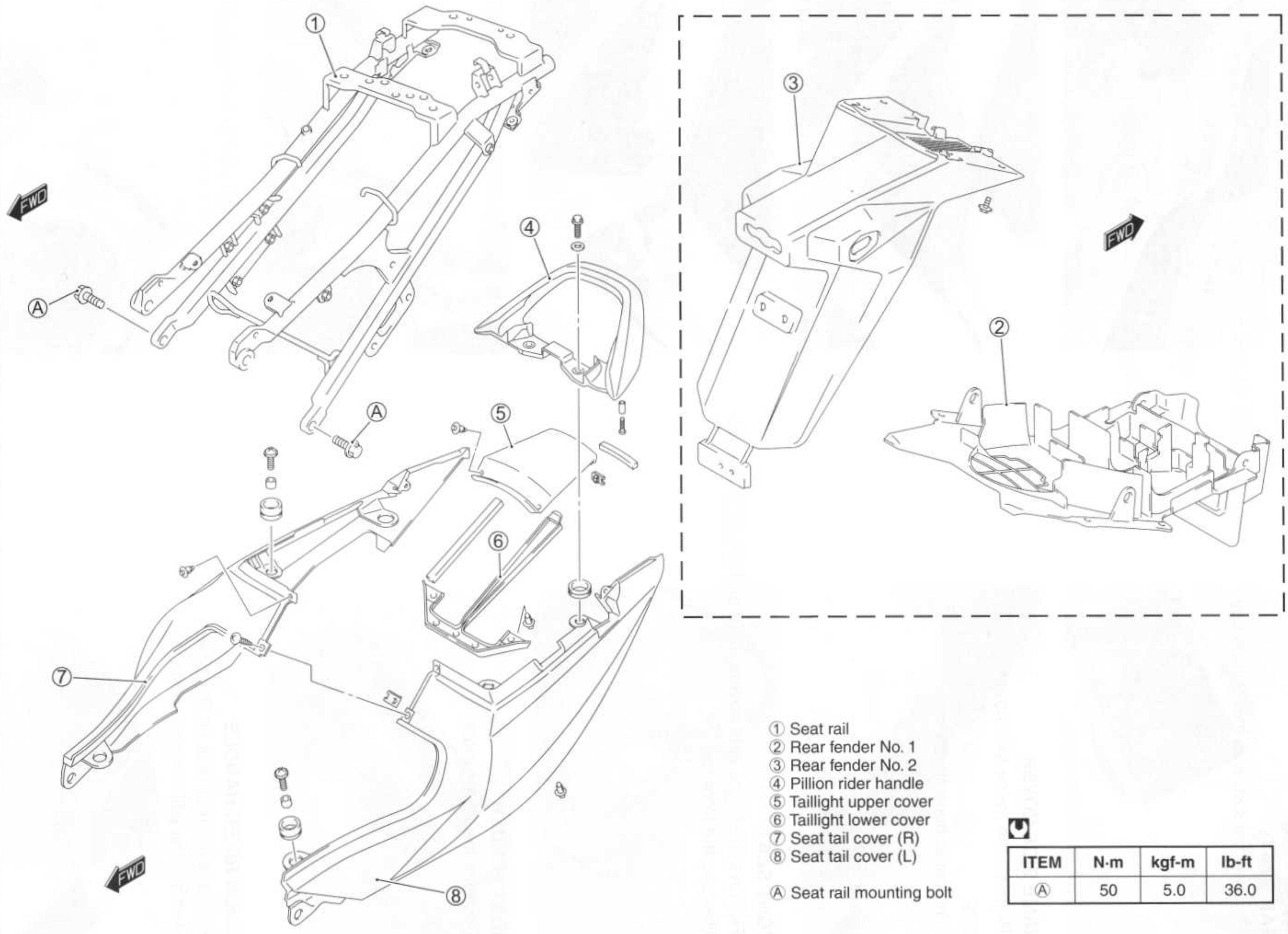
CHASSIS

CONTENTS

EXTERIOR PARTS
CONSTRUCTION



① Wind screen
② Meter panel
③ Cowling bracket, RH
④ Cowling bracket, LH
⑤ Meter panel lid, RH
⑥ Meter panel lid, LH
⑦ Body cowling
⑧ Cowling brace
⑨ Cowling inner cover



① Seat rail
② Rear fender No. 1
③ Rear fender No. 2
④ Pillion rider handle
⑤ Taillight upper cover
⑥ Taillight lower cover
⑦ Seat tail cover (R)
⑧ Seat tail cover (L)

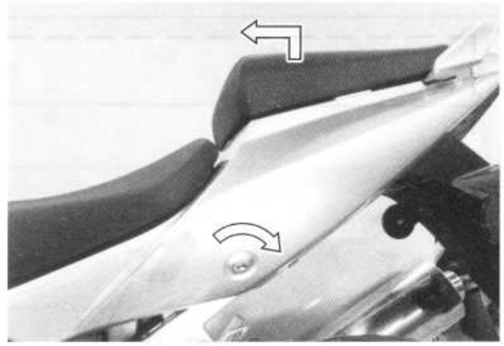
Ⓐ Seat rail mounting bolt

ITEM	N·m	kgf-m	lb-ft
Ⓐ	50	5.0	36.0

REMOVAL

REAR SEAT

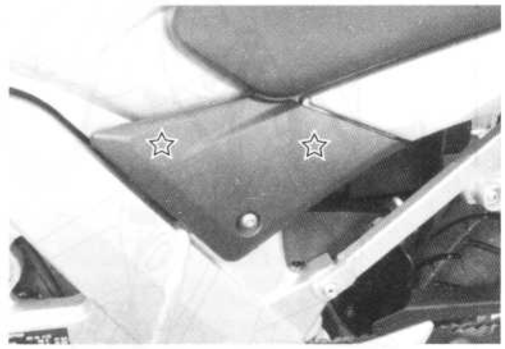
- Remove the seat with the ignition key.



FRAME SIDE COVER

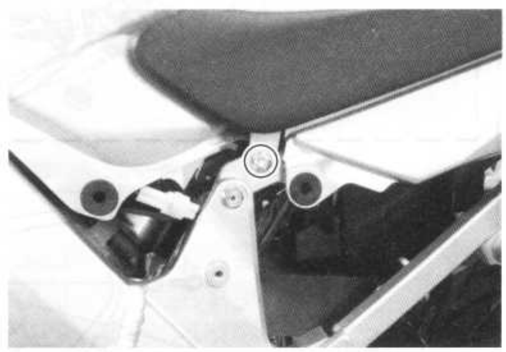
- Remove the frame side cover.

NOTE:
"☆" indicates hook location.



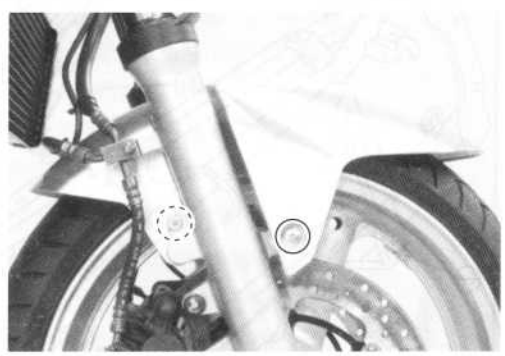
FRONT SEAT

- Remove the frame side covers, right and left. (☞Above)
- Remove the front seat.



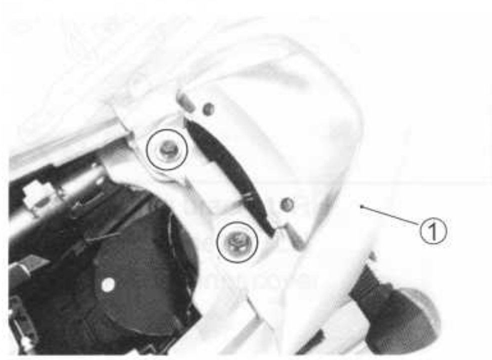
FRONT FENDER

- Remove the front fender.



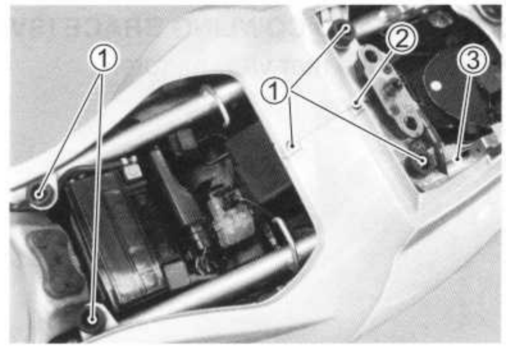
PILLION RIDER HANDLE

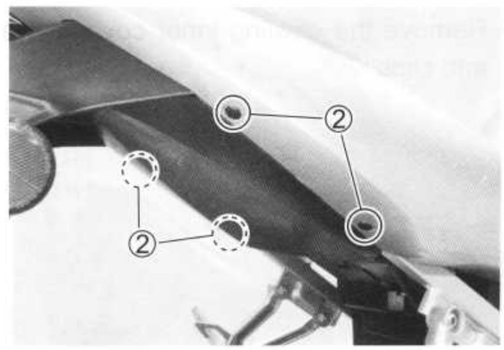
- Remove the rear seat. (☞Above)
- Remove the pillion rider handle ①.



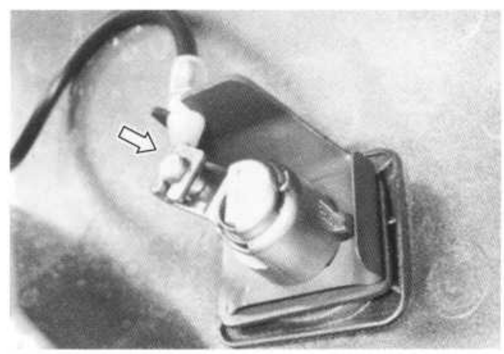
SEAT TAIL COVER

- Remove the rear seat. (☞7-4)
- Remove the frame side covers, right and left. (☞7-4)
- Remove the front seat. (☞7-4)
- Remove the pillion rider handle. (☞7-4)
- Remove the screws ① and clips ②.
- Disconnect the brake light/taillight lead wire coupler ③.

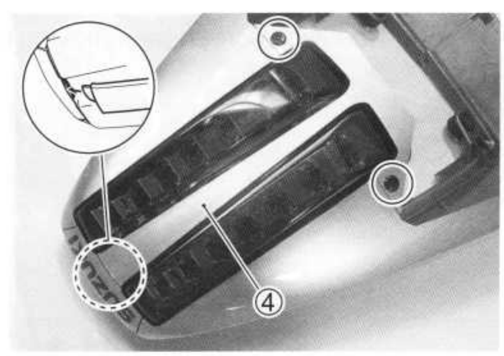




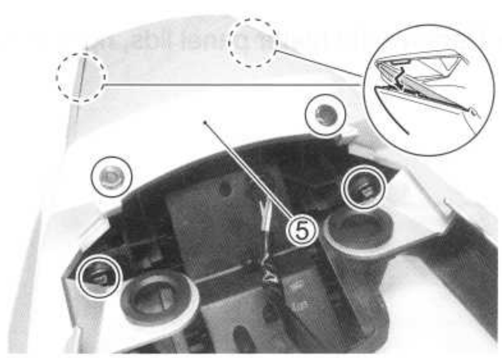
- Disconnect the seat lock cable.
- Remove the seat tail cover.



- Remove the taillight lower cover ④.



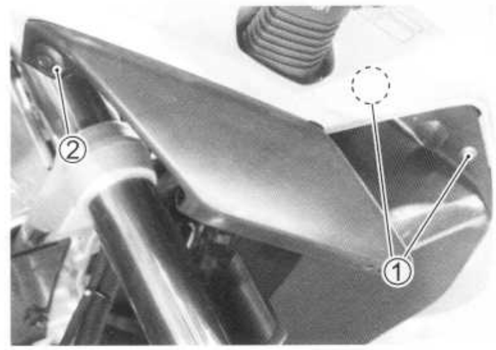
- Remove the taillight upper cover ⑤.

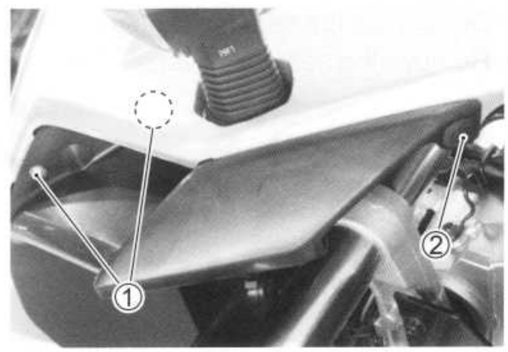


COWLING AND COWLING BRACE (SV650S)

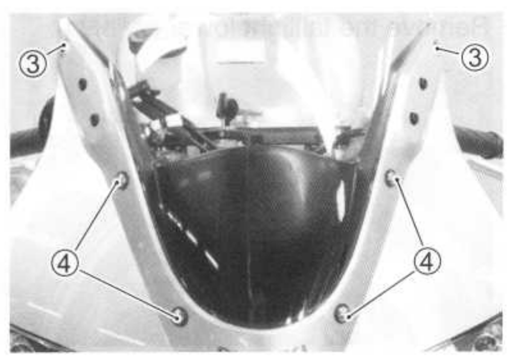
- Remove the rear view mirrors.

- Remove the cowling inner cover by removing the screws ① and clips ②.

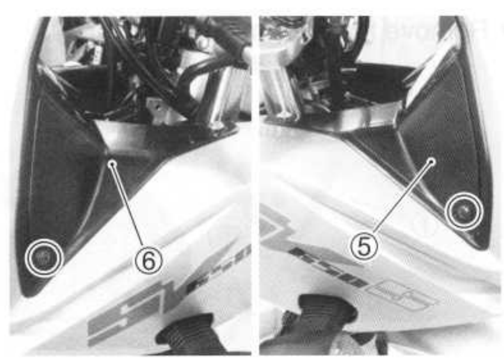




- Remove the wind screen by removing screws ③, ④.

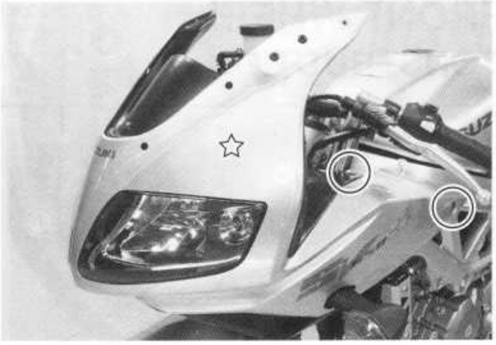


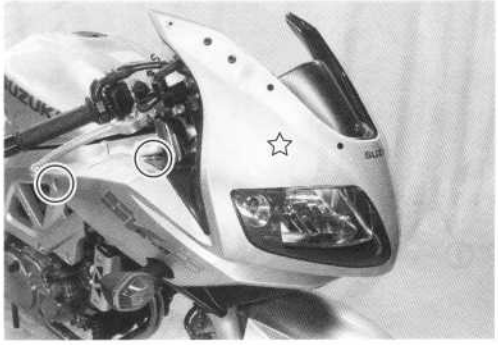
- Remove the meter panel lids, right ⑤ and left ⑥.



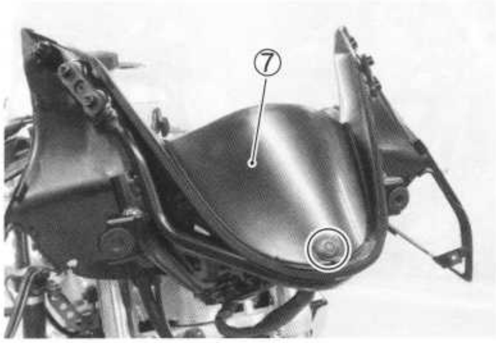
- Remove the body cowling.
- Disconnect the head light/turn light coupler.

NOTE:
"☆" indicates hook location.

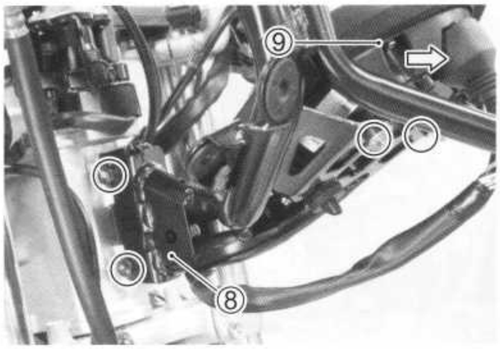




- Remove the meter panel ⑦.

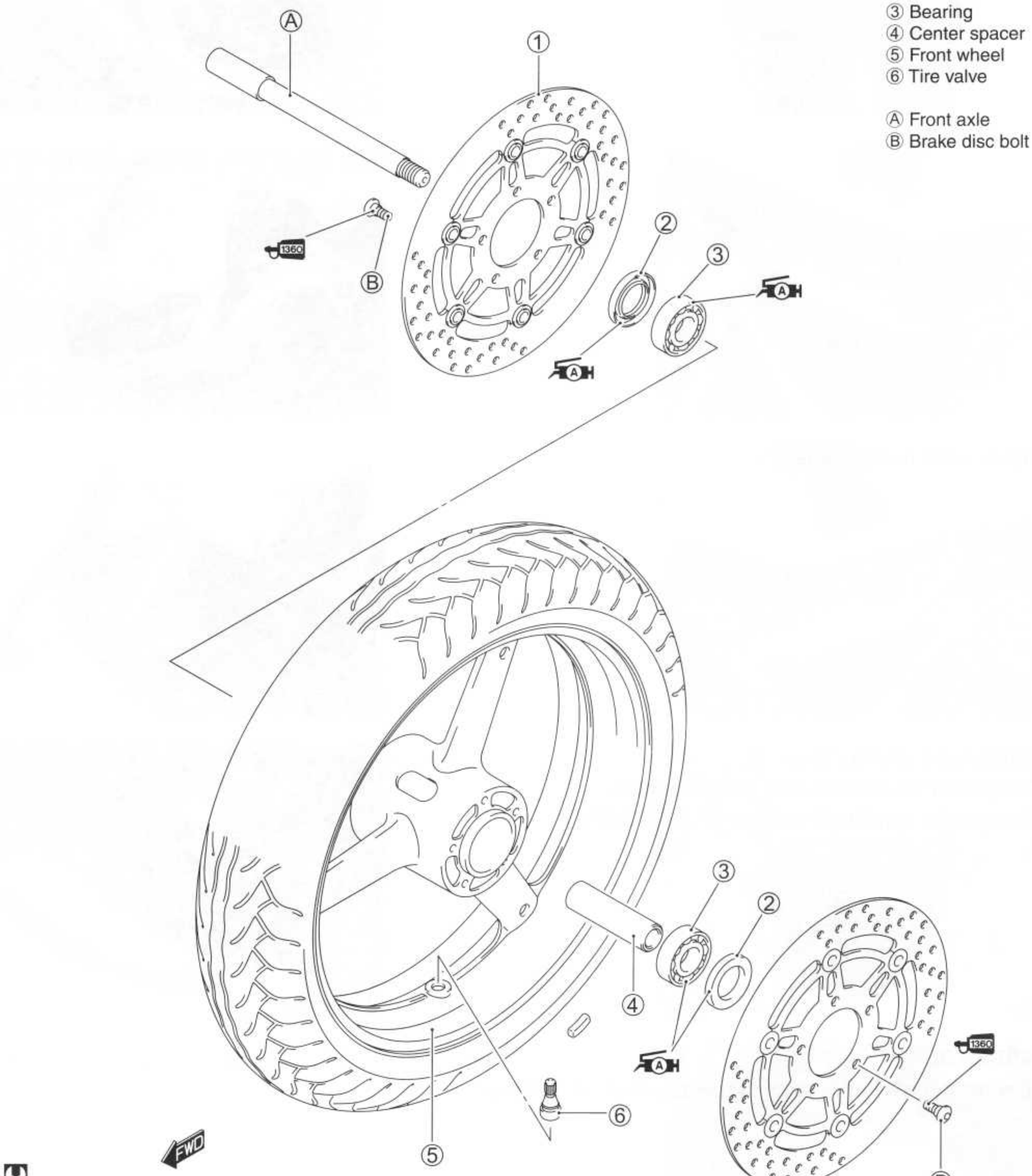


- Remove the cowling brace ⑧.
- Disconnect the combination meter couplers.
- Remove the combination meter ⑨. (☞8-29)



REASSEMBLY
Reassemble the exterior parts in reverse order of removal.

FRONT WHEEL
CONSTRUCTION



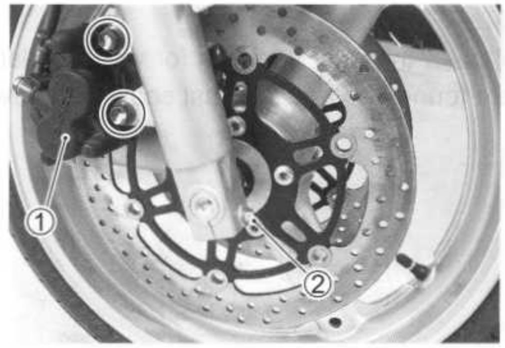
① Brake disc
② Dust seal
③ Bearing
④ Center spacer
⑤ Front wheel
⑥ Tire valve

Ⓐ Front axle
Ⓑ Brake disc bolt

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

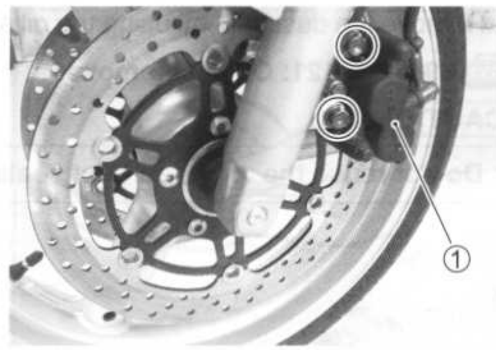
REMOVAL

- Remove the right and left brake calipers ①.
- Loosen the axle pinch bolt ② on the right front fork leg.



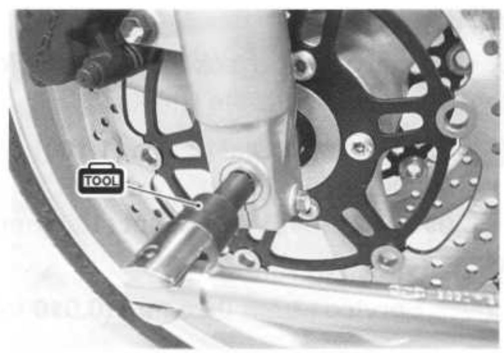
CAUTION

Do not operate the brake lever while removing the calipers.



- Slightly loosen the front axle by using the special tool.

TOOL 09900-18710: Hexagon bit 12 mm



- Raise the front wheel off the ground and support the motorcycle with a jack or a wooden block.
- Remove the front axle and the front wheel.

NOTE:
After removing the front wheel, fit the calipers temporarily to the original positions.

INSPECTION AND DISASSEMBLY

TIRE (☞7-89)

BRAKE DISC (☞7-69)

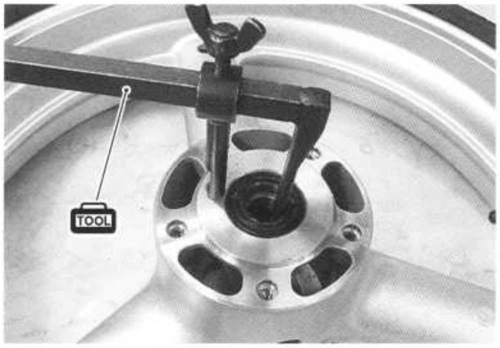
- Remove the brake discs.

DUST SEAL

Inspect the dust seal lips for wear or damage. If any damages are found, replace the dust seals with new ones.

- Remove the dust seal by using the oil seal remover.

TOOL **09913-50121: Oil seal remover**



CAUTION

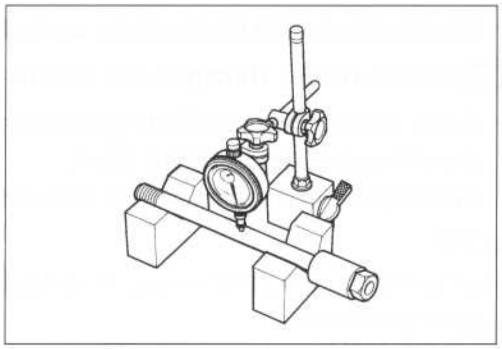
Do not reuse the removed dust seals.

FRONT AXLE

Using a dial gauge, check the front axle for runout and replace it if the runout exceeds the limit.

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

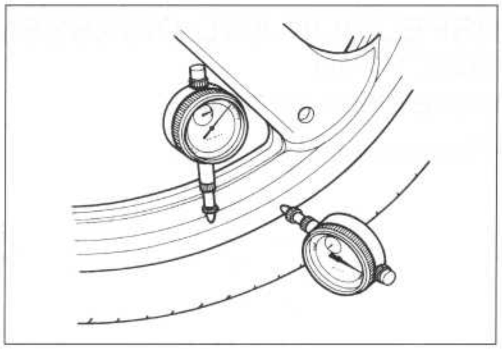
DATA **Axle shaft runout**
Service Limit: 0.25 mm (0.010 in)



WHEEL

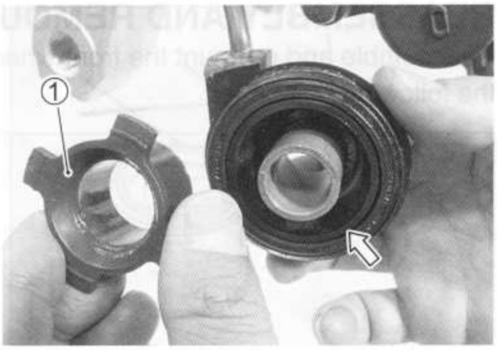
Make sure that the wheel runout checked as shown does not exceed the service limit. An excessive runout is usually due to worn or loosened wheel bearings and can be reduced by replacing the bearings. If bearing replacement fails to reduce the runout, replace the wheel.

DATA **Wheel runout**
Service Limit (Axial and Radial): 2.0 mm (0.08 in)



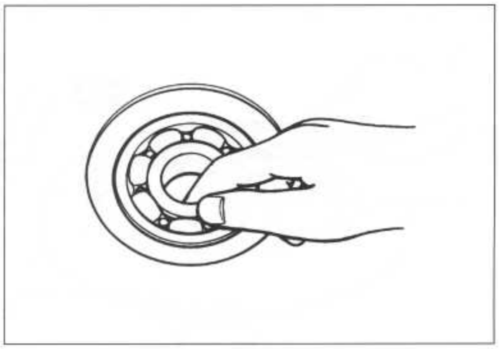
SPEED SENSOR

Inspect the smooth rotation of the speed sensor rotor ① by hand.
Inspect the dust seal for damage or wear.



WHEEL BEARING

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

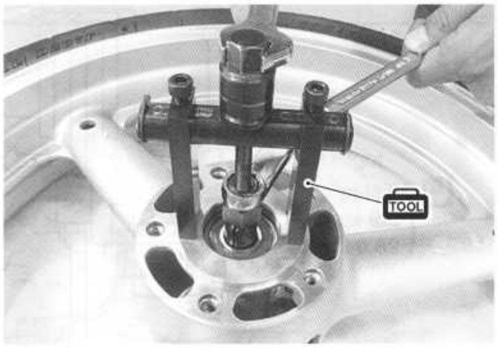


- Remove the wheel bearings by using the special tool.

TOOL **09921-20240: Bearing remover set**

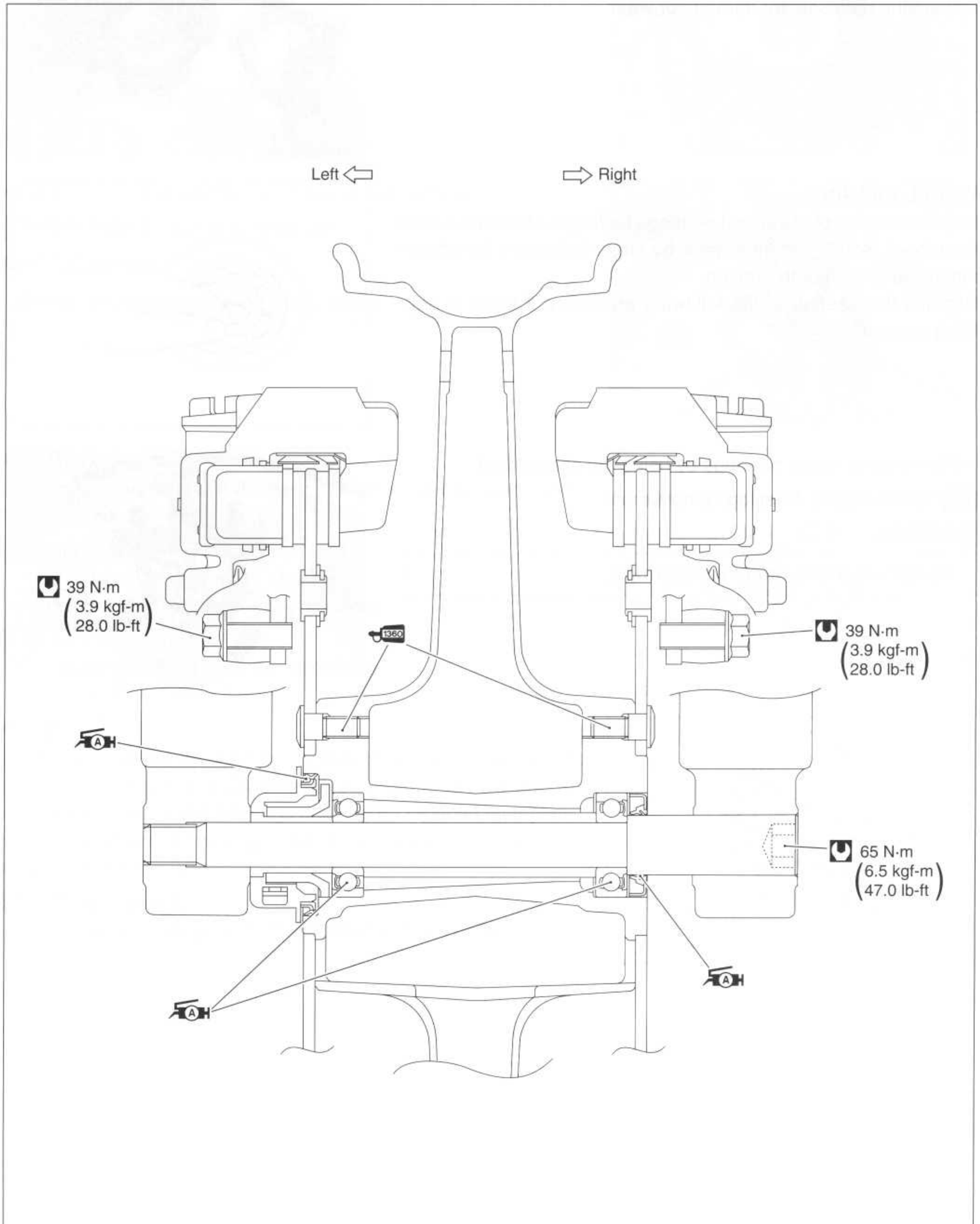
CAUTION

Do not reuse the removed bearings.



REASSEMBLY AND REMOUNTING

Reassemble and remount the front wheel in the reverse order of removal and disassembly. Pay attention to the following points:



WHEEL BEARING

- Apply SUZUKI SUPER GREASE to the wheel bearings.

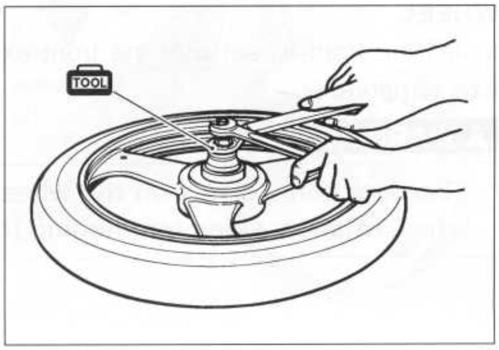
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

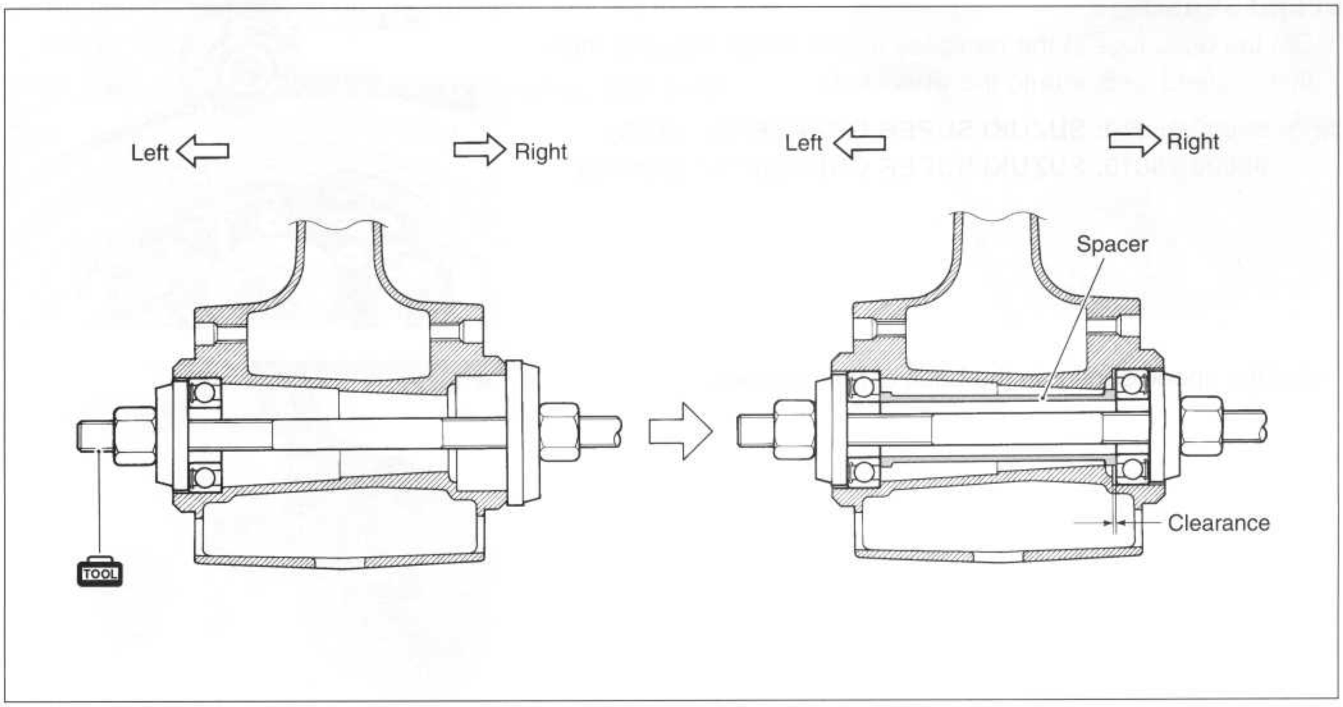
- First install the left wheel bearing, then install the right wheel bearing and spacer by using the special tools.

09941-34513: Bearing/Steering race installer set
09913-70210: Bearing installer set

CAUTION

The sealed cover of the bearing must face outside.

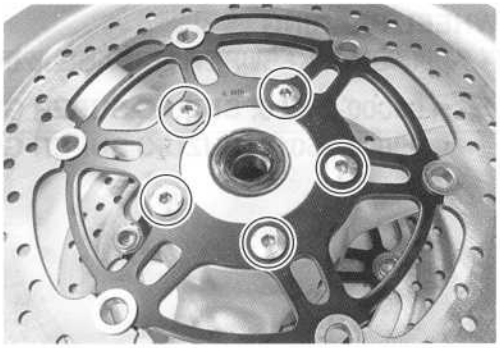




BRAKE DISC

Make sure that the brake disc is clean and free of any greasy matter.

- Apply THREAD LOCK SUPER to the disc mounting bolts and tighten them to the specified torque.

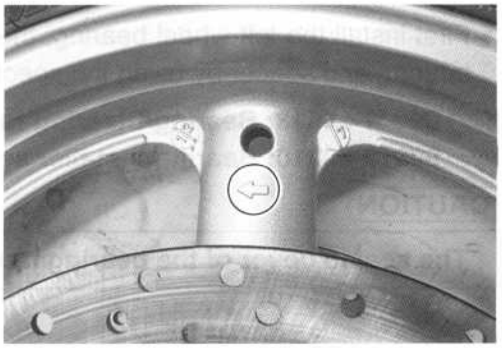


Brake disc bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

1360 99000-32130: THREAD LOCK SUPER "1360"

WHEEL

Install the front wheel with the front axle and tighten the front axle temporarily.

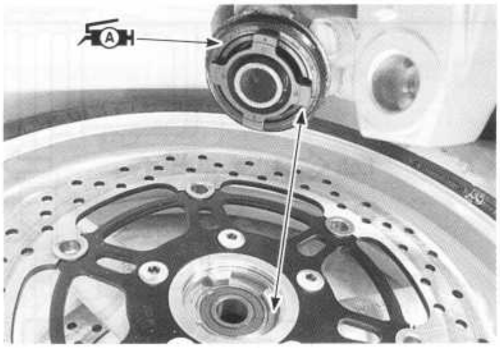


⚠ WARNING

> **The directional arrow on the wheel must point to the wheel rotation, when remounting the wheel.**

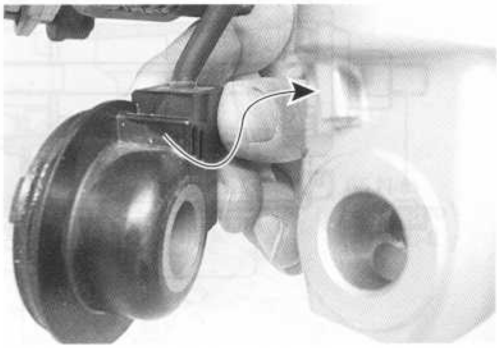
SPEED SENSOR

- Set the drive lugs in the recesses on the wheel hub and then fit the speed sensor onto the wheel hub.

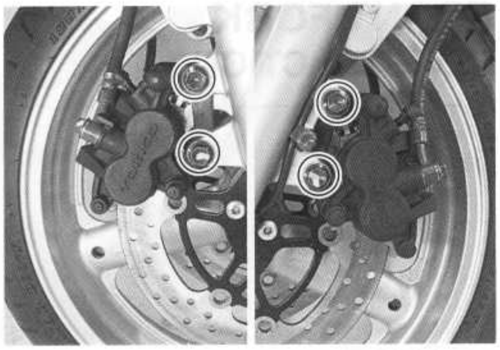


A 99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Set the speed sensor in the back of fork stopper.



BRAKE CALIPER

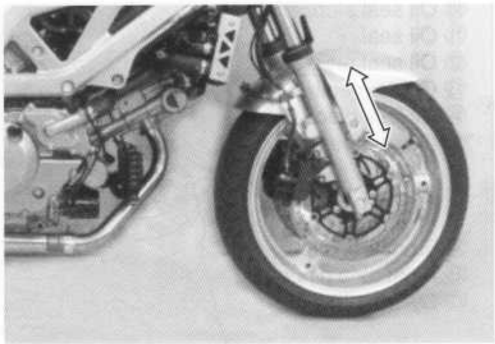


- Tighten the brake caliper mounting bolts to the specified torque.

Front brake caliper mounting bolt:
39 N·m (3.9 kgf-m, 28.0 lb-ft)

NOTE:
Push the pistons all the way into the caliper and remount the calipers.

FRONT AXLE



- Tighten the front axle to the specified torque with special tool.

TOOL **09900-18710: Hexagon bit 12 mm**

Front axle: 65 N·m (6.5 kgf-m, 47.0 lb-ft)

NOTE:
Before tightening the two axle pinch bolts on the right front fork leg, move the front fork up and down 4 or 5 times without applying front brake.

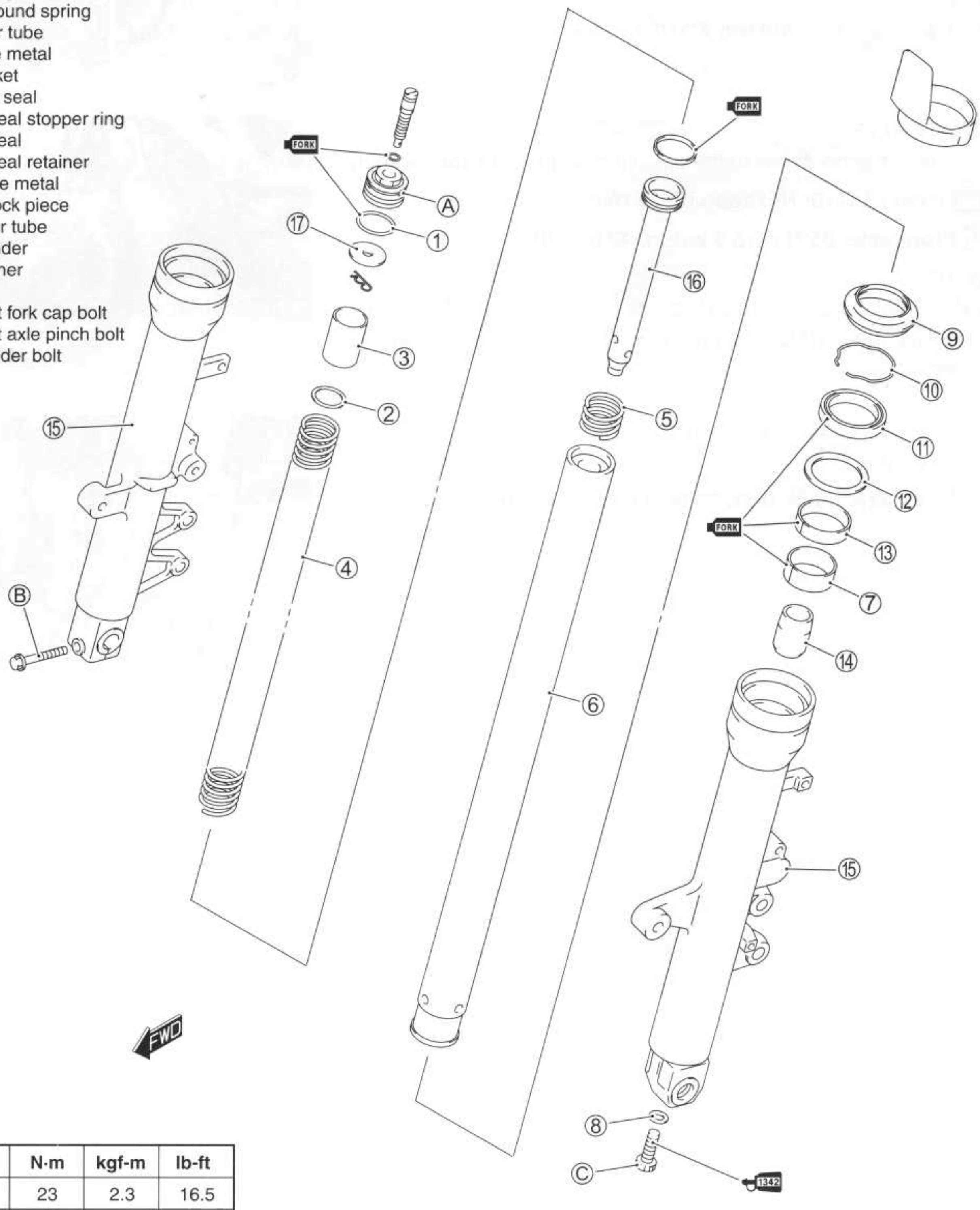
- Tighten axle pinch bolt on the right front fork leg to the specified torque.

Front axle pinch bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

FRONT FORK
CONSTRUCTION

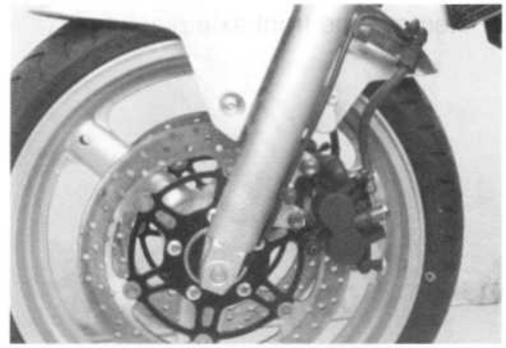
① O-ring
② Washer
③ Spacer
④ Spring
⑤ Rebound spring
⑥ Inner tube
⑦ Slide metal
⑧ Gasket
⑨ Dust seal
⑩ Oil seal stopper ring
⑪ Oil seal
⑫ Oil seal retainer
⑬ Guide metal
⑭ Oil lock piece
⑮ Outer tube
⑯ Cylinder
⑰ Washer

Ⓐ Front fork cap bolt
Ⓑ Front axle pinch bolt
Ⓒ Cylinder bolt

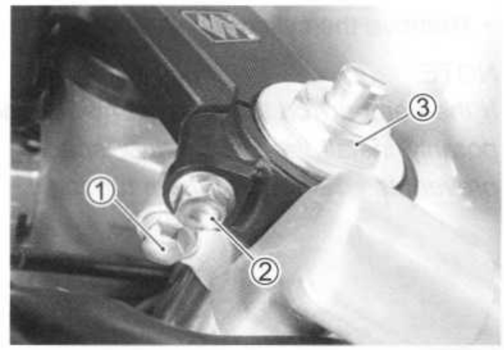


ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	23	2.3	16.5
Ⓒ	20	2.0	14.5

REMOVAL AND DISASSEMBLY

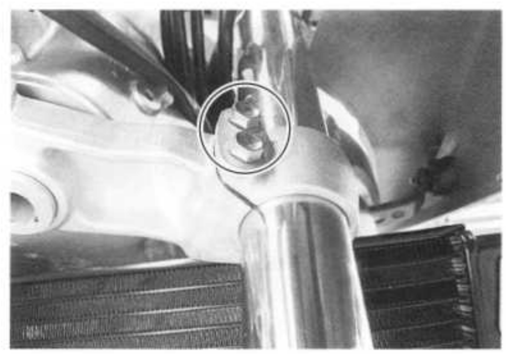


- Remove the front wheel. (☞7-9)
- Remove the brake hose clamp bolt and speed sensor clamp bolts.
- Remove the front fender. (☞7-4)



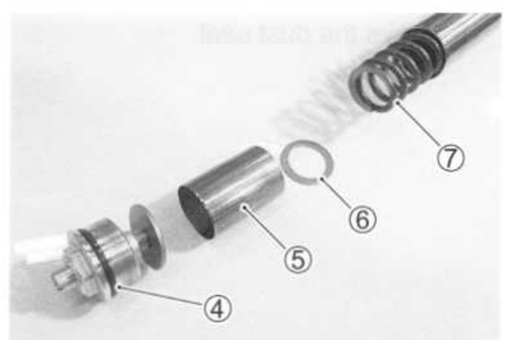
- Loosen the handlebar clamp bolt ①. (SV650S)
- Loosen the front fork upper clamp bolt ②.

NOTE:
Slightly loosen the front fork cap bolts ③ before loosening the lower clamp bolts to facilitate later disassembly.

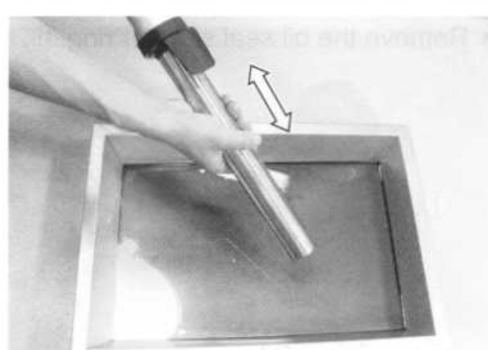


- Loosen the front fork lower clamp bolts.

NOTE:
Hold the front fork by hand to prevent it from sliding out of the steering stem.

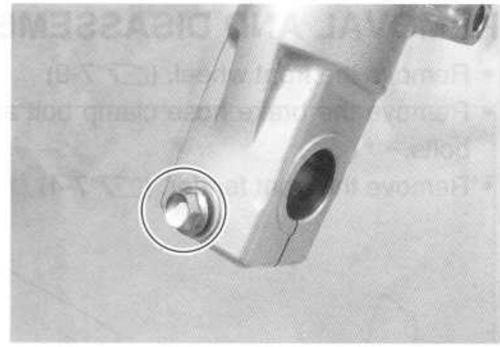


- Remove the front fork cap bolt ④.
- Remove the spacer ⑤ the washer ⑥ and the spring ⑦.



- Invert the fork and drain the fork oil out of the fork by stroking.
- Hold the fork inverted for a few minutes to drain oil completely.

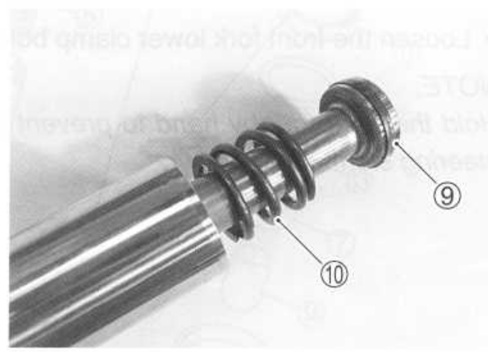
* Remove the front axle pinch bolt.



* Remove the cylinder bolt ⑧.

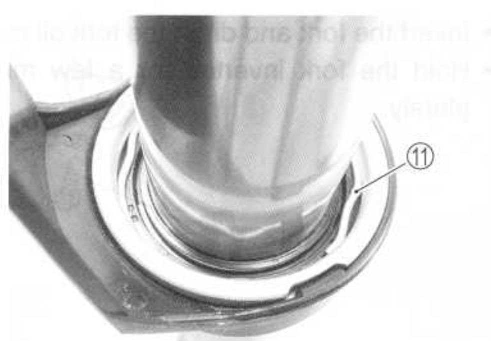
NOTE:
If the damper rod turns together with the damper rod bolt, temporarily install the fork spring, spacer, washer and cap bolt to prevent the damper rod from turning.

* Remove the cylinder ⑨ and rebound spring ⑩.

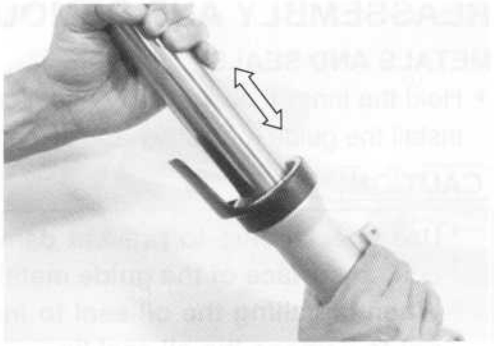


* Remove the dust seal.

* Remove the oil seal stopper ring ⑪.



- Pull the inner tube out of the outer tube with light impact.



NOTE:
Be careful not to damage the inner tube.

CAUTION

The slide metals, oil seal and dust seal must be replaced with the new ones when reassembling the front fork.

- Remove the following parts.
  ⑫ Oil seal
  ⑬ Oil seal retainer
  ⑭ Guide metal
  ⑮ Slide metal
  ⑯ Oil lock piece

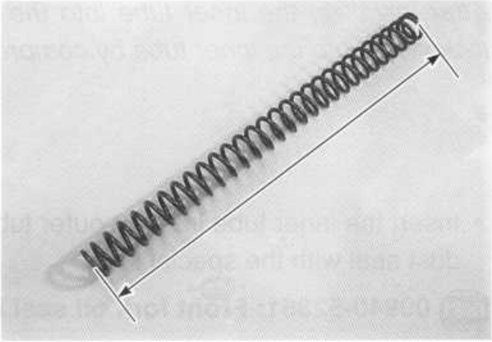
INSPECTION

INNER AND OUTER TUBES

Inspect the inner tube outer surface and the outer tube inner surface for scratches. If any defects are found, replace them with the new ones.

FORK SPRING

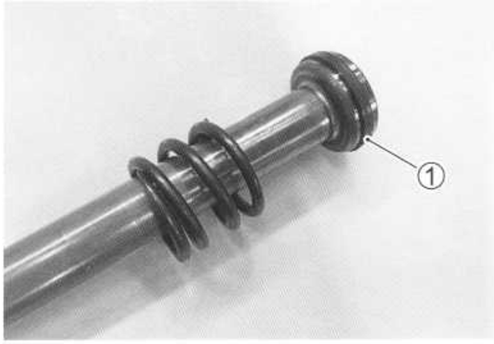
Measure the fork spring free length. If it is shorter than the service limit, replace it with a new one.



DATA **Front fork spring free length**
Service limit: 420 mm (16.53 in) for SV650
428 mm (16.85 in) for SV650S

CYLINDER

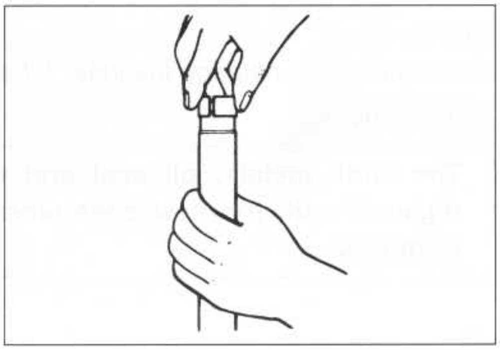
Inspect the cylinder and cylinder ring ① for damage.
If any defects are found, replace them with new ones.



REASSEMBLY AND REMOUNTING

METALS AND SEALS

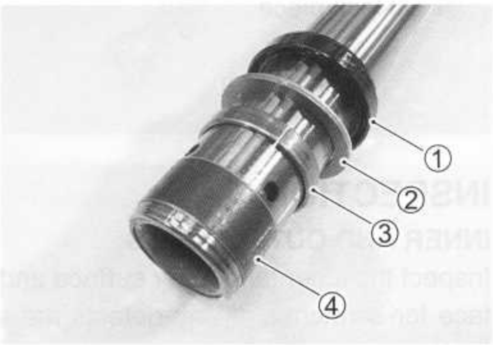
- Hold the inner tube vertically and clean the metal groove and install the guide metal by hand as shown.



CAUTION

- * **Use special care to prevent damage to the "Teflon" coated surface of the guide metal when mounting it.**
- * **When installing the oil seal to inner tube, be careful not to damage the oil seal lip.**
- * **Replace the removed metals and seals with new ones.**
- * **Apply fork oil to the Anti-friction metals and lip of the oil seal.**

- Assemble the following parts as shown.
  ① Oil seal
  ② Oil seal retainer
  ③ Guide metal
  ④ Slide metal



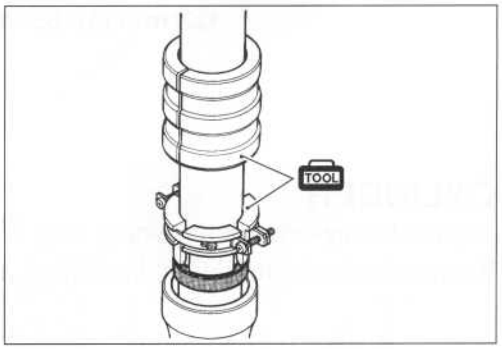
NOTE:
Stamped mark on the oil seal must face upward.

- Install the oil lock piece into the inner tube.
- Install the inner tube into the outer tube with care not to drop the oil lock piece out.

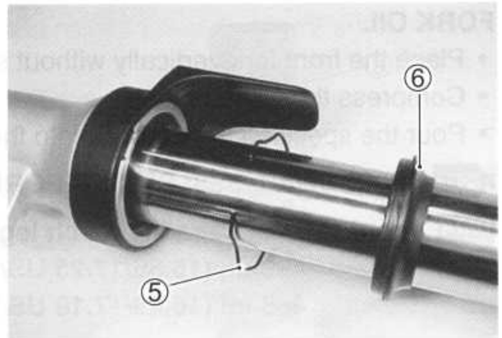
NOTE:
After installing the inner tube into the outer tube, keep the oil lock piece into the inner tube by compressing the front fork fully.

- Insert the inner tube into the outer tube and fit the oil seal and dust seal with the special tool.

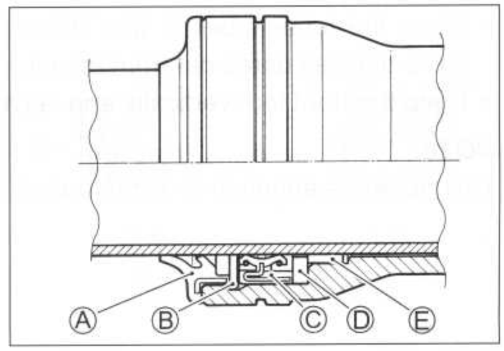
TOOL 09940-52861: Front fork oil seal installer



- Install the oil seal stopper ring ⑤ and the dust seal ⑥.

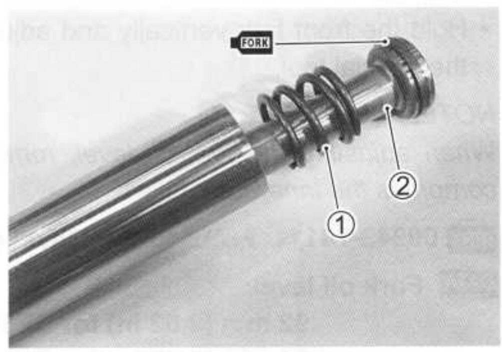


Ⓐ Dust seal
Ⓑ Oil seal stopper ring
Ⓒ Oil seal
Ⓓ Oil seal retainer
Ⓔ Guide metal



CYLINDER BOLT

- Install the rebound spring ① to the cylinder ②.
- Apply fork oil to the cylinder ring.
- Install the cylinder into the front fork.



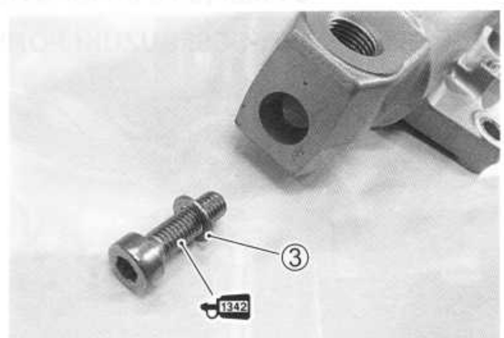
- Apply THREAD LOCK to the cylinder bolt and tighten it to the specified torque.

1342 99000-32050: THREAD LOCK "1342"

Cylinder bolt: 20 N·m (2.0 kgf-m, 14.5 lb-ft)

CAUTION

Use a new gasket ③ to prevent oil leakage.

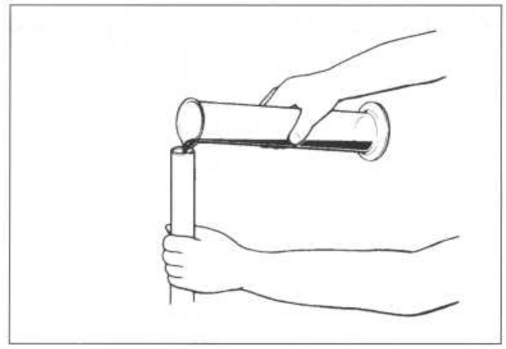


NOTE:

** If the cylinder turns together with the cylinder bolt, temporarily install the fork spring, spacer, washer and cap bolt to prevent the cylinder from turning.*

** Check the front fork for smoothness by stroking it after installing the cylinder.*

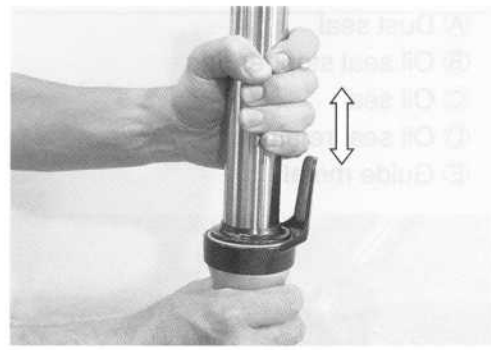
FORK OIL



- Place the front fork vertically without spring.
- Compress the front fork fully.
- Pour the specified front fork oil into the front fork.

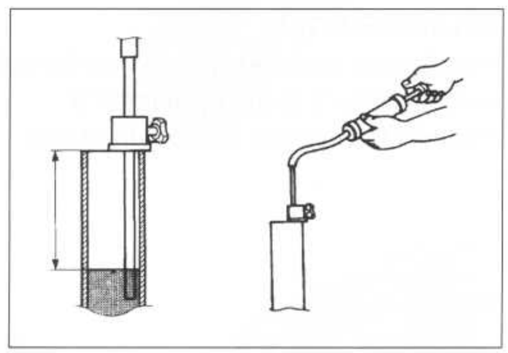
99000-99001-SS8: SUZUKI FORK OIL SS-08

Front fork oil capacity (each leg):
490 ml (16.56/17.25 US/Imp oz) for SV650
488 ml (16.49/17.18 US/Imp oz) for SV650S



- Move the inner tube up and down several strokes until no more bubbles come out from the oil.
- Keep the front fork vertically and leave it during 5 – 6 minutes.

NOTE:
Take extreme attention to pump out air completely.



- Hold the front fork vertically and adjust the fork oil level with the special tool.

NOTE:
When adjusting the fork oil level, remove the fork spring and compress the inner tube fully.

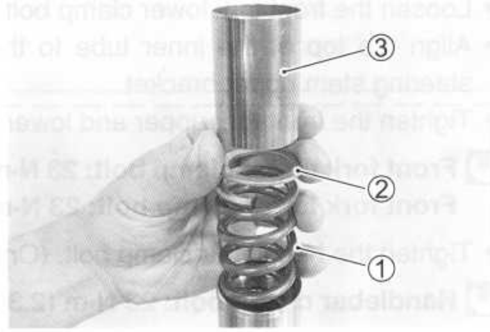
09943-74111: Front fork oil level gauge

Fork oil level:
92 mm (3.62 in) for SV650
94 mm (3.70 in) for SV650S

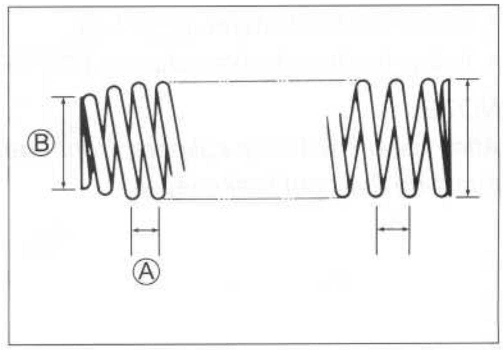
99000-99001-SS8: SUZUKI FORK OIL SS-08

FORK SPRING

- Install the fork spring ① into the front fork.
- Install the washer ② and spacer ③.



NOTE:
** The smaller spring pitch end Ⓐ must face downward. (SV650S)*
** The smaller spring end diameter Ⓑ must face downward. (SV650)*

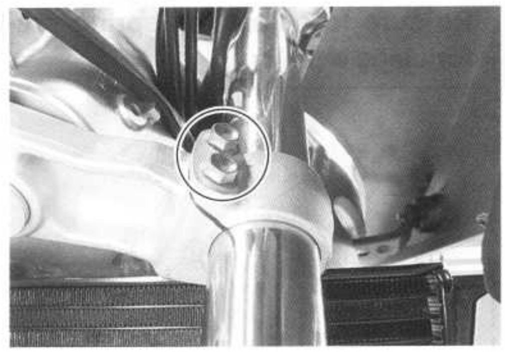


- Apply fork oil lightly to the O-ring.

CAUTION

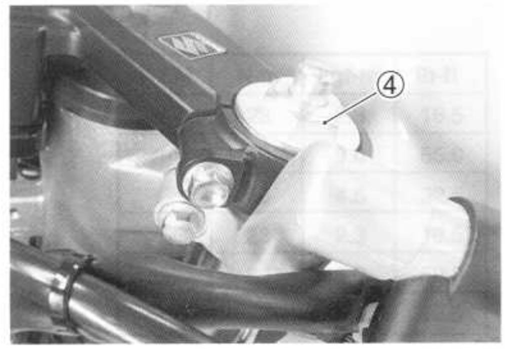
Use a new O-ring to prevent oil leakage.

- Tighten the front fork cap bolt temporarily.



- Set the front fork to the front fork lower bracket temporarily by tightening the lower clamp bolts.
- Tighten the front fork cap bolt ④ to the specified torque.

Front fork cap bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

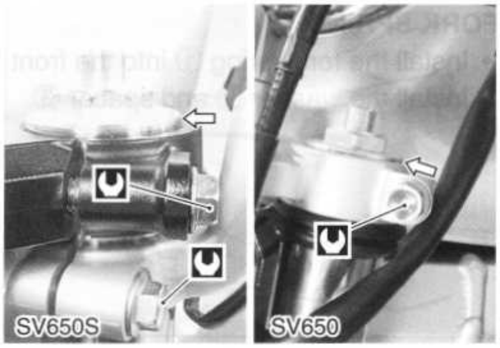


* Loosen the front fork lower clamp bolt.
* Align the top of the inner tube to the upper surface of the steering stem upper bracket.
* Tighten the front fork upper and lower clamp bolts.

Front fork upper clamp bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)
Front fork lower clamp bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

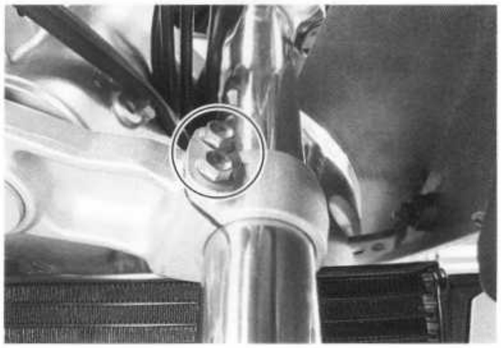
* Tighten the handlebar clamp bolt. (Only SV650S)

Handlebar clamp bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



* Install the front wheel. (☞7-9)
* Install the front brake calipers. (☞7-68)

NOTE:
After install the brake calipers, front brake should be efficient by pumping the front brake lever.



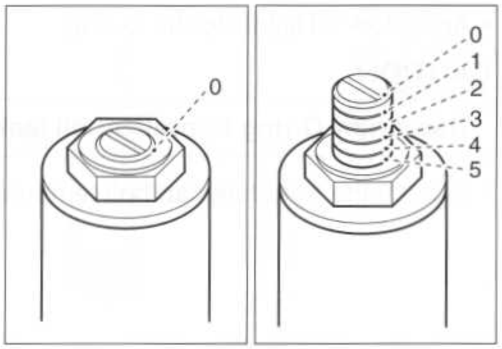
SUSPENSION SETTING

After installing the front fork, adjust the spring per-load as follows.

SPRING PRE-LOAD ADJUSTMENT

There are five grooved lines on the side of the spring adjuster. Position 0 provides the maximum spring pre-load and position 5 provides the minimum spring pre-load.

STD POSITION: 3

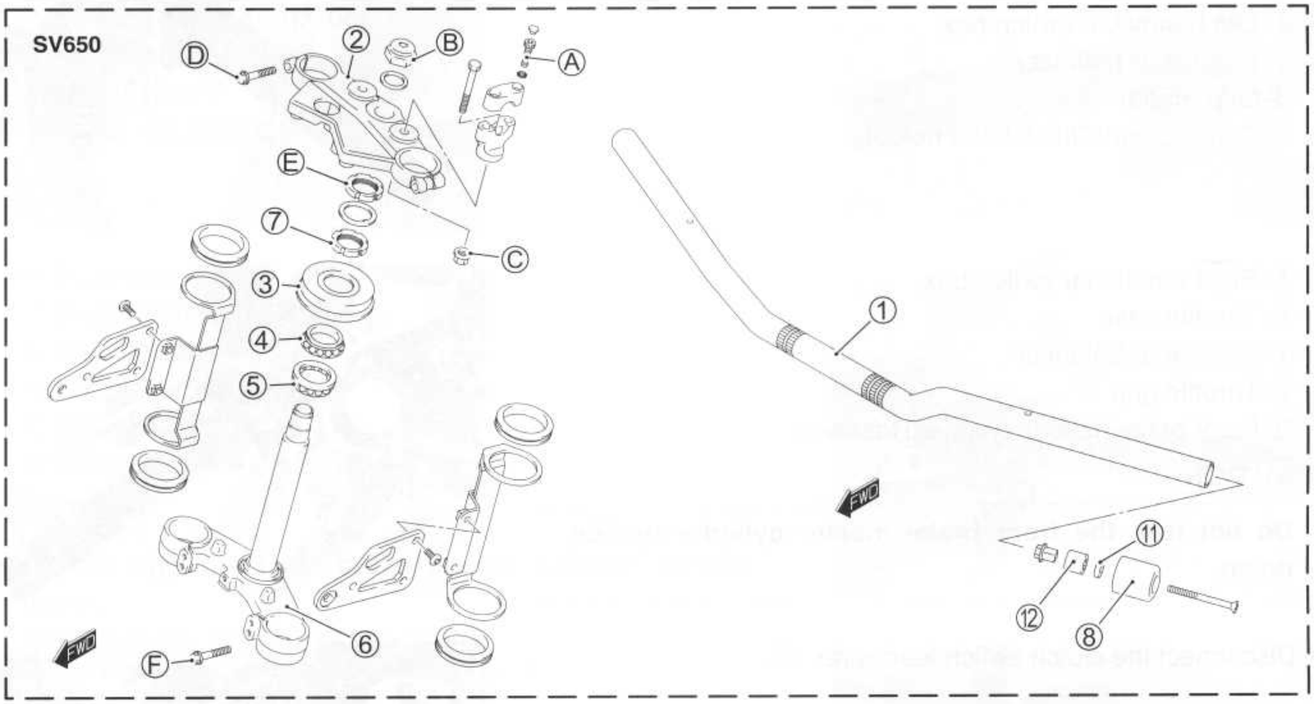


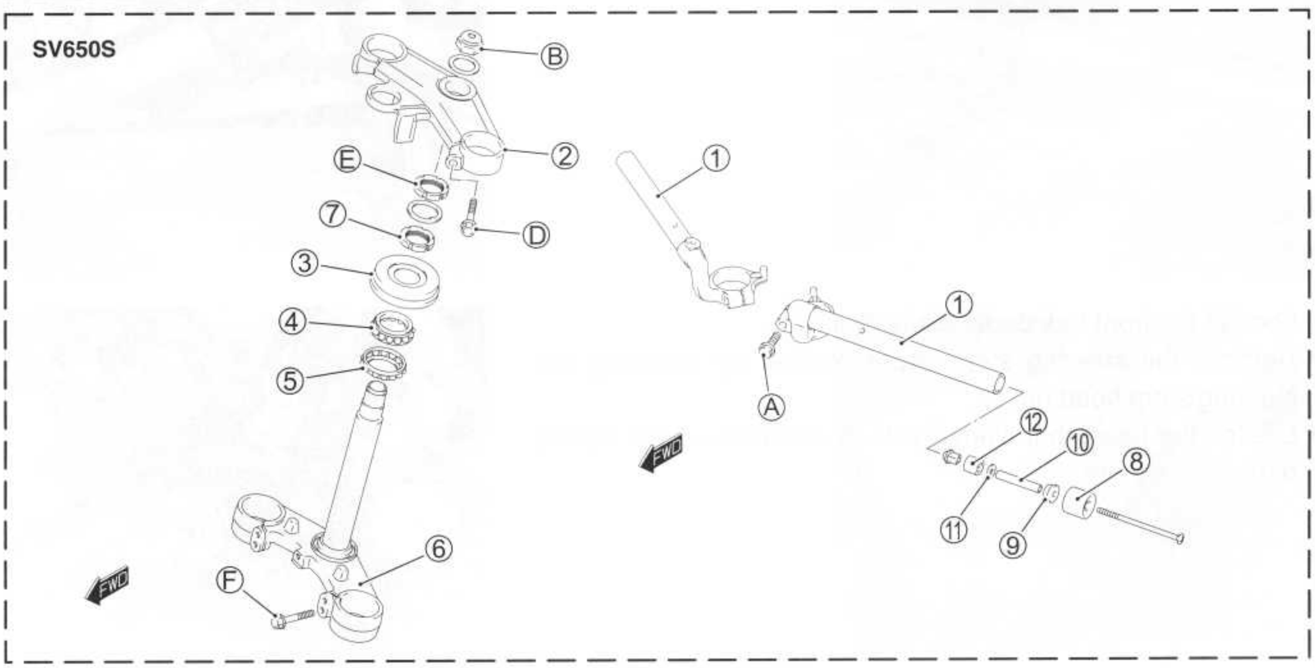
⚠ WARNING

Be sure to adjust the spring pre-load on both front fork legs equally.

STEERING AND HANDLEBAR

CONSTRUCTION





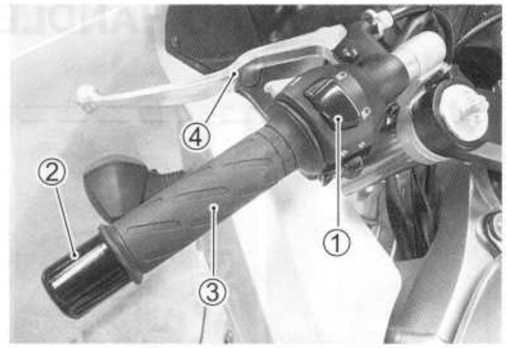
① Handlebars
② Steering stem upper bracket
③ Dust seal
④ Bearing upper
⑤ Bearing lower
⑥ Steering stem lower bracket
⑦ Steering stem nut
⑧ Handlebar balancer
⑨ Expander
⑩ Spacer
⑪ Washer
⑫ Expander

Ⓐ Handlebar clamp bolt
Ⓑ Steering stem head nut
Ⓒ Handlebar holder nut
Ⓓ Front fork upper clamp bolt
Ⓔ Steering stem lock nut
Ⓕ Front fork lower clamp bolt

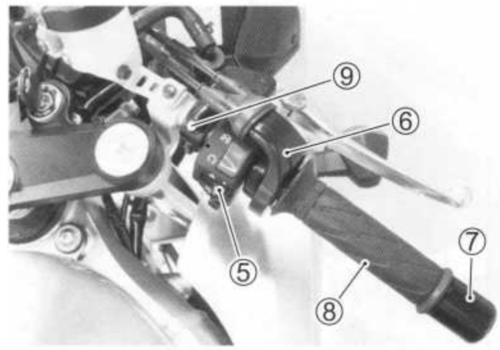
ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	90	9.0	65.0
Ⓒ	45	4.5	32.5
Ⓓ	23	2.3	16.5
Ⓔ	80	8.0	58.0
Ⓕ	23	2.3	16.5

REMOVAL
HANDLEBARS (SV650S)

- Remove the following items from the handlebars.
  ① Left handlebar switch box
  ② Handlebar balancer
  ③ Grip rubber
  ④ Clutch cable/Clutch lever holder



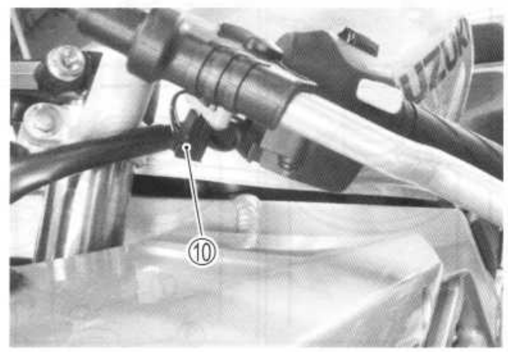
⑤ Right handlebar switch box
⑥ Throttle case
⑦ Handlebar balancer
⑧ Throttle grip
⑨ Front brake master cylinder/Reservoir



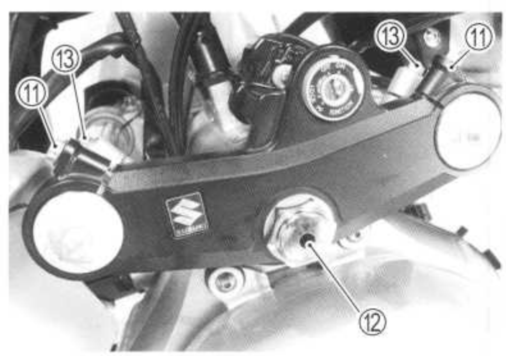
CAUTION

Do not turn the front brake master cylinder upside down.

- Disconnect the clutch switch lead wires ⑩.

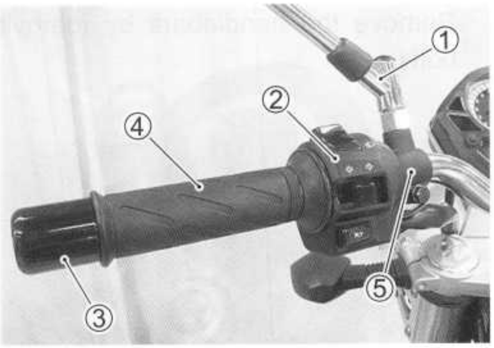


- Loosen the front fork upper clamp bolts ⑪.
- Remove the steering stem upper bracket by removing the steering stem head nut ⑫.
- Loosen the handlebar clamp bolts ⑬ and remove the handle bars.

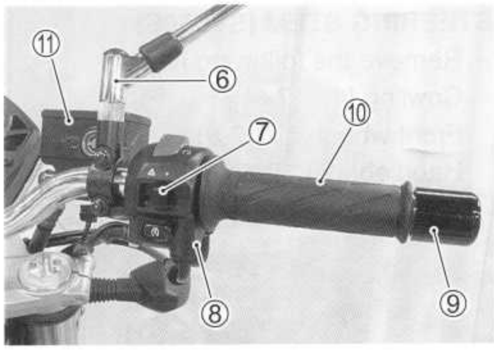


HANDLEBARS (SV650)

- Remove the following items from the handlebars.
  ① Rear view mirror
  ② Left handlebar switch box
  ③ Handlebar balancer
  ④ Grip rubber
  ⑤ Clutch cable/Clutch lever holder



  ⑥ Rear view mirror
  ⑦ Right handlebar switch box
  ⑧ Throttle cables
  ⑨ Handlebar balancer
  ⑩ Throttle grip
  ⑪ Front brake master cylinder

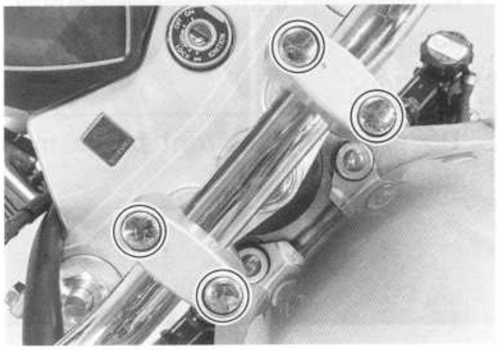


CAUTION

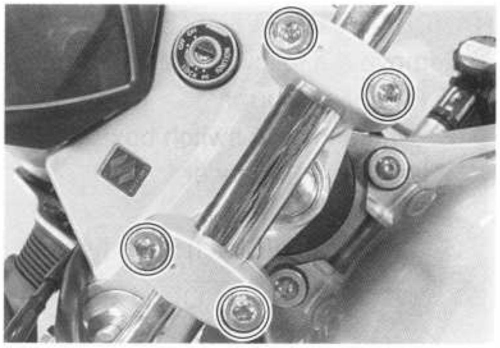
Do not turn the front brake master cylinder upside down.

- Disconnect the clutch switch lead wires ⑫.

- Remove the bolt caps.



* Remove the handlebars by removing the handlebar clamp bolts.



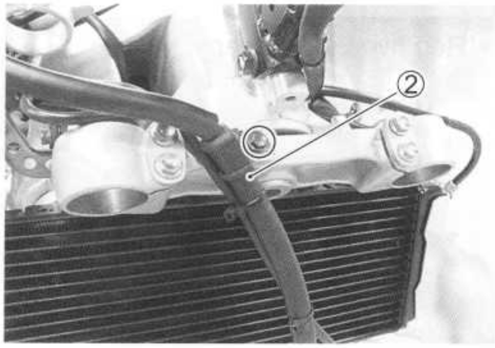
STEERING STEM (SV650S)

* Remove the following items.
  Cowling (☞7-6)
  Front wheel (☞7-9)
  Handlebars (☞7-26)
  Front fork (☞7-17)

* Remove the ignition switch ① by using the special tools.

TOOL **09930-11920: Torx bit JT40H**
09930-11940: Bit holder

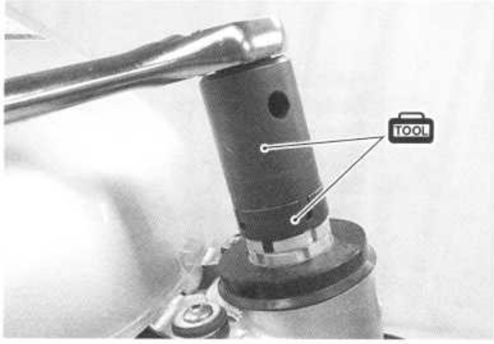
* Remove the front brake assembly by removing the brake hose guide ②.



CAUTION

Do not turn the front brake master cylinder upside down.

* Remove the steering stem nuts with the special tools.

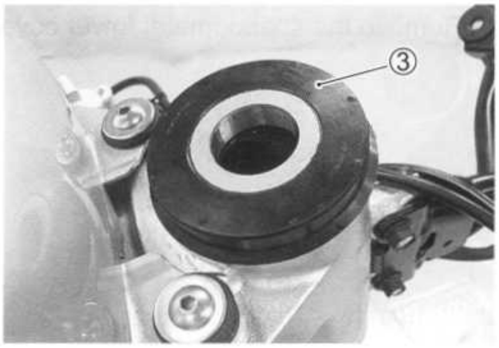


TOOL **09940-14911: Steering stem nut wrench**
09940-14960: Steering stem nut wrench socket

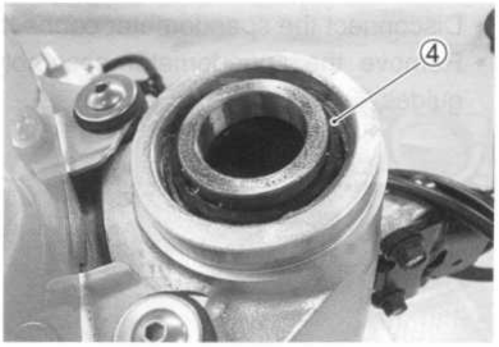
NOTE:
When loosing the stem nuts, hold the steering stem lower bracket to prevent it from falling.

* Remove the steering stem lower bracket.

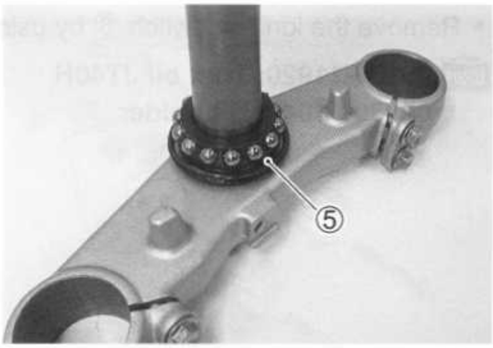
- Remove the dust seal ③.



- Remove the steering stem upper bearing ④.

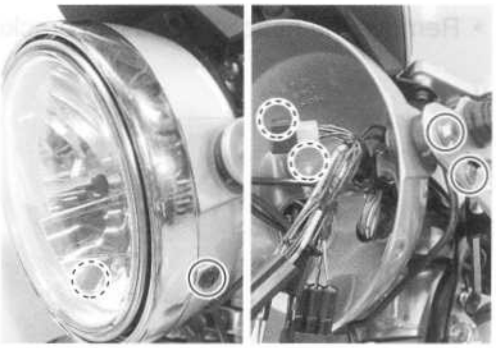


- Remove the steering stem lower bearing ⑤.



STEERING STEM (SV650)

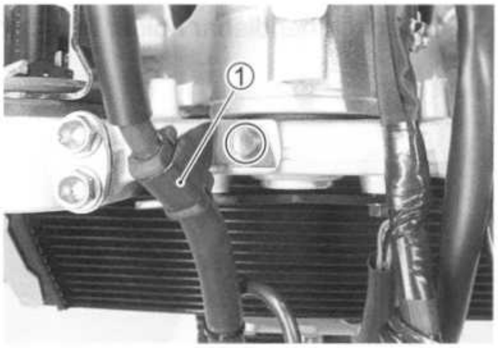
- Remove the following items.
  Front wheel (☞7-9)
  Handlebar (☞7-27)
  Front fork (☞7-17)
- Remove the headlight and its housing.



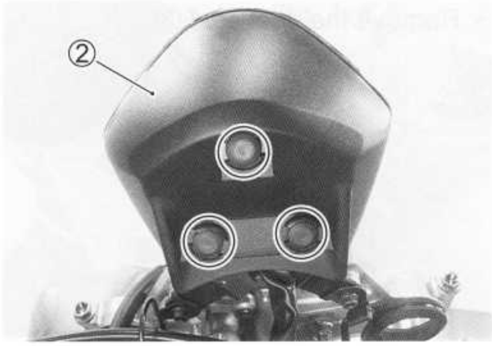
- Remove the front brake assembly by removing the brake hose guide ①.

CAUTION

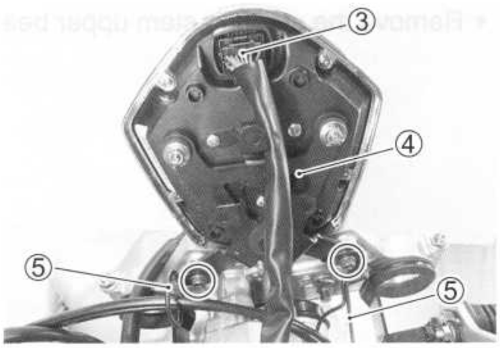
Do not turn the front brake master cylinder upside down.



- Remove the speedometer lower cover ②.

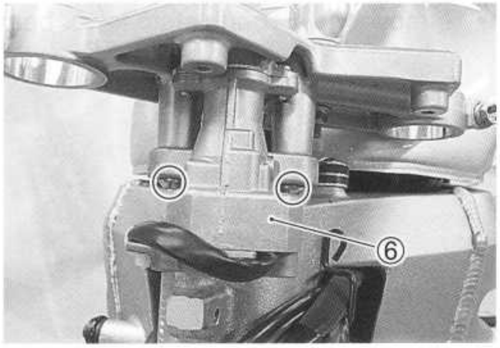


- Disconnect the speedometer connector ③.
- Remove the speedometer assembly ④ and throttle cable guides ⑤.

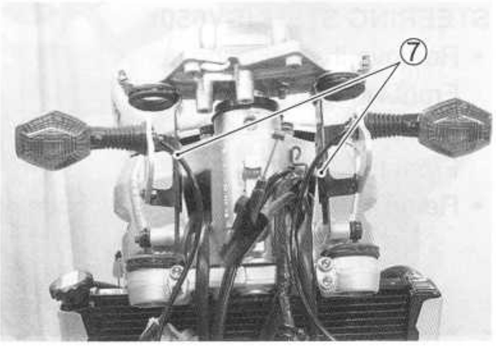


- Remove the ignition switch ⑥ by using the special tools.

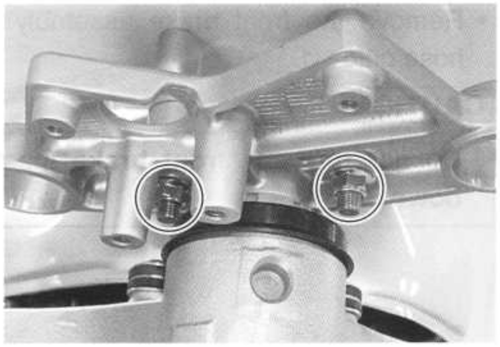
TOOL **09930-11920: Torx bit JT40H**
09930-11940: Bit holder



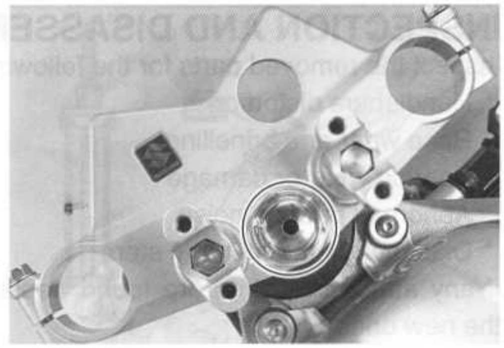
- Remove the headlight housing brackets ⑦.



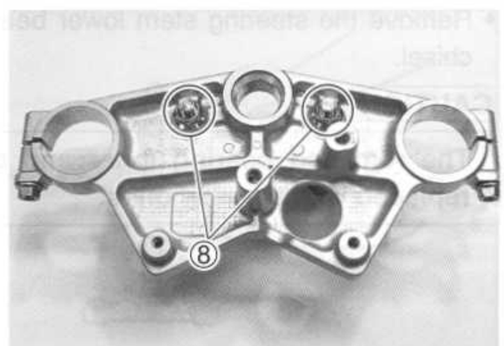
- Loosen the handlebar holder nuts lightly.

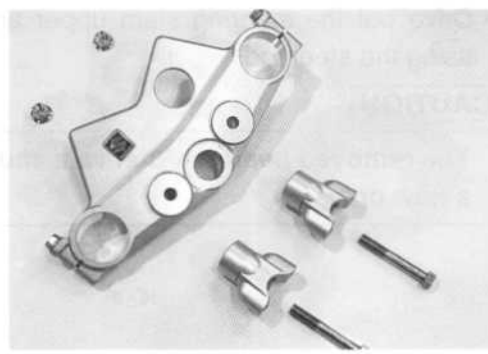


- Remove the steering stem upper bracket by removing the steering stem head nut.



- Remove the handle holder nuts ⑧ and disassemble the handle holder.





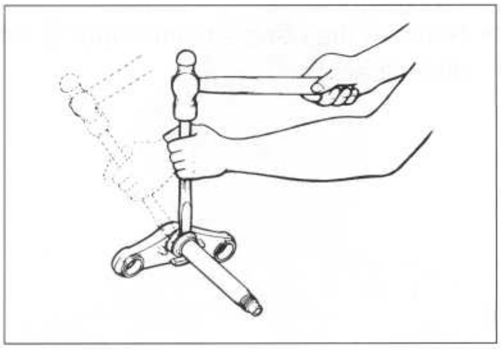
- The removal procedure of steering stem is the same as SV650S. (☞7-28)

INSPECTION AND DISASSEMBLY

Inspect the removed parts for the following abnormalities.

* Handlebars distortion
* Race wear and brinelling
* Bearing wear or damage
* Abnormal bearing noise
* Distortion of the steering stem

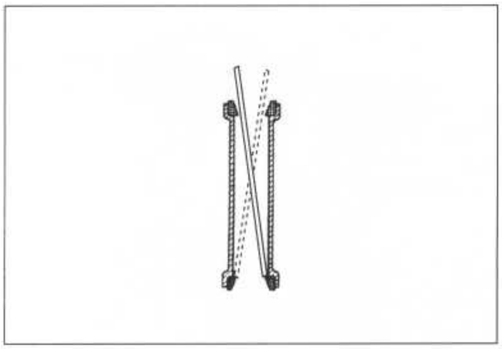
If any abnormal points are found, replace defective parts with the new ones.



- Remove the steering stem lower bearing inner race using a chisel.

CAUTION

The removed bearing inner and dust seal must be replaced with the new ones.



- Drive out the steering stem upper and lower bearing races using the steel rod.

CAUTION

The removed bearing outer race must be replaced with a new one.

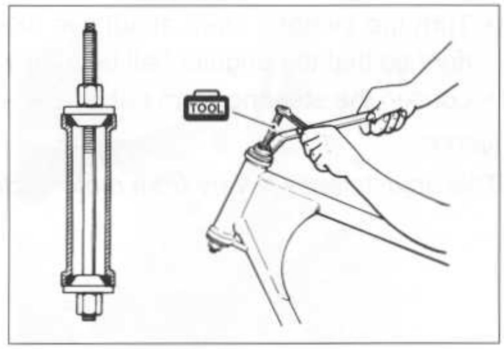
REASSEMBLY AND REMOUNTING

Reassemble and remount the steering stem in the reverse order of removal and disassembly. Pay attention to the following points:

OUTER RACES

- Press in the upper and lower outer races using the special tool.

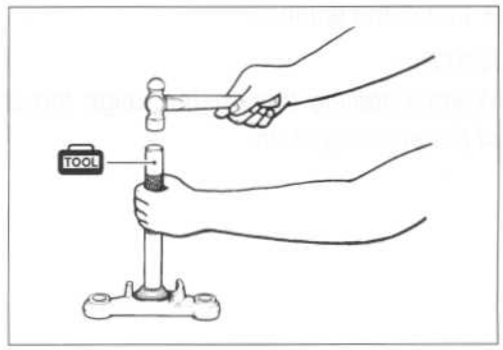
09941-34513: Steering outer race installer
09924-84510: Bearing installer set



BEARINGS

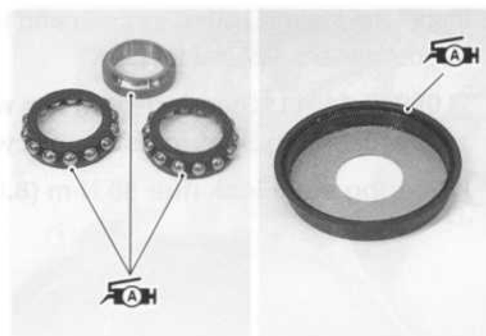
- Press in the dust seal and lower bearing using the special tool.

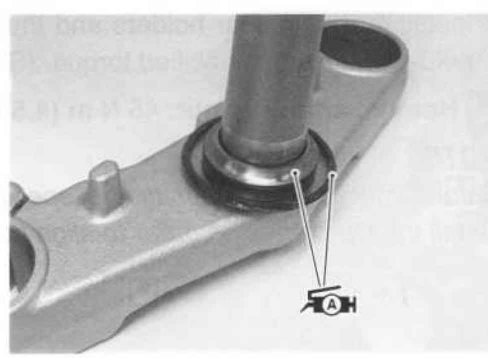
09925-18011: Steering bearing installer



- Apply SUZUKI SUPER GREASE to the bearings and dust seal.
- Install the lower bearing to the steering stem lower bracket.
- Install the upper bearing, bearing inner race, dust seal and dust cover onto the frame.

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



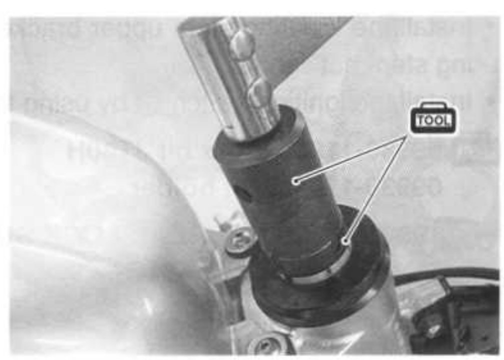


STEERING STEM

- Tighten the steering stem nut to the specified torque with the special tools.

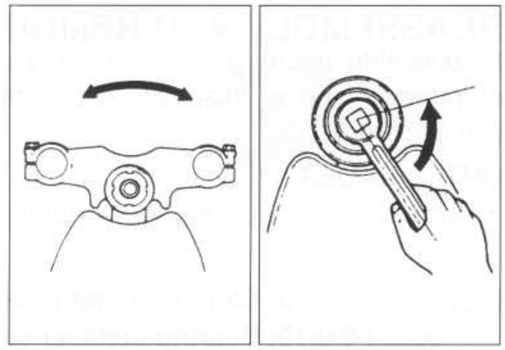
09940-14911: Steering stem nut wrench
09940-14960: Steering stem nut wrench socket

Steering stem nut: 45 N·m (4.5 kgf-m, 32.5 lb-ft)



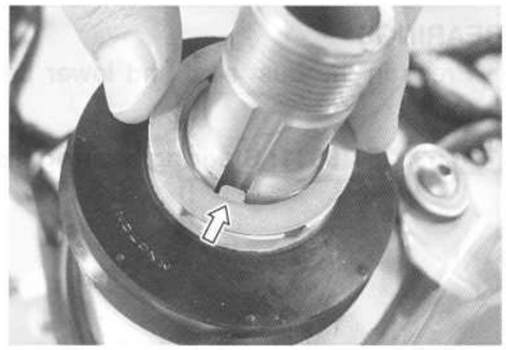
- Turn the steering stem about five or six times to the left and right so that the angular ball bearing will be seated properly.
- Loosen the steering stem nut by 1/4 – 1/2 turn.

NOTE:
This adjustment will vary from motorcycle to motorcycle.



- Install the washer.

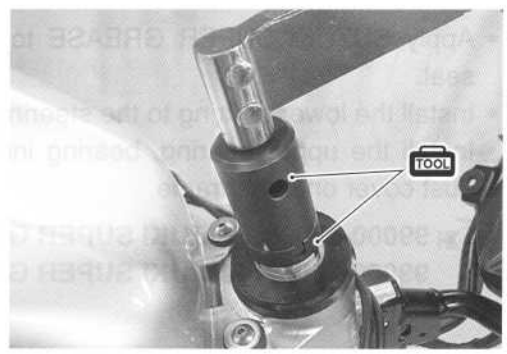
NOTE:
When installing the washer, align the stopper lug to the groove of the steering stem.



- Install the steering stem lock nut and tighten it to the specified torque with the special tools.

TOOL 09940-14911: Steering stem nut wrench
09940-14960: Steering stem nut wrench socket

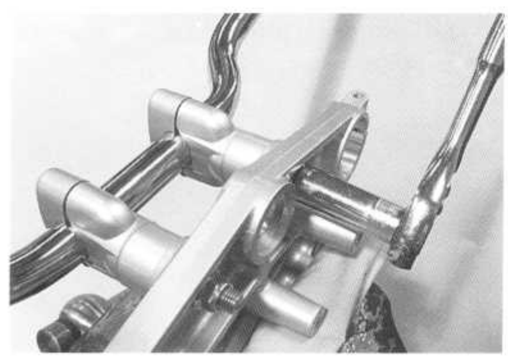
Steering stem lock nut: 80 N·m (8.0 kgf-m, 58.0 lb-ft)



- Install the handlebar holders and then tighten the handlebar holder nuts to the specified torque. (SV650)

Handlebar holder nut: 45 N·m (4.5 kgf-m, 32.5 lb-ft)

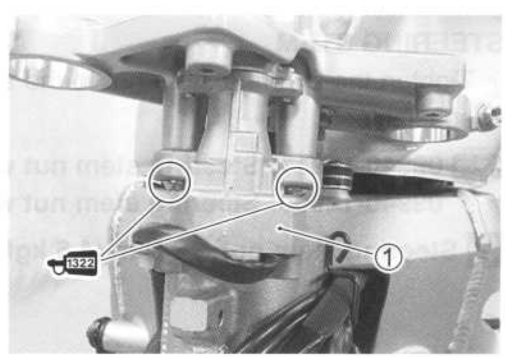
NOTE:
Before tightening the nut to the specified torque, temporarily install the handlebars in order to align both holders.

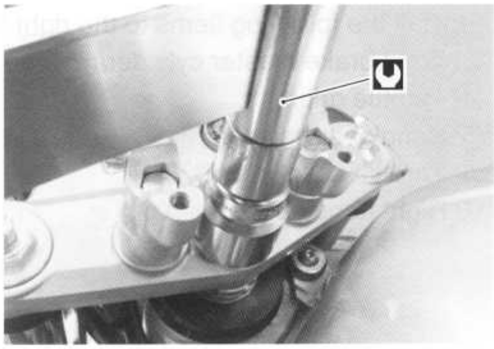


- Install the steering stem upper bracket and tighten the steering stem nut lightly.
- Install the ignition switch ① by using the special tool.

TOOL 09930-11920: Torx bit JT40H
09930-11940: Bit holder

1322 99000-32050: THREAD LOCK SUPER "1322"





- Install the front fork to the steering stem and tighten the lower clamp bolts temporarily. (SV650)
- Tighten the steering stem head nut to the specified torque.

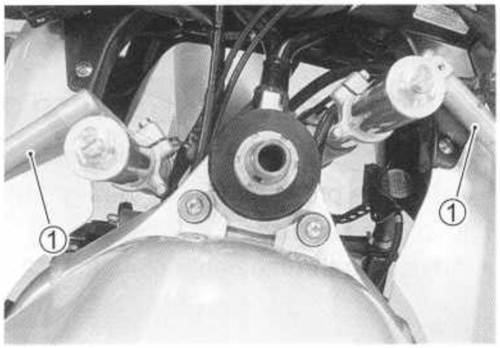
Steering stem head nut: 90 N·m (9.0 kgf-m, 65.0 lb-ft)

- Remount the front forks and the front fender. (☞7-20)

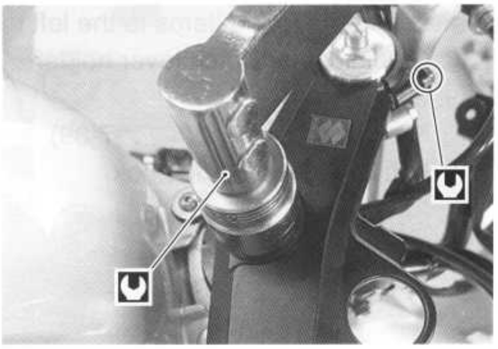
NOTE:
As for SV650S, install the handlebars to the front forks before installing the steering stem head.

- Install the following items.
- * Front brake assembly.
- * Front wheel (☞7-12)
- * Cowling (SV650S) (☞7-7)

HANDLEBARS (SV650S)

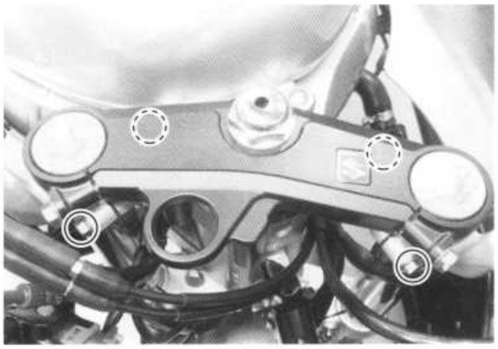


- Install the handlebars ① to the front forks.



- Tighten the steering stem head nut and front fork upper clamp bolts to the specified torque.

Steering stem head nut: 90 N·m (9.0 kgf-m, 65.0 lb-ft)
Front fork upper clamp bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



- Tighten the handlebar clamp bolts

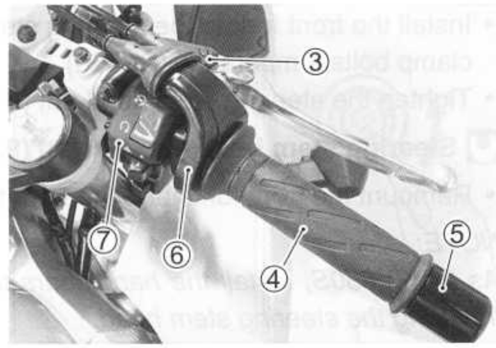
Handlebar clamp bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

CAUTION

United the projection of the handlebars and the hole of the steering stem upper bracket.

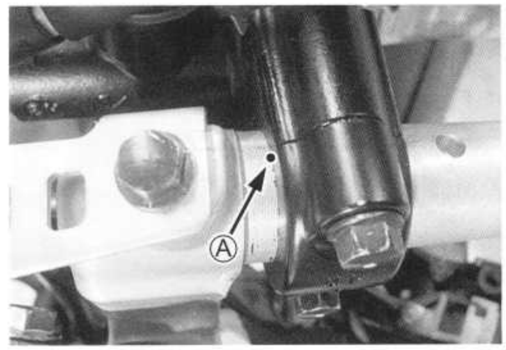
- Install the ignition switch by using the special tools. (☞8-46)

- Install the following items to the right handlebar.
  ③ Front brake master cylinder/reservoir
  ④ Throttle grip
  ⑤ Handlebar balancer (☞7-39)
  ⑥ Throttle case
  ⑦ Right handlebar switch box



- Align the front brake master cylinder holder's matching surface with the punched mark Ⓐ on the handlebar and tighten the upper mounting bolt first, then lower one.
- Tighten the front brake master cylinder mounting bolts to the specified torque.

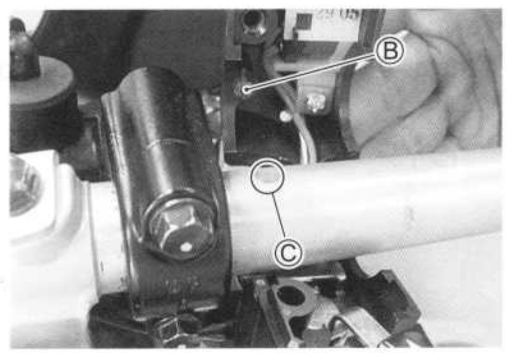
Front brake master cylinder mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



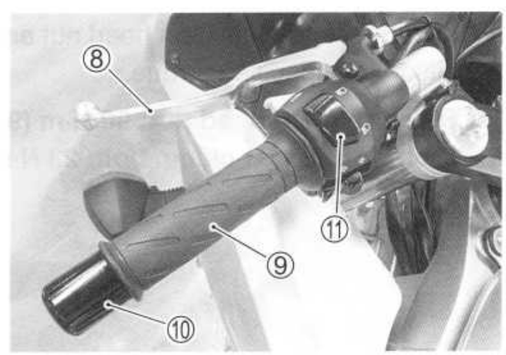
- Apply SUZUKI SUPER GREASE to the throttle cable and cable drum.

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

- Insert the projection Ⓑ of the right handlebar switch into hole Ⓒ of the handlebar.
- Adjust the throttle cable play. (☞2-17)

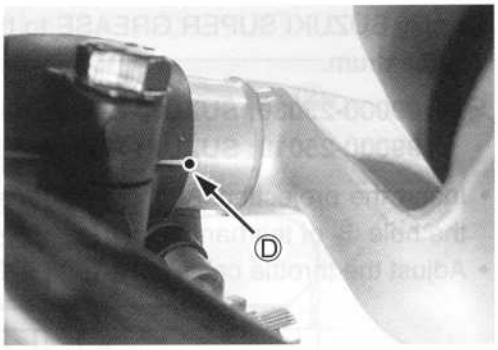


- Install the following items to the left handlebar.
  ⑧ Clutch cable/Clutch lever holder
  ⑨ Grip rubber
  ⑩ Handlebar balancer (☞7-39)
  ⑪ Left handlebar switch box

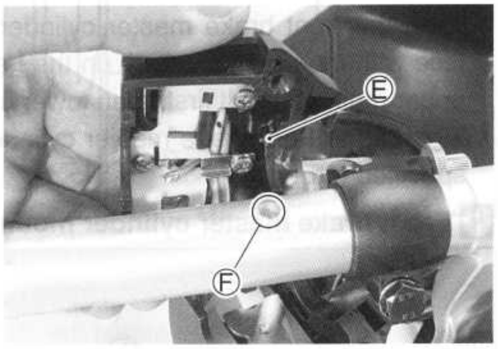


- Align the clutch holder's matching surface with the punched mark Ⓓ on the handlebar.
- Tighten the clutch holder mounting bolt to the specified torque.

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

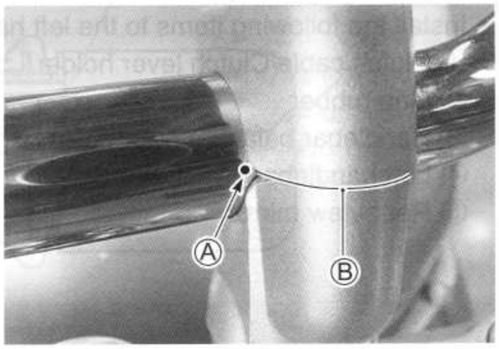


NOTE:
** Insert the projection Ⓔ of the left handlebar switch box into the hole Ⓕ of the handlebar.*
** Adhere the left grip rubber to the left handlebar.*



HANDLEBARS (SV650)

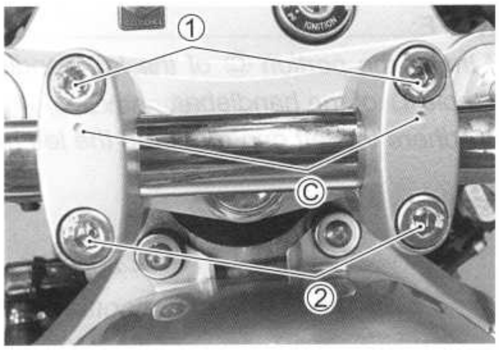
- Install the handlebars with the punch mark Ⓐ aligned with the mating surface Ⓑ of the handlebar holder.



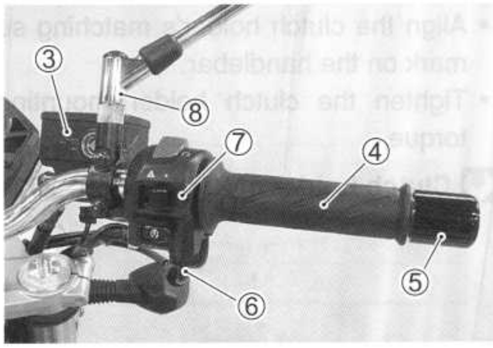
- Set the punch mark Ⓒ on the handlebar clamp forward.
- Tighten the handlebar clamp bolts to the specified torque.

Handlebar clamp bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

NOTE:
When tightening the handlebar clamp bolts, first tighten the bolts ① and then tighten the bolts ②.



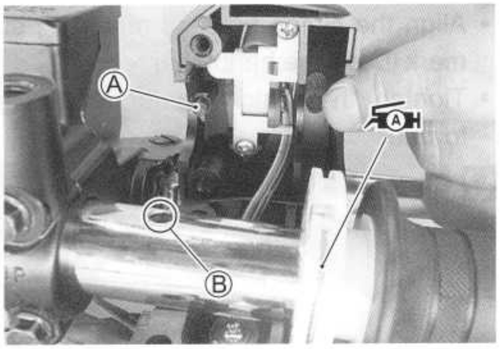
- Install the following items to the right handlebar.
  ③ Front brake master cylinder/reservoir
  ④ Throttle grip
  ⑤ Handlebar balancer (☞7-39)
  ⑥ Throttle cables
  ⑦ Right handlebar switch box
  ⑧ Rear view mirror



- Apply SUZUKI SUPER GREASE to the throttle cable and the cable drum.

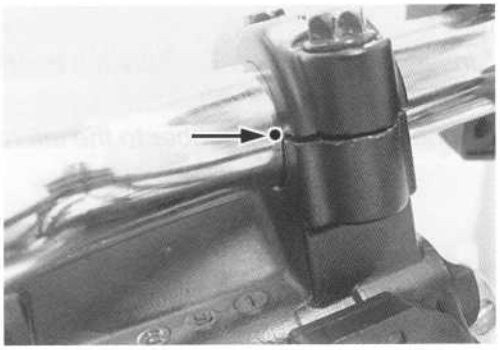
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

- Insert the projection Ⓐ of the right handlebar switch box into the hole Ⓑ of the handlebar.
- Adjust the throttle cable play. (☞2-17)

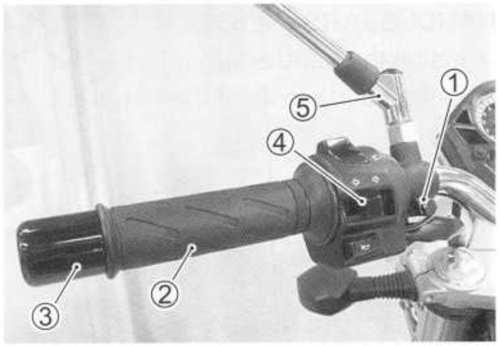


- Align the front brake master cylinder holder's matching surface with the punched mark on the handlebar and tighten the upper mounting bolt first, then lower one.
- Tighten the front brake master cylinder mounting bolts to the specified torque.

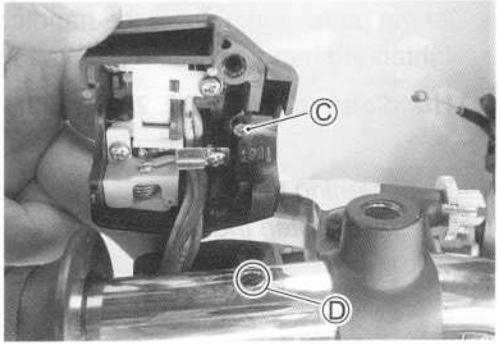
Front brake master cylinder mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



- Install the following items to the left handlebar.
  ① Clutch cable/Clutch lever holder
  ② Grip rubber
  ③ Handlebar balancer (☞7-39)
  ④ Left handlebar switch box
  ⑤ Rear view mirror

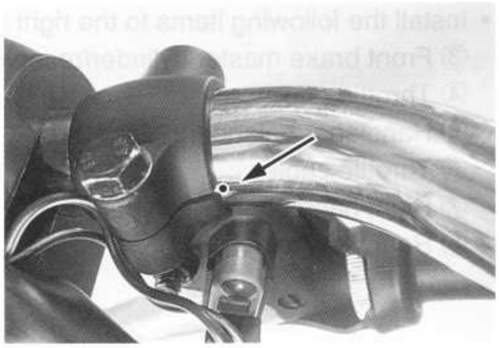


NOTE:
** Insert the portion Ⓒ of the left handlebar switch box into the hole Ⓓ of the handlebar.*
** Adhere the left grip rubber to the left handlebar.*

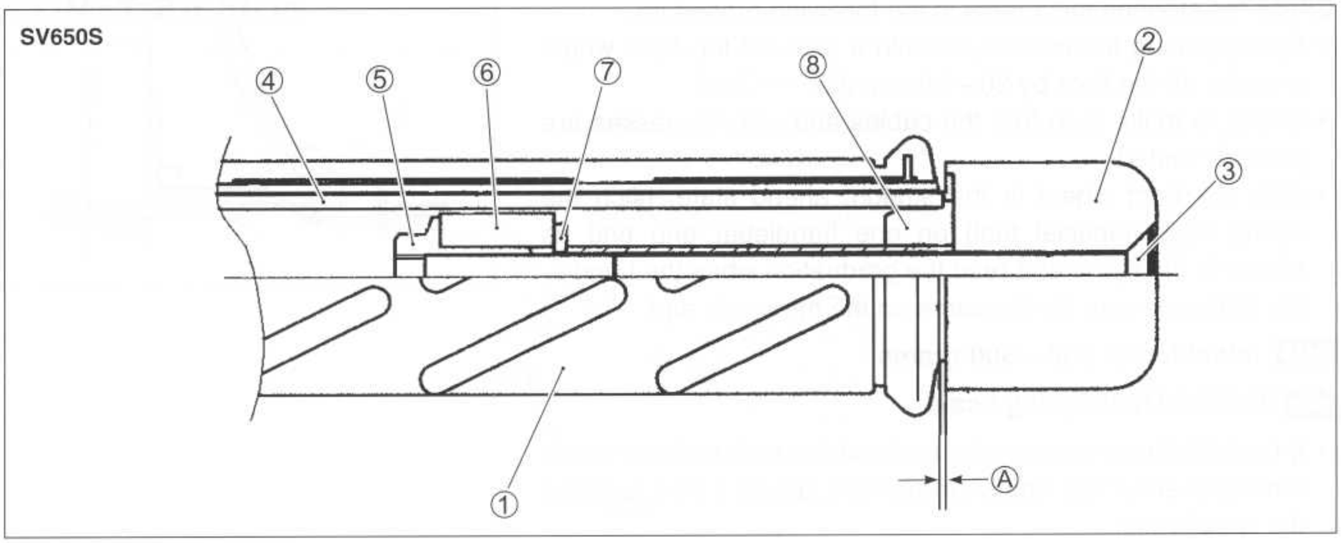


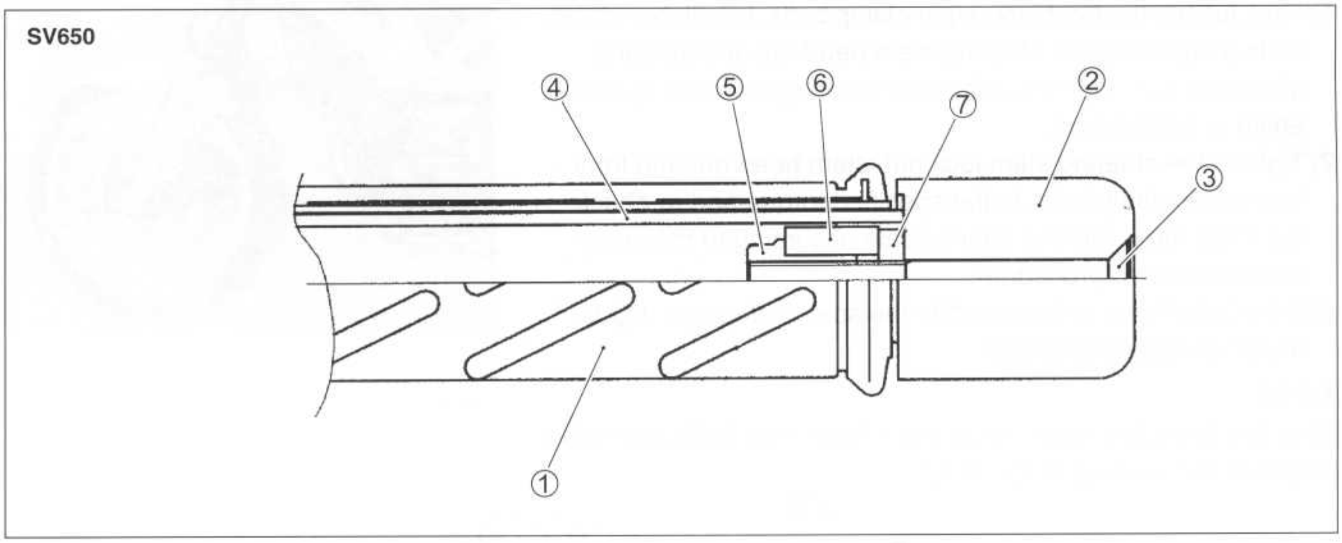
- Align the clutch holder's matching surface with the punched mark on the handlebar.
- Tighten the clutch holder mounting bolt to the specified torque.

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



Handlebar balancer installation information.





① Throttle grip	② Handlebar balancer	③ Screw
④ Handlebar	⑤ Nut	⑥ Expander
⑦ Washer	⑧ Expander	

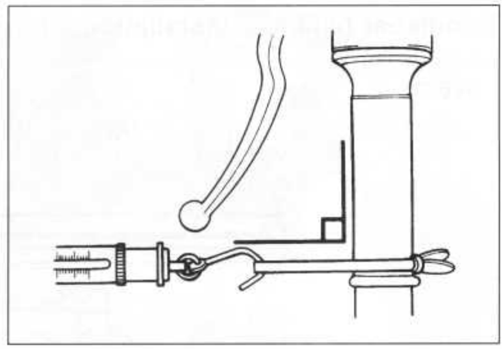
Clearance Ⓐ: 0 mm (LH)
0.5 – 1.5 mm (RH)

NOTE:
After installing the RH balancer, make sure that throttle grip operating is smooth.

STEERING TENSION ADJUSTMENT

Check the steering movement in the following procedure.

- By supporting the motorcycle with a jack, lift the front wheel until it is off the floor by 20 – 30 mm (0.8 – 1.2 in).
- Check to make sure that the cables and wire harnesses are properly routed.
- With the front wheel in the straight ahead state, hitch the spring scale (special tool) on one handlebar grip end as shown in the figure and read the graduation when the handlebar starts moving. Do the same on the other grip end.

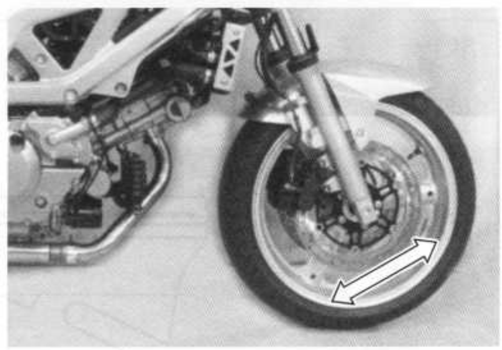


DATA **Initial force: 200 – 500 grams**

TOOL **09940-92720: Spring scale**

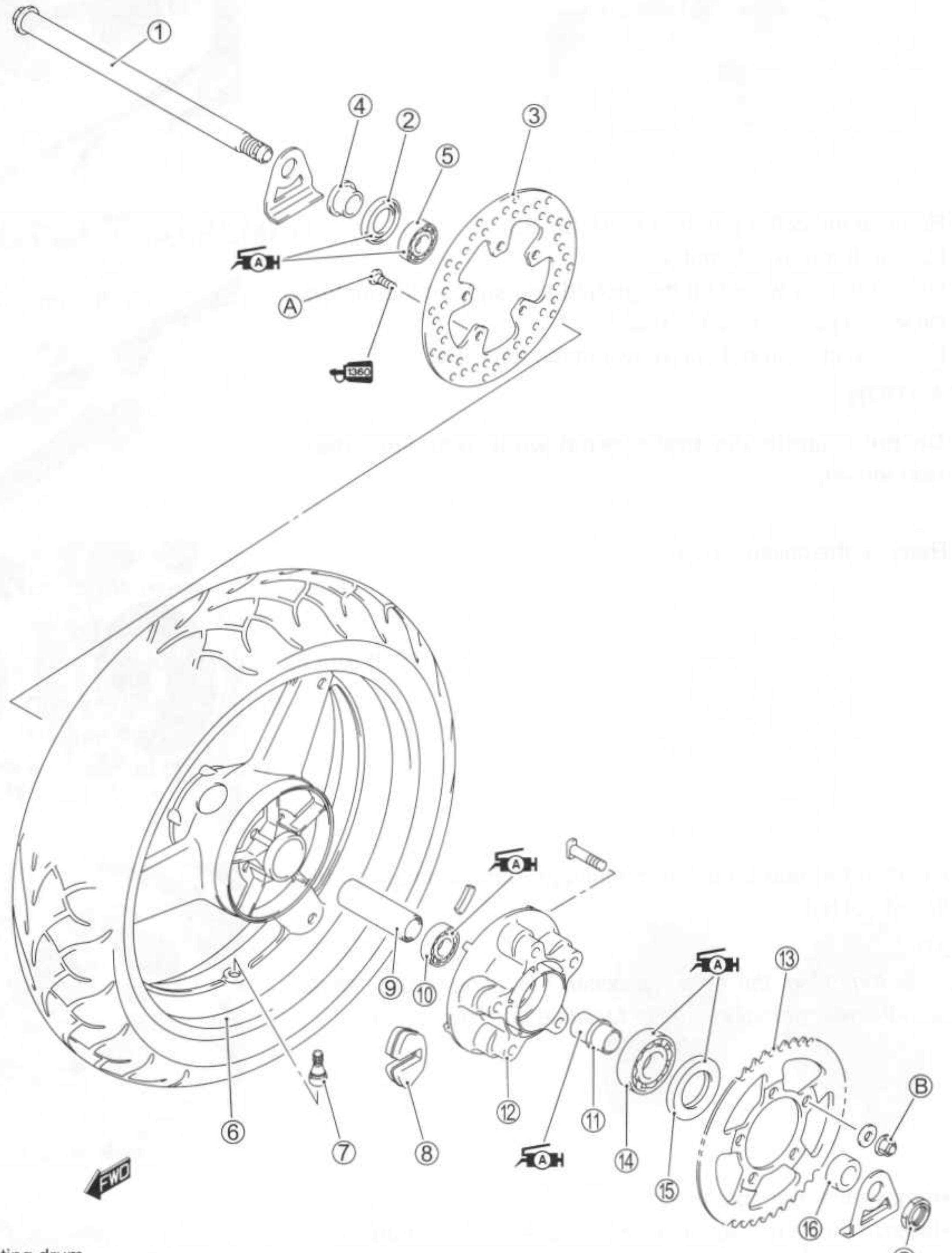
- If the initial force read on the scale when the handlebar starts turning is either too heavy or too light, adjust it till it satisfies the specification.

1) First, loosen the front fork upper clamp bolts, handlebar clamp bolts (only SV650S), steering stem head nut and steering stem lock nut, and then adjust the steering stem nut by loosening or tightening it.
2) Tighten the steering stem lock nut, stem head nut and front fork upper clamp bolts to the specified torque and re-check the initial force with the spring scale according to the previously described procedure.
3) If the initial force is found within the specified range, adjustment has been completed.



NOTE:
Hold the front fork legs, move them back and forth and make sure that the steering is not loose.

REAR WHEEL
CONSTRUCTION



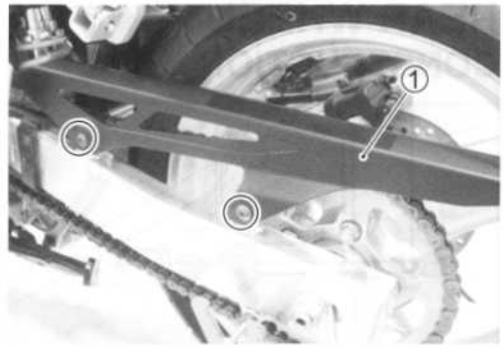
① Rear axle
② Dust seal
③ Brake disc
④ Collar
⑤ Bearing
⑥ Rear wheel
⑦ Tire valve
⑧ Damper
⑨ Spacer
⑩ Bearing
⑪ Retainer
⑫ Sprocket mounting drum
⑬ Rear sprocket
⑭ Bearing
⑮ Dust seal
⑯ Spacer

Ⓐ Brake disc bolt
Ⓑ Rear sprocket nut
Ⓒ Rear axle nut

ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	60	6.0	43.5
Ⓒ	100	10.0	72.5

REMOVAL

* Remove the chain cover ①.

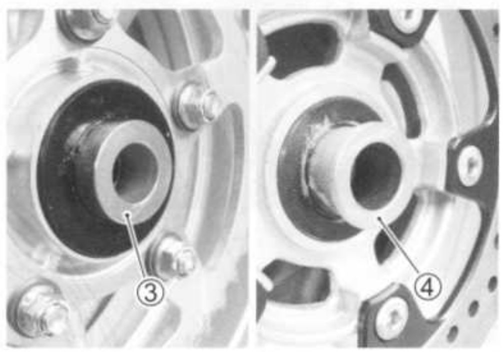


* Remove the cotter pin. (For E-03, 28, 33)
* Loosen the rear axle nut ②.
* Raise the rear wheel off the ground and support the motorcycle with a jack or wooden block.
* Remove the axle nut and draw out the rear axle.

CAUTION

Do not operate the brake pedal while removing the rear wheel.

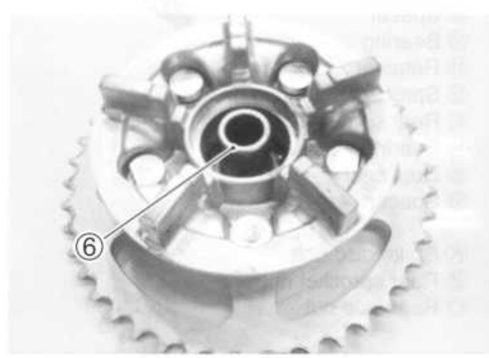
* Remove the collars ③, ④.



* Remove the rear sprocket mounting drum assembly ⑤ from the wheel hub.

NOTE:
Before removing the rear sprocket mounting drum, slightly loosen the rear sprocket nuts to facilitate later disassembly.

* Remove the rear sprocket mounting drum retainer ⑥.
* Remove the rear sprocket from sprocket mounting drum.



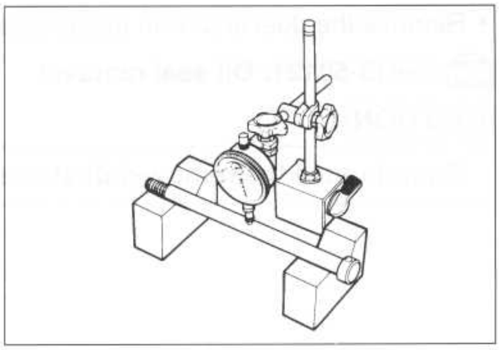
• Remove the brake disc.

INSPECTION AND DISASSEMBLY

TIRE: (☞7-89)
WHEEL: (☞7-10 and 7-89)

REAR AXLE

Using a dial gauge, check the rear axle for runout.
If the runout exceeds the limit, replace the rear axle.

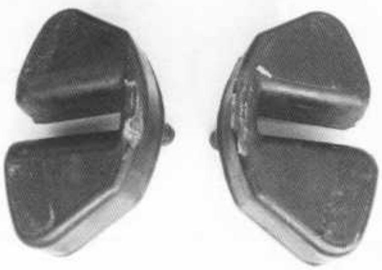


DATA **Axle shaft runout: Service Limit: 0.25 mm (0.010 in)**

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

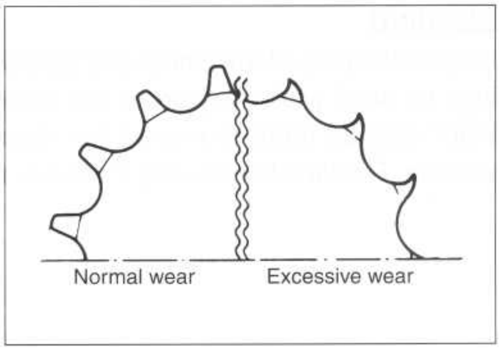
WHEEL DAMPER

Inspect the dampers for wear and damage.
Replace the damper if there is anything unusual.



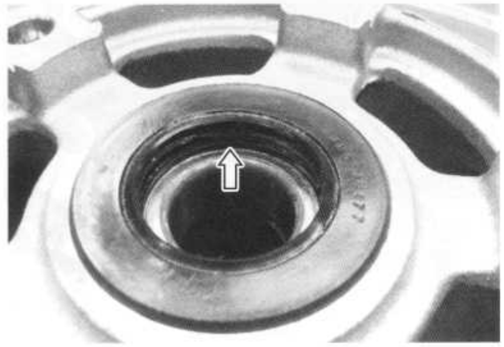
SPROCKET

Inspect the rear sprocket teeth for wear. If they are worn as shown, replace the engine sprocket, rear sprocket and drive chain as a set.



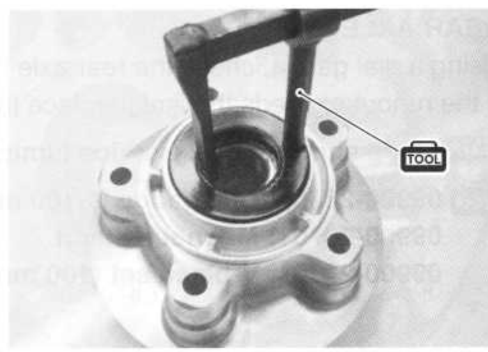
DUST SEAL

- Inspect the wheel dust seal lip and sprocket mounting drum dust seal lips for wear or damage. If any damage is found, replace the dust seal with a new one.

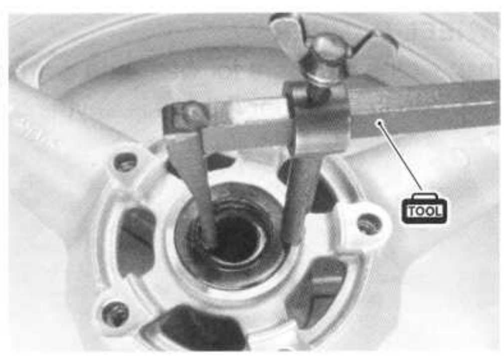


- Remove the dust seal with the special tool.

09913-50121: Oil seal remover

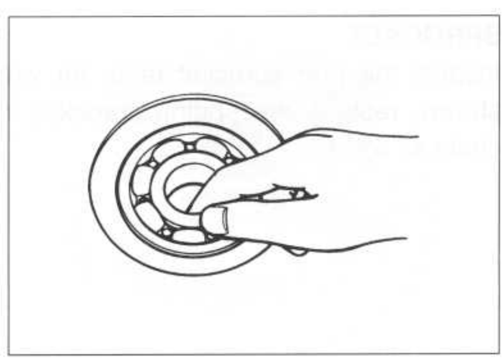


CAUTION
Do not reuse the removed dust seal.

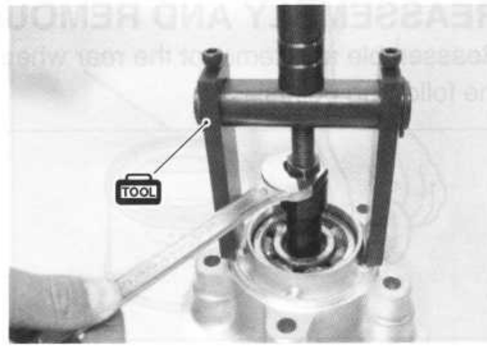


BEARING

Inspect the play of the wheel and sprocket mounting drum bearings by hand while they are in the wheel and drum. Rotate the inner race by hand to inspect for abnormal noise and smooth rotation. Replace the bearing if there is anything unusual.



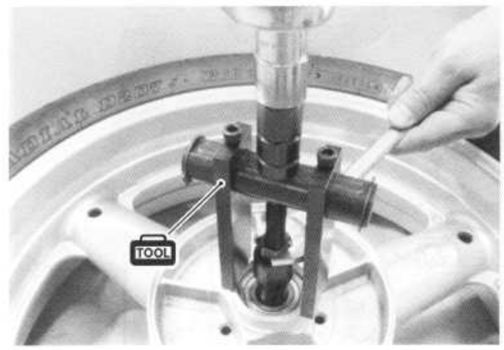
- Remove the sprocket mounting drum bearing and wheel bearings by using the special tool.



TOOL **09921-20240: Bearing remover set**

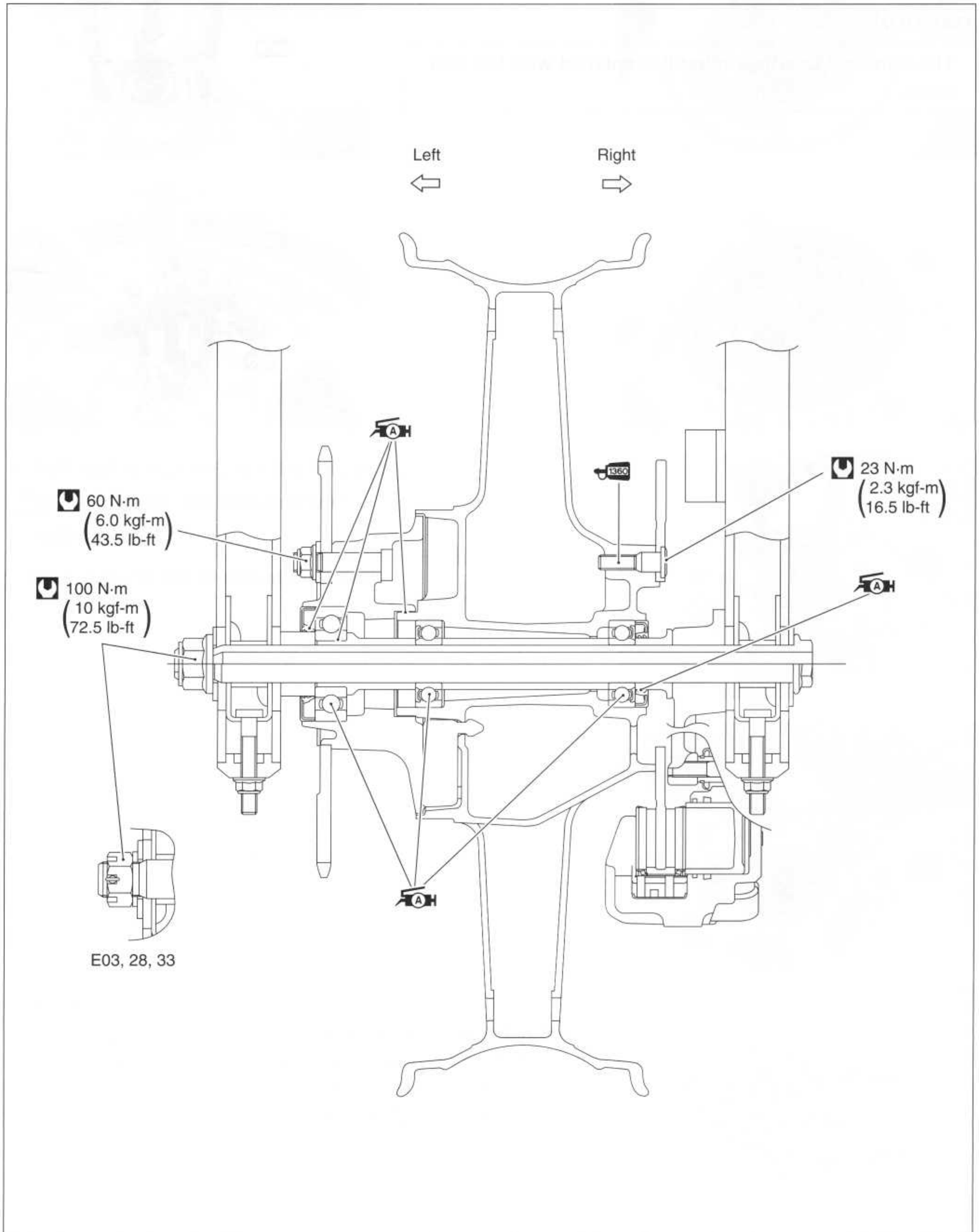
CAUTION

The removed bearings must be replaced with the new ones.



REASSEMBLY AND REMOUNTING

Reassemble and remount the rear wheel in the reverse order of removal and disassembly. Pay attention to the following points:



BEARING

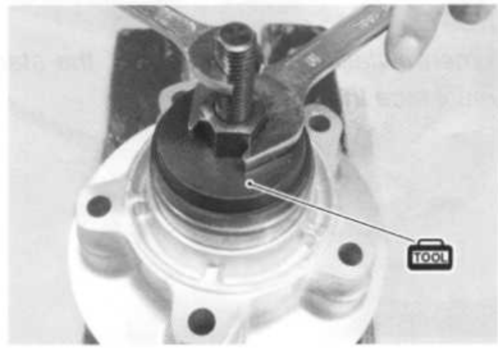
- Apply SUZUKI SUPER GREASE to the bearings before installing.

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

- Install the new bearing to the sprocket mounting drum using the special tool.

09924-84510: Bearing installer set

NOTE:
When installing the bearing, non-sealed side of bearing must face the special tool.

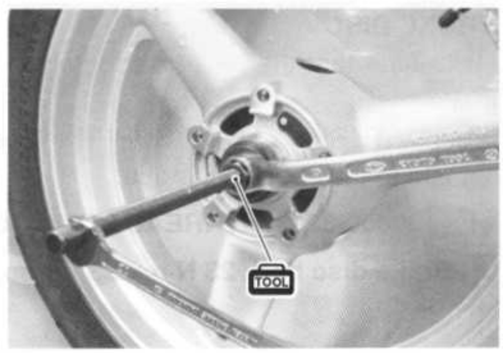


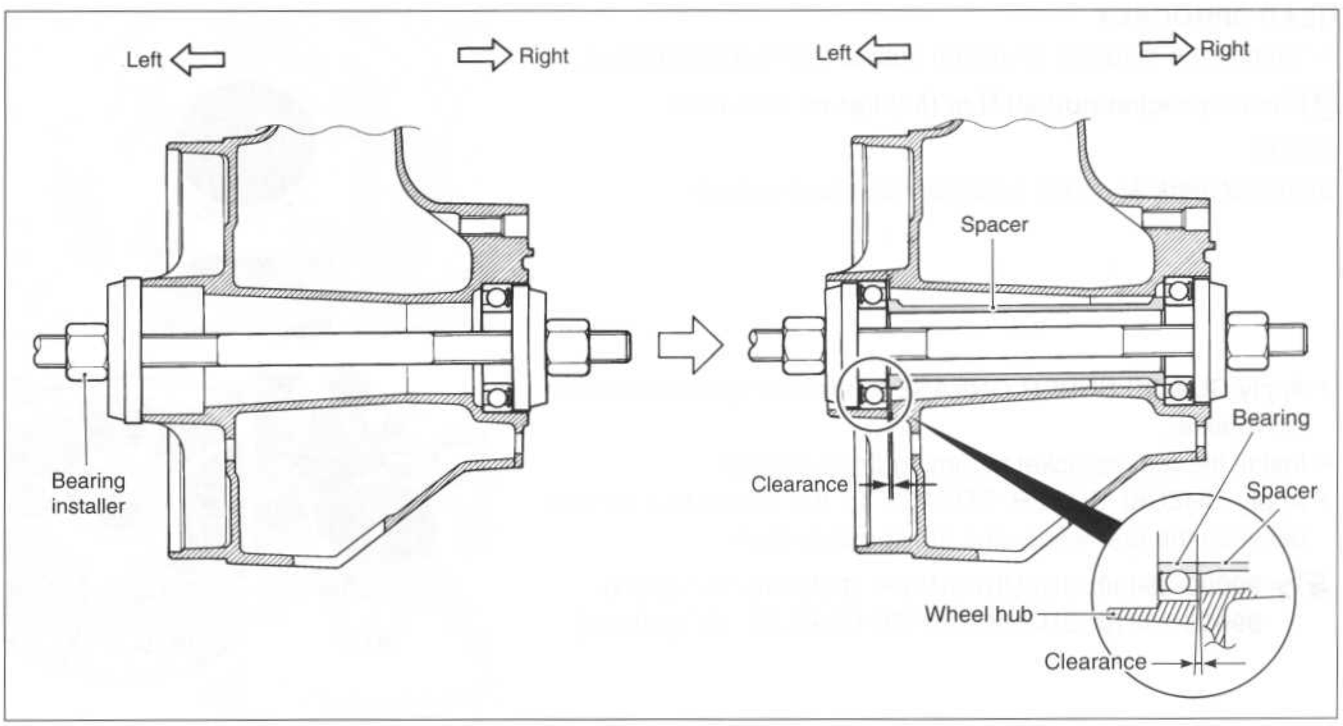
- First install the right wheel bearing, then install the left wheel bearing and spacer using the special tool.

09941-34513: Bearing/Steering race installer set
09913-70210: Bearing installer set

CAUTION

The sealed cover of the bearing must face outside.





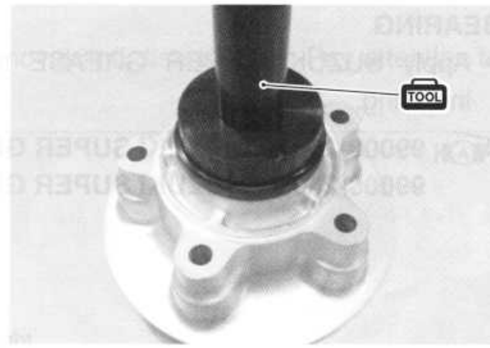
DUST SEAL

- Install the new dust seal using the special tool.

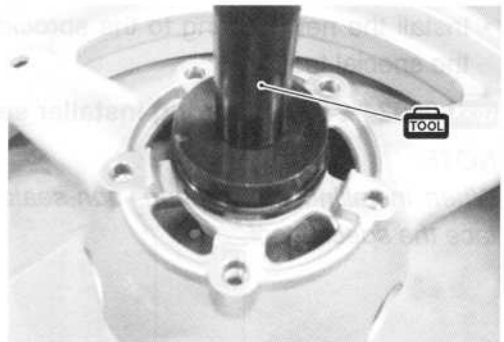
09913-70210: Bearing installer set

- Apply SUZUKI SUPER GREASE to the dust seal lips before assembling rear wheel.

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



NOTE:
When installing the dust seals, the stamped mark of dust seal must face the special tool.



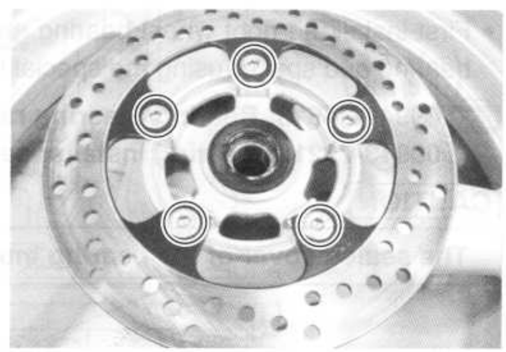
BRAKE DISC

Make sure that the brake disc is clean and free of any greasy matter.

- Apply THREAD LOCK SUPER to the disc bolts and tighten them to the specified torque.

99000-32130: THREAD LOCK SUPER "1360"

Brake disc bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

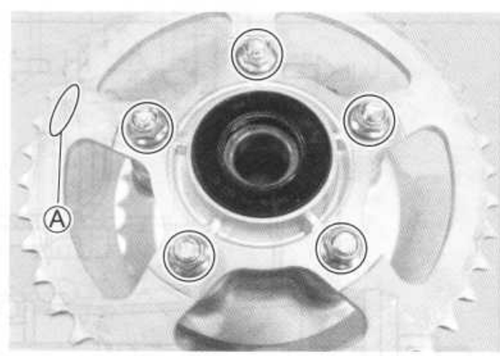


REAR SPROCKET

- Tighten the sprocket mounting nuts to the specified torque.

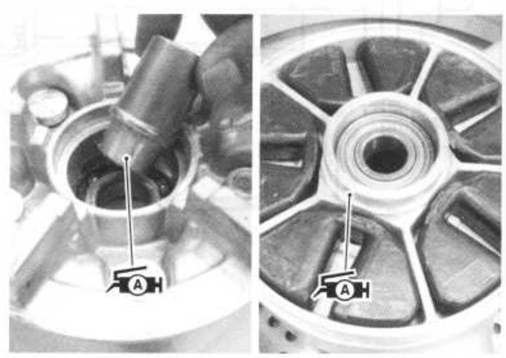
Rear sprocket nut: 60 N·m (6.0 kgf-m, 43.5 lb-ft)

NOTE:
Stamped mark Ⓐ on the sprocket must face outside.



- Apply SUZUKI SUPER GREASE to the rear sprocket mounting retainer.
- Install the rear sprocket mounting drum retainer.
- Apply SUZUKI SUPER GREASE to the contacting surface between the rear wheel and the sprocket drum.

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



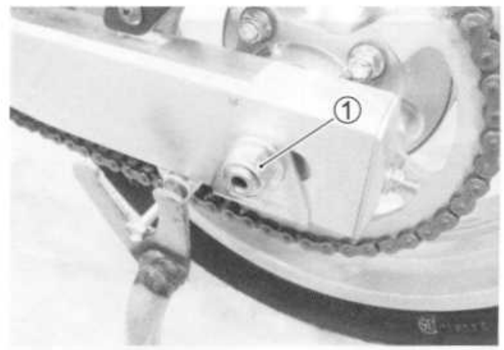
- Install the rear sprocket mounting drum to the rear wheel.
- Install the collar.

REAR AXLE

- Remount the rear wheel and rear axle, install the washer and rear axle nut.
- Tighten the rear axle nut ① to the specified torque.
- Adjust the chain slack after rear wheel installation. (☞2-22)

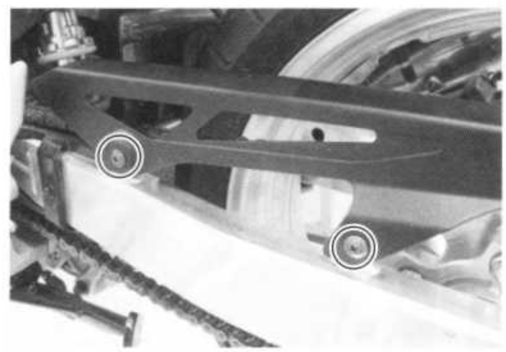
Rear axle nut: 100 N·m (10.0 kgf-m, 72.5 lb-ft)

- Install the new cotter pin. (For E-03, 28, 33)

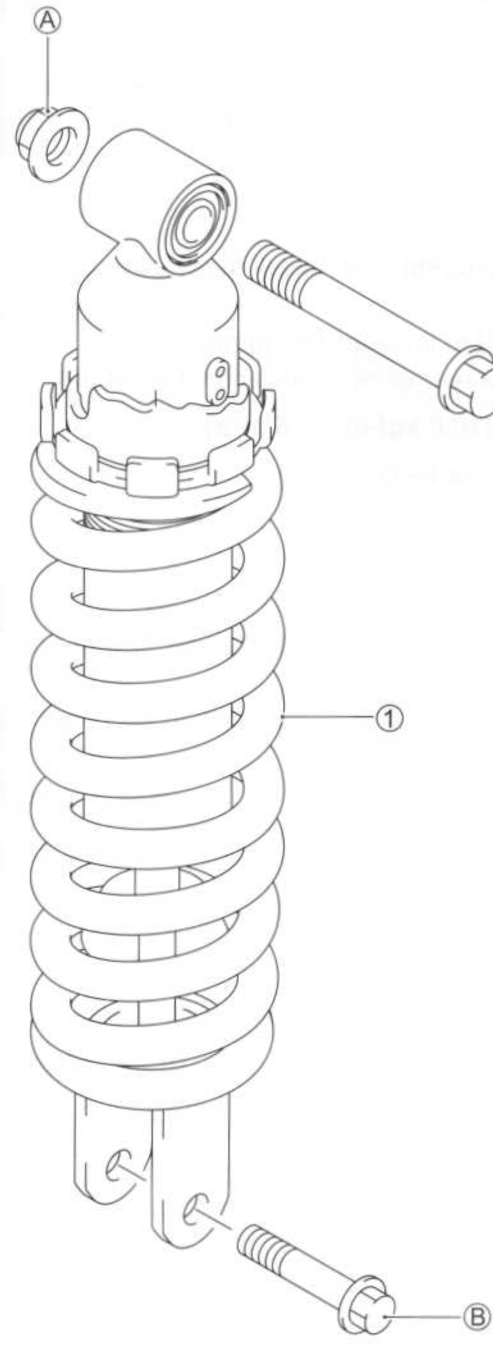


CHAIN COVER

- Install the chain cover.



REAR SHOCK ABSORBER
CONSTRUCTION



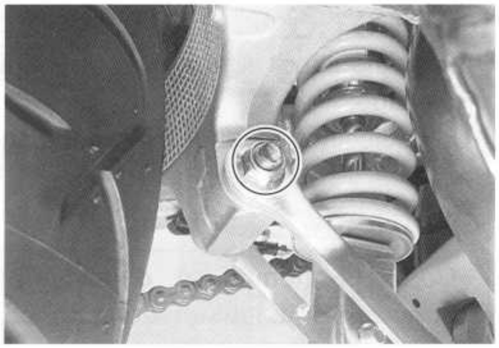
① Rear shock absorber

Ⓐ Rear shock absorber upper mounting nut
Ⓑ Rear shock absorber lower mounting bolt

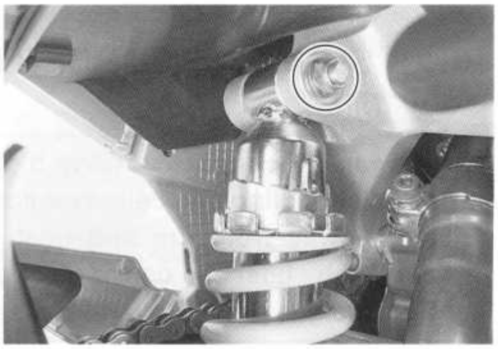
ITEM	N·m	kgf-m	lb-ft
Ⓐ	50	5.0	36.0
Ⓑ	50	5.0	36.0

REMOVAL

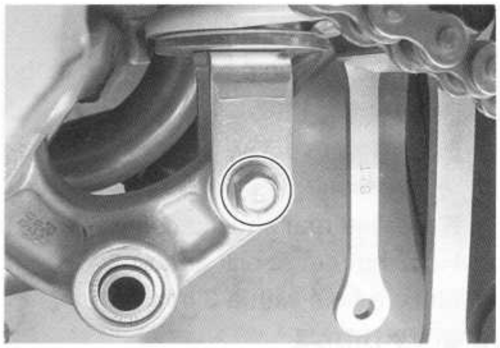
- Raise the rear wheel off the ground and support the motorcycle with a jack or wooden block.
- Remove the cushion rod bolt/nut.



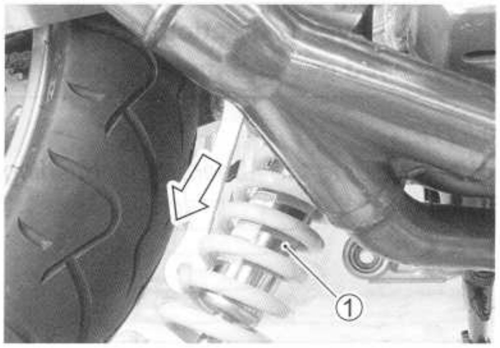
- Remove the rear shock absorber upper mounting bolt.



- Remove the rear shock absorber lower mounting bolt.



- Remove the rear shock absorber ①.



INSPECTION

Inspect the shock absorber body and bushing for damage and oil leakage.
If any defects are found, replace the shock absorber with a new one.

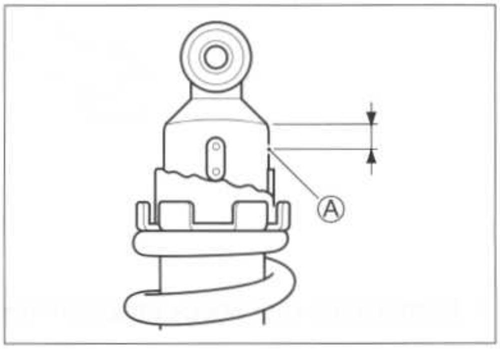
CAUTION

Do not attempt to disassemble the rear shock absorber unit. It is unserviceable.

REAR SHOCK ABSORBER DISPOSAL

⚠ WARNING

The rear shock unit contains high-pressure nitrogen gas. Mishandling can cause explosion.
*** Keep away from fire and heat. High gas pressure caused by heat can cause an explosion.**
*** Release gas pressure before disposing.**



GAS PRESSURE RELEASE

- Mark the drill hole at Ⓐ, shown in the illustration, with a center punch.

  Ⓐ: 7 mm (0.28 in)

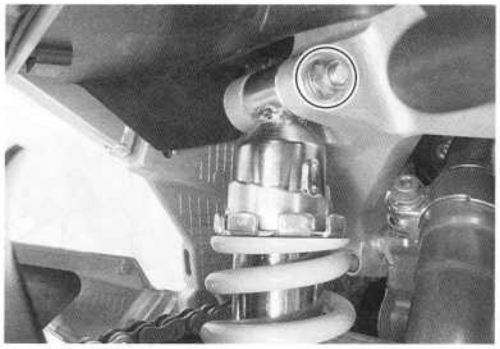
- Cover the rear shock absorber with a transparent vinyl bag ①.
- Hold the rear shock absorber ② with a vice.
- Make a hole with a 3 mm drill.

⚠ WARNING

Wear eye protection to protect your eyes from released gas and metal chips.

NOTE:
When holding the absorber, its bushing must be faced upward.

REMOUNTING

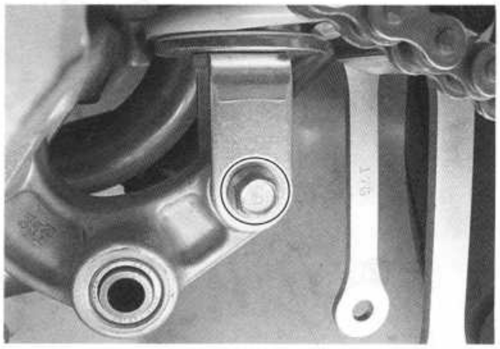


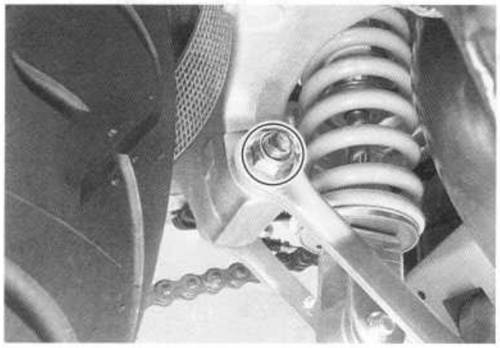
Remount the rear shock absorbers in the reverse order of removal. Pay attention to the following points:

- Install the rear shock absorber and tighten the rear shock absorber upper/lower mounting nuts.

Rear shock absorber mounting lower nut: 50 N·m (5.0 kgf-m, 36.0 lb-ft)

Rear shock absorber mounting upper nut: 50 N·m (5.0 kgf-m, 36.0 lb-ft)

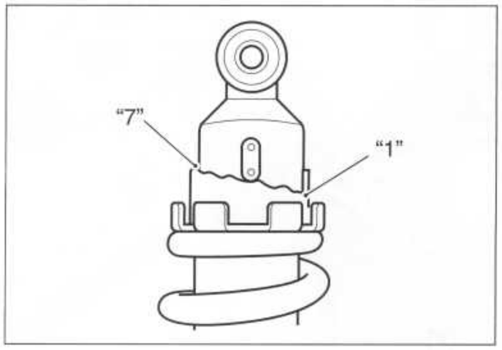




- Install the cushion rod bolt/Nut.
- Tighten the cushion rod nuts to the specified torque.

Cushion rod nut: 78 N·m (7.8 kgf-m, 56.5 lb-ft)

SUSPENSION SETTING



After installing the rear suspension, adjust the spring pre-load as follows.

SPRING PRE-LOAD ADJUSTMENT

The pre-load is adjusted by turning the pre-load adjuster.

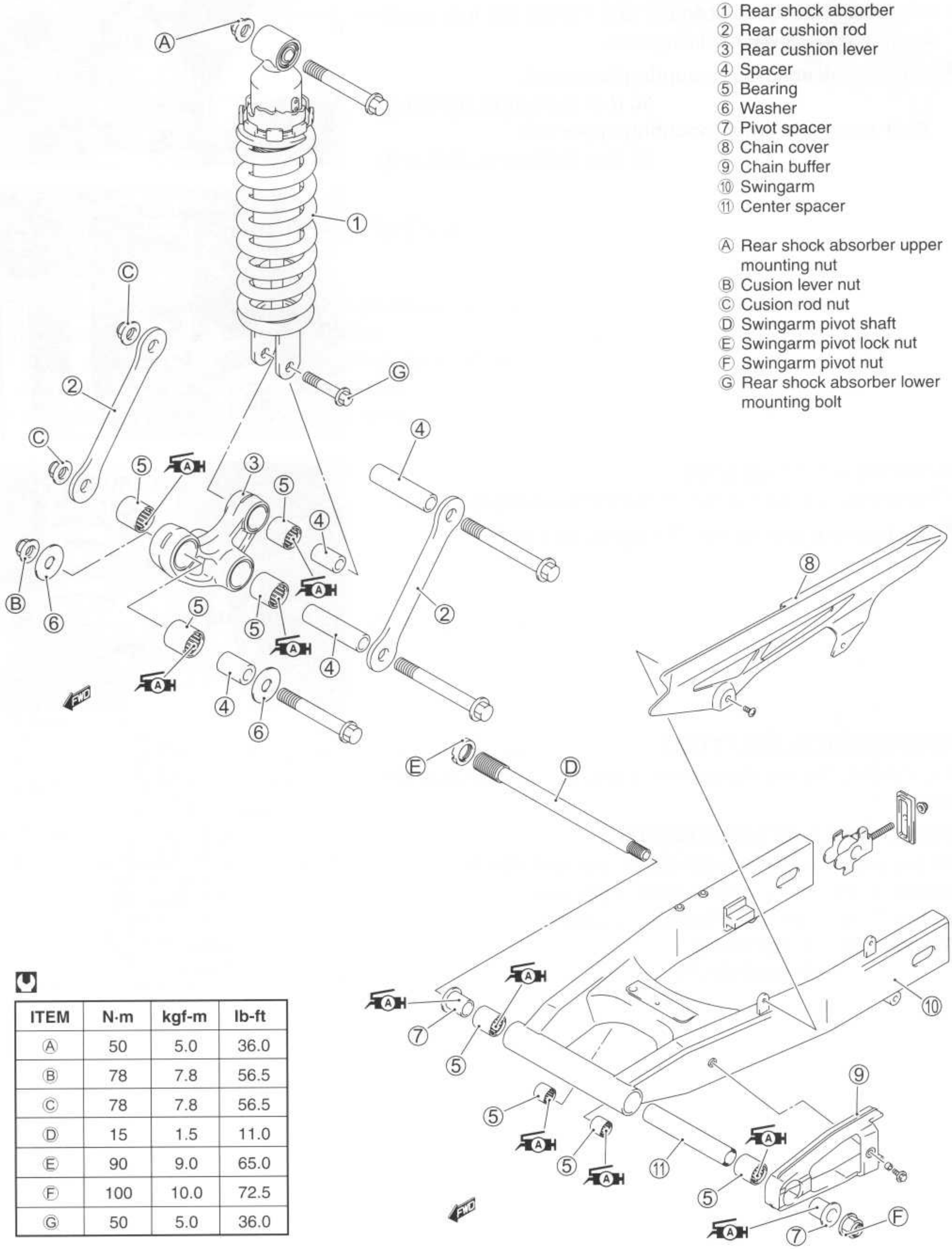
Position "1" provides the softest spring pre-load.

Position "7" provides the stiffest spring pre-load.

STD position: "3" for SV650
"4" for SV650S

REAR SWINGARM

CONSTRUCTION



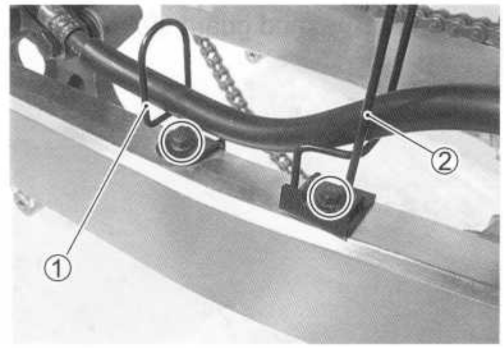
① Rear shock absorber
② Rear cushion rod
③ Rear cushion lever
④ Spacer
⑤ Bearing
⑥ Washer
⑦ Pivot spacer
⑧ Chain cover
⑨ Chain buffer
⑩ Swingarm
⑪ Center spacer

Ⓐ Rear shock absorber upper mounting nut
Ⓑ Cusion lever nut
Ⓒ Cusion rod nut
Ⓓ Swingarm pivot shaft
Ⓔ Swingarm pivot lock nut
Ⓕ Swingarm pivot nut
Ⓖ Rear shock absorber lower mounting bolt

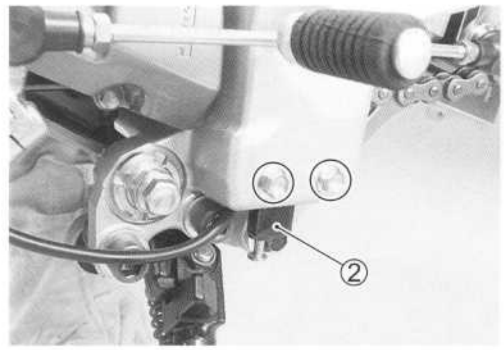
ITEM	N·m	kgf-m	lb-ft
Ⓐ	50	5.0	36.0
Ⓑ	78	7.8	56.5
Ⓒ	78	7.8	56.5
Ⓓ	15	1.5	11.0
Ⓔ	90	9.0	65.0
Ⓕ	100	10.0	72.5
Ⓖ	50	5.0	36.0

REMOVAL

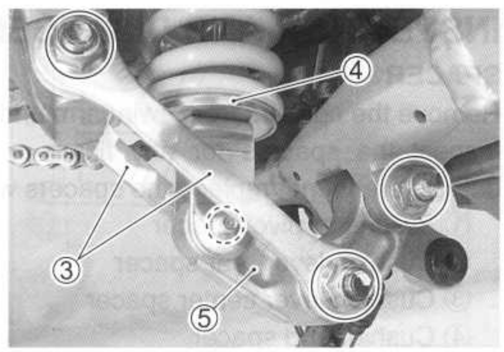
- Remove the exhaust pipe and exhaust muffler. (☞3-6)
- Raise the rear wheel off the ground and support the motorcycle with a jack or wooden block.
- Remove the chain cover.
- Remove the rear wheel. (☞7-42)
- Remove the rear brake hose guides ① and ②. (SV650S isn't equipped with the hose guide ①.)



- Remove the side-stand switch ②.

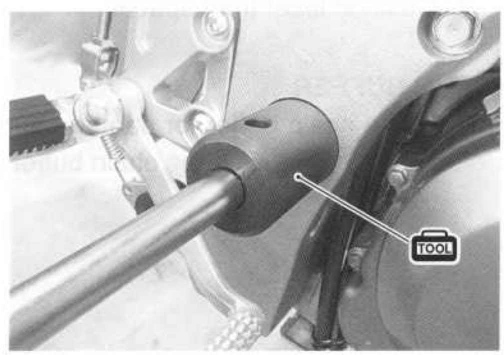


- Remove the cushion rods ③.
- Remove the shock absorber ④. (☞7-51)
- Remove the cushion lever ⑤.



- Remove the swingarm pivot shaft locknut by using the special tool.

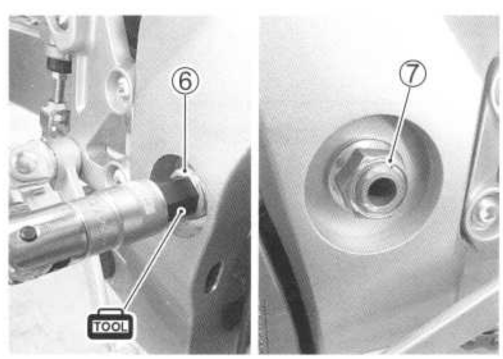
TOOL 09940-14940: Swingarm pivot thrust adjuster socket wrench



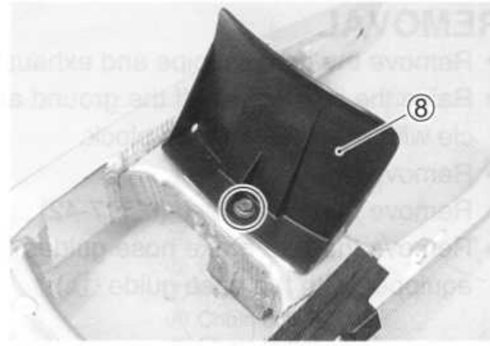
- Hold the swingarm pivot shaft ⑥ and remove the swingarm pivot nut ⑦.
- Remove the swingarm pivot shaft by using the special tool.

TOOL 09944-28320: Hexagon bit 19 mm

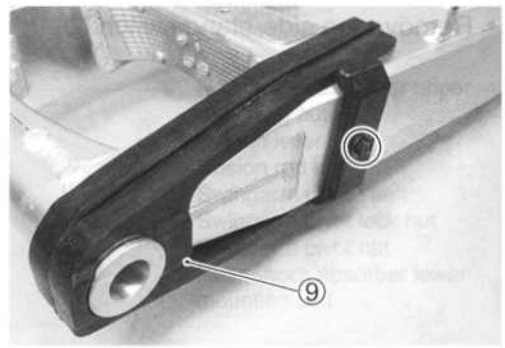
- Remove the swingarm.



• Remove the mud guard ⑧.



• Remove the chain buffer ⑨.



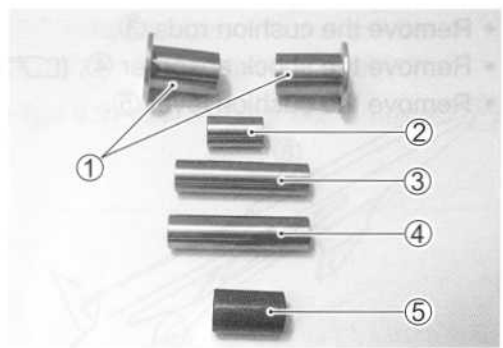
INSPECTION AND DISASSEMBLY

SPACER

Remove the spacers from swingarm and cushion lever.

Inspect the spacers for any flaws or other damage. If any defects are found, replace the spacers with the new ones.

① Swingarm pivot spacer
② Cushion lever rear spacer
③ Cushion lever center spacer
④ Cushion rod spacer
⑤ Cushion lever front spacer

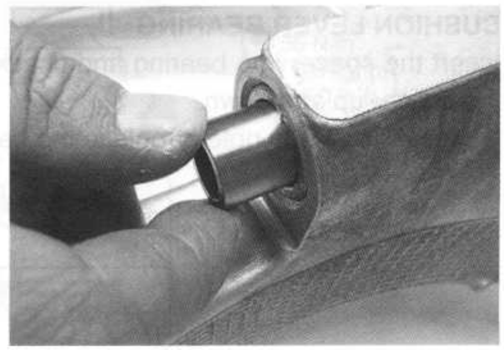


CHAIN BUFFER

Inspect the chain buffer for damage and excessive wear. If any defect is found, replace the chain buffer with a new one.

SWINGARM BEARING

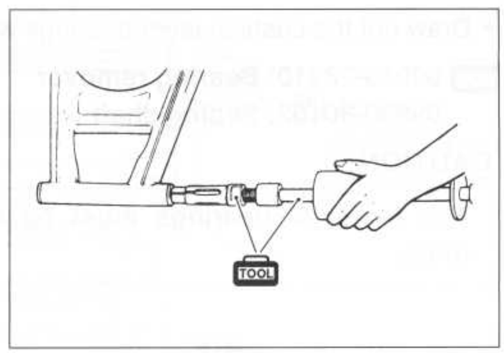
Insert the spacer into bearing and check the play when moving the spacer up and down.
If excessive play is noted, replace the bearing with a new one.



- Remove the swingarm pivot bearing and spacer with the special tools.

09923-74511: Bearing remover
09930-30102: Sliding shaft

CAUTION
Do not reuse the removed bearings.



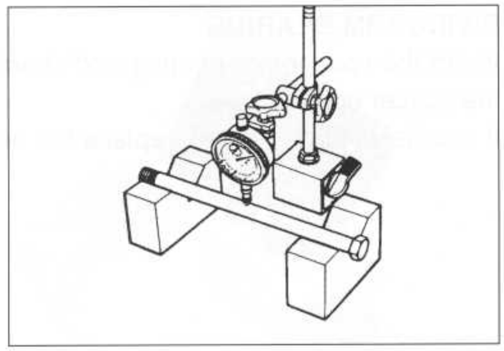
- Remove the cushion rod bearings by using the special tool.

09913-73210: Bearing remover
09930-30102: Sliding shaft

CAUTION
Do not reuse the removed bearings.

SWINGARM PIVOT SHAFT

Using a dial gauge, check the pivot shaft runout and replace it if the runout exceeds the limit.

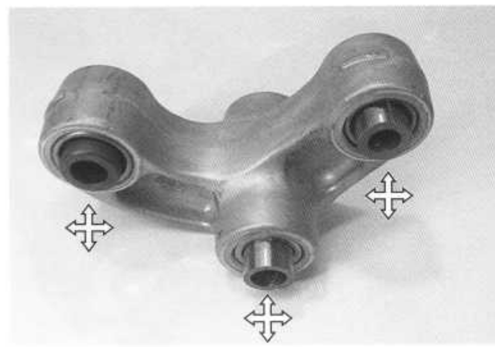


TOOL **09900-20607: Dial gauge (1/100 mm, 10 mm)**
09900-20701: Magnetic stand
09900-21304: V-block (100 mm)

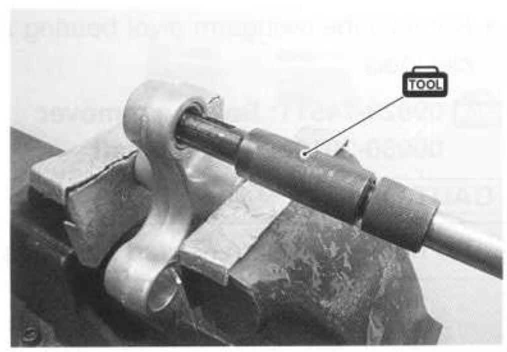
DATA **Swingarm pivot shaft runout:**
Service limit: 0.3 mm (0.01 in)

CUSHION LEVER BEARING

Insert the spacer into bearing and check the play when moving the spacer up and down.
If excessive play is noted, replace the bearing with a new one.



- Draw out the cushion lever bearings with the special tool.



TOOL **09913-73210: Bearing remover**
09930-30102: Sliding shaft

CAUTION

The removed bearings must be replaced with new ones.

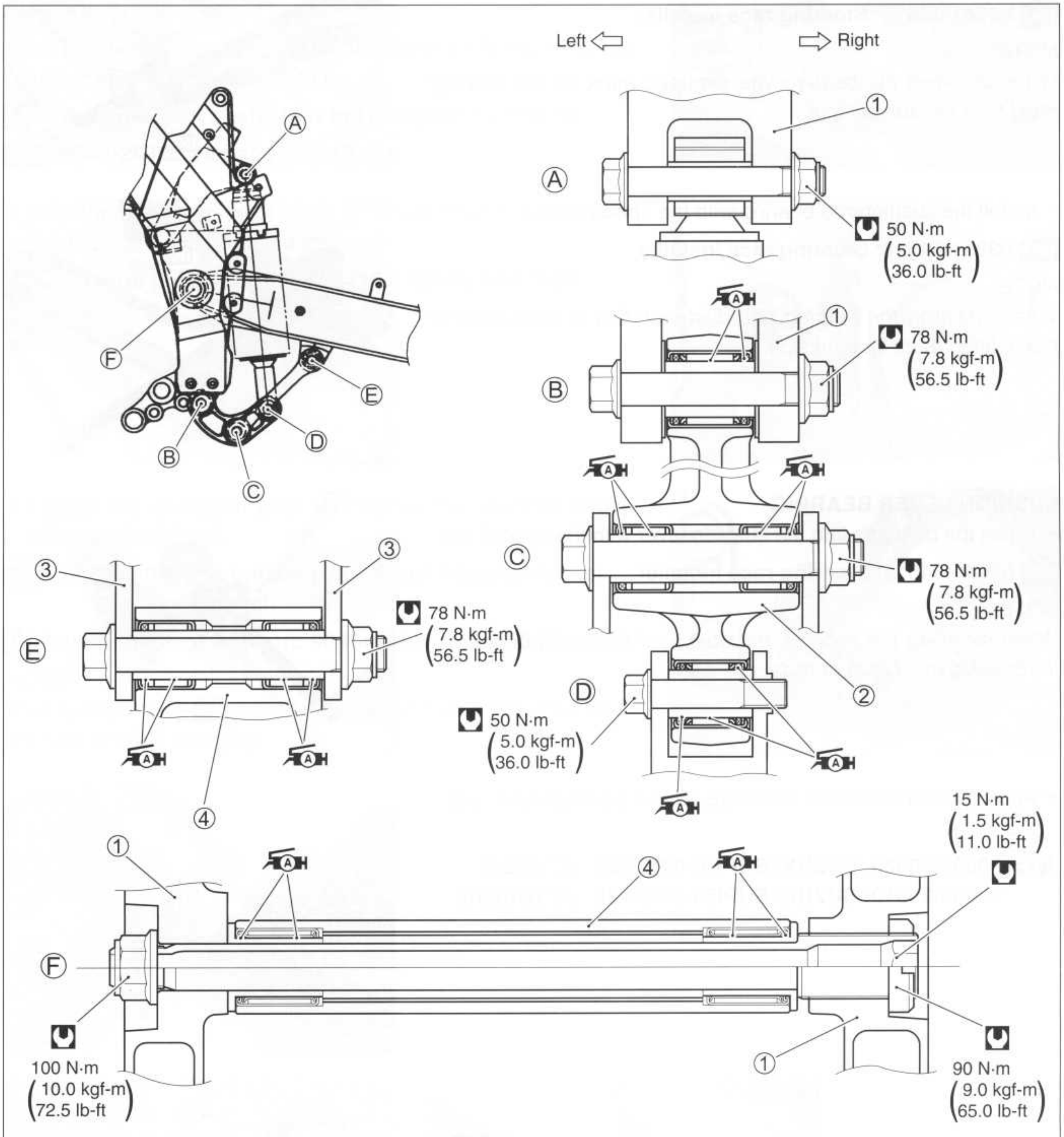
CUSHION RODS

Inspect the cushion lever rods for damage and distortion.

REASSEMBLY

Reassemble the swingarm in the reverse order of disassembly and removal.

Pay attention to the following points:



① Frame ② Cushion lever ③ Cushion rod ④ Swingarm

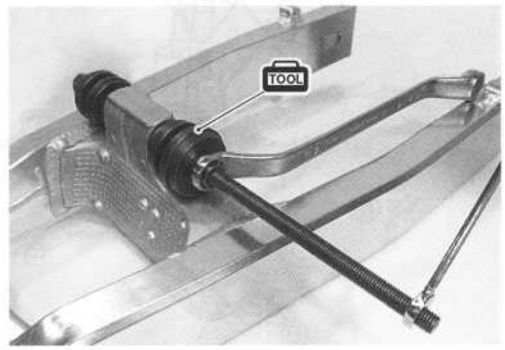
SWINGARM BEARING

- Install the bearings and spacer into the swingarm pivot all together by using the special tool.

TOOL **09941-34513: Steering race installer**

NOTE:
When installing the bearing, the stamped mark on the bearing must face the special tool.

- Install the cushion rod bearing with the special tool.



TOOL **09941-34513: Steering race installer**

NOTE:
When installing the bearing, the dust seal that is embedded in the bearing must face outside.

CUSHION LEVER BEARING

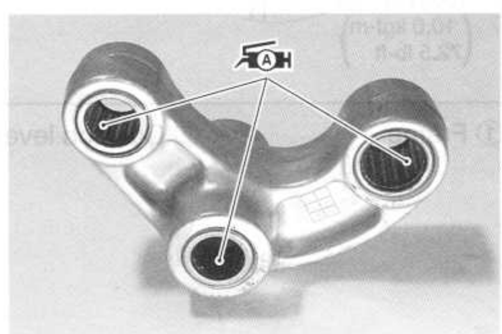
- Press the bearings into the cushion lever with the special tool.

TOOL **09941-34513: Steering race installer**

NOTE:
When installing the bearing, the dust seal that is embedded in the bearing must face outside.

- Apply SUZUKI SUPER GREASE to the bearings and spacers.

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



REMOUNTING

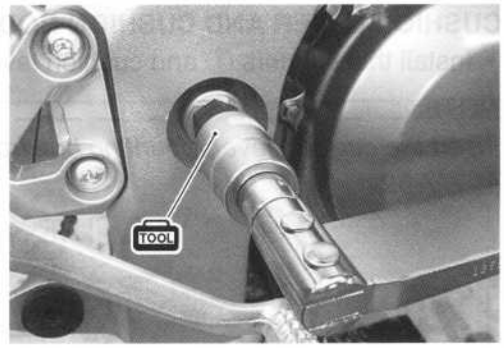
Remount the swingarm in the reverse order of disassembly and removal, and pay attention to the following points:

SWINGARM

- Insert the swingarm pivot shaft and tighten it to the specified torque by using the special tool.

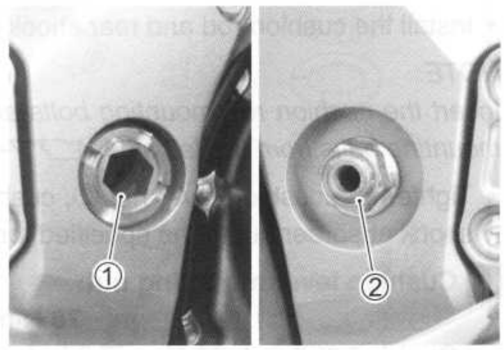
Swingarm pivot shaft: 15 N·m (1.5 kgf-m, 11.0 lb-ft)

09944-28320: Hexagon bit 19 mm



- Hold the swingarm pivot shaft ① and tighten the swingarm pivot nut ② to the specified torque.

Swingarm pivot nut: 100 N·m (10.0 kgf-m, 72.5 lb-ft)

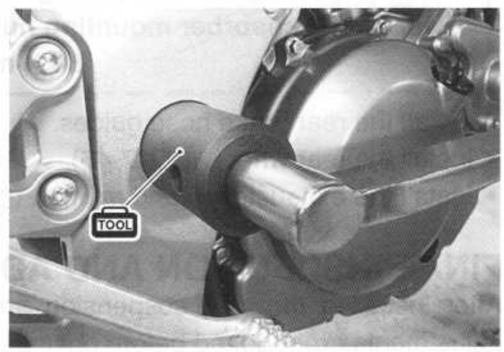


- Tighten the swingarm pivot lock nut to the specified torque with the special tool.

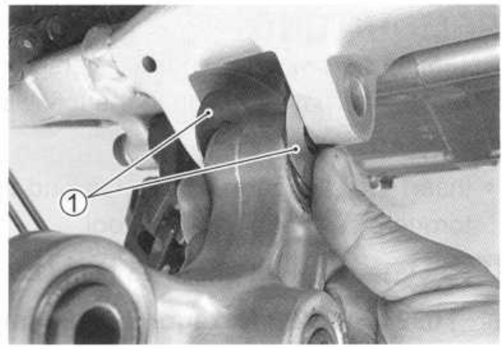
09940-14940: Swingarm pivot thrust adjuster socket wrench

Swingarm pivot lock nut: 90 N·m (9.0 kgf-m, 65.0 lb-ft)

NOTE:
After tightening the pivot shaft nut and lock nut, inspect the swingarm for smooth swinging.

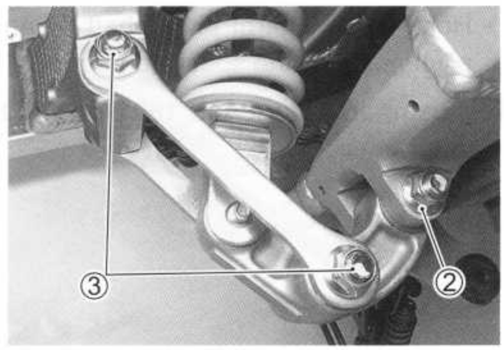


CUSHION LEVER AND CUSHION ROD



- Install the washers ① and cushion lever.

NOTE:
Insert the cushion lever mounting bolt from the left side.
(☞7-59)



- Install the cushion rod and rear shock absorber. (☞7-53)

NOTE:
Insert the cushion rod mounting bolts and rear shock absorber mounting bolts from the left side. (☞7-59)

- Tighten the cushion lever nut ②, cushion rod nut ③ and rear shock absorber nut to the specified torque.

Cushion lever mounting nut:
78 N·m (7.8 kgf-m, 56.5 lb-ft)
Cushion rod nut: 78 N·m (7.8 kgf-m, 56.5 lb-ft)
Rear shock absorber mounting nut:
50 N·m (5.0 kgf-m, 36.0 lb-ft)

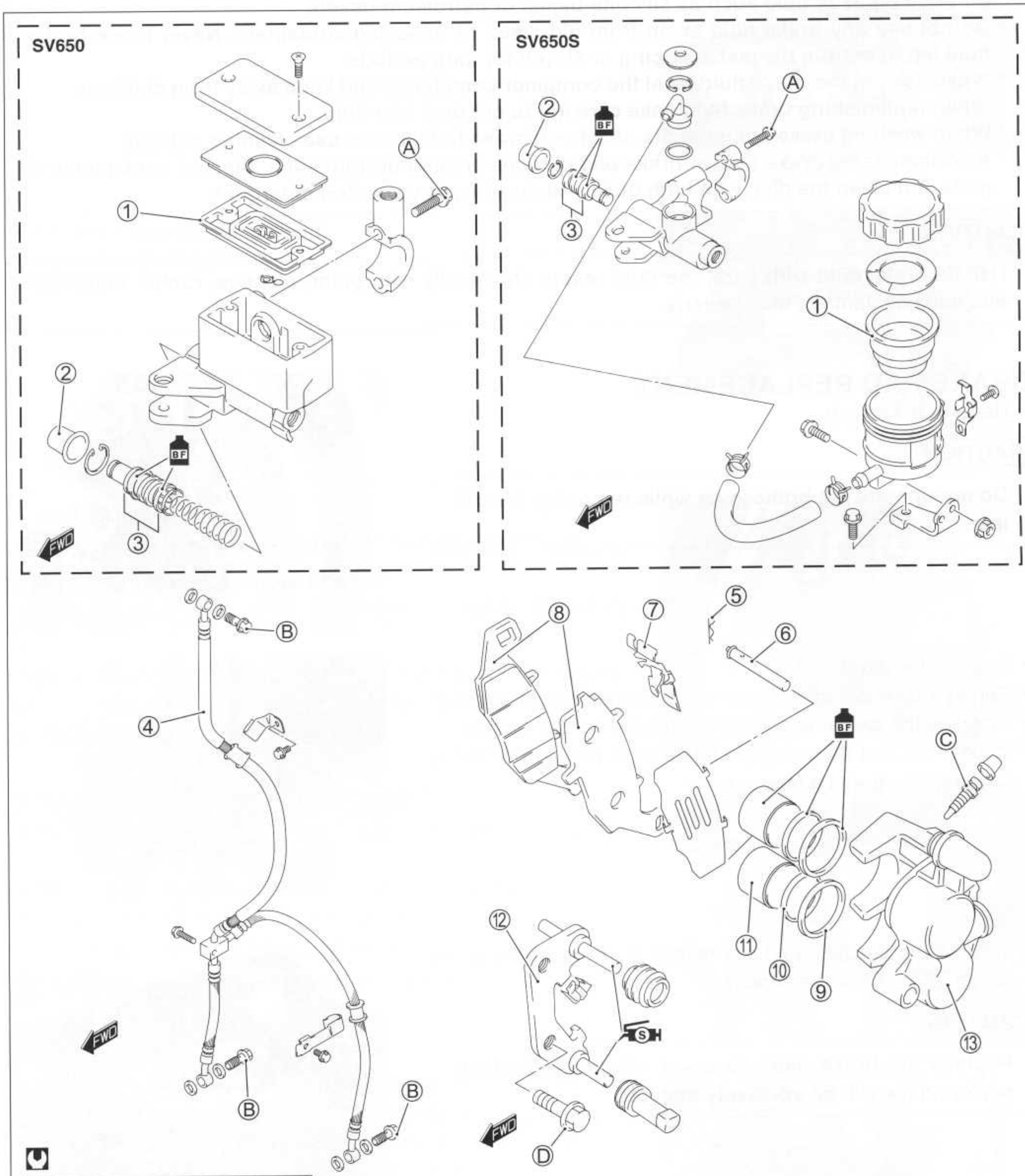
- Install the rear brake hose guides.
- Install the rear wheel. (☞7-46)
- Install the exhaust pipe and muffler. (☞3-20)

FINAL INSPECTION AND ADJUSTMENT

After installing the rear suspension and wheel, the following adjustments are required before driving.

* Drive chain: ☞2-24
* Tire pressure: ☞7-92
* Chassis bolts and nuts: ☞2-32

FRONT BRAKE
CONSTRUCTION



ITEM	N·m	kgf-m	lb-ft
Ⓐ	10	1.0	7.0
Ⓑ	23	2.3	16.5
Ⓒ	7.5	0.75	5.5
Ⓓ	39	3.9	28.0

① Diaphragm
② Dust boot
③ Piston/cup set
④ Brake hose
⑤ Pin
⑥ Pad mounting pin
⑦ Brake pad spring
⑧ Brake pad
⑨ Piston seal
⑩ Dust seal
⑪ Piston
⑫ Caliper holder
⑬ Caliper

Ⓐ Brake master cylinder mounting bolt
Ⓑ Brake hose union bolt
Ⓒ Front caliper air bleeder valve
Ⓓ Brake caliper mounting bolt

⚠ WARNING

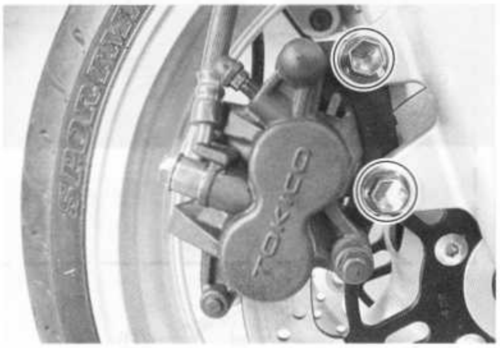
* **This brake system is filled with an ethylene glycol-based DOT 4 brake fluid. Do not use mix different types of fluid such as silicone-based or petroleum-based.**
* **Do not use any brake fluid taken from old, used or unsealed containers. Never reuse brake fluid left over from the last servicing or stored for long periods.**
* **When storing the brake fluid, seal the container completely and keep away from children.**
* **When replenishing brake fluid, take care not to get dust into fluid.**
* **When washing brake components, use fresh brake fluid. Never use cleaning solvent.**
* **A contaminated brake disc or brake pad reduces braking performance. Discard contaminated pads and clean the disc with high quality brake cleaner or neutral detergent.**

CAUTION

Handle brake fluid with care: the fluid reacts chemically with paint, plastics, rubber materials etc. and will damage then severly.

BRAKE PAD REPLACEMENT

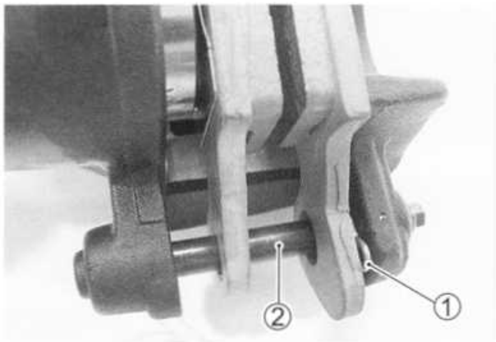
* Remove the caliper.



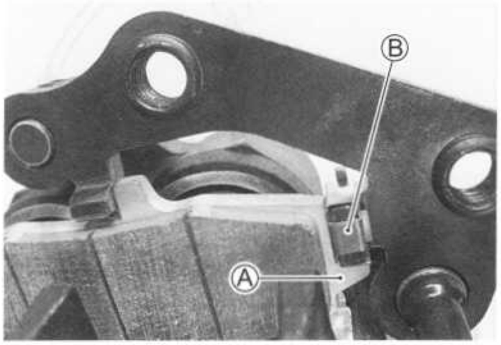
CAUTION

Do not operate the brake lever while removing the caliper.

* Remove the pin ①.
* Remove the brake pads by removing the pad mounting pin ②.
* Clean up the caliper especially around the caliper pistons.
* Inspect the pad mounting pin for wear or damage. If necessary, replace it with a new one.



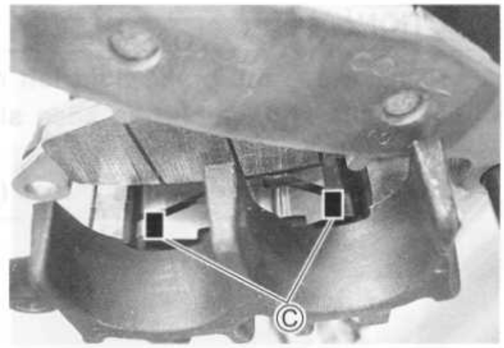
* Install the outer pad with the detent Ⓐ of pad fitted to the detent Ⓑ on the caliper holder.



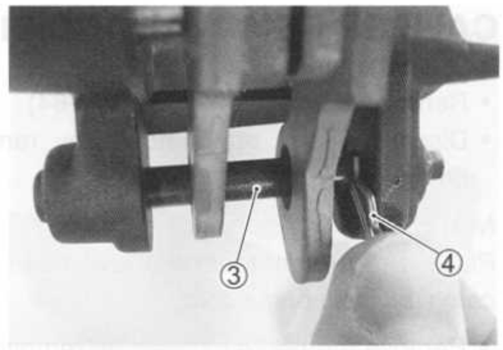
CAUTION

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

- Install the inner pad so that the inner pad will be seated on the hatched part ©.



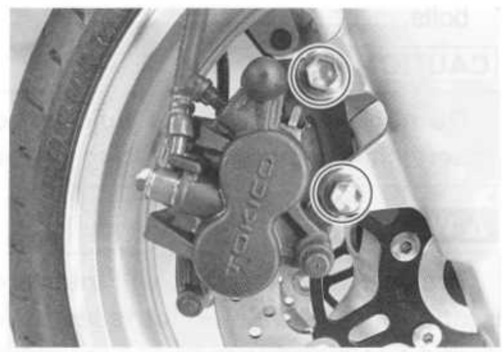
- Install the pad mounting pin ③.
- Install the pin ④ securely.



- Remount the caliper.
- Tighten the caliper mounting bolts to the specified torque.

Front brake caliper mounting bolt:
39 N·m (3.9 kgf-m, 28.0 lb-ft)

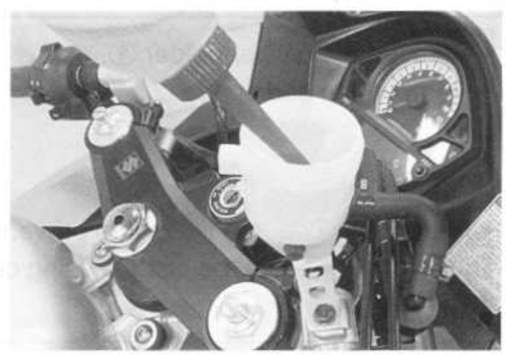
NOTE:
After replacing the brake pads, pump the brake lever several times to check for proper brake operation and then check the brake fluid level.



BRAKE FLUID REPLACEMENT

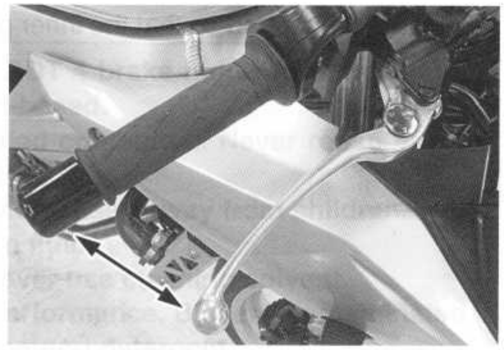
- Place the motorcycle on a level surface and keep the handlebars straight.
- Remove the brake fluid reservoir cap and diaphragm.
- Suck up the old brake fluid as much as possible.
- Fill the reservoir with the new brake fluid.

Specification and Classification: DOT 4



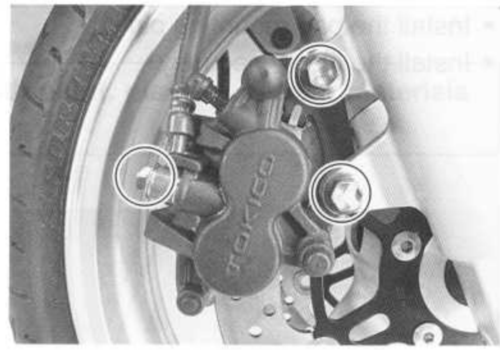
- Connect a clear hose to the caliper air bleeder valve and insert the other end of hose into a receptacle.
- Loosen the air bleeder valve and pump the brake lever until old brake fluid flows out of the bleeder system.
- Close the caliper air bleeder valve and disconnect a clear hose. Fill the reservoir with the new fluid to the upper mark of the reservoir.

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



CAUTION

> * **Never reuse the brake fluid left over from previous servicing and which has been stored for long periods of time.**
> * **Bleed air from the brake system. (☞2-28)**



CALIPER REMOVAL AND DISASSEMBLY

- Drain the brake fluid. (☞7-65)
- Remove the brake pads. (☞7-64)
- Disconnect the brake hoses by removing the brake hose union bolts.

NOTE:
Place a rag underneath the union bolt on the brake caliper to catch any spilt brake fluid.

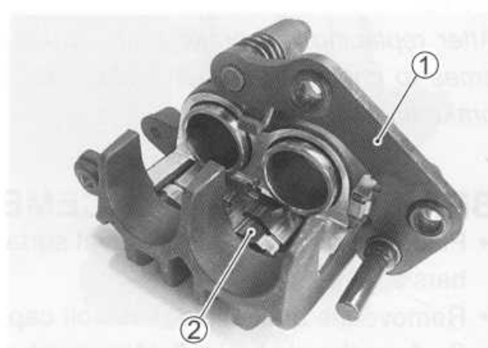
- Remove the brake calipers by removing the caliper mounting bolts.

CAUTION

> **Do not reuse the brake fluid left over from previous servicing and stored for long periods of time.**

⚠ WARNING

> **Brake fluid, if it leaks, will interfere with safe running and discolor painted surfaces. Check the brake hose and hose joints for cracks and fluid leakage.**



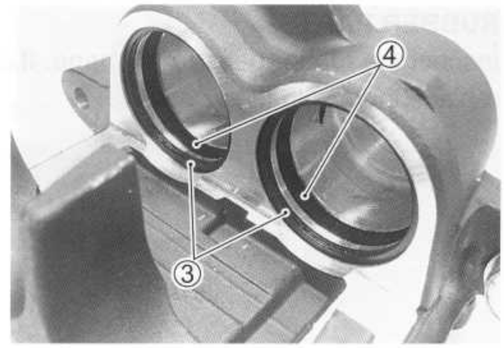
- Remove the caliper holder ①.
- Remove the pad spring ②.

- Place a rag over the pistons to prevent them from popping out and then force out the pistons using compressed air.

CAUTION

> **Do not use high pressure air to prevent piston damage.**

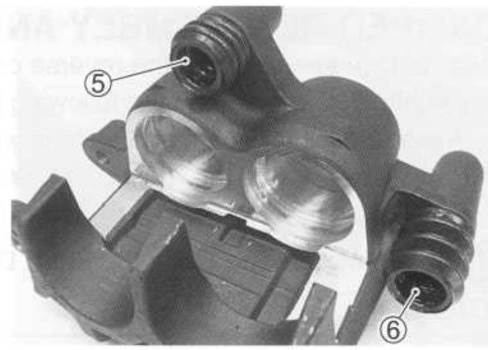
- Remove the dust seals ③ and piston seals ④.



CAUTION

Do not reuse the removed dust seals and piston seals to prevent fluid leakage.

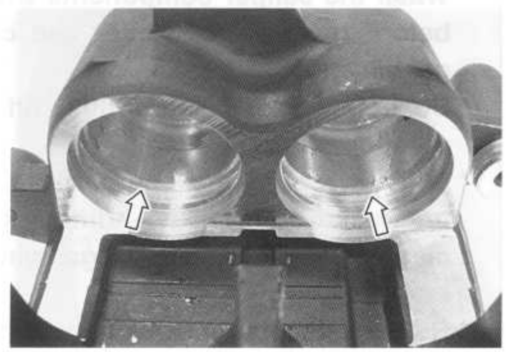
- Remove the rubber parts ⑤, ⑥.



CALIPER INSPECTION

BRAKE CALIPER

Inspect the brake caliper cylinder wall for nicks, scratches and other damage. If any damage is found, replace the caliper with a new one.

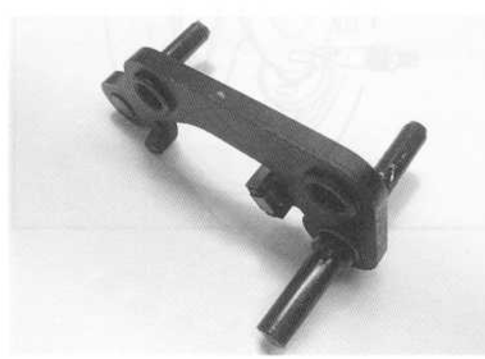


BRAKE CALIPER PISTON

Inspect the brake caliper piston surface for any scratches and other damage. If any damage is found, replace the caliper piston with a new one.

CALIPER HOLDER

- Inspect the caliper holder for damage. If any damage is found, replace it with a new one.



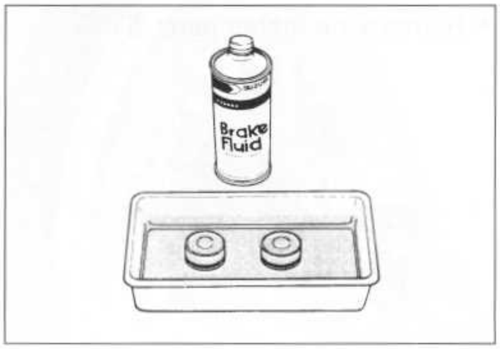
RUBBER PARTS

Inspect the rubber parts for damage. If any damages are found, replace them with the new ones.

CALIPER REASSEMBLY AND REMOUNTING

Reassemble the caliper in the reverse order of removal and disassembly. Pay attention to the following points:

- Wash the caliper bores and pistons with specified brake fluid. Particularly wash the dust seal grooves and piston seal grooves.



BF **Specification and Classification: DOT 4**

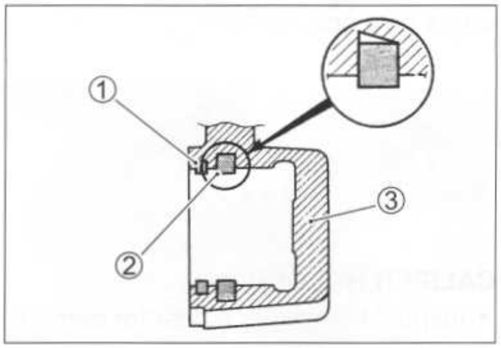
CAUTION

- *** Wash the caliper components with fresh brake fluid before reassembly. Never use cleaning solvent or gasoline to wash them.**
- *** Do not wipe the brake fluid off after washing the components with a rag.**
- *** When washing the components, use the specified brake fluid. Never use different types of fluid or cleaning solvent such as gasoline, kerosine or others.**
- *** Replace the piston seals and dust seals with the new ones when reassembly.**
- *** Apply the brake fluid to both seals when installing them.**

PISTON SEAL

- Install the piston seals as shown in the illustration.
- Install the piston to the caliper.

  ① Dust seal
  ② Piston seal
  ③ Caliper

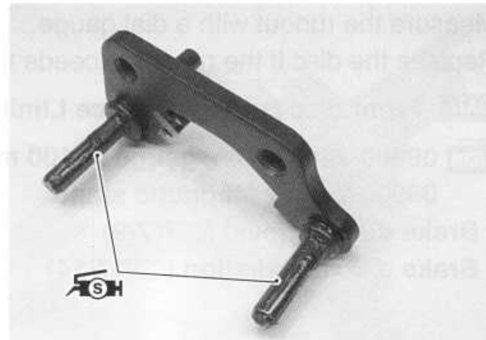


CALIPER HOLDER

- Apply SUZUKI SILICONE GREASE to the caliper holder pin.

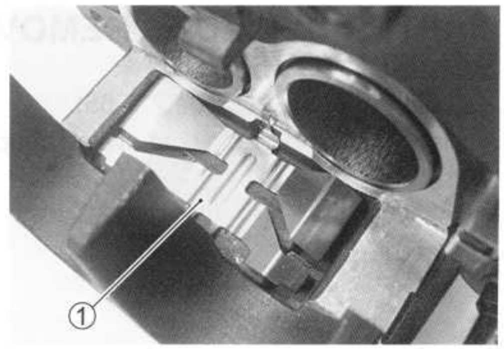
99000-25100: SUZUKI SILICONE GREASE

- Install the caliper holder to the caliper.



- Install the pad spring ①.
- Install the brake pads. (☞7-64)

NOTE:
Before remounting the caliper, push the piston all the way into the caliper.

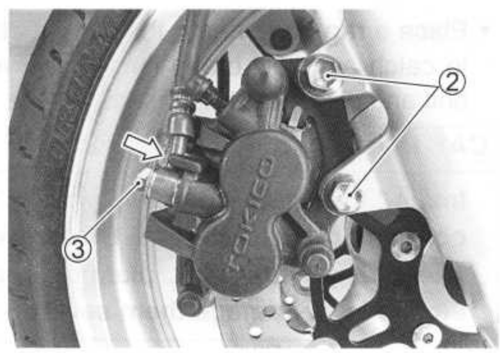


- Remount the brake caliper to the front fork.

Front brake caliper mounting bolt ②:
39 N·m (3.9 kgf-m, 28.0 lb-ft)

- Install the brake hose.
- After setting the brake hose union to the stopper (refer to page 9-33, 9-34), tighten the union bolt to the specified torque.

Front brake hose union bolt ③:
23 N·m (2.3 kgf-m, 16.5 lb-ft)



CAUTION

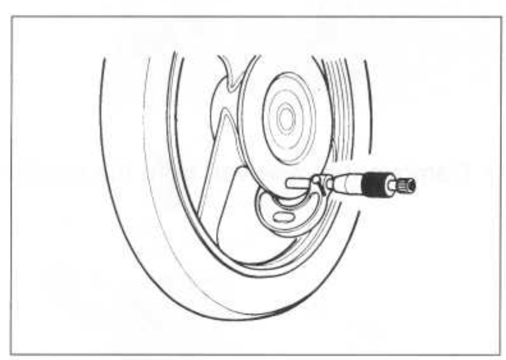
- **The seal washers should be replaced with the new ones to prevent fluid leakage.**
- **Bleed air from the system after reassembling the caliper. (☞2-28)**

BRAKE DISC INSPECTION

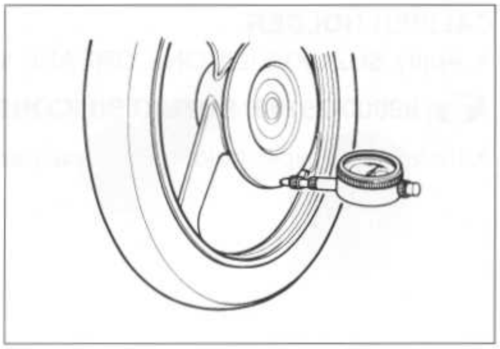
Visually check the brake disc for damage or cracks.
Measure the thickness with a micrometer.
Replace the disc if the thickness is less than the service limit or if damage is found.

DATA **Front disc thickness: Service Limit: 4.0 mm (0.16 in)**

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



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



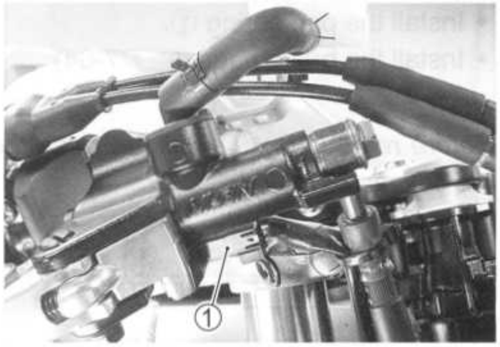
DATA **Front disc runout: Service Limit: 0.30 mm (0.012 in)**

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

*** Brake disc removal (☞7-9)**
*** Brake disc installation (☞7-14)**

MASTER CYLINDER REMOVAL AND DISASSEMBLY (SV650S)

- Drain the brake fluid. (☞7-65)
- Disconnect the brake light switch coupler ①.

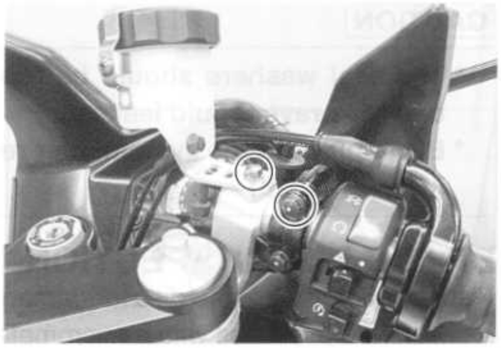


- Place a rag underneath the union bolt on the master cylinder to catch any spilt brake fluid. Remove the brake hose union bolt and disconnect the brake hose.

CAUTION

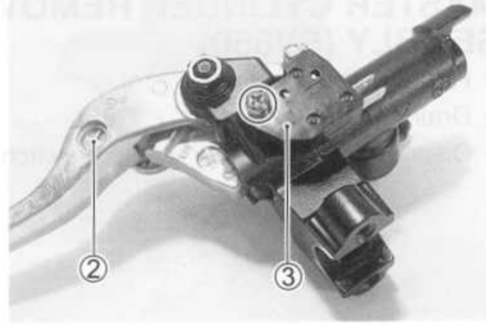
Immediately and completely wipe off any brake fluid contacting any part of the motorcycle. The fluid reacts chemically with paint, plastics and rubber materials, etc. and will damage them severely.

- Remove the master cylinder along with the reservoir.

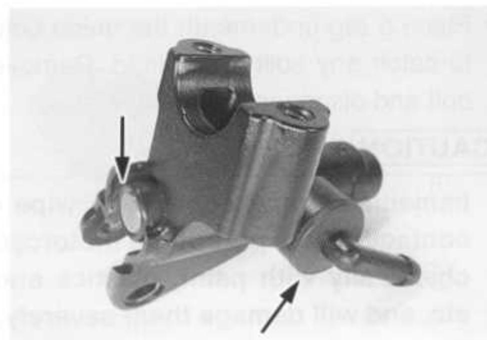


- Remove the reservoir from the master cylinder.

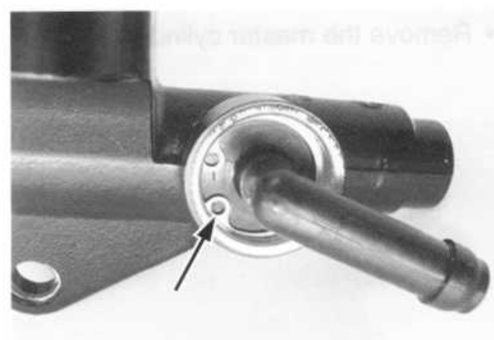
- Remove the brake lever ② and brake light switch ③.

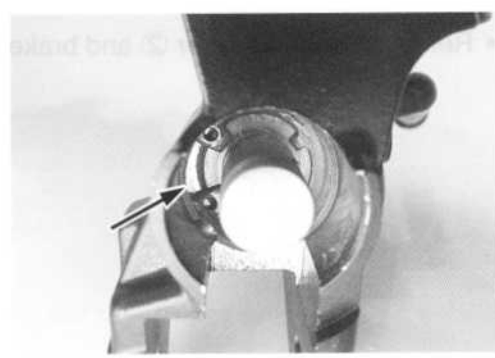


- Remove the dust cover and dust boot.

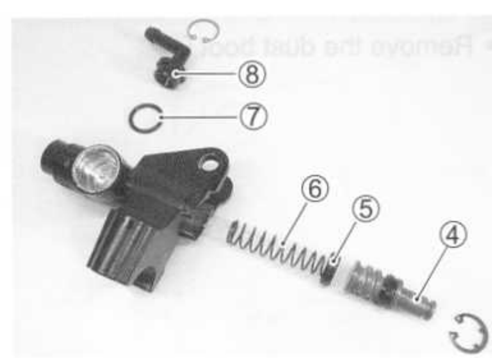


- Remove the snap rings.



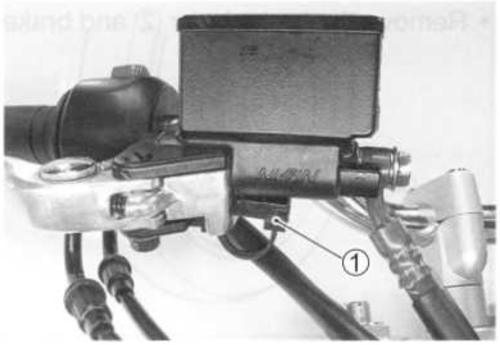


- Remove the piston and return spring.
  ④ Piston/Cup set
  ⑤ Primary cup
  ⑥ Return spring
  ⑦ O-ring
  ⑧ Brake hose connector



MASTER CYLINDER REMOVAL AND DISASSEMBLY (SV650)

- Remove the rear view mirror.
- Drain the brake fluid. (☞7-65)
- Disconnect the front brake light switch coupler ①.



- Place a rag underneath the union bolt on the master cylinder to catch any spilt brake fluid. Remove the brake hose union bolt and disconnect the brake hose.

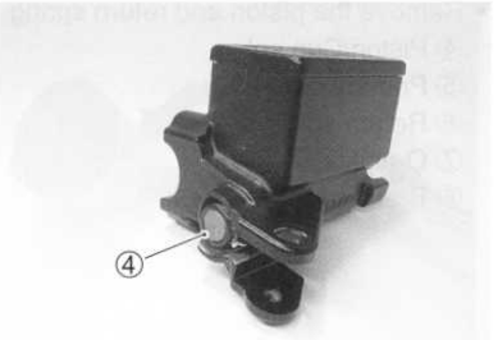
CAUTION

Immediately and completely wipe off any brake fluid contacting any part of the motorcycle. The fluid reacts chemically with paint, plastics and rubber materials, etc. and will damage them severely.

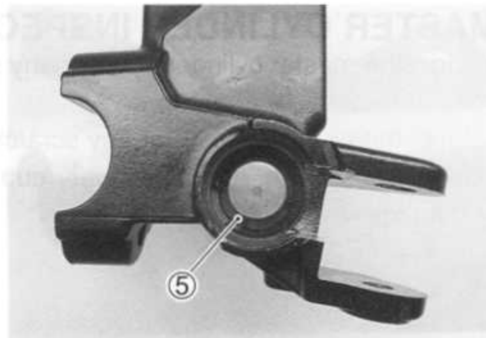
- Remove the master cylinder.

- Remove the brake lever ② and brake light switch ③.

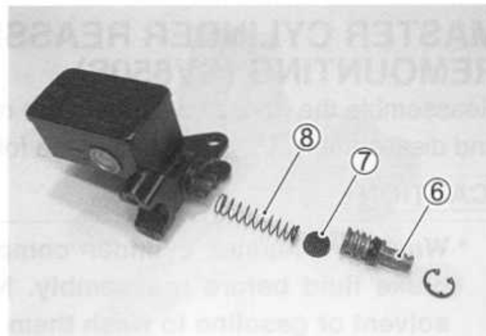
- Remove the dust boot ④.



• Remove the snap ring ⑤.



• Remove the piston and return spring.
⑥ Piston/Cup set
⑦ Primary cup
⑧ Return spring

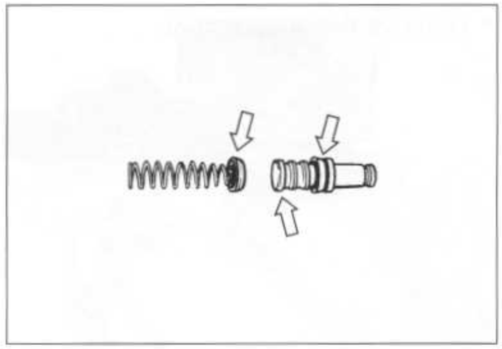


MASTER CYLINDER INSPECTION

Inspect the master cylinder bore for any scratches or other damage.

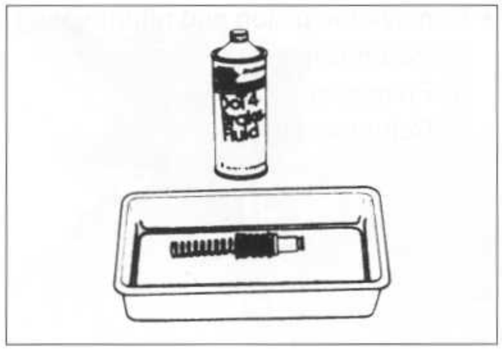
Inspect the piston surface for any scratches or other damage.

Inspect the primary cup, secondary cup and dust seal for wear or damage.



MASTER CYLINDER REASSEMBLY AND REMOUNTING (SV650S)

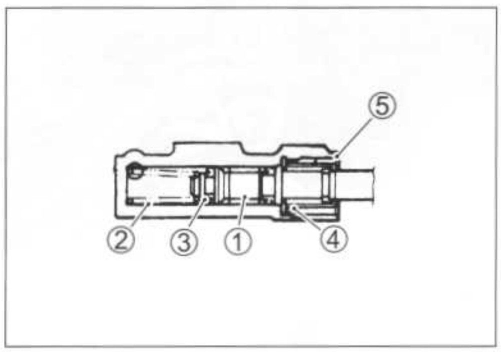
Reassemble the master cylinder in the reverse order of removal and disassembly. Pay attention to the following points:



CAUTION

- **Wash the master cylinder components with fresh brake fluid before reassembly. Never use cleaning solvent or gasoline to wash them.**
- **Do not wipe the components with a rag.**
- **Apply brake fluid to the cylinder bore and all the component to be inserted into the bore.**

- Install the piston/Cup set into the master cylinder.
  ① Piston
  ② Return spring
  ③ Primary cap
  ④ Snap ring
  ⑤ Dust boot

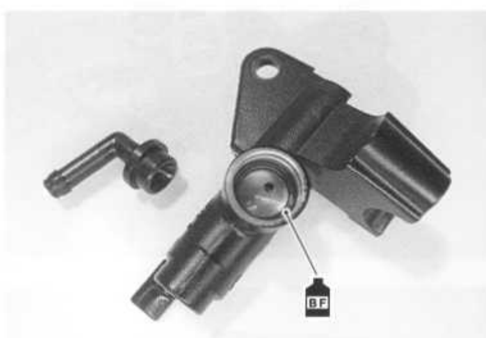


- Apply brake fluid to the O-ring, then install the O-ring to the master cylinder.
- Install the brake hose connector.

CAUTION

Use a new O-ring to prevent the fluid leakage.

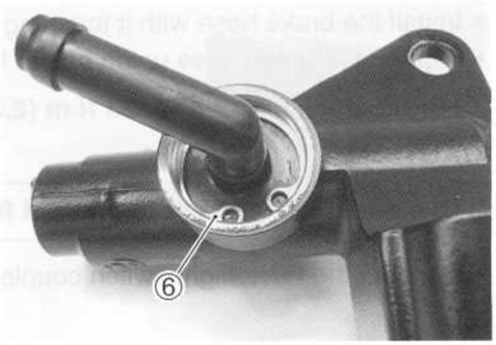
Specification and Classification: DOT 4



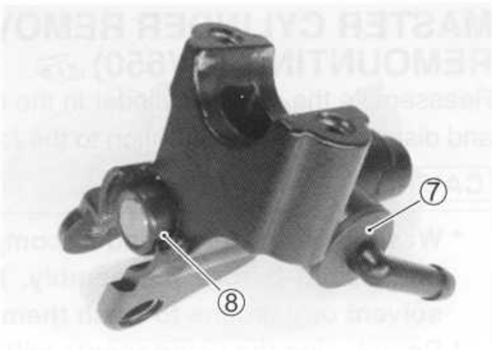
• Install the snap ring ⑥.

CAUTION

The round edge side of the circlip must be against to inside.



• Install the dust cover ⑦ and dust boot ⑧.



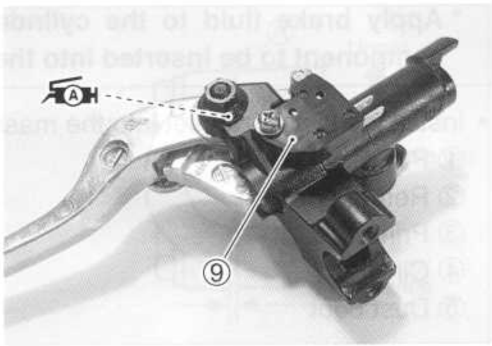
• Install the brake lever and brake light switch ⑨.

NOTE:

* *Apply SUZUKI SUPER GREASE to the brake lever pivot bolt when installing.*

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

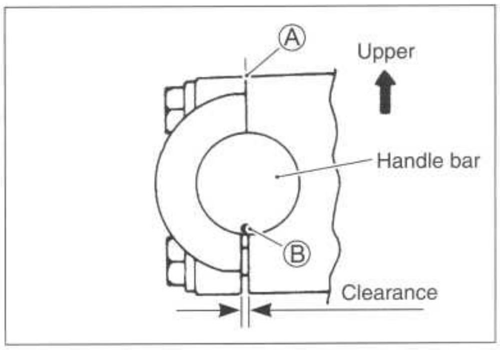
* *Align the projection on the brake light switch with the hole on the master cylinder.*



• Install the reservoir to the master cylinder.

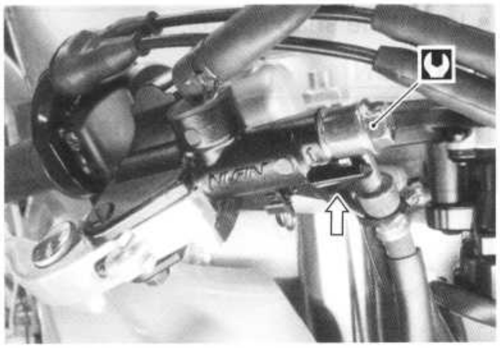
• When remounting the brake master cylinder onto the handlebar, align the master cylinder holder's mating surface Ⓐ with punched mark Ⓑ on the handlebar and tighten the upper clamp bolt first as shown.

Front brake master cylinder mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



* Install the brake hose with it touching the stopper. (☞9-33)
* Tighten the brake hose union bolt to the specified torque.

Brake hose union bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



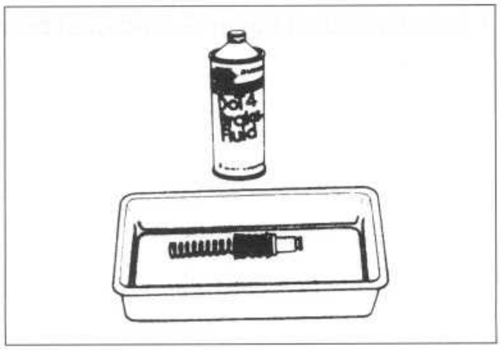
CAUTION

Use new seal washers to prevent fluid leakage.

* Connect the brake light switch coupler.

MASTER CYLINDER REMOVAL AND REMOUNTING (SV650)

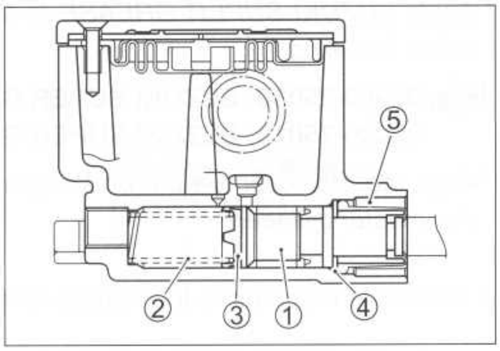
Reassemble the master cylinder in the reverse order of removal and disassembly. Pay attention to the following points:



CAUTION

* **Wash the master cylinder components with fresh brake fluid before reassembly. Never use cleaning solvent or gasoline to wash them.**
* **Do not wipe the components with a rag.**
* **Apply brake fluid to the cylinder bore and all the component to be inserted into the bore.**

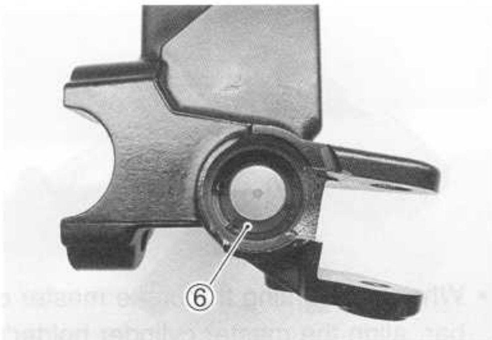
* Install the piston/cup set into the master cylinder.
  ① Piston
  ② Return spring
  ③ Primary cap
  ④ Circlip
  ⑤ Dust boot



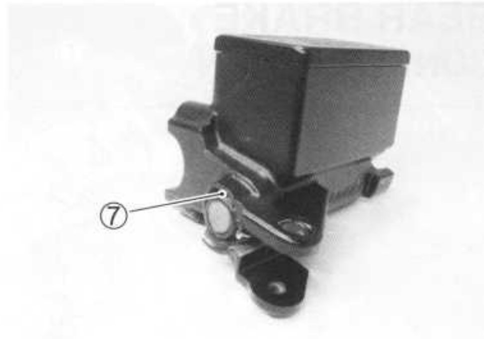
* Install the snap ring ⑥.

CAUTION

The round edge side of the circlip must be against to inside.



- Install the dust boot ⑦.

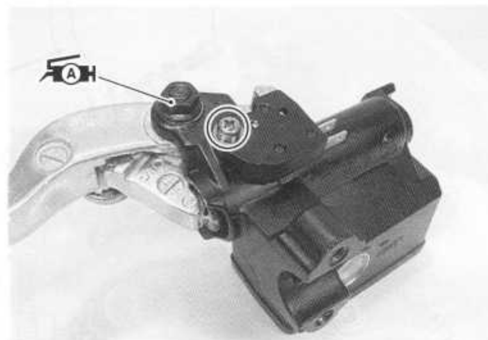


- Install the brake lever and brake light switch.

NOTE:
** Apply SUZUKI SUPER GREASE to the brake lever pivot bolt when installing.*

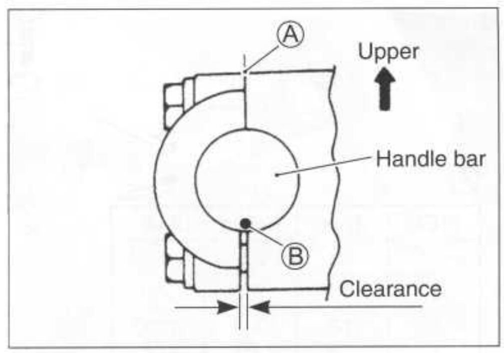
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)

** Align the projection on the brake light switch with the hole on the master cylinder.*



- When remounting the brake master cylinder onto the handlebar, align the master cylinder holder's mating surface Ⓐ with punched mark Ⓑ on the handlebar and tighten the upper clamp bolt first as shown.

Front brake master cylinder mounting bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



- Install the brake hose with it touching the stopper. (☞9-32)
- Tighten the brake hose union bolt to the specified torque.

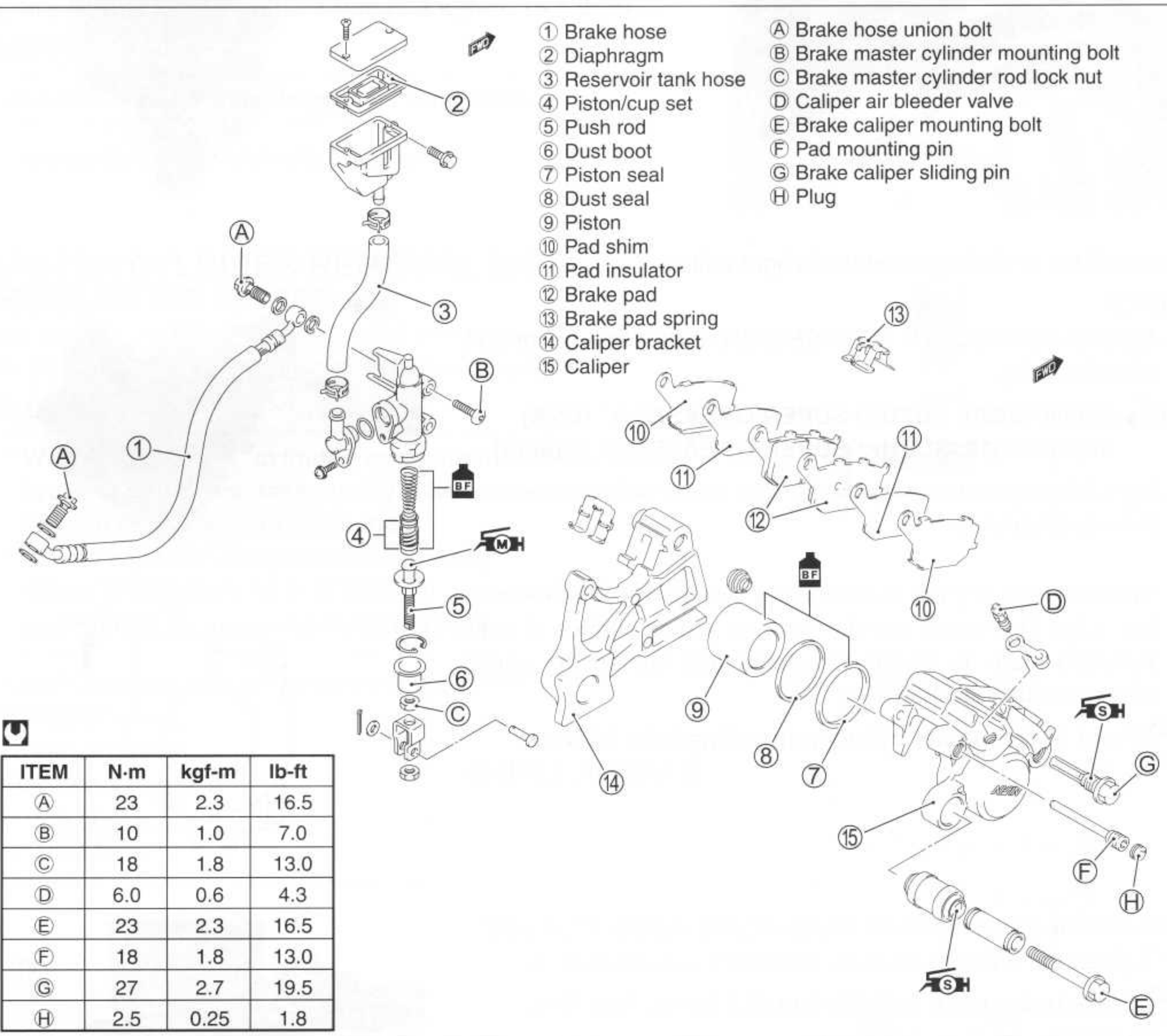
Brake hose union bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

CAUTION

Use new seal washers to prevent fluid leakage.

- Connect the brake light switch.

REAR BRAKE
CONSTRUCTION



ITEM	N·m	kgf-m	lb-ft
Ⓐ	23	2.3	16.5
Ⓑ	10	1.0	7.0
Ⓒ	18	1.8	13.0
Ⓓ	6.0	0.6	4.3
Ⓔ	23	2.3	16.5
Ⓕ	18	1.8	13.0
Ⓖ	27	2.7	19.5
Ⓗ	2.5	0.25	1.8

⚠ WARNING

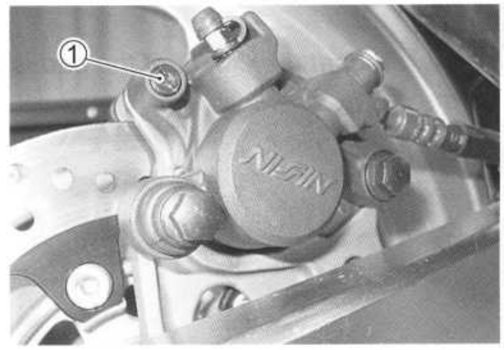
* **This brake system is filled with an ethylene glycol-based DOT 4 brake fluid. Do not use or mix different types of fluid such as silicone-based or petroleum-based.**
* **Do not use any brake fluid taken from old, used or unsealed containers. Never reuse brake fluid left over from the last servicing or stored for long periods.**
* **When storing the brake fluid, seal the container completely and keep away from children.**
* **When replenishing brake fluid, take care not to get dust into fluid.**
* **When washing brake components, use fresh brake fluid. Never use cleaning solvent.**
* **A contaminated brake disc or brake pad reduces braking performance. Discard contaminated pads and clean the disc with high quality brake cleaner or neutral detergent.**

CAUTION

Handle brake fluid with care: the fluid reacts chemically with paint, plastics, rubber materials etc. and will damage them severly.

BRAKE PAD REPLACEMENT

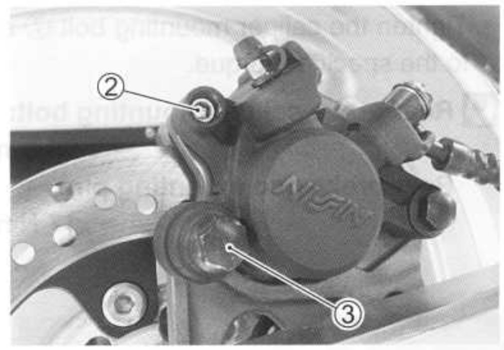
- Remove the plug ①.



- Loosen the pad mounting pin ②.
- Remove the caliper bracket bolt ③.

CAUTION

> *** Do not operate the brake pedal while dismounting the pads.**
> *** Replace the brake pads as a set, otherwise braking performance will be adversely affected.**

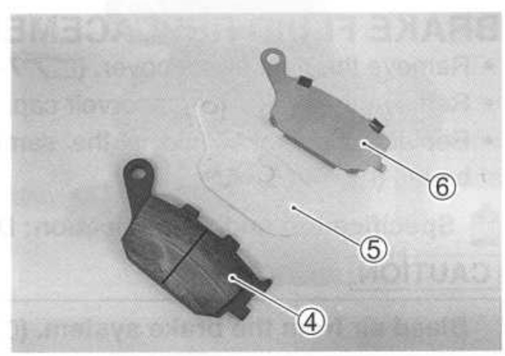


- Remove the pad mounting pin and brake pads with the rear caliper pivoted up.
- Clean up the caliper especially around the caliper pistons.
- Inspect the pad mounting pin for wear or damage. If necessary, replace it with a new one.

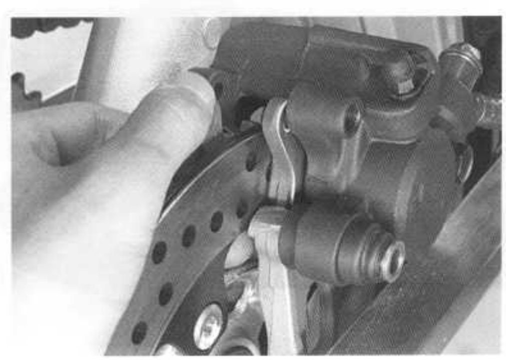
- Assemble the new brake pad ④, insulator ⑤ and shim ⑥.

CAUTION

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

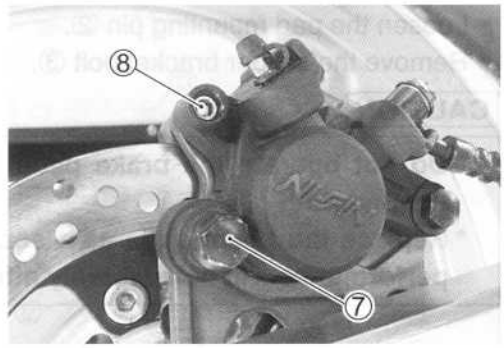


- Install the new brake pads and pad mounting pin.



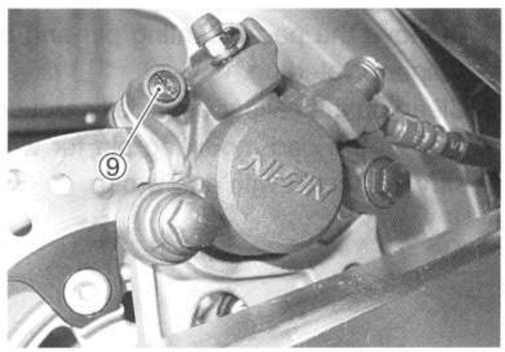
NOTE:
Make sure that the detent of the pad is seated onto the retainer on the caliper bracket.

- Tighten the caliper mounting bolt ⑦ and pad mounting pin ⑧ to the specified torque.



Rear brake caliper mounting bolt:
23 N·m (2.3 kgf-m, 16.5 lb-ft)
Rear brake pad mounting pin:
17 N·m (1.7 kgf-m, 12.5 lb-ft)

- Install the plug ⑨ to the specified torque.

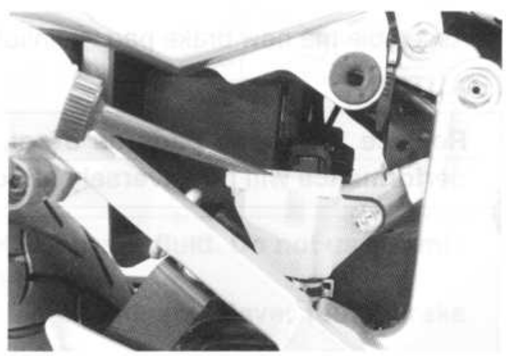


Pad pin plug: 2.5 N·m (0.25 kgf-m, 1.8 lb-ft)

NOTE:
After replacing the brake pads, pump the brake pedal several times in order to operate the brake parts correctly and then check the brake fluid level.

BRAKE FLUID REPLACEMENT

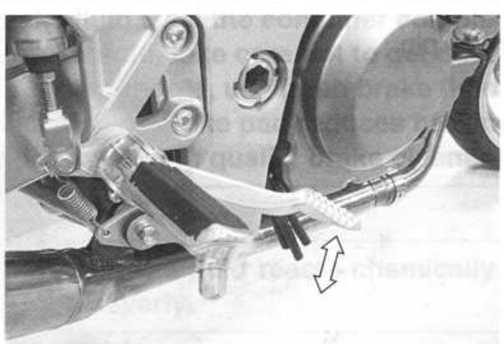
- Remove the right frame cover. (☞7-4)
- Remove the brake fluid reservoir cap.
- Replace the brake fluid in the same manner as the front brake. (☞7-65)

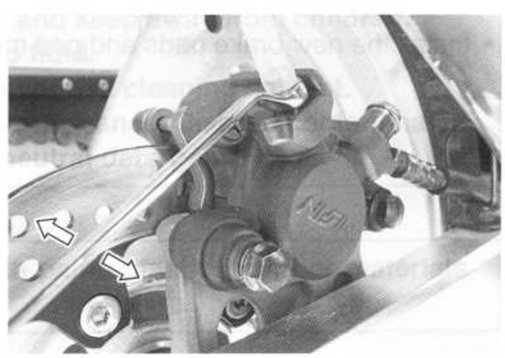


Specification and Classification: DOT 4

CAUTION

Bleed air from the brake system. (☞2-28)





CALIPER REMOVAL AND DISASSEMBLY

- Drain the brake fluid. (☞7-65)
- Remove the brake pads. (☞7-79)
- Place a rag underneath the union bolt to catch any spilt brake fluid.
- Disconnect the brake hose by removing the brake hose union bolt.

CAUTION

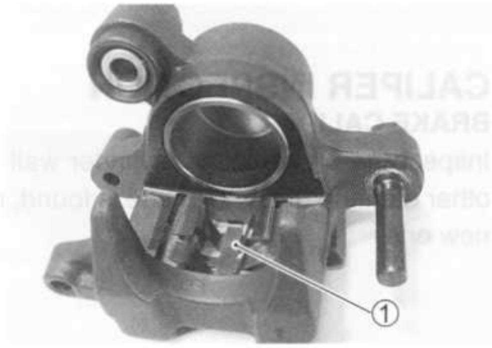
Do not reuse the brake fluid left over from previous servicing and stored for long periods.

⚠ WARNING

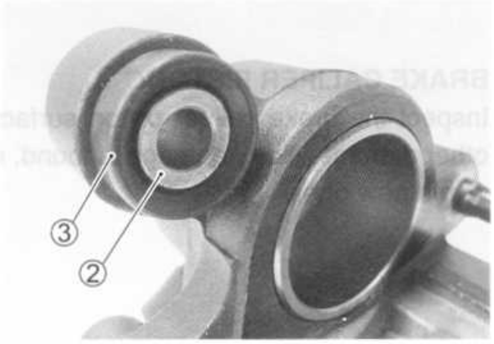
Brake fluid, if it leaks, will interfere with safe running and discolor painted surfaces. Check the brake hose and hose joints for cracks and fluid leakage.

- Pivot the caliper up and remove the caliper from the caliper bracket.

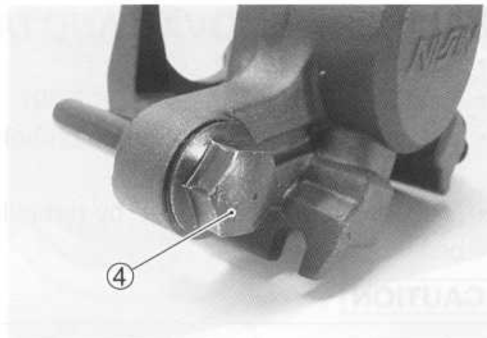
- Remove the brake pad spring ①.



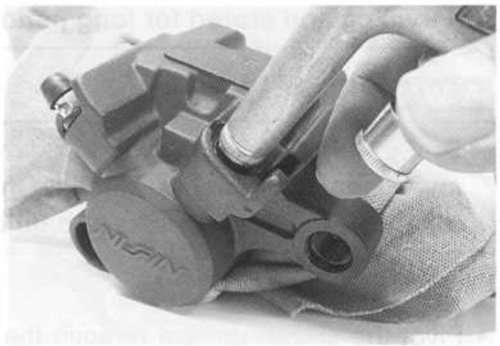
- Remove the spacer ② and boot ③ from the caliper.



- Remove the slide pin ④.



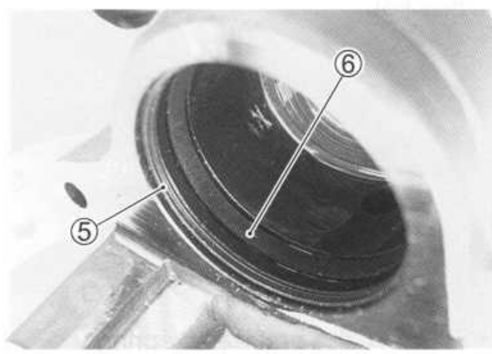
- Place a rag over the piston to prevent it from popping out and then force out the piston using compressed air.



CAUTION

Do not use high pressure air to prevent piston damage.

- Remove the dust seal ⑤ and piston seal ⑥.



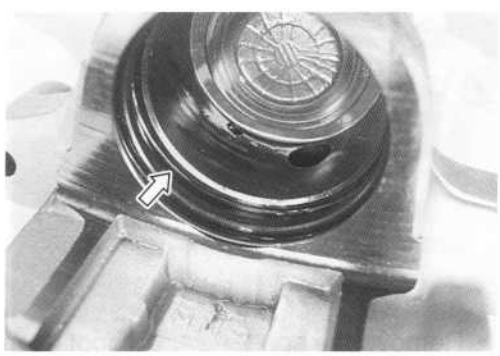
CAUTION

Do not reuse the dust seal and piston seal to prevent fluid leakage.

CALIPER INSPECTION

BRAKE CALIPER

Inspect the brake caliper cylinder wall for nicks, scratches and other damage. If any damage is found, replace the caliper with a new one.



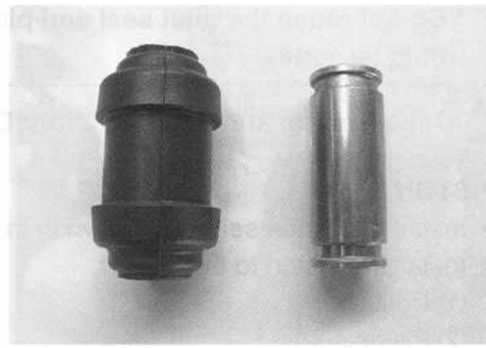
BRAKE CALIPER PISTON

Inspect the brake caliper piston surface for any scratches and other damage. If any damage is found, replace the caliper piston with a new one.

BRAKE CALIPER SLIDING PIN

Inspect the brake caliper sliding pin for wear and other damage. If any damage is found, replace the sliding pin with a new one.

Inspect the boot and spacer for damage and wear. If any damages are found, replace boot and spacer with new ones.



BRAKE DISC INSPECTION

Inspect the rear brake disc in the same manner as that of the front one. (☞7-69)

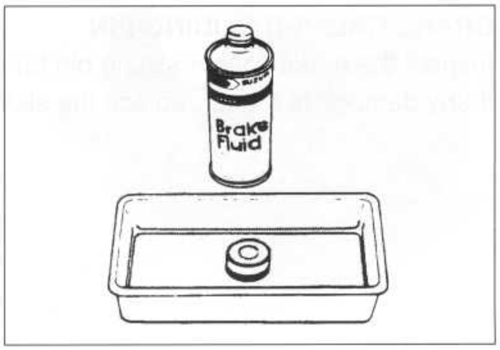
DATA **Service Limit**

Rear disc thickness: 4.5 mm (0.18 in)
Rear disc runout: 0.30 mm (0.012 in)

*** Brake disc removal (☞7-43)**
*** Brake disc installation (☞7-48)**

CALIPER REASSEMBLY AND REMOUNTING

Reassemble and remount the caliper in the reverse order of removal and disassembly. Pay attention to the following points:



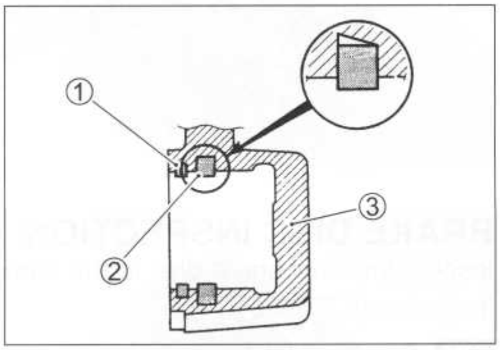
CAUTION

*** Wash the caliper components with fresh brake fluid before reassembly. Never use cleaning solvent or gasoline to wash them.**
*** Apply brake fluid to the caliper bore and piston to be inserted into the bore.**
*** Do not reuse the dust seal and piston seal to prevent fluid leakage.**

BF Specification and Classification: DOT 4

PISTON SEAL

- Install the piston seals as shown in the right illustration.
- Install the piston to the caliper.
  ① Dust seal
  ② Piston seal
  ③ Caliper

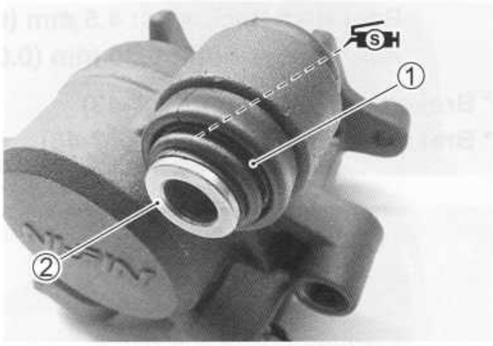


SLIDING PIN

- Install the boot ①.
- Apply SUZUKI SILICONE GREASE to the inside of the boot.

SH 99000-25100: SUZUKI SILICONE GREASE

- Install the spacer ②.

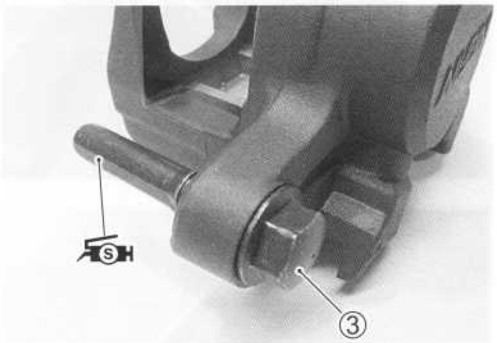


- Tighten the sliding pin ③ to the specified torque.

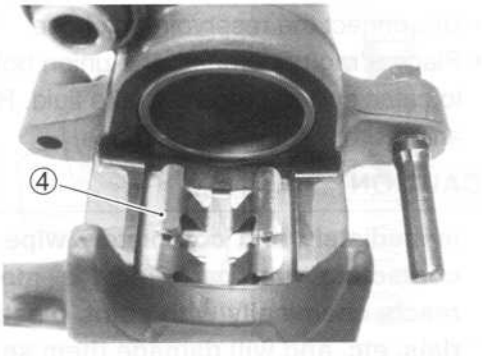
Brake caliper sliding pin: 27 N·m (2.7 kgf-m, 19.5 lb-ft)

- Apply SUZUKI SILICONE GREASE to the sliding pin.

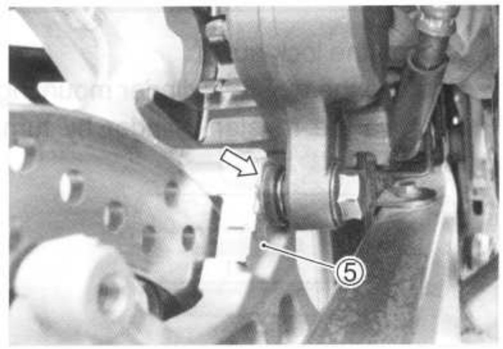
SH 99000-25100: SUZUKI SILICONE GREASE



* Install the brake pad spring ④ so that the longer tabs will be on piston side as shown.



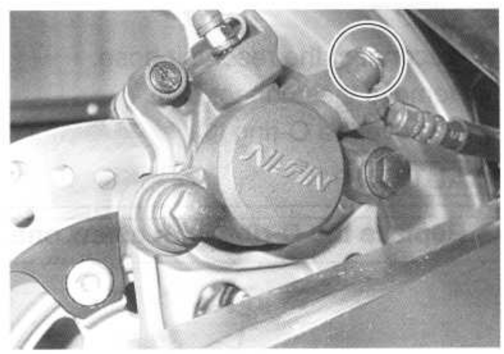
* Install the caliper to the caliper bracket ⑤.
* Set the boot onto the sliding pin securely.
* Install the brake pad. (☞7-79)



CAUTION

Confirm that there is a brake pad spring when installing the brake pads.

* Tighten the brake hose union bolt with the brake hose union pipe seated in the cutout on the caliper.
  (Rear brake hose routing: ☞9-34 and 35)



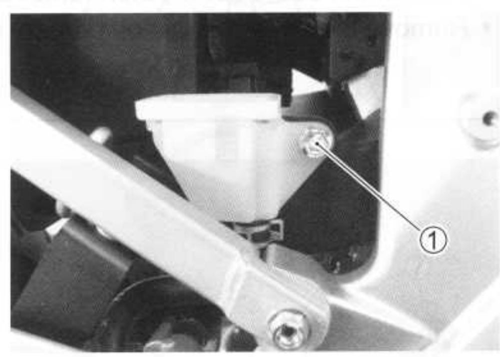
Brake hose union bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

CAUTION

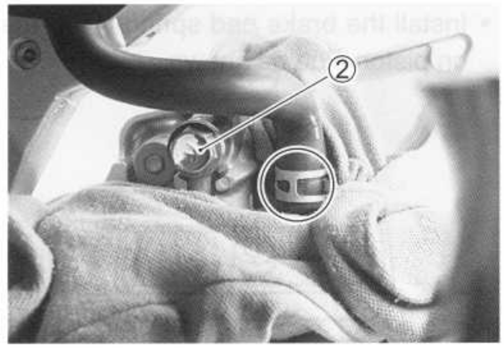
*** The seal washers should be replaced with the new ones to prevent fluid leakage.**
*** Bleed air from the system after reassembling the caliper. (☞2-28)**

MASTER CYLINDER REMOVAL AND DISASSEMBLY

* Drain the brake fluid. (☞7-65)
* Remove the brake fluid reservoir tank mounting bolt ①.



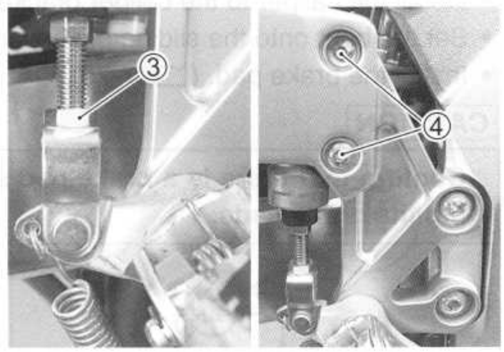
- Disconnect the reservoir tank hose.
- Place a rag underneath the union bolt on the master cylinder to catch spilled drops of brake fluid. Remove the union bolt ② and disconnect the brake hose.



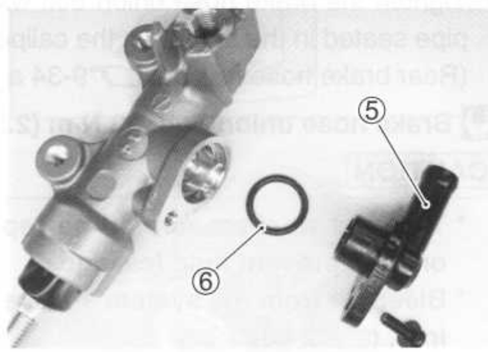
CAUTION

Immediately and completely wipe off any brake fluid contacting any parts of the motorcycle. The fluid reacts chemically with paint, plastic and rubber materials, etc. and will damage them severely.

- Loosen the lock nut ③.
- Remove the master cylinder mounting bolts ④.
- Remove the master cylinder by turning the master cylinder rod.



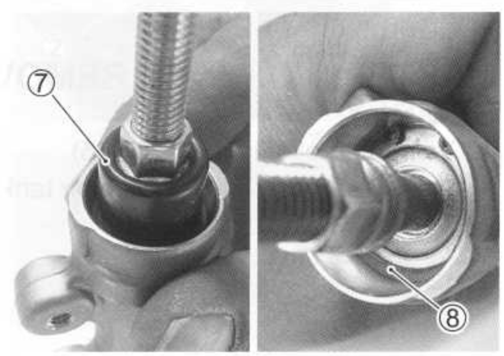
- Disconnect the reservoir hose.
- Remove the connector ⑤.
- Remove the O-ring ⑥.



CAUTION

Replace the O-ring with a new one.

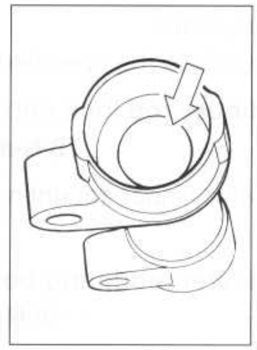
- Pull out the dust boot ⑦, then remove the snap ring ⑧.
- Remove the push rod, piston/primary cup and spring.

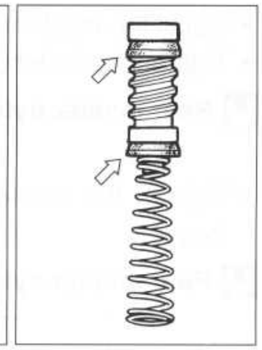


MASTER CYLINDER INSPECTION

CYLINDER, PISTON AND CUP SET

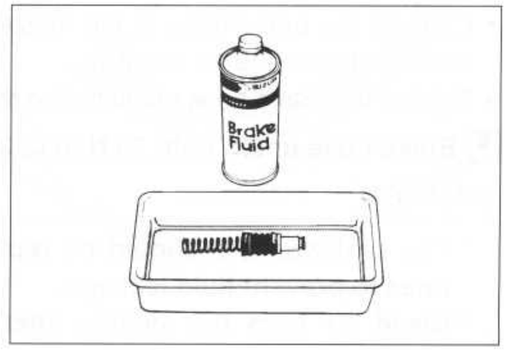
Inspect the cylinder bore wall for any scratches or other damage.
Inspect the cup set and each rubber part for damage.





MASTER CYLINDER REASSEMBLY AND REMOUNTING

Reassemble and remount the master cylinder in the reverse order of removal and disassembly. Pay attention to the following points:



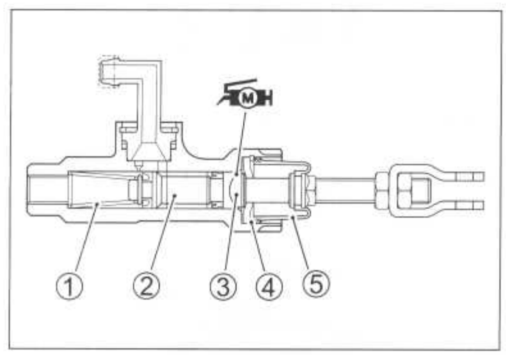
CAUTION

- * **Wash the master cylinder components with fresh brake fluid before reassembly. Never use cleaning solvent or gasoline to wash them.**
- * **Do not wipe the components with a rag.**
- * **Apply brake fluid to the cylinder bore and all the component to be inserted into the bore.**

Specification and Classification: DOT 4

- Apply brake fluid to the piston/Cup set.
- Install the following parts.
  ① Return spring
  ② Piston/Primary cup
  ③ Push rod
  ④ Snap ring
  ⑤ Dust boot
- Apply SUZUKI MOLY PASTE to the push rod.

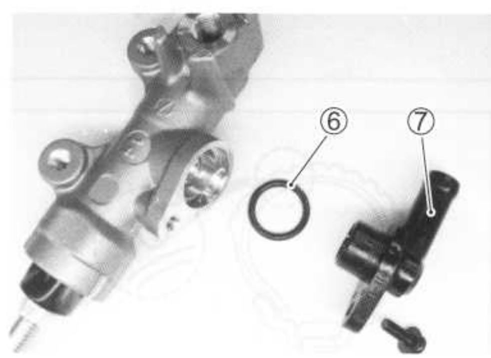
99000-25140: SUZUKI MOLY PASTE

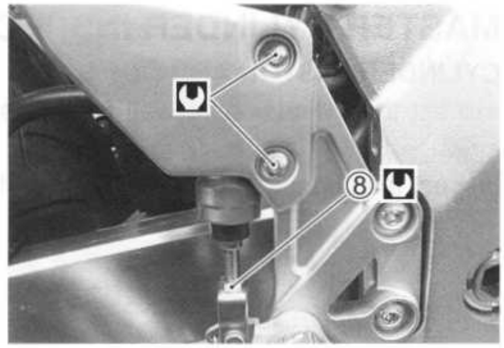


- Install the O-ring ⑥ and connector ⑦ to the master cylinder.

CAUTION

Replace the removed O-ring with a new one.



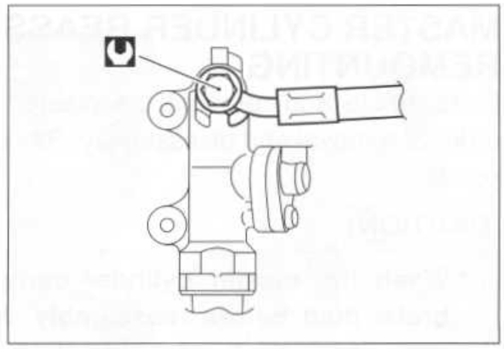


- Install the master cylinder.
- Tighten the lock nut ⑧ to the specified torque.

Rear master cylinder rod lock nut:
18 N·m (1.8 kgf-m, 13.0 lb-ft)

- Tighten the master cylinder mounting bolts to the specified torque.

Rear master cylinder mounting bolt:
10 N·m (1.0 kgf-m, 7.0 lb-ft)



- Connect the brake hose to the master cylinder. (Rear brake hose routing: ☞9-34 and 35)
- Tighten the brake hose union bolt to the specified torque.

Brake hose union bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)

CAUTION

*** The seal washers should be replaced with the new ones to prevent fluid leakage.**
*** Bleed air from the system after reassembling the master cylinder. (☞2-28)**

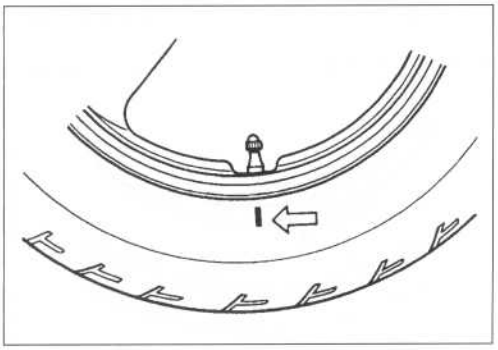
- Adjust the brake pedal height. (☞2-27)
- Reinstall the master cylinder.

TIRE AND WHEEL

TIRE REMOVAL

The most critical factor of a tubeless tire is the seal between the wheel rim and the tire bead. For this reason, it is recommended to use a tire changer that can satisfy this sealing requirement and can make the operation efficient as well as functional.
For operating procedures, refer to the instructions supplied by the tire changer manufacturer.

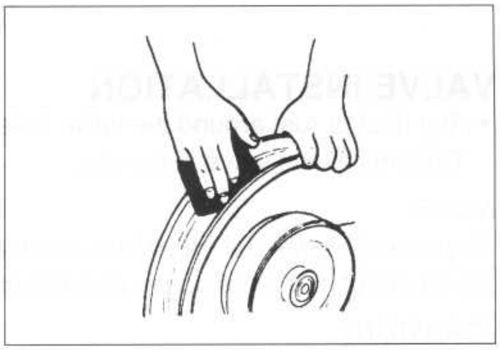
NOTE:
When removing the tire in the case of repair or inspection, mark the tire with a chalk to indicate the tire position relative to the valve position.
Even though the tire is refitted to the original position after repairing puncture, the tire may have to be balanced again since such a repair can cause imbalance.



INSPECTION

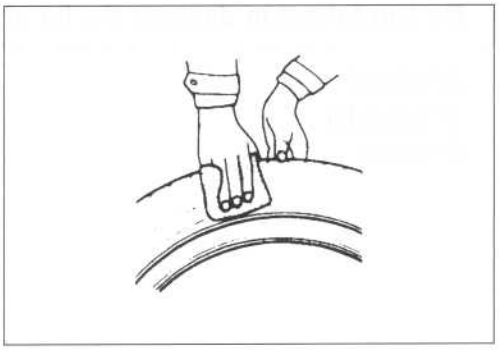
WHEEL

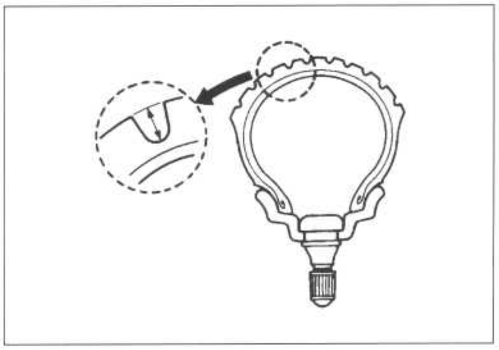
Wipe the wheel clean and check for the following:
* Distortion and crack
* Any flaws and scratches at the bead seating area.
* Wheel rim runout (☞7-10)



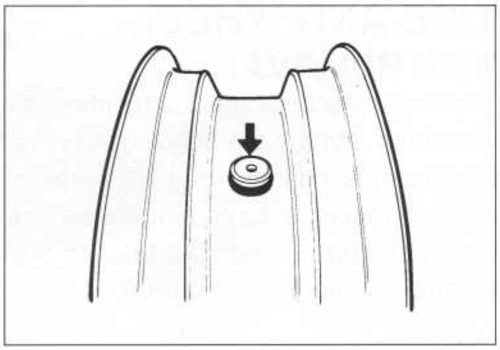
TIRE

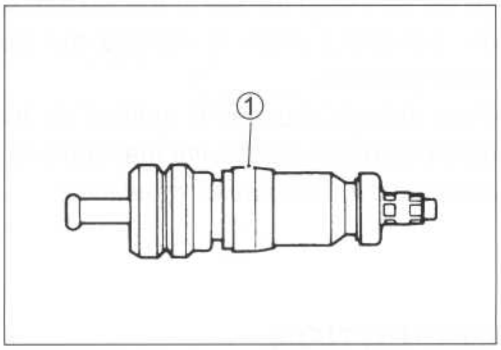
Tire must be checked for the following points:
* Nick and rupture on side wall
* Tire tread depth (☞2-29)
* Tread separation
* Abnormal, uneven wear on tread
* Surface damage on bead
* Localized tread wear due to skidding (Flat spot)
* Abnormal condition of inner liner





VALVE
- Inspect the valve after the tire is removed from the rim. Replace the valve with a new one if the seal rubber is peeling or has damage.
- Inspect the valve core. If the seal ① has abnormal deformation, replace the valve with a new one.





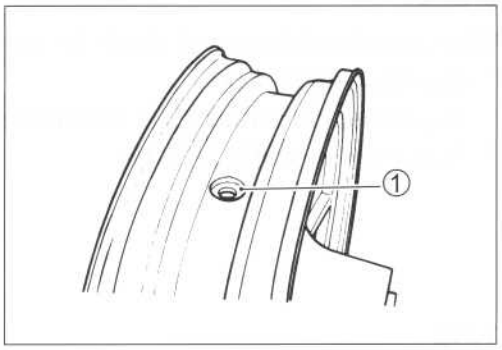
VALVE INSTALLATION
- Any dust or rust around the valve hole ① must be cleaned off. Then install the valve in the rim.

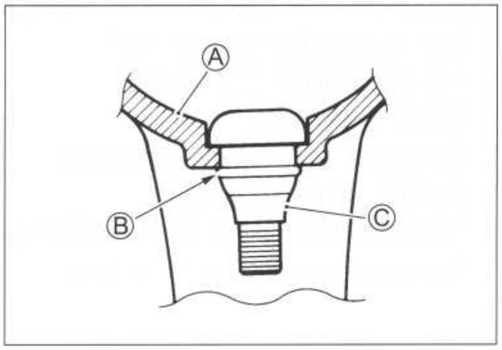
NOTE:
To properly install the valve into the valve hole, apply a special tire lubricant or neutral soapy liquid to the valve.

CAUTION

Be careful not to damage the lip of valve.

Ⓐ Wheel
Ⓑ Valve lip
Ⓒ Valve





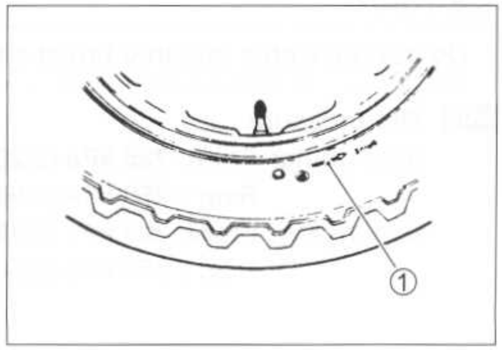
TIRE INSTALLATION

* Apply tire lubricant to the tire bead.
* When installing the tire onto the wheel, observe the following points.

CAUTION

*** Do not reuse the valve which has been once removed.**
*** Do not use oil, grease or gasoline on the tire bead in place of tire lubricant.**

* When installing the tire, the arrow ① on the side wall should point to the direction of wheel rotation.
* Align the chalk mark put on the tire at the time of removal with the valve position.

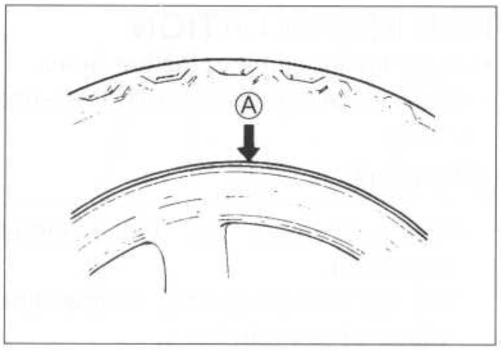


* For installation procedure of tire onto the wheel, follow the instructions given by the tire changer manufacturer.
* Bounce the tire several times while rotating. This makes the tire bead expand outward to contact the wheel, thereby facilitating air inflation.
* Inflate the tire.

⚠ WARNING

*** Do not inflate the tire to more than 400 kPa (4.0kgf/cm²). If inflated beyond this limit, the tire can burst and possibly cause injury. Do not stand directly over the tire while inflating.**
*** In the case of preset pressure air inflator, pay special care for the set pressure adjustment.**

- In this condition, check the "rim line" Ⓐ cast on the tire side walls. The line must be equidistant from the wheel rim all around. If the distance between the rim line Ⓐ and wheel rim varies, this indicates that the bead is not properly seated. If this is the case, deflate the tire completely and unseat the bead for both sides. Coat the bead with lubricant and fit the tire again.
- When the bead has been fitted properly, adjust the pressure to specification.
- As necessary, adjust the tire balance.



CAUTION

Do not run with a repaired tire at a high speed.

DATA **Tire pressure**

Solo riding: Front: 225 kPa (2.25 kgf/cm², 33 psi)
Rear : 250 kPa (2.50 kgf/cm², 36 psi)
Dual riding: Front: 225 kPa (2.25 kgf/cm², 33 psi)
Rear : 250 kPa (2.50 kgf/cm², 36 psi)

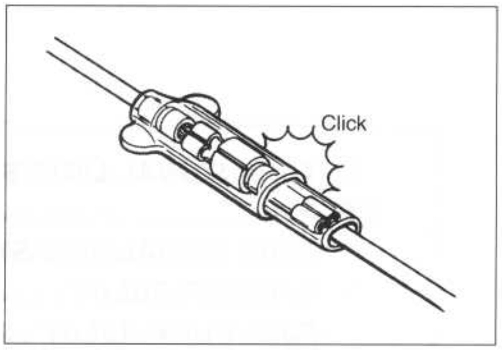
ELECTRICAL SYSTEM

CONTENTS

CAUTIONS IN SERVICING

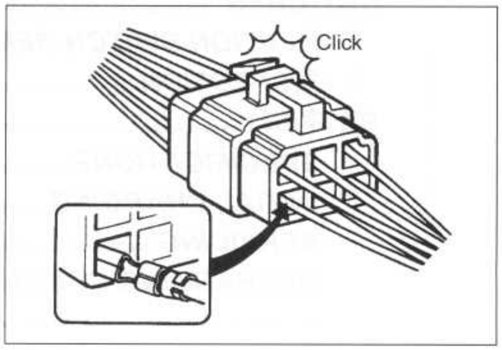
CONNECTOR

- When connecting a connector, be sure to push it in until a click is felt.
- Inspect the connector for corrosion, contamination and breakage in its cover.



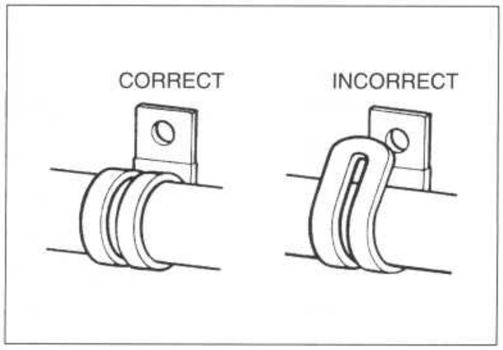
COUPLER

- With a lock type coupler, be sure to release the lock before disconnecting it and push it in fully till the lock works when connecting it.
- When disconnecting the coupler, be sure to hold the coupler itself and do not pull the lead wires.
- Inspect each terminal on the coupler for being loose or bent.
- Inspect each terminal for corrosion and contamination.



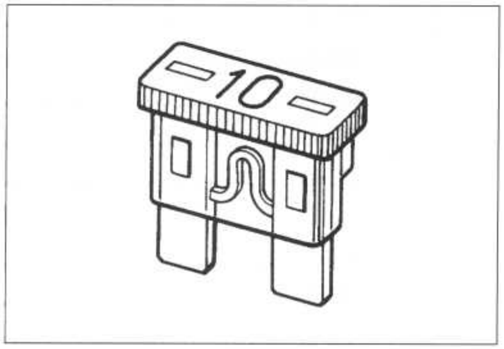
CLAMP

- Clamp the wire harness at such positions as indicated in "WIRE HARNESS ROUTING". (☞9-14 to 9-16)
- Bend the clamp properly so that the wire harness is clamped securely.
- In clamping the wire harness, use care not to allow it to hang down.
- Do not use wire or any other substitute for the band type clamp.

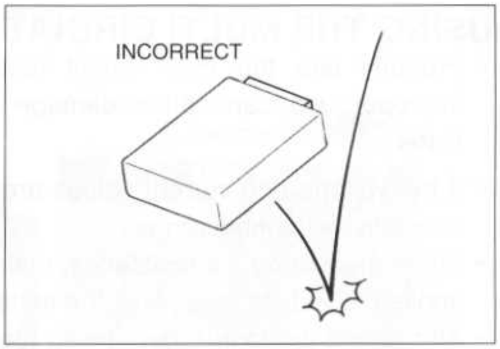


FUSE

- When a fuse blows, always investigate the cause, 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.



SEMI-CONDUCTOR EQUIPPED PART

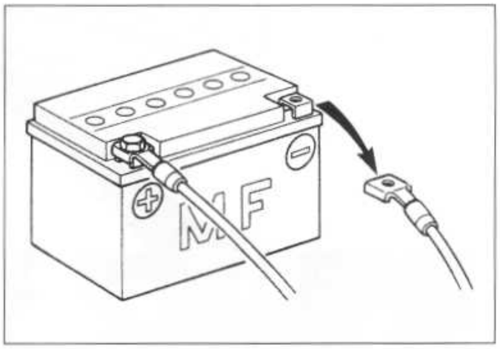


- Be careful not to drop the part with a semi-conductor built in such as a ECM.
- When inspecting this part, follow inspection instruction strictly. Neglecting proper procedure may cause damage to this part.

BATTERY

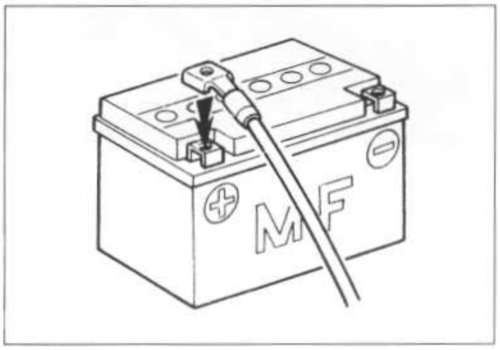
- The MF battery used in this motorcycle does not require maintenance (e.g., electrolyte level inspection, distilled water replenishment).
- During normal charging, no hydrogen gas is produced. However, if the battery is overcharged, hydrogen gas may be produced. Therefore, be sure there are no fire or spark sources (e.g., short circuit) nearby when charging the battery.
- Be sure to recharge the battery in a well-ventilated and open area.
- Note that the charging system for the MF battery is different from that of a conventional battery. Do not replace the MF battery with a conventional battery.

CONNECTING THE BATTERY



- When disconnecting terminals from the battery for disassembly or servicing, be sure to disconnect the ⊖ battery lead wire, first.
- When connecting the battery lead wires, be sure to connect the ⊕ battery lead wire, first.
- If the terminal is corroded, remove the battery, pour warm water over it and clean it with a wire brush.
- After connecting the battery, apply a light coat of grease to the battery terminals.
- Install the cover over the ⊕ battery terminal.

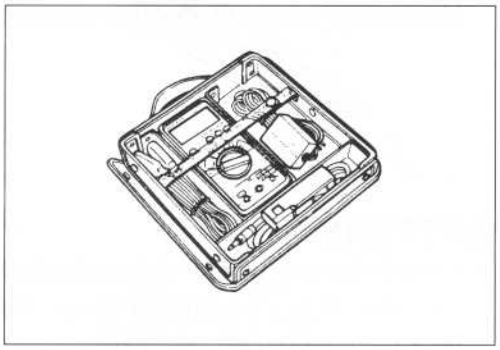
WIRING PROCEDURE



- Properly route the wire harness according to the "WIRE ROUTING" section. (☞9-14 to 9-16)

USING THE MULTI CIRCUIT TESTER

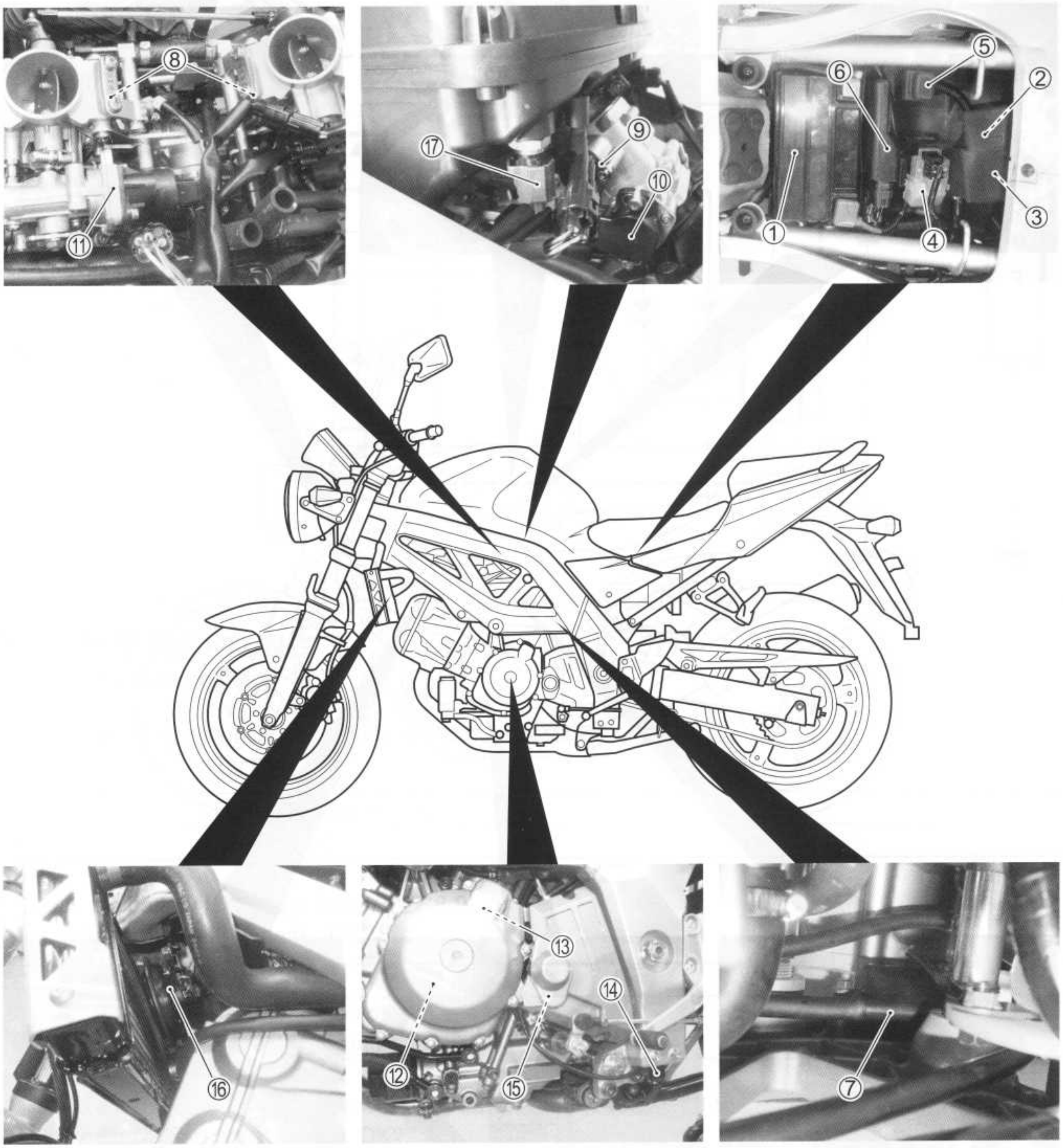
- Properly use the multi circuit tester ⊕ and ⊖ probes. Improper use can cause damage to the motorcycle and tester.
- If the voltage and current values are not known, begin measuring in the highest range.
- When measuring the resistance, make sure that no voltage is applied. If voltage is applied, the tester will be damaged.
- After using the tester, be sure to turn the switch to the OFF position.



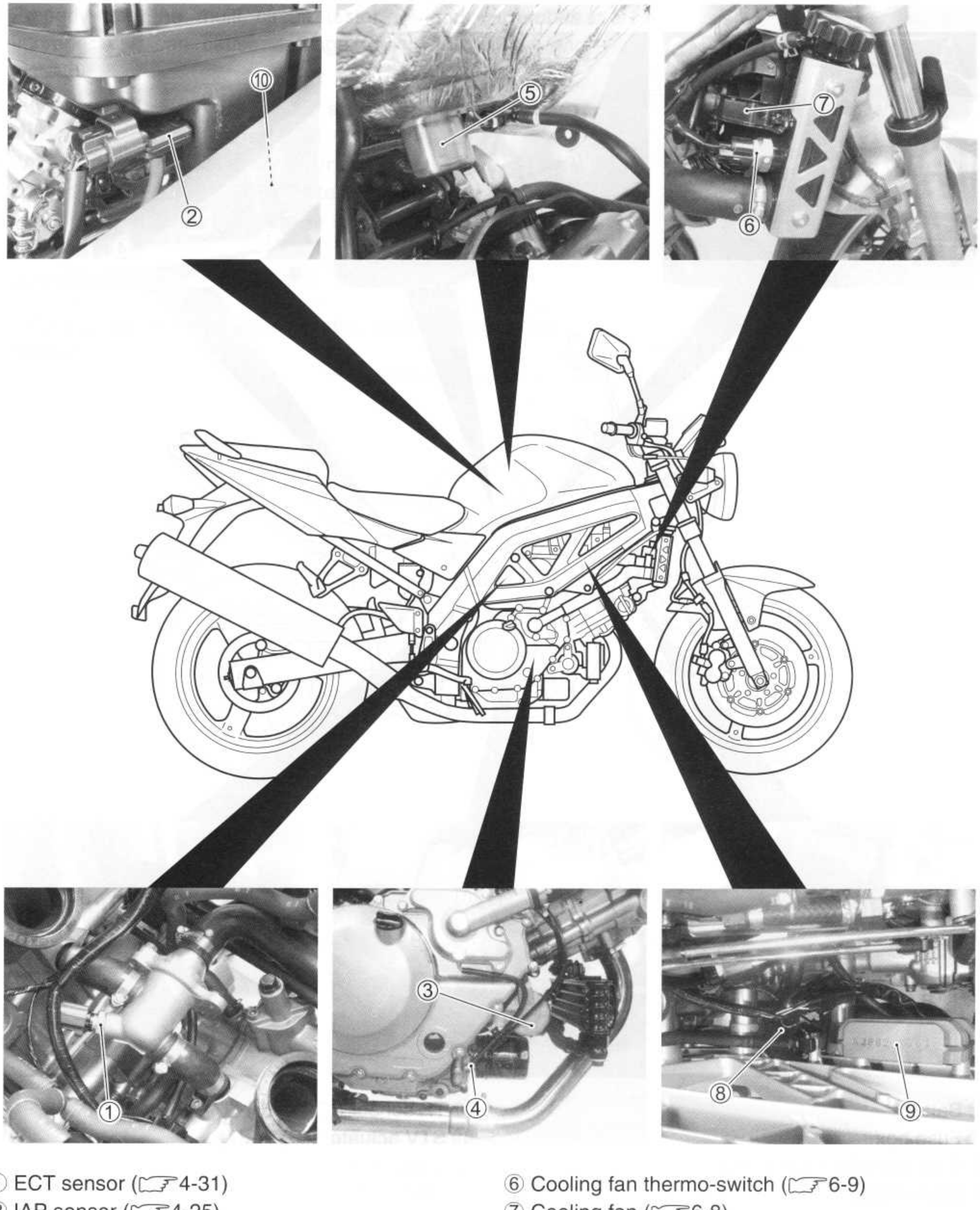
CAUTION

Before using the multi circuit tester, read its instruction manual.

LOCATION OF ELECTRICAL COMPONENTS

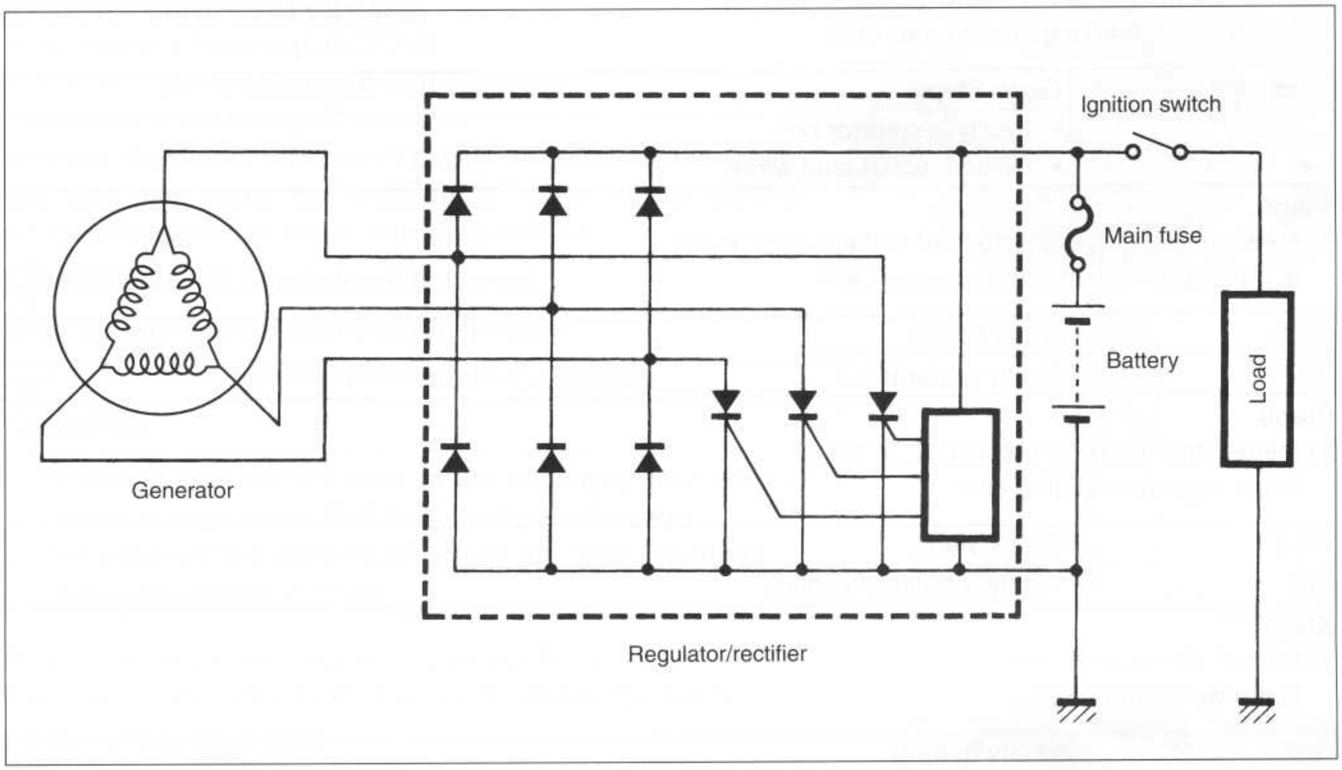


① Battery
② Fuse box
③ Side-stand/turn signal relay
④ Starter relay
⑤ Fuel pump relay
⑥ ECM (Engine Control Module)
⑦ Ignition coil (No.1)
⑧ Fuel injector (☞4-42)
⑨ STP sensor (☞4-38)
⑩ TP sensor (☞4-28)
⑪ STV actuator (☞4-37)
⑫ Generator
⑬ CKP sensor
⑭ Side stand switch
⑮ Gear position switch
⑯ Horn
⑰ IAT sensor



① ECT sensor (☞4-31)
② IAP sensor (☞4-25)
③ Starter motor
④ Oil pressure switch
⑤ Fuel pump (☞5-9)
⑥ Cooling fan thermo-switch (☞6-9)
⑦ Cooling fan (☞6-8)
⑧ Ignition coil (No.2)
⑨ Regulator/rectifier
⑩ PAIR control valve

CHARGING SYSTEM



TROUBLE SHOOTING

Battery runs down quickly

Step1

1) Check accessories which use excessive amounts of electricity.
   Are accessories being installed?

YES	Remove accessories.
NO	Go to Step2.

Step2

1) Check the battery for current leaks. (☞8-9)
   Is the battery for current leaks OK?

YES	Go to Step3.
NO	• Short circuit of wire harness. • Faulty electrical equipment.

Step3

1) Measure the charging voltage between the battery terminals. (☞8-9)
   Is the battery charging of voltage OK?

YES	• Faulty battery. • Abnormal driving condition.
NO	Go to Step4.

Step4

1) Measure the continuity of the generator coil. (☞8-10)
   Is the resistance of generator coil OK?

YES	Go to Step5.
NO	• Faulty generator coil. • Disconnected lead wires.

Step5

1) Measure the generator no-load voltage. (☞8-10)
   Is generator no-load performance OK?

YES	Go to Step6.
NO	Faulty generator.

Step6

1) Inspect the regulator/rectifier. (☞8-11)
   Is the regulator/rectifier OK?

YES	Go to Step7.
NO	Faulty regulator/rectifier.

Step7

1) Inspect the wire harness.
   Is the wire harness OK?

YES	Faulty battery
NO	• Short circuit of wire harness. • Poor contact of coupler.

Battery overcharges

Faulty regulator/rectifier.

Faulty battery.

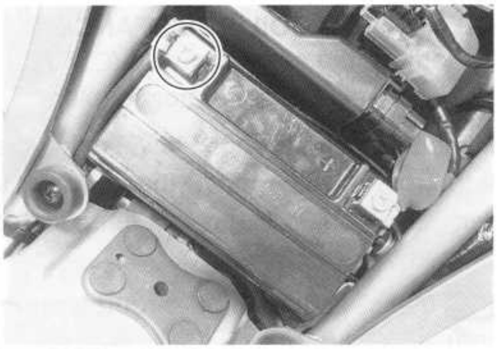
Poor contact of generator lead wire coupler.

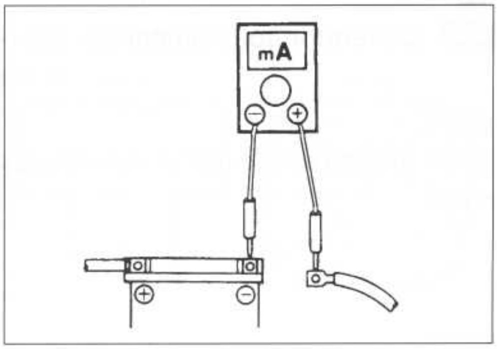
INSPECTION

BATTERY CURRENT LEAKAGE

- Remove the front seat. (☞7-4)
- Turn the ignition switch to the OFF position.
- Disconnect the battery ⊖ lead wire.

Measure the current between ⊖ battery terminal and the ⊖ battery lead wire using the multi circuit tester. If the reading exceeds the specified value, leakage is evident.





TOOL **09900-25008: Multi circuit tester set**

DATA **Battery current (leak): 3 mA and less**

Tester knob indication: Current (⎓, 20 mA)

CAUTION

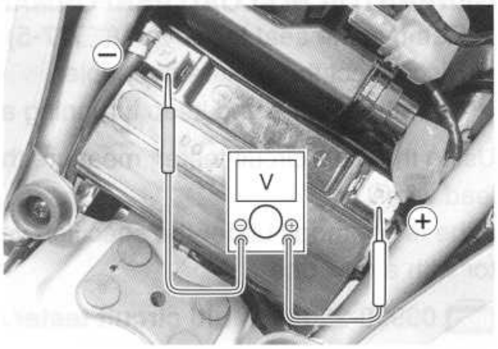
> * **Because the current leak might be large, turn the tester to high range first to avoid tester damage.**
> * **Do not turn the ignition switch to the "ON" position when measuring current.**

When checking to find the excessive current leakage, remove the couplers and connectors, one by one, checking each part.

REGULATED VOLTAGE

- Remove the front seat. (☞7-4).
- Start the engine and keep it running at 5 000 r/min. with the dimmer switch turned HI position.

Measure the DC voltage between the ⊕ and ⊖ battery terminals using the multi circuit tester. If the voltage is not within the specified value, inspect the generator and regulator/rectifier. (☞8-10 and 8-11)



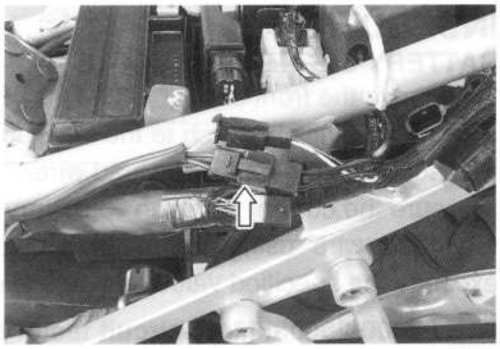
NOTE:
When making this test, be sure that the battery is in fully-charged condition.

TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Voltage (⎓)

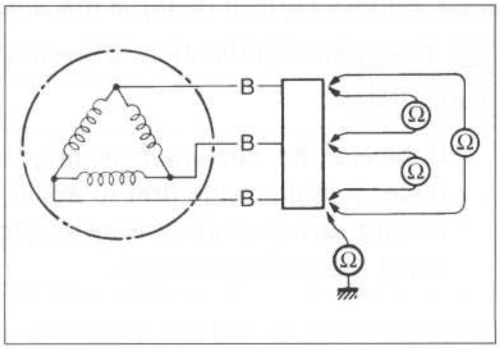
DATA **Charging output (Regulated voltage):**
14.0 – 15.5 V at 5 000 r/min.

GENERATOR COIL RESISTANCE



- Remove the seat tail cover. (☞7-5)
- Disconnect the generator coupler.

Measure the resistance between the three lead wires.
If the resistance is out of the specified value, replace the stator with a new one. Also, check that the generator core is insulated properly.



TOOL 09900-25008: Multi circuit tester set

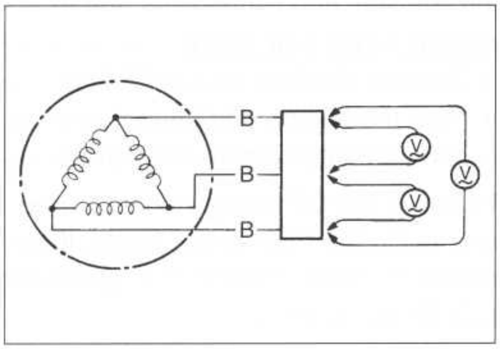
Tester knob indication: Resistance (Ω)

DATA Generator coil resistance: 0.2 – 0.7 Ω (Black – Black)
∞ Ω (Black – Ground)

NOTE:
When making above test, it is not necessary to remove the generator.

GENERATOR NO-LOAD PERFORMANCE

- Remove the seat tail cover. (☞7-5)
- Disconnect the generator coupler.
- Start the engine and keep it running at 5 000 r/min.



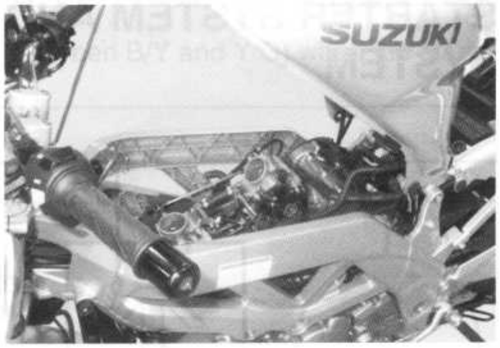
Using the multi circuit tester, measure the voltage between three lead wires.
If the tester reads under the specified value, replace the generator with a new one.

TOOL 09900-25008: Multi circuit tester set

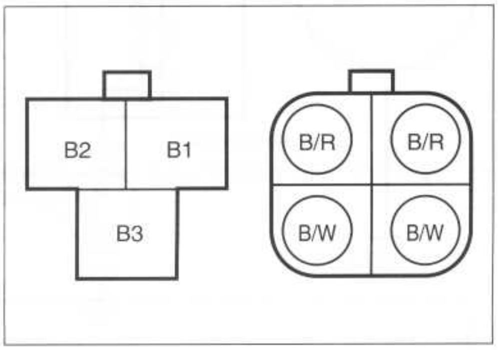
Tester knob indication: Voltage (~)

DATA Generator no-load performance:
More than 60 V at 5 000 r/min (When engine is cold)

REGULATOR/RECTIFIER



- Lift and support the fuel tank. (☞5-6)
- Remove the air cleaner box. (☞5-16)
- Disconnect the regulator/rectifier couplers.



Measure the voltage between the terminals using the multi circuit tester as indicated in the table below. If the voltage is not within the specified value, replace the regulator/rectifier with a new one.

09900-25008: Multi circuit tester set

Tester knob indication: Diode test (→|—)

Unit: V

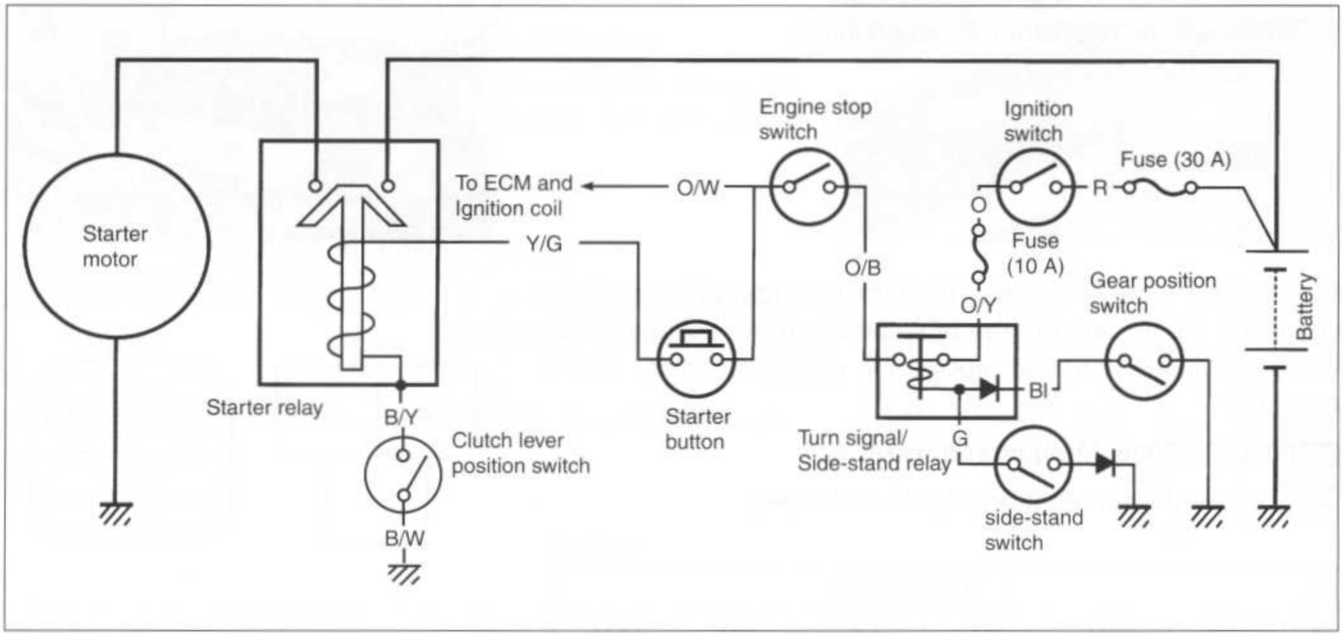
⊖ Tester probe \ ⊕ Tester probe	B/R	B1	B2	B3	B/W
B/R		0.4 – 0.7	0.4 – 0.7	0.4 – 0.7	0.5 – 1.2
B1	*		*	*	0.4 – 0.7
B2	*	*		*	0.4 – 0.7
B3	*	*	*		0.4 – 0.7
B/W	*	*	*	*	

* More tham 1.4 V (tester's battery voltage)

NOTE:

If the tester reads under 1.4 V when the tester probes are not connected, replace its battery.

STARTER SYSTEM AND SIDE-STAND/IGNITION INTERLOCK SYSTEM



TROUBLE SHOOTING

Make sure that the fuses are not blown and the battery is fully-charged before diagnosing.

Starter motor will not run.

Step1

1) Grasp the clutch lever, turn on the ignition switch with the engine stop switch in the "RUN" position and side-stand switch in the "ON" position.
2) Listen for a click from the starter relay when the starter button is pushed.
   Is a click sound heard?

YES	Go to Step2.
NO	Go to Step3.

Step2

1) Check if the starter motor runs when its terminal is connected to the ⊕ battery terminal (Do not use a thin wire because a large amount of current flows.)
   Does the starter motor run?

YES	• Faulty starter relay. • Loose or disconnected starter motor lead wire. • Loose or disconnected between starter relay and ⊕ battery terminal.
NO	Faulty starter motor.

Step3

1) Measure the starter relay voltage at the starter relay connectors (between B/Y and Y/G) when the starter button is pushed.
   Is a voltage OK?

YES	Go to Step4.
NO	• Faulty gear position switch. • Faulty starter button. • Faulty engine stop switch. • Faulty turn signal/side-stand relay. • Faulty ignition switch. • Faulty clutch lever position switch. • Faulty side-stand switch. • Improper connector contact. • Open circuit in wire harness.

Step4

1) Inspect the starter relay. (☞8-19)
   Is the starter relay OK?

YES	Poor starter relay connection.
NO	Faulty starter relay.

Step5

The starter motor runs when the transmission is neutral with the side-stand up or down, but does not run when the transmission is in any position other than neutral with the side-stand down.

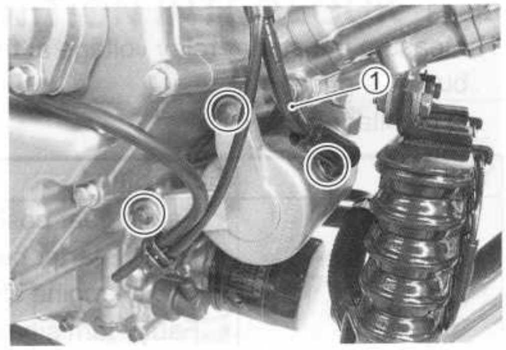
1) Inspect the side-stand switch. (☞8-20)
   Is the side-stand switch OK?

YES	• Open circuit in wire harness. • Poor contact of connector.
NO	• Faulty side-stand switch.

Engine does not turn though the starter motor runs.

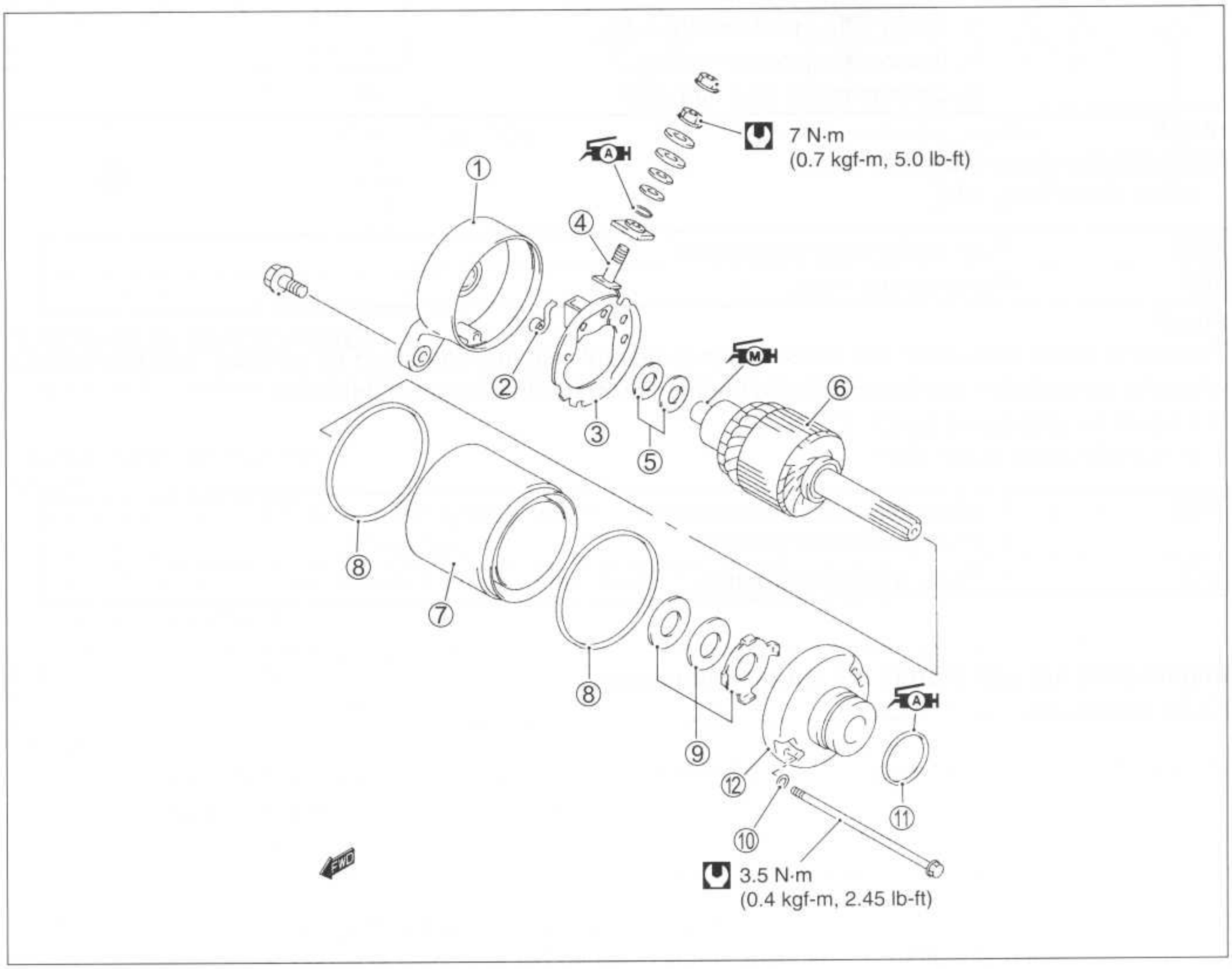
Faulty starter clutch. (☞3-82)

STARTER MOTOR REMOVAL AND DISASSEMBLY



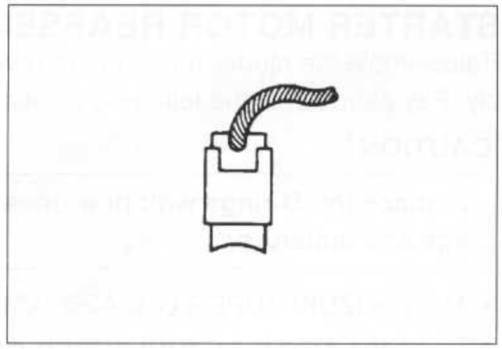
- Remove the starter motor and disconnect the starter motor lead wire ①.

- Disassemble the starter motor as shown in the illustration.



① Housing end (rear bracket)	② Brush spring (2 pcs)	③ Brush holder
④ Terminal	⑤ Washer	⑥ Armature
⑦ Starter motor case	⑧ Seal ring (2 pcs)	⑨ Washer
⑩ O-ring (2 pcs)	⑪ O-ring	⑫ Housing end (front bracket)

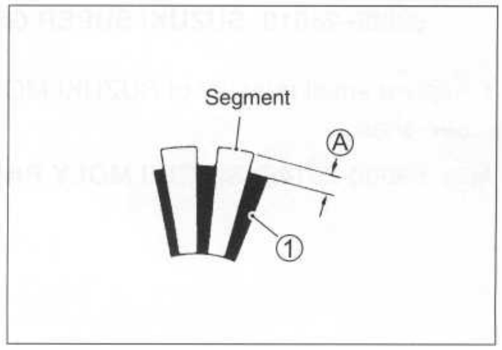
STARTER MOTOR INSPECTION



CARBON BRUSH

Inspect the brushes for abnormal wear, cracks, or smoothness in the brush holder.

If any damage is found, replace the brush assembly with a new one.



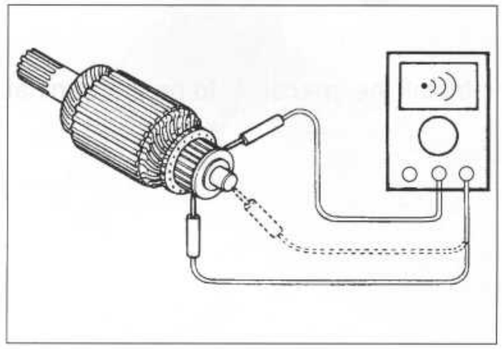
COMMUTATOR

Inspect the commutator for discoloration, abnormal wear or undercut Ⓐ.

If abnormal wear is found, replace the armature with a new one.

If the commutator surface is discolored, polish it with #400 sand paper and wipe it using a clean dry cloth.

If there is no undercut, scrape out the insulator ① with a saw blade.



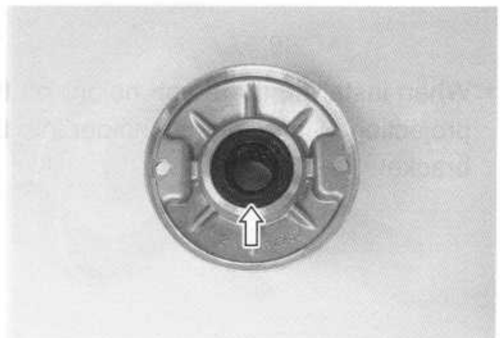
ARMATURE COIL INSPECTION

Check for continuity between each segment and between each segment and the armature shaft using the multi circuit tester.

If there is no continuity between the segments or there is continuity between the segments and shaft, replace the armature with a new one.

TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•)))



OIL SEAL INSPECTION

Check the oil seal lip for damage or leakage.

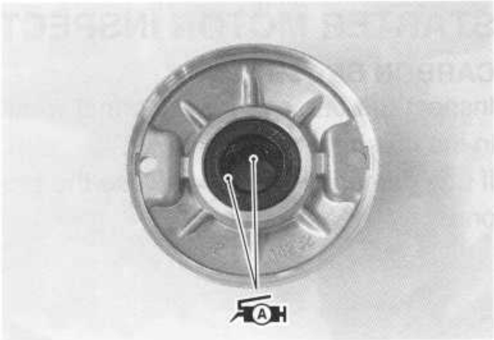
If any damage is found, replace the housing end.

STARTER MOTOR REASSEMBLY

Reassemble the starter motor in the reverse order of disassembly. Pay attention to the following points:

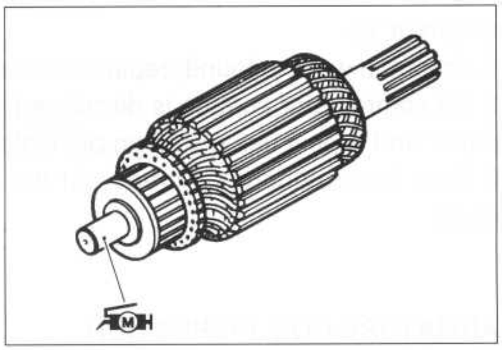
CAUTION

Replace the O-rings with new ones to prevent oil leakage and moisture.



- Apply SUZUKI SUPER GREASE "A" to the lip of the oil seal.

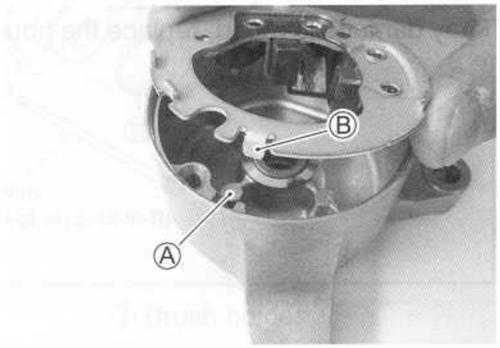
99000-25030: SUZUKI SUPER GREASE "A" (USA)
99000-25010: SUZUKI SUPER GREASE "A" (Others)



- Apply a small quantity of SUZUKI MOLY PASTE to the armature shaft.

99000-25140: SUZUKI MOLY PASTE

- Install the spacer ① to brush terminal.

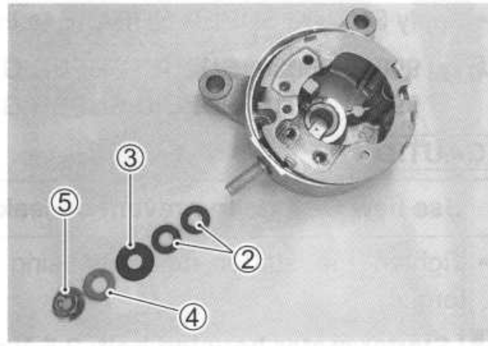


- When installing the brush holder on the rear bracket, set the projection Ⓑ of the brush holder into the groove Ⓐ of the rear bracket.

- Install the washers ② (12 × 6.5 × 2), washer ③ (16 × 6.5 × 1), washer ④ (14 × 6.5 × 1) and nut ⑤.

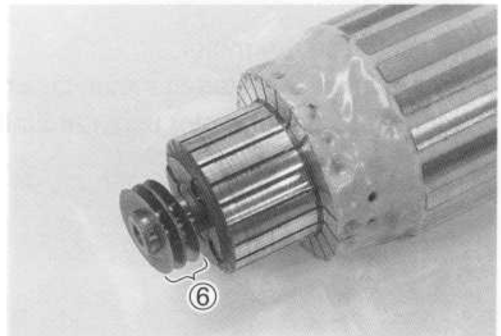
CAUTION

> **Replace the O-rings with new ones to prevent oil leakage and moisture.**



- Install the washers ⑥.

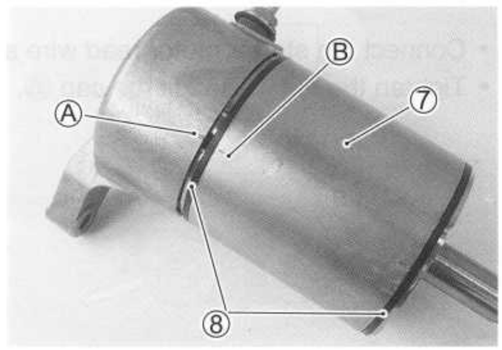
NOTE:
The number of washer ⑥ varies according to individual.



- Install the seal rings ⑧ to starter motor case ⑦.
- When install the rear bracket to starter motor case, align the marks Ⓐ on the rear bracket with cut point Ⓑ at the starter motor case.

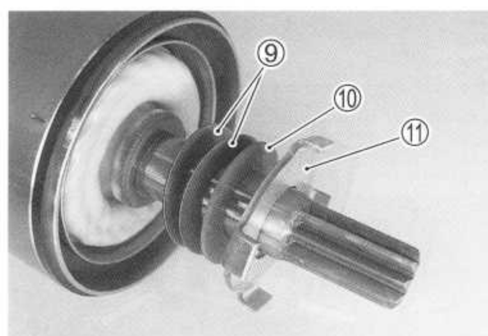
CAUTION

> **Replace the seal rings with new ones to prevent oil leakage and moisture.**

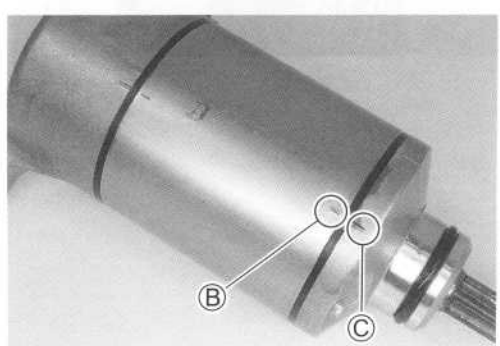


- Install the washers ⑨ slip washer ⑩ and thrust stopper ⑪.

NOTE:
The number of washer ⑨ varies according to individual.

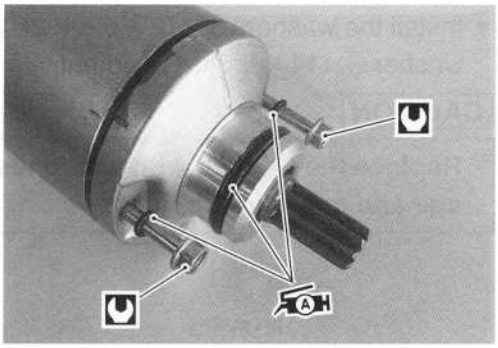


- Install the front bracket.
- Align the marks Ⓒ on the front bracket with the marks Ⓑ on the starter motor case.



- Apply SUZUKI SUPER GREASE to the starter motor O-rings.

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



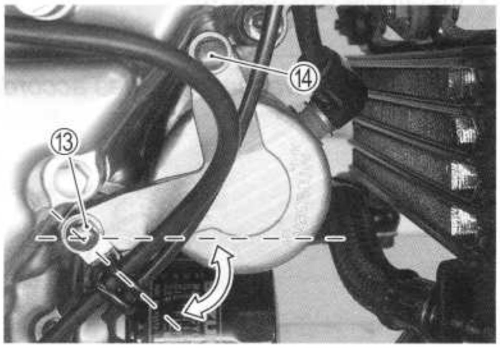
CAUTION

Use new O-rings to prevent oil leakage.

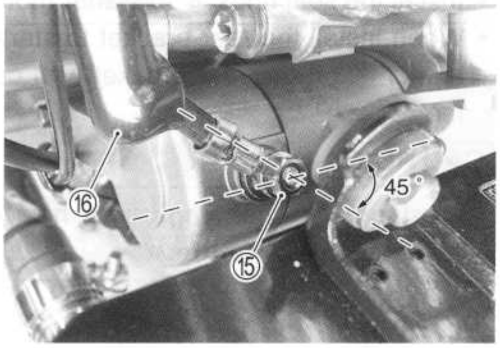
- Tighten the starter motor housing bolts to the specified torque.

Starter motor housing bolt: 3.5 N·m (0.4 kgf-m 2.45 lb-ft)

- Install the starter motor.
- First tighten the starter motor lower mounting bolt ⑬, then tighten the starter motor upper mounting bolt ⑭.

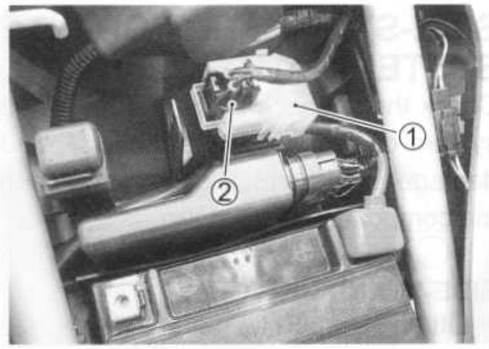


- Connect the starter motor read wire as shown.
- Tighten the nut ⑮ and fit the cap ⑯.

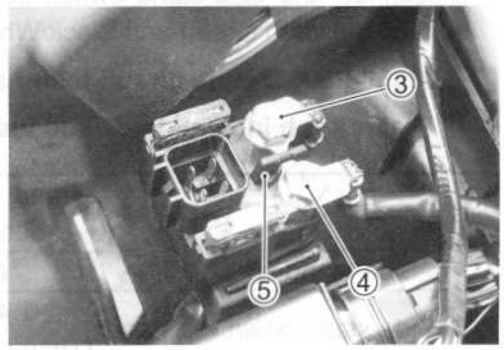


STARTER RELAY INSPECTION

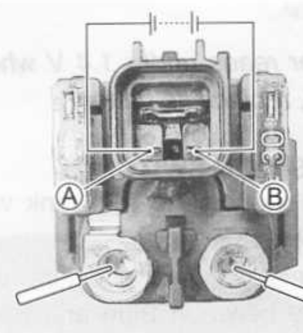
- Remove the front seat. (☞7-4)
- Disconnect the battery ⊖ lead wire from the battery.
- Remove the starter relay cover ①.
- Disconnect the starter relay coupler ②.



- Disconnect the starter motor lead wire ③ and battery lead wire ④.
- Remove the starter relay ⑤.



Apply 12 V to Ⓐ and Ⓑ terminals and check for continuity between the positive and negative terminals using the multi circuit tester. If the starter relay clicks and continuity is found, the relay is ok.



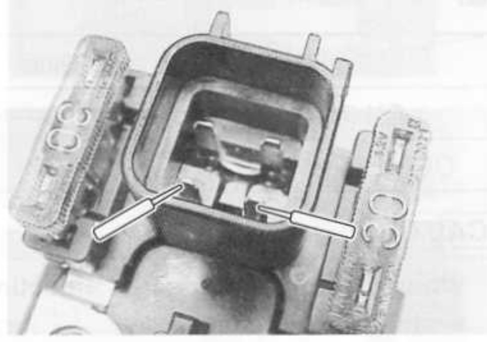
TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•)))

CAUTION

Do not apply a battery voltage to the starter relay for more than five seconds, since the relay coil may overheat and get damaged.

Measure the relay coil resistance between the terminals using the multi circuit tester. If the resistance is not within the specified value, replace the starter relay with a new one.



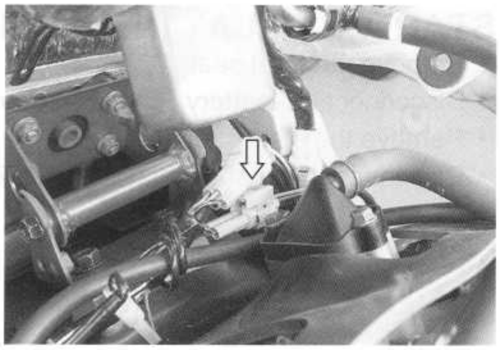
TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Resistance (Ω)

DATA Starter relay resistance: 3 – 6 Ω

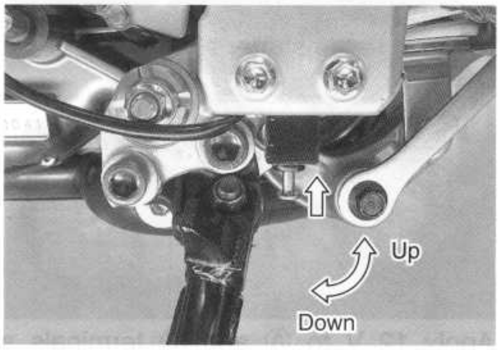
SIDE-STAND/IGNITION INTERLOCK SYSTEM PARTS INSPECTION

Check the interlock system for proper operation. If the interlock system does not operate properly, check each component for damage or abnormalities. If any abnormality is found, replace the component with a new one.



SIDE-STAND SWITCH

- Lift and support the fuel tank with its prop stay. (☞5-6)
- Disconnect the side-stand switch coupler and measure the voltage between Green and Black/White lead wires.



TOOL 09900-25008: Multi circuit tester set

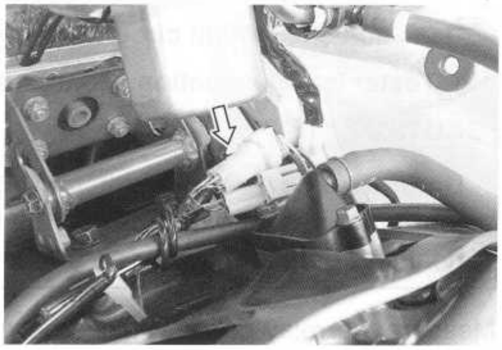
Tester knob indication: Diode test (→|–)

	Green (⊕ probe)	Black/White (⊖ probe)
Side-stand up	0.4 – 0.6 V	
Side-stand down	1.4 V and more (Tester's battery voltage)	

NOTE:
If the tester reads under 1.4 V when the tester probes are not connected, replace its battery.

GEAR POSITION SWITCH

- Lift and support the fuel tank with the fuel tank prop stay. (☞5-6)
- Disconnect the gear position switch coupler and check the continuity between Blue and Black/White with the transmission in "NEUTRAL".



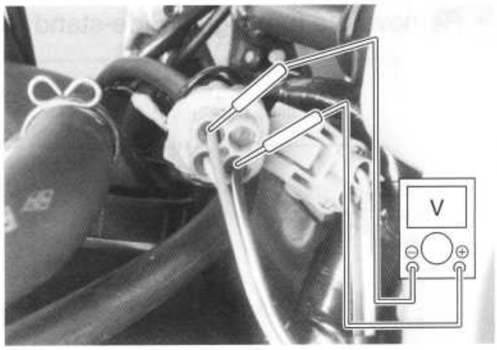
TOOL 09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•)))

	Blue	Black/White
ON (Neutral)	O———	———O
OFF (Expect neutral)		

CAUTION

When disconnecting and connecting the gear position switch coupler, make sure to turn OFF the ignition switch, or electronic parts may get damaged.



- Connect the gear position switch coupler to the wiring harness.
- Turn the ignition switch to "ON" position and side-stand to upright position.

Measure the voltage between Pink and Black lead wires using the multi circuit tester when shifting the gearshift lever from low to top.

TOOL **09900-25008: Multi circuit tester set**
09900-25009: Needle pointed probe set

Tester knob indication: voltage (V)

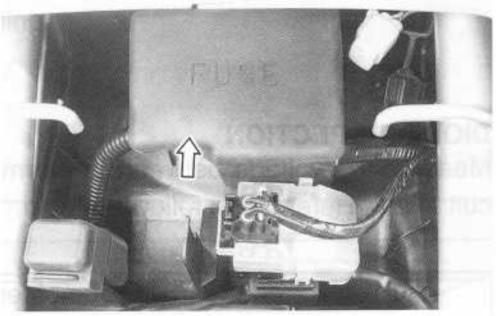
DATA **Gear position switch voltage**

Gear position	1st	2nd	3rd	4th	5th	6th
Voltage	Approx. 1.36 V	Approx. 1.77 V	Approx. 2.49 V	Approx. 3.23 V	Approx. 4.10 V	Approx. 4.55 V

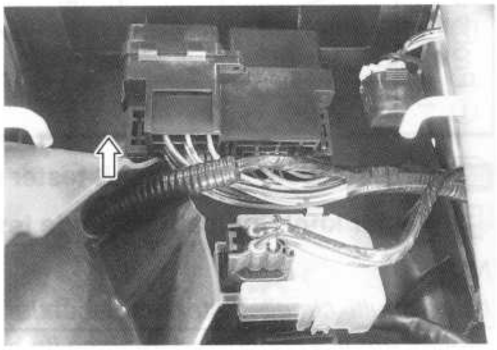
NOTE:
** When connecting the multi circuit tester, use the needle pointed probe to the back side of the lead wire coupler and connect the probes of tester to them.*
** Use a needle pointed probe outer diameter being below 0.5 mm to prevent the rubber of the water proof coupler from damage.*

TURN SIGNAL/SIDE-STAND RELAY
The turn signal/side-stand relay is composed of the turn signal relay, side-stand relay and diode.

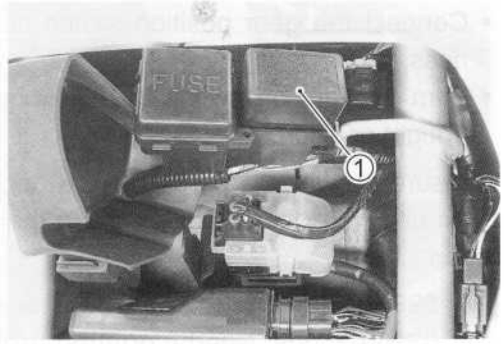
- Remove the front seat. (☞7-4)
- Remove the fuse box cover.



- Remove the fuse box from the rear fender.



• Remove the turn signal/Side-stand relay ①.

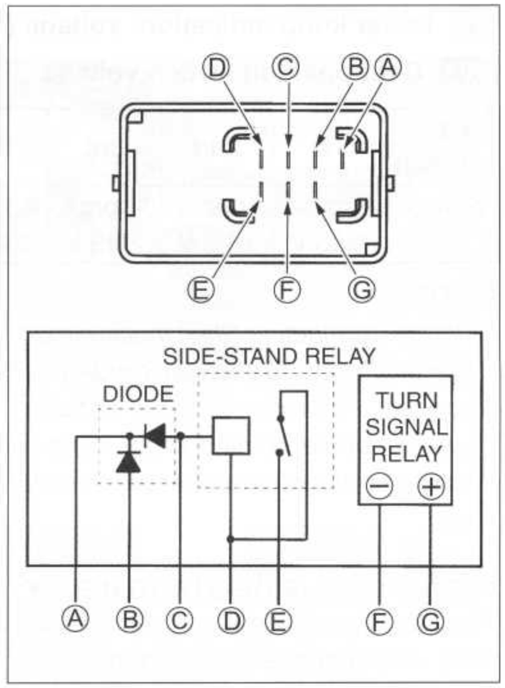


SIDE-STAND RELAY INSPECTION

First check the insulation between Ⓓ and Ⓔ terminals with the tester. Then apply 12 V to terminals Ⓓ and Ⓒ (⊕ to Ⓓ and ⊖ to Ⓒ) and check the continuity between Ⓓ and Ⓔ. If there is no continuity, replace the turn signal/Side-stand relay with a new one.

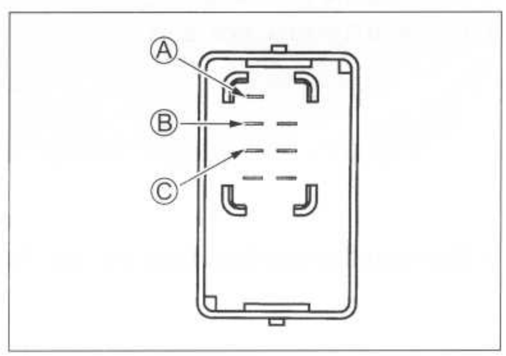
09900-25008: Multi circuit tester set

Tester knob indication: Continuity test (•)))



DIODE INSPECTION

Measure the voltage between the terminals using the multi circuit tester. Refer to the following table.



Unit: V

		⊕ Probe of tester to:	
⊖ Probe of tester to:		Ⓒ, Ⓑ	Ⓐ
	Ⓒ, Ⓑ		More than 1.4 V
	Ⓐ	0.4 – 0.6	

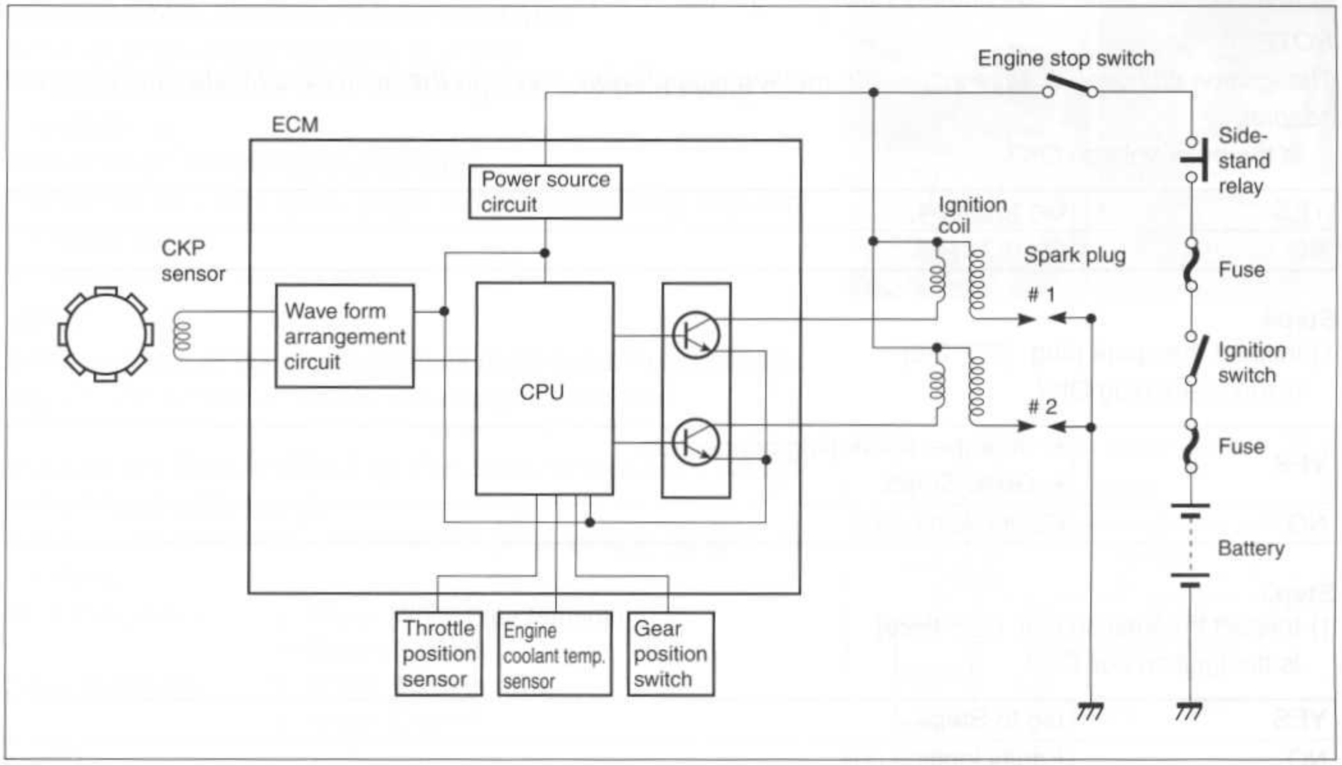
09900-25008: Multi circuit tester set

Tester knob indication: Diode test (-⊳|-)

NOTE:

If the multi circuit tester reads under 1.4 V when the tester probes are not connected, replace its battery.

IGNITION SYSTEM



TROUBLESHOOTING

No spark or poor spark

Make sure the engine stop switch is in the "RUN" position and side-stand is in up-right position. Make sure the fuse is not blown and the battery is fully-charged before diagnosing.

Step1

1) Check ignition system couplers for poor connections.
   Is there connection in the ignition switch couplers?

YES	Go to Step2.
NO	Improper coupler connection.

Step 2

1) Measure the battery voltage between input lead wire (O/G and B/W) at the ECM with the ignition switch in the "ON" position.
   Is the voltage OK?

YES	Go to Step3.
NO	• Faulty ignition switch. • Faulty turn signal/Side-stand switch relay. • Faulty engine stop switch. • Broken wire harness or poor connection of related circuit couplers.

Step3

1) Measure the ignition coil primary peak voltage. (☞8-25)

NOTE:

The ignition coil peak voltage inspection method is applicable only with the multi circuit tester and peak volt adaptor.

Is the peak voltage OK?

YES	Go to Step4.
NO	Go to Step5.

Step4

1) Inspect the spark plug. (☞2-6)

Is the spark plug OK?

YES	• Improper spark plug connection. • Go to Step5.
NO	Faulty spark plug.

Step5

1) Inspect the ignition coil. (☞8-26)

Is the ignition coil OK?

YES	Go to Step6.
NO	Faulty ignition coil.

Step6

1) Measure the CKP sensor peak voltage and its resistance.

NOTE:

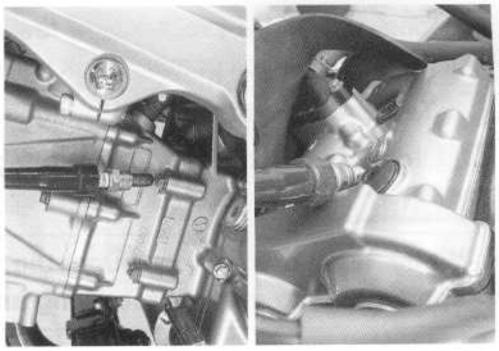
The CKP sensor peak voltage inspection is applicable only with the multi circuit tester and peak volt adaptor.

Is the peak voltage and resistance OK?

YES	• Faulty ECM. • Faulty wire harness. • Improper ignition coupler connection.
NO	Faulty CKP sensor.

INSPECTION

IGNITION COIL PRIMARY PEAK VOLTAGE

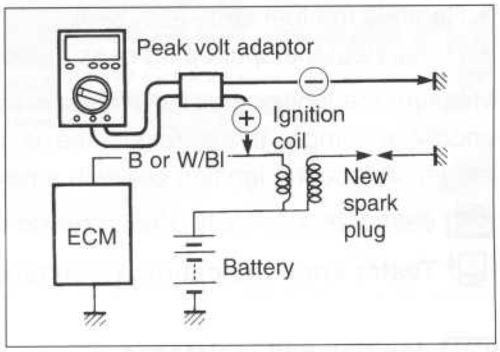


- Lift and support the fuel tank. (☞5-6)
- Loosen the radiator lower mounting bolt and then swing the radiator up.
- Disconnect the two spark plug caps.
- Connect new two spark plugs to each spark plug cap and ground them.
- Remove the air cleaner box.

NOTE:
Make sure that all couplers and spark plugs are connected properly and the battery used is in fully-charged condition.

Measure the No.1 and No.2 ignition coils primary peak voltage in the following procedure.

- Connect the multi circuit tester with peak voltage adaptor as follows.



No.1 ignition coil: ⊕ Probe: White/Blue terminal
⊖ Probe: Ground
No.2 ignition coil: ⊕ Probe: Black terminal
⊖ Probe: Ground

NOTE:
Do not disconnect the ignition coil primary wire coupler.

TOOL 09900-25008: Multi circuit tester set

CAUTION

Before using the multi circuit tester and peak volt adaptor, be sure to refer to the appropriate instruction manual.

- Shift the transmission into the neutral and then turn the ignition switch to the "ON" position.
- Pull the clutch lever.
- Press the starter button and allow the engine to crank for a few seconds, and then measure the ignition coil primary peak voltage.

- Repeat the above procedure a few times and measure the highest ignition coil primary peak voltage.

Tester knob indication: Voltage (⎓)

DATA **Ignition coil primary peak voltage: 150 V and more**

⚠ WARNING

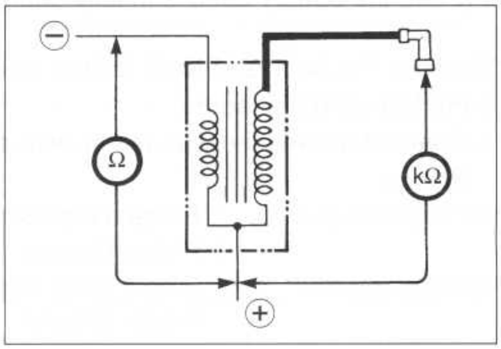
While testing, do not touch the tester probes and spark plugs to prevent receiving an electric shock.

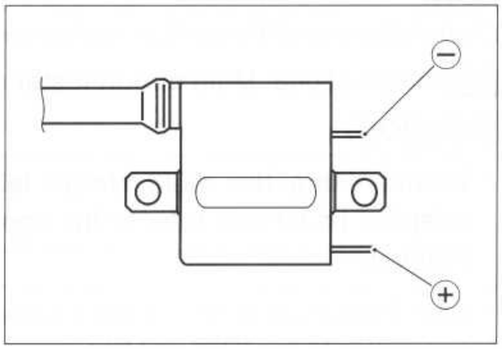
- If the peak voltage is lower than the specified values, inspect the ignition coil. (☞8-26)

IGNITION COIL RESISTANCE

- Remove the fuel tank. (☞5-6)
- Disconnect the spark plug caps and coupler.

Measure the ignition coil resistance in both the primary and secondary windings. If the resistance is not within the standard range, replace the ignition coil with a new one.





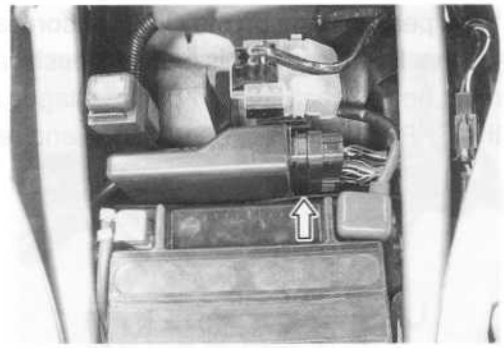
TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Resistance (Ω)

DATA **Ignition coil resistance**

Primary : 2 – 5 Ω (⊕ terminal – ⊖ terminal)
Secondary : 24 – 37 kΩ (Plug cap – ⊕ terminal)

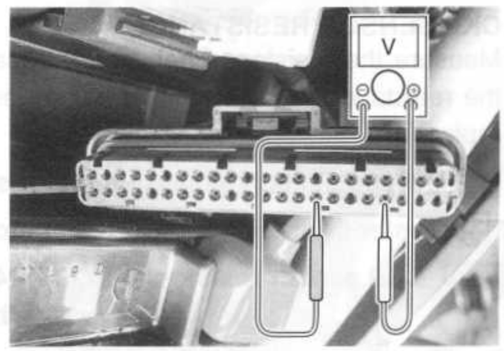
CKP SENSOR PEAK VOLTAGE



- Remove the front seat. (☞7-4)
- Disconnect the ECM coupler.

NOTE:
Make sure that all of the couplers are connected properly and the battery used is in fully-charged condition.

Measure the CKP sensor peak voltage in the following procedures.

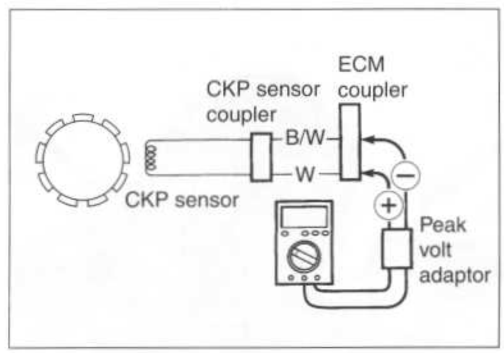


- Connect the multi circuit tester with peak volt adaptor as follows.
  ⊕ Probe: White lead wire
  ⊖ Probe: Black/White lead wire

TOOL 09900-25008: Multi circuit tester set

CAUTION

Before using the multi circuit tester and peak volt adaptor, be sure to refer to the appropriate instruction manual.

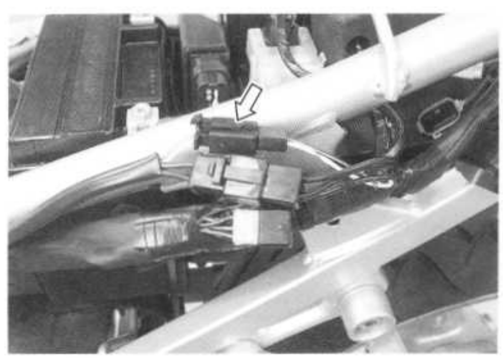


- Shift the transmission into the neutral, and then turn the ignition switch to the "ON" position.
- Pull the clutch lever.
- Press the starter button and allow the engine to crank for a few seconds, and then measure the CKP sensor peak voltage.
- Repeat the above procedure a few times and measure the highest peak voltage.

Tester knob indication: Voltage (⎓)

DATA CKP sensor peak voltage: 3.7 V and more

If the peak voltage is lower than the specified values, check the peak voltage at the CKP sensor lead wire coupler.

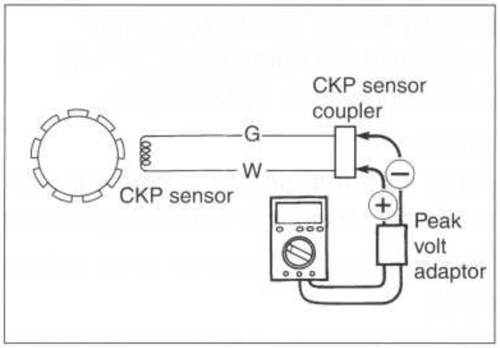


- Remove the seat tail cover. (☞7-5)
- Disconnect the CKP sensor lead wire coupler and connect the multi circuit tester with the peak volt adaptor.
  ⊕ Probe: Green lead wire
  ⊖ Probe: Blue lead wire
- Measure the CKP sensor peak voltage at the CKP sensor lead wire coupler in the same manner as on the ECM coupler.

Tester knob indication: Voltage (⎓)

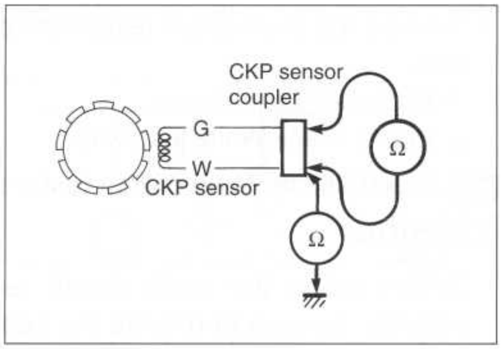
DATA CKP sensor peak voltage: 3.7 V and more

If the peak voltage on the CKP sensor lead wire coupler is ok but on the ECM coupler is out of specification, the wire harness must be replaced. If both peak voltages are out of specification, the CKP sensor must be replaced and re-checked.



CKP SENSOR RESISTANCE

Measure the resistance between the lead wires and ground. If the resistance is not specified value, the CKP sensor must be replaced.



TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Resistance (Ω)

DATA **CKP sensor resistance: 130 – 240 Ω (White – Green)**
∞ Ω (White – Ground)

COMBINATION METER

REMOVAL

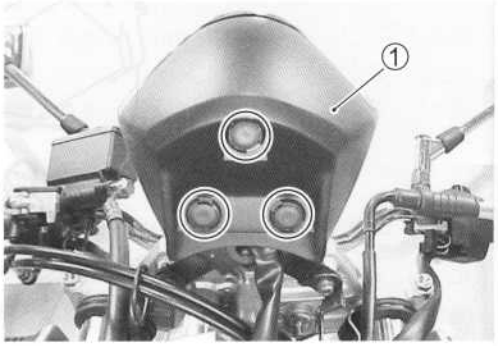
(SV650S)

- Remove the cowling. (☞7-6)
- Remove the combination meter.

NOTE:
"☆" indicates hook location.

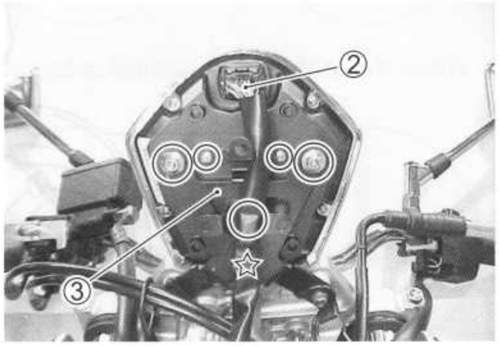
(SV650)

- Remove the headlight. (☞7-29)
- Remove the cover ①.

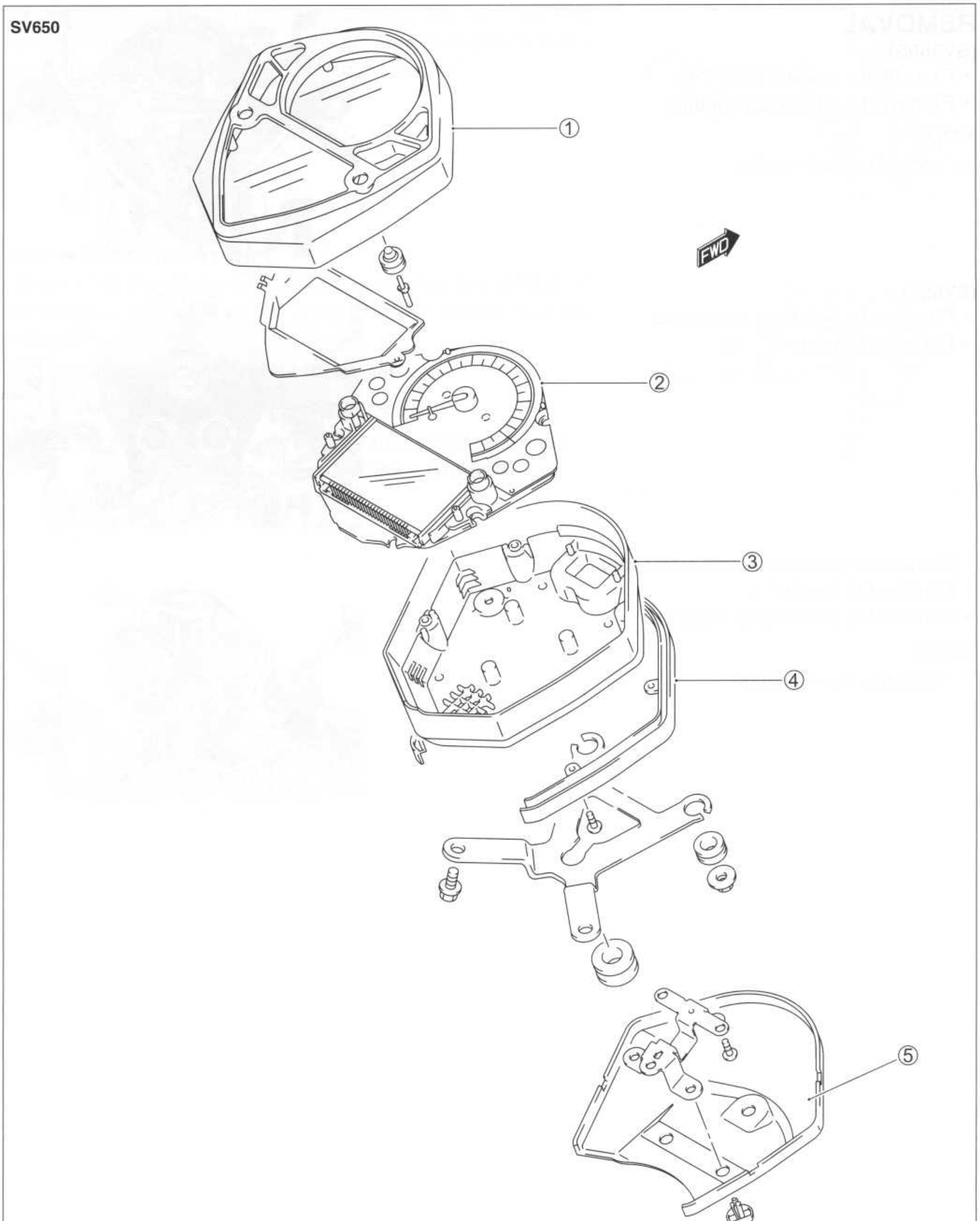


- Disconnect the combination meter coupler ②.
- Remove the bracket ③.
- Remove the combination meter.

NOTE:
"☆" indicates hook location.

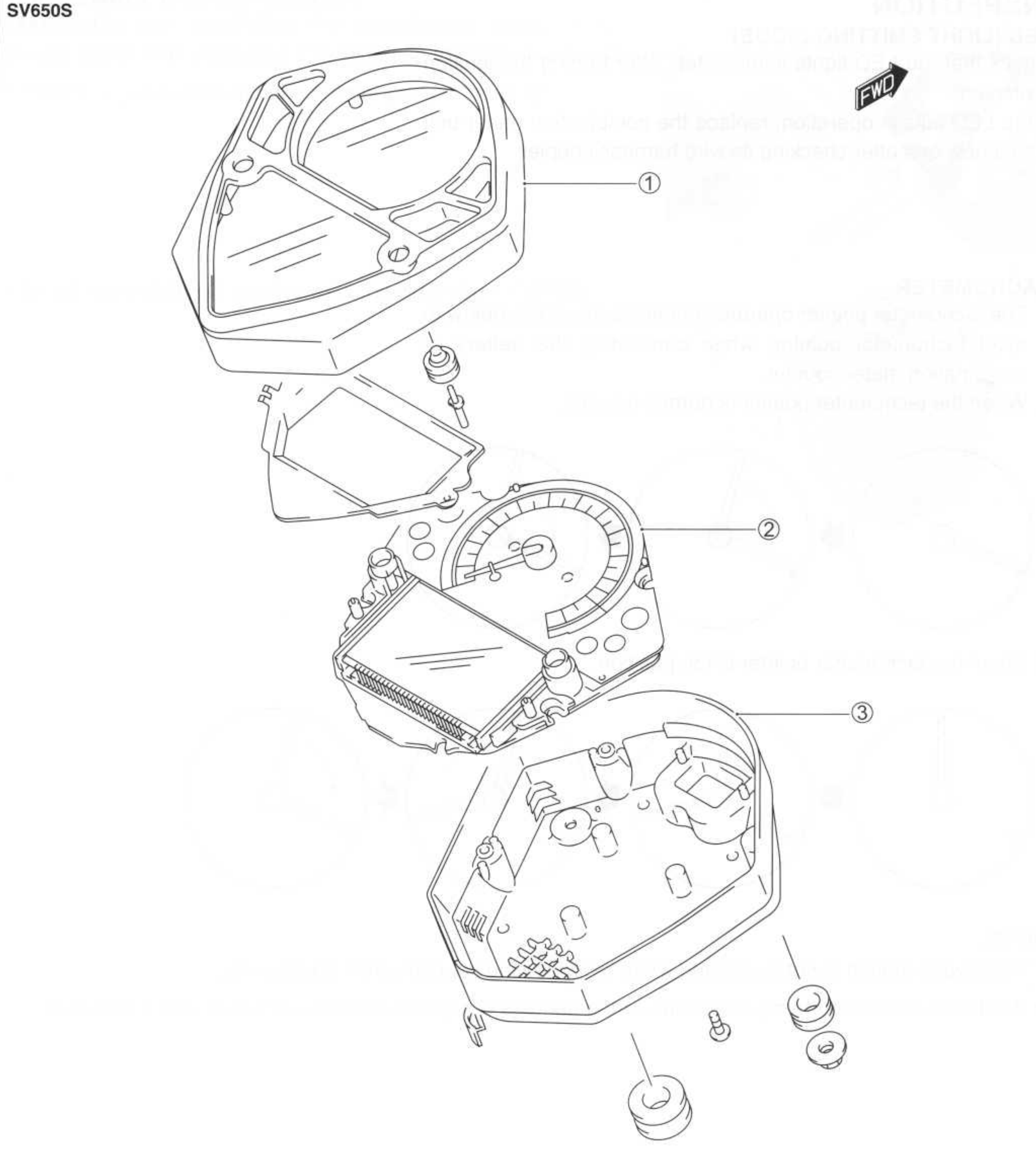


- Disassemble the combination meter as shown in the illustration.



① Meter cover ② Combination meter ③ Housing
④ Molding ⑤ Cover

SV650S



① Meter cover ② Combination meter ③ Housing

INSPECTION

LED (LIGHT EMITTING DIODE)

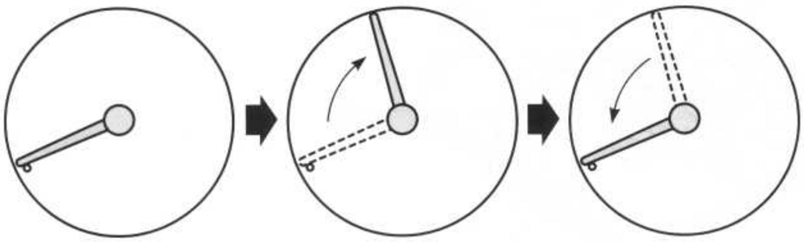
Check that the LED lights immediately after turning the ignition switch on.

If the LED fails in operation, replace the combination meter unit with a new one after checking its wire harness/coupler.

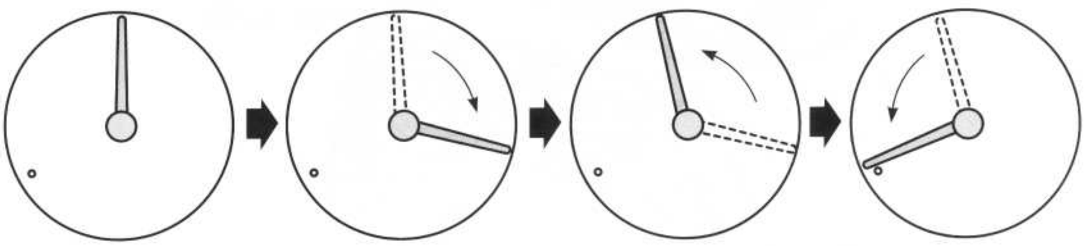
TACHOMETER

- The tachometer pointer operates onetimes as shown below to reset tachometer pointer, when connecting the battery or combination meter coupler.

1. When the tachometer pointer is normal position.



2. When the tachometer pointer is top position.



NOTE:

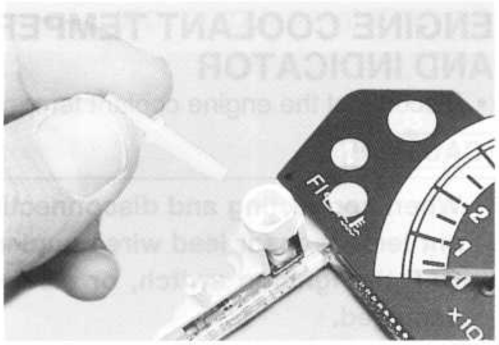
** This sweep motion is not performed when reconnecting coupler within 40 seconds.*

- If it do not operate correctly, check the wiring harness or replace combination meter with a new one.

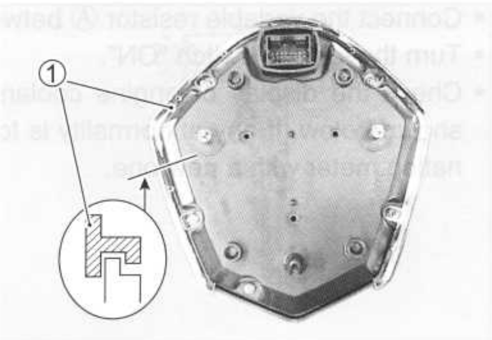
REASSEMBLY AND INSTLLATION

Reassemble and installation the combination meter in the reverse order of disassembly. Pay attention the following points.

- Install the push-rods with the shorter portion faced up.



- Install the molding ① as shown in the illustration. (SV650)

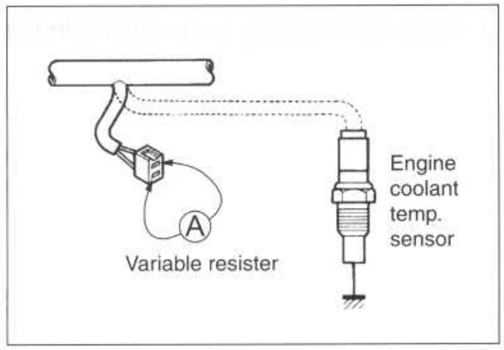


ENGINE COOLANT TEMPERATURE METER AND INDICATOR

- Disconnect the engine coolant temperature sensor coupler.

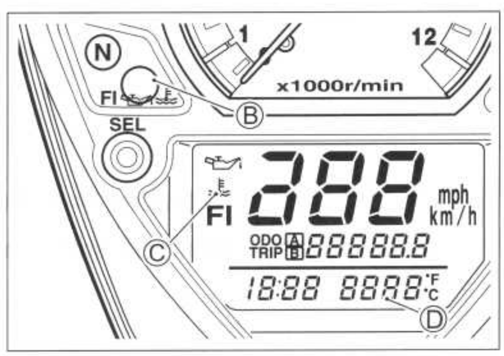
CAUTION

When connecting and disconnecting the engine coolant temp. sensor lead wire coupler, make sure to turn OFF the ignition switch, or electronic parts may get damaged.



- Connect the variable resistor Ⓐ between the terminals.
- Turn the ignition switch "ON".
- Check the display of engine coolant temperature meter as shown below. If any abnormality is found, replace the combination meter with a new one.

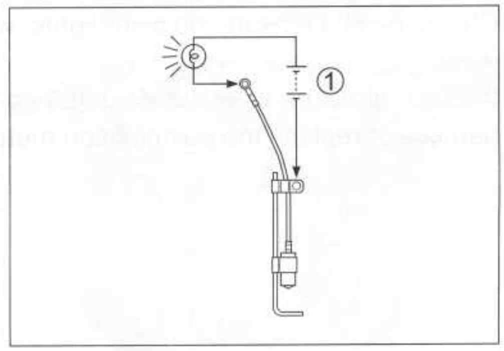
Water temperature	Under 19 °C (67 °F)	Approx. 60 °C (140 °F)	120 – 129 °C (248 – 265 °F)	Over 130 °C (266 °F)
Resistance	2.45 kΩ and more	Approx. 0.587 kΩ	0.1 kΩ and less	0 Ω
LCD Ⓑ	OFF	OFF	ON	ON
LCD Ⓒ	OFF	OFF	ON	ON
LCD Ⓓ	---	60 (140)	120 – 129/Flicker (248 – 265/Flicker)	HI/Flicker



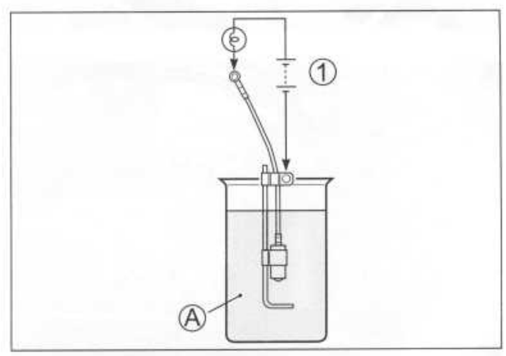
FUEL LEVEL SWITCH INSPECTION

- Remove the fuel pump assembly. (☞5-10)

- Connect 12 V battery ① and test bulb (12 V, 3.4 W) to the fuel level switch as shown in the right illustrations. The bulb should come on after several seconds if the switch is in good condition.

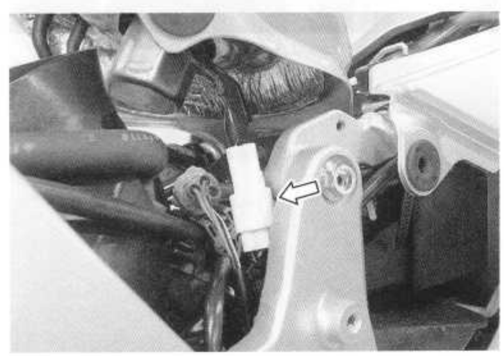


- When the switch is immersed in water Ⓐ under the above condition, the bulb should go out. If the bulb remains lit, replace the unit with a new one.



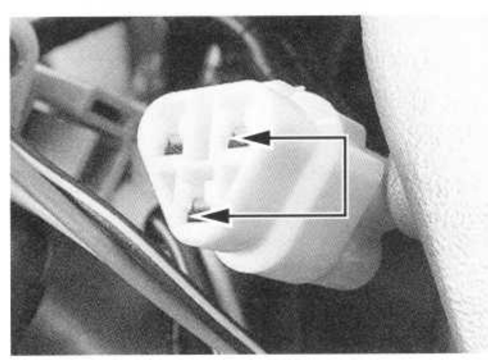
FUEL LEVEL INDICATOR

- Lift and support the fuel tank with the fuel tank prop stay. (☞5-6)
- Connect jumper wire between the Yellow/Black and Black/White lead wires at the wire harness.
- Turn the ignition switch "ON" position and wait for approx. 5 seconds.



Check the fuel level indicator lights.
If not, replace the combination meter with a new one.

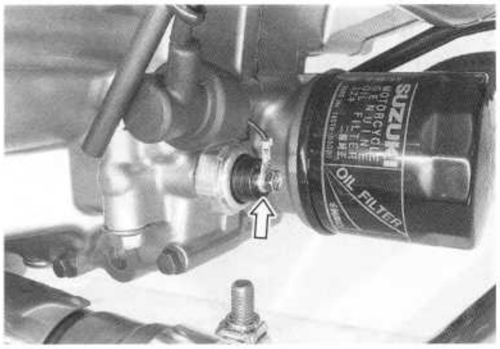
NOTE:
After disconnecting the jump wire, it takes 30 seconds that the fuel level indicator comes off.



OIL PRESSURE INDICATOR

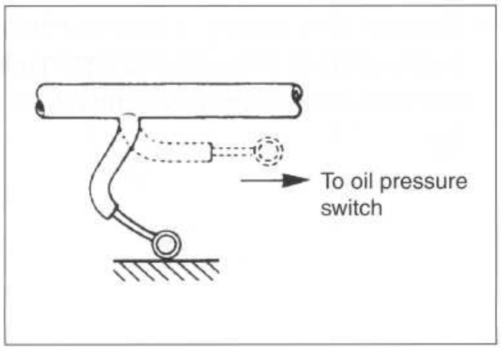
Before inspecting the oil pressure switch, check the engine oil level. (☞2-14)

- Disconnect the oil pressure switch lead wire from the oil pressure switch.
- Turn the ignition switch "ON" position.



Check the oil pressure indicator lights, when grounding the lead wire.

If the oil pressure indicator does not come on, check the wiring harness or replace the combination meter with a new one.

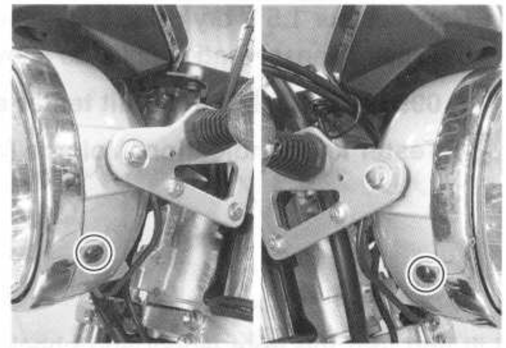


SPEED SENSOR

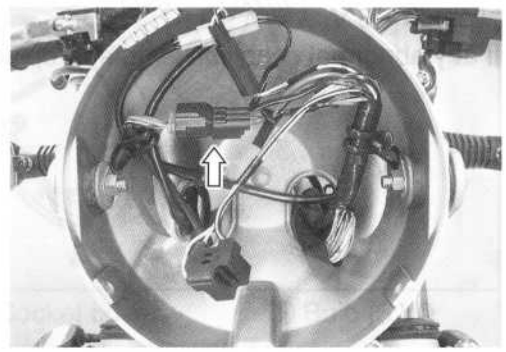
REMOVAL

SV650

- Remove the headlight with two screws.

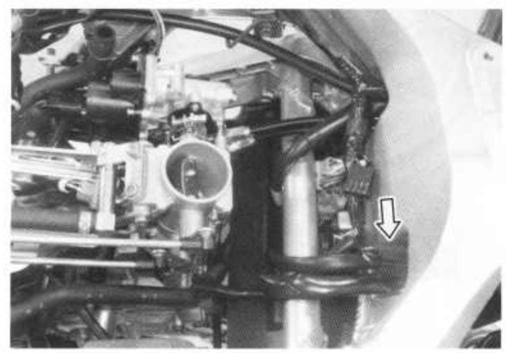


- Disconnect the speed sensor coupler.



SV650S

- Lift up and support the fuel tank. (☞5-6)
- Remove the air cleaner box. (☞5-16)
- Disconnect the speed sensor coupler.

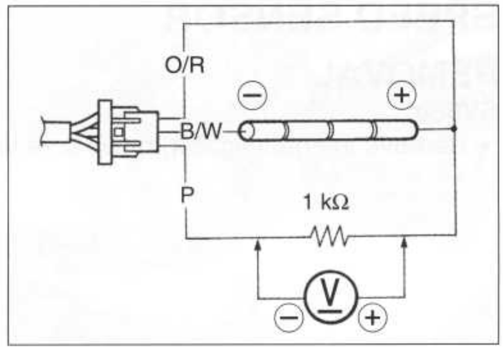


INSTALLATION

- Installation is in the reverse of removal.
- Connect the speed sensor coupler and check the wire harness routing. (☞9-17)

INSPECTION

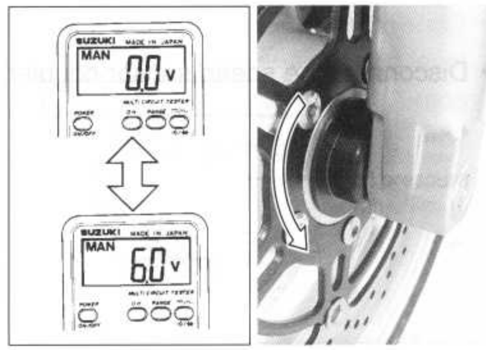
- Connect four 1.5 V dry cells, 1 kΩ resistance and the tester to the speed sensor lead coupler as shown.



09900-25008: Multi-circuit tester set

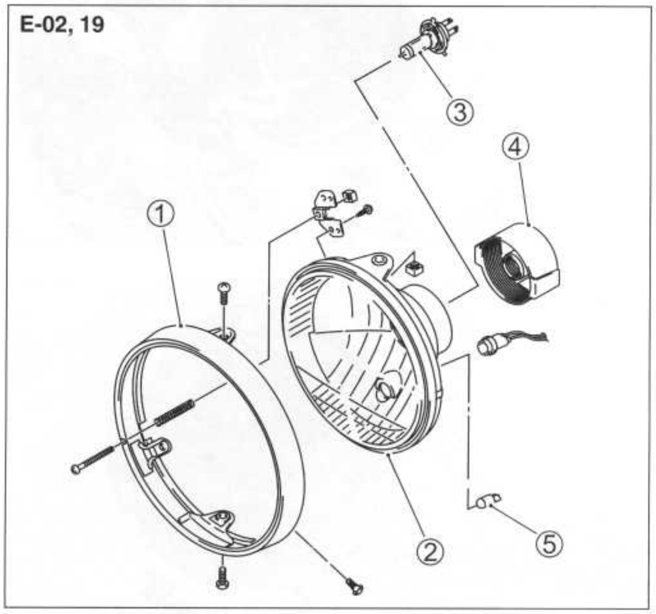
Tester knob indication: Voltage (⎓)

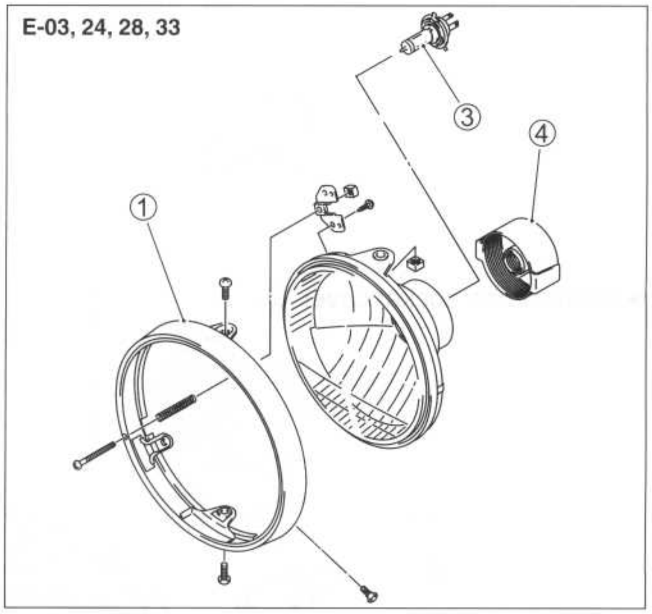
Lift and turn the front wheel and check that voltage varies between 0 – 6 V.
If any abnormal condition is noted, replace the sensor.



LAMPS

HEADLIGHT (SV650)

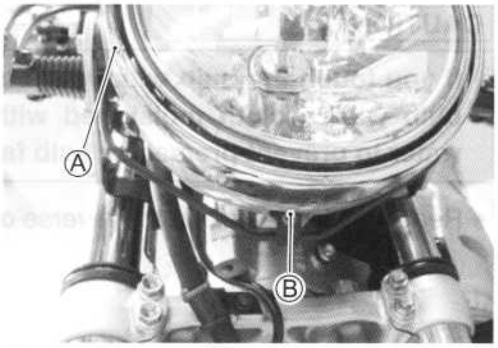




① Rim ② Reflector ③ Bulb (60/50 W) ④ Socket cover ⑤ Bulb (5 W)

HEADLIGHT BEAM ADJUSTMENT

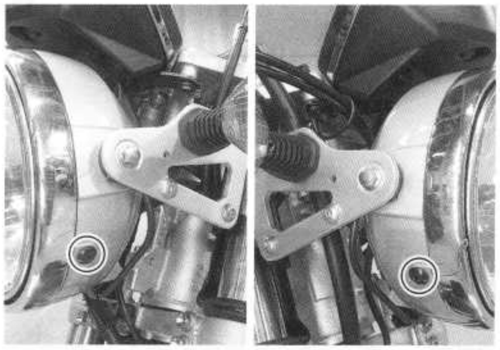
- Adjust the headlight beam, both vertical and horizontal.
  Ⓐ: Vertical adjuster
  Ⓑ: Horizontal adjuster



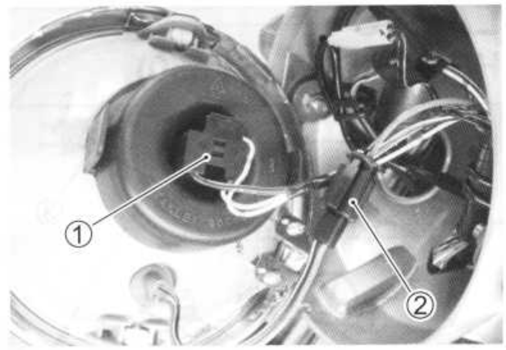
NOTE:
To adjust the headlight beam, adjust the beam horizontally first, then adjust the vertically.

BULB REPLACEMENT

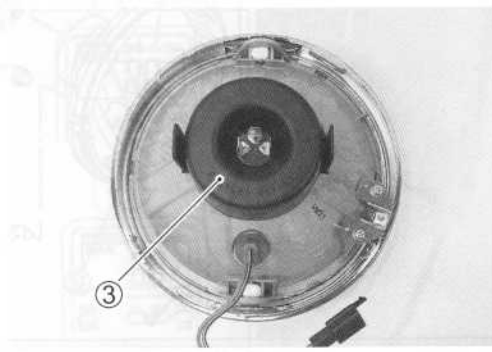
- Remove the headlight with two screws.



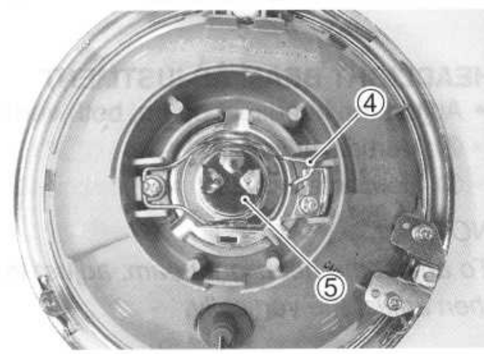
- Disconnect the coupler ①.
- Disconnect the position light coupler ②.



- Remove the socket cover ③.



- Unhook the bulb holder spring ④ and pull out the bulb ⑤.

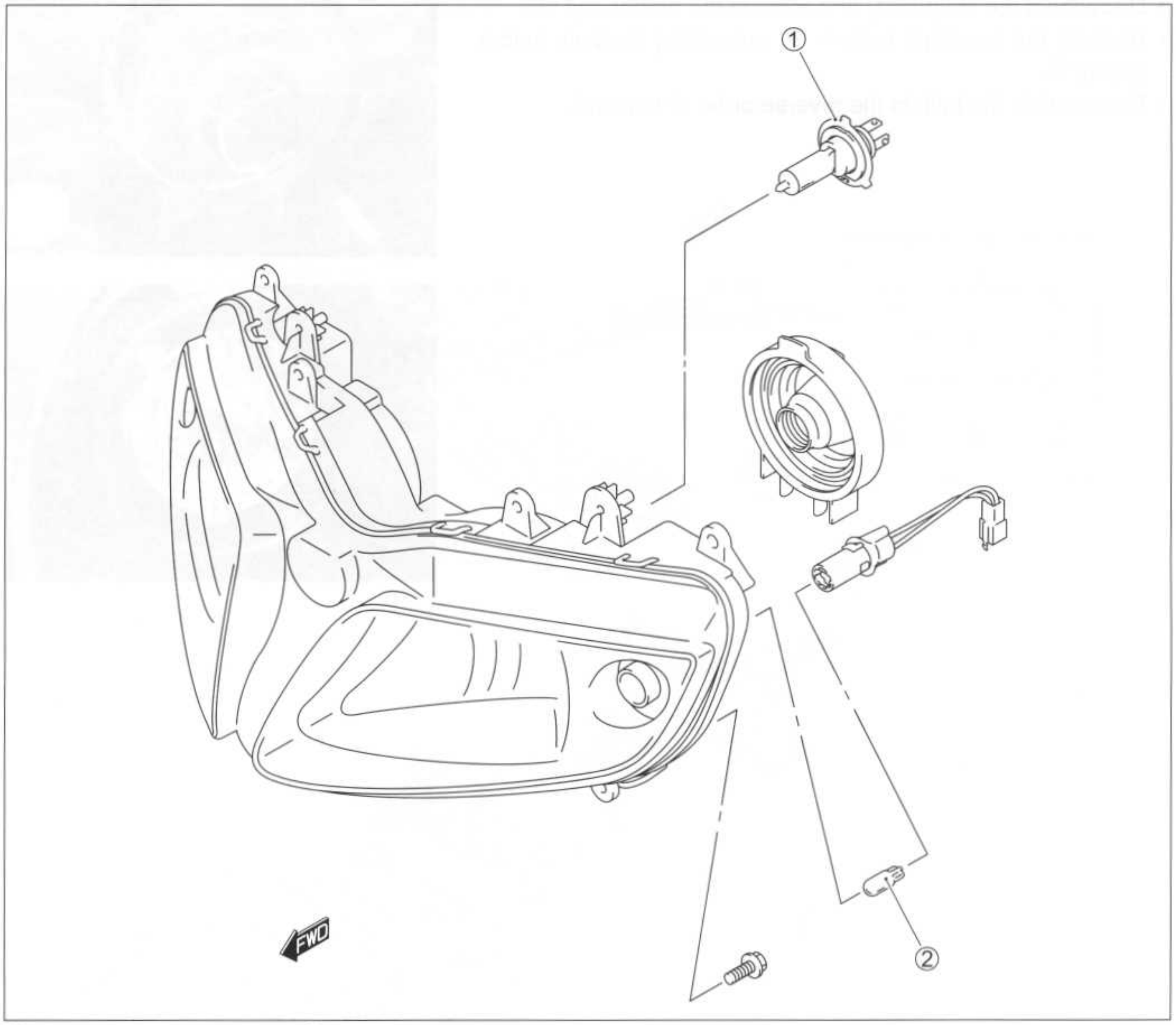


CAUTION

If you touch the bulb with your bare hands, clean the bulb with a cloth moistened with alcohol or soapy water to prevent premature bulb failure.

- Reassemble the bulb in the reverse order of removal.

HEADLIGHT (SV650S)



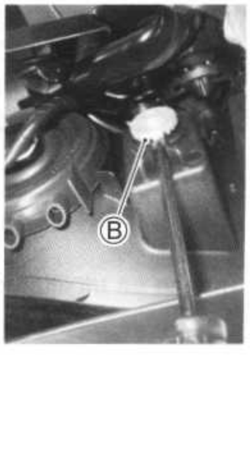
① Headlight ② Position light

Headlight bulb ①: 12 V 60/55 W
Position light bulb ②: 12 V 5 W

HEADLIGHT BEAM ADJUSTMENT

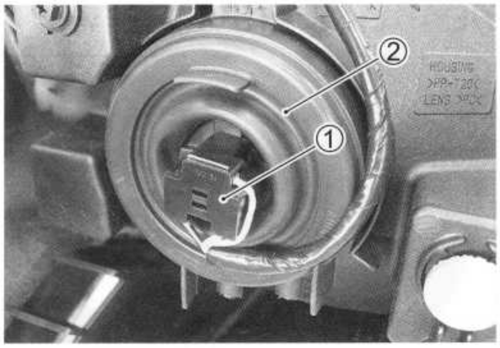
- Adjust the headlight beam, both vertical and horizontal.
  Ⓐ: Vertical adjuster
  Ⓑ: Horizontal adjuster

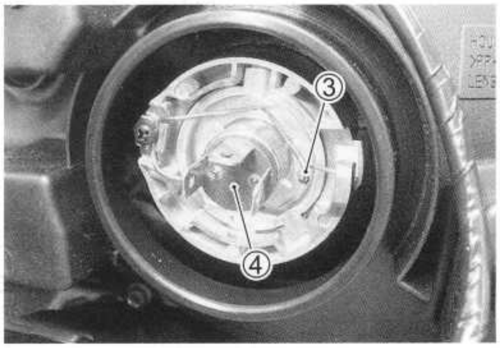
NOTE:
To adjust the headlight beam, adjust the beam horizontally first, then adjust the vertically.



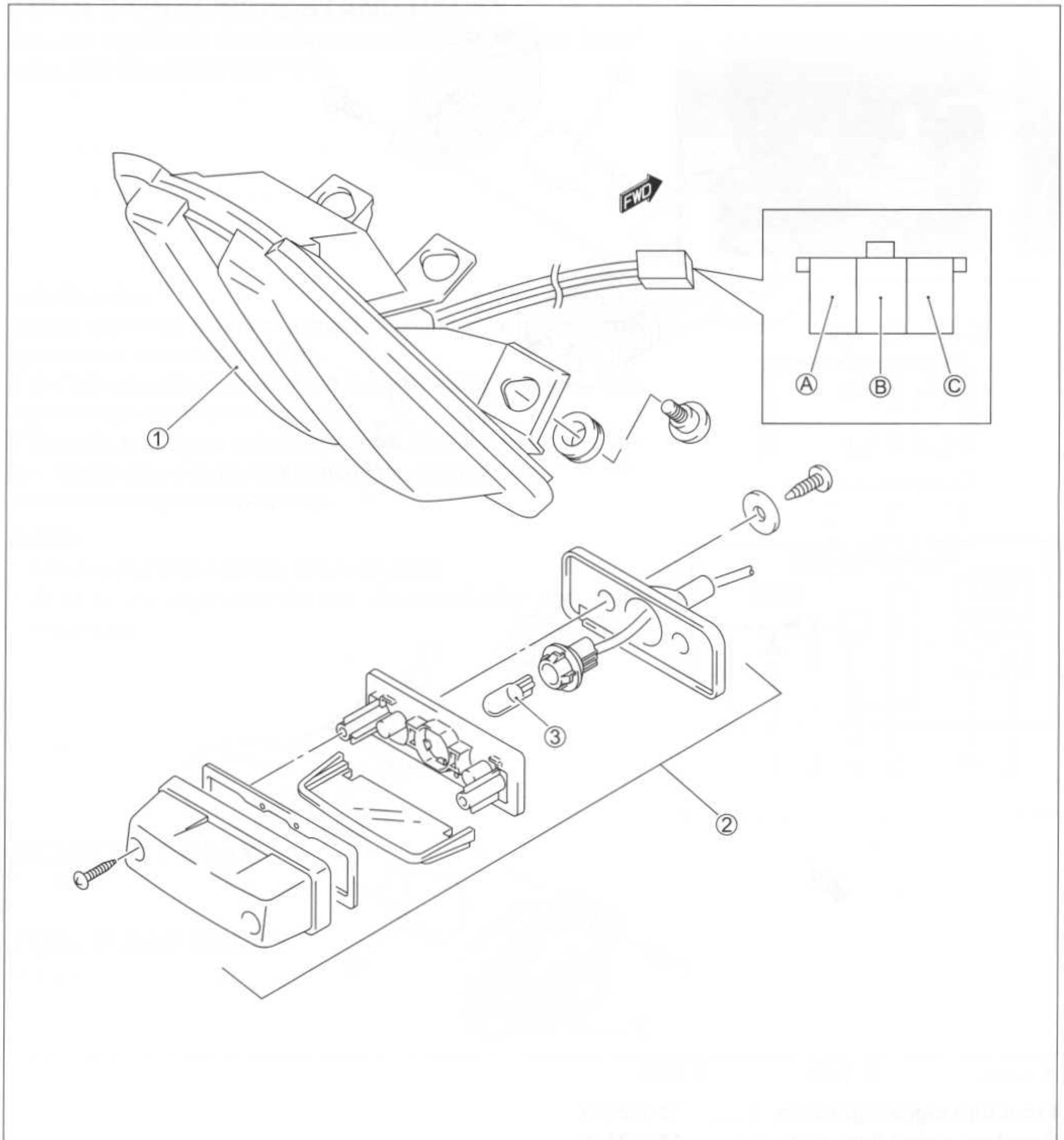
BULB REPLACEMENT

- Disconnect the coupler ① and remove the rubber cap ②.
- Remove the headlight bulb ④ by unhooking the bulb holder spring ③.
- Reassemble the bulb in the reverse order of removal.





BRAKE LIGHT/TAILLIGHT

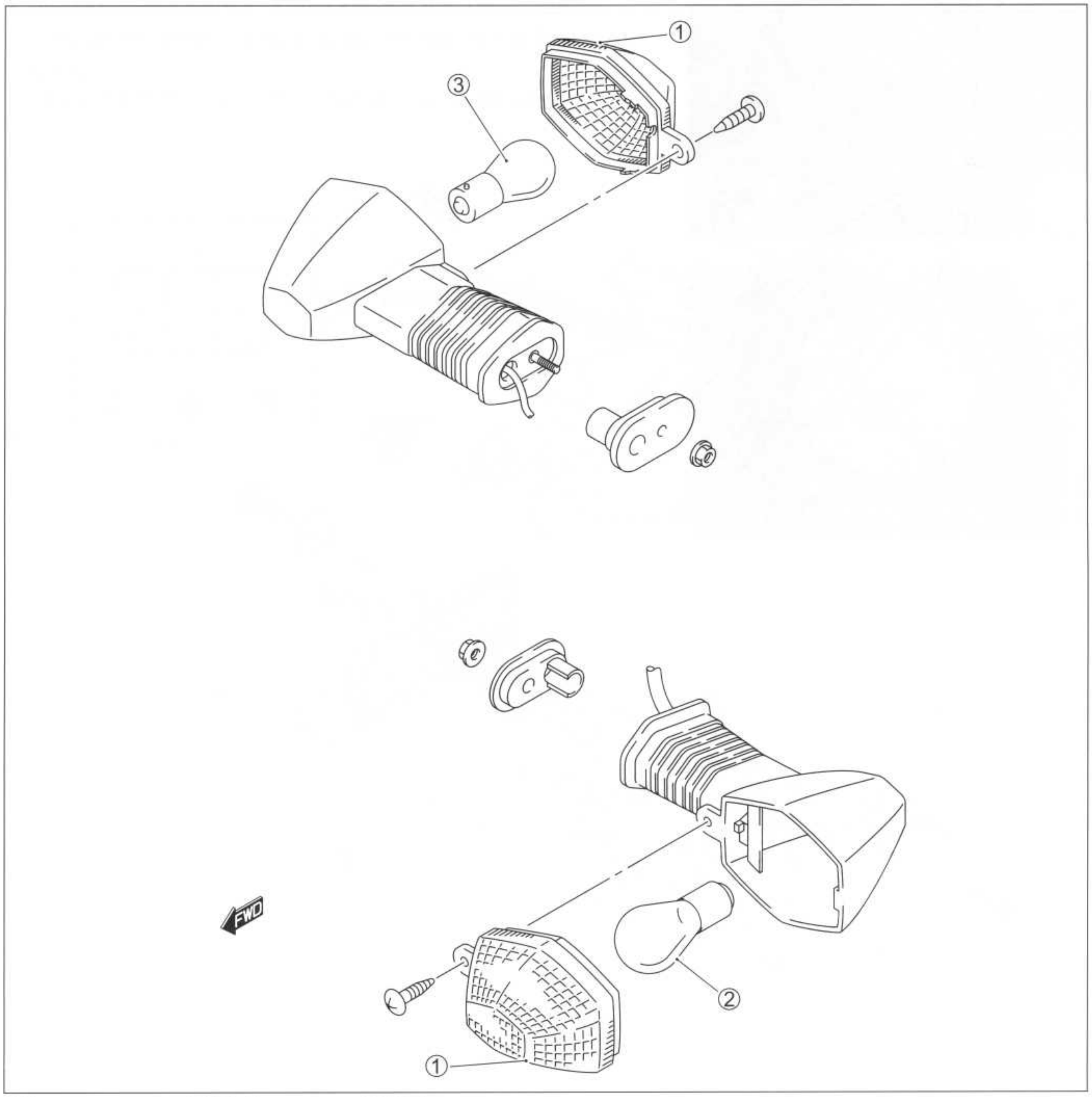


① Brake light/taillight	② License lamp	③ Bulb
Ⓐ Brake light	Ⓑ Tail light	Ⓒ GND

License lamp bulb ③: 12 V 5 W

The brake light/taillight is equipped LED. If LED fails in operation, replace the brake light/taillight as assembly.

TURN SIGNAL LIGHTS



① Lens ② Bulb ③ Bulb

Front turn signal light bulb ②: ... 12 V 21 W
Rear turn signal light bulb ③: ..... 12 V 21 W

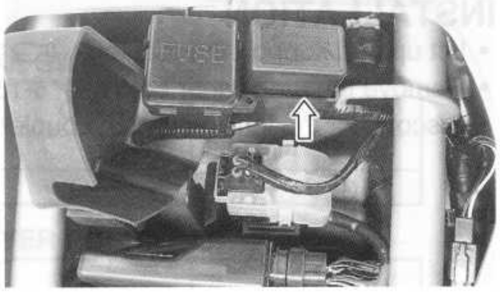
CAUTION

Do not overtighten the lens fitting screws.
If you touch the bulb with your bare hands, clean the bulb with a cloth moistened with alcohol or soapy water to prevent premature bulb failure.

RELAYS

TURN SIGNAL/SIDE-STAND RELAY

The turn signal/side-stand relay is composed of the turn signal relay, side-stand relay and diode.



INSPECTION

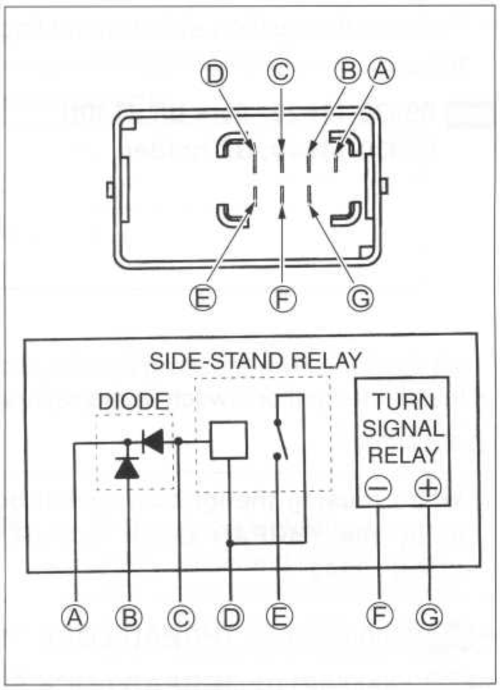
Before removing the turn signal/side-stand relay, check the operation of the turn signal light.

If the turn signal light does not illuminate, inspect the bulb, turn signal switch and circuit connection.

If the bulb, turn signal switch and circuit connection are OK, the turn signal relay may be faulty; therefore, replace the turn signal/side-stand relay with a new one.

NOTE:

* *Make sure that the battery is fully charged.*
* *Refer to the page 8-22 for the side-stand relay and diode inspection.*



STARTER RELAY

☞8-19

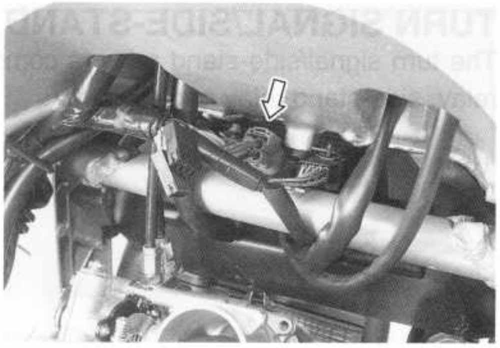
FUEL PUMP RELAY

☞5-10

SWITCHES

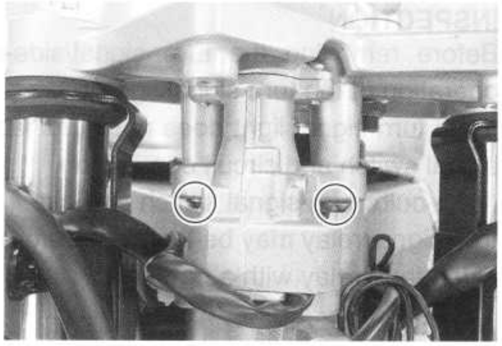
IGNITION SWITCH REMOVAL/ INSTALLATION

* Lift up and support the fuel tank. (☞5-6)
* Remove the air cleaner box. (☞5-16)
* Disconnect the ignition switch coupler.



* Remove the ignition switch mounting bolts using the special tools.

TOOL 09930-11920: Torx bit JT40H
09930-11940: Bit holder



* Install the ignition switch in the reverse order of removal.

CAUTION

When reusing the ignition switch bolt, clean thread and apply the THREAD LOCK SUPER "1322" or THREAD LOCK "1342".

1342 99000-32050: THREAD LOCK "1342" (USA)
1322 99000-32110: THREAD LOCK SUPER "1322" (Others)

INSPECTION

Inspect each switch for continuity with a tester. If any abnormality is found, replace the respective switch assemblies with new ones.

IGNITION SWITCH

Position \ Color	R	O	O/Y	Br
ON	○	○	○	○
OFF				
LOCK				
P	○	—	—	○

DIMMER SWITCH

Position \ Color	W	Y	O
HI		○	○
LO	○	—	○

TURN SIGNAL SWITCH

Position \ Color	Lg	Lbl	B
L		○	○
PUSH			
R	○	○	

PASSING LIGHT SWITCH

Position \ Color	O	Y
•		
PUSH	○	○

ENGINE STOP SWICH

Position \ Color	O/B	O/W
OFF		
RUN	○	○

STARTER BUTTON

Position \ Color	O/W	Y/G
•		
PUSH	○	○

HORN BUTTON

Position \ Color	O/G	B/W
•		
PUSH	○	○

HAZARD

Position \ Color	B	Lbl	Lg
ON	○	○	○
OFF			

FRONT BRAKE SWITCH

Position \ Color	B/R	B/Bl
OFF		
ON	○	○

REAR BRAKE SWITCH

Position \ Color	O/G	W/B
OFF		
ON	○	○

CLUTCH LEVER POSITION SWITCH

Position \ Color	B/Y	B/Y
OFF		
ON	○	○

OIL PRESSURE SWITCH

Position \ Color	G/Y	Ground
ON (engine is stopped)	○	○
OFF (engine is running)		

NOTE:
Before inspecting the oil pressure switch, check the engine oil level. *(☞2-14)*

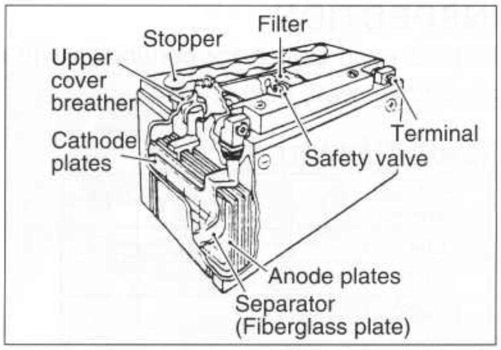
WIRE COLOR

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

BATTERY

SPECIFICATIONS

Type designation	YTX12 – BS
Capacity	12 V, 36.0 kC (10 Ah)/10 HR



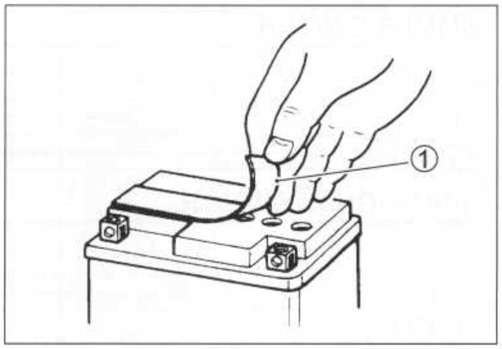
INITIAL CHARGING

Filling electrolyte

- Remove the aluminum tape ① sealing the battery electrolyte filler holes.

NOTE:

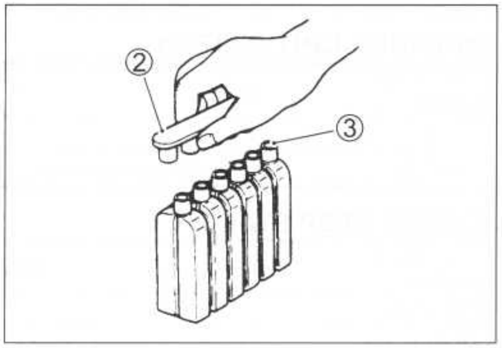
When filling electrolyte, the battery must be removed from the vehicle and must be put on the level ground.



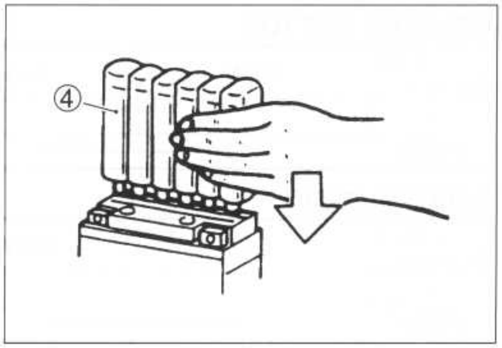
- Remove the caps ②.

NOTE:

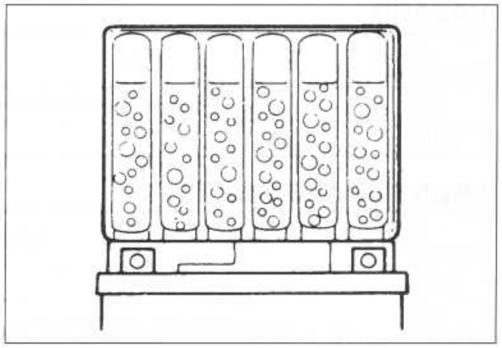
* *After filling the electrolyte completely, use the removed cap ② as the sealed caps of battery-filler holes.*
* *Do not remove or pierce the sealed areas ③ of the electrolyte container.*



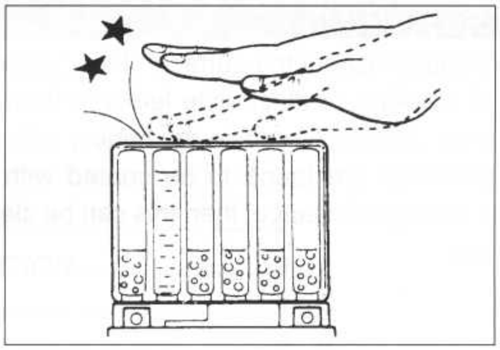
- Insert the nozzles of the electrolyte container ④ into the battery's electrolyte filler holes, holding the container firmly so that it does not fall. Take precaution not to allow any of the fluid to spill.



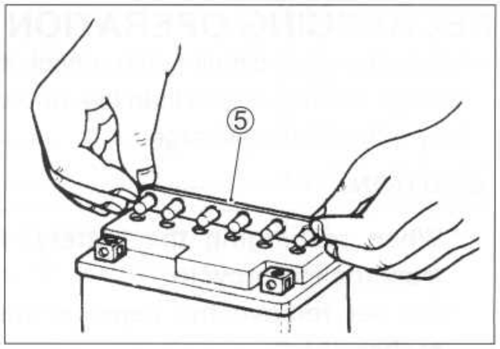
- Make sure air bubbles are coming up each electrolyte container, and leave in this position for about more than 20 minutes.



NOTE:
If no air bubbles are coming up from a filler port, tap the bottom of the electrolyte container two or three times.
Never remove the container from the battery.



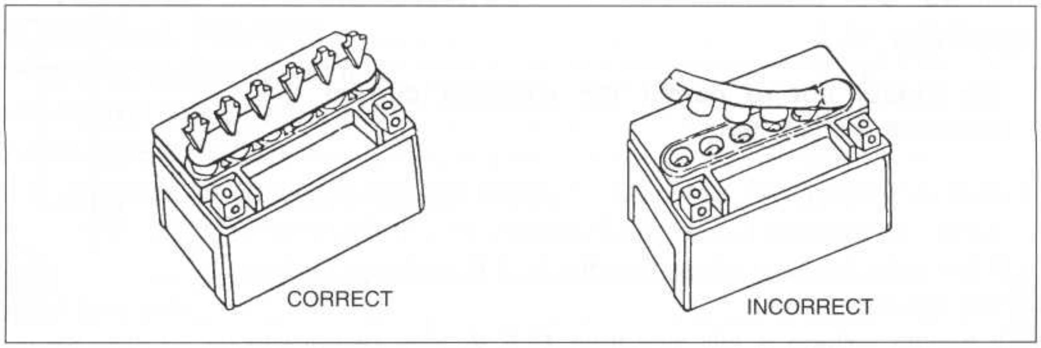
- After confirming that the electrolyte has entered the battery completely, remove the electrolyte containers from the battery. Wait for about 20 minutes.



- Insert the caps ⑤ into the filler holes, pressing in firmly so that the top of the caps do not protrude above the upper surface of the battery's top cover.

CAUTION

* **Never use anything except the specified battery.**
* **Once install the caps to the battery; do not remove the caps.**
* **Do not tap the caps with a hammer when installing them.**



For initial charging, use the charger specially designed for MF battery.

CAUTION

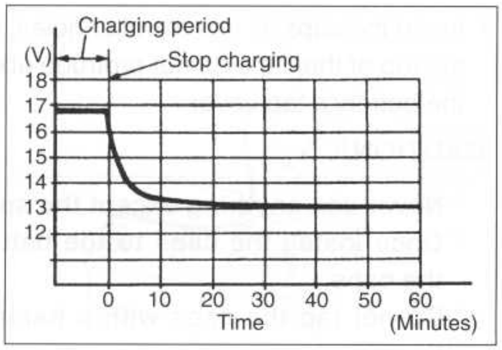
* **For charging the battery, make sure to use the charger specially designed for MF battery. Otherwise, the battery may be overcharged resulting in shortened service life.**
* **Do not remove the cap during charging.**
* **Position the battery with the cap facing upward during charging.**

SERVICING

Visually inspect the surface of the battery container. If any signs of cracking or electrolyte leakage from the sides of the battery have occurred, replace the battery with a new one. If the battery terminals are found to be coated with rust or an acidic white powdery substance, then this can be cleaned away with sandpaper.

RECHARGING OPERATION

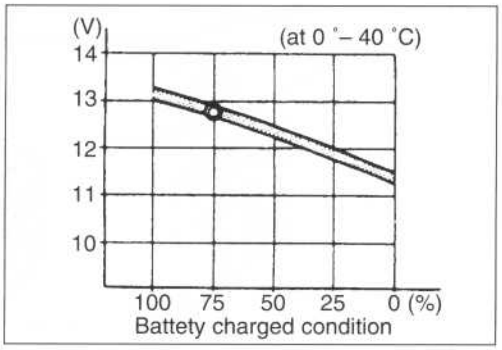
- Using the multi circuit tester, check the battery voltage. If the voltage reading is less than the 12.0 V (DC), recharge the battery with a battery charger.



CAUTION

- * **When recharging the battery, remove the battery from the motorcycle.**
- * **Do not remove the caps on the battery top while recharging.**

Recharging time: 1.4 A for 5 to 10 hours or 6 A for one hour



CAUTION

Be careful not to permit the charging current to exceed 6 A at any time.

- After recharging, wait for more than 30 minutes and check the battery voltage with a multi circuit tester.
- If the battery voltage is less than the 12.5 V, recharge the battery again.
- If battery voltage is still less than 12.5 V, after recharging, replace the battery with a new one.
- When the motorcycle is not used for a long period, check the battery every 1 month to prevent the battery discharge.

SERVICING INFORMATION

CONTENTS

9

TROUBLESHOOTING

MALFUNCTION CODE AND DEFECTIVE CONDITION

MALFUNCTION CODE	DETECTED ITEM	DETECTED FAILURE CONDITION / CHECK FOR
C00	NO FAULT	————
C12	Crankshaft position sensor	The signal does not reach ECM for more than 3 sec. after receiving the IAP signal.
		The crankshaft position sensor wiring and mechanical parts. (Crankshaft position sensor, lead wire/coupler connection)
C13	Intake air pressure sensor	The sensor should produce following voltage. 0.10 V ≦ sensor voltage ≦ 4.80 V Without the above range for 4 sec. and more, C13 is indicated.
		Intake air pressure sensor, lead wire/coupler connection.
C14	Throttle position sensor	The sensor should produce following voltage. 0.1 V ≦ sensor voltage < 4.8 V Without the above range for 4 sec. and more, C14 is indicated.
		Throttle position sensor, lead wire/coupler connection.
C15	Engine coolant temperature sensor	The sensor voltage should be the following. 0.1 V ≦ sensor voltage < 4.6 V Without the above range for 4 sec. and more, C15 is indicated.
		Engine coolant temperature sensor, lead wire/coupler connection.
C21	Intake air temperature sensor	The sensor voltage should be the following. 0.1 V ≦ sensor voltage < 4.6 V Without the above range for 4 sec. and more, C21 is indicated.
		Intake air temperature sensor, lead wire/coupler connection.
C23	Tip over sensor	The sensor voltage should be the following for more than 2 sec. after ignition switch turns ON. 0.2 V ≦ sensor voltage ≦ 4.6 V Without the above value for 2 sec. and more, C23 is indicated.
		Tip over sensor, lead wire/coupler connection.

MALFUNCTION CODE	DETECTED ITEM	DETECTED FAILURE CONDITION / CHECK FOR
C24/C25	Ignition signal #1/#2	Crankshaft position sensor (pick-up coil) signal is produced, but signal from ignition coil is interrupted continuous by 4 times or more. In this case, the code C24 or C25 is indicated.
		Ignition coil, wiring/coupler connection, power supply from the battery.
C28	Secondary throttle valve actuator	When no actuator control signal is supplied from the ECM or communication signal does not reach ECM or operation voltage does not reach STVA motor, C28 is indicated. STVA can not operate.
		STVA lead wire/coupler.
C29	Secondary throttle position sensor	The sensor should produce following voltage. 0.1 V $\leqq$ sensor voltage $\leqq$ 4.8 V Without the above range for 4 sec. and more, C29 is indicated.
		Secondary throttle position sensor, lead wire/coupler connection.
C31	Gear position signal	It judges from gear position voltage, engine speed and throttle position by ECM, when the gear position voltage is 0 V.
		Gear position sensor, wiring/coupler connection. Gearshift cam etc.
C32/C33	Fuel injector #1/#2	When fuel injector voltage gets 1.3 V and less, C32 or C33 is indicated.
		Injector, wiring/coupler connection, power supply to the injector.
C41	Fuel pump relay	No voltage is applied to the both injectors #1/#2 for 3 sec. after the contact of fuel pump relay is turned ON. Or voltage is applied to the both injectors #1/#2, when the contact of fuel pump is OFF.
		Fuel pump relay, connecting lead wire, power source to fuel pump relay, fuel injectors.
C42	Ignition switch	Ignition switch signal is not input in ECM.
		Ignition switch, lead wire/coupler.
C49	PAIR control solenoid valve	PAIR control solenoid valve voltage is not input in ECM.
		PAIR control solenoid valve, lead wire/coupler.

ENGINE

Complaint	Symptom and possible causes	Remedy
Engine will not start or is hard to start.	**Compression too low**	
	1. Tappet clearance out of adjustment.	Adjust.
	2. Worn valve guides or poor seating of valves.	Repair or replace.
	3. Mistimed valves.	Adjust.
	4. Excessively worn piston rings.	Replace.
	5. Worn-down cylinder bores.	Replace.
	6. Starter motor cranks too slowly.	See electrical section.
	7. Poor seating of spark plugs.	Retighten.
	Plug not sparking	
	1. Fouled spark plugs.	Clean.
	2. Wet spark plugs.	Clean and dry.
	3. Defective ignition coils.	Replace.
	4. Open or short in high-tension cord.	Replace.
	5. Defective CKP sensor.	Replace.
	6. Defective ECM.	Replace.
	7. Open-circuited wiring connections.	Repair or replace.
	No fuel reaching the intake manifold	
	1. Clogged fuel filter or fuel hose.	Clean or replace.
	2. Defective fuel pump.	Replace.
	3. Defective fuel pressure regulator.	Replace.
	4. Defective fuel injector.	Replace.
	5. Defective fuel pump relay.	Replace.
	6. Defective ECM.	Replace.
	7. Open-circuited wiring connections.	Check and repair.
	Incorrect fuel/air mixture	
	1. TP sensor out of adjustment.	Adjust.
	2. Defective fuel pump.	Replace.
	3. Defective fuel pressure regulator.	Replace.
	4. Defective TP sensor.	Replace.
	5. Defective CKP sensor.	Replace.
	6. Defective IAP sensor.	Replace.
	7. Defective ECM.	Replace.
	8. Defective ECT sensor.	Replace.
	9. Defective IAT sensor.	Replace.

Complaint	Symptom and possible causes	Remedy
Engine idles poorly.	1. Tappet clearance out of adjustment.	Adjust.
	2. Poor seating of valves.	Replace or repair.
	3. Defective valve guides.	Replace.
	4. Worn down camshafts.	Replace.
	5. Too wide spark plug gaps.	Adjust or replace.
	6. Defective ignition coils.	Replace.
	7. Defective CKP sensor.	Replace.
	8. Defective ECM.	Replace.
	9. Defective TP sensor.	Replace.
	10. Defective fuel pump.	Replace.
	11. Imbalanced throttle valve or STV.	Adjust.
	12. Damaged or cracked vacuum hose.	Replace.
Engine stalls often	**Incorrect fuel/air mixture**	
	1. Defective IAP sensor or circuit.	Repair or replace.
	2. Clogged fuel filter.	Clean or replace.
	3. Defective fuel pump.	Replace.
	4. Defective fuel pressure regulator.	Replace.
	5. Defective ECT sensor.	Replace.
	6. Defective thermostat.	Replace.
	7. Defective IAT sensor.	Replace.
	8. Damaged or cracked vacuum hose.	Replace.
	Fuel injector improperly operating	
	1. Defective fuel injectors.	Replace.
	2. No injection signal from ECM.	Repair or replace.
	3. Open or short circuited wiring connection.	Repair or replace.
	4. Defective battery or low battery voltage.	Replace or recharge.
	Control circuit or sensor improperly operating	
	1. Defective ECM.	Replace.
	2. Defective fuel pressure regulator.	Replace.
	3. Defective TP sensor.	Replace.
	4. Defective IAT sensor.	Replace.
	5. Defective CKP sensor.	Replace.
	6. Defective ECT sensor.	Replace.
	7. Defective fuel pump relay.	Replace.
	Engine internal parts improperly operating	
	1. Fouled spark plugs.	Clean.
	2. Defective CKP sensor or ECM.	Replace.
	3. Clogged fuel hose.	Clean.
	4. Tappet clearance out of adjustment.	Adjust.

Complaint	Symptom and possible causes	Remedy
Noisy engine.	**Excessive valve chatter**	
	1. Too large tappet clearance.	Adjust.
	2. Weakened or broken valve springs.	Replace.
	3. Worn tappet or cam surface.	Replace.
	4. Worn and burnt camshaft journal.	Replace.
	Noise seems to come from piston	
	1. Worn down pistons or cylinders.	Replace.
	2. Combustion chambers fouled with carbon.	Clean.
	3. Worn piston pins or piston pin bore.	Replace.
	4. Worn piston rings or ring grooves.	Replace.
	Noise seems to come from cam chain	
	1. Stretched chain.	Replace.
	2. Worn sprockets.	Replace.
	3. Tension adjuster not working.	Repair or replace.
	Noise seems to come from clutch	
	1. Worn splines of countershaft or hub.	Replace.
	2. Worn teeth of clutch plates.	Replace.
	3. Distorted clutch plates, driven and drive.	Replace.
	4. Worn clutch release bearing.	Replace.
	5. Weakened clutch dampers.	Replace the primary driven gear.
	Noise seems to come from crankshaft	
	1. Rattling bearings due to wear.	Replace.
	2. Worn and burnt big-end bearings.	Replace.
	3. Worn and burnt journal bearings.	Replace.
	Noise seems to come from transmission	
	1. Worn or rubbing gears.	Replace.
	2. Worn splines.	Replace.
	3. Worn or rubbing primary gears.	Replace.
	4. Worn bearings.	Replace.
	Noise seems to come from water pump	
	1. Too much play on pump shaft bearing.	Replace.
	2. Worn or damaged impeller shaft.	Replace.
	3. Worn or damaged mechanical seal.	Replace.
	4. Contact between pump case and impeller.	Replace.

Complaint	Symptom and possible causes	Remedy
Engine runs poorly in high speed range.	**Defective engine internal/electrical parts**	
	1. Weakened valve springs.	Replace.
	2. Worn camshafts.	Replace.
	3. Valve timing out of adjustment.	Adjust.
	4. Too narrow spark plug gaps.	Adjust.
	5. Ignition not advanced sufficiently due to poorly working timing advance circuit.	Replace ECM.
	6. Defective ignition coils.	Replace.
	7. Defective CKP sensor.	Replace.
	8. Defective ECM.	Replace.
	9. Clogged fuel hose, resulting in inadequate fuel supply to injector.	Clean and prime.
	10. Defective fuel pump.	Replace.
	11. Defective TP sensor.	Replace.
	12. Defective STP sensor or STVA.	Replace.
	Defective air flow system	
	1. Clogged air cleaner element.	Clean or replace.
	2. Defective throttle valve.	Adjust or replace.
	3. Defective secondary throttle valve.	Adjust or replace.
	4. Sucking air from throttle body joint.	Repair or replace.
	5. Defective ECM.	Replace.
	6. Imbalanced throttle valve synchronization.	Adjust.
	Defective control circuit or sensor	
	1. Low fuel pressure.	Repair or replace.
	2. Defective TP sensor.	Replace.
	3. Defective IAT sensor.	Replace.
	4. Defective CKP sensor.	Replace.
	5. Defective GP switch.	Replace.
	6. Defective IAP sensor.	Replace.
	7. Defective ECM.	Replace.
	8. TP sensor out of adjustment.	Adjust.
	9. Defective STP sensor and/or STVA.	Replace.

Complaint	Symptom and possible causes	Remedy
Engine lacks power.	**Defective engine internal/electrical parts**	
	1. Loss of tappet clearance.	Adjust.
	2. Weakened valve springs.	Replace.
	3. Valve timing out of adjustment.	Adjust.
	4. Worn piston rings or cylinders.	Replace.
	5. Poor seating of valves.	Repair.
	6. Fouled spark plugs.	Clean or replace.
	7. Incorrect spark plugs.	Adjust or replace.
	8. Clogged injectors.	Clean.
	9. TP sensor out of adjustment.	Adjust.
	10. Clogged air cleaner element.	Clean.
	11. Imbalanced throttle valve synchronization.	Adjust.
	12. Sucking air from throttle valve or vacuum hose.	Retighten or replace.
	13. Too much engine oil.	Drain out excess oil.
	14. Defective fuel pump or ECM.	Replace.
	15. Defective CKP sensor and ignition coils.	Replace.
	Defective control circuit or sensor	
	1. Low fuel pressure.	Repair or replace.
	2. Defective TP sensor.	Replace.
	3. Defective IAT sensor.	Replace.
	4. Defective CKP sensor.	Replace.
	5. Defective GP switch.	Replace.
	6. Defective IAP sensor.	Replace.
	7. Defective ECM.	Replace.
	8. Imbalanced throttle valve synchronization.	Adjust.
	9. TP sensor out of adjustment.	Adjust.
	10. Defective STP sensor and/or STVA.	Replace.
Engine overheats.	**Defective engine internal parts**	
	1. Heavy carbon deposit on piston crowns.	Clean.
	2. Not enough oil in the engine.	Add oil.
	3. Defective oil pump or clogged oil circuit.	Replace or clean.
	4. Sucking air from intake pipes.	Retighten or replace.
	5. Use incorrect engine oil.	Change.
	6. Defective cooling system.	See radiator section.
	Lean fuel/air mixture	
	1. Short-circuited IAP sensor/lead wire.	Repair or replace.
	2. Short-circuited IAT sensor/lead wire.	Repair or replace.
	3. Sucking air from intake pipe joint.	Repair or replace.
	4. Defective fuel injectors.	Replace.
	5. Defective ECT sensor.	Replace.
	The other factors	
	1. Ignition timing too advanced due to defective timing advance system (ECT sensor, GP switch, CKP sensor and ECM.)	Replace.
	2. Drive chain is too tight.	Adjust.

Complaint	Symptom and possible causes	Remedy
Dirty or heavy exhaust smoke.	1. Too much engine oil in the engine. 2. Worn piston rings or cylinders. 3. Worn valve guides. 4. Scored or scuffed cylinder walls. 5. Worn valves stems. 6. Defective stem seal. 7. Worn oil ring side rails.	Check with inspection window. Drain excess oil. Replace. Replace. Replace. Replace. Replace. Replace.
Slipping clutch.	1. Weakened clutch springs. 2. Worn or distorted pressure plates. 3. Distorted clutch plates or pressure plates.	Replace. Replace. Replace.
Dragging clutch.	1. Some clutch springs weakened while others are not. 2. Distorted pressure plates or clutch plates.	Replace. Replace.
Transmission will not shift.	1. Broken gearshift cam. 2. Distorted gearshift forks. 3. Worn gearshift pawl.	Replace. Replace. Replace.
Transmission will not shift back.	1. Broken return spring on shift shaft. 2. Rubbing or sticky shift shaft. 3. Distorted or worn gearshift forks.	Replace. Repair or replace. Replace.
Transmission jumps out of gear.	1. Worn shifting gears on driveshaft or countershaft. 2. Distorted or worn gearshift forks. 3. Weakened stopper spring on gearshift stopper.	Replace. Replace. Replace.

RADIATOR (COOLING SYSTEM)

Complaint	Symptom and possible causes	Remedy
Engine overheats.	1. Not enough engine coolant. 2. Radiator core and oil cooler core clogged with dirt or scale. 3. Faulty cooling fan. 4. Defective cooling fan thermo-switch. 5. Clogged water passage. 6. Air trapped in the cooling circuit. 7. Defective water pump. 8. Use of incorrect engine coolant. 9. Defective thermostat.	Add coolant. Clean. Repair or replace. Replace. Clean. Bleed out air. Replace. Replace. Replace.
Engine overcools.	1. Defective cooling fan thermo-switch. 2. Extremely cold weather. 3. Defective thermostat.	Replace. Put on the radiator cover. Replace.

CHASSIS

Complaint	Symptom and possible causes	Remedy
Heavy steering.	1. Overtightened steering stem nut.	Adjust.
	2. Broken bearing in steering stem.	Replace.
	3. Distorted steering stem.	Replace.
	4. Not enough pressure in tires.	Adjust.
Wobbly handlebars.	1. Loss of balance between right and left front forks.	Adjust.
	2. Distorted front fork.	Repair or replace.
	3. Distorted front axle or crooked tire.	Replace.
	4. Loose steering stem nut.	Adjust.
	5. Worn or incorrect tire or wrong tire pressure.	Adjust or replace.
	6. Worn bearing/race in steering stem.	Replace.
Wobbly front wheel.	1. Distorted wheel rim.	Replace.
	2. Worn front wheel bearings.	Replace.
	3. Defective or incorrect tire.	Replace.
	4. Loose axle or axle pinch bolt.	Retighten.
	5. Incorrect front fork oil level.	Adjust.
	6. Incorrect front wheel weight balance.	Adjust.
Front suspension too soft.	1. Weakened springs.	Replace.
	2. Not enough fork oil.	Replenish.
	3. Wrong viscous fork oil.	Replace.
	4. Improperly set front fork spring adjuster.	Adjust.
Front suspension too stiff.	1. Too viscous fork oil.	Replace.
	2. Too much fork oil.	Drain excess oil.
	3. Improperly set front fork spring adjuster.	Adjust.
	4. Bent front axle.	Replace.
Noisy front suspension.	1. Not enough fork oil.	Replenish.
	2. Loose bolts on suspension.	Retighten.
Wobbly rear wheel.	1. Distorted wheel rim.	Replace.
	2. Worn rear wheel bearing or swingarm bearings.	Replace.
	3. Defective or incorrect tire.	Replace.
	4. Worn swingarm and rear suspensions.	Replace.
	5. Loose nuts or bolts on rear suspensions.	Retighten.
Rear suspension too soft.	1. Weakened spring of shock absorber.	Replace.
	2. Leakage of oil from shock absorber.	Replace.
	3. Improperly set rear spring unit adjuster.	Adjust.
Rear suspension too stiff.	1. Bent shock absorber shaft.	Replace.
	2. Bent swingarm pivot shaft.	Replace.
	3. Worn swingarm and suspension bearings.	Replace.
	4. Improperly set rear spring unit adjuster.	Adjust.
Noisy rear suspension.	1. Loose nuts or bolts on rear suspension.	Retighten.
	2. Worn swingarm and suspension bearings.	Replace.

BRAKES

Complaint	Symptom and possible causes	Remedy
Insufficient brake power.	1. Leakage of brake fluid from hydraulic system.	Repair or replace.
	2. Worn pads.	Replace.
	3. Oil adhesion on friction surface of pads.	Clean disc and pads.
	4. Worn disc.	Replace.
	5. Air in hydraulic system.	Bleed air.
	6. Not enough brake fluid in the reservoir.	Replenish.
Brake squeaking.	1. Carbon adhesion on pad surface.	Repair surface with sandpaper.
	2. Tilted pad.	Correct pad fitting or replace.
	3. Damaged wheel bearing.	Replace.
	4. Loose front wheel axle or rear wheel axle.	Tighten to specified torque.
	5. Worn pads or disc.	Replace.
	6. Foreign material in brake fluid.	Replace brake fluid.
	7. Clogged return port of master cylinder.	Disassemble and clean master cylinder.
Excessive brake lever stroke.	1. Air in hydraulic system.	Bleed air.
	2. Insufficient brake fluid.	Replenish fluid to specified level; bleed air.
	3. Improper quality of brake fluid.	Replace with correct fluid.
Leakage of brake fluid.	1. Insufficient tightening of connection joints.	Tighten to specified torque.
	2. Cracked hose.	Replace.
	3. Worn piston and/or cup.	Replace piston and/or cup.
Brake drags.	1. Rusty part.	Clean and lubricate.
	2. Insufficient brake lever or brake pedal pivot lubrication.	Lubricate.

ELECTRICAL

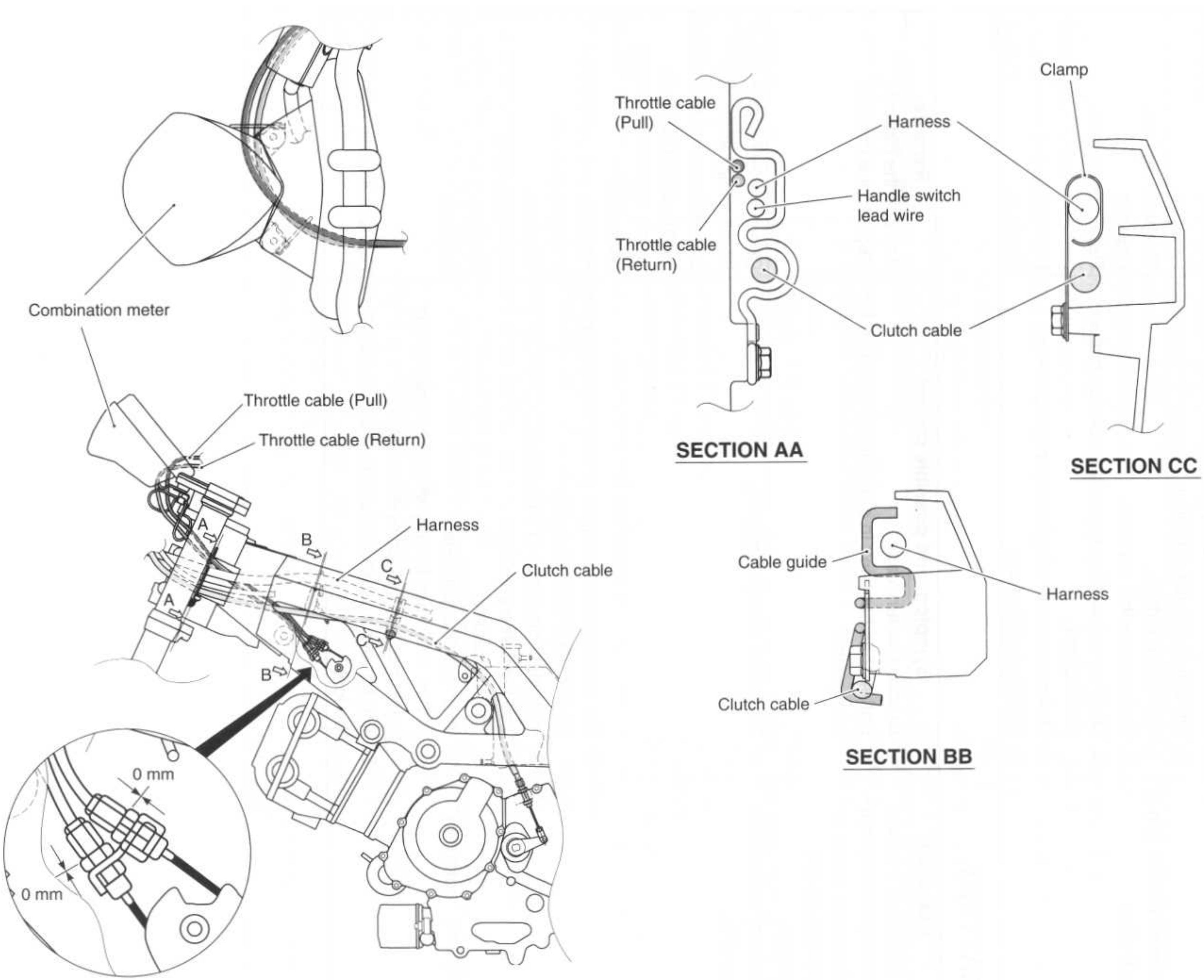
Complaint	Symptom and possible causes	Remedy
No sparking or poor sparking.	1. Defective ignition coils or spark plug caps.	Replace.
	2. Defective spark plugs.	Replace.
	3. Defective CKP sensor.	Replace.
	4. Defective ECM.	Replace.
	5. Defective TO sensor.	Replace.
	6. Open-circuited wiring connections.	Check and repair.
Spark plug soon become fouled with carbon.	1. Mixture too rich.	Inspect FI system.
	2. Idling speed set too high.	Adjust fast idle or throttle stop screw.
	3. Incorrect gasoline.	Change.
	4. Dirty air cleaner element.	Clean or replace.
	5. Too cold spark plugs.	Replace with hot type plugs.
Spark plug become fouled too soon.	1. Worn piston rings.	Replace.
	2. Worn piston or cylinders.	Replace.
	3. Excessive clearance of valve stems in valve guides.	Replace.
	4. Worn stem oil seal.	Replace.
Spark plug electrodes overheat or burn.	1. Too hot spark plugs.	Replace with cold type plugs.
	2. Overheated the engine.	Tune up.
	3. Loose spark plugs.	Retighten.
	4. Too lean mixture.	Consult FI system.
Generator does not charge.	1. Open- or short-circuited lead wires, or loose lead connections.	Repair or replace or retighten.
	2. Short-circuited, grounded or open generator coil.	Replace.
	3. Short-circuited or punctured regulator/rectifier.	Replace.
Generator does charge, but charging rate is below the specification.	1. Lead wires tend to get short- or open-circuited or loosely connected at terminals.	Repair or retighten.
	2. Grounded or open-circuited generator coil.	Replace.
	3. Defective regulator/rectifier.	Replace.
	4. Defective cell plates in the battery.	Replace the battery.
Generator overcharges.	1. Internal short-circuit in the battery.	Replace the battery.
	2. Damaged or defective resistor element in the regulator/rectifier.	Replace.
	3. Poorly grounded regulator/rectifier.	Clean and tighten ground connection.

Complaint	Symptom and possible causes	Remedy
Unstable charging.	1. Lead wire insulation frayed due to vibration, resulting in intermittent short-circuiting. 2. Internally short-circuited generator. 3. Defective regulator/rectifier.	Repair or replace. Replace. Replace.
Starter button is not effective.	1. Run down battery. 2. Defective switch contacts. 3. Brushes not seating properly on starter motor commutator. 4. Defective starter relay/starter interlock switch. 5. Defective main fuse.	Repair or replace. Replace. Repair or replace. Replace. Replace.

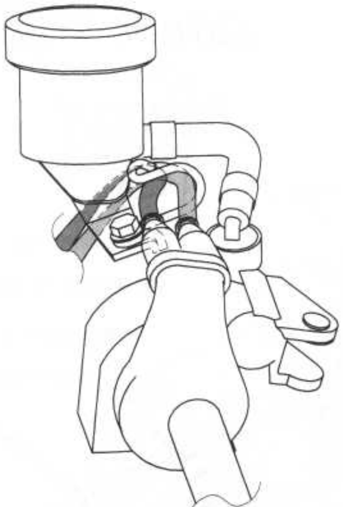
BATTERY

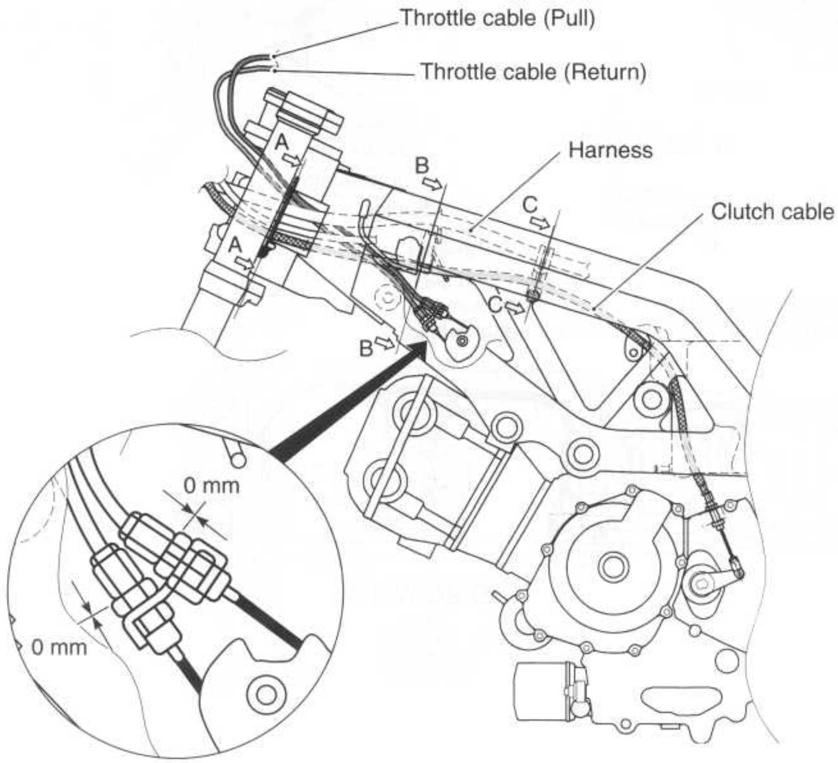
Complaint	Symptom and possible causes	Remedy
"Sulfation", acidic white powdery substance or spots on surface of cell plates.	1. Cracked battery case. 2. Battery has been left in a run-down condition for a long time.	Replace the battery. Replace the battery.
Battery runs down quickly.	1. Trouble in charging system. 2. Cell plates have lost much of their active material as a result of overcharging. 3. Internal short-circuit in the battery. 4. Too low battery voltage. 5. Too old battery.	Check the generator, regulator/rectifier and circuit connections and make necessary adjustments to obtain specified charging operation. Replace and correct the charging system. Replace. Recharge fully. Replace.
Battery "sulfation".	1. Incorrect charging rate. (When not in use battery should be checked at least once a month to avoid sulfation.) 2. The battery was left unused in a cold climate for too long.	Replace. Replace if badly sulfated.

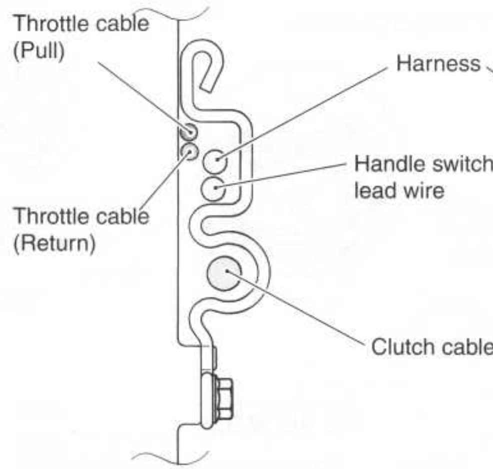
WIRE HARNESS, CABLE AND HOSE ROUTING
CABLE ROUTING (SV650)



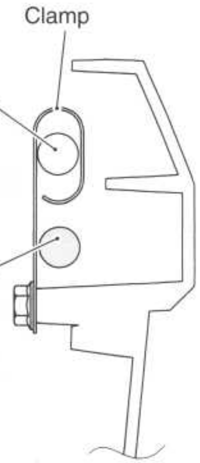
CABLE ROUTING (SV650S)







SECTION AA



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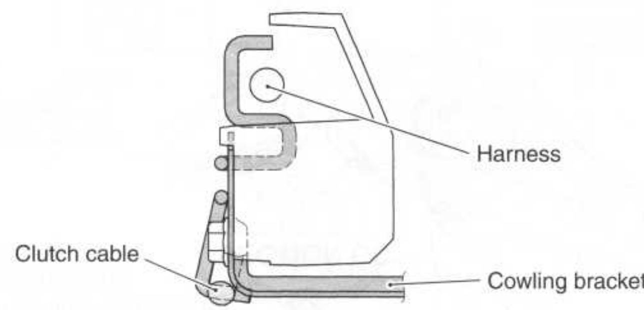
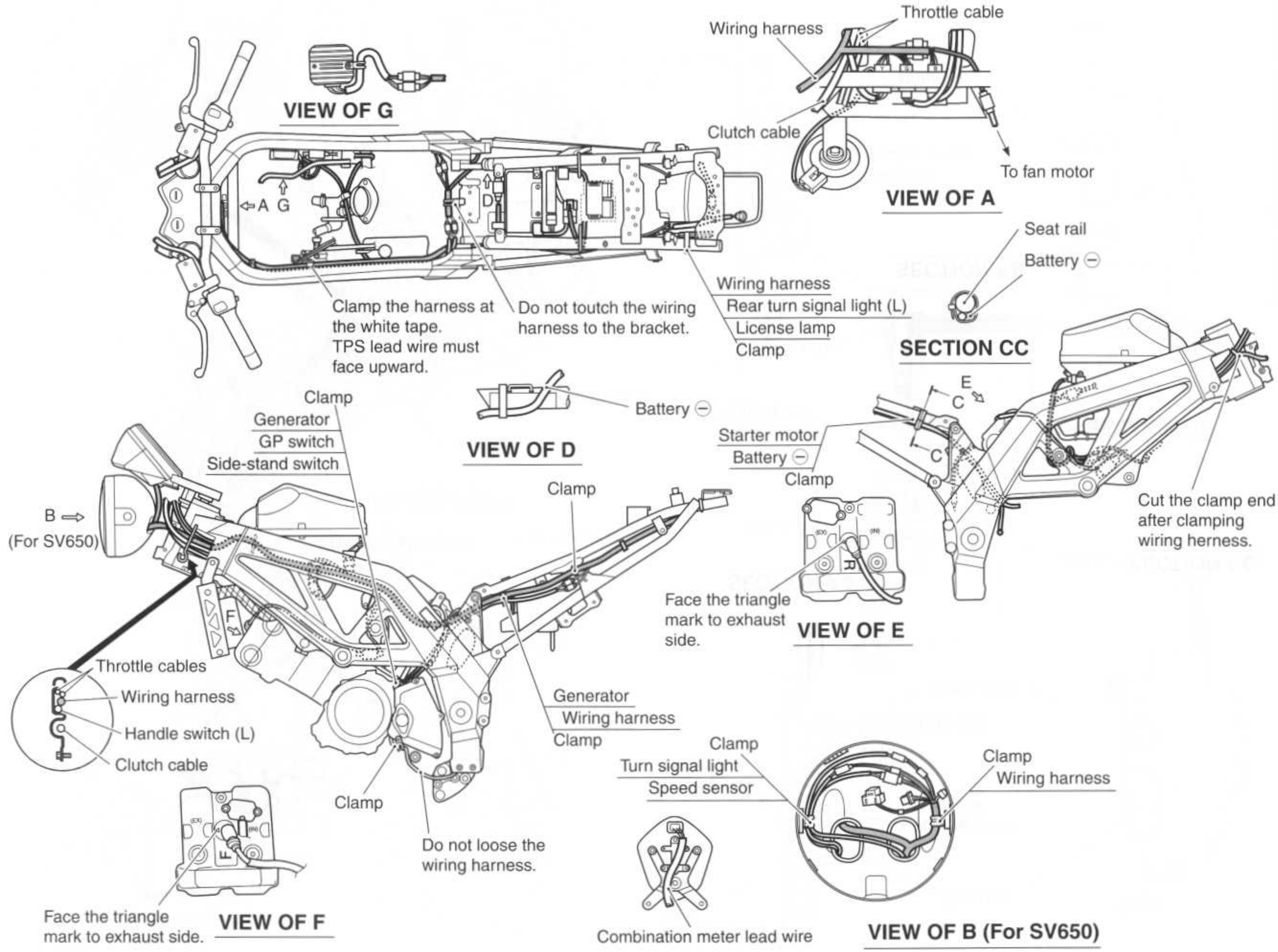
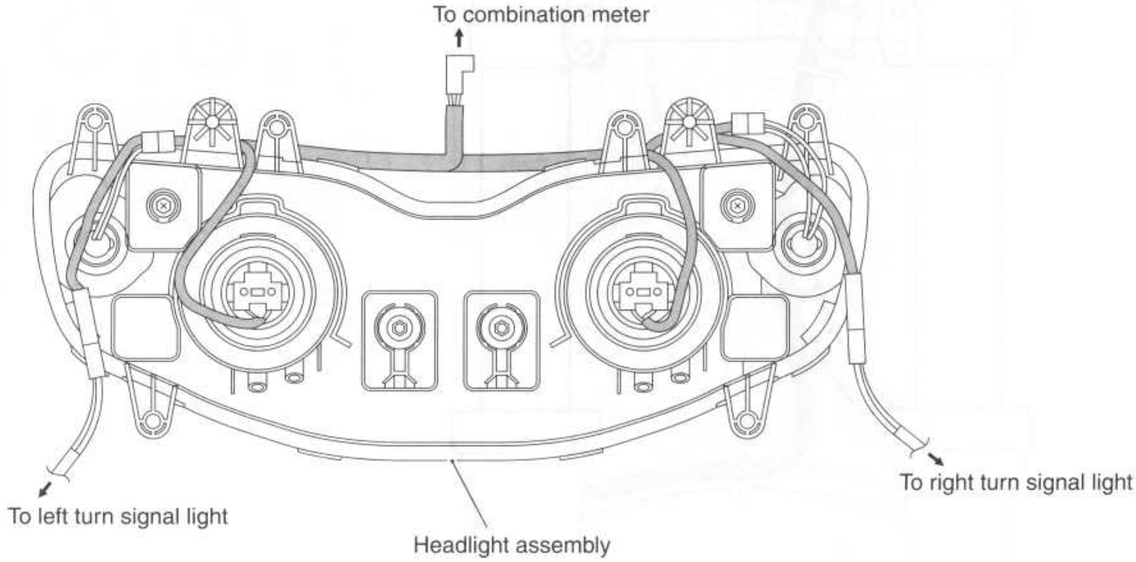


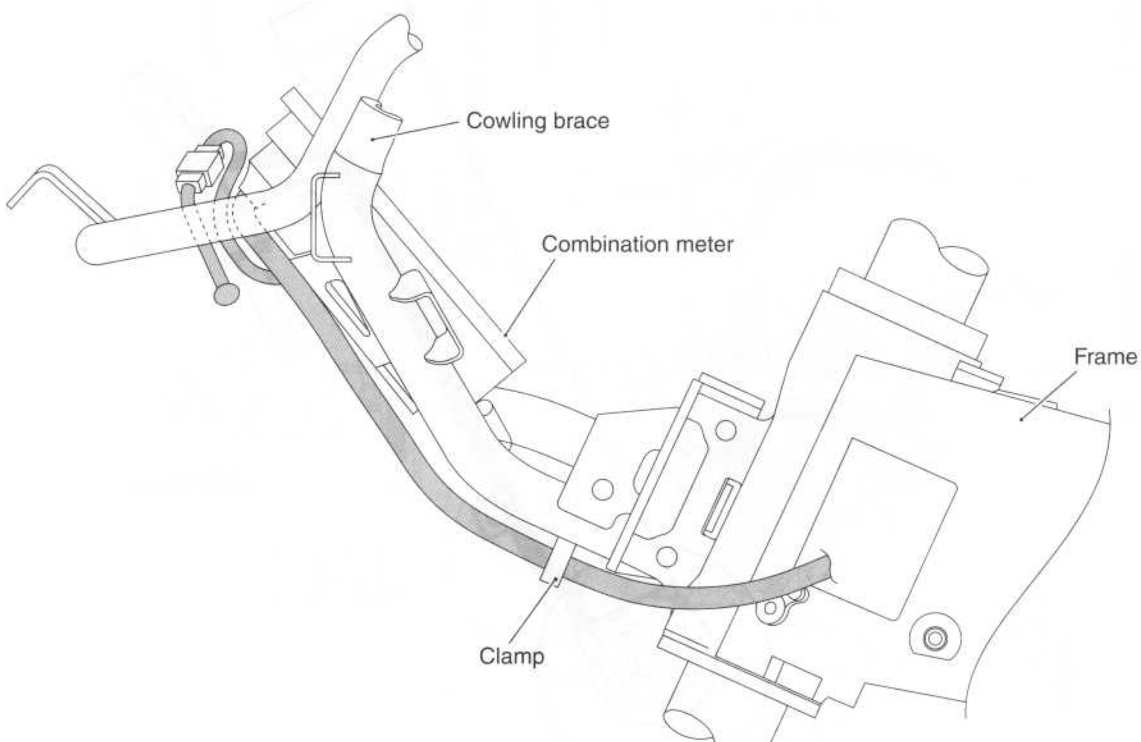
SECTION BB

WIRE HARNESS ROUTING

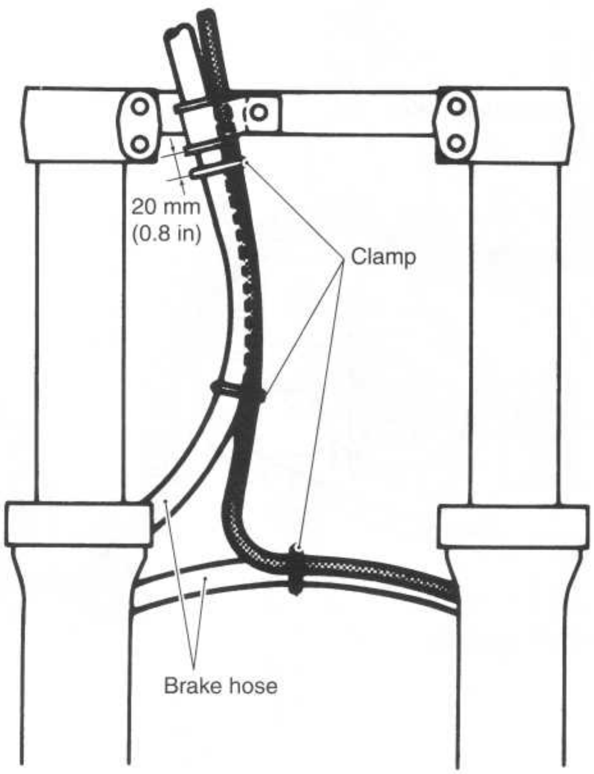


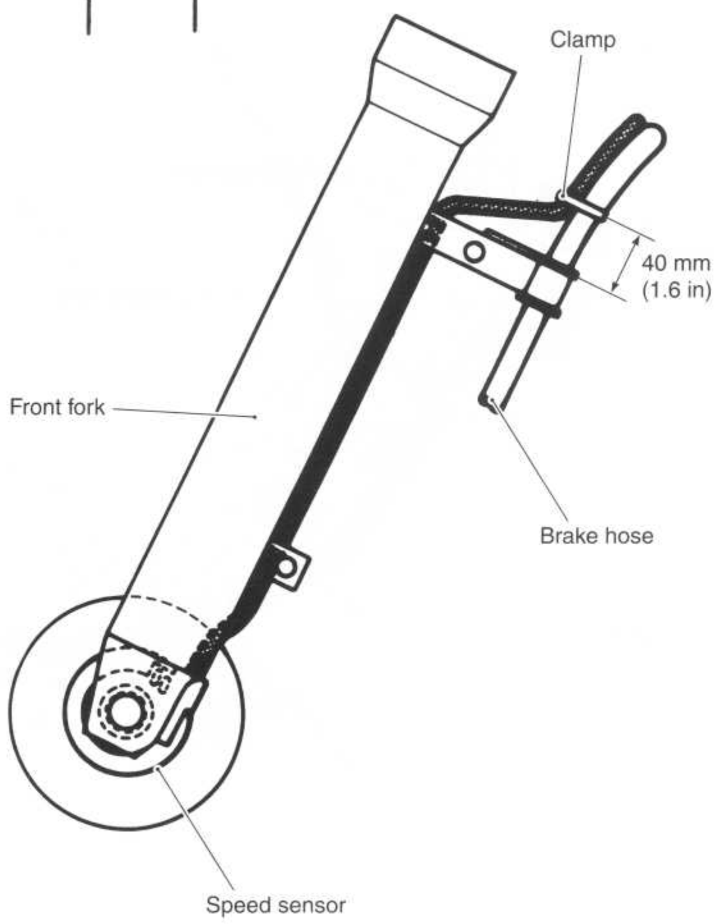
WIRE HARNESS ROUTING (SV650S only)



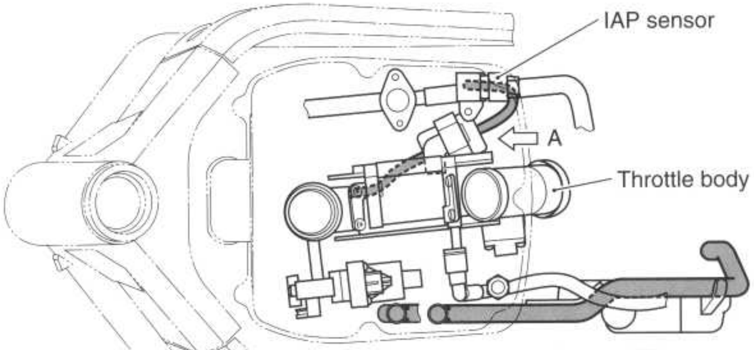


SPEED SENSOR LEAD WIRE ROUTING



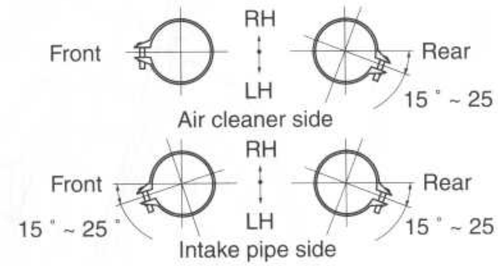


THROTTLE BODY INSTALLATION/HOSE ROUTING

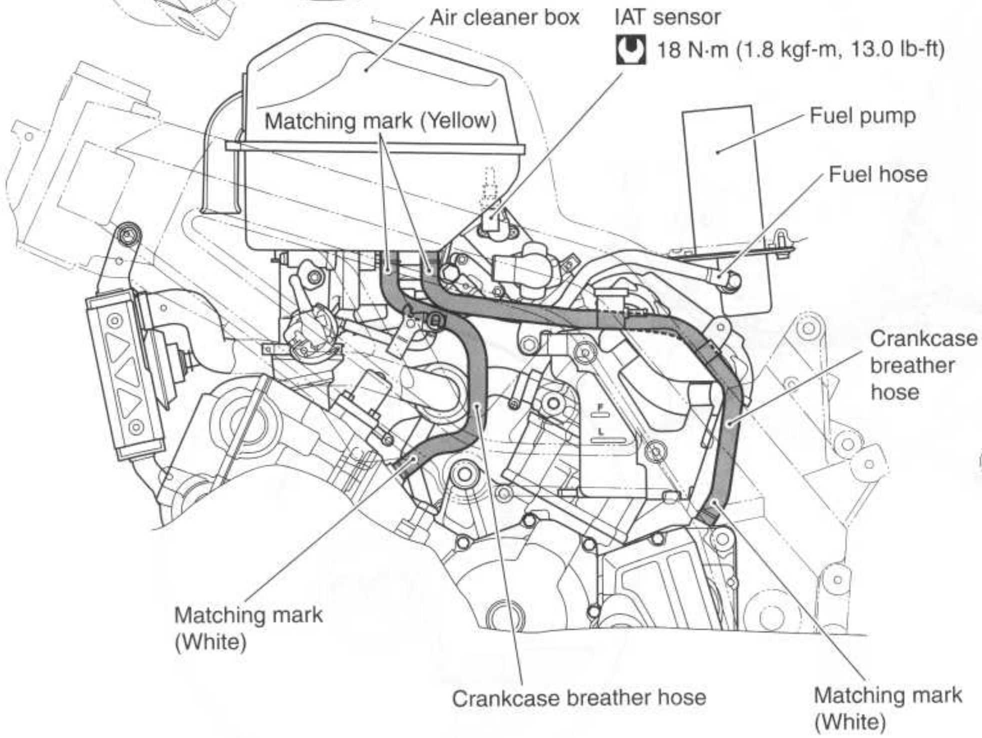


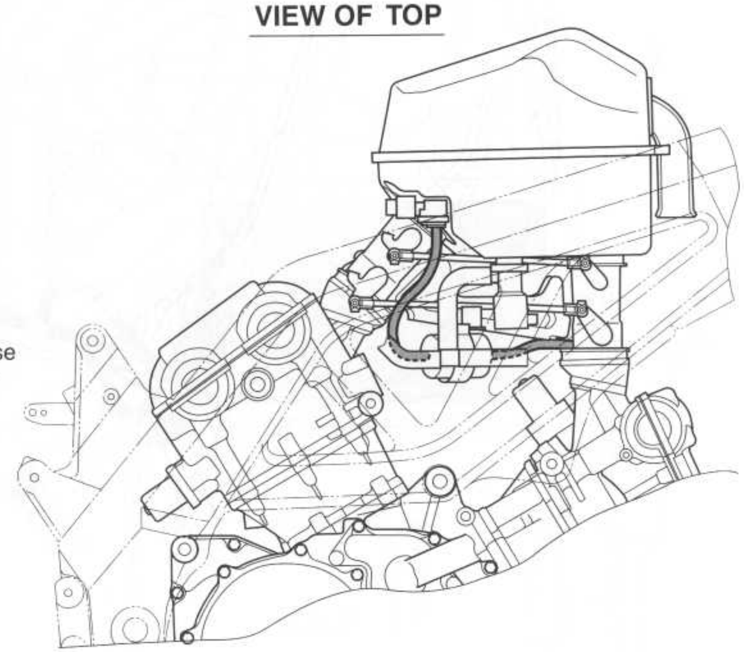
VIEW OF A

THROTTLE BODY CLAMP POSITION

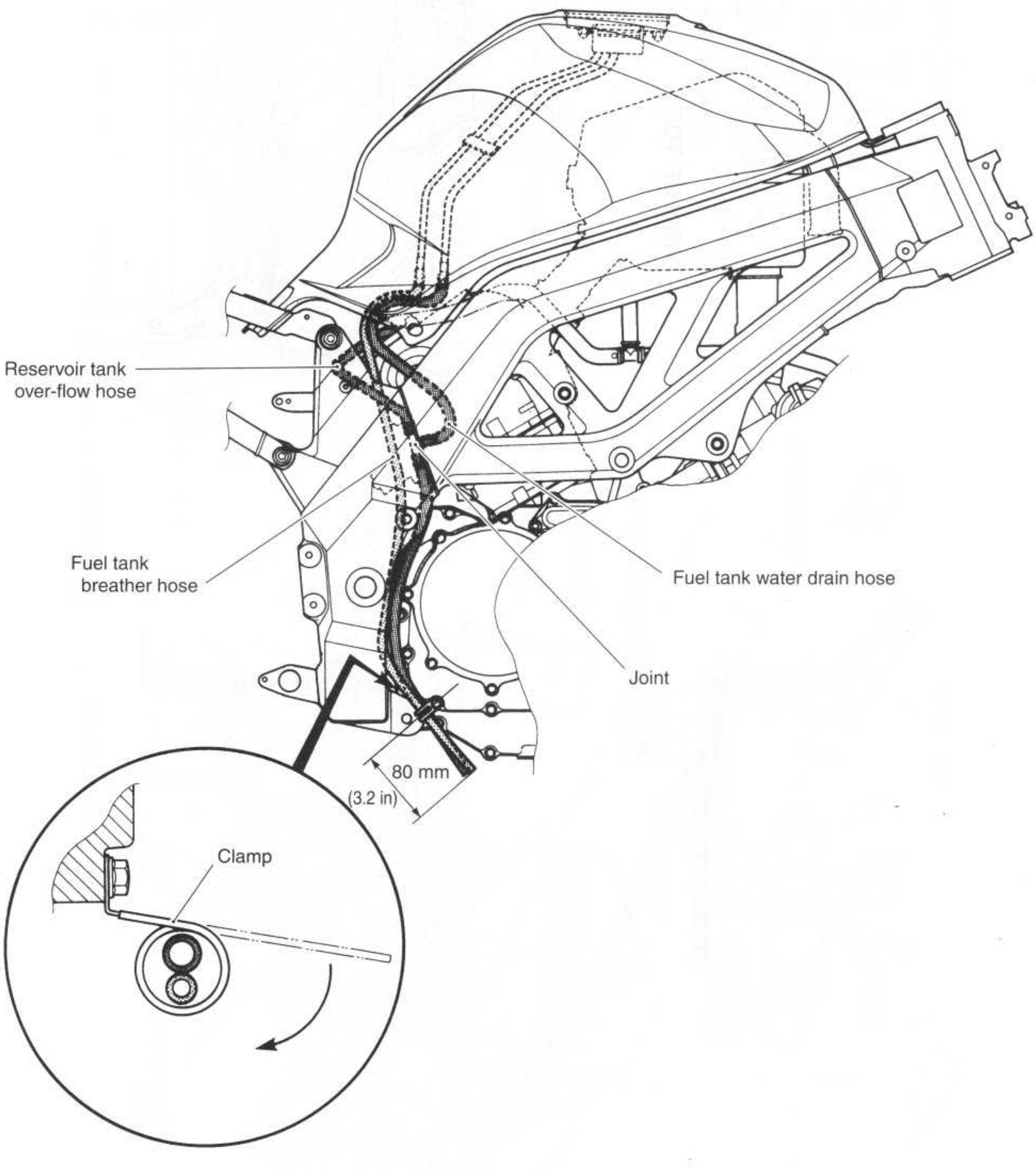


VIEW OF TOP

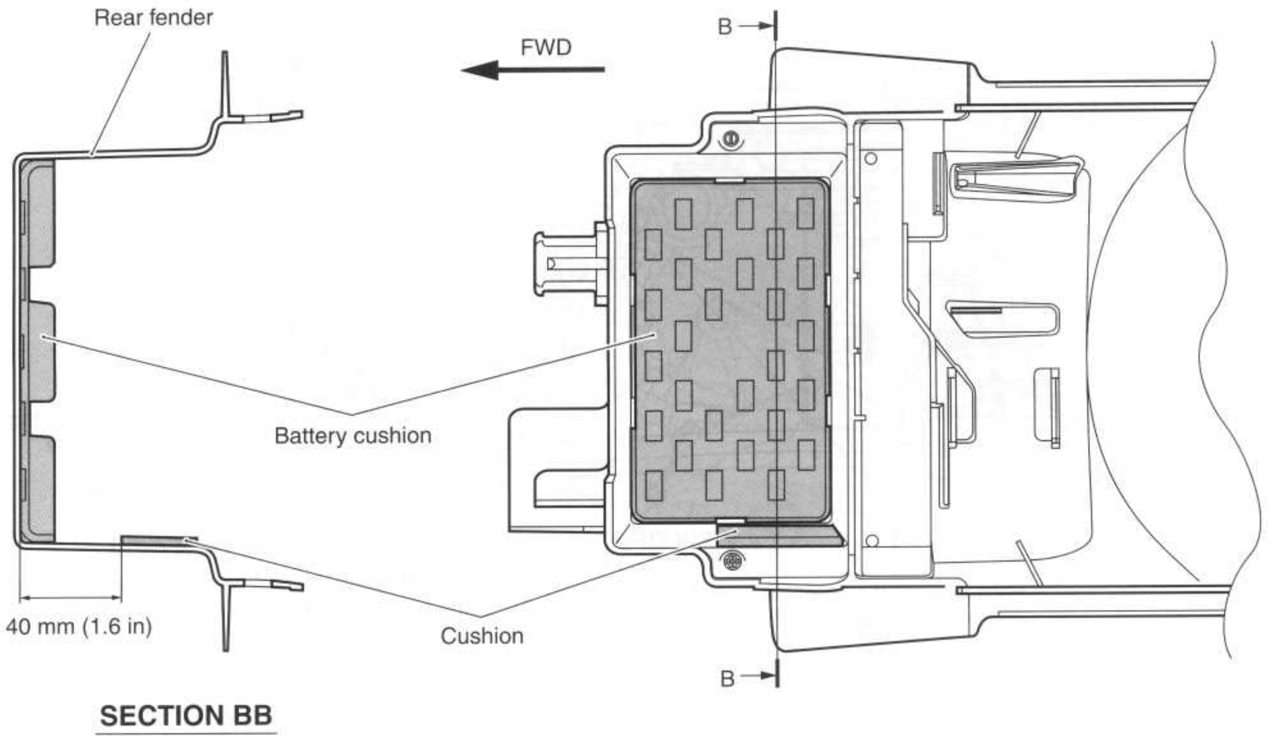




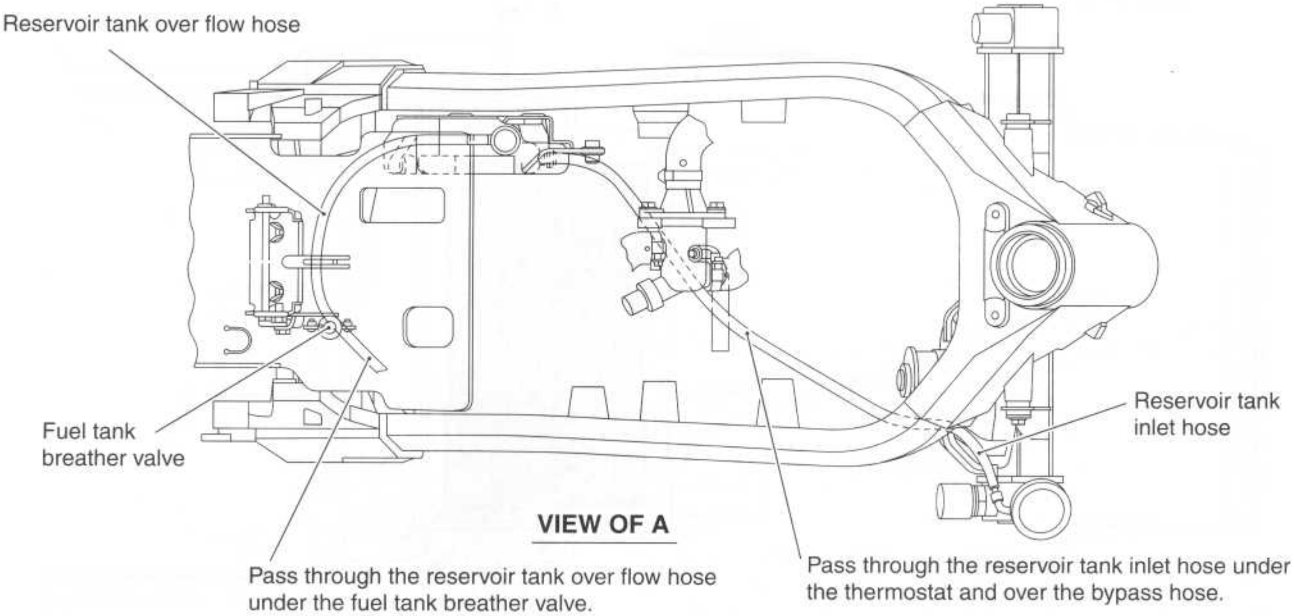
FUEL SYSTEM HOSE ROUTING

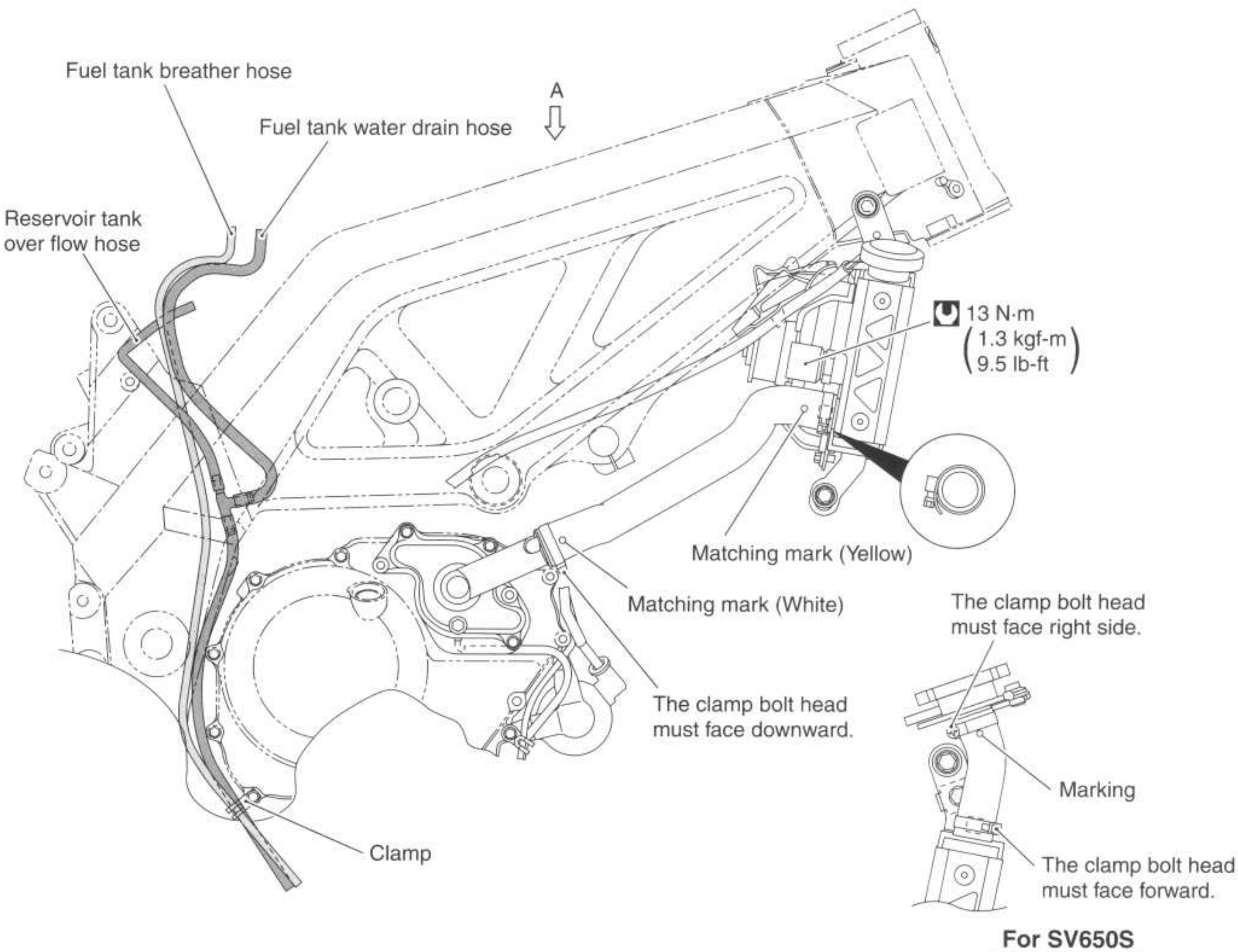


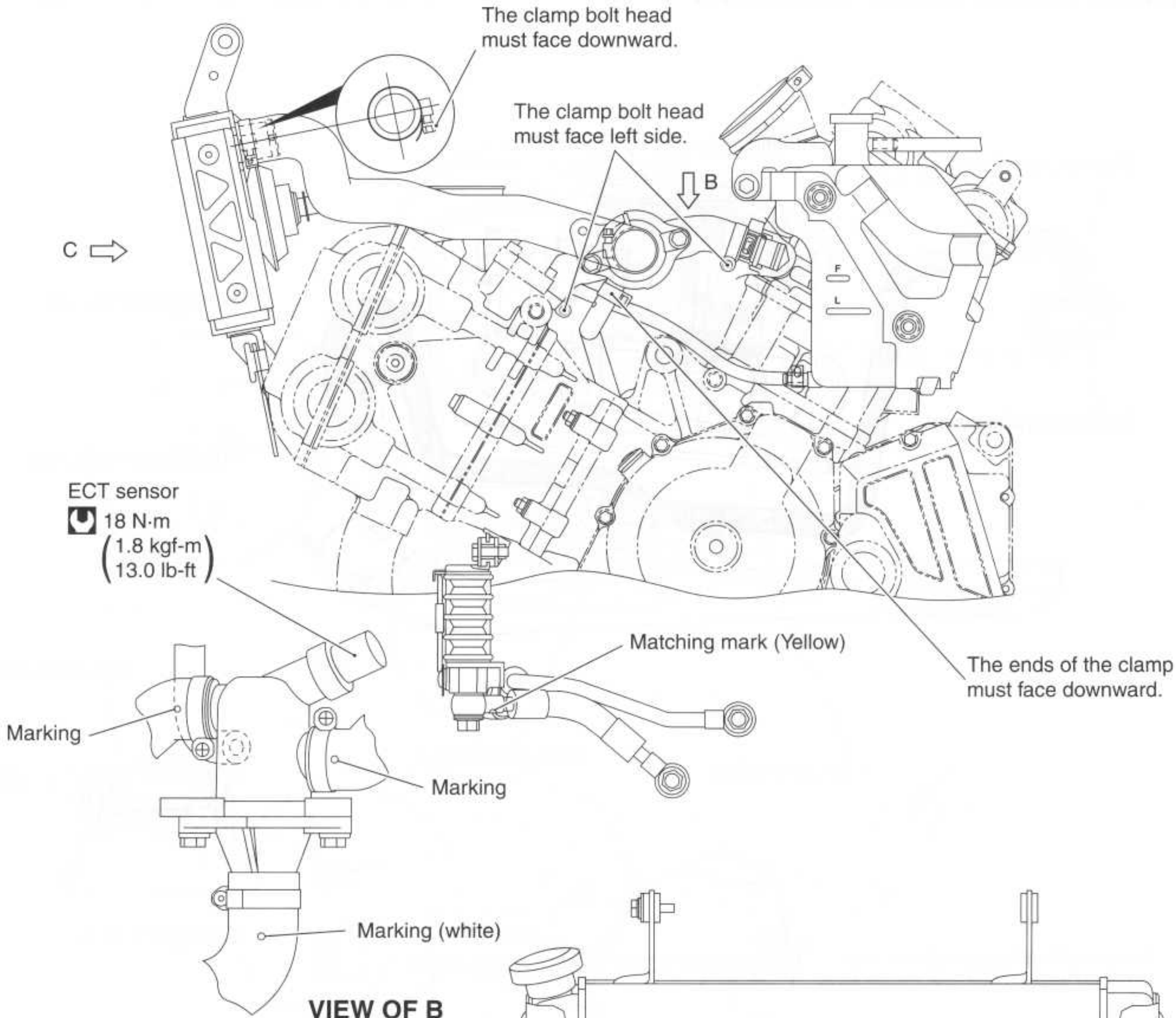
BATTERY CUSHION INSTALLATION



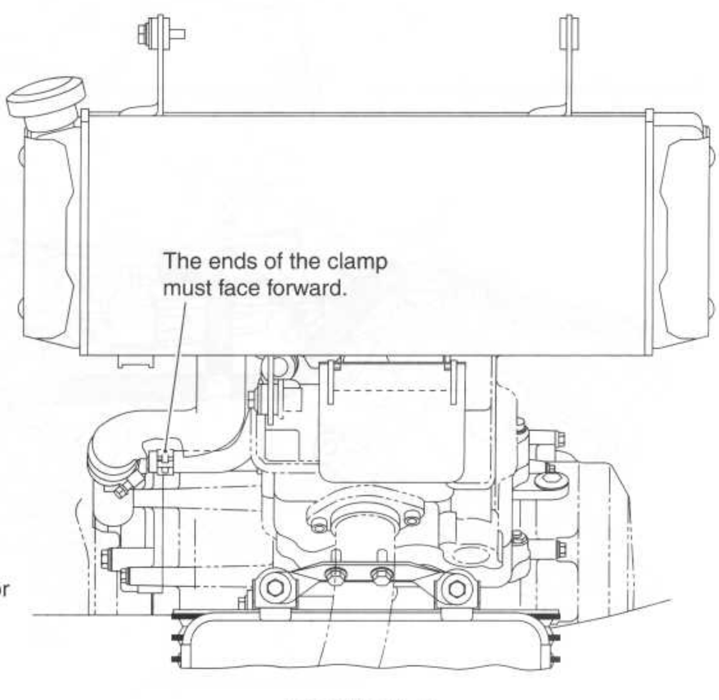
COOLING SYSTEM HOSE ROUTING

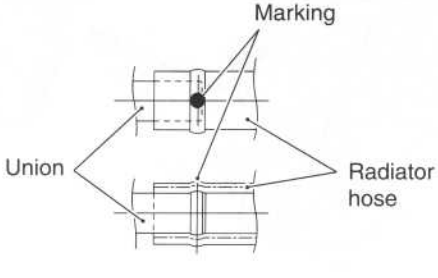






VIEW OF B

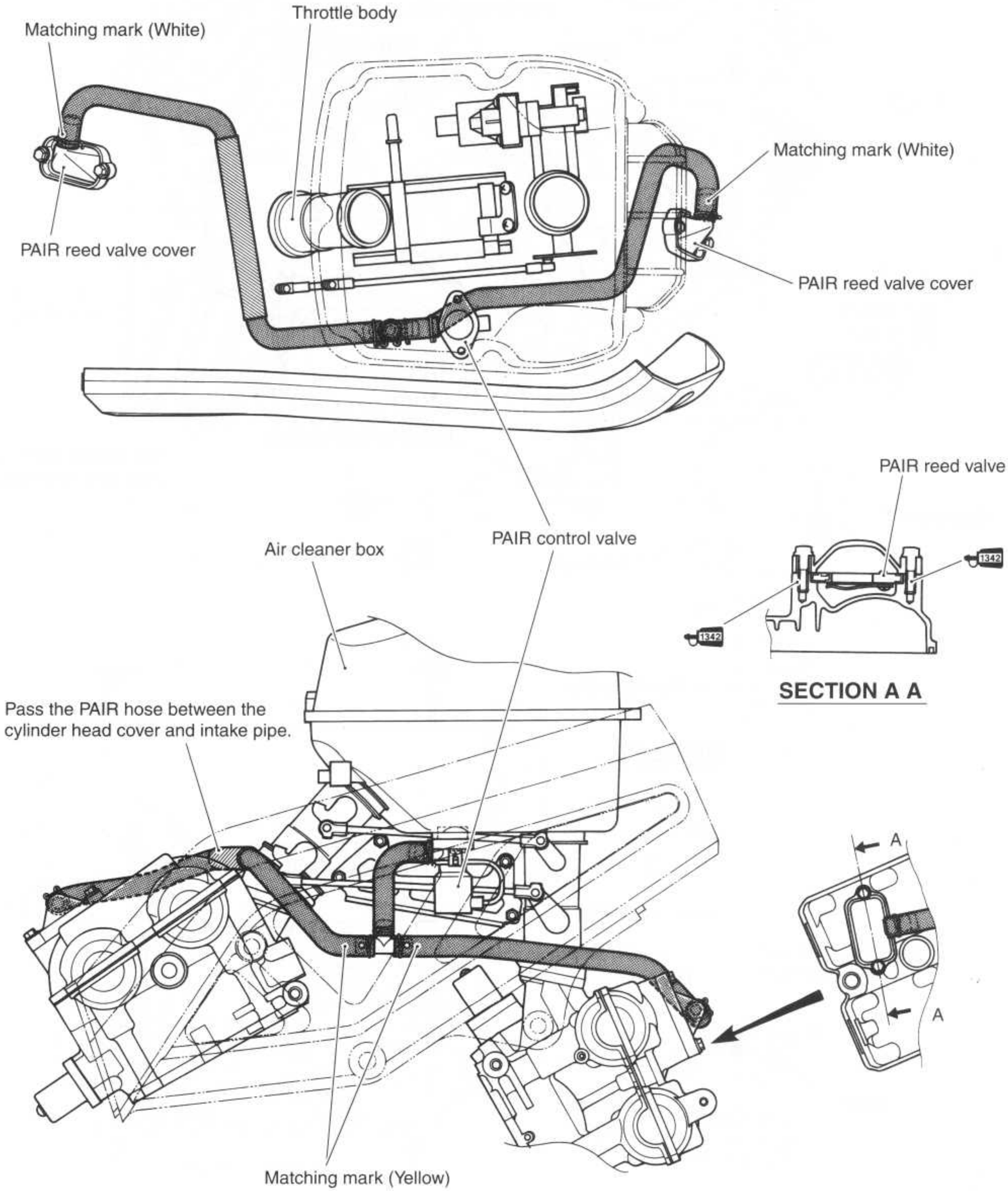




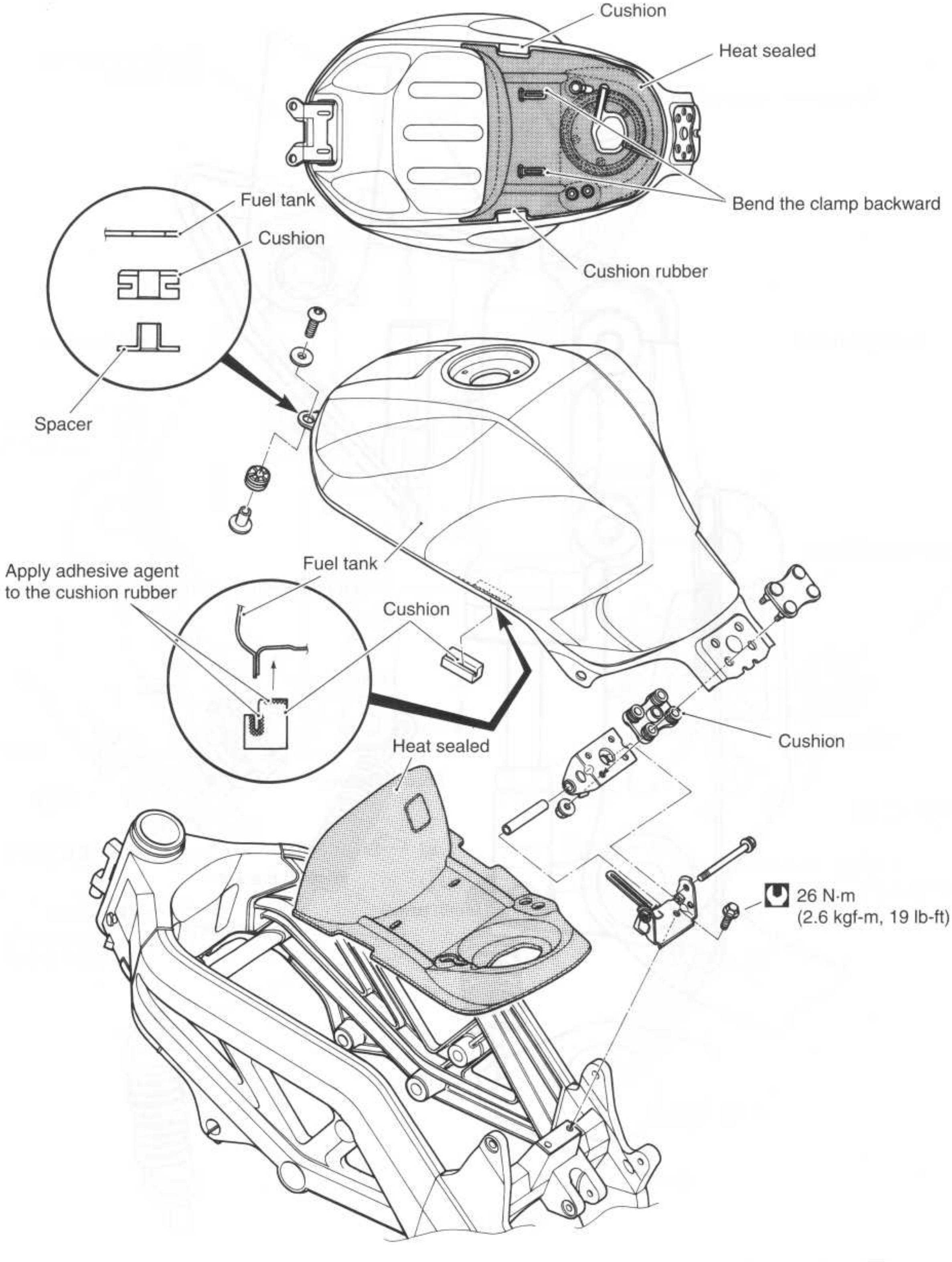
Inserting the radiator hose to the union

VIEW OF C

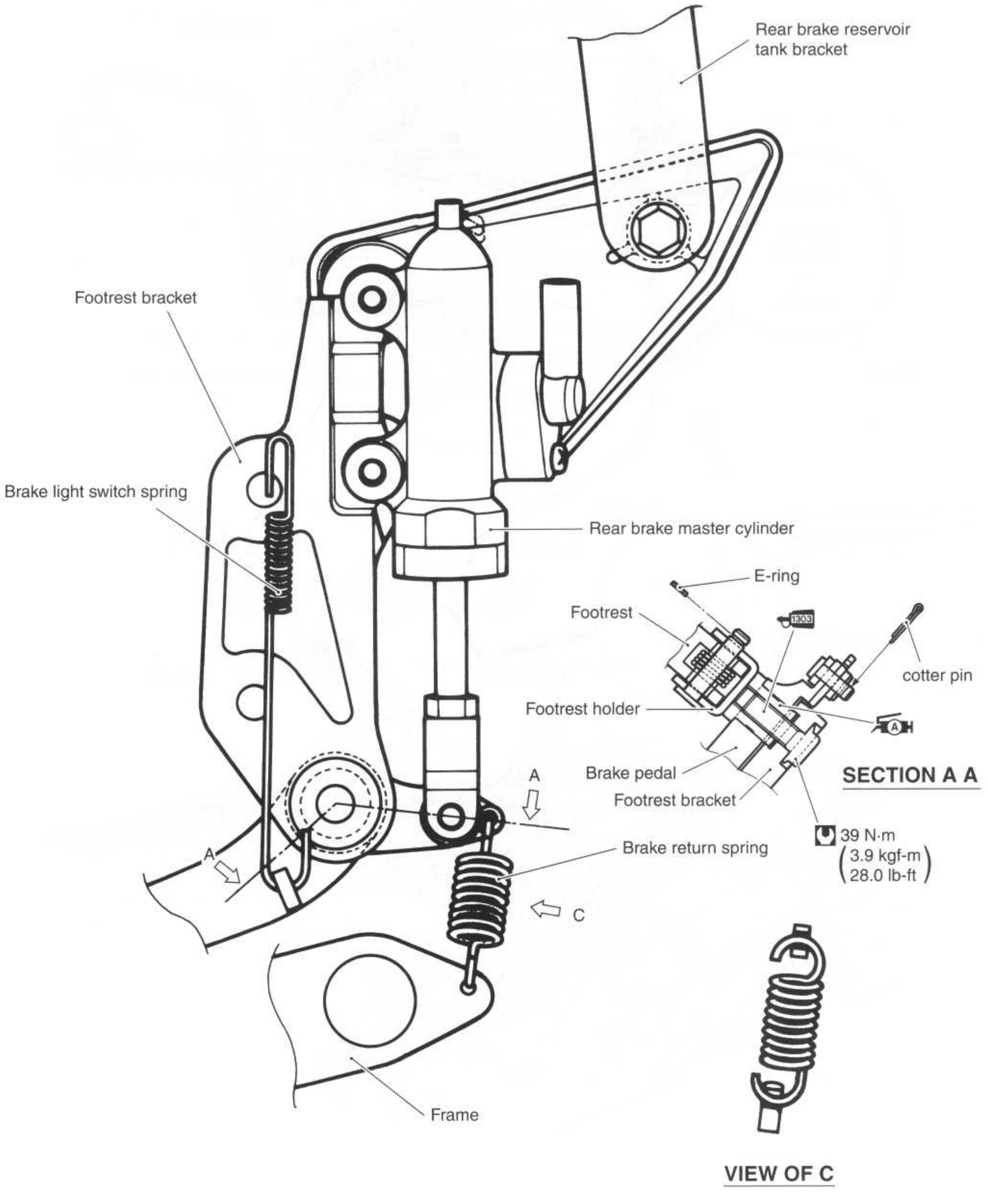
PAIR SYSTEM HOSE ROUTING



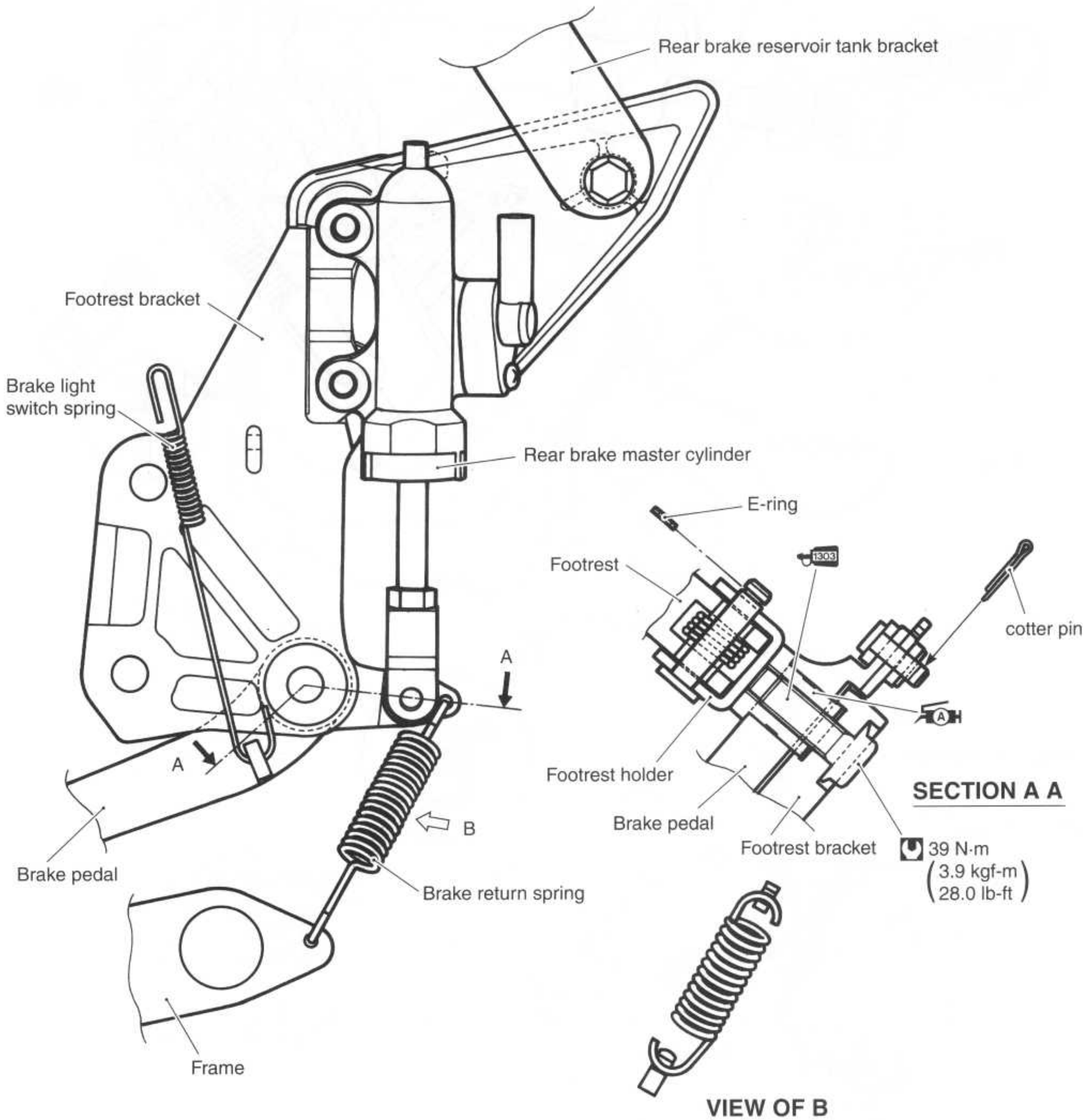
FUEL TANK INSTALLATION



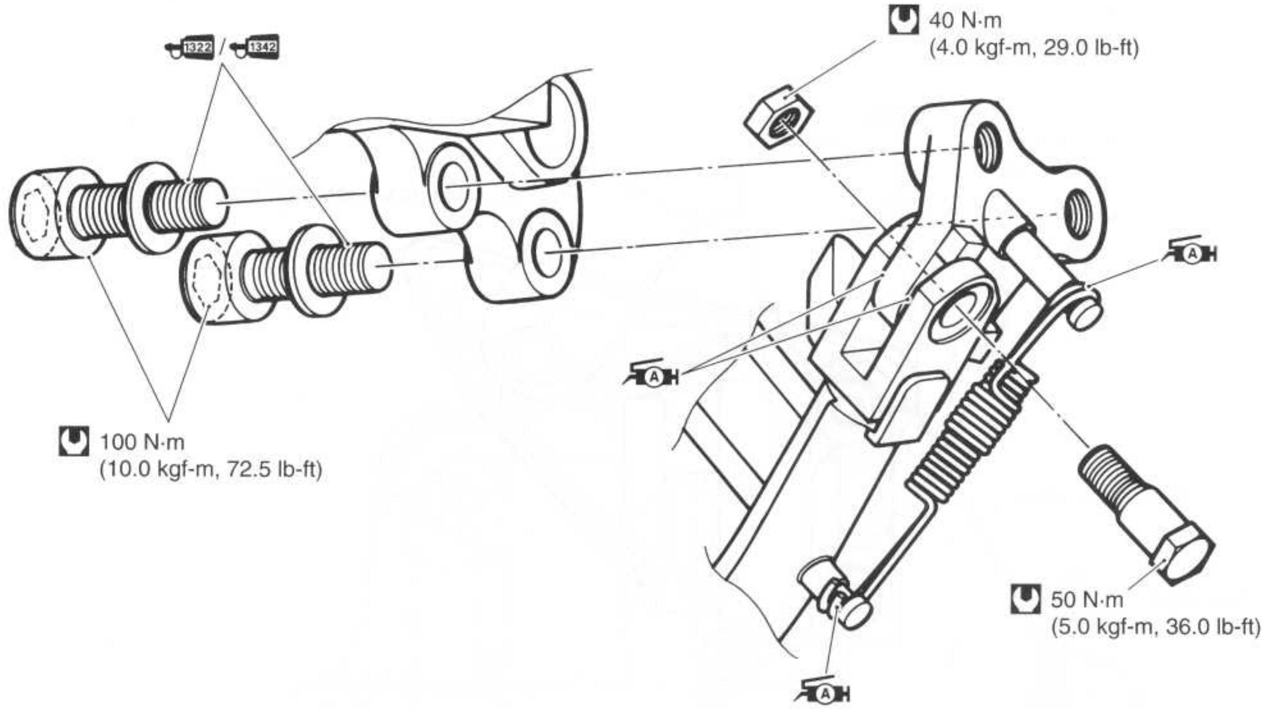
BRAKE PEDAL/FOOTREST SET-UP
For SV650



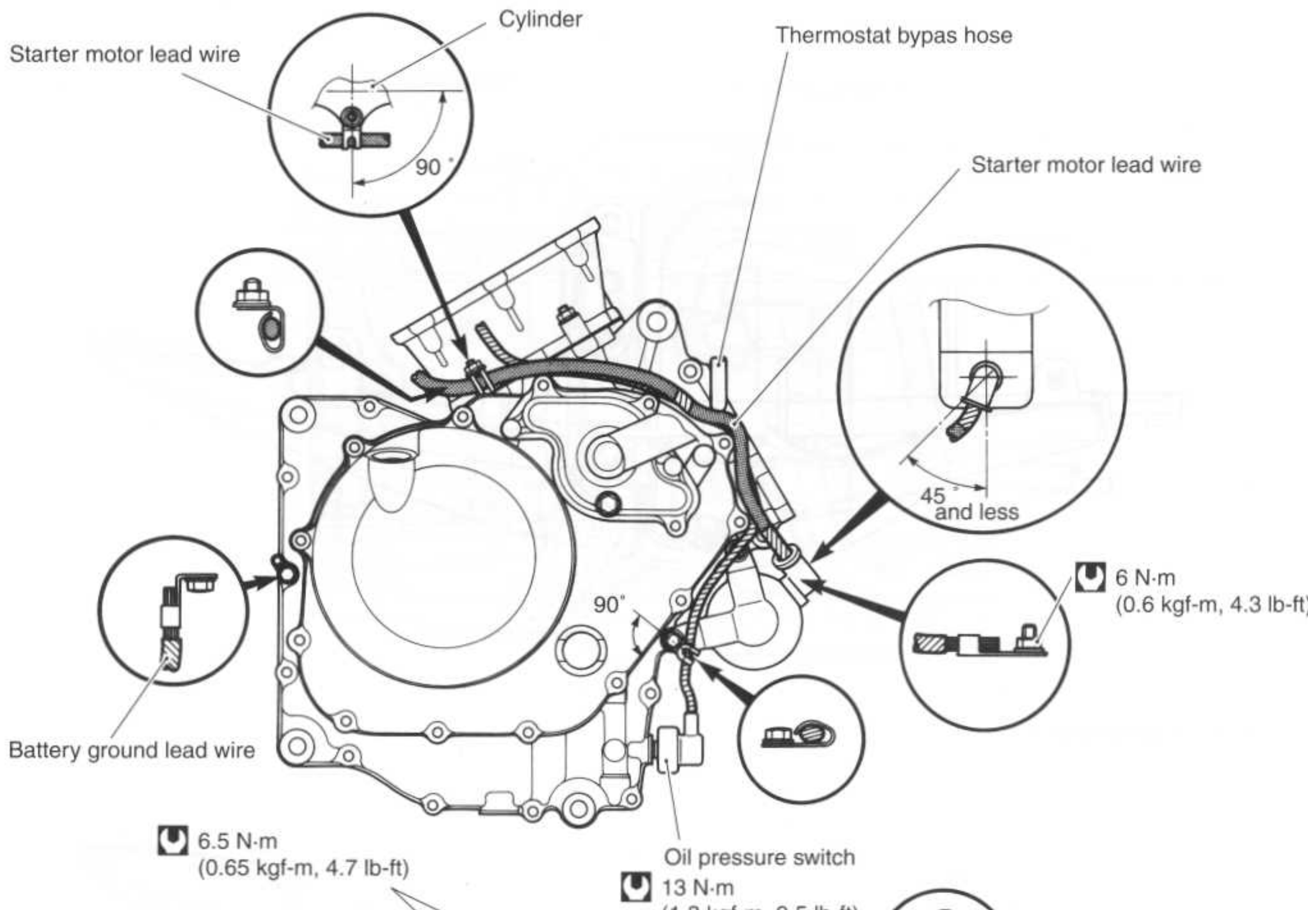
For SV650S

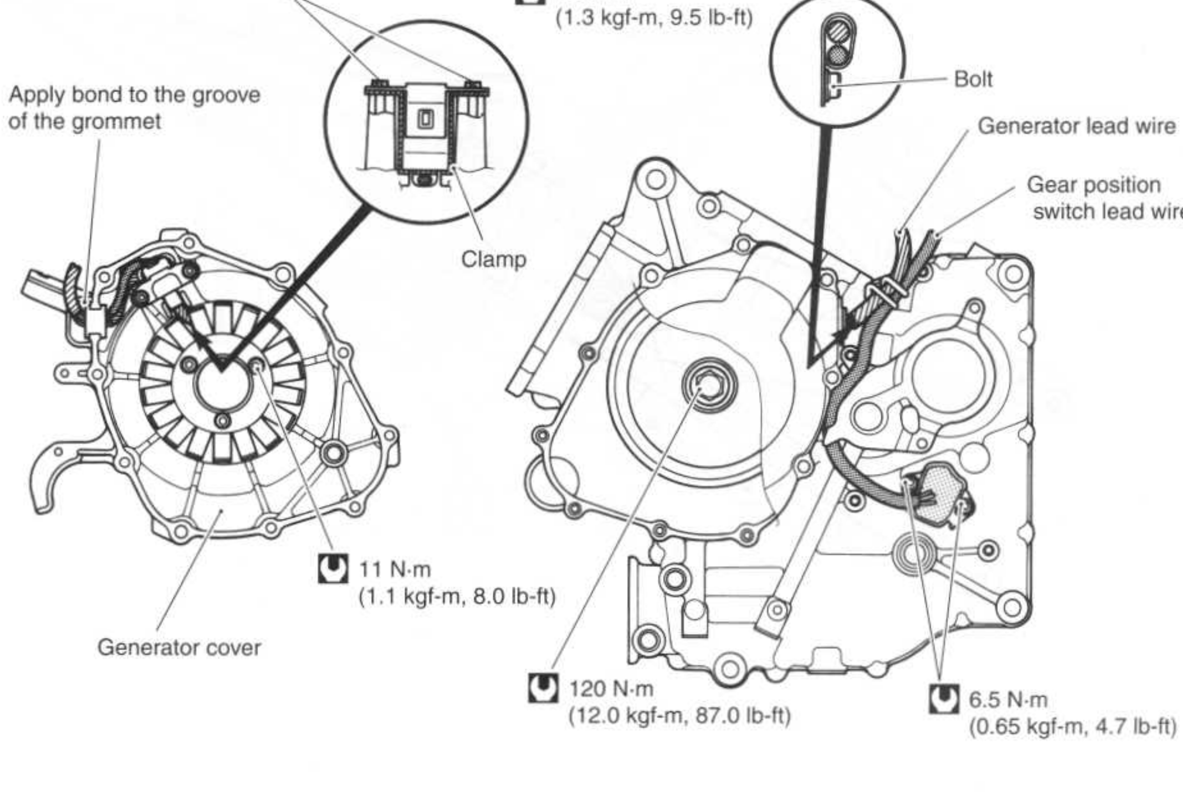

Rear brake reservoir tank bracket
Footrest bracket
Brake light
switch spring
Rear brake master cylinder
E-ring
Footrest
1303
cotter pin
A
A
A
B
Footrest holder
SECTION A A
Brake pedal
Footrest bracket
39 N·m
3.9 kgf-m
28.0 lb-ft
Brake pedal
Brake return spring
Frame
VIEW OF B

SIDE-STAND SET-UP

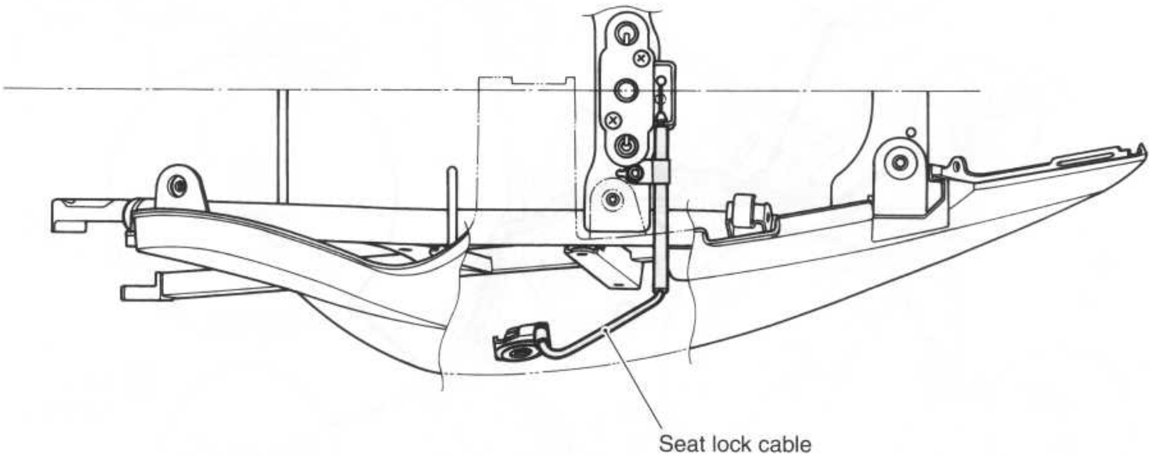


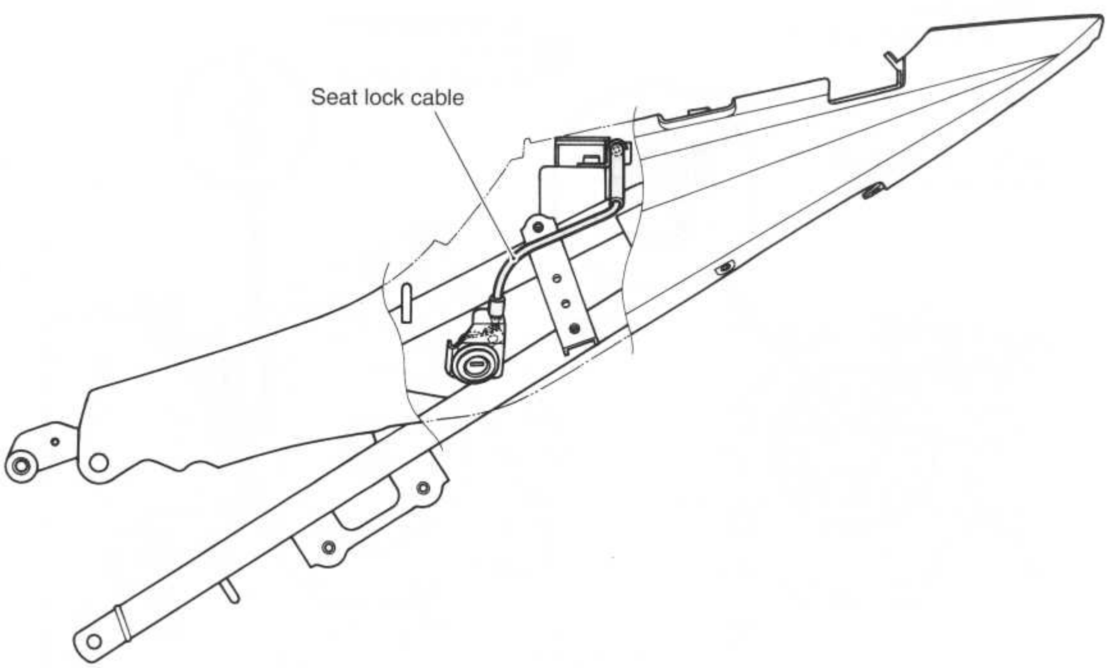
ENGINE ELECTRICAL PARTS SET-UP



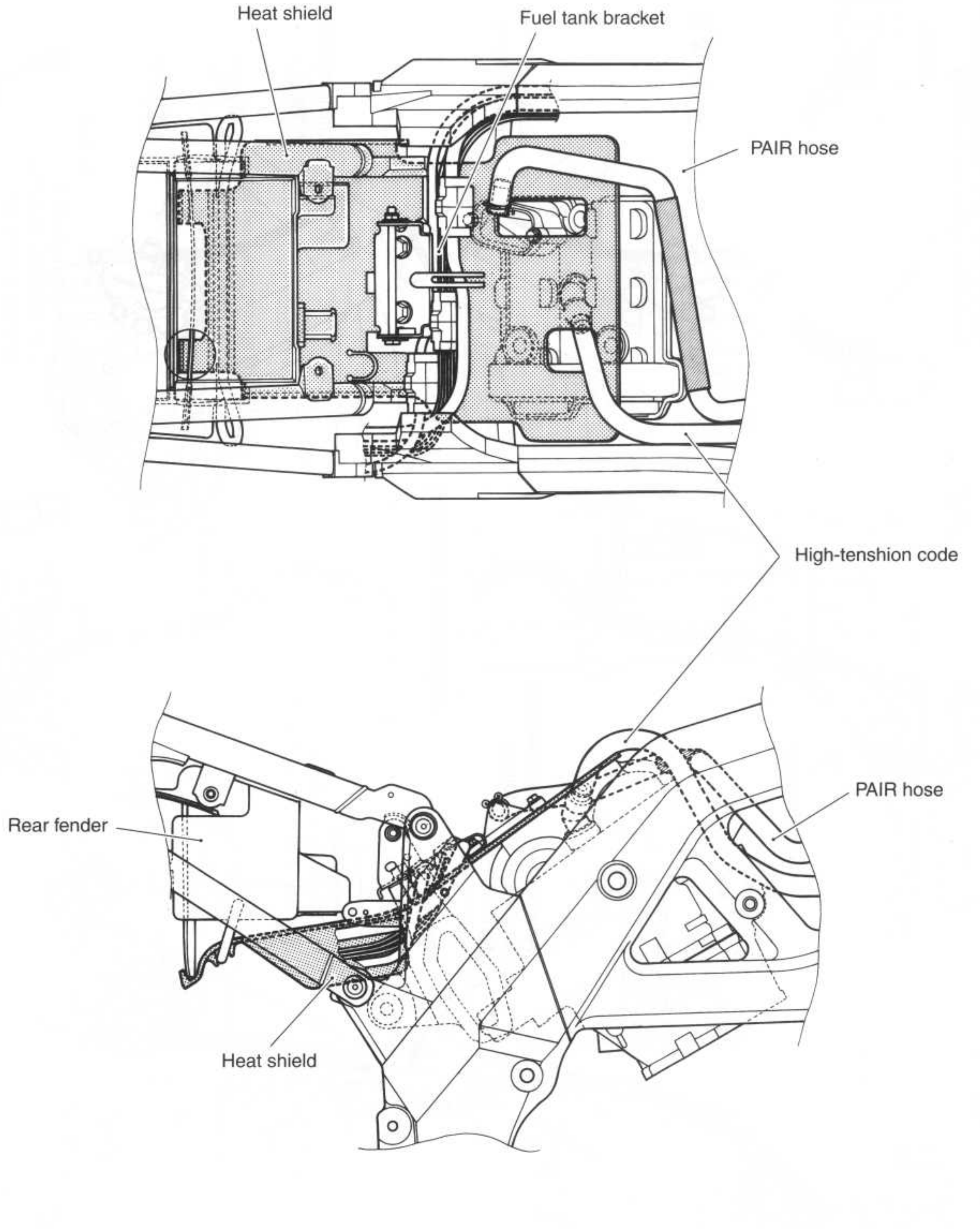


SEAT LOCK CABLE ROUTING

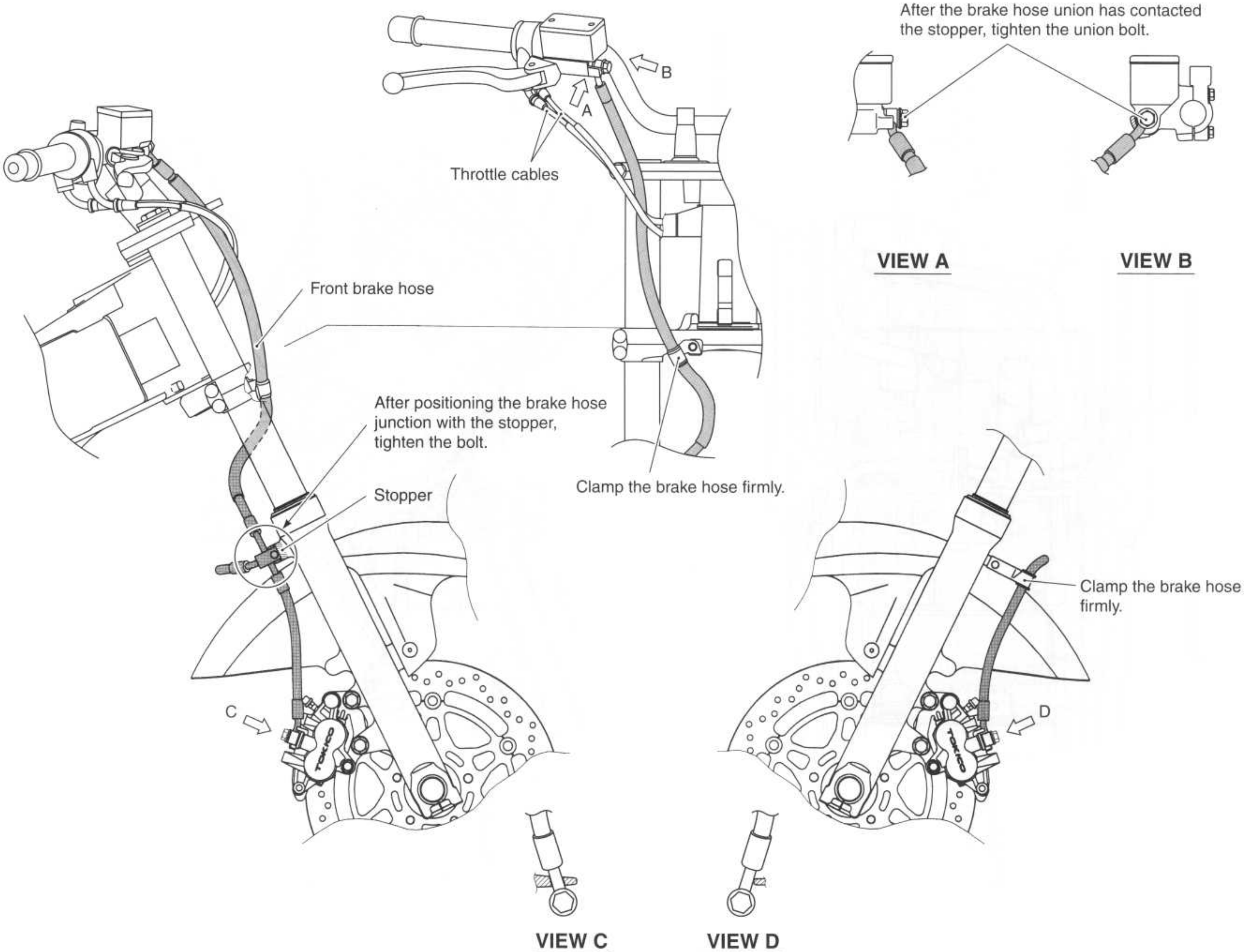




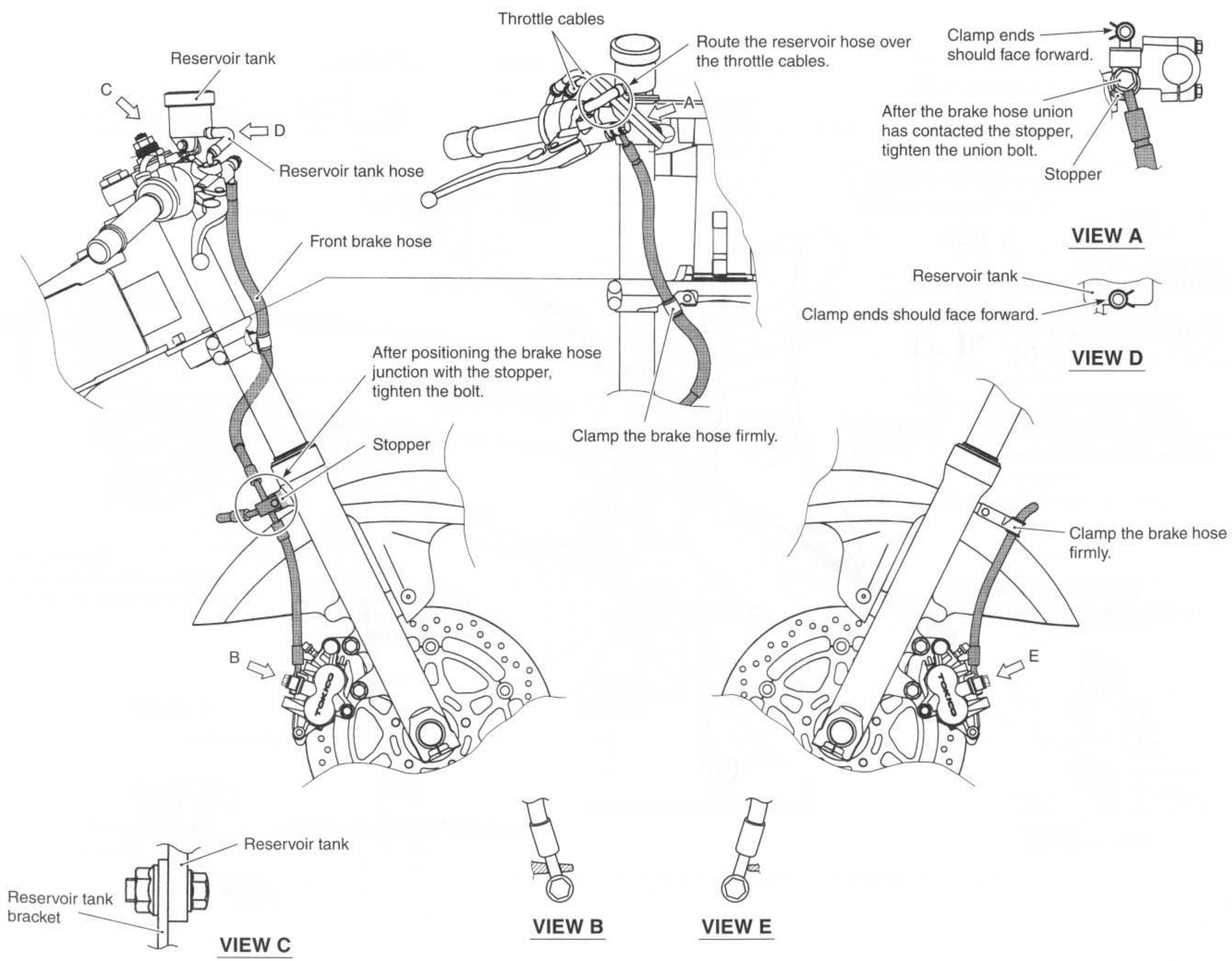
HEAT SHIELD INSTALLATION



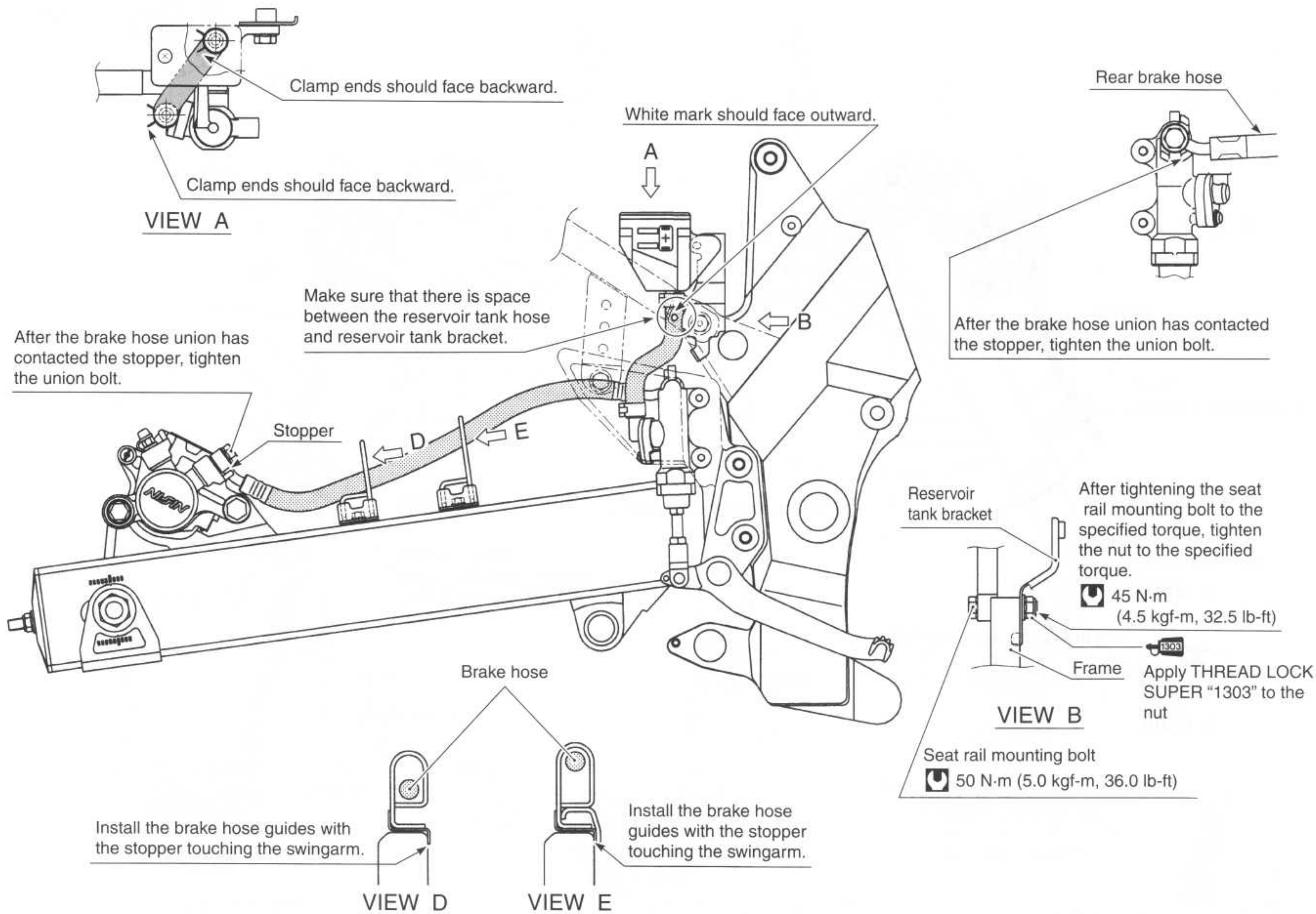
FRONT BRAKE HOSE ROUTING For SV650



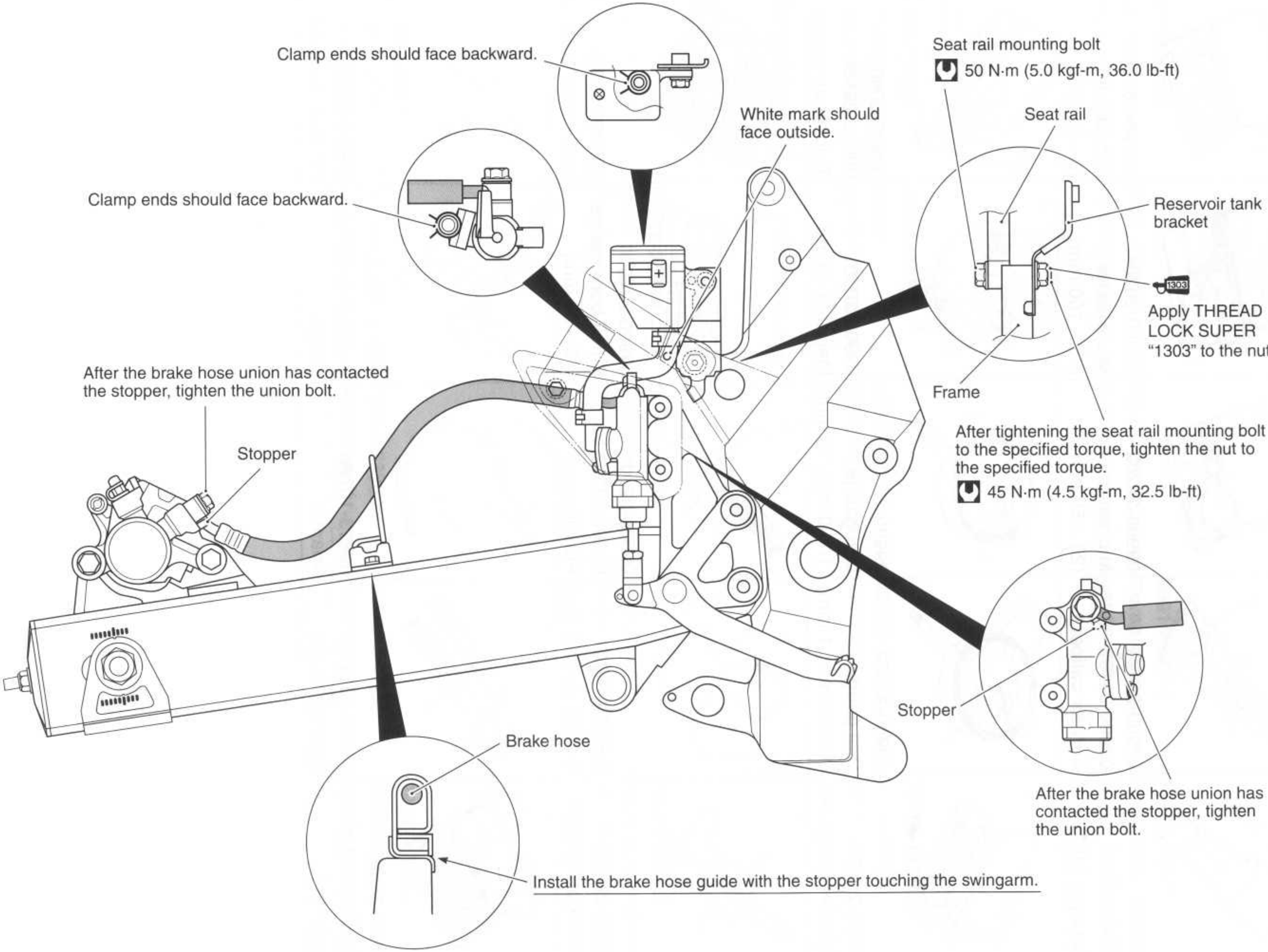
FRONT BRAKE HOSE ROUTING For SV650S



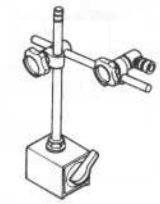
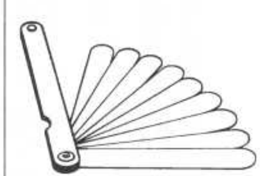
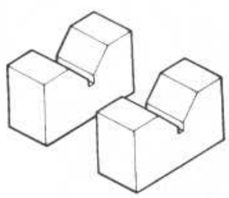
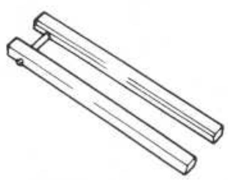
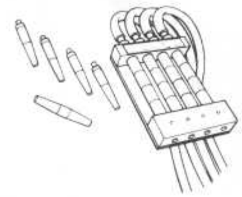
REAR BRAKE HOSE ROUTING
For SV650

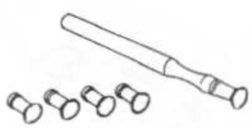
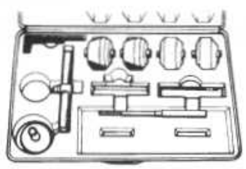


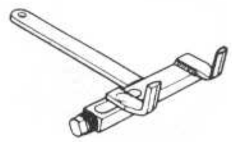
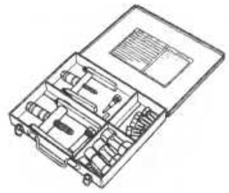
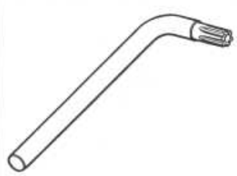
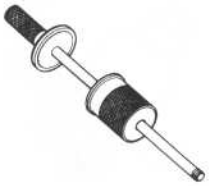
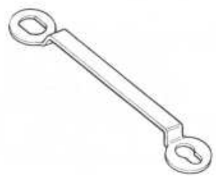
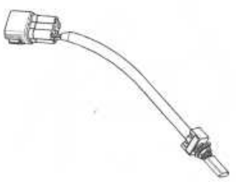
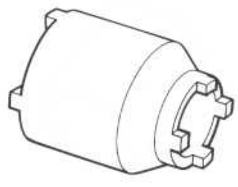
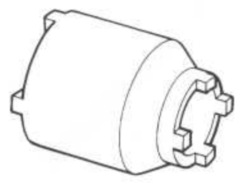
REAR BRAKE HOSE ROUTING
For SV650S

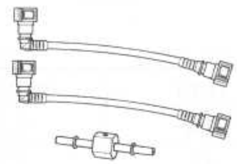
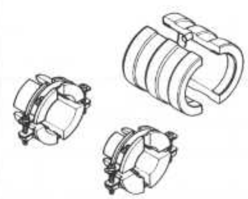
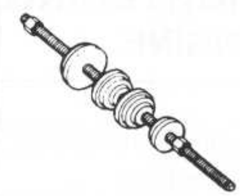
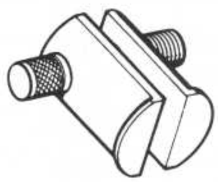
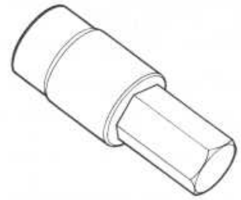


SPECIAL TOOLS

 09900-18710 Hexagon bit 12 mm	 09900-20101 09900-20102 Vernier calipers	 09900-20202 Micrometer (25 – 50 mm)	 09900-20204 Micrometer (75 – 100 mm)	 09900-20205 Micrometer (0 – 25 mm)
 09900-20508 Cylinder gauge set	 09900-20602 Dial gauge (1/1000 mm, 1 mm)	 09900-20607 Dial gauge (1/100 mm, 10 mm)	 09900-20701 Magnetic stand	 09900-20803 09900-20806 Thickness gauge
 09900-20805 Tire depth gauge	 09900-21304 V-block set (100 mm)	 09900-22301 09900-22302 Plastigauge	 09900-22403 Small bore gauge (18 – 35 mm)	 09900-25008 Multi circuit tester set
 09900-25009 Needle pointed probe set	 09910-20116 Conrod holder	 09913-10750 Adapter	 09913-13121 Vacuum balancer gauge	 09913-50121 Oil seal remover

 09913-60220 Journal bearing remover/installer	 09913-70210 Bearing installer set	 09915-40610 Oil filter wrench	 09915-64512 Compression gauge set	 09915-74521 Oil pressure gauge hose
 09915-74532 Oil pressure gauge attachment	 09915-77331 Meter (for high pressure)	 09916-10911 Valve lapper set	 09916-14510 Valve lifter	 09916-14521 Valve lifter attachment
 09916-21111 Valve seat cutter set	 09916-20640 Solid pilot (N-100-4.5)	 09916-20630 Valve seat cutter head (N-126)	 09916-34542 Reamer handle	 09916-33210 Valve guide reamer (4.5 mm)
 09916-34580 Valve guide reamer (10.8 mm)	 09916-43210 Valve guide installer/remover	 09916-53330 Attachment	 09916-84511 Tweezers	 09917-47010 Vacuum pump gauge

 09920-13120 Crankcase separating tool	 09920-53740 Clutch sleeve hub holder	 09921-20240 Bearing remover set	 09923-74511 Bearing remover	 09924-84510 Bearing installer set
 09924-84521 Bearing installer set	 09925-18011 Steering bearing installer	 09930-10121 Spark plug socket wrench set	 09930-11920 Torx bit JT40H	 09930-11940 Bit holder
 09930-11950 Torx wrench	 09930-11960 Torx wrench	 09930-30104 Sliding shaft	 09930-30450 Rotor remover	 09930-44530 Rotor holder
 09930-82720 Mode select switch	 09940-14911 Steering stem nut wrench	 09940-14940 Swingarm pivot thrust adjuster socket wrench	 09940-14960 Steering stem nut wrench socket	 09940-14990 Engine mounting thrust adjuster socket wrench

 **09940-40211** **Fuel pressure gauge adaptor**	 **09940-40220** **Fuel pressure gauge hose attachment**	 **09940-52861** **Front fork oil seal installer**	 **09940-92720** **Spring scale**	 **09941-34513** **Bearing/steering race installer set**
 **09941-54911** **Bearing outer race remover**	 **09943-74111** **Front fork oil level gauge**	 **09944-28320** **Hexagon bit 19 mm**		

NOTE:
When order the special tool, please confirm whether it is available or not.

TIGHTENING TORQUE
ENGINE

ITEM		N·m	kgf-m	lb-ft
Cylinder head cover bolt		14	1.4	10.0
Spark plug		11	1.1	8.0
Camshaft journal holder bolt		10	1.0	7.0
Cam chain tension adjuster bolt		10	1.0	7.0
Cam chain tensioner mounting bolt		10	1.0	7.0
Cylinder head bolt [M: 10]	Initial	25	2.5	18.0
	Final	42	4.2	30.5
Water drain bolt		13	1.3	9.5
Clutch sleeve hub nut		50	5.0	36.0
Clutch spring set bolt		10	1.0	7.0
Oil plate bolt		10	1.0	7.0
Oil pressure regulator		27	2.7	19.5
Oil strainer plate bolt		10	1.0	7.0
Primary drive gear bolt		70	7.0	50.5
Generator cover plug		11	1.1	8.0
Valve timing inspection plug		23	2.3	16.5
Generator rotor bolt		120	12.0	87.0
Starter clutch bolt		25	2.5	18.0
Generator stator set bolt		11	1.1	8.0
CKP sensor set bolt		6.5	0.65	4.7
Gearshift cam stopper bolt		10	1.0	7.0
Gearshift cam stopper plate bolt		13	1.3	9.5
Gearshift arm stopper bolt		19	1.9	13.5
Oil pressure switch		14	1.4	10.0
Crankcase bolt	[M: 6]	11	1.1	8.0
	[M: 8]	26	2.6	19.0
Generator cover bolt	[M: 6]	10	1.0	7.0
Oil gallery plug	[M: 8]	18	1.8	13.0
Oil drain plug		21	2.1	15.0
Piston cooling oil jet bolt		10	1.0	7.0
Conrod bearing cap bolt	Initial	21	2.1	15.0
	Final	After tightenig the bolts to the above torque, tighten them 1/4 of a turn (90 °).		

ITEM		N·m	kgf-m	lb-ft
Exhaust pipe bolt/nut		23	2.3	16.5
Muffler mounting nut		23	2.3	16.5
Muffler joint nut		23	2.3	16.5
Oil pipe stopper screw		8	0.8	6.0
Engine sprocket nut		145	14.5	105
Engine mounting bolt/nut	[M: 12]	93	9.3	67.5
	[M: 10]	55	5.5	40.0
Engine mounting thrust adjuster	[Center]	12	1.2	8.5
	[Rear Lower]	12	1.2	8.5
Engine mounting thrust adjuster lock nut	[Center]	45	4.5	32.5
	[Rear Lower]	45	4.5	32.5
Engine mounting clamp bolt		23	2.3	16.5
Cooling fan thermo-switch		13	1.3	9.5
Engine coolant temperature sensor		18	1.8	13.0
Cam chain tension adjuster bolt		35	3.5	25.5
Fuel pump mounting bolt		10	1.0	7.0
Fuel delivery pipe mounting screw		5	0.5	3.7
Cooling fan motor mounting bolt		8	0.8	6.0
Thermostat case bolt		10	1.0	7.0
Oil cooler mounting bolt		10	1.0	7.0
Oil cooler union bolt		23	2.3	16.5

FI SYSTEM PARTS

ITEM	N·m	kgf-m	lb-ft
TP sensor mounting screw	3.5	0.35	2.5
STP sensor mounting screw	2.0	0.2	1.5
ECT sensor	20	2.0	14.5
IAT sensor	18	1.8	13.0

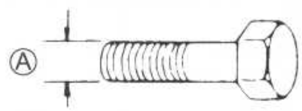
CHASSIS

ITEM	N·m	kgf-m	lb-ft
Steering stem head nut	90	9.0	65.0
Steering stem nut	80	8.0	58.0
Front fork upper clamp bolt	23	2.3	16.5
Front fork lower clamp bolt	23	2.3	16.5
Front fork cap bolt	23	2.3	16.5
Front fork cylinder bolt	20	2.0	14.5
Front axle	65	6.5	47.0
Front axle pinch bolt	23	2.3	16.5
Handlebar clamp bolt	23	2.3	16.5
Handlebar holder nut (SV650)	45	4.5	32.5
Front brake master cylinder mounting bolt	10	1.0	7.0
Front brake caliper mounting bolt	39	3.9	28.0
Brake hose union bolt	23	2.3	16.5
Front caliper air bleeder valve	7.5	0.75	5.5
Rear caliper air bleeder valve	6.0	0.6	4.3
Brake disc bolt (Front and Rear)	23	2.3	16.5
Rear brake caliper mounting bolt	23	2.3	16.5
Rear brake caliper sliding pin	27	2.7	19.5
Rear brake pad mounting pin	17	1.7	12.5
Rear brake pad mounting pin plug	2.5	0.25	1.8
Rear brake master cylinder mounting bolt	10	1.0	7.0
Rear brake master cylinder rod lock-nut	18	1.8	13.0
Front footrest bracket mounting bolt	23	2.3	16.5
Front footrest bolt	39	3.9	28.0
Swingarm pivot shaft	15	1.5	11.0
Swingarm pivot shaft nut	100	10.0	72.5
Swingarm pivot shaft lock-nut	90	9.0	65.0
Rear shock absorber mounting upper nut	50	5.0	36.0
Rear shock absorber mounting bolt	50	5.0	36.0
Cushion lever mounting nut (Front)	78	7.8	56.5
Cushion rod nut (Upper and Lower)	78	7.8	56.5
Rear axle nut	100	10.0	72.5
Rear sprocket nut	60	6.0	43.5
Seat rail mounting bolt	50	5.0	36.0
Side stand bracket mounting bolt	100	10.0	72.5
Side stand bolt	50	50	36.0
Side stand nut	40	4.0	29.0

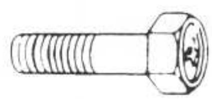
TIGHTENING TORQUE CHART

For other nuts and bolts not listed in the preceding page, refer to this chart:

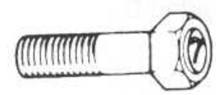
Bolt Diameter	Conventional or "4" marked bolt			"7" marked bolt		
Ⓐ (mm)	N·m	kgf-m	lb-ft	N·m	kgf-m	lb-ft
4	1.5	0.15	1.0	2.3	0.23	1.5
5	3	0.3	2.0	4.5	0.45	3.0
6	5.5	0.55	4.0	10	1.0	7.0
8	13	1.3	9.5	23	2.3	16.5
10	29	2.9	21.0	50	5.0	36.0
12	45	4.5	32.5	85	8.5	61.5
14	65	6.5	47.0	135	13.5	97.5
16	105	10.5	76.0	210	21.0	152.0
18	160	16.0	115.5	240	24.0	173.5



Conventional bolt



"4" marked bolt



"7" marked bolt

SERVICE DATA

VALVE + GUIDE

Unit: mm (in)

ITEM	STANDARD		LIMIT
Valve diam.	IN.	31 (1.2)	—
	EX.	25.5 (1.0)	—
Valve clearance (when cold)	IN.	0.1 – 0.2 (0.004 – 0.008)	—
	EX.	0.2 – 0.3 (0.008 – 0.012)	—
Valve guide to valve stem clearance	IN.	0.020 – 0.047 (0.0008 – 0.0019)	—
	EX.	0.030 – 0.057 (0.0012 – 0.0022)	—
Valve guide I.D.	IN. & EX.	4.500 – 4.512 (0.1772 – 0.1776)	—
Valve stem O.D.	IN.	4.465 – 4.480 (0.1758 – 0.1764)	—
	EX.	4.455 – 4.470 (0.1754 – 0.1760)	—
Valve stem deflection	IN. & EX.	—	0.35 (0.014)
Valve stem runout	IN. & EX.	—	0.05 (0.002)
Valve head thickness	IN. & EX.	—	0.5 (0.02)
Valve seat width	IN. & EX.	0.9 – 1.1 (0.035 – 0.043)	—
Valve head radial runout	IN. & EX.	—	0.03 (0.001)
Valve spring free length (IN. & EX.)	INNER	—	36.8 (1.45)
	OUTER	—	39.8 (1.57)
Valve spring tension (IN. & EX.)	INNER	4.1 – 4.7 kgf (9.03 – 10.36 lbs) at length 29.9 mm (1.18 in)	—
	OUTER	16.6 – 19.2 kgf (36.60 – 42.33 lbs) at length 33.4 mm (1.31 in)	—

CAMSHAFT + CYLINDER HEAD

Unit: mm (in)

ITEM		STANDARD	LIMIT
Cam height	IN.	36.060 – 36.105 (1.4196 – 1.4214)	35.76 (1.408)
	EX.	34.680 – 34.725 (1.3654 – 1.3671)	34.38 (1.354)
Camshaft journal oil clearance	IN. & EX.	0.032 – 0.066 (0.0013 – 0.0026)	0.150 (0.0059)
Camshaft journal holder I.D.	IN. & EX.	22.012 – 22.025 (0.8666 – 0.8671)	—
Camshaft journal O.D.	IN. & EX.	21.959 – 21.980 (0.8645 – 0.8654)	—
Camshaft runout	IN. & EX.	—	0.10 (0.004)
Cam chain pin (at arrow “3”)	16th pin		—
Cylinder head distortion	—		0.05 (0.002)

CYLINDER + PISTON + PISTON RING

Unit: mm (in)

ITEM		STANDARD	LIMIT
Compression pressure		1 500 kPa (15 kgf/cm² / 213 psi)	1 100 kPa (11 kgf/cm² / 156 psi)
Compression pressure difference		—	200 kPa (2 kgf/cm² / 28 psi)
Piston to cylinder clearance		0.055 – 0.065 (0.0022 – 0.0026)	0.120 (0.0047)
Cylinder bore		81.000 – 81.015 (3.1890 – 3.1896)	81.075 (3.1919)
Piston diam.		80.940 – 80.955 (3.1866 – 3.1872) Measure at 20 mm (0.79 in) from the skirt end.	80.88 (3.184)
Cylinder distortion		—	0.05 (0.002)
Piston ring free end gap	1st	Approx. 9.5 (0.37)	7.6 (0.30)
	2nd	Approx. 11 (0.43)	8.8 (0.34)
Piston ring end gap	1st	0.20 – 0.35 (0.008 – 0.014)	0.70 (0.028)
	2nd	0.20 – 0.35 (0.008 – 0.0014)	0.70 (0.028)
Piston ring to groove clearance	1st	—	0.180 (0.0071)
	2nd	—	0.150 (0.0059)
Piston ring groove width	1st	1.21 – 1.23 (0.0476 – 0.0484)	—
	2nd	1.01 – 1.03 (0.0398 – 0.0406)	—
	Oil	2.01 – 2.03 (0.0791 – 0.0799)	—
Piston ring thickness	1st	1.17 – 1.19 (0.0461 – 0.0469)	—
	2nd	0.97 – 0.99 (0.0382 – 0.0390)	—
Piston pin bore		20.002 – 20.008 (0.7875 – 0.7877)	20.030 (0.7886)
Piston pin O.D.		19.992 – 20.000 (0.7871 – 0.7874)	19.980 (0.7866)

CONROD + CRANKSHAFT

Unit: mm (in)

ITEM	STANDARD	LIMIT
Conrod small end I.D.	20.010 – 20.018 (0.7878 – 0.7881)	20.040 (0.7890)
Conrod big end side clearance	0.170 – 0.320 (0.0067 – 0.0126)	0.5 (0.02)
Conrod big end width	20.95 – 21.00 (0.825 – 0.827)	—
Crank pin width	42.17 – 42.22 (1.660 – 1.662)	—
Conrod big end oil clearance	0.032 – 0.056 (0.0013 – 0.0022)	0.080 (0.0031)
Crank pin O.D.	37.976 – 38.000 (1.4951 – 1.4960)	—
Crankshaft journal oil clearance	0.008 – 0.035 (0.0003 – 0.0014)	0.080 (0.0031)
Crankshaft journal O.D.	41.985 – 42.000 (1.6529 – 1.6535)	—
Crankshaft runout	—	0.05 (0.002)

OIL PUMP

ITEM	STANDARD	LIMIT
Oil pressure (at 60 °C, 140 °F)	Above 200 kPa (2.0 kgf/cm², 28 psi) Below 600 kPa (6.0 kgf/cm², 85 psi) at 3 000 r/min.	—

CLUTCH

Unit: mm (in)

ITEM	STANDARD		LIMIT
Clutch cable play	10 – 15 (0.4 – 0.6)		—
Clutch release screw	1/4 turn (s) back		—
Drive plate thickness	No. 1 & No. 2	2.92 – 3.08 (0.115 – 0.121)	2.62 (0.103)
Drive plate claw width	No. 1 & No. 2	13.7 – 13.8 (0.539 – 0.543)	12.9 (0.507)
Driven plate distortion	—		0.10 (0.004)
Clutch spring free length	53.1 (2.09)		50.5 (1.99)

TRANSMISSION + DRIVE CHAIN

Unit: mm (in) Except ratio

ITEM		STANDARD			LIMIT
Primary reduction ratio		2.088 (71/34)			—
Final reduction ratio		SV650S	2.933 (44/15)		—
		SV650	3.000 (45/15)		—
Gear ratios	Low	2.461 (32/13)			—
	2nd	1.777 (32/18)			—
	3rd	1.380 (29/21)			—
	4th	1.125 (27/24)			—
	5th	0.961 (25/26)			—
	Top	0.851 (23/27)			—
Shift fork to groove clearance		0.1 – 0.3 (0.004 – 0.012)			0.50 (0.020)
Shift fork groove width		5.5 – 5.6 (0.217 – 0.220)			—
Shift fork thickness		5.3 – 5.4 (0.209 – 0.213)			—
Drive chain		Type	DID525V8		—
					—
		Links	SV650	110 links	—
			SV650S	108 links	—
		20-pitch length	—		319.4 (12.57)
Drive chain slack (on side-stand)		20 – 30 (0.79 – 1.18)			—
Gearshift lever height		SV650	60 – 70 (2.4 – 2.8)		—
		SV650S	55 – 60 (2.2 – 2.4)		—

THERMOSTAT + RADIATOR + FAN + COOLANT

ITEM	STANDARD		NOTE
Thermostat valve opening temperature	Approx. 88 °C (190 °F)		—
Thermostat valve lift	Over 8.0 mm (0.31 in) at 100 °C (212 °F)		—
Engine coolant temperature sensor 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	—
Radiator cap valve opening pressure	95 – 125 kPa (0.95 – 1.25 kgf/cm², 13.5 – 17.8 psi)		—
Cooling fan thermo-switch operating temperature	OFF→ON	Approx. 98 °C (208 °F)	—
	ON→OFF	Approx. 92 °C (198 °F)	—
Engine coolant type	Use an antifreeze/coolant compatible with aluminum radiator, mixed with distilled water only, at the ratio of 50:50.		—
Engine coolant including reserve	Reserve tank side	Approx. 250 ml (0.26/0.22 US/Imp qt)	—
	Engine side	Approx. 1 480 ml (1.43/1.19 US/Imp qt)	—

INJECTOR + FUEL PUMP + FUEL PRESSURE REGULATOR

ITEM	SPECIFICATION	NOTE
Injector resistance	11 – 13 Ω at 20 °C (68 °F)	
Fuel pump discharge amount	Min 168 ml (5.7/5.9 US/Imp oz) for 10 sec. at 300 kPa (3.0 kgf/cm², 43 psi)	
Fuel pressure regulator operating set pressure	Approx. 300 kPa (3.0 kgf/cm², 43 psi)	

FI SENSORS+ SECONDARY THROTTLE VALVE ACTUATOR

ITEM	SPECIFICATION		NOTE
CKP sensor resistance	130 – 240 Ω		
CKP sensor peak voltage	3.7 V (When cranking) and more		
IAP sensor input voltage	4.5 – 5.5 V		
IAP sensor output voltage	Approx. 2.7 V at idle speed		
TP sensor input voltage	4.5 – 5.5 V		
TP sensor resistance	Closed	Approx. 1.12 kΩ	
	Opened	Approx. 4.26 kΩ	
TP sensor output voltage	Closed	Approx. 1.12 V	
	Opened	Approx. 4.26 V	
ECT sensor input voltage	4.5 – 5.5 V		
ECT sensor resistance	Approx. 2.45 kΩ at 20 °C (68 °F)		
IAT sensor input voltage	4.5 – 5.5 V		
IAT sensor resistance	Approx. 2.45 kΩ at 20 °C (68 °F)		
TO sensor resistance	19.1 – 19.7 kΩ		
TO sensor voltage	Approx. 0.4 – 1.4 V		
GP switch voltage	1.0 V and more (From 1st to Top)		
Injector voltage	Battery voltage		
STP sensor input voltage	4.5 – 5.5 V		
STP sensor resistance	Closed	Approx. 0.58 kΩ	
	Opened	Approx. 4.38 kΩ	
STP sensor output voltage	Closed	Approx. 0.58 V	
	Opened	Approx. 4.38 V	
STV actuator resistance	7 – 14 Ω		
PAIR solenoid valve resistance	20 – 24 kΩ at 20 °C (68 °F)		

THROTTLE BODY

ITEM	SPECIFICATION
I.D. No.	17G0 (Others), 17G1 (For E-33)
Bore size	39 mm
Fast idle r/min.	1 800 – 2 400 r/min at 25 °C (77 °F)
Idle r/min.	1 300 ± 100 r/min/Warmed engine
Throttle cable play	2.0 – 4.0 mm (0.08 – 0.16 in)

ELECTRICAL

Unit: mm (in)

ITEM			SPECIFICATION		NOTE
Firing order			1.2		
Spark plug			Type	NGK: CR8E DENSO: U24ESR-N	
			Gap	0.7 – 0.8 mm (0.028 – 0.031 in)	
Spark performance			Over 8 mm (0.3 in) at 1 atm.		
Crankshaft position sensor resistance			130 – 240 Ω		Bl – G
Ignition coil resistance			Primary	2 – 5 Ω	⊕ tap – ⊖ tap
			Secondary	24 – 37 kΩ	⊕ tap – Plug cap
Crankshaft position sensor peak voltage			3.7 V and more		When cranking
Ignition coil primary peak voltage			150 V and more		
Generator coil resistance			0.2 – 0.7 Ω		
Generator Max. output			Approx. 375 W at 5 000 r/min		
Generator no-load voltage (When cold)			60 V (AC) and more at 5 000 r/min.		
Regulated voltage			14.0 – 15.5 V at 5 000 r/min.		
Starter relay resistance			3 – 6 Ω		
Battery	Type designation		YTX12A-BS		
	Capacity		12 V 36.0 kC (10 Ah)/10 HR		
Fuse size	Headlight	HI	SV650S	15 A	
			SV650	10 A	
		LO	SV650S	15 A	
			SV650	10 A	
	Fuel		10 A		
	Ignition		10 A		
	Fan motor		15 A		
	Signal		10 A		
	Main		30 A		

WATTAGE

Unit: W

ITEM		SPECIFICATION		
		SV650S	SV650	
			E-03, 24, 28, 33	Others
Headlight	HI	60 W × 2	60 W	←
	LO	55 W × 2	55 W	←
Parking or position light		5 W		5 W
Brake light/Taillight		LED	←	←
Turn signal light		21 W	←	←
License light		5 W	←	←
Speedometer light		LED	←	←
Turn signal indicator light		LED	←	←
High beam indicator light		LED	←	←
Neutral indicator light		LED	←	←
Oil pressure/coolant temp./FI indicator light		LED	←	←
Fuel indicator light		LED	←	←

BRAKE + WHEEL

Unit: mm (in)

ITEM		STANDARD	LIMIT
Rear brake pedal height	SV650	50 – 60 (1.97 – 2.36)	—
	SV650S	60 – 70 (2.36 – 2.76)	
Brake disc thickness	Front	4.5 (0.18)	4.0 (0.16)
	Rear	5.0 (0.20)	4.5 (0.18)
Brake disc runout		—	0.3 (0.012)
Master cylinder bore	Front	15.870 – 15.913 (0.6248 – 0.6265)	—
	Rear	14.000 – 14.043 (0.5512 – 0.5529)	—
Master cylinder piston diam.	Front	15.827 – 15.854 (0.6231 – 0.6242)	—
	Rear	13.957 – 13.984 (0.5495 – 0.5506)	—
Brake caliper cylinder bore	Front	30.230 – 30.306 (1.1902 – 1.1931)	—
	Rear	38.180 – 38.230 (1.5031 – 1.5051)	—
Brake caliper piston diam.	Front	30.150 – 30.200 (1.1870 – 1.1890)	—
	Rear	38.098 – 38.148 (1.4999 – 1.5019)	—
Brake fluid type		DOT 4	
Wheel rim runout	Axial	—	2.0 (0.08)
	Radial	—	2.0 (0.08)
Wheel rim size	Front	17 M/C × MT3.50	—
	Rear	17 M/C × MT4.50	—
Wheel axle runout	Front	—	0.25 (0.010)
	Rear	—	0.25 (0.010)

TIRE

ITEM	STD/SPEC.		LIMIT
Cold inflation tire pressure (Solo riding)	Front	225 kPa (2.25 kgf/cm², 33 psi)	—
	Rear	250 kPa (2.50 kgf/cm², 36 psi)	—
Cold inflation tire pressure (Dual riding)	Front	225 kPa (2.25 kgf/cm², 33 psi)	—
	Rear	250 kPa (2.50 kgf/cm², 36 psi)	—
Tire size	Front	120/60 ZR17 M/C (55 W)	—
	Rear	160/60 ZR17 M/C (69 W)	—
Tire type	Front	DUNLOP: D220FST L	—
	Rear	DUNLOP: D220ST L	—
Tire tread depth	Front	—	1.6 (0.06)
	Rear	—	2.0 (0.08)

SUSPENSION

Unit: mm (in)

ITEM	STD/SPEC.		LIMIT
Front fork stroke	130 (5.1)		—
Front fork spring free length	SV650	429 (16.89)	420 (16.5)
	SV650S	437.4 (17.22)	428 (16.8)
Front fork oil level (without spring, outer tube fully compressed)	SV650	92 (3.62)	—
	SV650S	94 (3.70)	
Front fork spring adjuster	3rd groove from Top		—
Front fork oil type	SUZUKI FORK OIL SS8 or equivalent fork oil		—
Front fork oil capacity (each leg)	SV650	490 ml (20.2/17.3 US/Imp oz)	—
	SV650S	488 ml (16.5/17.2 US/Imp oz)	—
Rear shock absorber spring pre-set length	SV650	4/7	—
	SV650S	3/7	—
Rear wheel travel	137 (5.4)		—
Swingarm pivot shaft runout	—		0.3 (0.01)

FUEL + OIL

ITEM	STD/SPEC.		NOTE
Fuel type	Use only unleaded gasoline of at least 87 pump octane ($\frac{R+M}{2}$) 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.		E-03, 28, 33
	Gasoline used should be graded 91 octane or higher. An unleaded gasoline is recommended.		Others
Fuel tank capacity	16 L (4.2/3.5 US/Imp gal)		E-33
	17 L (4.5/3.7 US/Imp gal)		Others
Engine oil type	SAE 10 W – 40, API SF or SG		
Engine oil capacity	Change	2 300 ml (2.4/2.0 US/Imp qt)	
	Filter change	2 700 ml (2.9/2.4 US/Imp qt)	
	Overhaul	3 100 ml (3.3/2.7 US/Imp qt)	

EMISSION CONTROL INFORMATION

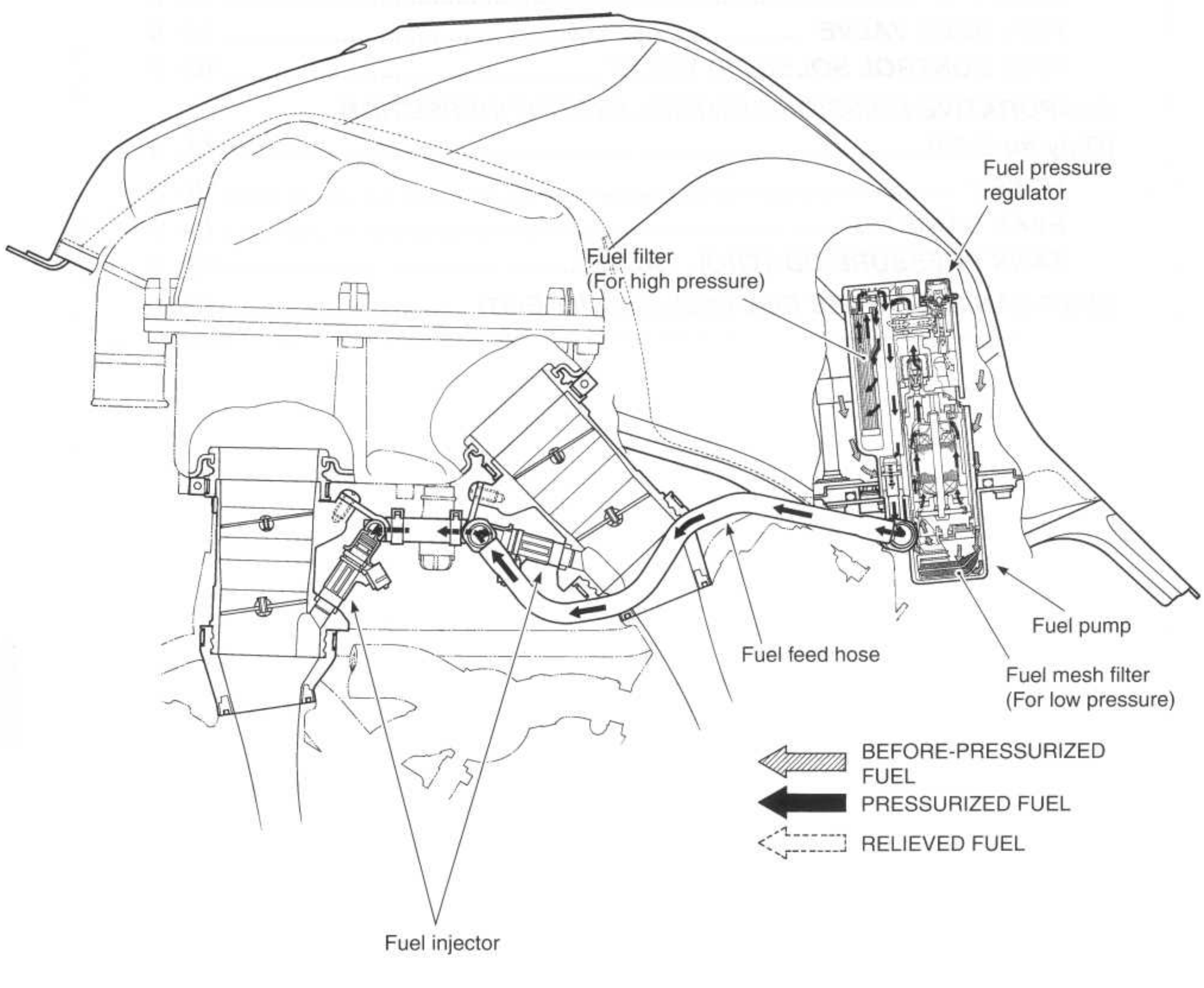
CONTENTS

EMISSION CONTROL SYSTEMS

FUEL INJECTION SYSTEM

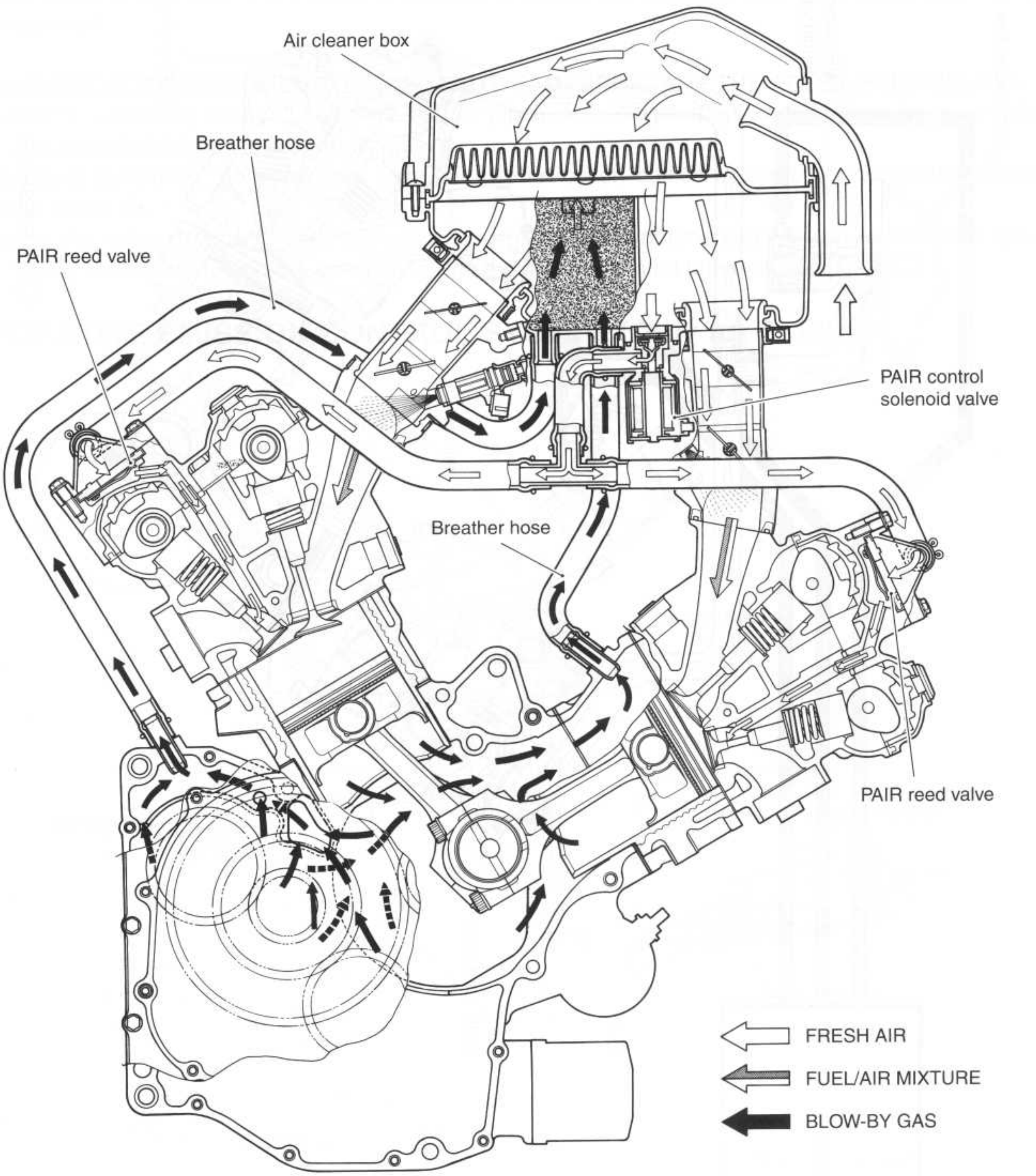
SV650/S motorcycles are equipped with a fuel injection system for emission level control.

This fuel injection system is precision designed, manufactured and adjusted to comply with the applicable emission limits.



CRANKCASE EMISSION CONTROL SYSTEM

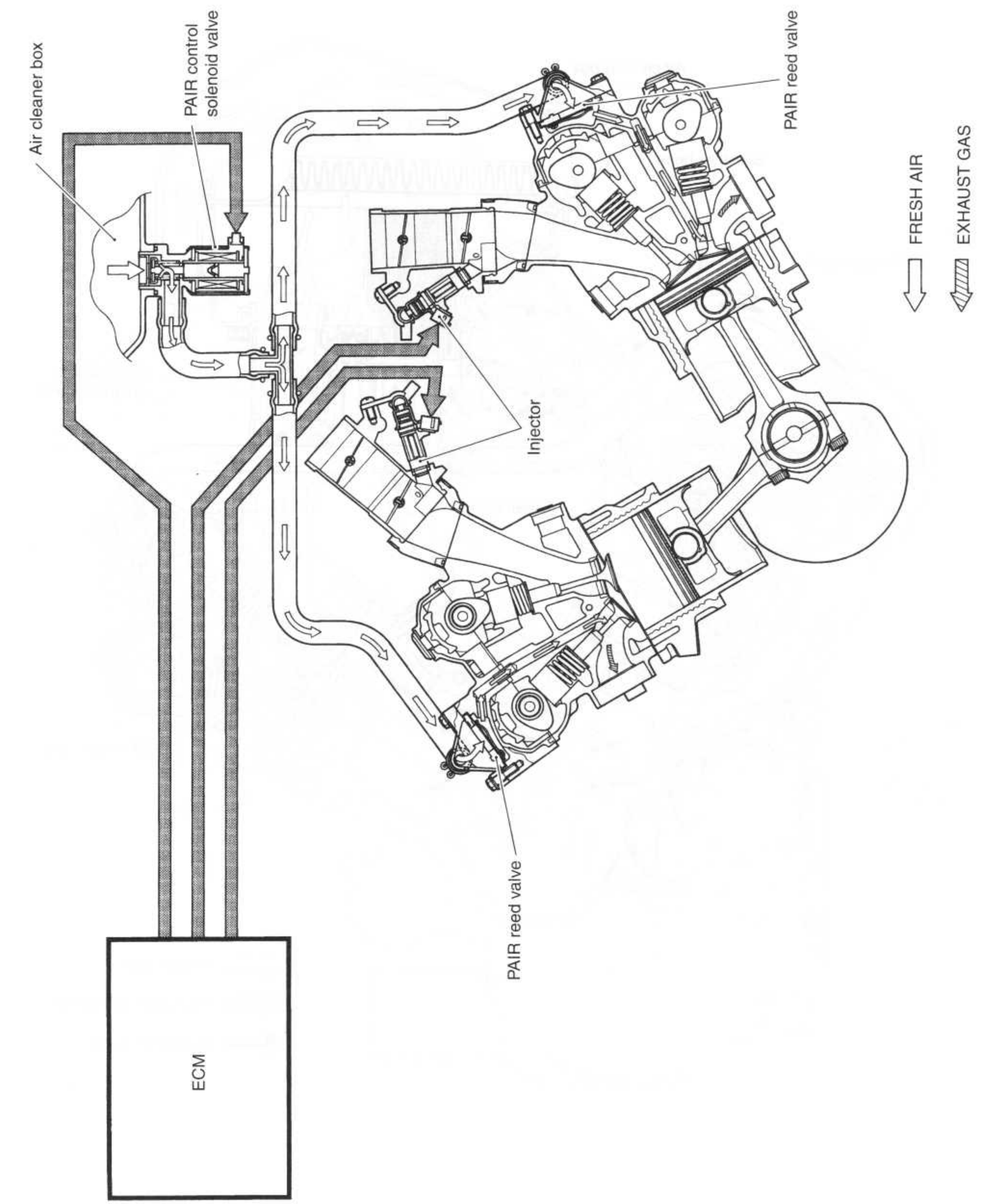
The engine is equipped with a PCV system. Blow-by gas in the engine is constantly drawn into the crankcase, which is returned to the combustion chamber through the breather hose, air cleaner and throttle body.



EXHAUST EMISSION CONTROL SYSTEM (PAIR SYSTEM)

The exhaust emission control system is composed of the PAIR system.

The fresh air is drawn into the exhaust port with the PAIR solenoid valve and PAIR reed valve. The PAIR solenoid valve is operated by the ECM, and the fresh air flow is controlled according to the TPS, ECTS, IATS and IAPS.



NOISE EMISSION CONTROL SYSTEM

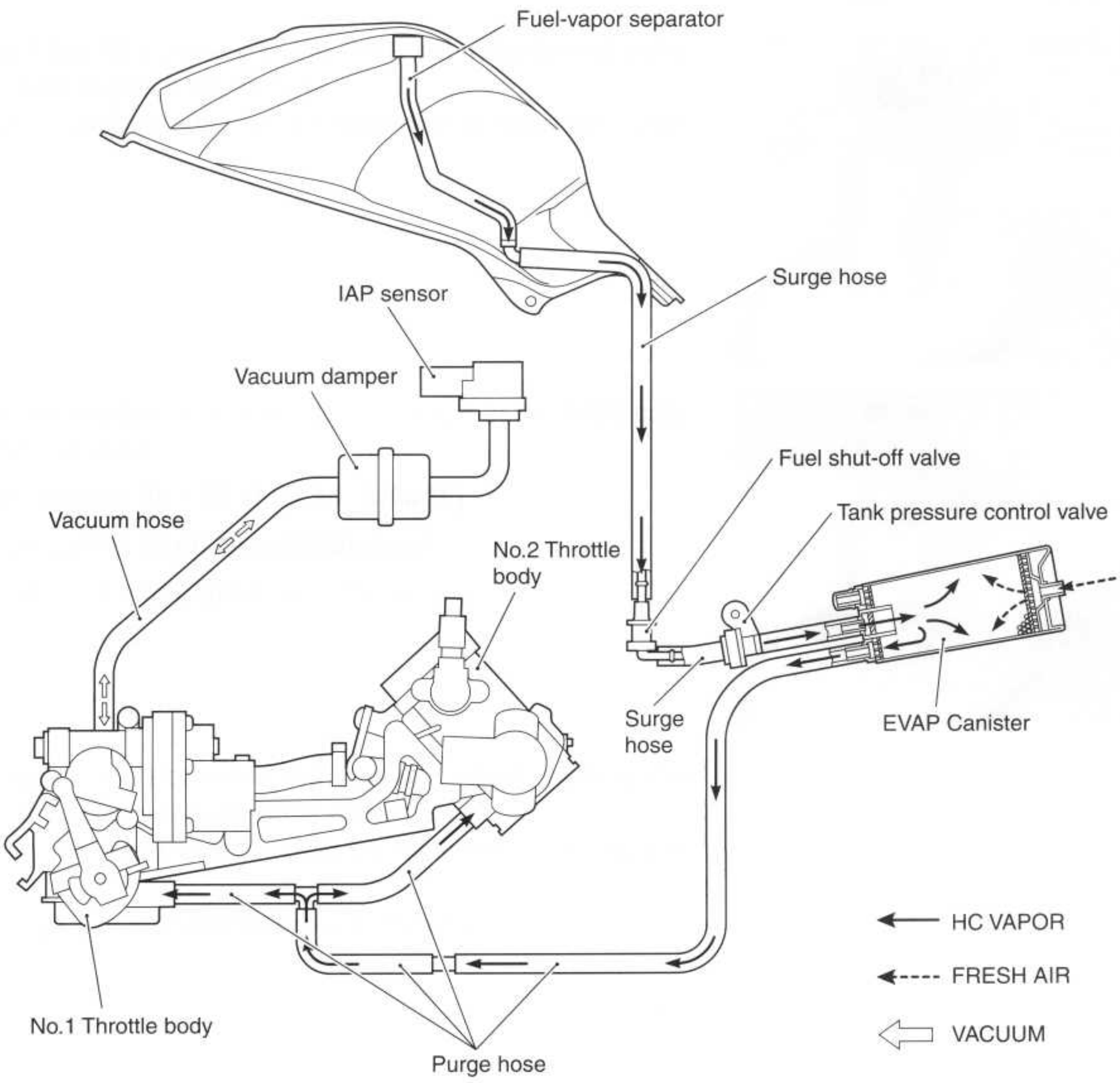
TAMPERING WITH THE NOISE CONTROL SYSTEM PROHIBITED: Federal law prohibits the following acts or the causing thereof:

1. The removal or rendering inoperative by any person, other than for purposes of maintenance, repair or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use, or
2. The use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

AMONG THOSE ACTS PRESUMED TO CONSTITUTE TAMPERING ARE THE ACTS LISTED BELOW:

- Removing or puncturing the muffler, baffles, header pipes, screen type spark arrester (if equipped) or any other component which conducts exhaust gases.
- Removing or puncturing the air cleaner case, air cleaner cover, baffles or any other component which conducts intake air.
- Replacing the exhaust system or muffler with a system or muffler not marked with the same model specific code as the code listed on the Motorcycle Noise Emission Control Information label.

EVAPORATIVE EMISSION CONTROL SYSTEM (Only for E-33)



PAIR (AIR SUPPLY) SYSTEM INSPECTION

HOSES

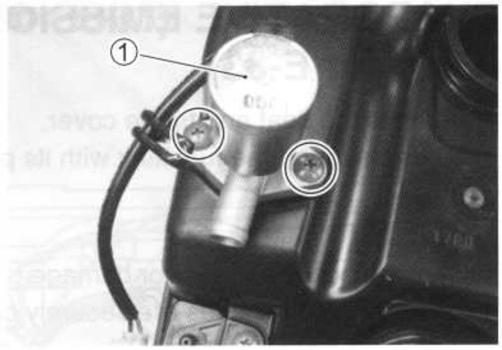
- Inspect the hoses for wear or damage.
- Inspect that the hoses are securely connected.

PAIR REED VALVE

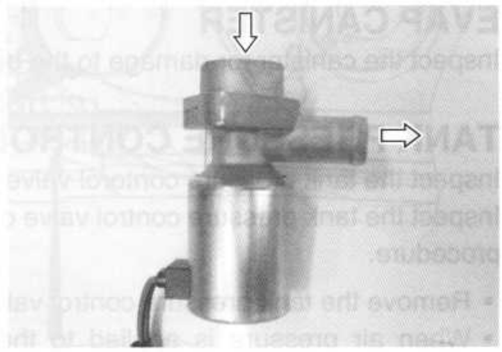
- Remove the PAIR reed valve cover. (☞3-40)
- Inspect the reed valve for the carbon deposit.
- If the carbon deposit is found in the reed valve, replace the PAIR reed valve with a new one
- Installation is in the reverse order of removal.

PAIR CONTROL SOLENOID VALVE

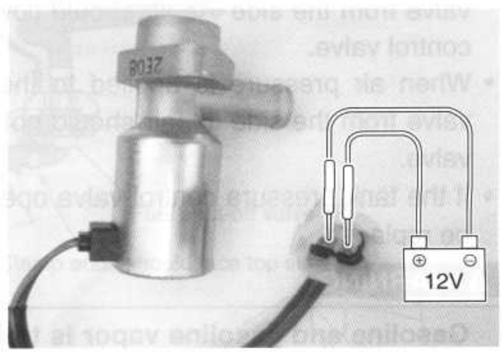
* Remove the air cleaner box. (☞5-16)
* Remove the PAIR control solenoid valve ①.



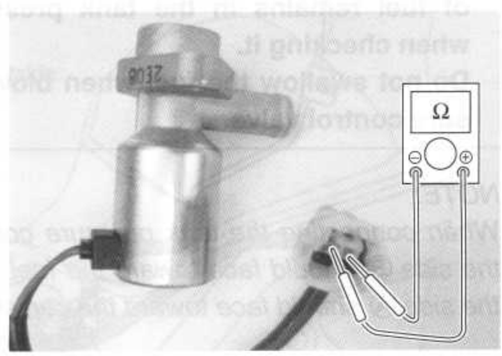
* Check that air flows through the air inlet port to the air outlet port.
* If air does not flow out, replace the PAIR control solenoid valve with a new one.



* Connect the 12 V battery to the PAIR control solenoid valve terminals and check the air flow.
* If air does not flow out, the solenoid valve is in normal condition.



* Check the resistance between the terminals of the PAIR control solenoid valve.



DATA **Resistance: 20 – 24 Ω (at 20 °C/68 °F)**

TOOL **09900-25008: Multi circuit tester set**

Tester knob indication: Resistance (Ω)

If the resistance is not within the standard range, replace the PAIR control solenoid valve with a new one.

* Connect the PAIR control solenoid valve lead wire coupler securely.
* Installation is in the reverse order of removal.

EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION (Only for E-33)

- Remove the seat and frame cover.
- Lift and support the fuel tank with its prop stay. (☞5-6)

HOSES

Inspect the hoses for wear or damage.

Make sure that the hoses are securely connected.

EVAP CANISTER

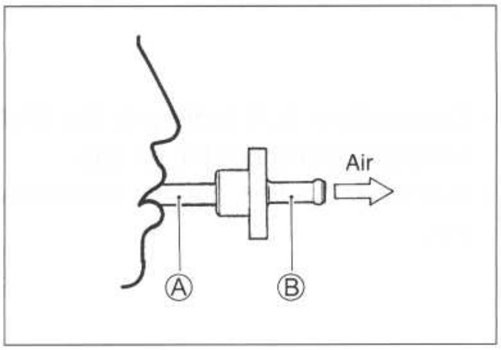
Inspect the canister for damage to the body.

TANK PRESSURE CONTROL VALVE

Inspect the tank pressure contorol valve body for damage.

Inspect the tank pressure control valve operation in the following procedure.

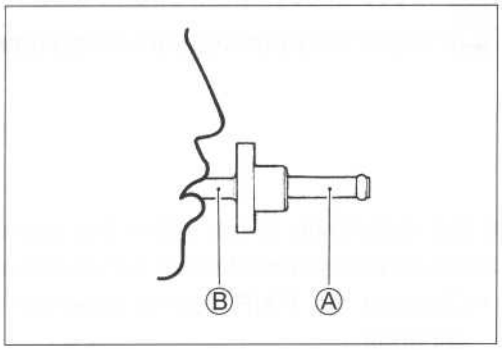
- Remove the tank pressure control valve.
- When air pressure is applied to the tank pressure control valve from the side Ⓐ, air should flow out through the purge control valve.
- When air pressure is applied to the tank pressure control valve from the side Ⓑ, air should not flow through the purge valve.
- If the tank pressure control valve operates otherwise, it must be replaced.



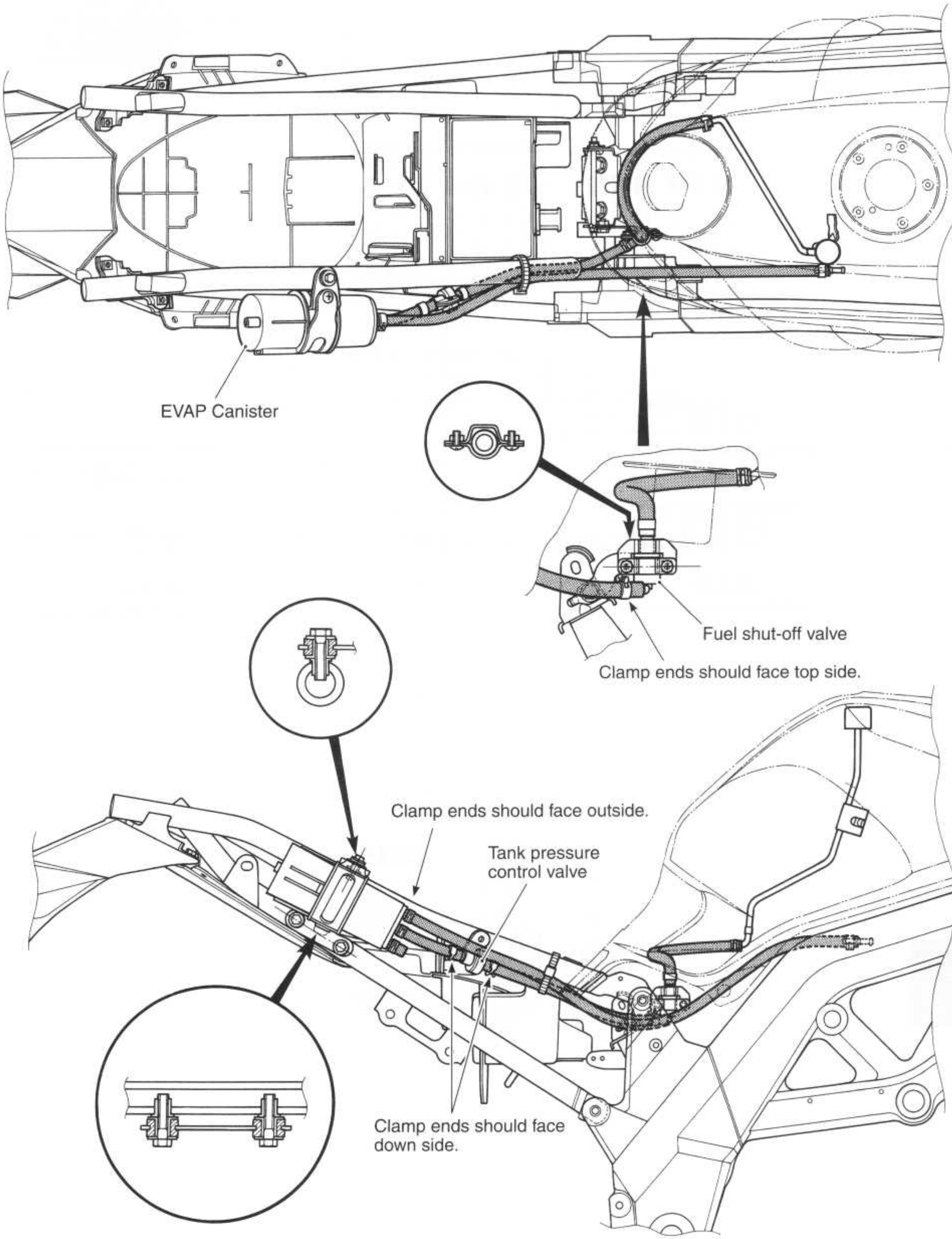
⚠ WARNING

Gasoline and gasoline vapor is toxic. A small amount of fuel remains in the tank pressure control valve when checking it.
Do not swallow the fuel when blowing the tank pressure control valve.

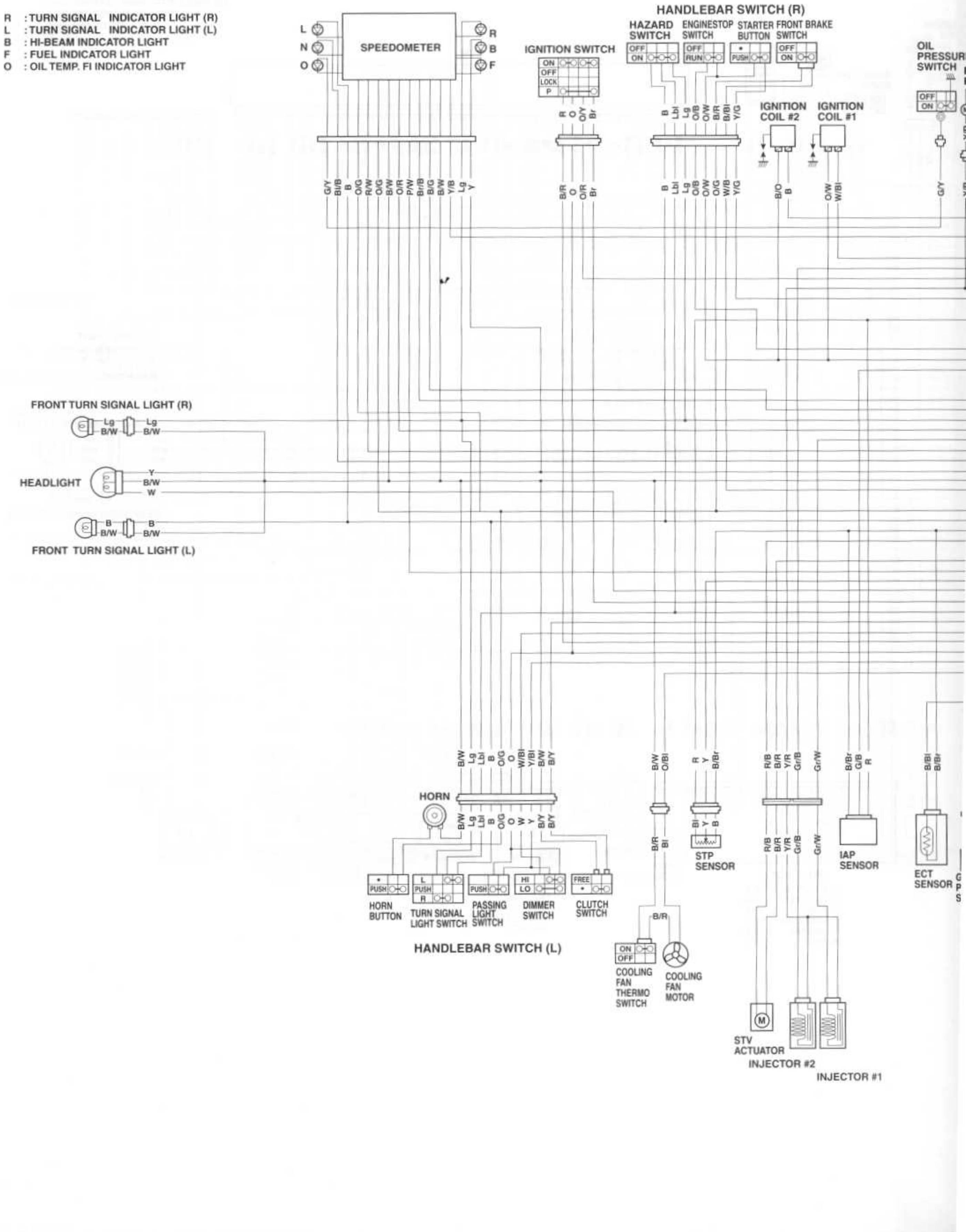
NOTE:
When connecting the tank pressure control valve to the hose, the side Ⓑ should face toward the fuel shut-off valve side, and the side Ⓐ should face toward the canister side.

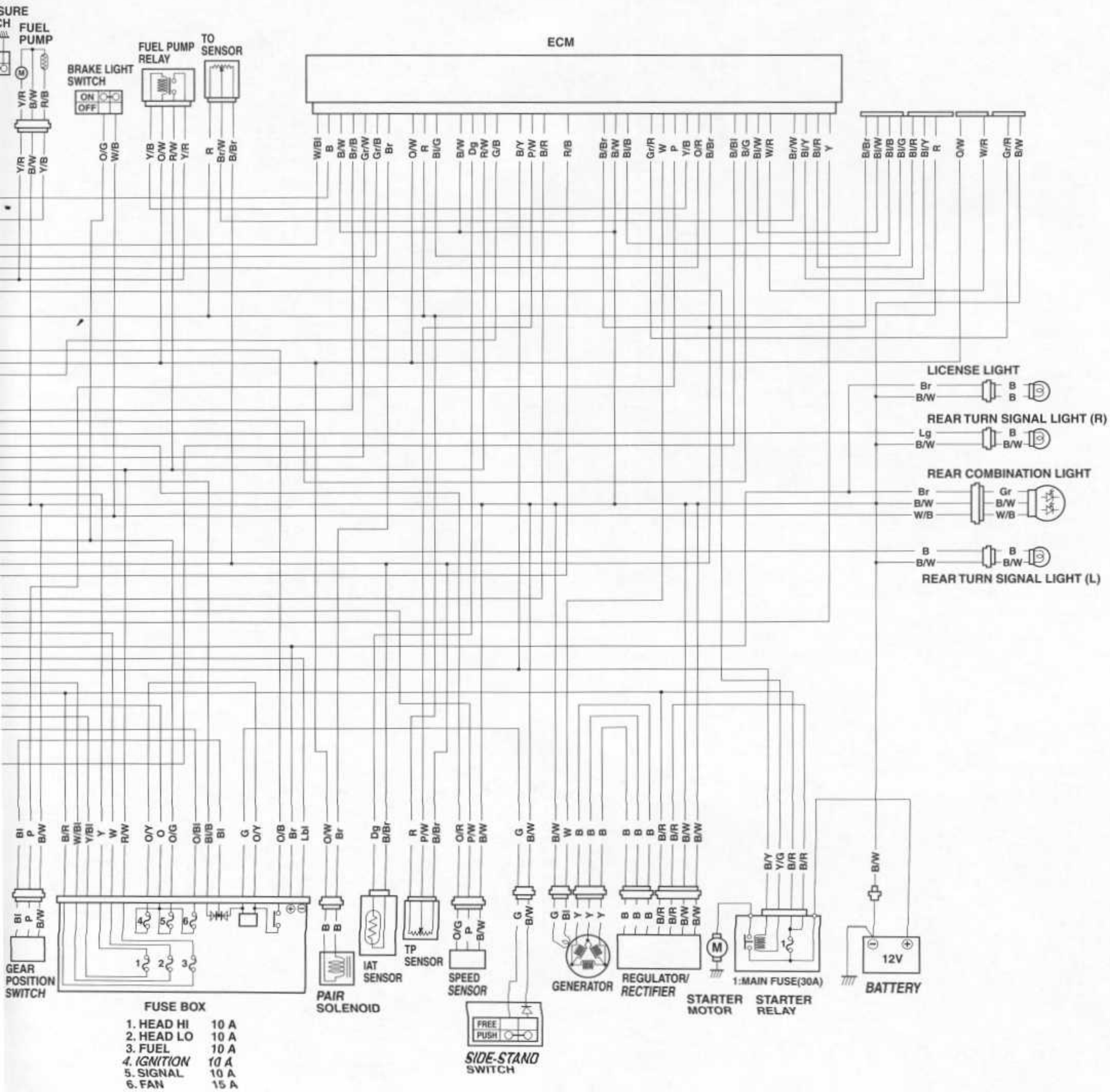


EVAP CANISTER HOSE ROUTING (Only for E-33)

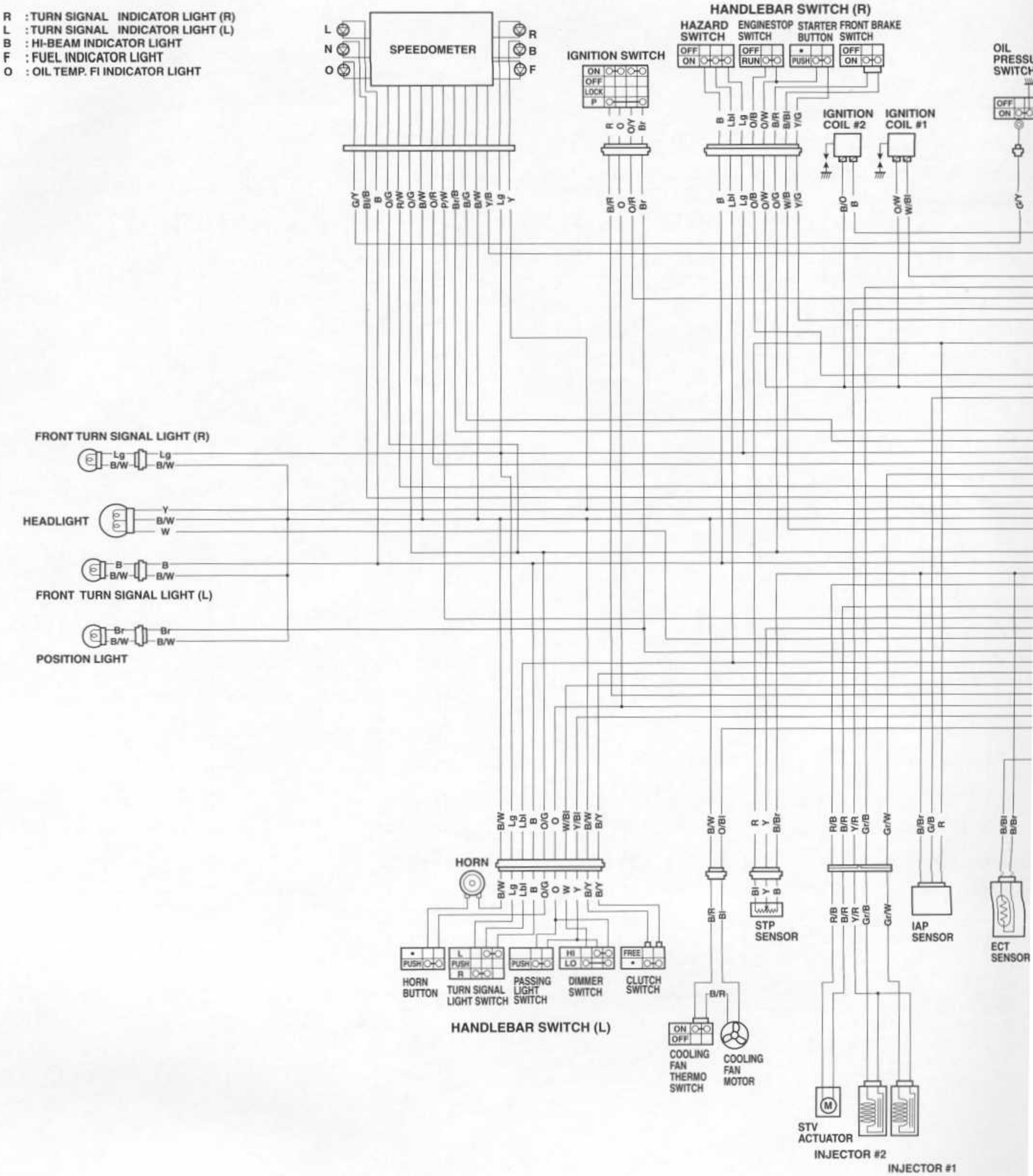


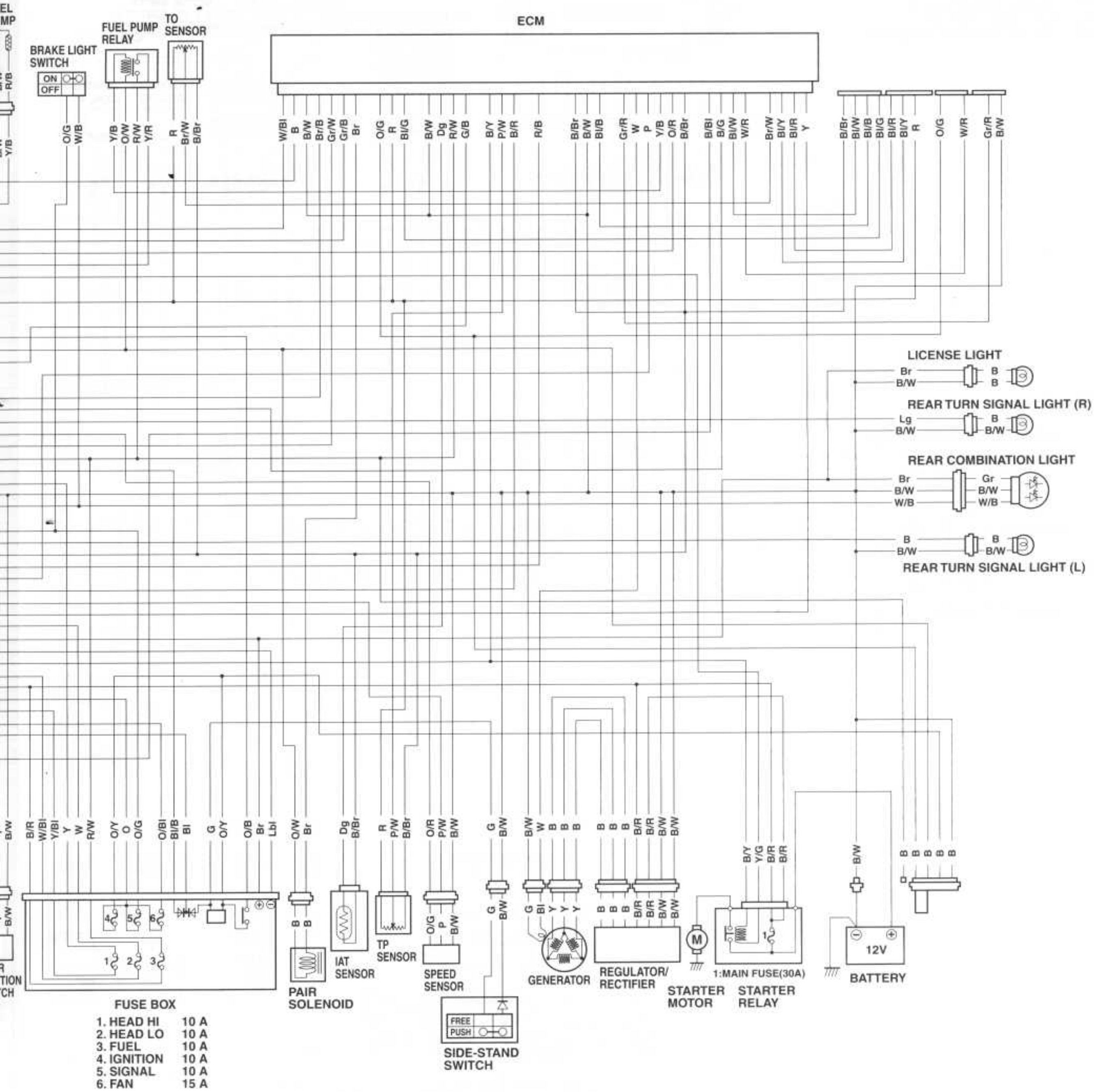
WIRING DIAGRAM
SV650 (FOR E-03, 24, 28, 33)




SURE
CH
FUEL PUMP
FUEL PUMP RELAY
TO SENSOR
BRAKE LIGHT SWITCH
ON
OFF
ECM
LICENSE LIGHT
REAR TURN SIGNAL LIGHT (R)
REAR COMBINATION LIGHT
REAR TURN SIGNAL LIGHT (L)
GEAR POSITION SWITCH
FUSE BOX
1. HEAD HI 10 A
2. HEAD LO 10 A
3. FUEL 10 A
4. IGNITION 10 A
5. SIGNAL 10 A
6. FAN 15 A
PAIR SOLENOID
IAT SENSOR
TP SENSOR
SPEED SENSOR
FREE
PUSH
SIDE-STAND SWITCH
GENERATOR
REGULATOR/ RECTIFIER
STARTER MOTOR
1:MAIN FUSE(30A)
STARTER RELAY
12V
BATTERY

SV650 (FOR E-02, 19)




ECM
FUEL PUMP RELAY
TO SENSOR
BRAKE LIGHT SWITCH
ON
OFF
LICENSE LIGHT
REAR TURN SIGNAL LIGHT (R)
REAR COMBINATION LIGHT
REAR TURN SIGNAL LIGHT (L)
PAIR SOLENOID
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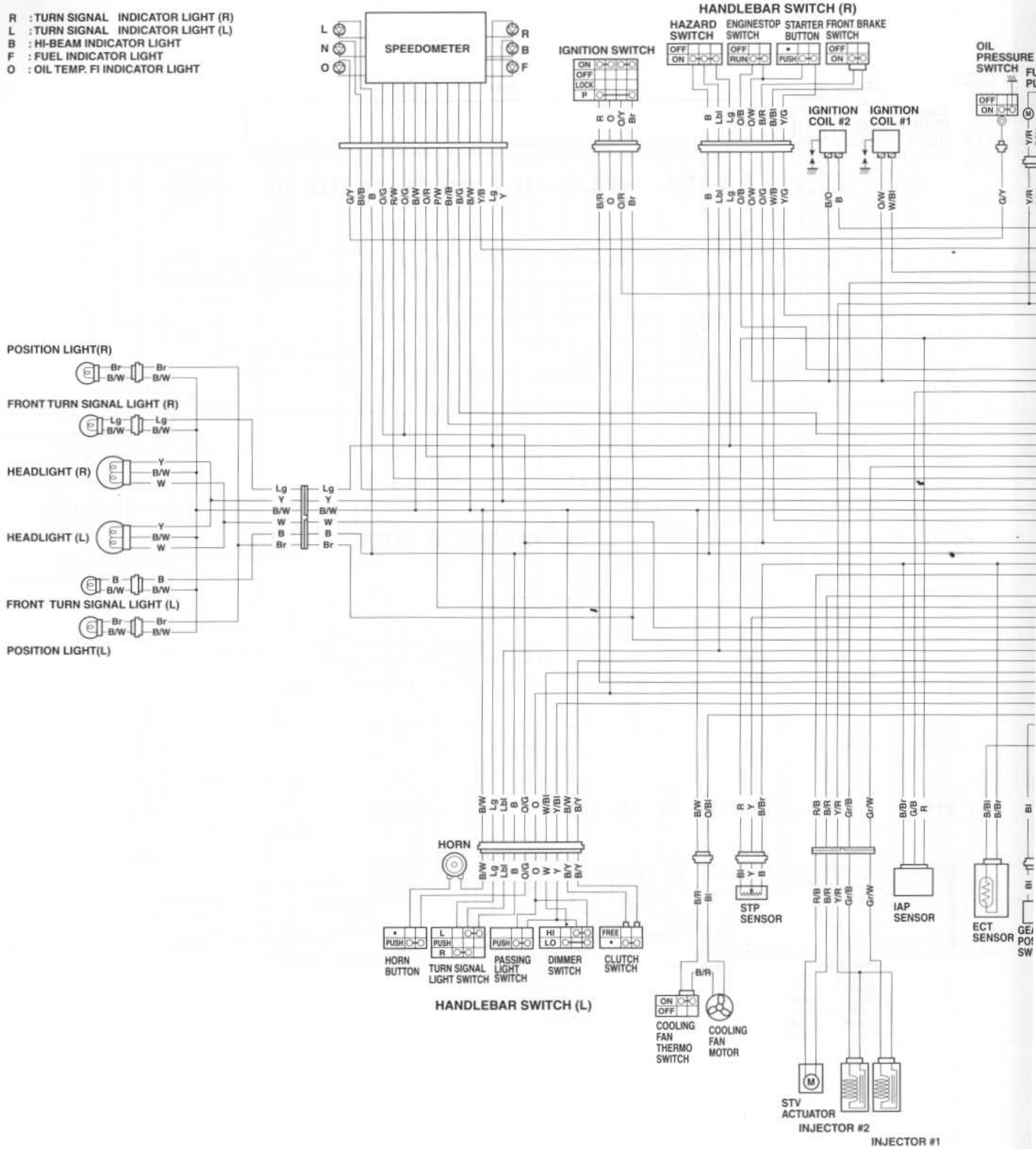
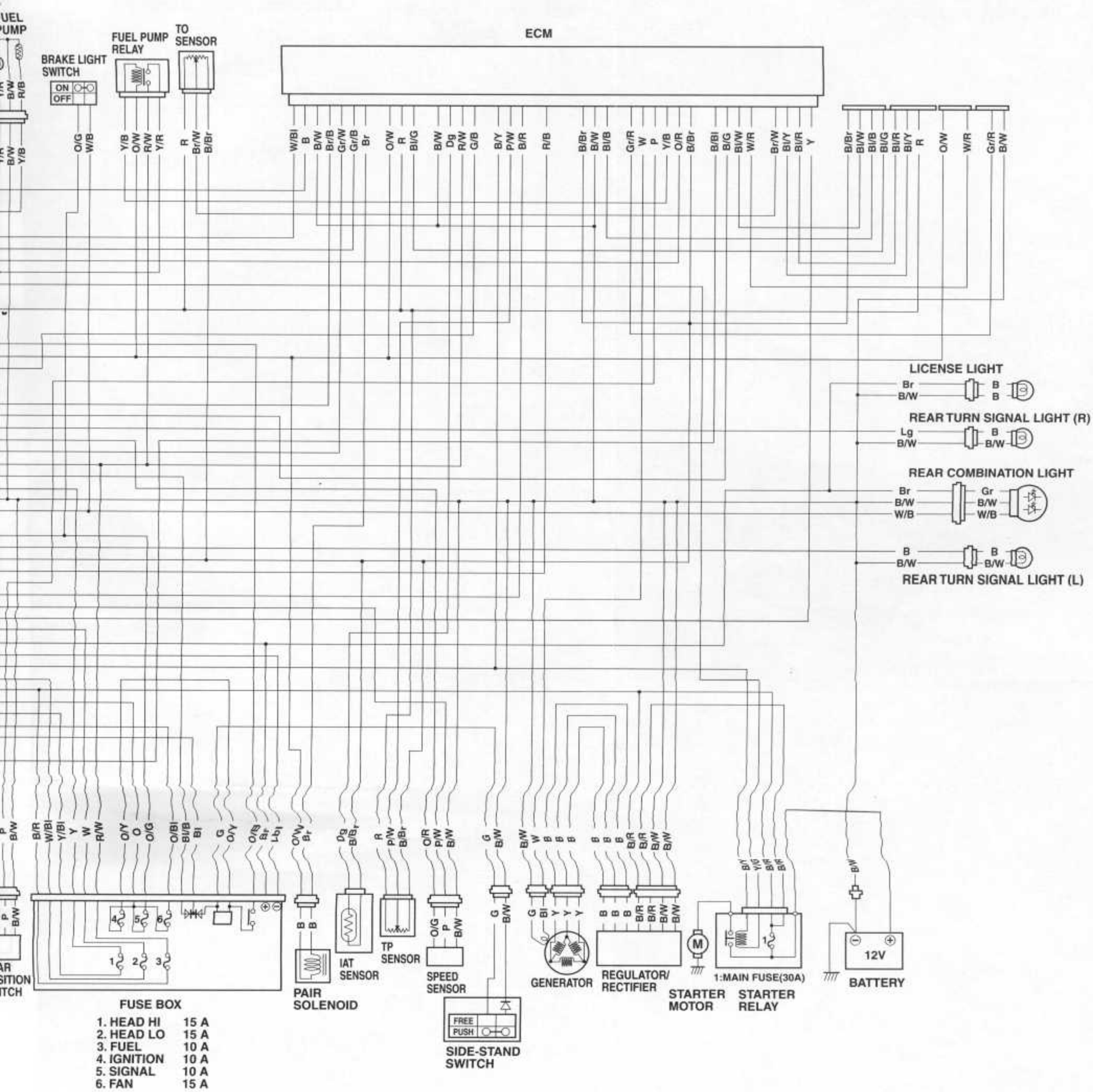
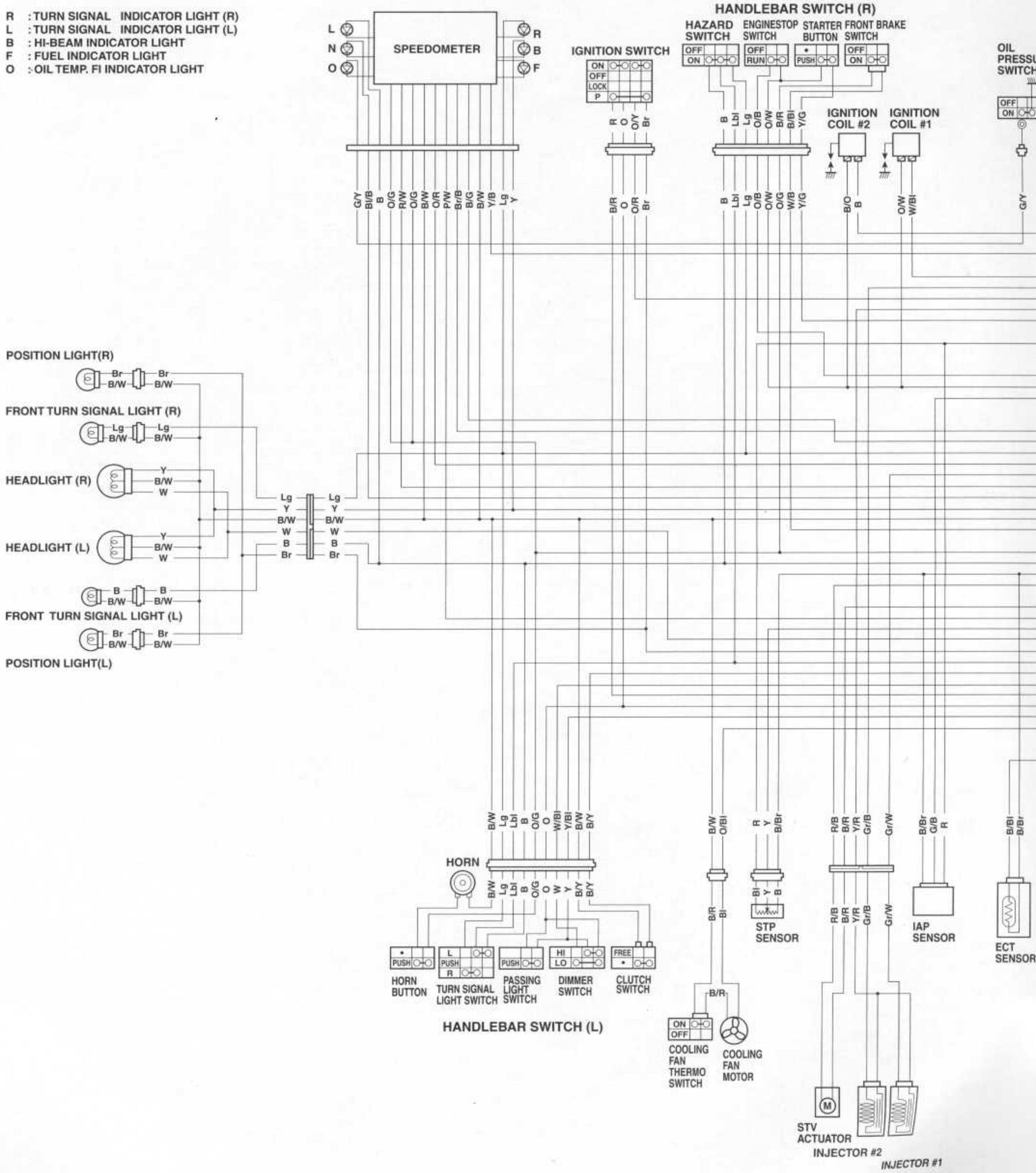
1:MAIN FUSE(30A)
12V
BATTERY
FUSE BOX
1. HEAD HI 10 A
2. HEAD LO 10 A
3. FUEL 10 A
4. IGNITION 10 A
5. SIGNAL 10 A
6. FAN 15 A

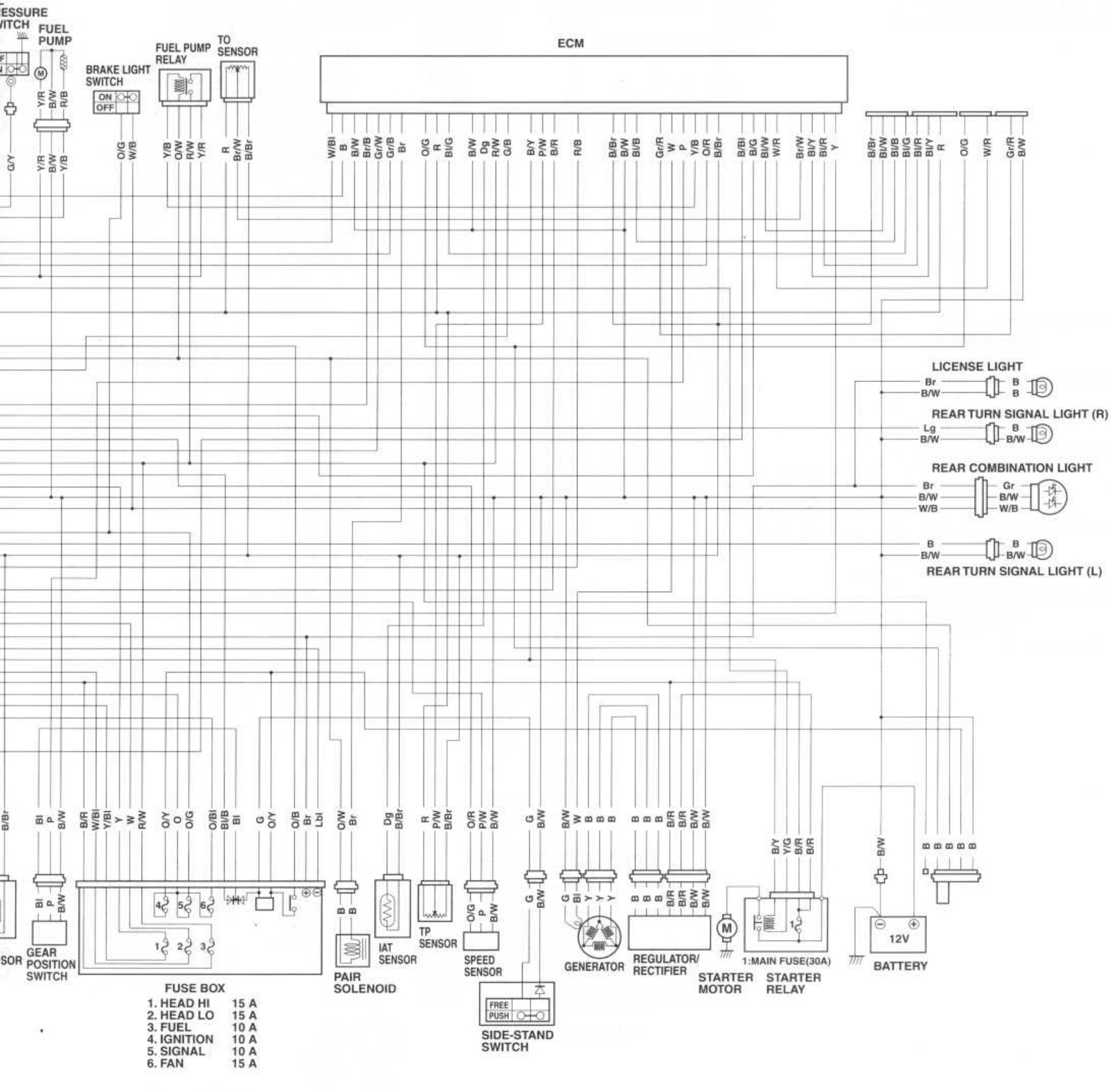
SV650S (FOR E-03, 24, 28, 33)




ECM
FUEL PUMP RELAY
TO SENSOR
BRAKE LIGHT SWITCH
ON
OFF
LICENSE LIGHT
REAR TURN SIGNAL LIGHT (R)
REAR COMBINATION LIGHT
REAR TURN SIGNAL LIGHT (L)
FUSE BOX
1. HEAD HI 15 A
2. HEAD LO 15 A
3. FUEL 10 A
4. IGNITION 10 A
5. SIGNAL 10 A
6. FAN 15 A
PAIR SOLENOID
IAT SENSOR
TP SENSOR
SPEED SENSOR
FREE
PUSH
SIDE-STAND SWITCH
GENERATOR
REGULATOR/RECTIFIER
STARTER MOTOR
1:MAIN FUSE(30A)
STARTER RELAY
12V
BATTERY

SV650S (FOR E-02, 19)





PRESSURE SWITCH
FUEL PUMP
BRAKE LIGHT SWITCH
FUEL PUMP RELAY
TO SENSOR
ECM
LICENSE LIGHT
REAR TURN SIGNAL LIGHT (R)
REAR COMBINATION LIGHT
REAR TURN SIGNAL LIGHT (L)
GEAR POSITION SWITCH
FUSE BOX
1. HEAD HI 15 A
2. HEAD LO 15 A
3. FUEL 10 A
4. IGNITION 10 A
5. SIGNAL 10 A
6. FAN 15 A
PAIR SOLENOID
IAT SENSOR
TP SENSOR
SPEED SENSOR
SIDE-STAND SWITCH
GENERATOR
REGULATOR/ RECTIFIER
STARTER MOTOR
STARTER RELAY
1:MAIN FUSE(30A)
BATTERY
12V

Prepared by

SUZUKI MOTOR CORPORATION

January, 2003
Part No.99500-36120-03E
Printed in Japan

SUZUKI MOTOR CORPORATION

Printed in Japan C
K3

* PREFACE *

When it becomes necessary to replace parts on SUZUKI MOTORCYCLES, always use SUZUKI GENUINE PARTS which have passed a strict inspection which guarantees quality and performance.

This parts catalogue covers the list of all service parts for SUZUKI SV650K3, SV650SK3.

INSTRUCTIONS FOR QUOTING THE CATALOGUE

1. DIMENSIONS
   Dimensions of the parts in this catalogue are indicated in unit millimeters.

2. ABBREVIATIONS

   Abbreviations used in this catalogue are as follows:

AR	: As required	NT	: Number of teeth
ASSY	: Assembly	OPT	: Optional
E. No.	: Engine number	OS	: Over size
F. No.	: Frame number	STD	: Standard
d	: Diameter of material	T	: Thickness
ID	: Inside diameter	US	: Under size
OD	: Outside diameter	W	: Width
L	: Length	E28	: Canada specification
LH	: Left hand side	E3	: Federal specification
RH	: Right hand side	E33	: California specification

~100045 : Up to F.No.100045
100046~ : From F.No.100046

```
12 x 34 x 5.6 ----------Figures in the description column
|    |    |              show the dimensions of parts.
ID   OD   T(or W, L)
```

3. INNER PARTS OF ASSEMBLY
   Part name with a dot (.) in front as shown in the description column indicates the component of the assembly also available individually.

4. MODIFICATION NOTICE
   A parts bulletin will be sent to you on all occasions when changes in parts occur, including interchangeable modifications between new parts and old ones.

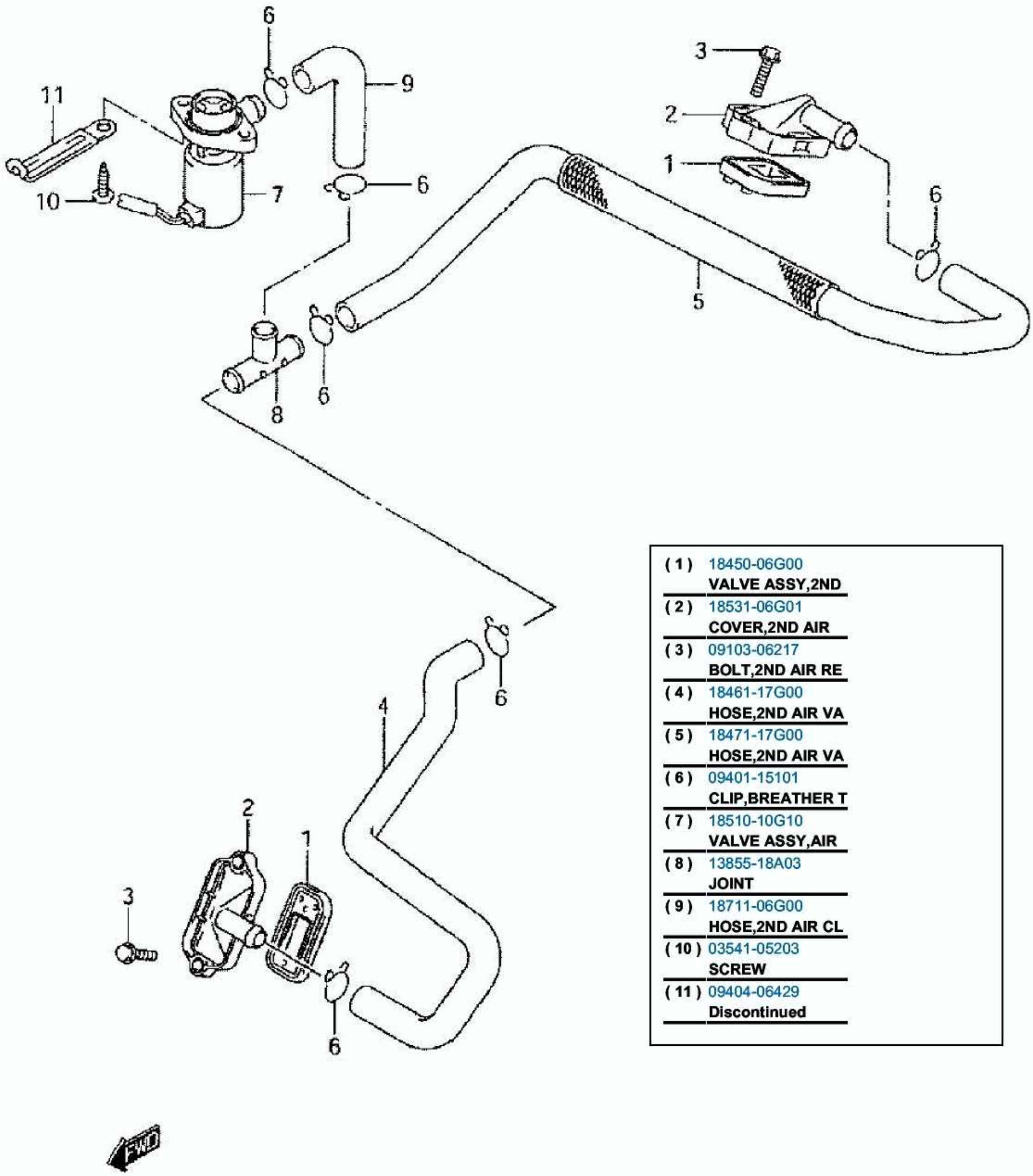
5. NOTE
   5-1. There are some different parts from those of production models among spare parts for the administrative reasons and common use of them with other models.

   5-2. In respect of rubber hoses and vinyl tubes, please be sure to use them by cutting off according to the length mentioned on parts catalogue or what is actually required on the vehicle.

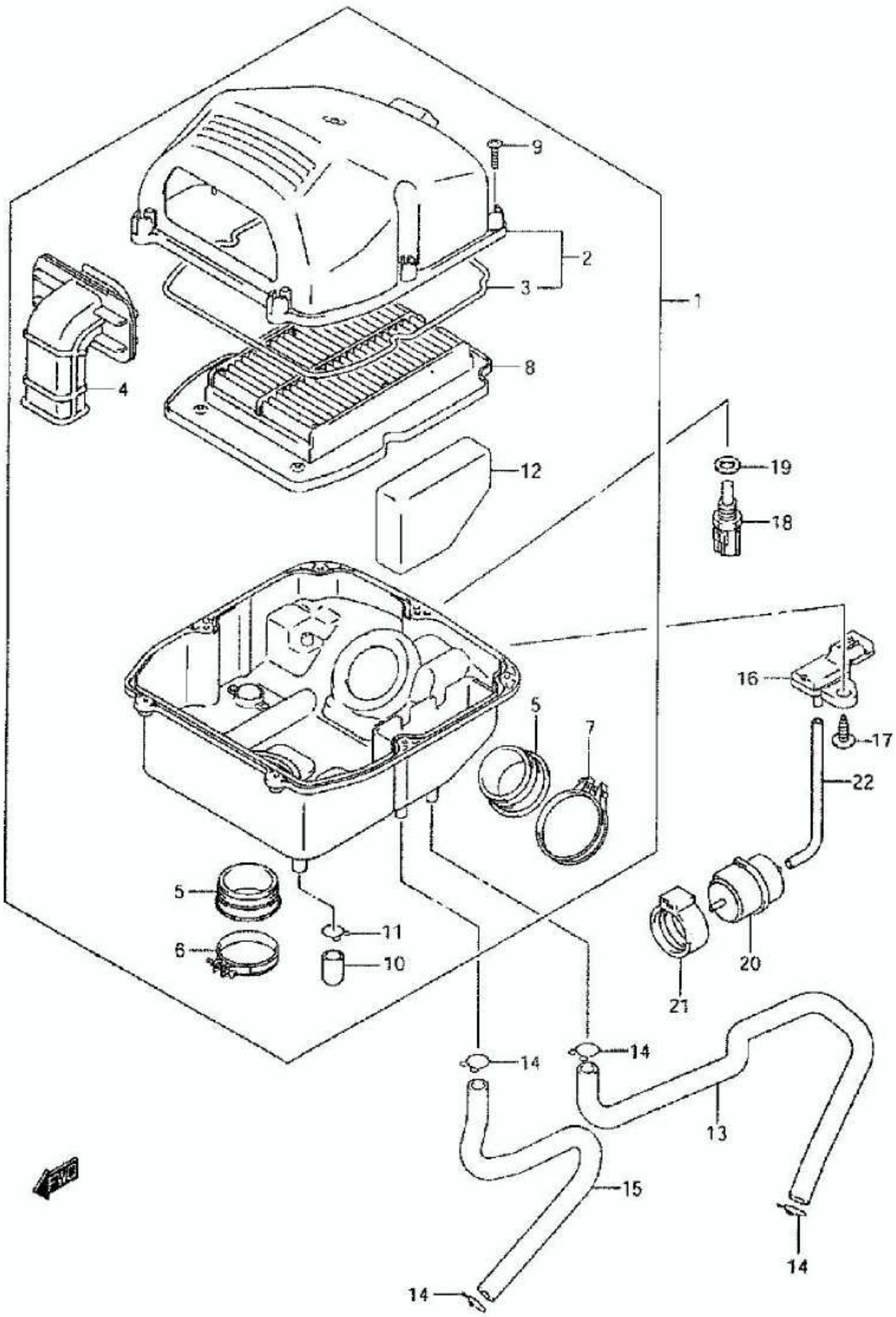
   5-3. Note that the drawings on the illustration page are for ready reference of spare parts number, not to be used as an assembly manual. When assembling, use "SUZUKI SERVICE MANUAL".

6. SERIAL FRAME NUMBER

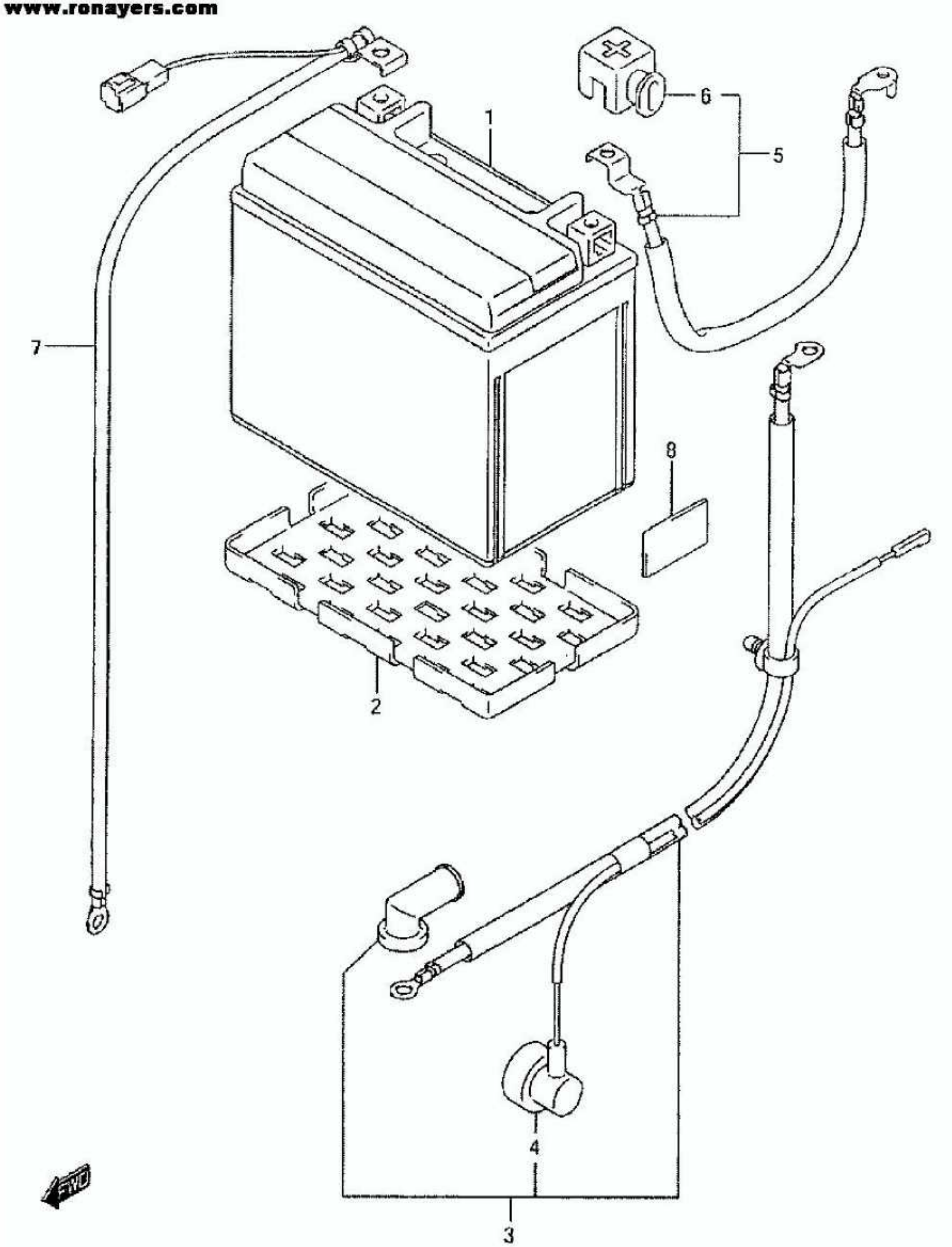
   SV650K3/SK3(E3,E33):F.NO.JS1VP53A 32100001~
   SV650K3/SK3(E28)   :F.NO.JS1VP53A 32100001~



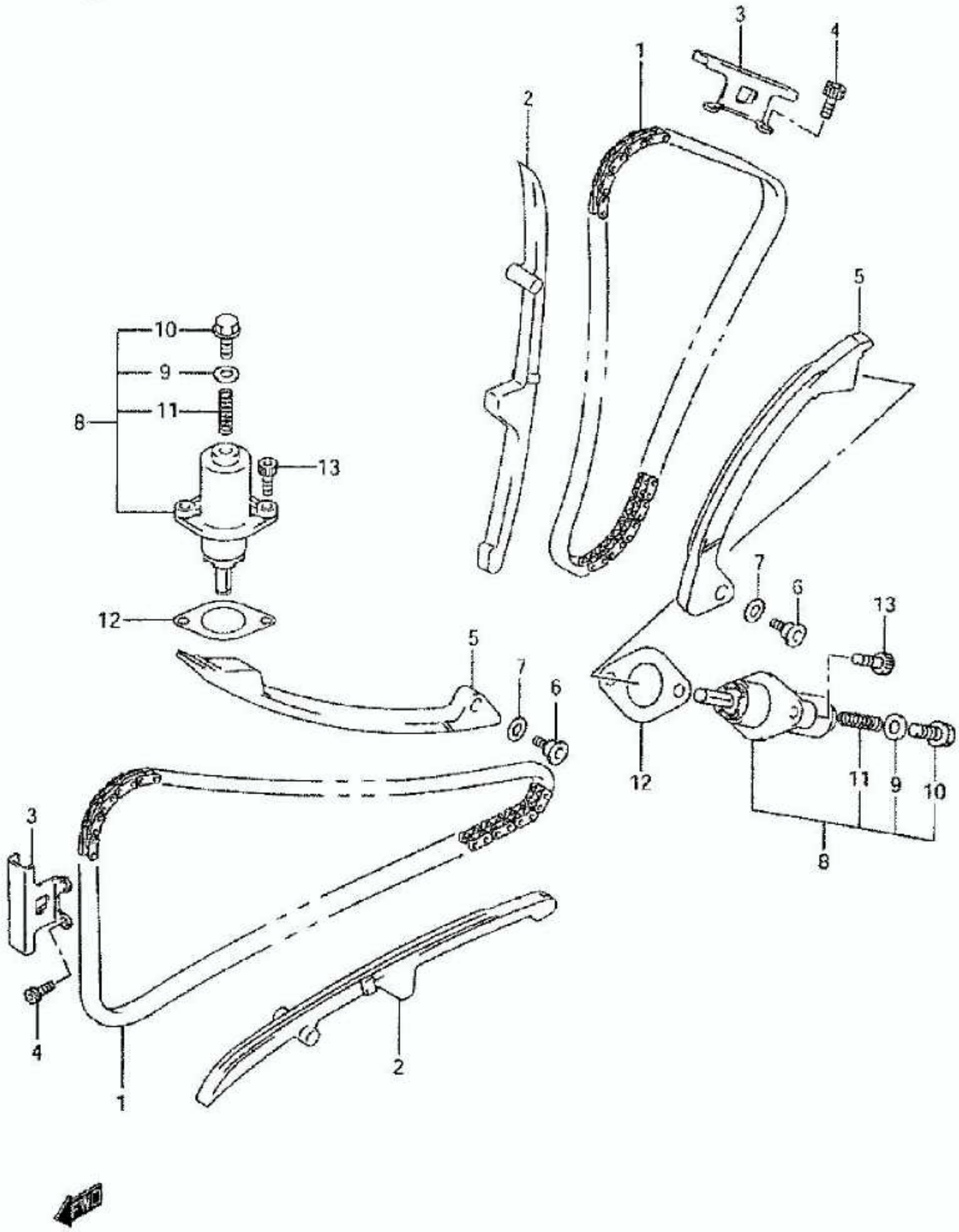
(1)	18450-06G00	VALVE ASSY,2ND
(2)	18531-06G01	COVER,2ND AIR
(3)	09103-06217	BOLT,2ND AIR RE
(4)	18461-17G00	HOSE,2ND AIR VA
(5)	18471-17G00	HOSE,2ND AIR VA
(6)	09401-15101	CLIP,BREATHER T
(7)	18510-10G10	VALVE ASSY,AIR
(8)	13855-18A03	JOINT
(9)	18711-06G00	HOSE,2ND AIR CL
(10)	03541-05203	SCREW
(11)	09404-06429	Discontinued



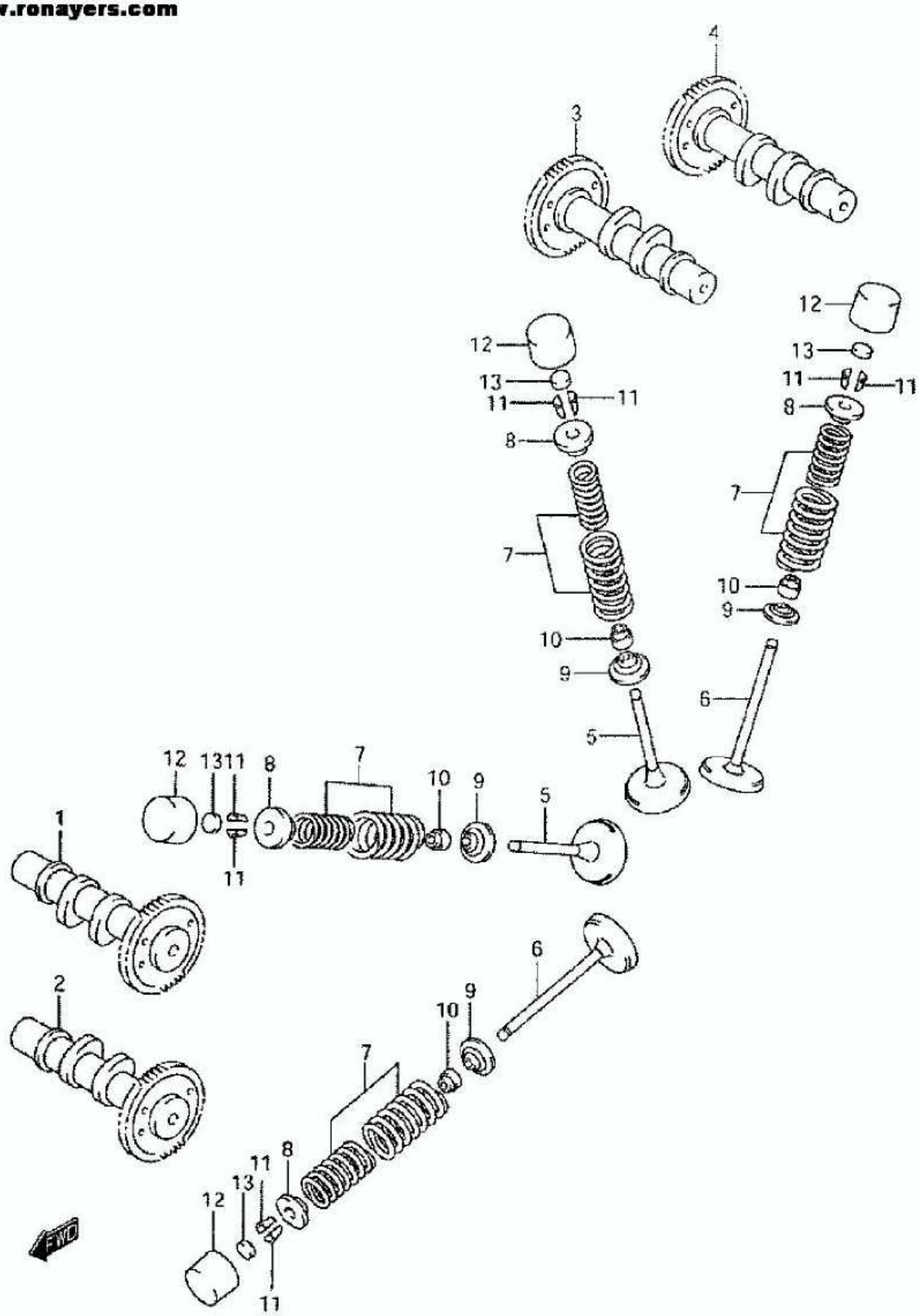
(1)	13700-17G00 CLEANER ASSY,AI
(2)	13740-16G00 273 CAP,AIR CLNR
(3)	13746-16G00 273 273 GASKET
(4)	13891-17G00 273 TUBE,INLET
(5)	13881-17G00 273 TUBE,OUTLET
(6)	13826-17G00 273 CLAMP
(7)	09402-54208 273 CLAMP
(8)	13780-16G00 273 FILTER
(9)	03541-05203 273 SCREW
(10)	13859-41B10 273 PLUG
(11)	09401-14301 273 BREATHER HOSE C
(12)	13788-17G00 273 UNAVAILABLE
(13)	13851-17G00 TUBE,BREATHER C
(14)	09401-15101 CLIP,BREATHER T
(15)	13851-17G10 TUBE,BREATHER C
(16)	18590-17G00 SENSOR COMP,BOO
(17)	03541-05163 SCREW 5 X 16
(18)	13650-57F00 SENSOR,WATER TE
(19)	09168-12017 GASKET,12X17X1
(20)	13715-06G00 CHAMBER COMP,VA
(21)	13912-17G00 BAND,VACUUM CHA
(22)	09355-35755-600 Discontinued



(1)	33610-17E10	YTX12-BS BATTER
(2)	33652-16G00	PROTECTOR BATTE
(3)	33810-17G00	WIRE,STARTER MO
(4)	36618-43410	273 DISCONTINUED
(5)	33820-16G00	WIRE,BATTERY PL
(6)	33624-35B00	273 CAP, BATTERY PL
(7)	33860-17G00	WIRE,BATTERY MI
(8)	33652-17G00	PROTECTOR(30X50



(1)	12760-19F00	CHAIN COMP,CAMS
(2)	12771-19F00	GUIDE,CAM CHAIN
(3)	12782-19F00	GUIDE,CAM CHAIN
(4)	07130-06123	BOLT
(5)	12811-17G00	TENSIONER,CAM C
(6)	12812-35C00	BOLT,CAM CHAIN
(7)	08211-06181	WASHER
(8)	12830-17G00	ADJUSTER ASSY,T
(9)	12837-24F10	273 GASKET
(10)	12833-17G00	273 PLUG,TENSIONER
(11)	12831-35F00	273 SPRING
(12)	12837-24A10	GASKET,TENSIONE
(13)	07130-06253	BOLT



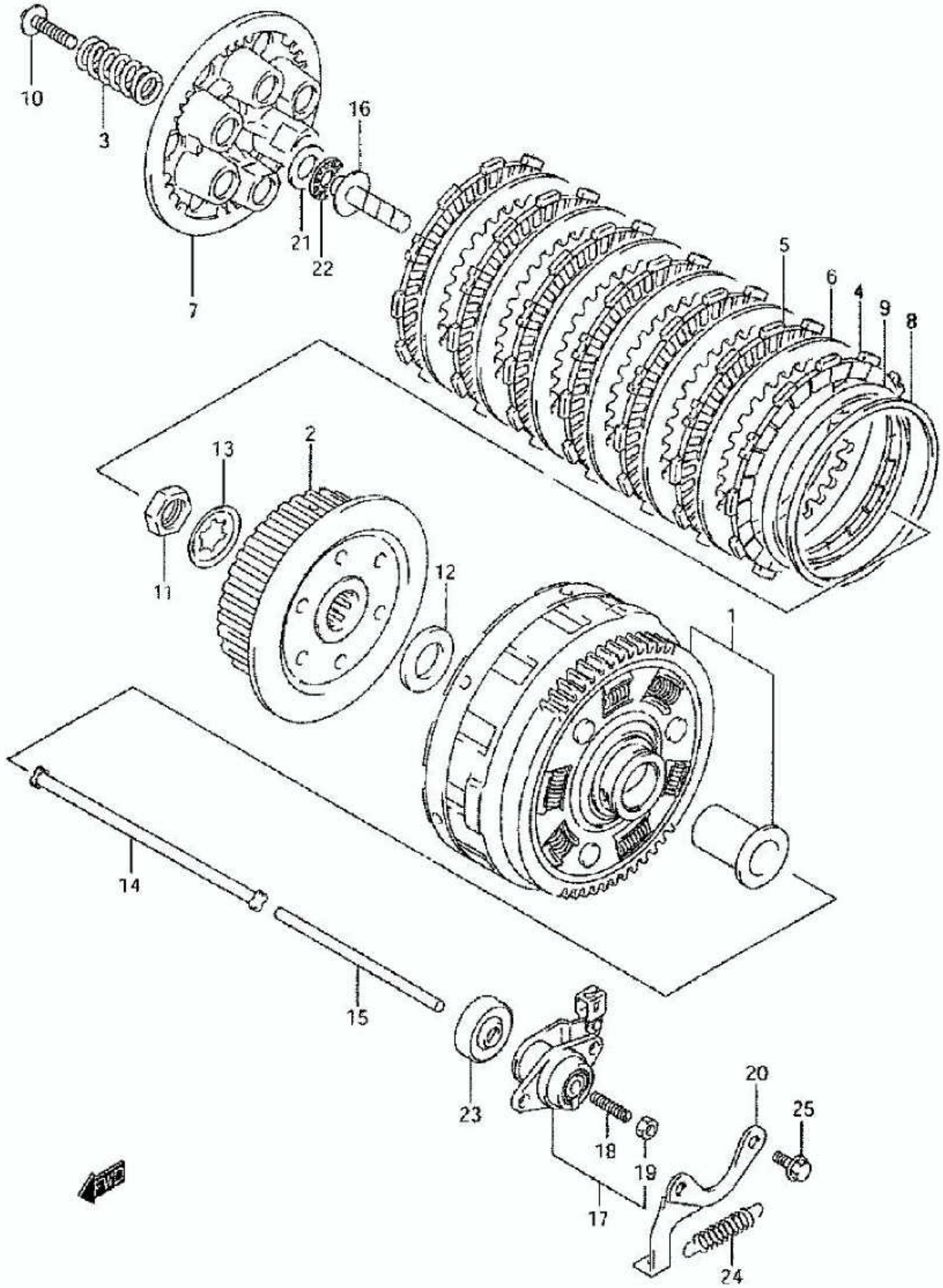
(1)	12710-17G00 CAMSHAFT COMP,I
(2)	12720-17G00 CAMSHAFT COMP,E
(3)	12730-17G00 CAMSHAFT COMP,I
(4)	12740-17G00 CAMSHAFT COMP,E
(5)	12911-46E00 VALVE,INTAKE
(6)	12912-20F00 VALVE,EXHAUST
(7)	12920-33E10 SPRING SET,VALV
(8)	12931-33E10 RETAINER,VALVE
(9)	12933-39E00 SEAT,VALVE SPRI
(10)	09289-04002 SEAL,OIL,4.5X10
(11)	12932-17E50 COTTER,VALVE
(12)	12891-17E00 TAPPET
(13-1)	12892-05C00-120 SHIM,TAPPET
(13-2)	12892-05C00-125 SHIM,TAPPET
(13-3)	12892-05C00-130 SHIM,TAPPET
(13-4)	12892-05C00-135 SHIM,TAPPET
(13-5)	12892-05C00-140 SHIM,TAPPET
(13-6)	12892-05C00-145 SHIM,TAPPET
(13-7)	12892-05C00-150 SHIM,TAPPET
(13-8)	12892-05C00-155 SHIM,TAPPET,T:1
(13-9)	12892-05C00-160 SHIM,TAPPET
(13-10)	12892-05C00-165 SHIM,TAPPET
(13-11)	12892-05C00-170 SHIM,TAPPET
(13-12)	12892-05C00-175 SHIM,TAPPET
(13-13)	12892-05C00-180 SHIM,TAPPET
(13-14)	12892-05C00-185 SHIM,TAPPET
(13-15)	12892-05C00-190 SHIM,TAPPET
(13-16)	12892-05C00-195 SHIM,TAPPET
(13-17)	12892-05C00-200 SHIM,TAPPET
(13-18)	12892-05C00-205 SHIM,TAPPET
(13-19)	12892-05C00-210 SHIM,TAPPET
(13-20)	12892-05C00-215 SHIM,TAPPET
(13-21)	12892-05C00-220 SHIM,TAPPET
(14)	12800-05820 Discontinued
(15)	99000-69491 273 CASE,TAPPET SHI

MILLIMETER - INCH CONVERSION CHART

	0	1	2	3	4	5	6	7	8	9
00	.000	.039	.079	.118	.157	.197	.236	.276	.315	.354
10	.394	.433	.472	.512	.551	.591	.630	.669	.709	.748
20	.787	.827	.866	.906	.945	.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.535
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.214	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.031	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

	0	1	2	3	4
00	---	---	---	---	---
10	---	---	---	---	---
20	---	---	---	0.906	---
30	---	---	---	---	---

23millimeters equal 0.906 inch.

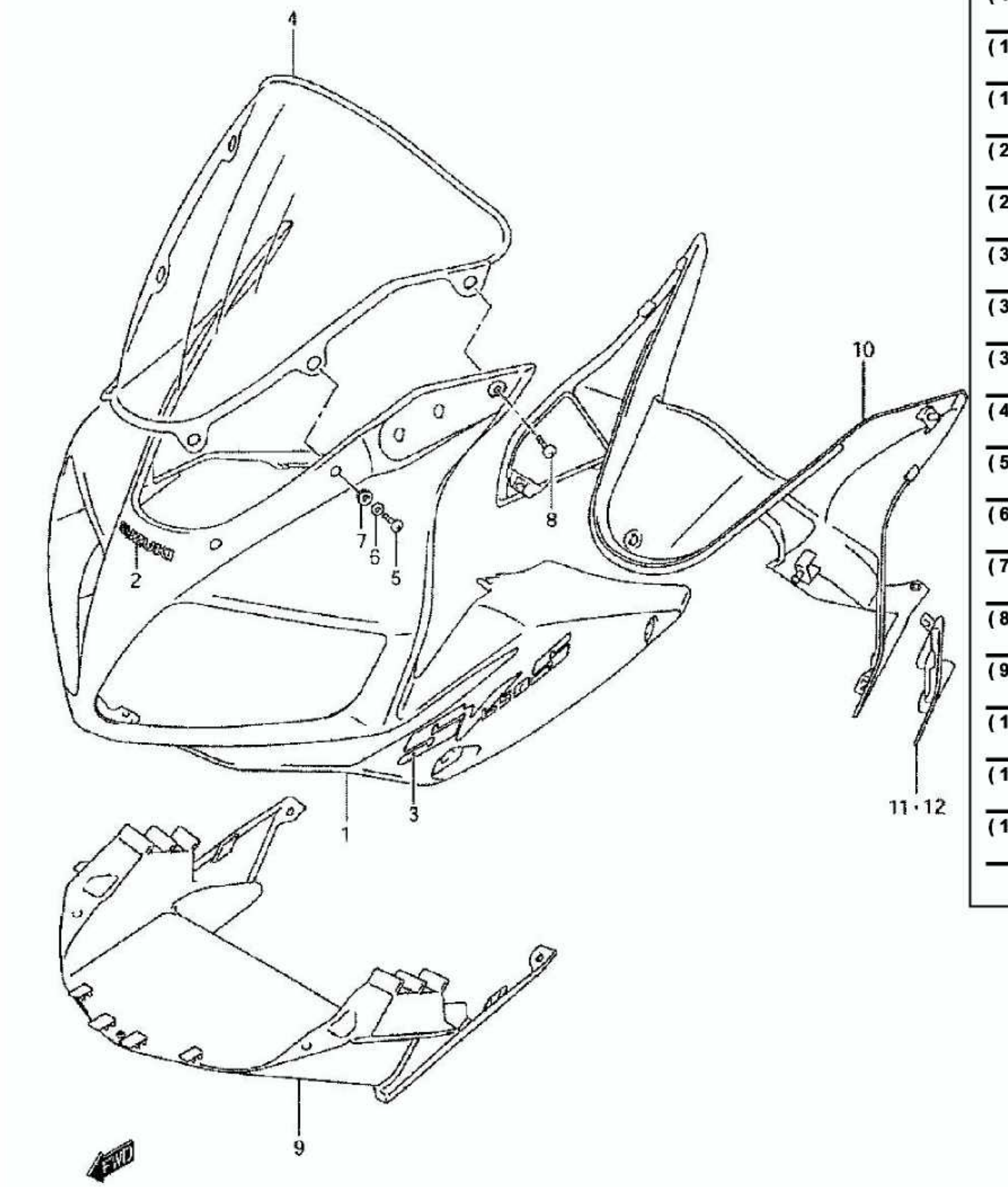


(1)	21200-17850	GEAR ASSY,PRIMA
(2)	21411-44101	HUB,CLUTCH SLEE
(3)	21413-17G00	SPRING,CLUTCH
(4)	21442-29F00	PLATE,DRIVE NO.
(5)	21441-29F10	PLATE,CLUTCH DR
(6)	21451-28C31	PLATE,CLUTCH DR
(7)	21462-14301	DISK,CLUTCH PRE
(8)	21471-17G00	SEAT,WAVE WASHE
(9)	21472-17G00	WASHER,CLUTCH P
(10)	09116-06185	BOLT
(11)	09140-20001	DRIVE SPROCKET
(12)	09160-20067	WASHER 20X36X3
(13)	09167-20006	Discontinued
(14)	23110-44111	ROD,CLUTCH PUSH
(15)	23111-24A01	ROD,CLUTCH PUSH
(16)	23121-44100	PIECE CLUTCH PU
(17)	23200-11D00	SCREW ASSY,CLUT
(18)	09134-06010	273 SCREW
(19)	08310-00067	273 NUT
(20)	23226-19F01	SUPPORT,CL RLSE
(21)	09160-15045	WASHER
(22)	09263-15003	RC 15X28X2 BRG
(23)	09285-06015	SEAL,OIL 6X34X5
(24)	09443-08001	CL REL ARM SPRI
(25)	01500-06163	Discontinued

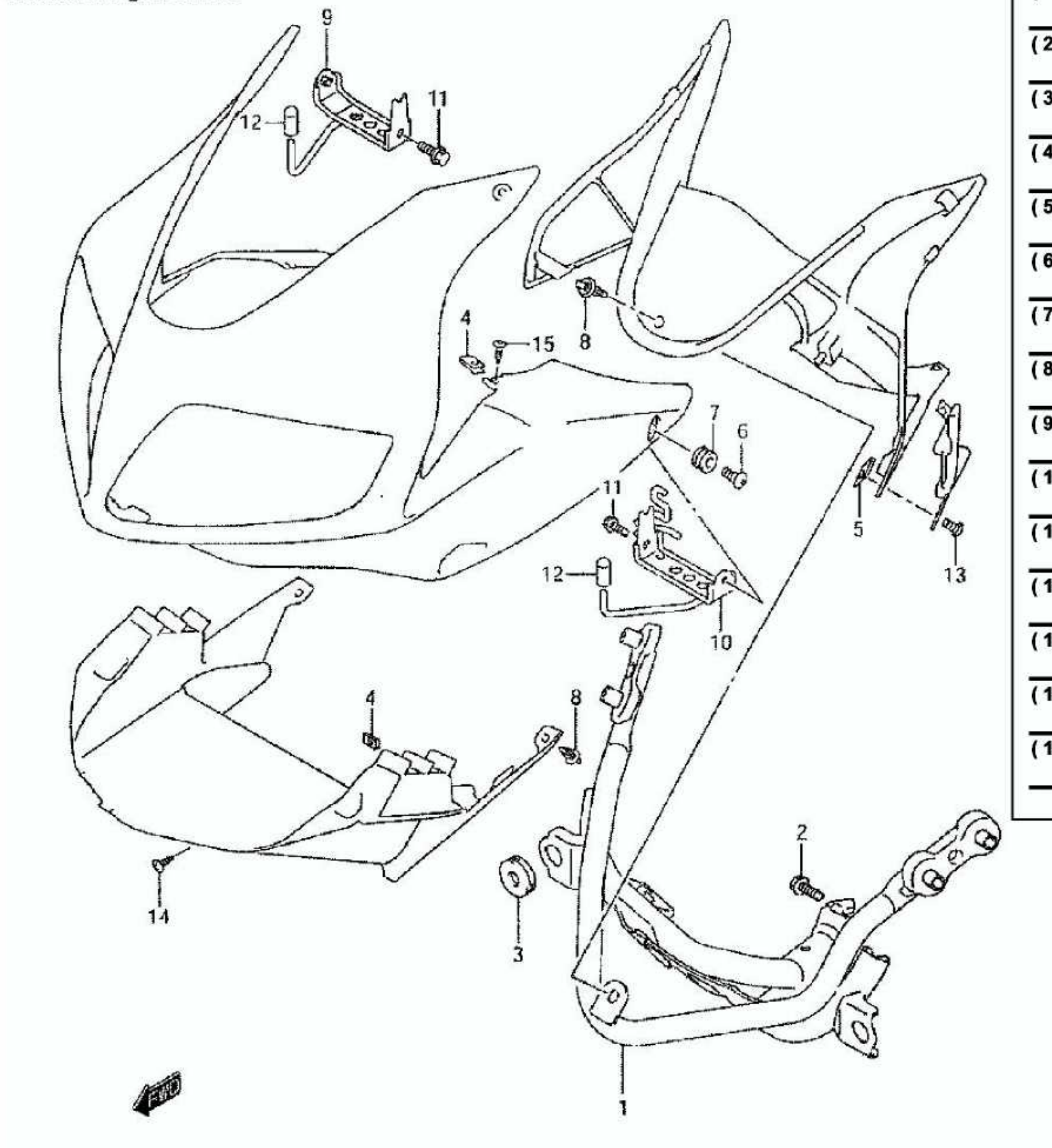
COLOR CODE CHART

CODE	COLOR
ML4	Y4P,YU8,35W,YD8
ML5	Y4P,YD8,YM2,33J
ML6	YBD,20H,YD8,YC2
ML7	Z94,20H,YDB,YAV
W05	BLACK (LEATHER)
YAD	BLACK 50% GLOSS
YAV	BURNING COPPER METALLIC
YBD	SPLASH WHITE
YBM	ALUMINA SILVER METALLIC
YC2	CANDY GRAND BLUE
YDB	NEW HYDRANGER BLUE METALLIC
YD8	SONIC SILVER METALLIC
YM2	PEARL FROSTY WHITE
YU8	FLINT GRAY METALLIC
Y4P	MAT SILKY GRAY METALLIC
Y6G	SHAINING SILVER
Z94	MARBLE AZTECA ORANGE
13L	BRIGHT SILVER METALLIC
20H	WARM SILVER METALLIC
225	MONZA ORANGE
28W	SPECIAL WHITE
291	BLACK (SEMI-GLOSS)
33J	PEARL NOVELTY BLACK
35W	CHARCOAL GRAY METALLIC NO.2
5ES	OFF BLACK
5PK	BLACK

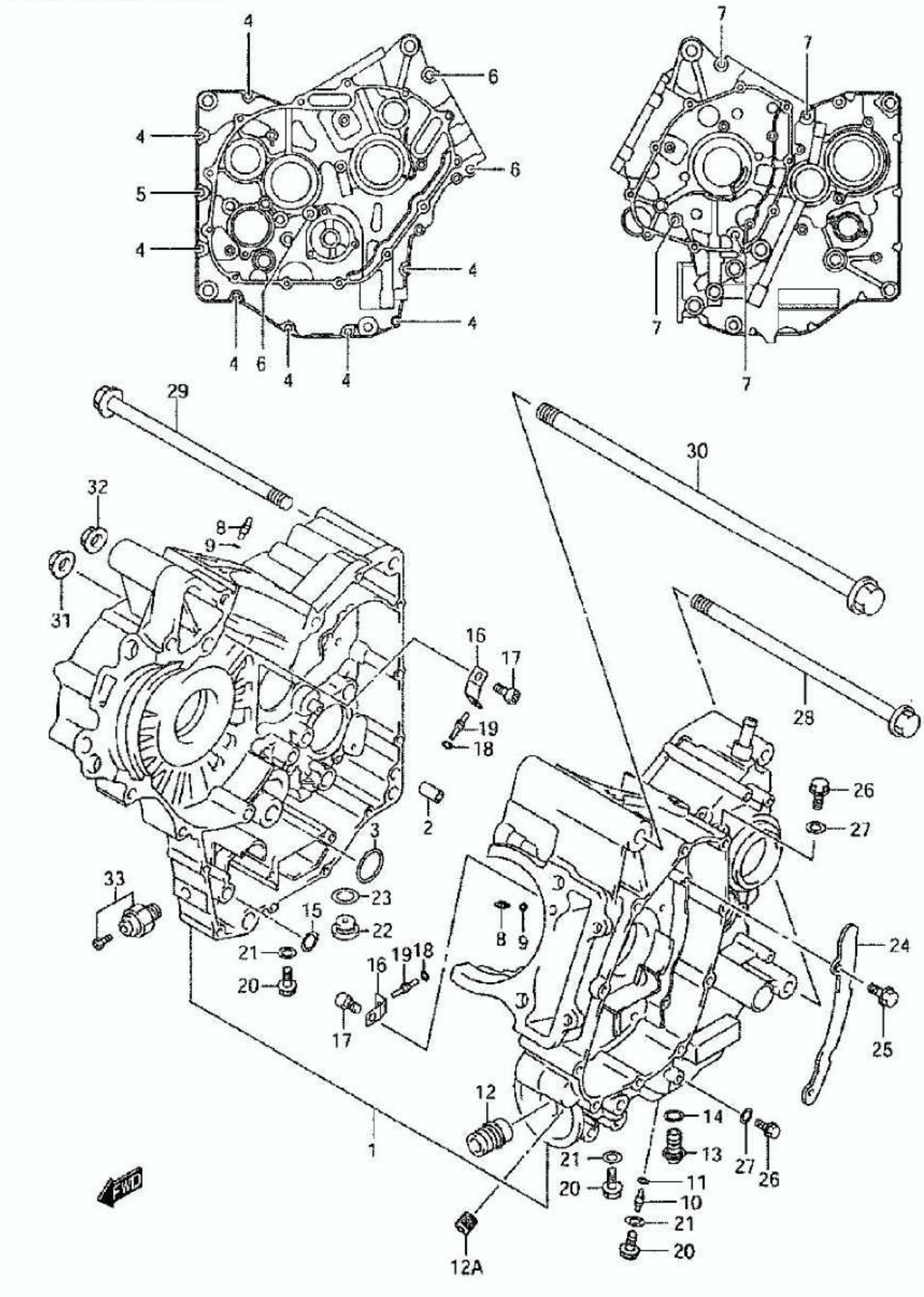
*** NOTE: FOR PAINT INQUIRIES PLEASE CALL COLOR-RITE AT (800) 736-7980*



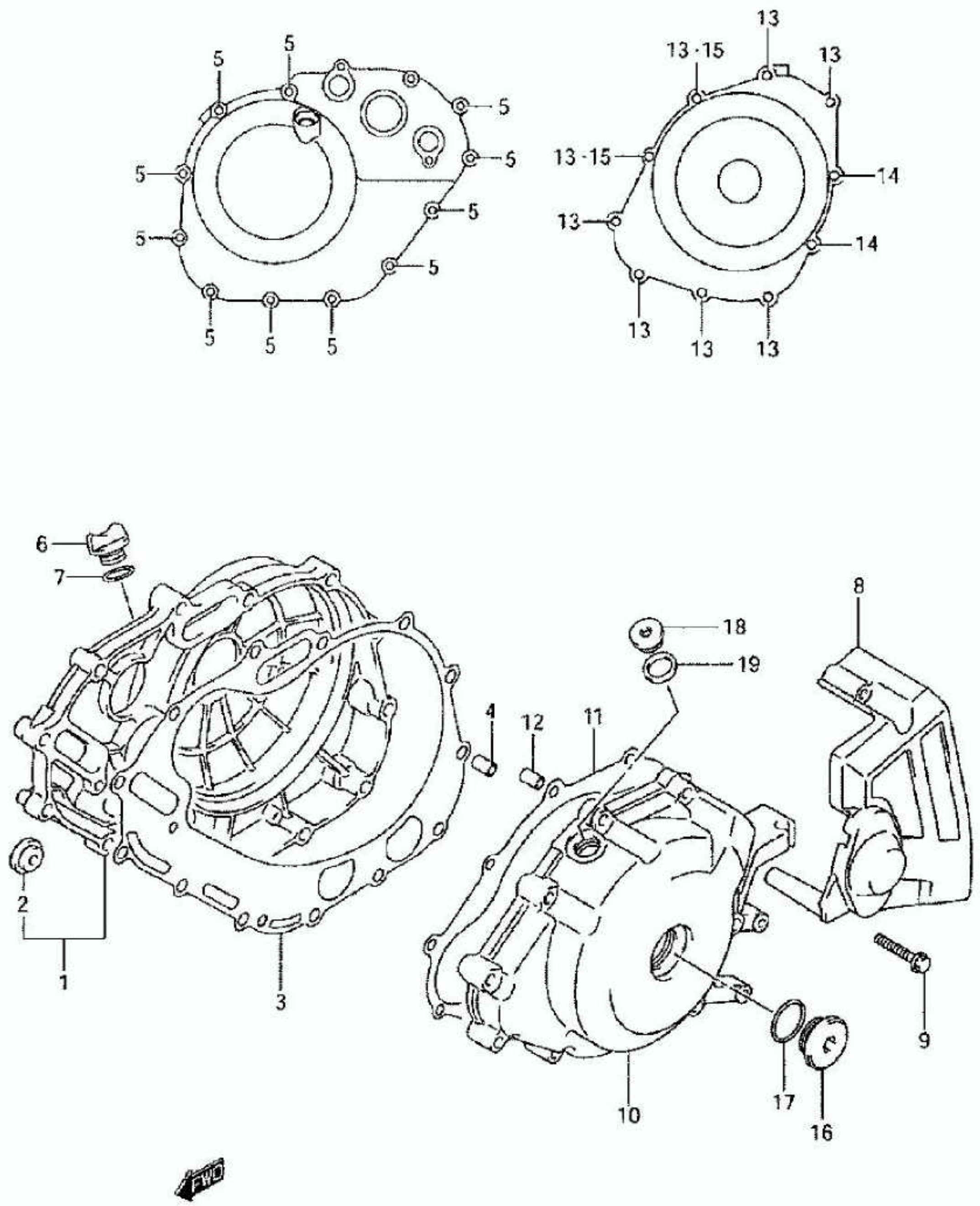
(1-1)	94401-17G00-YD8	COWLING ASSY,BO
(1-2)	94401-17G00-YC2	COWLING ASSY,BO
(1-3)	94401-17G00-YAV	UNAVAILABLE
(2-1)	68280-04F00-YU8	273 EMBLEM,"SUZUKI"
(2-2)	68280-04F00-YD8	273 EMBLEM,"SUZUKI"
(3-1)	68281-17G00-ML4	273 EMBLEM,BODY COW
(3-2)	68281-17G00-ML6	273 EMBLEM,BODY COW
(3-3)	68281-17G00-ML7	273 UNAVAILABLE
(4)	94610-16G00	WINDSCREEN COMP
(5)	09139-05025	SCREW 5X14
(6)	08322-01053	WASHER
(7)	09159-05019	NUT
(8)	09132-05053	BOLT
(9)	94461-16G00-291	COVER,COWL INNE
(10)	94630-16G00	PANEL COMP,METE
(11)	94641-16G00	LID,METER PANEL
(12)	94651-16G00	LID,METER PANEL



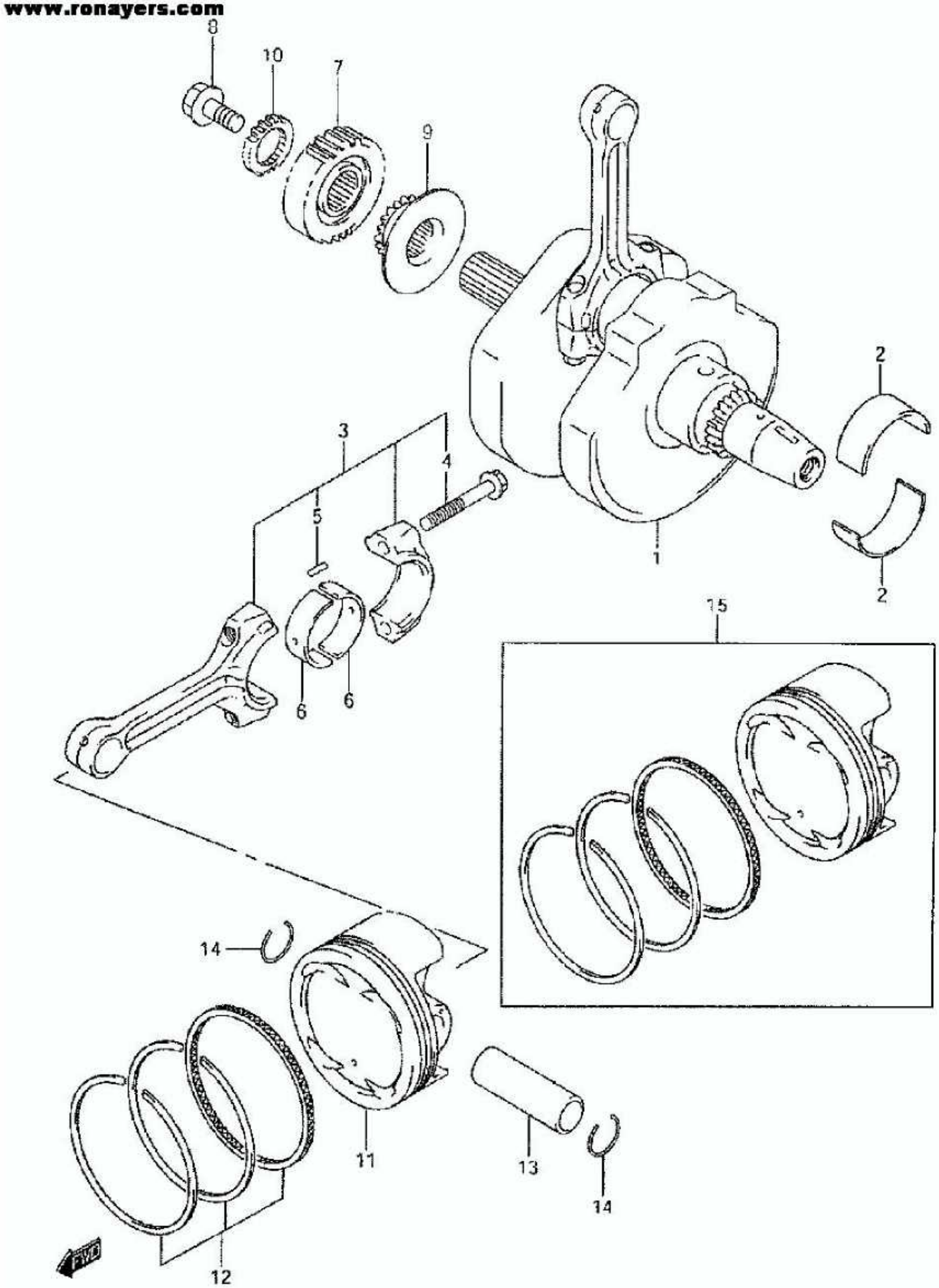
(1)	94510-16G00	BRACE COMP,COWL
(2)	01550-08203	HEX BOLT 8X20
(3)	09320-08028	CUSHION
(4)	94484-24F00	NUT,COWL
(5)	09148-05038	NUT,STEERING CO
(6)	09139-06126	SCREW
(7)	09320-09016	CUSHION
(8)	09409-08308-5ES	CLIP(BLACK)
(9)	94530-16G00	BRACKET COMP,CO
(10)	94540-16G10	BRACKET,COWL,L
(11)	01550-06123	BOLT
(12)	09251-04003	CAP
(13)	09132-05053	BOLT
(14)	03242-05123	SCREW
(15)	09139-05064	SCREW,5X13



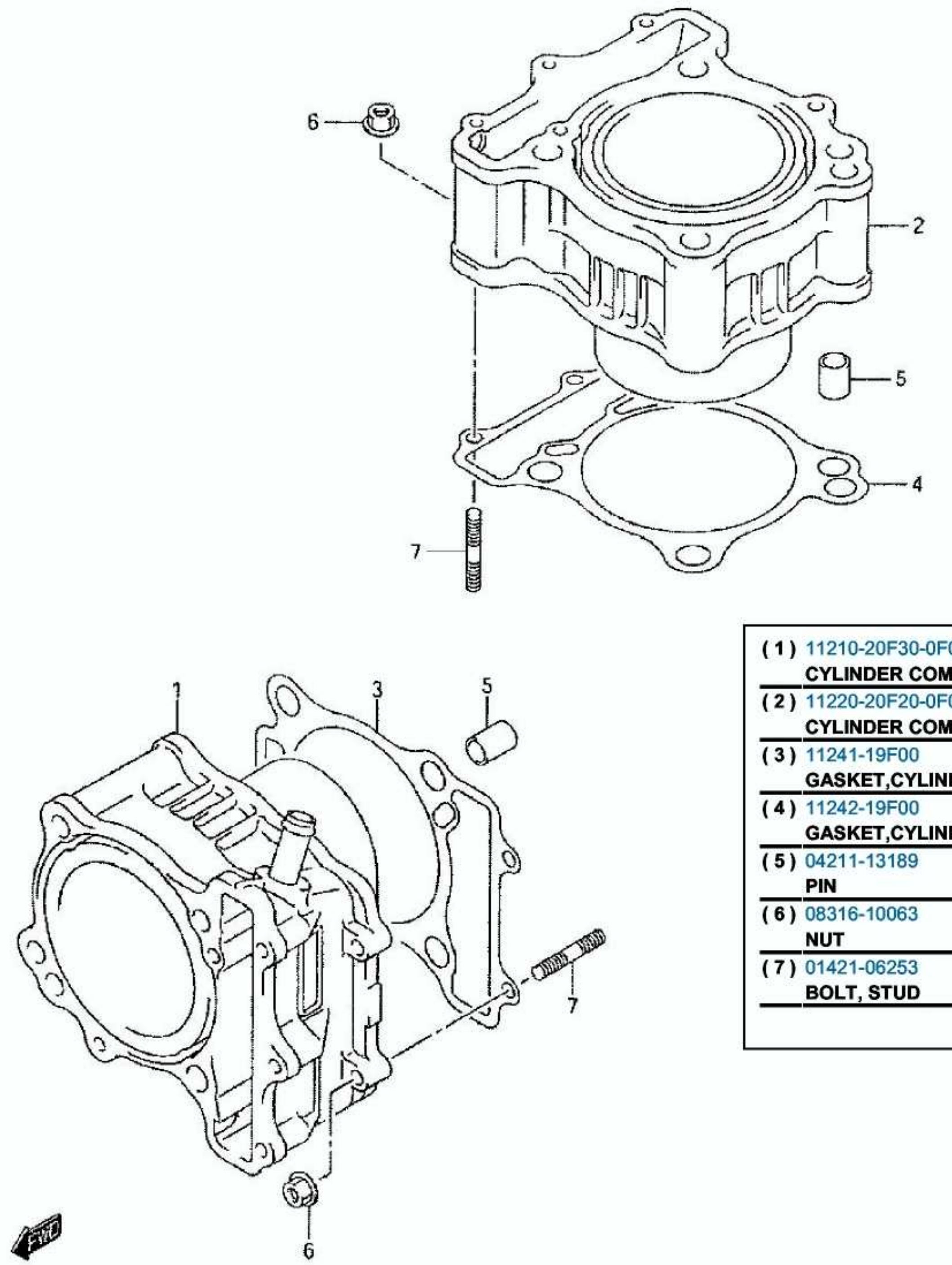
(1)	11301-20860	CRANKCASE SET
(2)	09206-11017	273 PIN 11X20
(3)	09280-15007	273 O-RING D:2.4 ID
(4)	01547-06503	273 BOLT
(5)	01547-06507	273 BOLT 6 X 50
(6)	07120-08553	273 BOLT
(7)	07120-08803	273 BOLT
(8)	09493-28010	273 JET AIR
(9)	09280-04004	273 O RING
(10)	09493-28010	273 JET AIR
(11)	09280-04004	273 O RING
(12)	16591-06B00	273 UNION OIL STAND
(12A)	11329-17G00	JET,OIL GALLERY
(13)	09247-12011	PLUG, OIL PAN
(14)	09168-12002	GASKET OIL GALL
(15)	09280-12009	O RING
(16)	16438-19F00	PLATE,PISTON CO
(17)	09106-06075	BOLT
(18)	09280-04004	O RING
(19)	09493-26007	JET,130
(20)	01550-08123	BOLT
(21)	09168-08016	GASKET 8.2X14X1
(22)	09248-16012	PLUG,16X8
(23)	09168-16002	Discontinued
(24)	11323-19F00	PLATE,OIL SEPAR
(25)	01547-06123	BOLT 6X12 BLK 8
(26)	01550-06123	BOLT
(27)	09168-06023	GASKET
(28)	09103-10137	BOLT 10X255
(29)	09103-10205	BOLT,10X225
(30)	09103-12054	BOLT,12X310
(31)	09159-10058	NUT
(32)	09159-12054	NUT,ENG MTG
(33)	37820-33D10	SWITCH ASSY,OIL



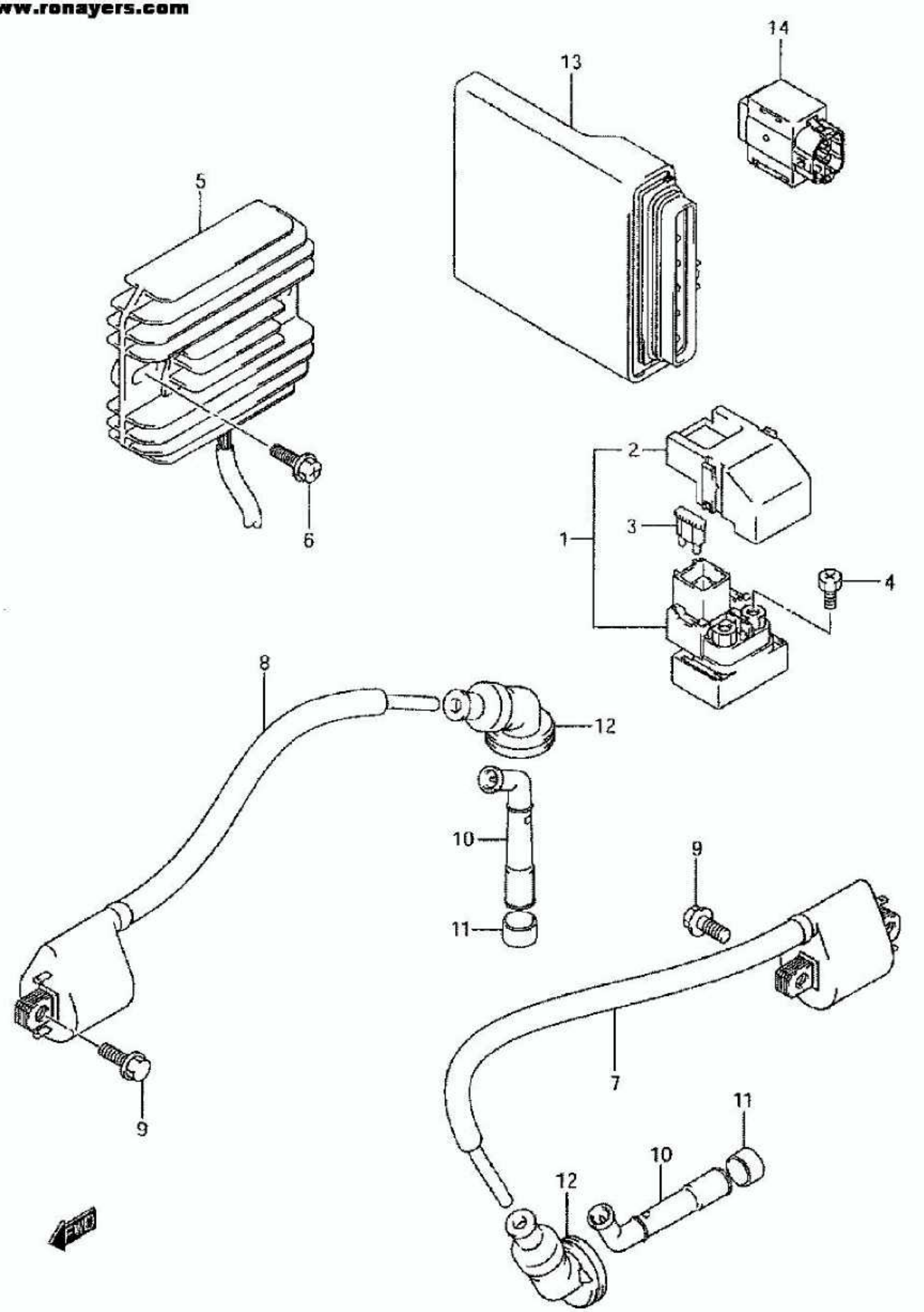
(1)	11340-17G00	COVER COMP,CLUT
(2)	11971-33210	273 LENS,OIL LEVEL
(3)	11482-17G00	GASKET,CLUTCH C
(4)	04211-09149	PIN 9X14
(5)	09103-06214	BOLT (6X34)
(6)	11971-25D00	PLUG,ENGINE OIL
(7)	09280-17003	O-RING, OIL FIL
(8)	11361-17G00	COVER,ENG SPROC
(9)	09103-06224	BOLT,MAG COV,L4
(10)	11351-19F50	COVER,MAGNETO
(11)	11483-19F00	GASKET,MAGNETO
(12)	04211-09149	PIN 9X14
(13)	09103-06214	BOLT (6X34)
(14)	09103-06239	BOLT
(15)	09168-06023	GASKET
(16)	09259-26011	PLUG,HOLE
(17)	09280-22008	O RING CRK HOLE
(18)	09248-16012	PLUG,16X8
(19)	09168-16002	Discontinued



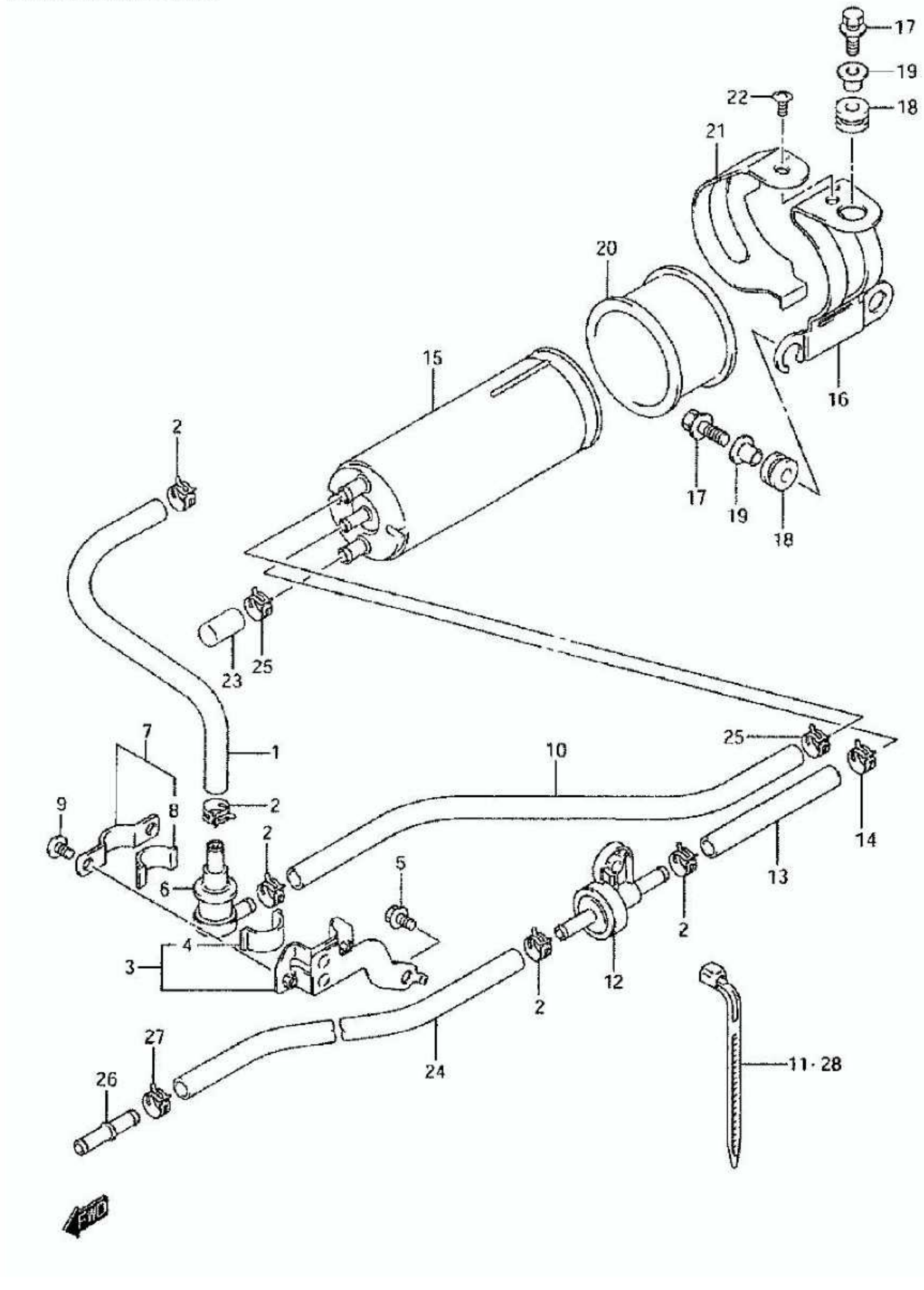
(1)	12220-17G00	CRANKSHAFT COMP
(2-1)	12229-19F10-0A0	BEARING,CRANKSH
(2-2)	12229-19F10-0B0	BEARING,CRANKSH
(2-3)	12229-19F10-0C0	BEARING,CRANKSH
(3)	12160-17G00	CONNROD ASSY
(4)	12163-24F00	273 BOLT,CONNROD
(5)	12165-27A50	273 PIN,CONNROD
(6-1)	12164-46E01-0A0	BEARING,CRANK P
(6-2)	12164-46E01-0B0	BEARING,CRANK P
(6-3)	12164-46E01-0C0	BEARING,CRANK P
(6-4)	12164-46E01-0D0	BEARING,CRANK P
(7)	21111-20F00	GEAR,PRIMARY DR
(8)	09103-10338	BOLT,PRIMARY DR
(9)	12731-19F00	SPROCKET,CAM CH
(10)	17451-17G00	GEAR,WATER PUMP
(11)	12111-20F00-0F0	PISTON
(12)	12140-17G00	RING SET,PISTON
(13)	12151-05A00	PIN PISTON
(14)	09381-20004	CIRCLIP PISTON
(15)	12100-17G00-050	PISTON SET,OS 0



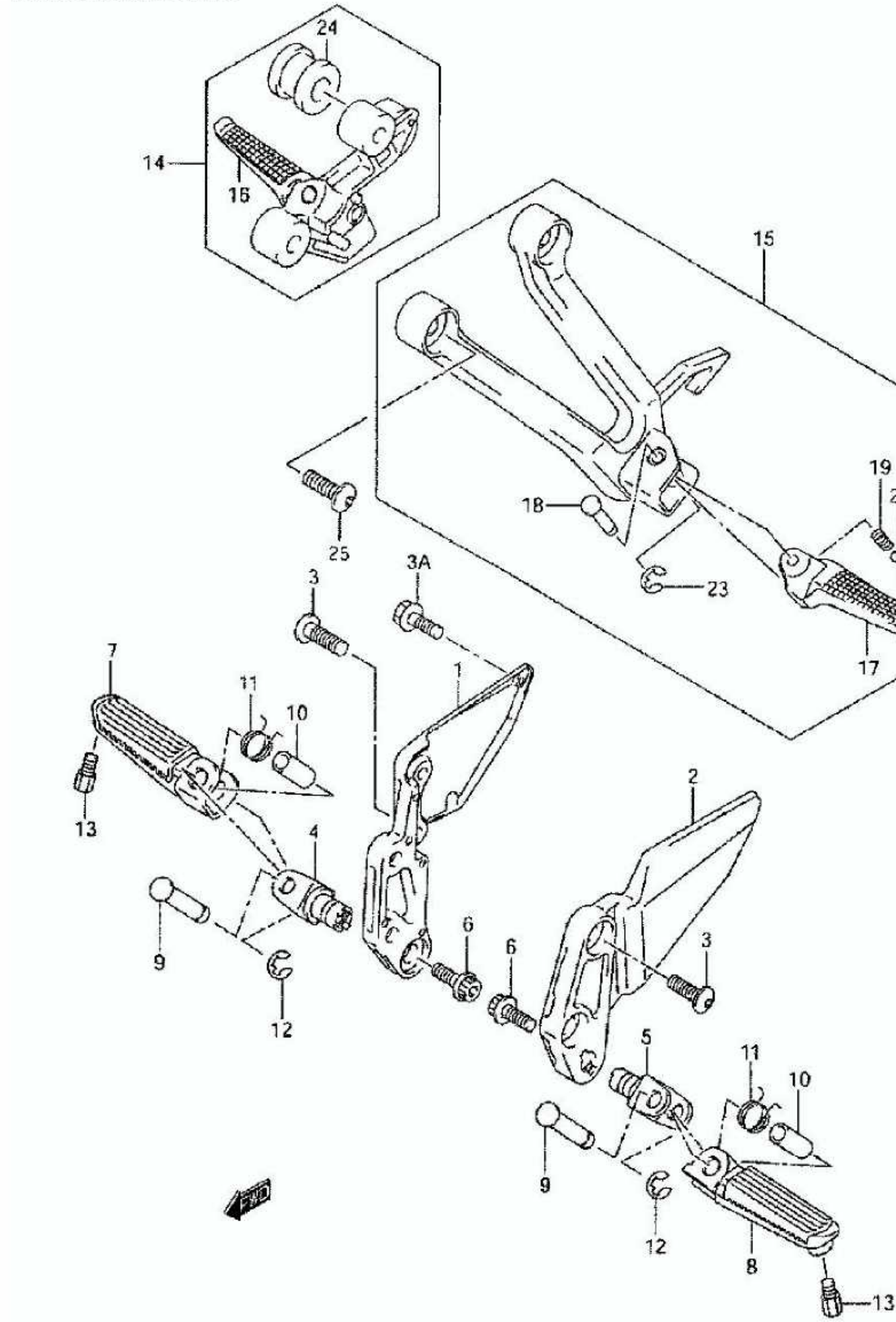
(1)	11210-20F30-0F0	CYLINDER COMP,F
(2)	11220-20F20-0F0	CYLINDER COMP,R
(3)	11241-19F00	GASKET,CYLINDER
(4)	11242-19F00	GASKET,CYLINDER
(5)	04211-13189	PIN
(6)	08316-10063	NUT
(7)	01421-06253	BOLT, STUD



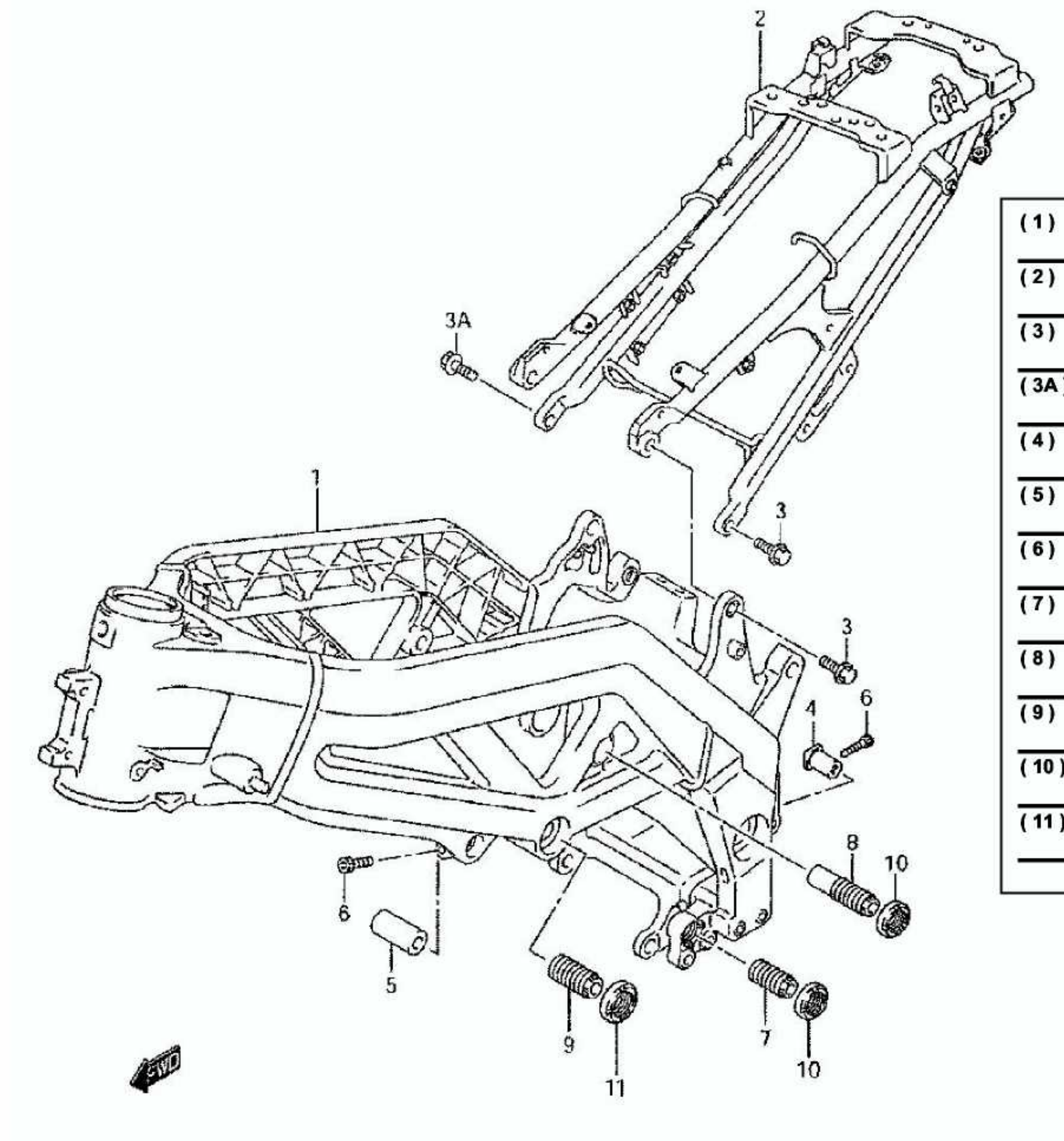
(1)	31800-06G00 **RELAY ASSY,STAR**
(2)	31861-21E20 **273 COVER,RELAY ASS**
(3)	09481-30101 **273 FUSE,30A**
(4)	09128-06013 **SCREW**
(5)	32800-16G00 **RECTIFIER ASSY**
(6)	02162-06203 **BOLT**
(7)	33410-17G00 **COIL ASSY,IGNIT**
(8)	33420-17G00 **COIL ASSY,IGNIT**
(9)	01547-06203 **BOLT6X20**
(10)	33510-17G00 **CAP ASSY,SPARK**
(11)	33541-23E01 **SEAL,SPARK PLUG**
(12)	33542-17G00 **SEAL,HIGH TENSI**
(13)	32920-17G20 **CONTROL UNIT,FI**
(14)	33960-06G10 **SENSOR ASSY,FUE**



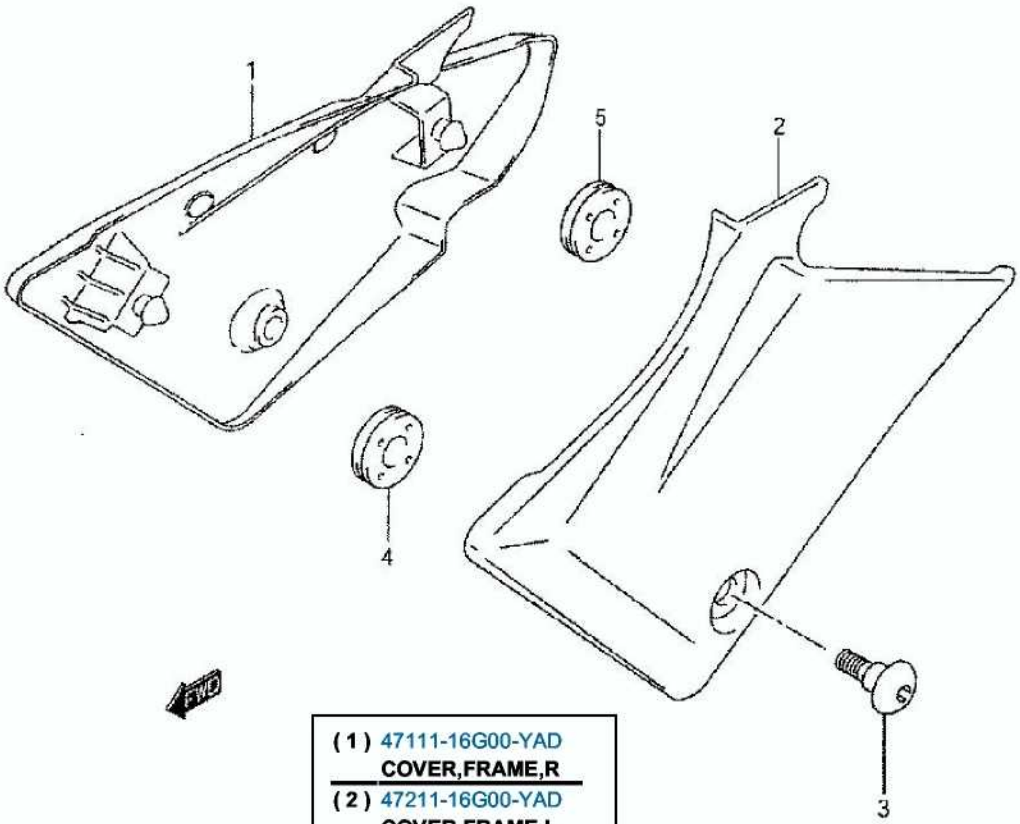
(1)	44434-16G00	UNAVAILABLE
(2)	09401-11413	CLIP (CA) ONLY
(3)	44890-16G00	UNAVAILABLE
(4)	44894-24A00	273 CUSHION
(5)	01550-06103	BOLT
(6)	44240-17C00	(CA) VALVE,FUEL
(7)	44892-24A00	PLATE,FUEL TANK
(8)	44894-24A00	273 CUSHION
(9)	02142-04083	SCREW 4X8
(10)	09355-54116-600	HOSE,L:600
(11)	09407-18402	CLAMP,WIRING HA
(12)	44240-24F00	VALVE,2 WAY & B
(13)	09355-54116-600	HOSE,L:600
(14)	09401-11413	CLIP (CA) ONLY
(15)	17210-26E00	CNISTR ASSY,CHA
(16)	44881-16G00	UNAVAILABLE
(17)	09116-06025	BOLT
(18)	09320-08001	CDI UNIT CUSHIO
(19)	09169-06062	WASHER,THROTTLE
(20)	44883-26E00	CUSHION,CANISTE
(21)	44882-16G00	UNAVAILABLE
(22)	02142-06103	SCREW 6X10
(23)	09251-07003	CAP
(24)	09359-54112-760	HOSE
(25)	09401-12404	CLIP
(26)	09367-06009	JOINT, PURGE HO
(27)	09401-11413	CLIP (CA) ONLY
(28)	09407-14408	Discontinued



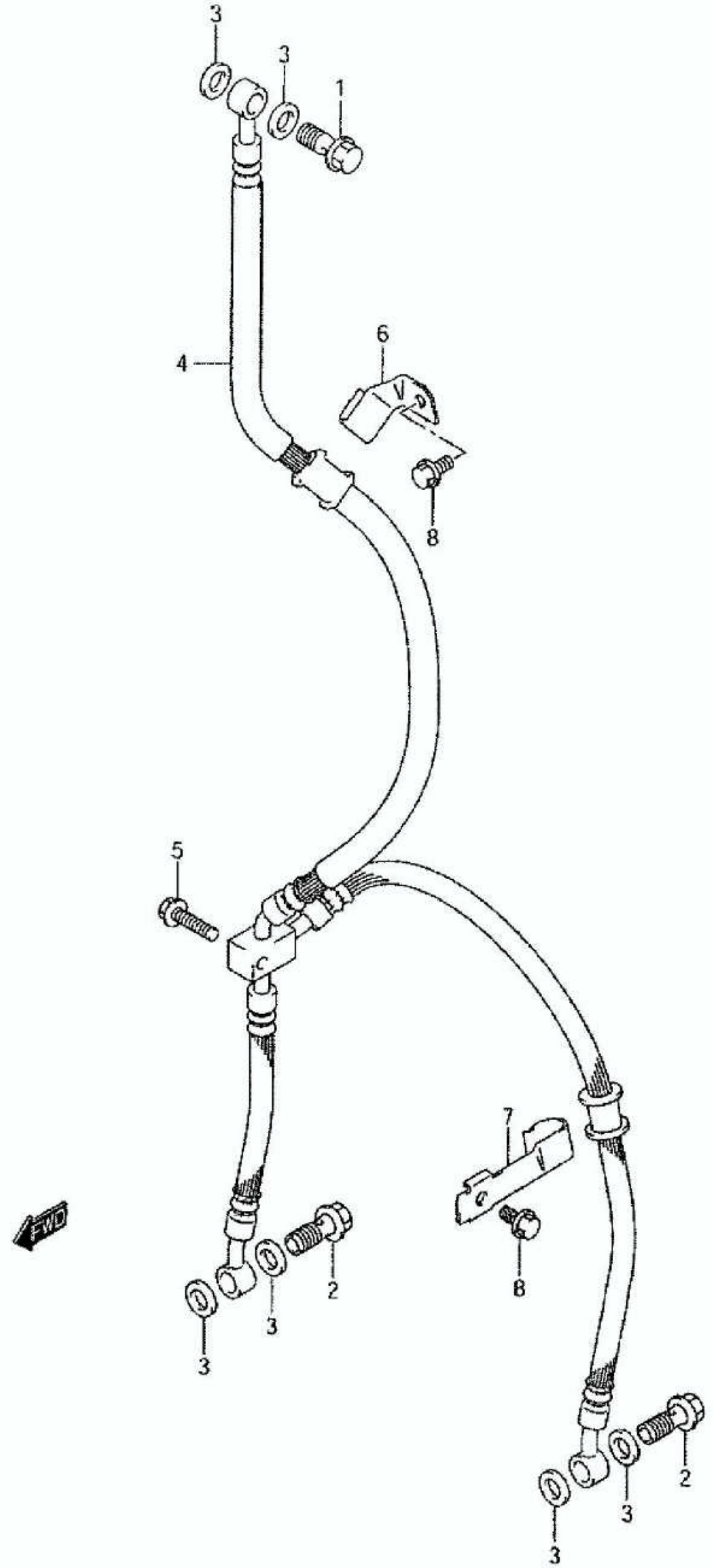
(1-1)	43511-16G50 UNAVAILABLE
(1-2)	43511-16G00 BRACKET,FR FOOT
(2-1)	43521-16G50 UNAVAILABLE
(2-2)	43521-16G00 BRACKET,FR FOOT
(3)	09106-08118 BOLT,8X20
(3A)	01550-06103 BOLT
(4-1)	43530-17E01 HOLDER, FOOTRES
(4-2)	43530-16G00 HOLDER COMP,FOO
(5-1)	43540-17E00 HOLDER COMP,FOO
(5-2)	43540-16G00 HOLDER COMP,FOO
(6)	09106-10064 BOLT
(7)	43510-02F11 BAR,FRONT FOOTR
(8)	43520-02F11 BAR,FRONT FOOTR
(9)	09208-08014 PIN
(10)	09180-08149 SPACER,8.1X12X2
(11)	09448-18022 SPRING
(12)	08332-11063 E RING 6MM
(13)	43576-07D01 BOLT,BANK SENSO
(14)	43600-16G00 FOOTREST ASSY,P
(15)	43700-17G00 FOOTREST ASSY,P
(16)	43611-35F01 273 BAR,PILLION FOO
(17)	43621-35F01 273 BAR,PILLION FOO
(18)	87259-85510 273 PIN,RR SEAT FRO
(19)	09440-05005 273 SPRING
(20)	06111-07004 273 STEEL BALL 7/32
(21)	43816-33E21 273 PLATE,PILLION F
(22)	43826-33E22 273 PLATE,PILLION F
(23)	08332-11043 273 E RING
(24)	09319-08028 273 BUSH
(25)	09106-08150 BOLT



(1)	41100-17G00-YBM FRAME COMP
(2)	41200-16G00 RAIL COMP,SEAT
(3)	09103-10296 BOLT
(3A)	41233-16G00 BOLT,SEAT RAIL
(4)	41941-19F01 SPACER,MOUNTING
(5)	41942-02F00 SPACER,ENG HEAD
(6)	09106-08149 BOLT
(7)	41921-16G00 BOLT,CASE LWR &
(8)	41921-17G00 BOLT,ENG HEAD M
(9)	41923-16G00 BOLT,CRANK CASE
(10)	41922-33E00 NUT,CRANK CASE
(11)	41922-19F00 NUT,CRANK CASE



(1)	47111-16G00-YAD
	COVER,FRAME,R
(2)	47211-16G00-YAD
	COVER,FRAME,L
(3)	09139-06107
	SCREW
(4)	09320-08018
	CUSHION FRAME C
(5)	09320-08028
	CUSHION



(1)	09360-10042	BOLT
(2)	09360-10042	BOLT
(3)	09161-10009	WASHER
(4-1)	59480-17G00	UNAVAILABLE
(4-2)	59480-17G10	HOSE,FRONT BRAK
(5)	01547-06253	BOLT
(6)	59264-17G00	CLAMP,FR BRAKE
(7)	59268-17G00	CLAMP,FR BRAKE
(8)	01547-06123	BOLT 6X12 BLK 8

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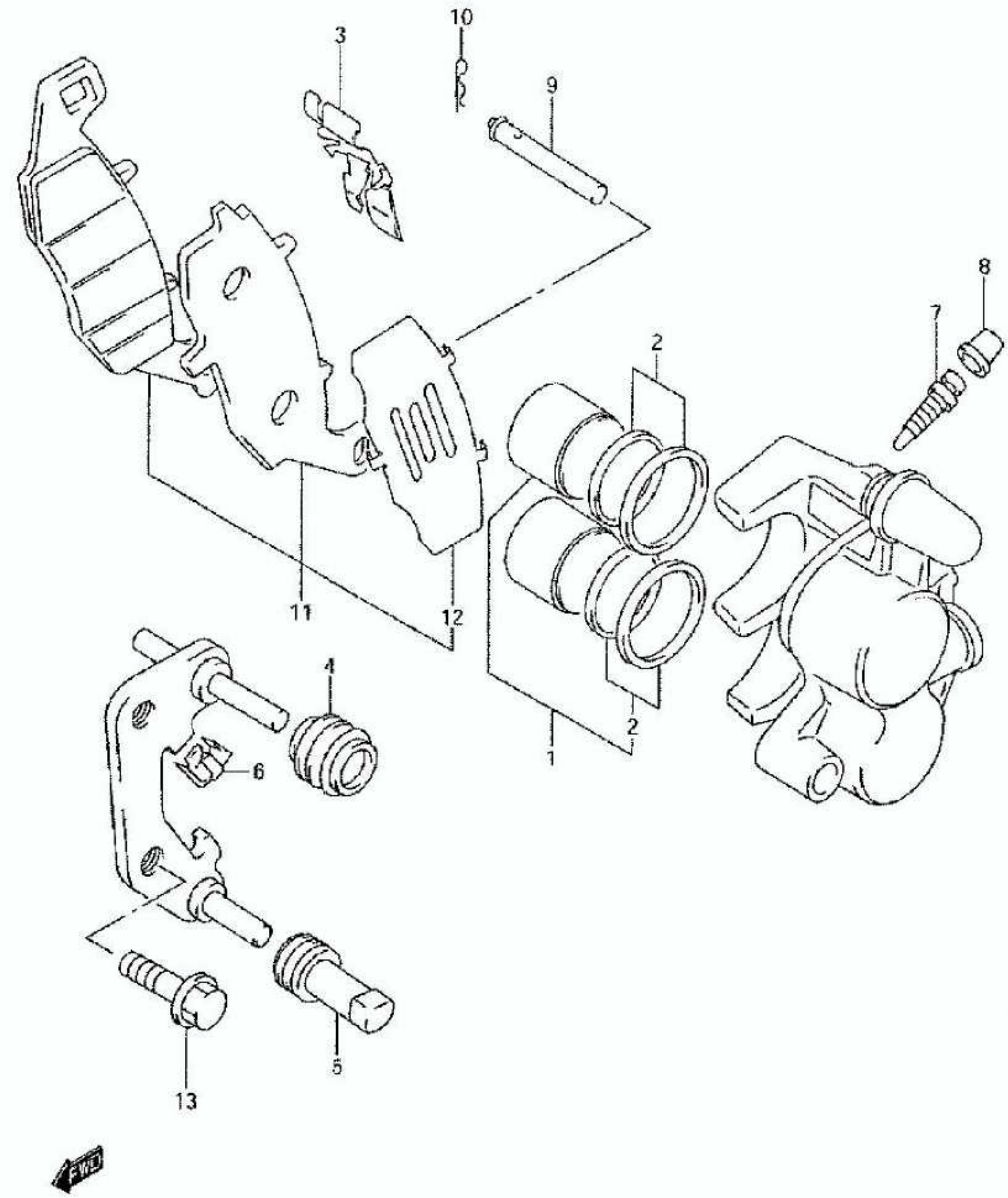
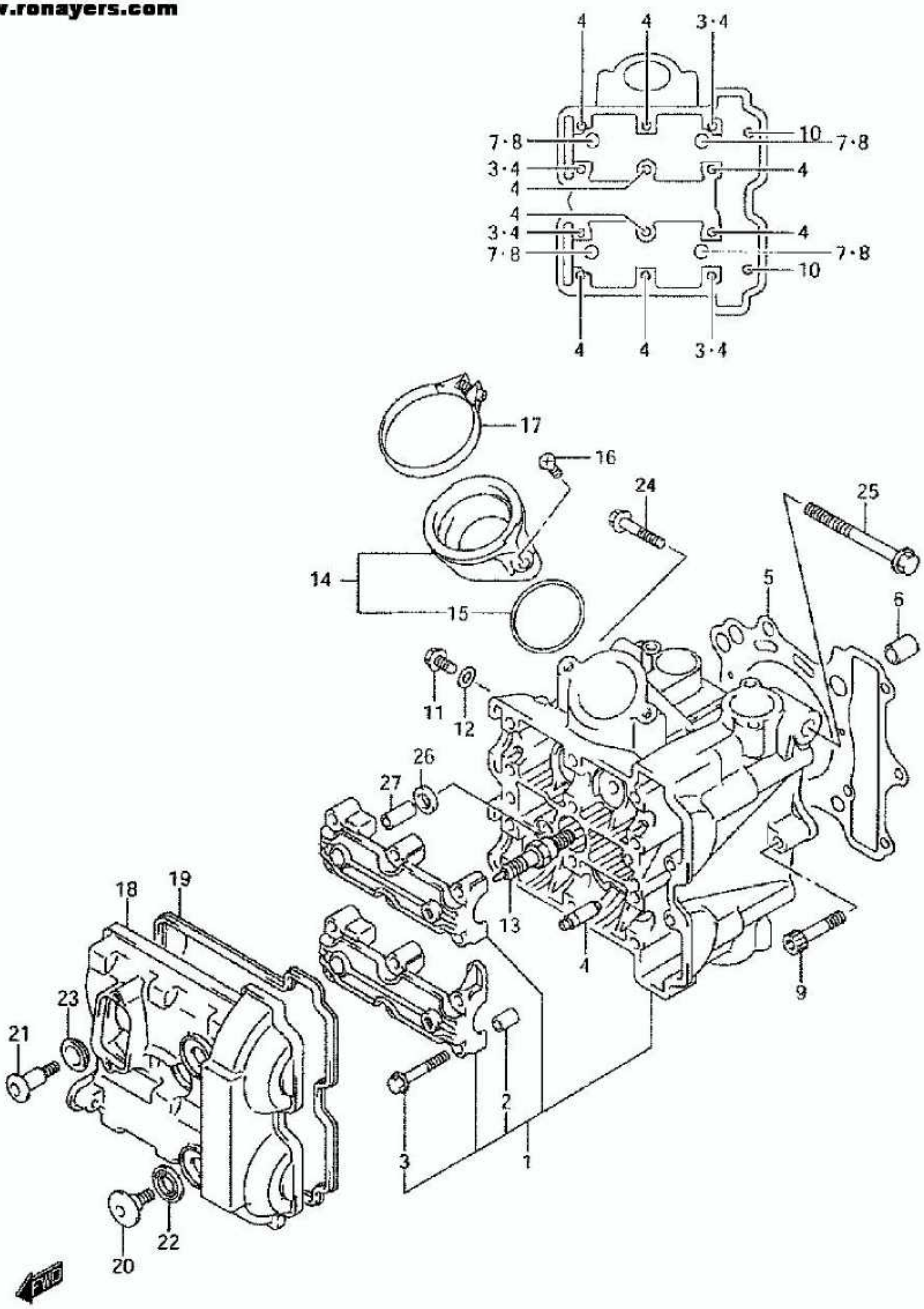
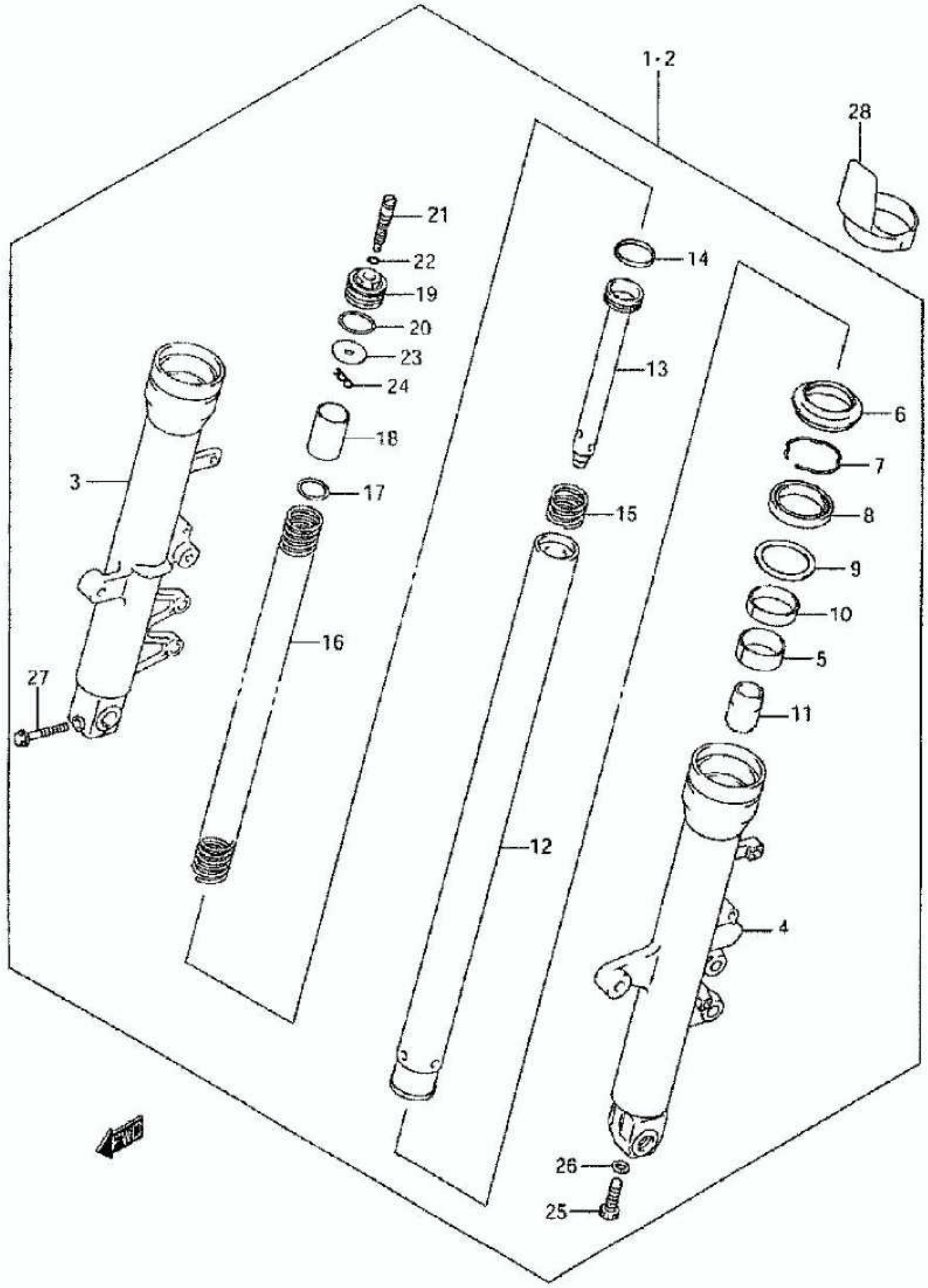


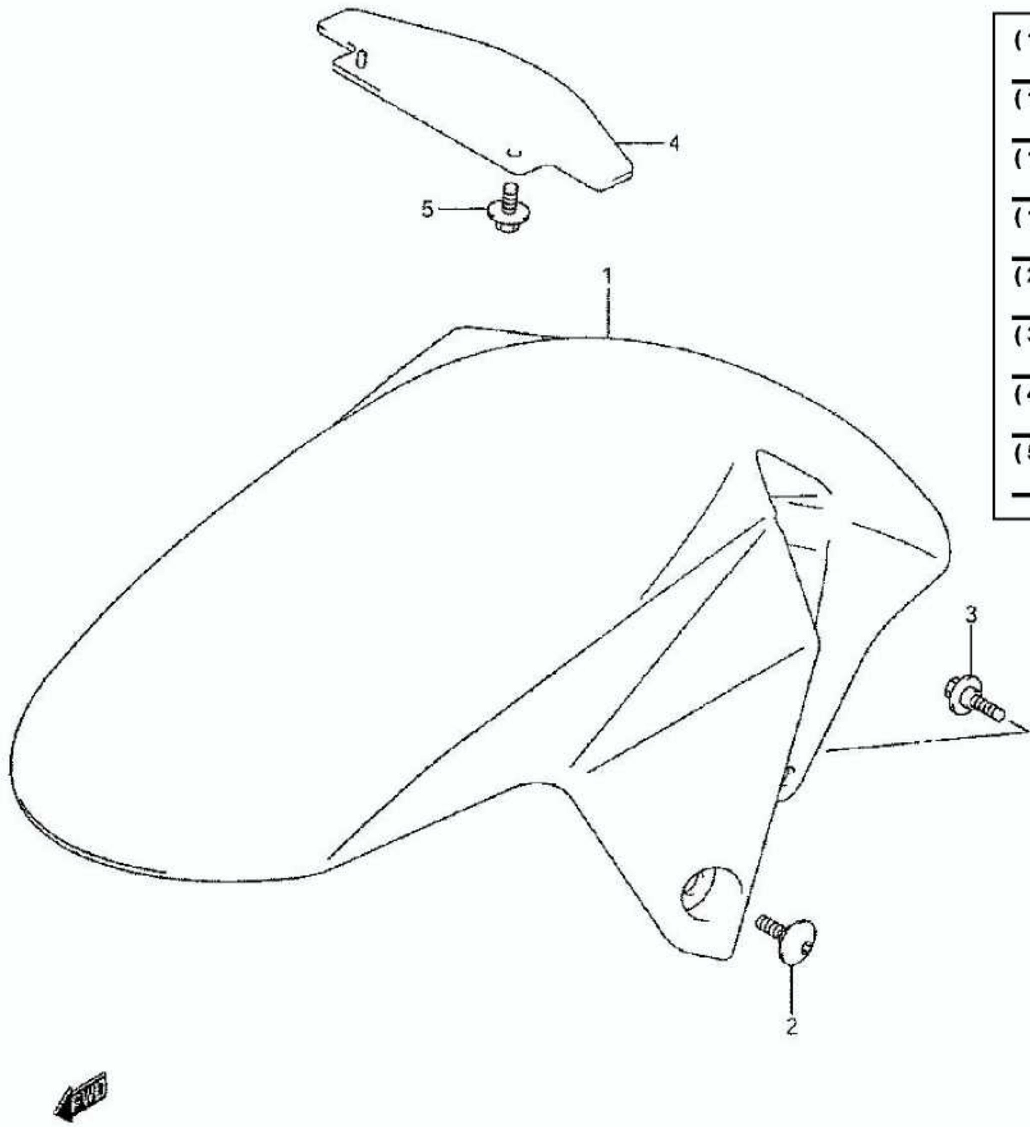
(-)	59100-33D90-999 CALIPER ASSY,FR
(-)	59300-33D90-999 CALIPER ASSY,FR
(1)	59300-33831 273 PISTON SET
(2)	59300-33841 273 273 SEAL SET, PISTO
(3-1)	59115-33D00 273 SPRING,PAD,R
(3-2)	59315-33D00 273 SPRING,PAD,L
(4)	59112-44B00 273 BOOT, AXLE
(5)	59313-36500 273 INSULATOR AXLE
(6)	59116-33D00 273 GUIDE,PAD
(7)	59121-18410 273 BLEEDER
(8)	55156-66310 273 CAP,BLEEDER PLU
(9)	59141-44B01 273 PIN,PAD
(10)	69142-45000 273 BRAKE PAD PIN C
(11-1)	59102-33860 PAD & SHIM SET
(11-2)	59302-33830 PAD & SHIM SET
(12)	59171-33D00 273 SHIM,PAD
(13)	01550-10253 BOLT



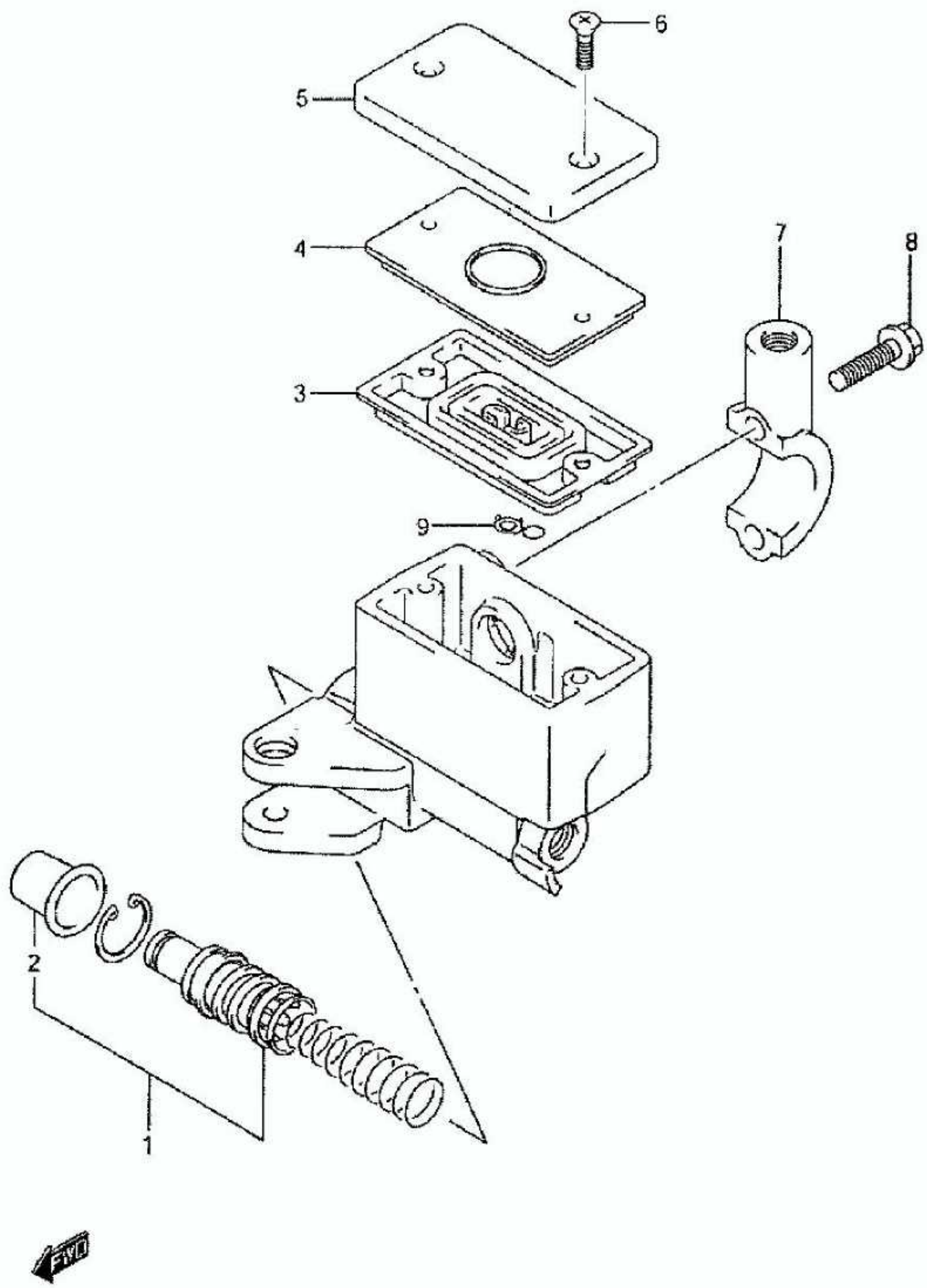
(1)	11101-17G00	HEAD ASSY,CYLIN
(2)	09206-08001	273 COVER DOWEL PIN
(3)	09103-06026	273 CAM SFT HOUSING
(4)	11115-18D72	GUIDE,VALVE
(5)	11141-20F00	GASKET,CYLINDER
(6)	04211-13189	PIN
(7)	09160-10082	WASHER
(8)	09103-10272	BOLT,CYLINDER H
(9)	07120-06403	BOLT
(10)	09103-06103	BOLT 6X70
(11)	07120-06123	BOLT
(12)	09168-06023	GASKET
(13-1)	09482-00456	SPARK PLUG CR8E
(13-2)	09482-00457	SPARK PLUG U24E
(13-3)	09482-00458	SPARK PLUG CR9E
(13-4)	09482-00459	SPARK PLUG U27E
(13-5)	09482-00516	SPARK PLUG CR7E
(13-6)	09482-00515	SPARK PLUG U22E
(14)	13101-17G00	PIPE ASSY,INTAK
(15)	09280-46006	273 O-RING
(16)	02122-06163	SCREW 6X16
(17)	09402-62208	Discontinued
(18)	11171-17G00	COVER,CYLINDER
(19)	11173-19F01	GASKET,CYLINDER
(20)	09106-07009	BOLT,L:5.5
(21)	09106-07010	BOLT,L:19
(22)	09161-11008	WASHER
(23)	11192-13E00	CUSHION,HEAD CO
(24)	09103-10244	BOLT 10X105
(25)	01550-10707	BOLT
(26)	11182-35F00	GASKET,2ND AIR
(27)	09206-08007	



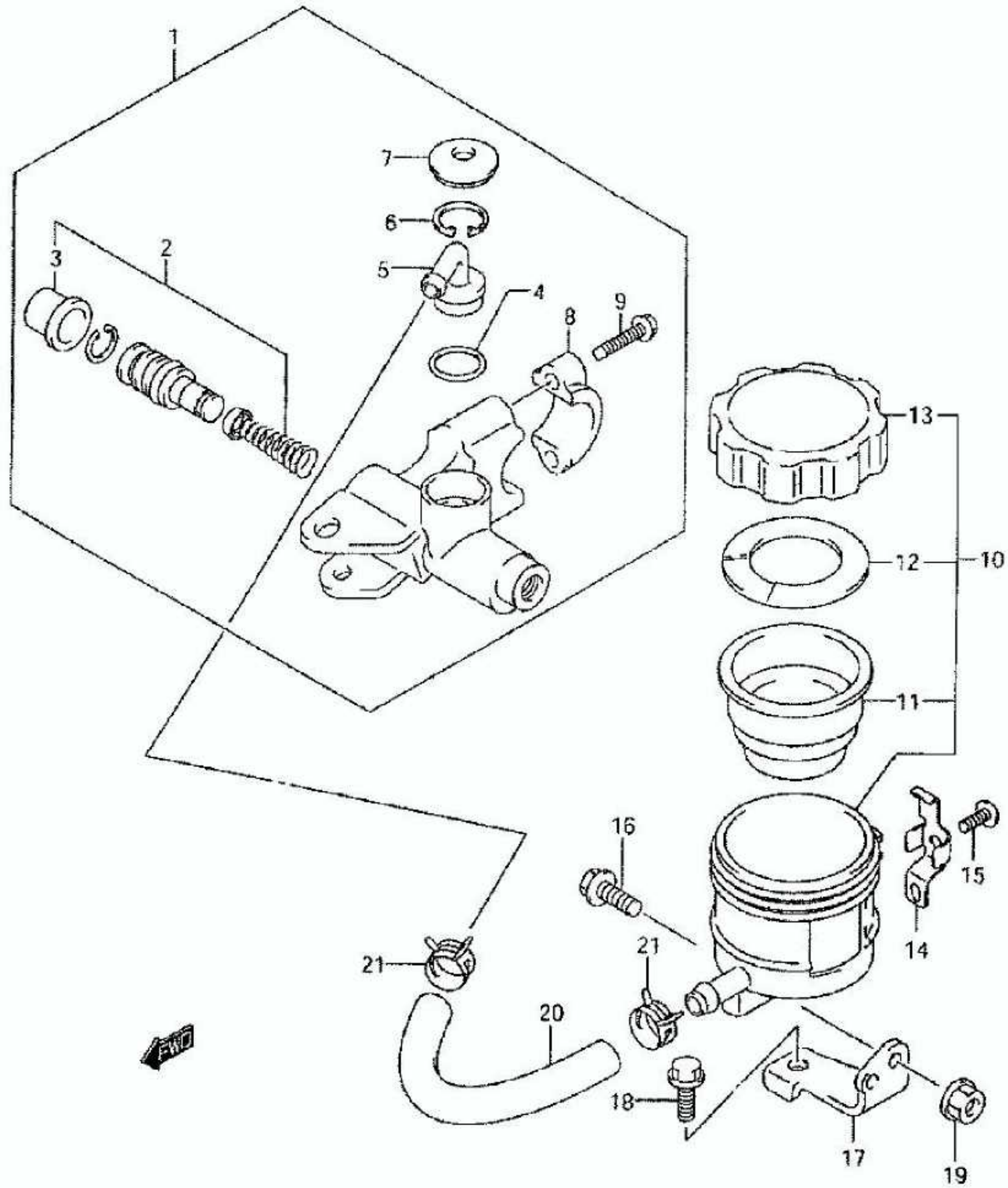
(1-1)	51103-17G00	UNAVAILABLE
(1-2)	51103-17G20	UNAVAILABLE
(2-1)	51104-17G00	UNAVAILABLE
(2-2)	51104-17G20	UNAVAILABLE
(3)	51130-17G00	273 UNAVAILABLE
(4)	51140-17G00	273 UNAVAILABLE
(5)	51121-42E00	273 BUSH,SLIDE
(6)	51571-47D50	273 SEAL,DUST
(7)	51556-38B00	273 RING STOPPER
(8)	51153-08D00	273 SEAL,OIL
(9)	51168-38B00	273 SPACER,SEAL
(10)	51152-17G00	273 UNAVAILABLE
(11)	51195-48B31	273 PIECE OIL LOCK
(12)	51110-17G00	273 UNAVAILABLE
(13-1)	51146-17G00	273 UNAVAILABLE
(13-2)	51146-17G20	273 UNAVAILABLE
(14)	51196-12C00	273 RING,PISTON
(15)	51177-12C00	273 SPRING,REBOUND
(16-1)	51171-17G00	273 UNAVAILABLE
(16-2)	51171-17G20	273 UNAVAILABLE
(17)	51192-19C00	273 JOINT SPRING
(18)	51176-12C10	273 SPACER, SPRING
(19)	51189-12C00	273 BOLT,FORK
(20)	51117-12C00	273 O RING BOLT
(21)	51185-17G00	273 UNAVAILABLE
(22)	09280-09005	273 O RING CAMSHAFT
(23)	51186-12C00	273 SEAT,SPRING
(24)	51188-32B00	273 PIN,SEAT SPRING
(25)	51147-48130	273 FRONT FORK BOLT
(26)	51148-36011	273 FORK CYL BOLT G
(27)	51328-03FK0	273 BOLT,8X40
(28)	51201-32F00	



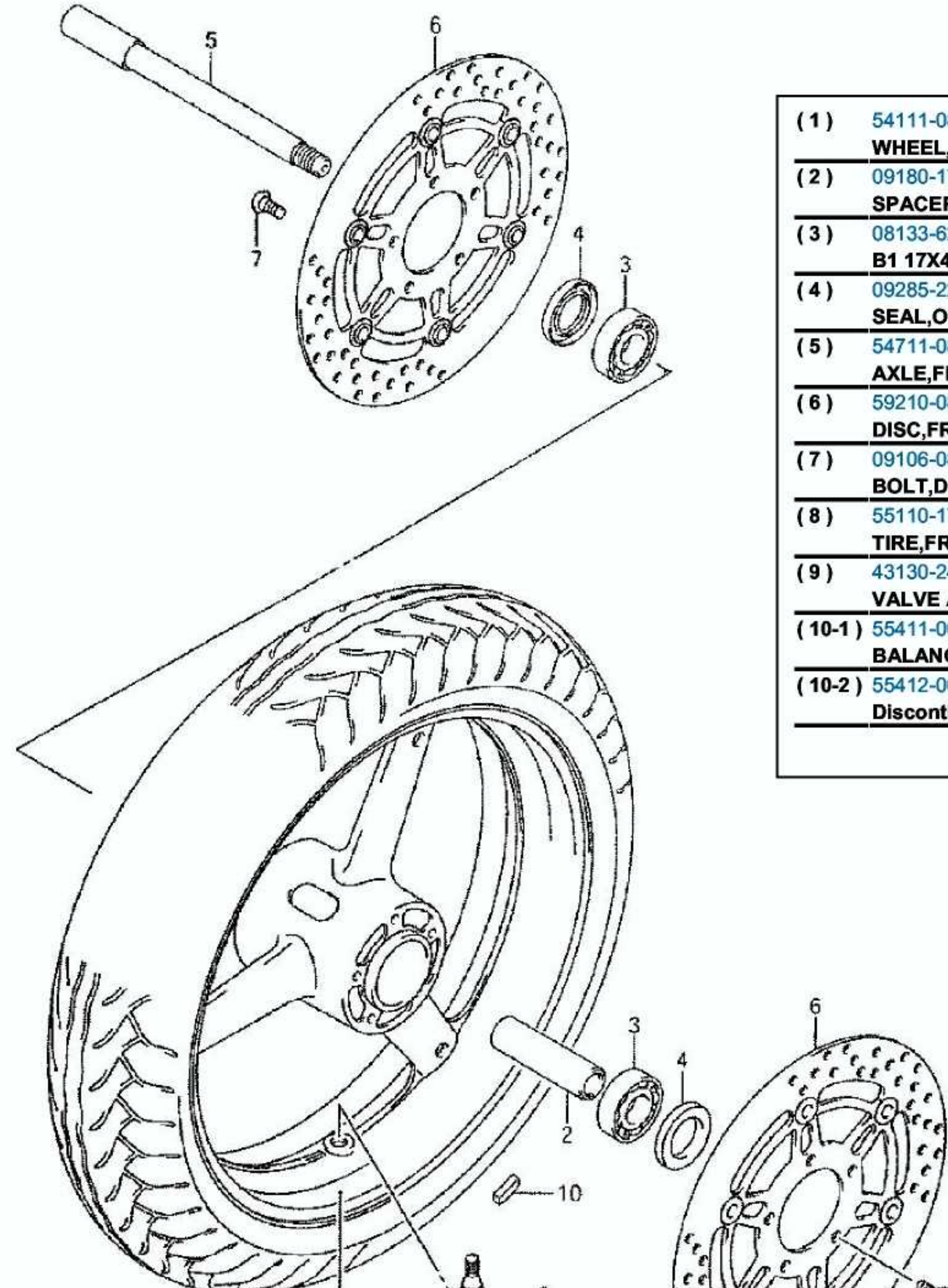
(1-1)	53111-16G10-YD8	FENDER,FRONT
(1-2)	53111-16G10-33J	UNAVAILABLE
(1-3)	53111-16G10-YC2	FENDER,FRONT
(1-4)	53111-16G10-YAV	UNAVAILABLE
(2)	09139-06121	SCREW,FRONT FEN
(3)	09122-86005	BOLT
(4)	53182-16G00	FENDER,FRONT UP
(5)	09111-06063	BOLT,6X14



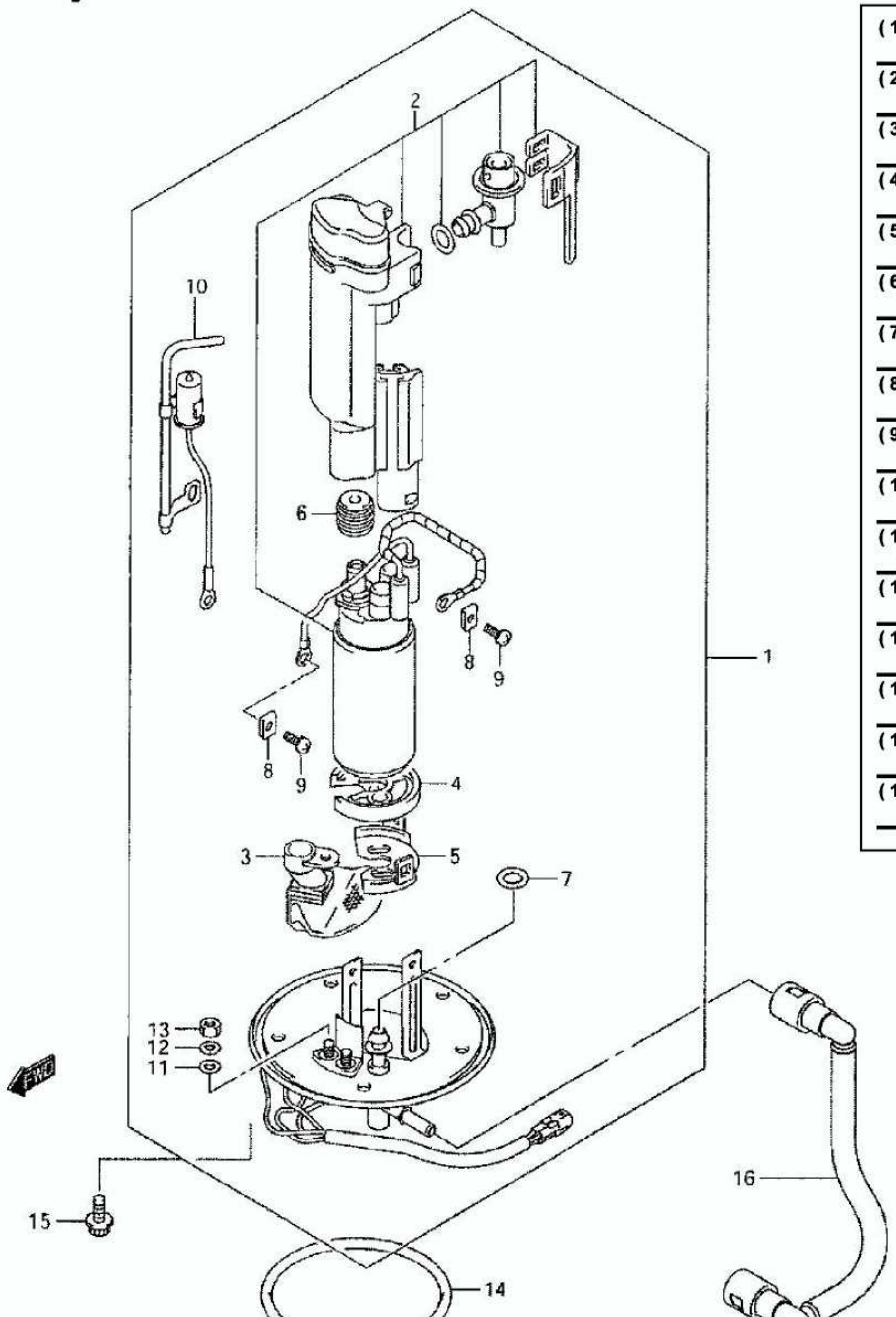
(-)	59600-42F00 **CYLINDER ASSY,F**
(1)	59600-45860 **273 PISTON/CUP SET**
(2)	59666-44300 **273 273 BOOT**
(3)	59667-49460 **273 DIAPHRAGM,MASTE**
(4)	59668-41C00 **273 PLATE,DIAPHRAGM**
(5)	59669-41C00 **273 CAP,MASTER CYLI**
(6)	69689-49300 **273 SCREW**
(7)	59671-32F00 **273 HOLDER**
(8)	59675-02FA0 **273 BOLT,6X22**
(9)	59664-32F00 **273 PROTECTOR**



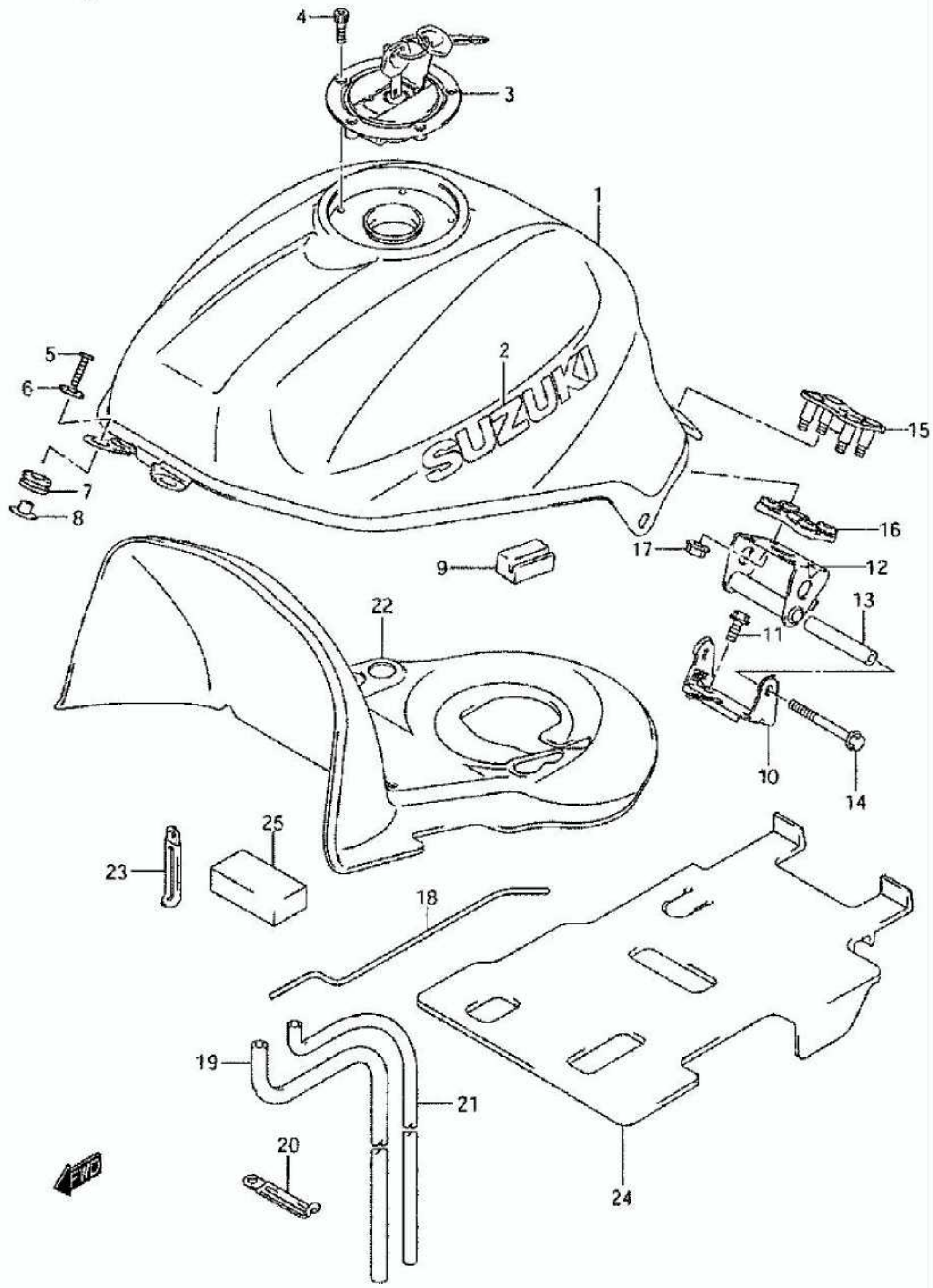
(1)	59600-40F00	CYLINDER ASSY,F
(2)	59600-45860	273 PISTON/CUP SET
(3)	59666-44300	273 273 BOOT
(4)	69686-34200	273 O RING CONNECTO
(5)	59672-17C00	273 CONNECTOR
(6)	69674-00B20	273 CIRCLIP
(7)	59673-17C00	273 COVER,DUST
(8)	59671-36500	273 HOLDER MST CYLI
(9)	59675-02FA0	273 BOLT,6X22
(10)	59740-07D00	TANK ASSY,RESER
(11)	59667-18441	273 DIAPHRAGM,MASTE
(12)	59668-18441	273 PLATE,DIAPHRAGM
(13)	59669-07D00	273 CAP,MASTER CYLI
(14)	59743-17C00	PLATE,RESERVOIR
(15)	02142-04103	SCREW 4X10
(16)	01547-06163	BOLT
(17)	59751-40F00	BRACKET,RESERVO
(18)	01547-06123	BOLT 6X12 BLK 8
(19)	08316-10063	NUT
(20)	59731-32C00	HOSE,FR RESERVO
(21)	59735-17C00	CLAMP,RESERVOIR



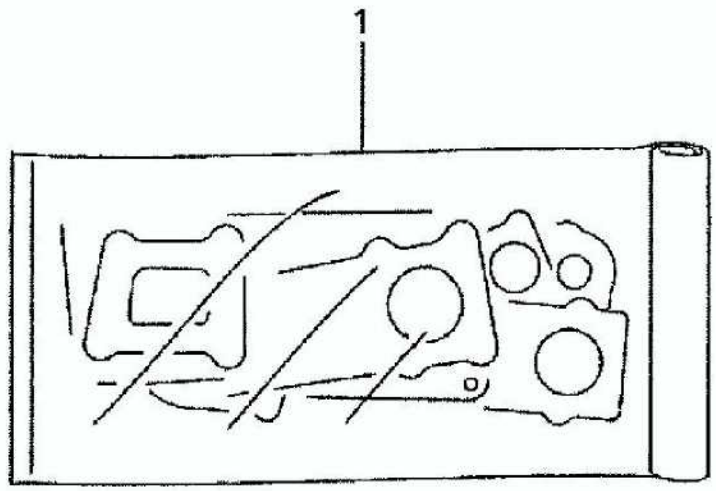
(1)	54111-08F20-Y6G	WHEEL,FR(17M/CX
(2)	09180-17067	SPACER RR HUB B
(3)	08133-62037	B1 17X40X12 BEA
(4)	09285-22004	SEAL,OIL,22X40X
(5)	54711-08F00	AXLE,FRONT
(6)	59210-08F10	DISC,FRONT BRAK
(7)	09106-08160	BOLT,DISC
(8)	55110-17G00	TIRE,FRONT,120/
(9)	43130-24A00	VALVE ASSY
(10-1)	55411-00A00	BALANCER,WHEEL,
(10-2)	55412-00A01	Discontinued



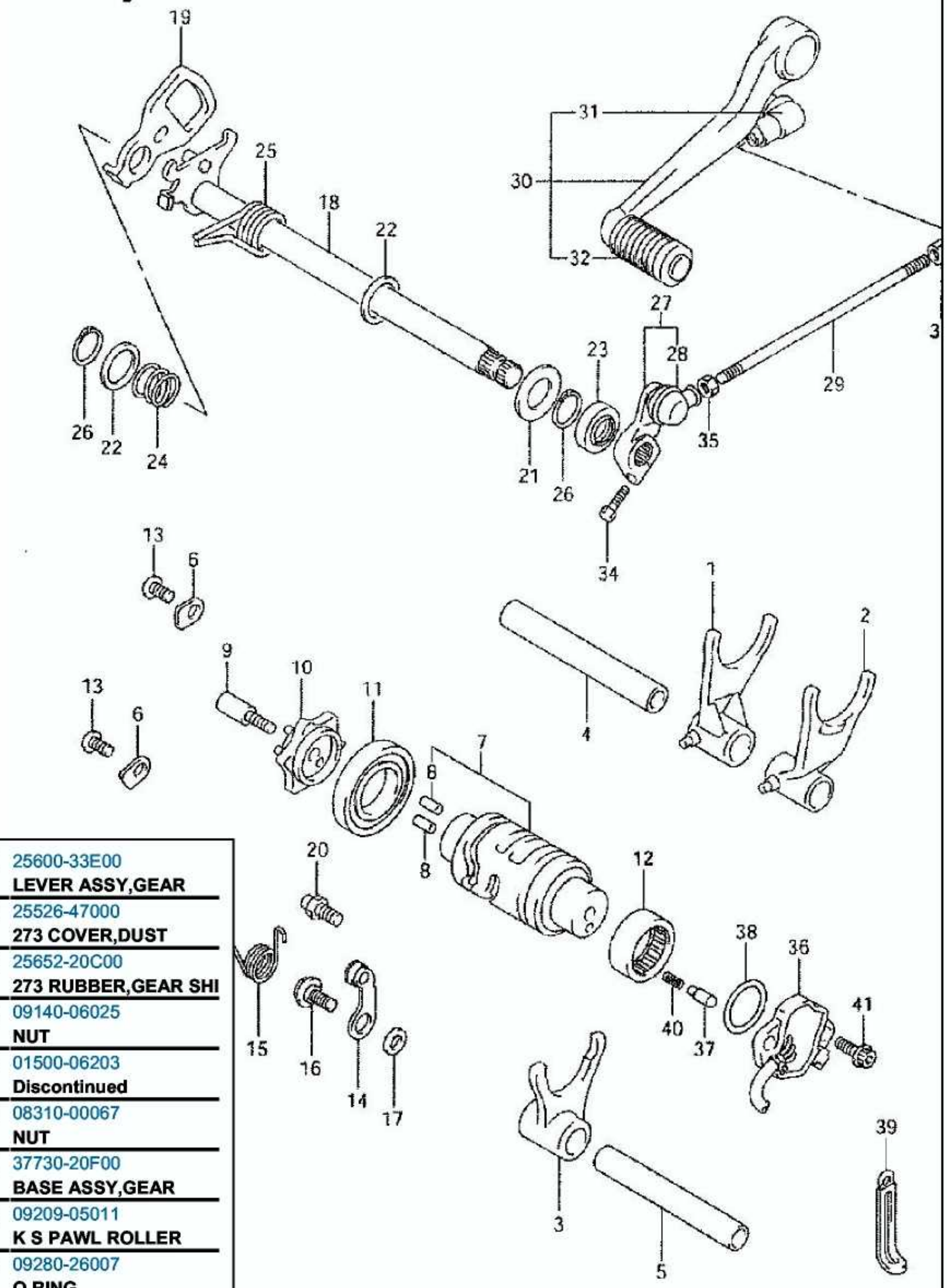
(1)	15100-35F30	PUMP ASSY,FUEL
(2)	15410-42F00	273 FILTER ASSY,FUE
(3)	15420-24FB0	273 STRAINER,FUEL P
(4)	15111-35F00	273 CUSHION,FUEL PU
(5)	15112-42F00	273 HOLDER,FUEL PUM
(6)	15114-35F00	273 BUSH,FUEL PUMP
(7)	15113-35F00	273 O RING
(8)	15115-35F00	273 NUT
(9)	15116-35F10	273 SCREW
(10)	15170-35F10	273 THERMISTOR
(11)	15171-35F00	273 WASHER
(12)	15172-35F00	273 SPRING WASHER
(13)	15173-35F00	273 NUT
(14)	15201-35F00	O-RING,FUEL PUM
(15)	07120-06123	BOLT
(16)	15810-16G00	HOSE COMP,FUEL



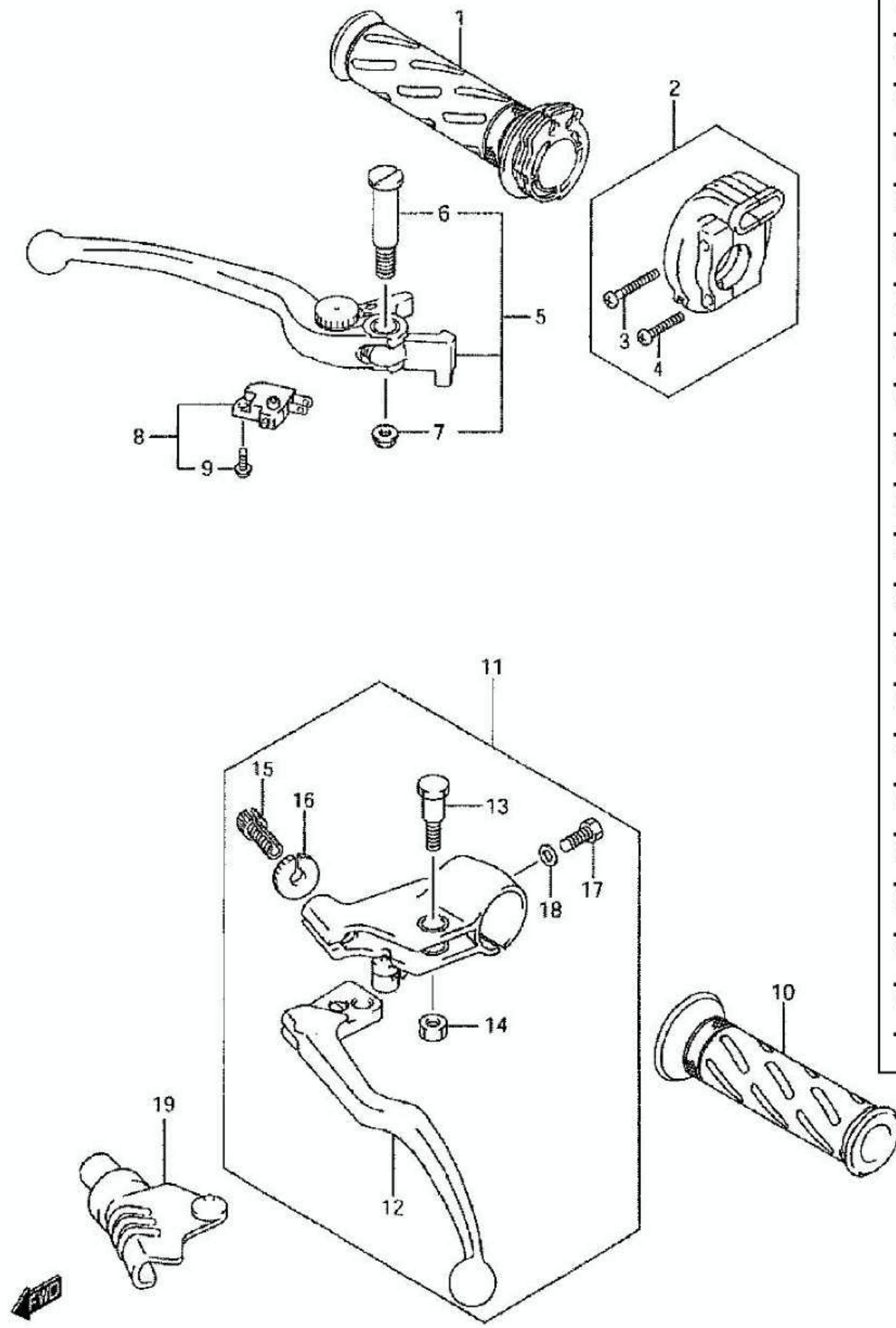
(1-1)	44100-16G00-YD8 TANK ASSY,FUEL
(1-2)	44100-16G00-33J UNAVAILABLE
(1-3)	44100-16G00-YC2 TANK ASSY,FUEL
(1-4)	44100-16G00-YAV TANK ASSY,FUEL
(1-5)	44100-16G20-YD8 UNAVAILABLE
(1-6)	44100-16G20-33J UNAVAILABLE
(1-7)	44100-16G20-YC2 UNAVAILABLE
(1-8)	44100-16G20-YAV UNAVAILABLE
(2-1)	68111-47C10-YU8 273 EMBLEM
(2-2)	68111-47C10-YD8 273 EMBLEM
(3-1)	44200-16850 CAP SET,FUEL TA
(3-2)	44200-16860 UNAVAILABLE
(4)	09106-05017 BOLT, L:20
(5)	09139-06029 SCREW
(6)	09160-06054 WASHER
(7)	44511-16G00 CUSHION,FUEL TA
(8)	44512-16G00 SPACER,FUEL TAN
(9)	44541-16G00 CUSHION,FUEL TA
(10)	44550-16G00 BRACKET COMP,FU
(11)	01550-08203 HEX BOLT 8X20
(12)	44530-16G00 BRACKET COMP,FU
(13)	44561-35F00 SPACER,FUEL TAN
(14)	09103-06060 BOLT 6X100
(15)	44570-16G00 BRACKET COMP,FU
(16)	44542-16G00 CUSHION,FUEL TA
(17)	08319-31063 NUT,LICENSE PLA
(18)	44574-35F00 STAY,FUEL TANK
(19)	44423-17G00 UNAVAILABLE
(20)	09404-06433 CLAMP,L:95
(21)	44424-16G00 HOSE,FUEL TANK
(22)	44191-16G00 SHIELD,FUEL TAN
(23)	09404-06433 CLAMP,L:95
(24)	44271-16G00 SHEET,HEAT SHIE
(25)	44545-16G00 CUSHION,FUEL TA



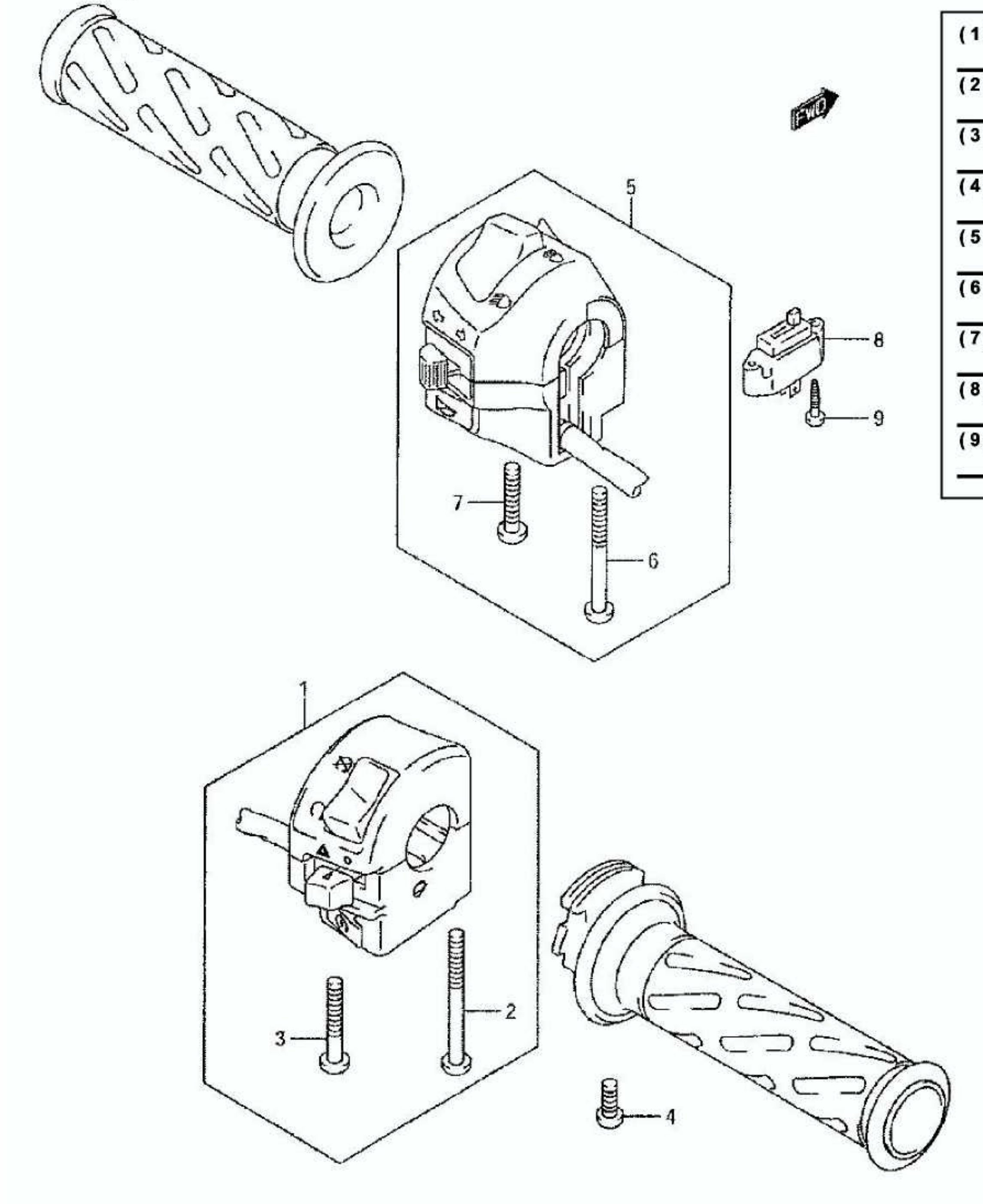
(1)	11401-20870	GASKET SET
(2)	11141-20F00	273 GASKET,CYLINDER
(3)	11173-19F01	273 GASKET,CYLINDER
(4)	11241-19F00	273 GASKET,CYLINDER
(5)	11242-19F00	273 GASKET,CYLINDER
(6)	11482-17G00	273 GASKET,CLUTCH C
(7)	11483-19F00	273 GASKET,MAGNETO
(8)	12837-24A10	273 GASKET,TENSIONE
(9)	14181-22D01	273 GASKET,EXHAUST
(10)	09161-11008	273 WASHER
(11)	09280-22008	273 O RING CRK HOLE
(12)	09280-46006	273 O-RING



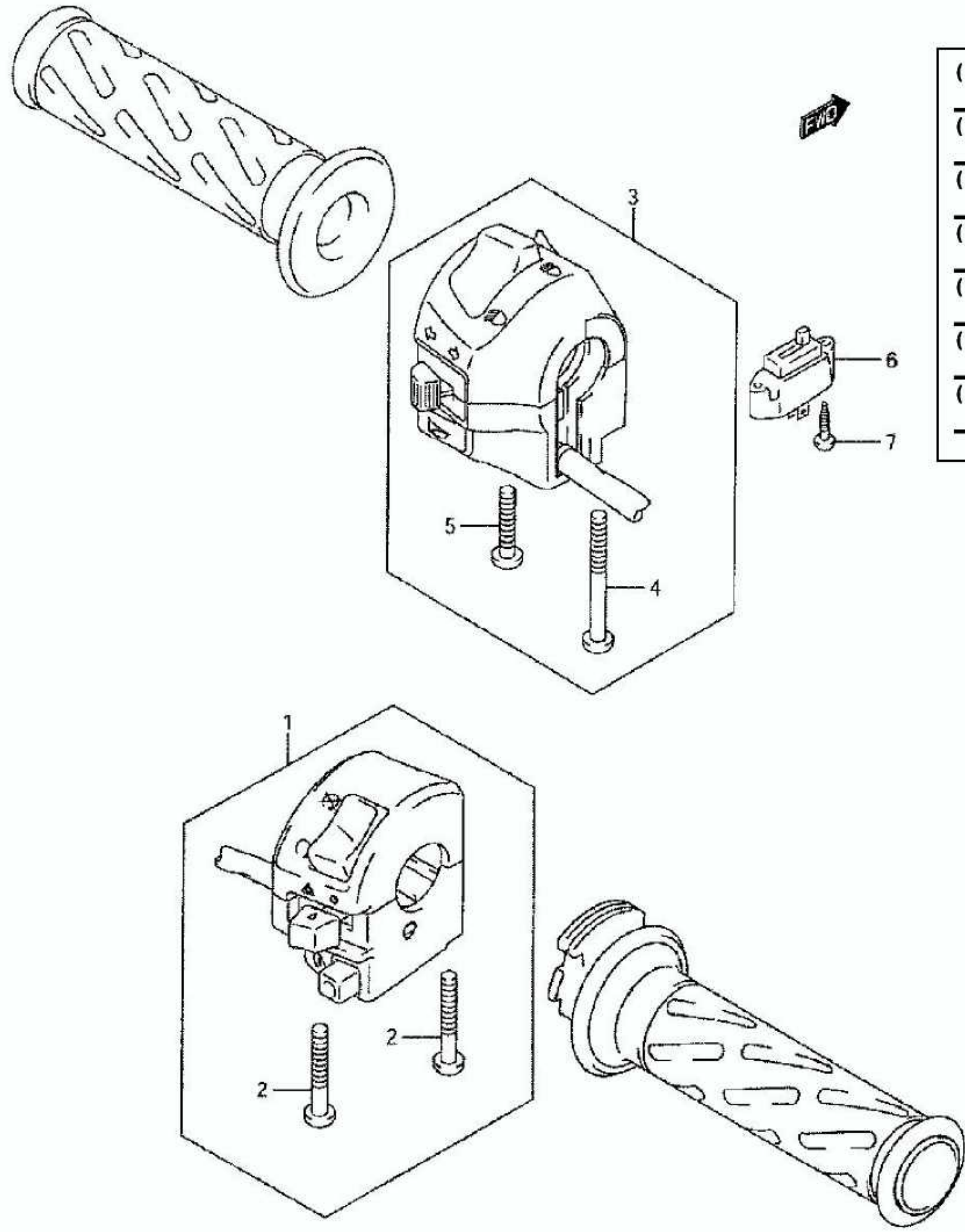
(1)	25211-42E10	FORK,GEAR SHIFT
(2)	25221-42E10	FORK,GEAR SHIFT
(3)	25231-42E10	FORK,GEAR SHIFT
(4)	25411-26D01	SHAFT,GEAR SHIF
(5)	25411-44B00	SHAFT,GEAR SHIF
(6)	24741-21A00	RETAINER,BEARIN
(7)	25310-19F00	CAM,GEAR SHIFT
(8)	04221-04089	273 PIN 4X8
(9)	25312-42F00	BOLT,GEAR SHIFT
(10)	25381-19F00	PLATE,GEAR SHIF
(11)	09262-25006	B1 25X47X8 BRG
(12)	09263-25018	RN 25X32X12 BRG
(13)	02112-06123	SCREW 6X12
(14)	25350-24B00	STOPPER COMP,GE
(15)	25355-17G00	SPRING,GEAR SHI
(16)	09111-06041	BOLT
(17)	08211-06141	WASHER GEAR SHI
(18)	25510-19F00	SHAFT,GEAR SHIF
(19)	25512-13E20	PLATE,GEAR SHIF
(20)	25671-01011	STOPPER,GEAR SH
(21)	09160-14016	K S SHAFT THR W
(22)	09181-14167	WASHER,GEAR SHI
(23)	09283-14006	SEAL,OIL,13X22X
(24)	09440-17009	SPRING
(25)	09444-20001	SPRING
(26)	08331-31146	CIRCLIP
(27)	25520-17G00	ARM,GEAR SHIFT
(28)	25526-47000	273 COVER,DUST
(29-1)	25525-19F00	ROD,GEAR SHAFT
(29-2)	25525-21E10	Discontinued
(30)	25600-33E00	LEVER ASSY,GEAR
(31)	25526-47000	273 COVER,DUST
(32)	25652-20C00	273 RUBBER,GEAR SHI
(33)	09140-06025	NUT
(34)	01500-06203	Discontinued
(35)	08310-00067	NUT
(36)	37730-20F00	BASE ASSY,GEAR
(37)	09209-05011	K S PAWL ROLLER
(38)	09280-26007	O RING
(39)	09404-08206	CLAMP,L:82
(40)	09440-04010	K S PAWL SPRING
(41)	07120-05163	BOLT



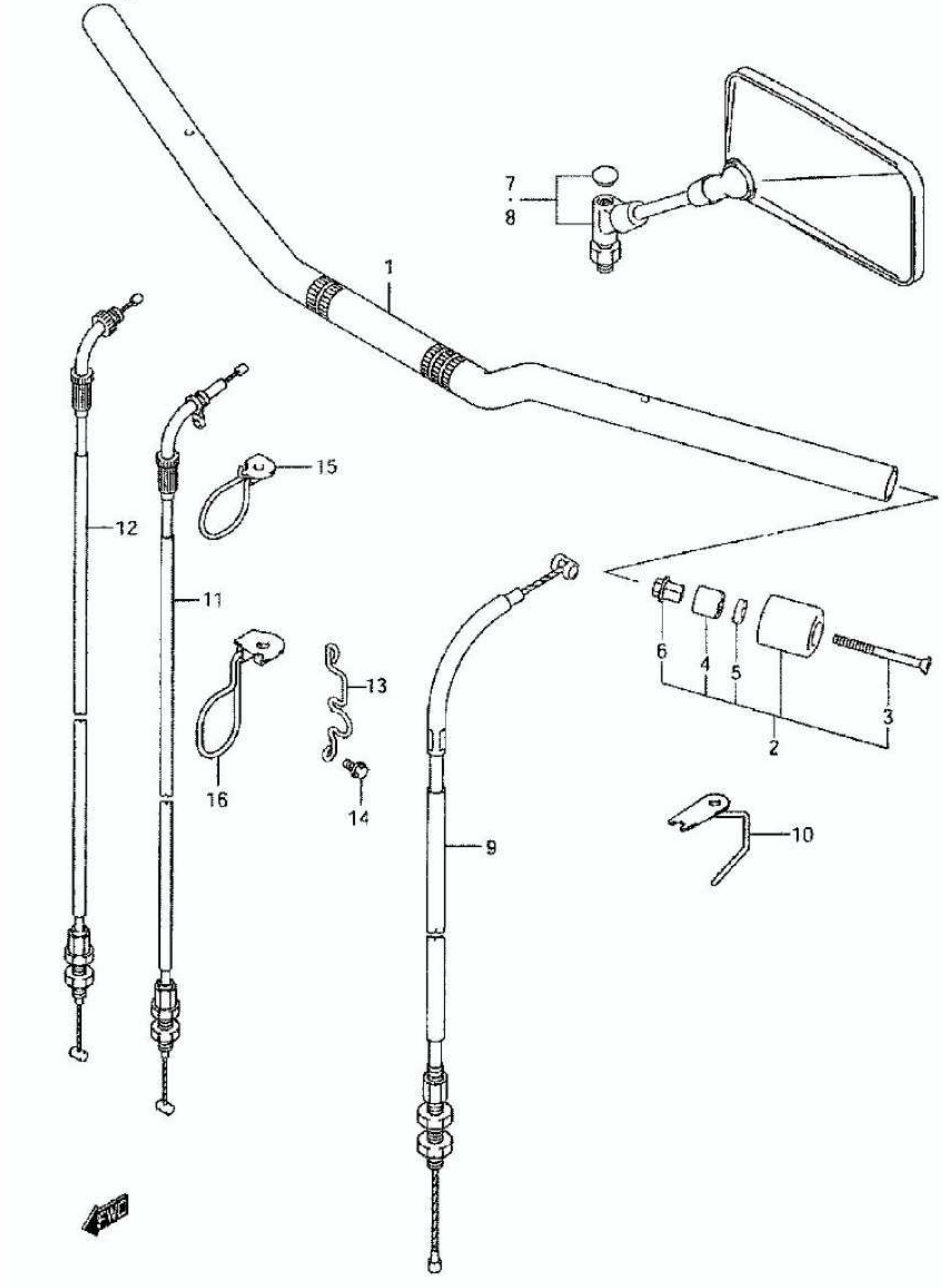
(1-1)	57110-46E01 GRIP, THROTTLE
(1-2)	57110-45D02 GRIP,THROTTLE
(2)	57100-14D00 CASE ASSY,THROT
(3)	09125-05066 273 SCREW
(4)	02112-05203 273 SCREW
(5)	57300-33E01 LEVER ASSY,BRAK
(6)	57431-17C00 273 BOLT,LEVER
(7)	08316-10063 273 NUT
(8)	57460-17C00 SWITCH ASSY,STO
(9)	57465-17C00 273 SCREW
(10)	57211-22D01 GRIP, L
(11-1)	57500-10D01 LEVER ASSY,CLUT
(11-2)	57500-10D80 LEVER ASSY,CLUT
(12)	57620-27A31 273 LEVER,CLUTCH
(13)	57531-14A00 273 BOLT,LEVER SET
(14)	08319-21063 273 NUT
(15)	57441-11010 273 CABLE ADJUSTER
(16)	57442-11010 273 CABLE ADJUSTMEN
(17)	01500-06203 273 Discontinued
(18)	08322-01063 273 WASHER
(19)	57661-45C00 COVER,CLUTCH LE



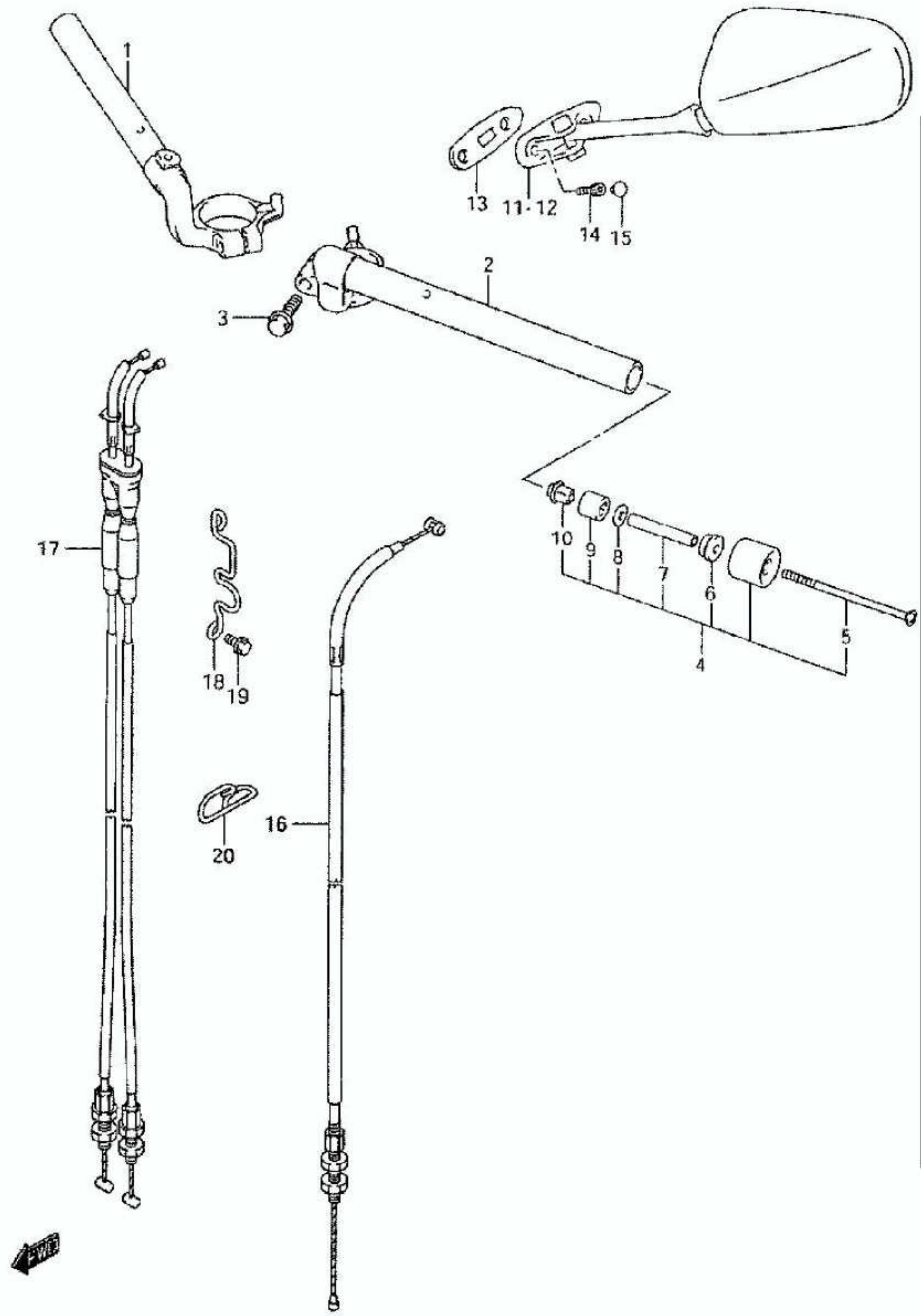
(1)	37200-17G50 UNAVAILABLE
(2)	02112-05505 273 BOLT
(3)	02112-05305 273 SCREW 5X30
(4)	02112-05103 SCREW, 5X10.8X1
(5)	37400-17G10 UNAVAILABLE
(6)	02112-05455 273 SCREW
(7)	09125-05066 273 SCREW
(8)	37560-31F00 SWITCH ASSY,CLU
(9)	09132-03017 SCREW



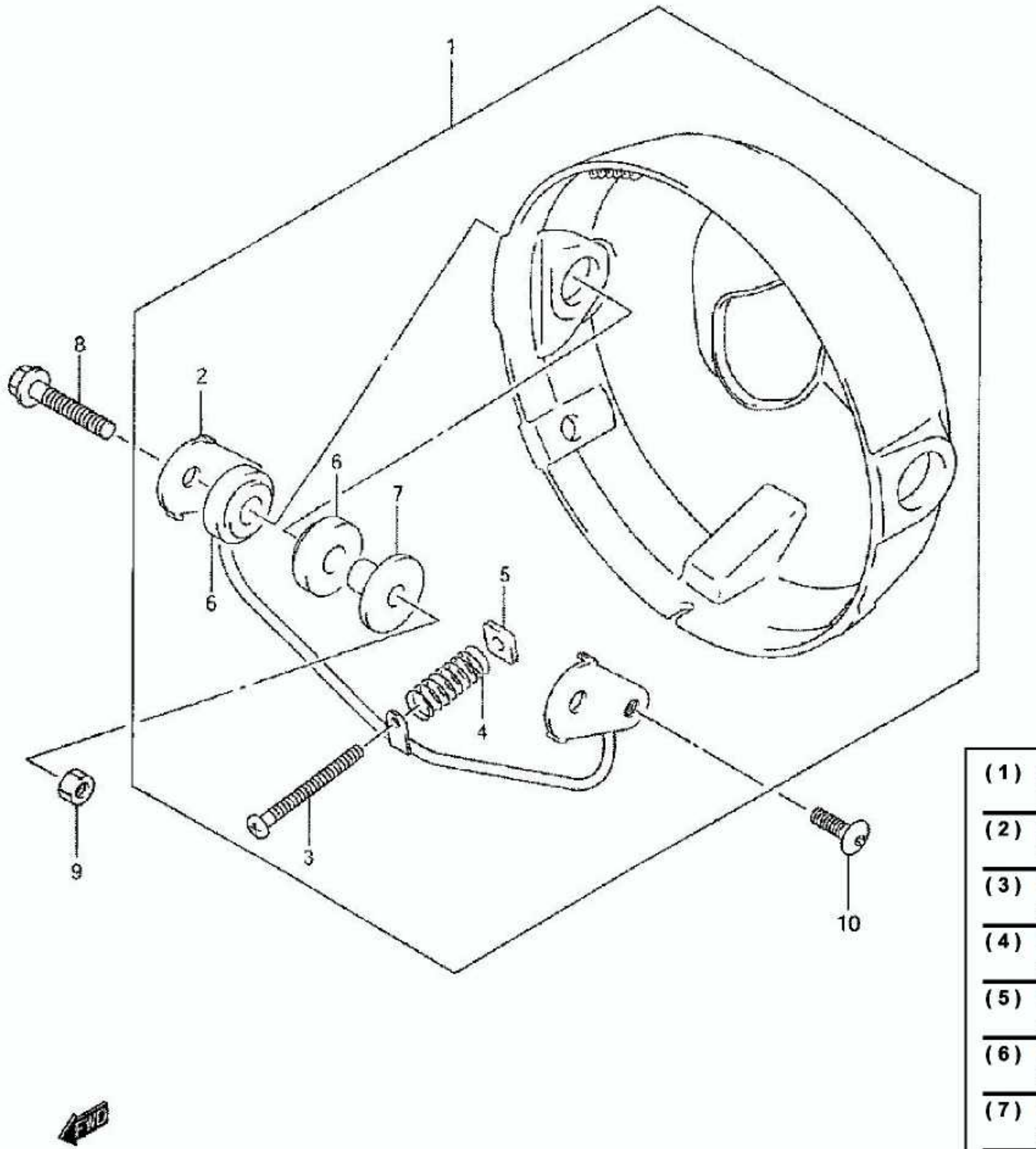
(1)	37200-16G50
	SWITCH ASSY,HAN
(2)	02112-05455
	273 SCREW
(3)	37400-16G10
	SWITCH ASSY,HAN
(4)	02112-05455
	273 SCREW
(5)	09125-05066
	273 SCREW
(6)	37560-31F00
	SWITCH ASSY,CLU
(7)	09132-03017
	SCREW



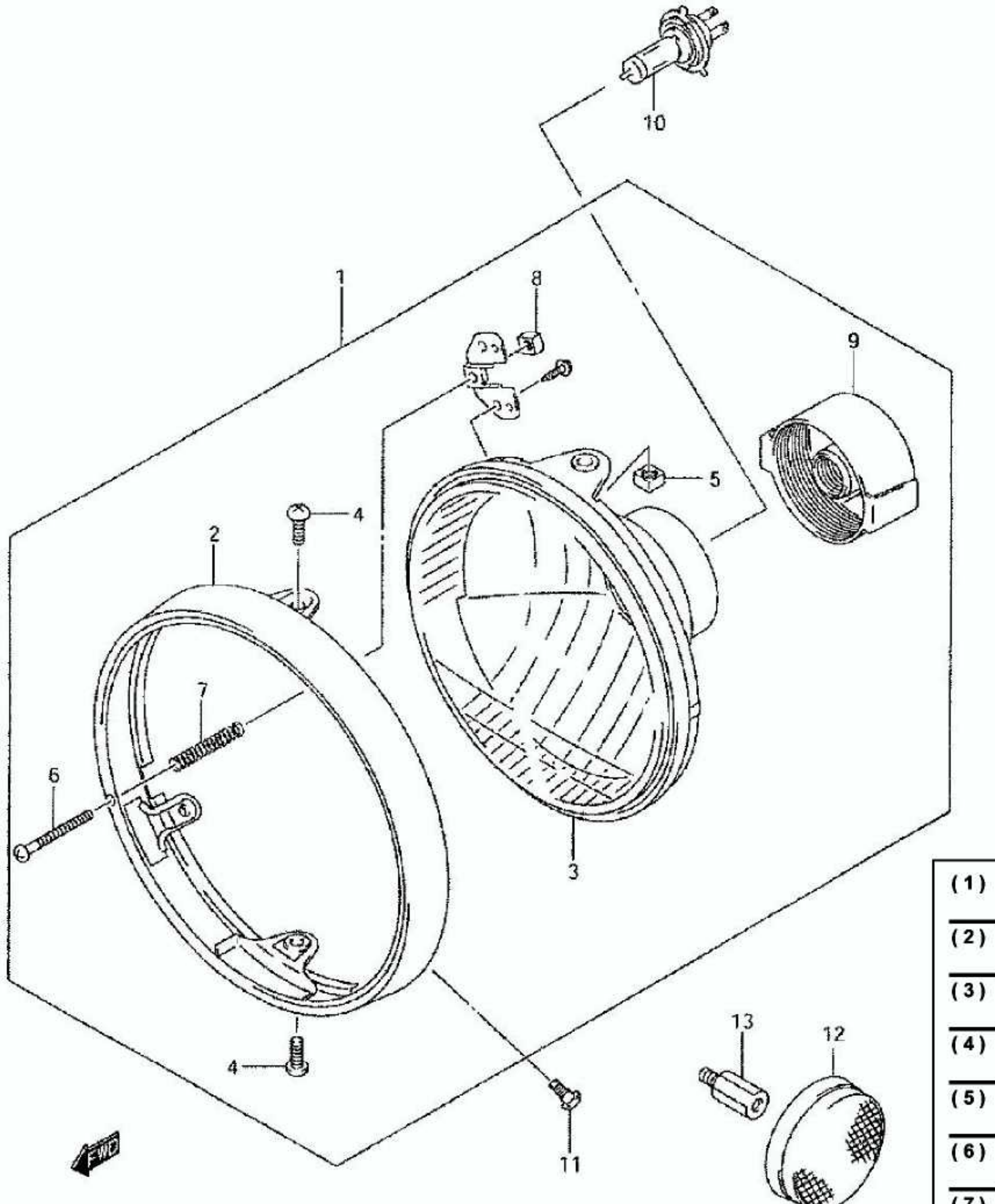
(1)	56111-17G10 UNAVAILABLE
(2)	56200-16820 UNAVAILABLE
(3)	02122-06603 273 SCREW
(4)	56272-10G00 273 EXPANDER,HANDLE
(5)	09160-06131 273 WASHER,6.5X16X4
(6)	56273-10G00 273 NUT,HANDLE BALA
(7)	56500-17G00 UNAVAILABLE
(8)	56600-17G00 MIRROR ASSY,REA
(9)	58200-17G00 UNAVAILABLE
(10)	58620-17G00 GUIDE,CLUTCH CA
(11)	58300-16GA0 UNAVAILABLE
(12)	58300-16GB0 CABLE ASSY,THRO
(13)	58621-16GA0 GUIDE,CABLE LH
(14)	01550-06123 BOLT
(15)	58620-16G00 UNAVAILABLE
(16)	58620-16G10 UNAVAILABLE



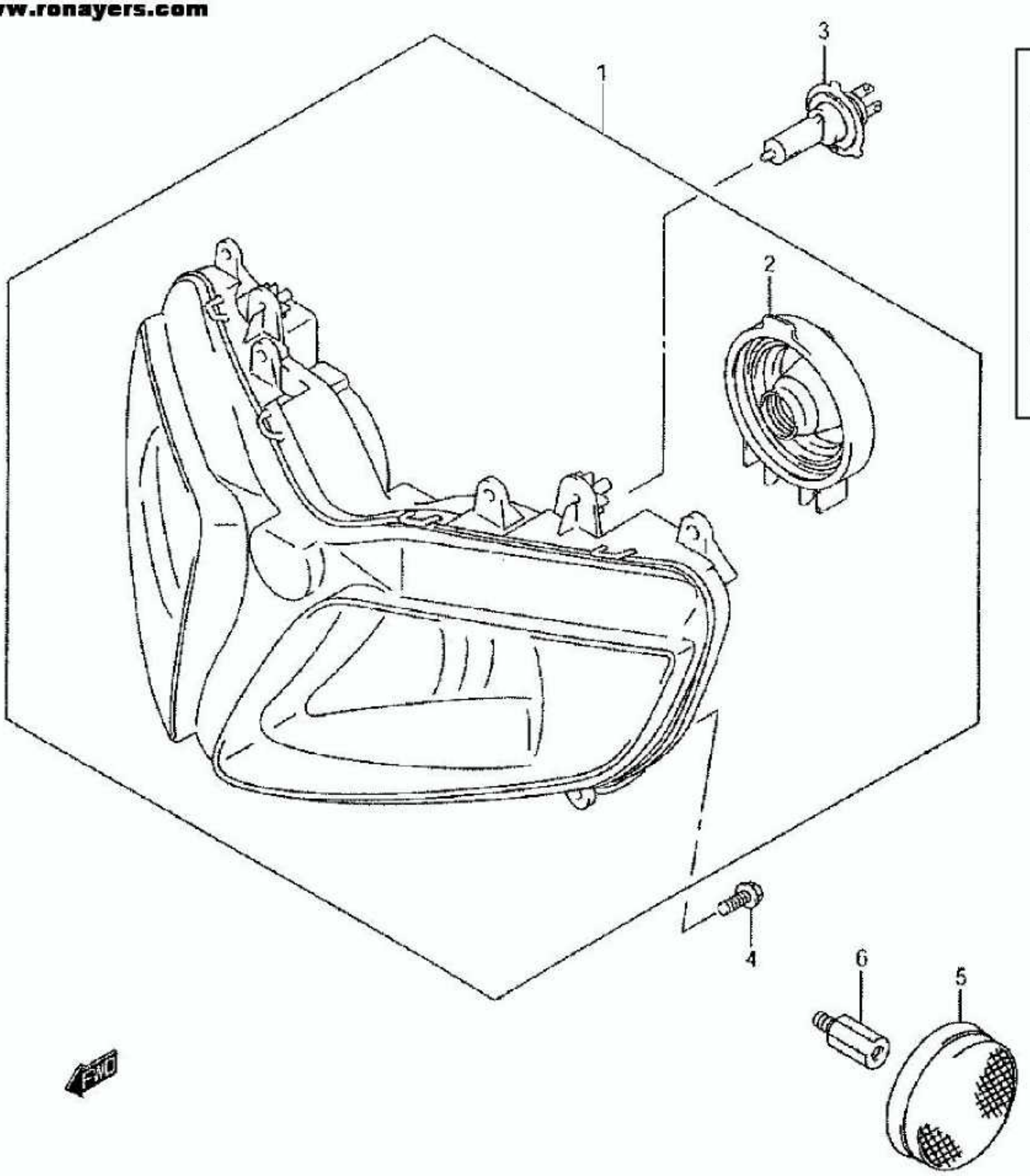
(1)	56111-17G00 HANDLEBAR,R
(2)	56151-17G00 HANDLEBAR,L
(3)	56123-35F00 BOLT,HANDLEBAR
(4)	56200-16830 BALANCER SET,HA
(5)	02122-06953 273 UNAVAILABLE
(6)	56272-23F00 273 EXPANDER,HANDLE
(7)	56276-17D00 273 SPACER,EXPANDER
(8)	09160-06130 273 Discontinued
(9)	56272-10G00 273 EXPANDER,HANDLE
(10)	56273-10G00 273 NUT,HANDLE BALA
(11)	56500-16G00 MIRROR ASSY,REA
(12)	56600-16G00 MIRROR ASSY,REA
(13)	94576-24F00 CUSHION,REAR VI
(14)	07130-06303 BOLT
(15)	09250-05009 CAP
(16)	58200-17G10 CABLE ASSY,CLUT
(17)	58300-16G10 CABLE ASSY,THRO
(18)	58621-16GA0 GUIDE,CABLE LH
(19)	01550-06123 BOLT
(20)	58621-16GB0 GUIDE,THROTTLE



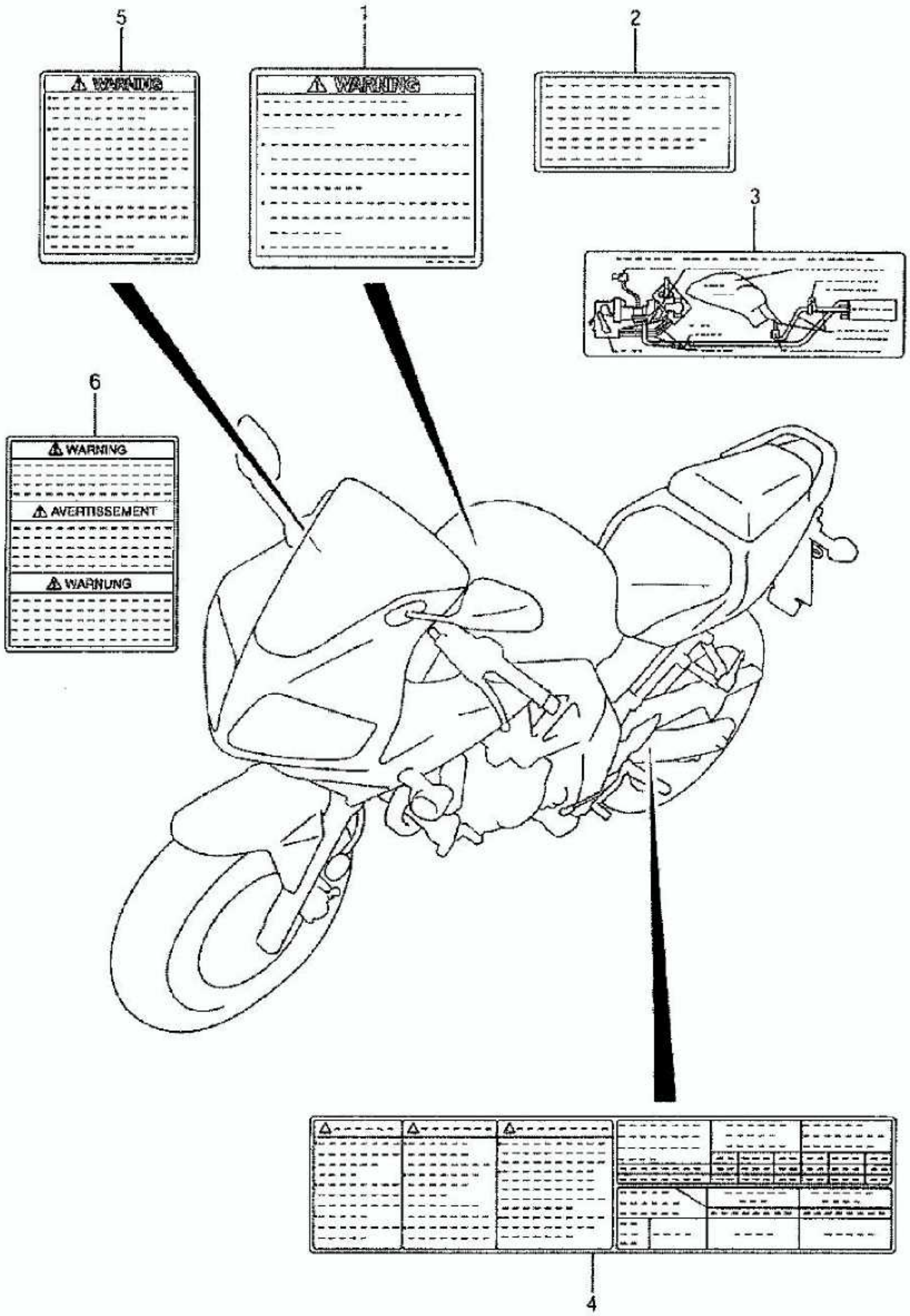
(1)	51800-16G00 UNAVAILABLE
(2)	51850-16G00 273 UNAVAILABLE
(3)	09125-05128 273 UNAVAILABLE
(4)	51837-25D00 273 SPRING,HEADLAMP
(5)	51825-25D00 273 NUT,HEADLAMP AD
(6)	09320-12065 273 CUSHION
(7)	09180-08217 273 UNAVAILABLE
(8)	09103-08391 BOLT
(9)	08310-00083 NUT
(10)	09139-06030 SCREW



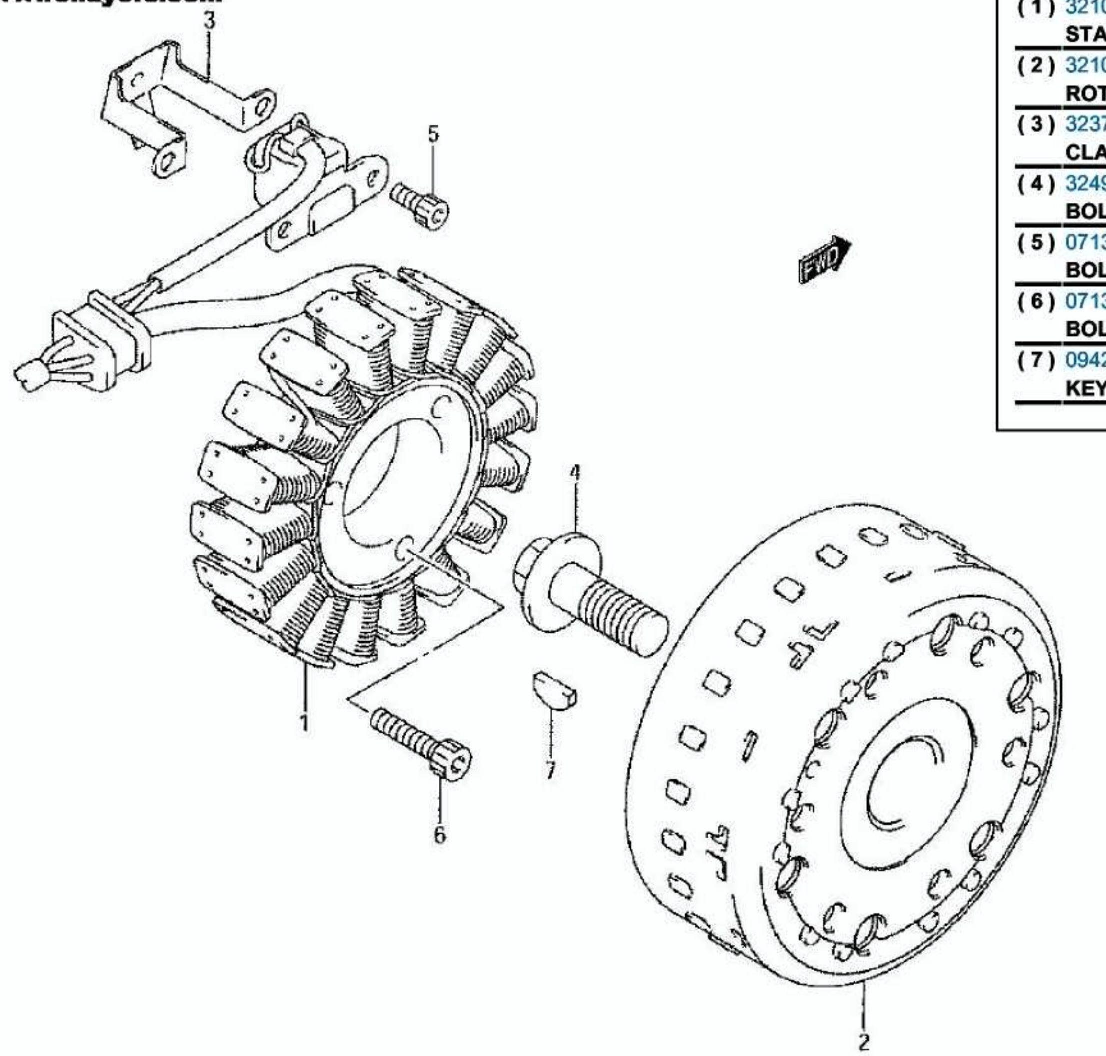
(1)	35100-19F70-999 UNAVAILABLE
(2)	35111-19F00 273 RIM
(3)	35121-19F00 273 LAMP UNIT
(4)	35181-19F00 273 SCREW,5X16
(5)	35135-45900 273 NUT
(6)	35151-19F00 273 SCREW,ADJUSTING
(7)	35154-49200 273 Discontinued
(8)	35152-45600 273 NUT
(9)	35174-19F00 273 COVER,SOCKET
(10)	09471-12060 BULB(HALOGEN)*
(11)	09139-05038 SCREW
(12)	35950-14A00 REFLECTOR,REFLE
(13)	09119-05023 BOLT



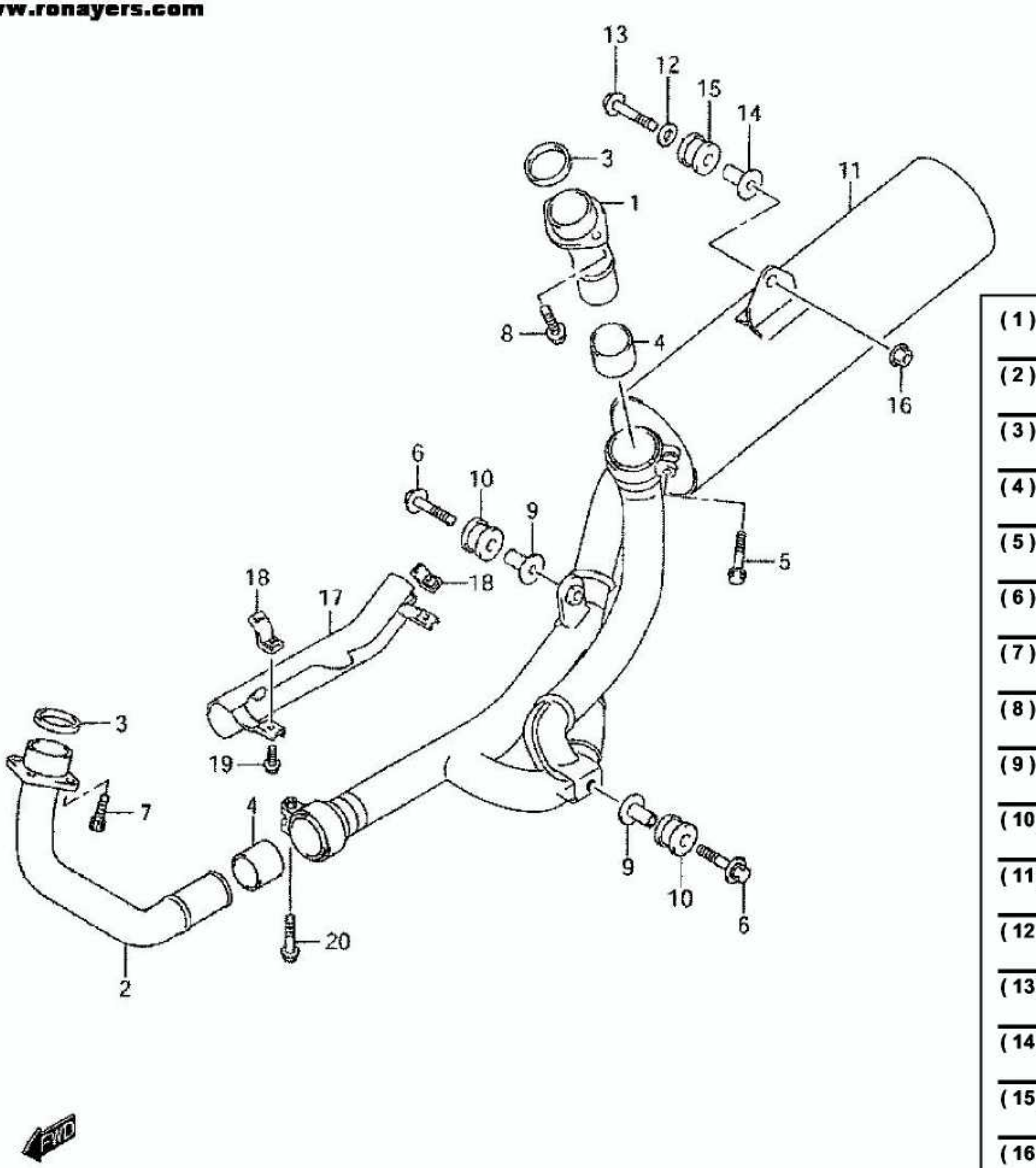
(1)	35100-16G30-999	UNAVAILABLE
(2)	35125-77A00	273 COVER,SOCKET
(3)	09471-12182	BULB(12V60/55W,
(4)	02162-05163	BOLT
(5)	35950-14A00	REFLECTOR,REFLE
(6)	09119-05023	BOLT



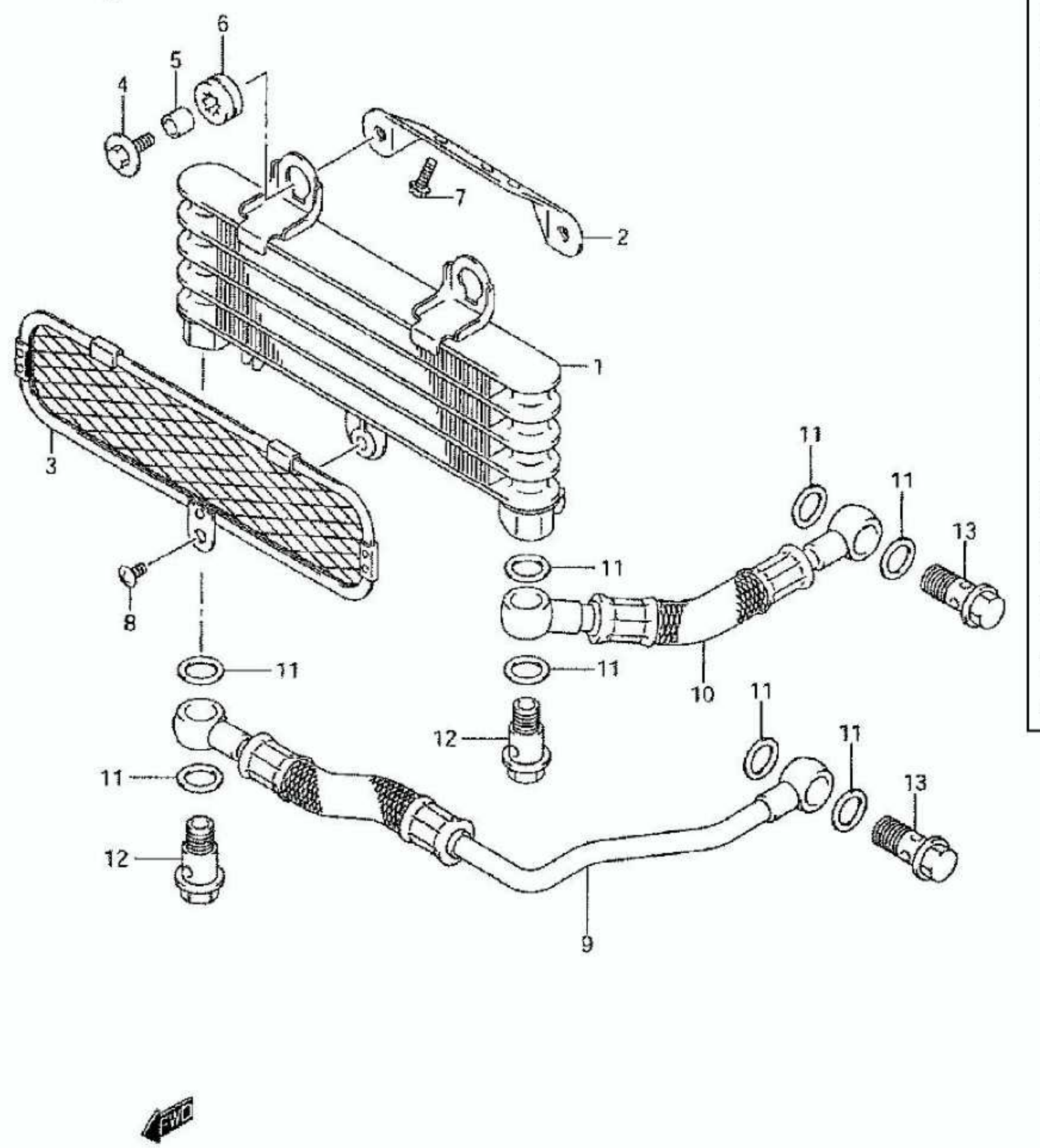
(1-1)	68319-29F00	LABEL,GENERAL W
(1-2)	68319-29F30	UNAVAILABLE
(2)	68353-26E02	LABEL,MANUAL NO
(3-1)	68387-16G00	Discontinued
(3-2)	68387-17G00	LABEL,VACUUM HO
(4-1)	68332-17G00	UNAVAILABLE
(4-2)	68332-17G10	LABEL,TIRE INFO
(5-1)	68922-29F00	LABEL,SCREEN
(5-2)	68922-29F30	UNAVAILABLE
(6-1)	68613-18E00	LABEL,WARNING S
(6-2)	68613-24F00	UNAVAILABLE
(7-1)	99011-17G50-03A	MANUAL,OWNER'S
(7-2)	99011-17G50-01A	UNAVAILABLE
(7-3)	99011-17G50-01F	UNAVAILABLE



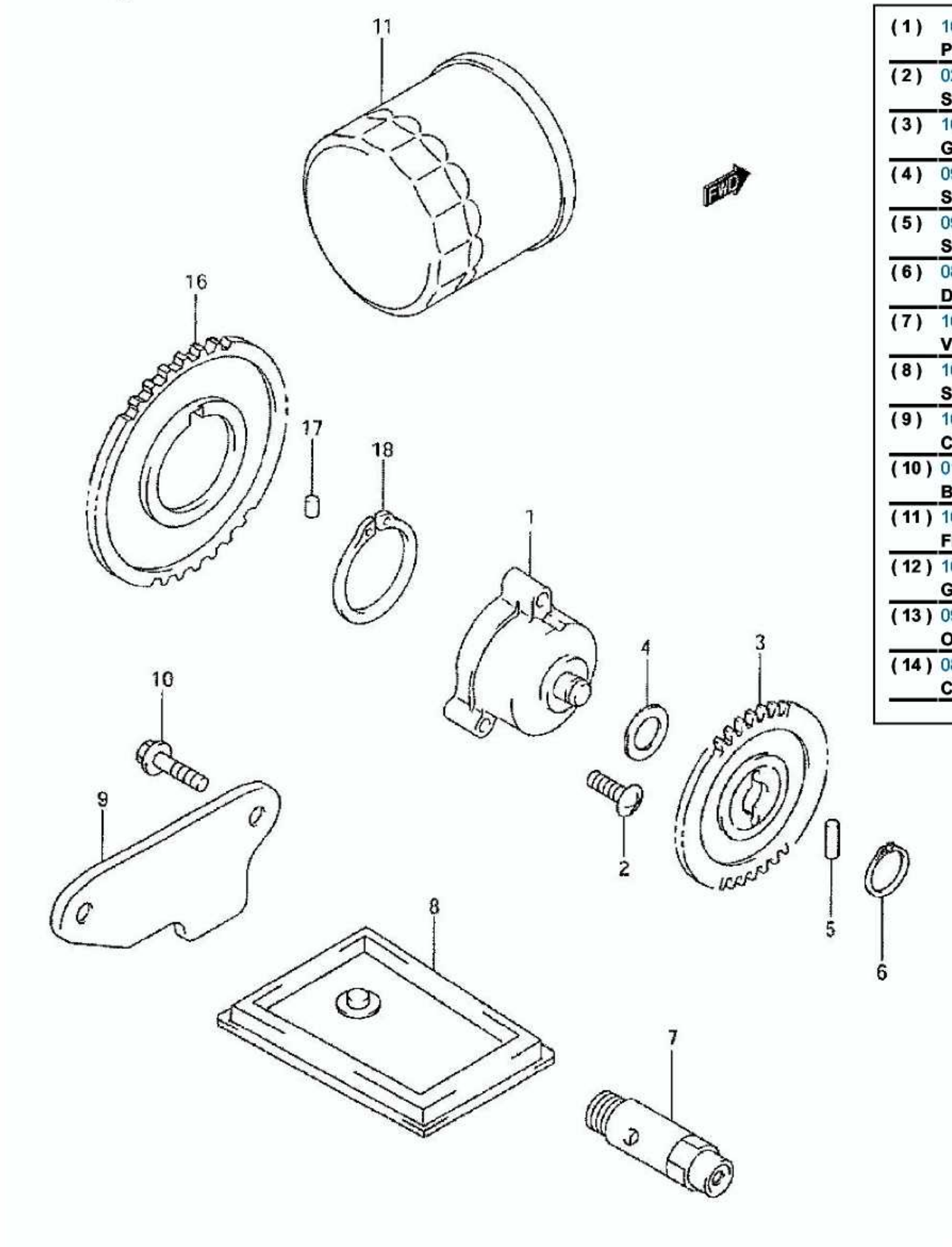
(1)	32101-17G00	STATOR ASSY
(2)	32102-17G00	ROTOR ASSY
(3)	32371-19F00	CLAMP,MAGNETO L
(4)	32491-06G00	BOLT,MAGNETO RO
(5)	07130-05123	BOLT
(6)	07130-06303	BOLT
(7)	09420-04008	KEY



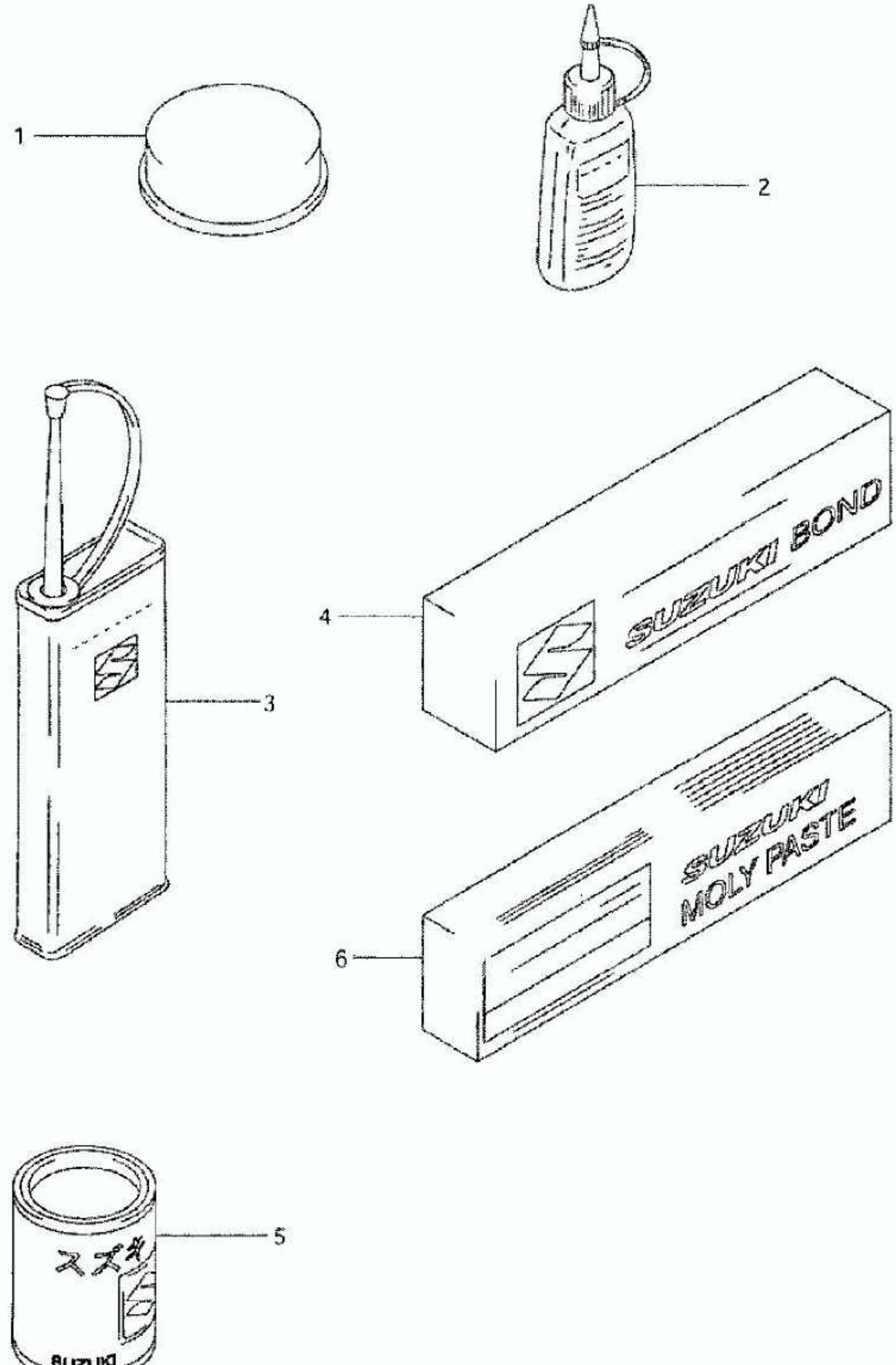
(1)	14150-17G00 PIPE COMP,EXH R
(2)	14160-17G00 PIPE COMP,EXH F
(3)	14181-22D01 GASKET,EXHAUST
(4)	14771-32E00 CONNECTOR,MUF
(5)	07120-08403 BOLT
(6)	09118-08152 BOLT,M8X45
(7)	09106-08104 BOLT
(8)	07130-08253 BOLT
(9)	09180-08152 SPACER,8.6X12X2
(10)	09320-12048 CUSHION
(11)	14305-17G10-H01 MUFFLER COMP
(12)	09160-08142 WASHER (8.5X28X
(13)	09103-08358 BOLT
(14)	09180-08152 SPACER,8.6X12X2
(15)	09320-12048 CUSHION
(16)	08361-25088 NUT
(17)	14770-17G00 COVER COMP,EXH
(18)	14185-17G00 CLAMP,EXH COV
(19)	07120-06203 BOLT
(20)	09103-08365 BOLT,MUF SPRT R



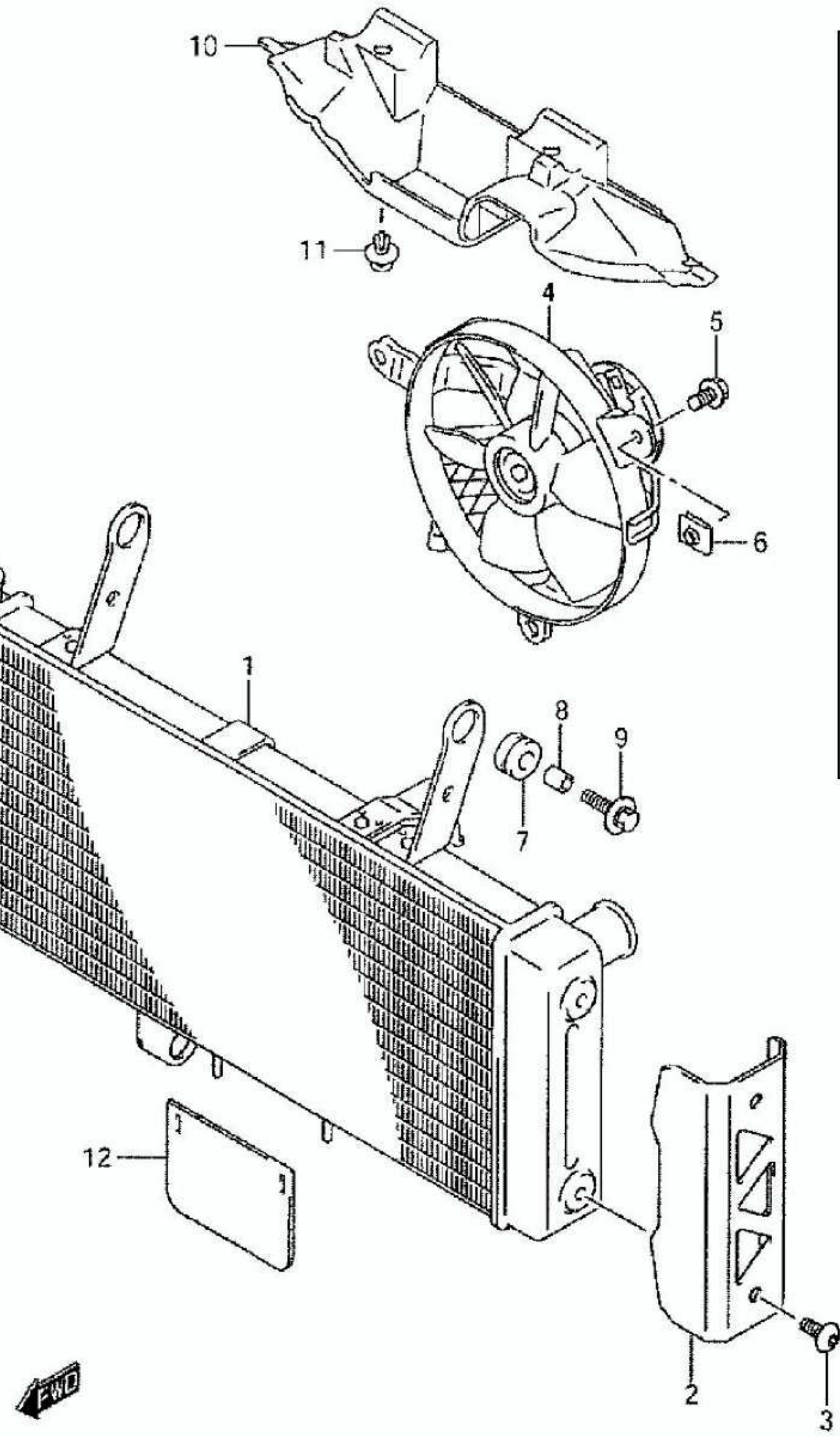
(1)	16600-17G00	COOLER ASSY,OIL
(2)	16620-17G00	BRACKET COMP,OI
(3)	16650-17G00	GUARD COMP,OIL
(4)	09116-06167	BOLT
(5)	09180-06310	SPACER
(6)	09320-09009	CUSHION
(7)	01550-06163	BOLT
(8)	02142-05103	SCREW 5X10
(9)	16460-17G00	HOSE COMP,OIL C
(10)	16470-17G00	HOSE COMP,OIL C
(11)	09168-14011	GASKET,FUEL INJ
(12)	09360-12012	BOLT,OIL HOSE U
(13)	09360-14012	BOLT,14X27



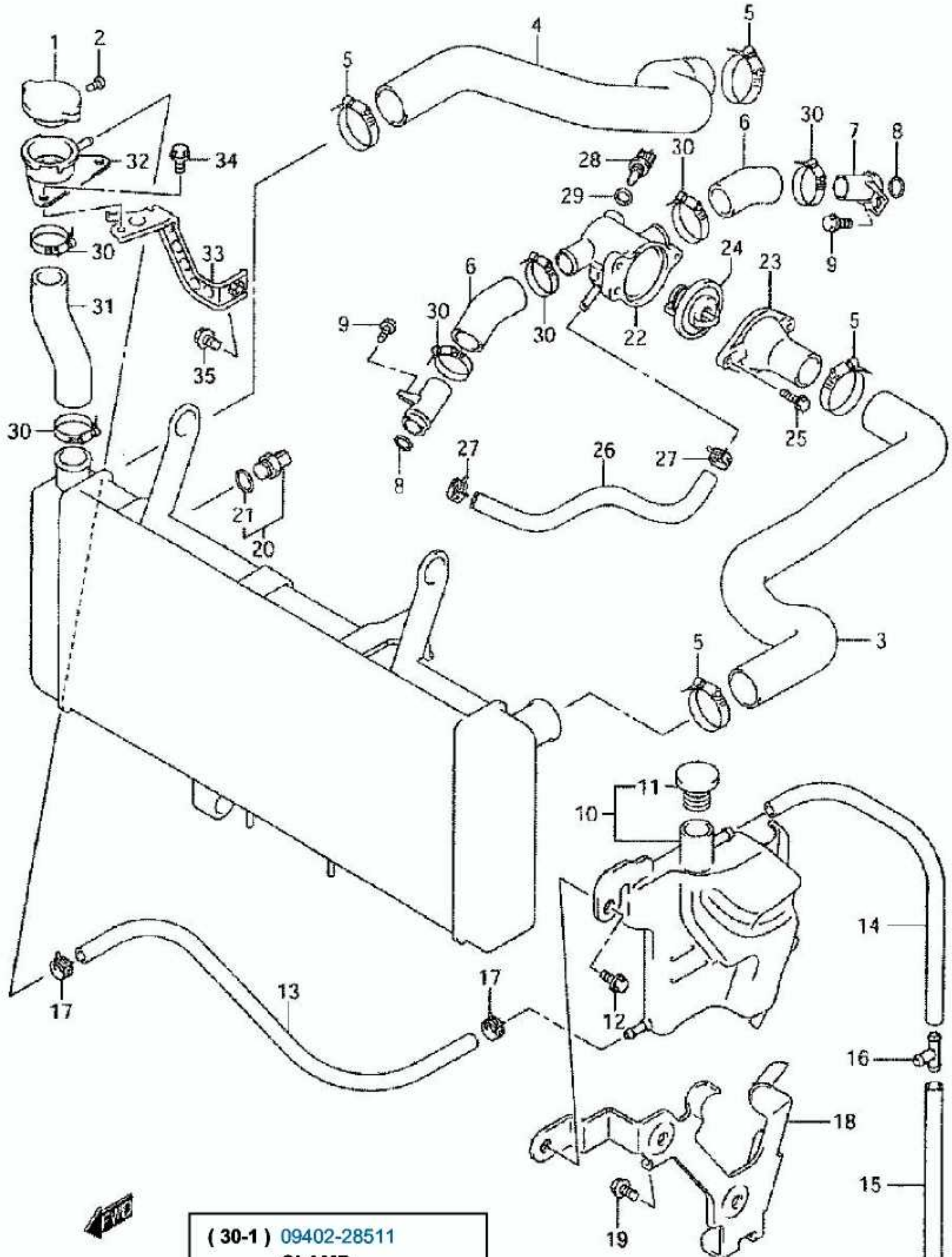
(1)	16400-20F00	PUMP ASSY,ENG O
(2)	02112-06253	SCREW
(3)	16331-19F00	GEAR,ENG OIL PU
(4)	09181-10158	SHIM,10X18X0.5
(5)	09261-04001	SHIFT CAM STOP
(6)	08331-31106	Discontinued
(7)	16440-17C20	VALVE ASSY,OIL
(8)	16520-32E00	STRAINER COMP,E
(9)	16523-17G00	CAP,OIL STRAINE
(10)	01547-06123	BOLT 6X12 BLK 8
(11)	16510-03G00	FILTER ASSY, EN
(12)	16321-19F00	GEAR,ENG OIL PU
(13)	09261-06002	OIL PUMP DRIV G
(14)	08331-31383	CIRCLIP



(1)	99000-25110	BRAKE PAD GREAS
(2-1)	99000-32020	1333B THREADLOC
(2-2)	99000-32030	1303 THREADLOCK
(2-3)	99000-32050	1342 THREADLOCK
(2-4)	99000-32100	DISCONTINUED
(2-5)	99000-32130	1360 THREADLOCK
(3)	99000-32040	1401 THREADLOCK
(4-1)	99000-31140	UNAVAILABLE
(4-2)	99000-31110	Discontinued
(5)	99000-25030	SUZUKI SUPER GR
(6)	99000-25140	MOLY PASTE



(1-1)	17710-17G00	UNAVAILABLE
(1-2)	17710-17G10	RADIATOR ASSY,W
(2)	17761-17G00	COVER,RADIATOR
(3)	09139-06027	SCREW 6X12
(4)	17800-17G00	FAN ASSY,RADIAT
(5)	01550-06103	BOLT
(6)	09148-06015	NUT
(7)	09320-10042	CUSHION
(8)	09180-06290	SPACER,6.5X10X1
(9)	09118-06097	BOLT,6X25
(10)	17771-17G00	SHIELD,RADIATOR
(11)	09409-06314-5PK	CLIP(BLACK)
(12)	17781-17G00	RUBBER,RADIATOR



(1-1)	17730-19D11	CAP COMP,RADIAT
(1-2)	17730-12C20	CAP COMP,RADIAT
(2)	17733-03D10	SCREW,RADIATOR
(3)	17851-17G00	HOSE,RADIATOR I
(4)	17852-17G00	HOSE,RADIATOR O
(5)	09402-38511	CLAMP
(6)	17853-19F00	HOSE,CONNECTOR
(7)	17890-06G00	UNION,CONN HOSE
(8)	09280-18009	O RING D:3.2 ID
(9)	07130-06123	BOLT
(10)	17910-17G00	TANK ASSY,RESER
(11)	17931-02FA0	273 CAP,RESERVOIR T
(12)	09111-06063	BOLT,6X14
(13)	09352-50901-600	HOSE
(14)	09352-50901-600	HOSE
(15)	09352-70103-600	HOSE 7X10.2X600
(16)	09367-08005	3 WAY
(17)	09401-08411	CLIP
(18)	17920-17G00	BRACKET COMP,RS
(19)	01550-06103	BOLT
(20)	17680-50F10	SWITCH COMP,FAN
(21)	17689-50F00	273 O RING
(22)	17662-02F11	CONNECTOR,THERM
(23)	17663-17G00	CAP,THERMOSTAT
(24)	17670-06G50	THERMOSTAT,WAT
(25)	01550-06163	BOLT
(26)	17856-19F00	HOSE,CONNECTOR
(27)	09401-12409	CLAMP
(28)	13650-57F00	SENSOR,WATER TE
(29)	09168-12017	GASKET,12X17X1

(30-1)	09402-28511	CLAMP
(30-2)	09402-28511	CLAMP
(31)	17855-17G00	HOSE,CONDUCTION
(32)	17791-24D00	CONDUCTION COMP
(33)	17790-17G10	BRACKET COMP,CO
(34)	01550-06123	BOLT
(35)	01550-06103	

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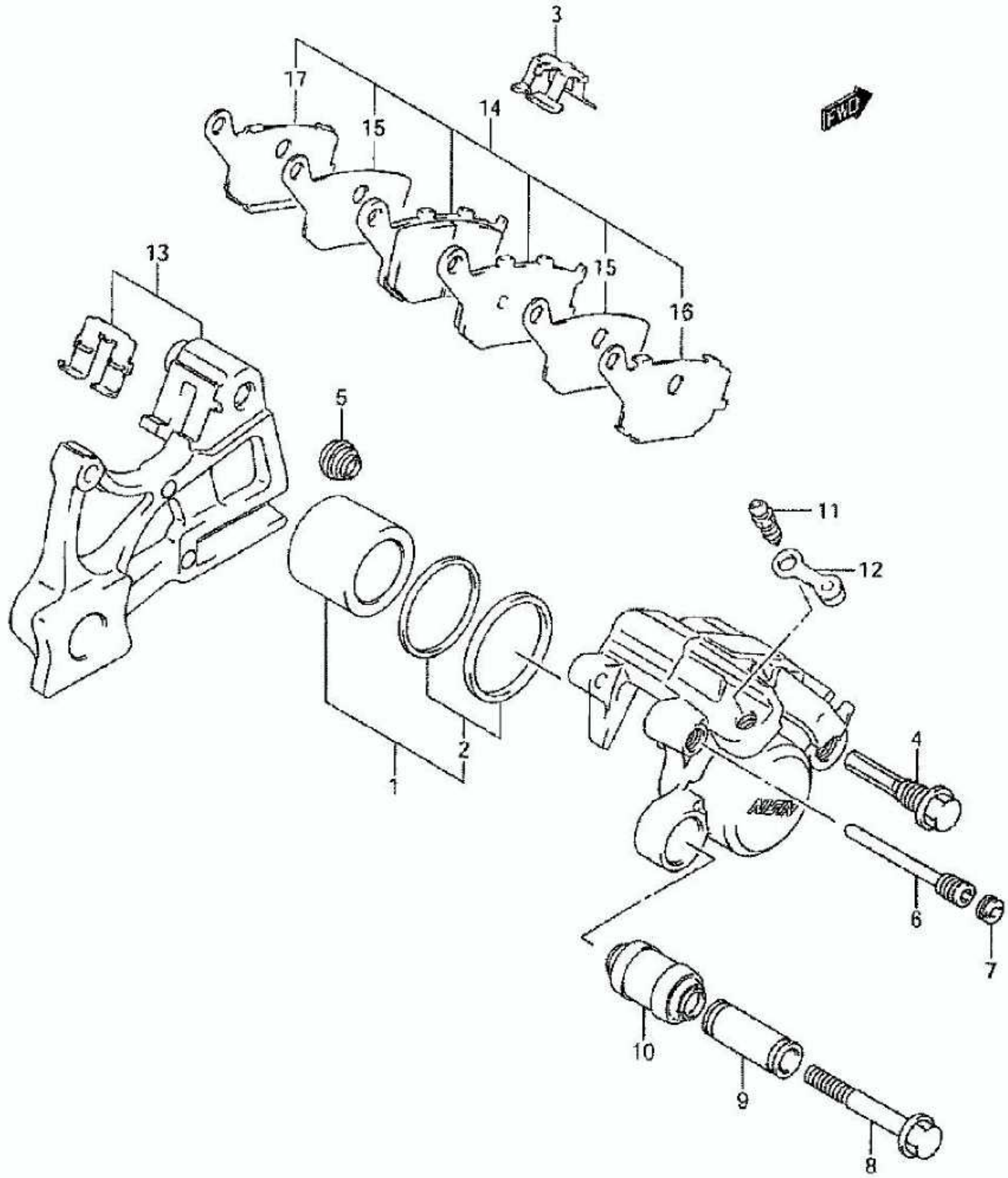
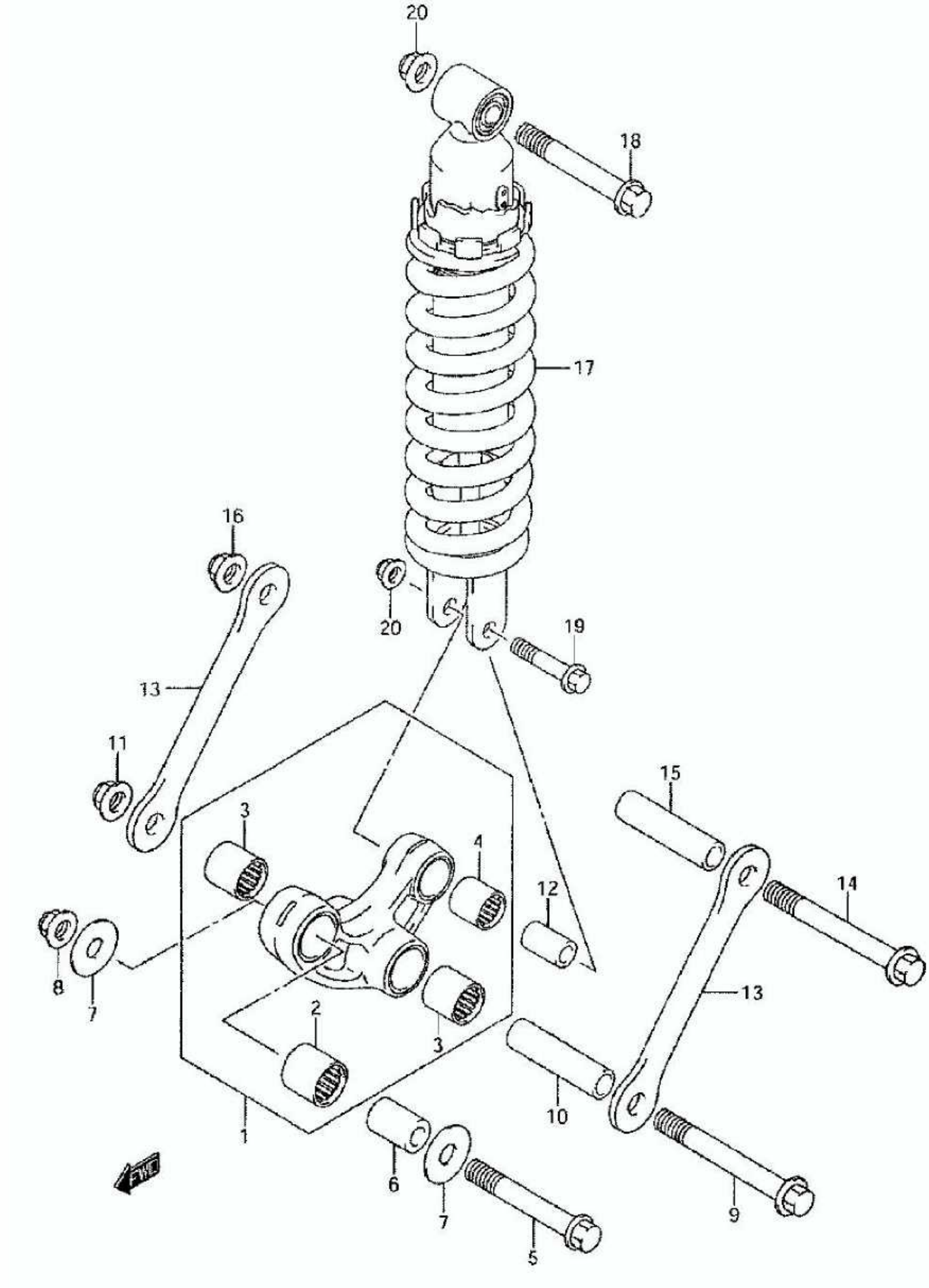
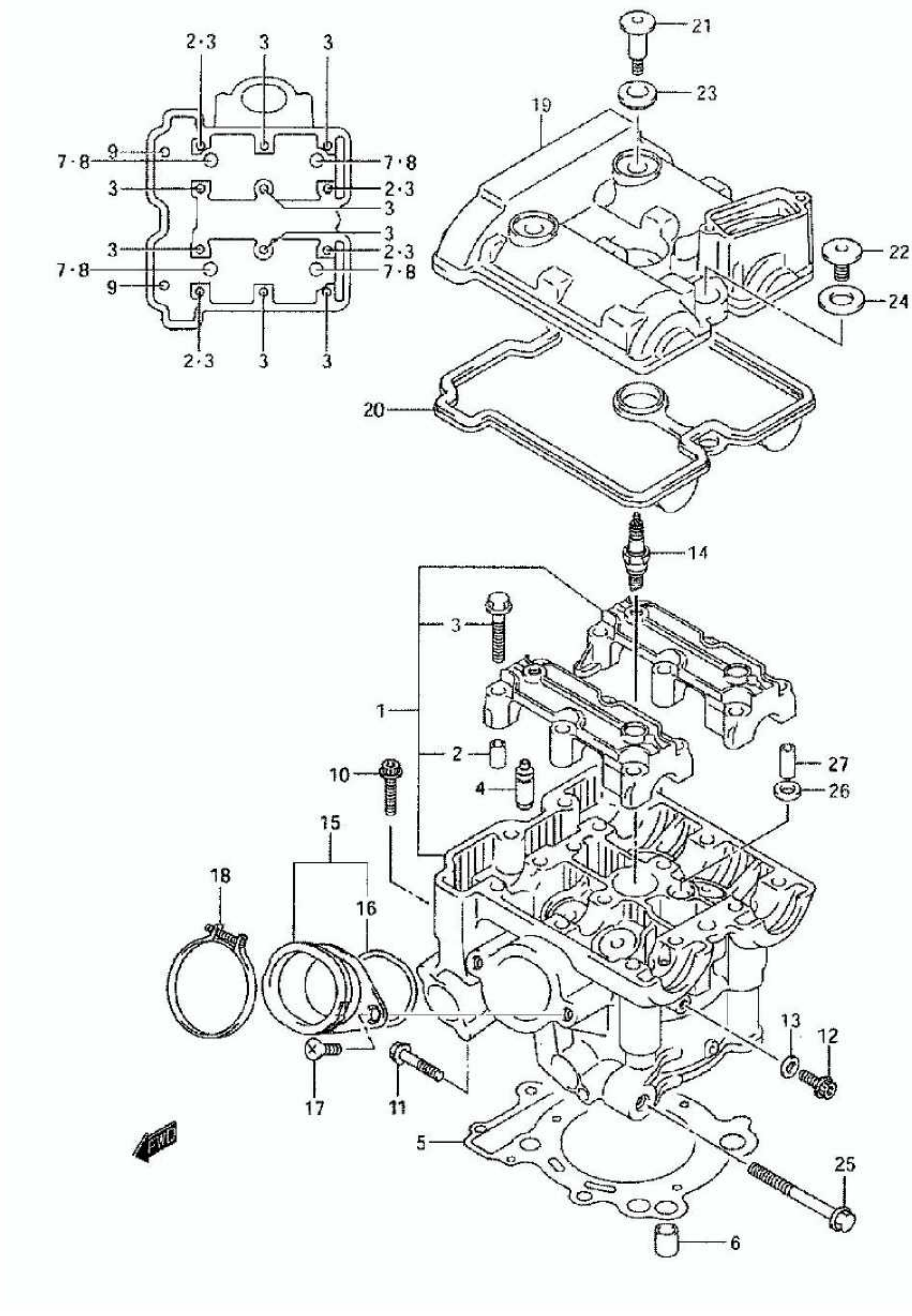


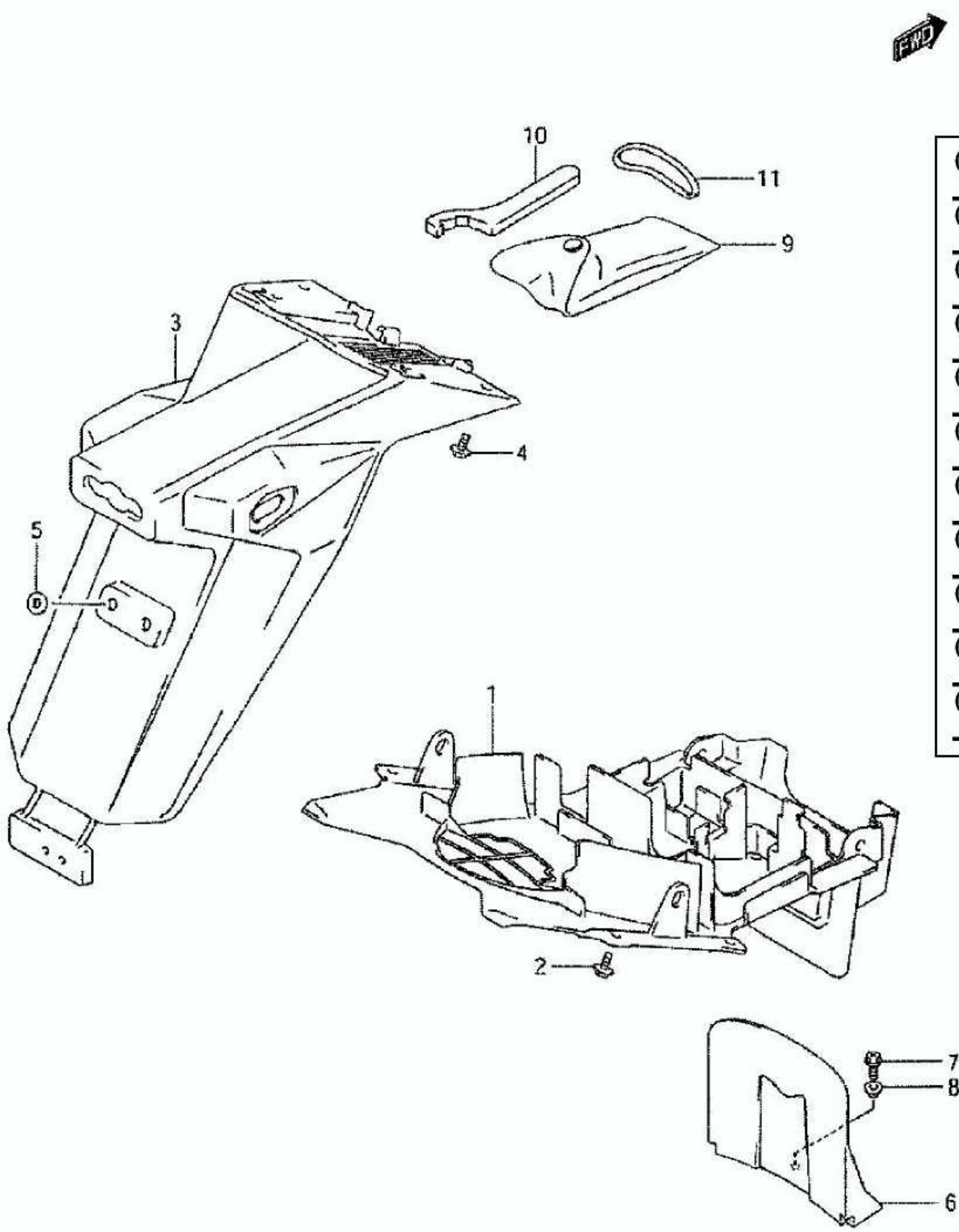
(-)	69100-17G00-999 **CALIPER ASSY,RE**
(1)	69100-04810 **273 PISTON SET**
(2)	69100-04820 **273 273 SEAL SET, PISTO**
(3)	69115-06G00 **273 SPRING,PAD**
(4)	69105-04F00 **273 BOLT**
(5)	59303-14500 **273 BOOT**
(6)	69141-40F00 **273 PIN,PAD**
(7)	59146-21E10 **273 PLUG,PIN**
(8)	69182-04F00 **273 BOLT**
(9)	69185-04F00 **273 SLEEVE**
(10)	69186-04F00 **273 BOOT,SLEEVE**
(11)	59121-01A00 **273 BLEEDER**
(12)	59122-01A00 **273 CAP BLEEDER**
(13)	69150-17G00 **273 BRACKET**
(14)	69100-06830 **PAD & RETAINER**
(15)	69132-06G00 **273 INSULATOR**
(16)	69133-06G00 **273 RETAINER**
(17)	69134-06G00 **273 RETAINER**



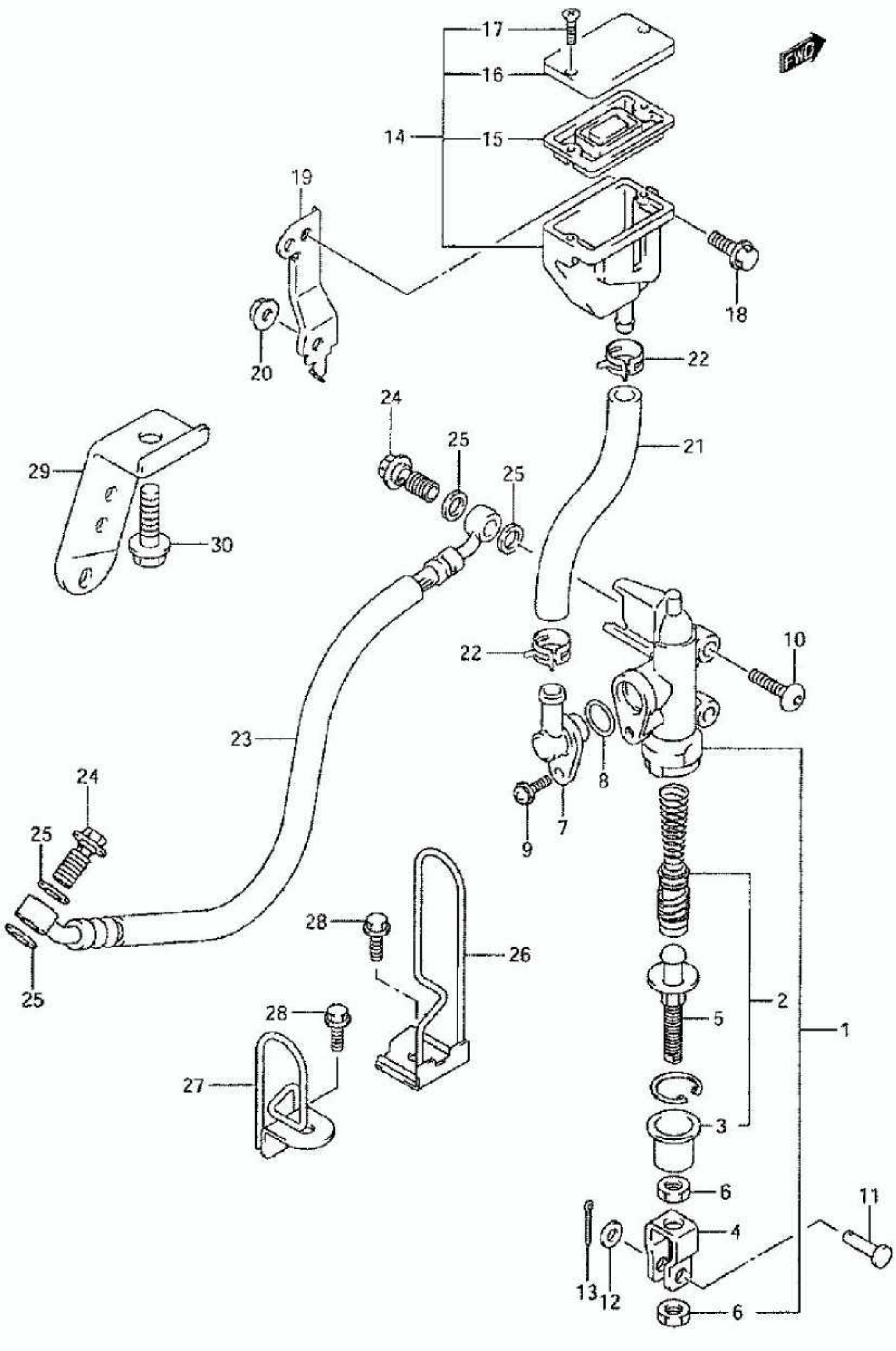
(1)	62600-17850	LEVER SET,REAR
(2)	09263-20073	273 RN 20X27X30BRG2
(3)	09263-17039	273 RN 17X24X20 BRG
(4)	09263-17034	273 RN 17X24X26 BRG
(5)	62658-19F00	BOLT,RR CUSHION
(6)	62684-12C00	SPACER,RR CUSHI
(7)	09160-12037	WASHER PRY DRIV
(8)	08319-31128	NUT 12MM
(9)	09103-12034	BOLT,L:96
(10)	62626-17G00	SPACER,RR CUSHI
(11)	08319-31128	NUT 12MM
(12)	62684-40A10	SPACER,RR CUSHI
(13)	62641-17G00	ROD,RR CUSHION
(14)	09103-12034	BOLT,L:96
(15)	62626-17G00	SPACER,RR CUSHI
(16)	08319-31128	NUT 12MM
(17-1)	62100-17G00-28W	UNAVAILABLE
(17-2)	62100-17G10-28W	UNAVAILABLE
(17-3)	62100-17G20-28W	UNAVAILABLE
(17-4)	62100-17G30-28W	ABSORBER ASSY,R
(18)	09103-10033	BOLT ENGINE MOU
(19)	09103-10126	BOLT
(20)	09159-10058	NUT



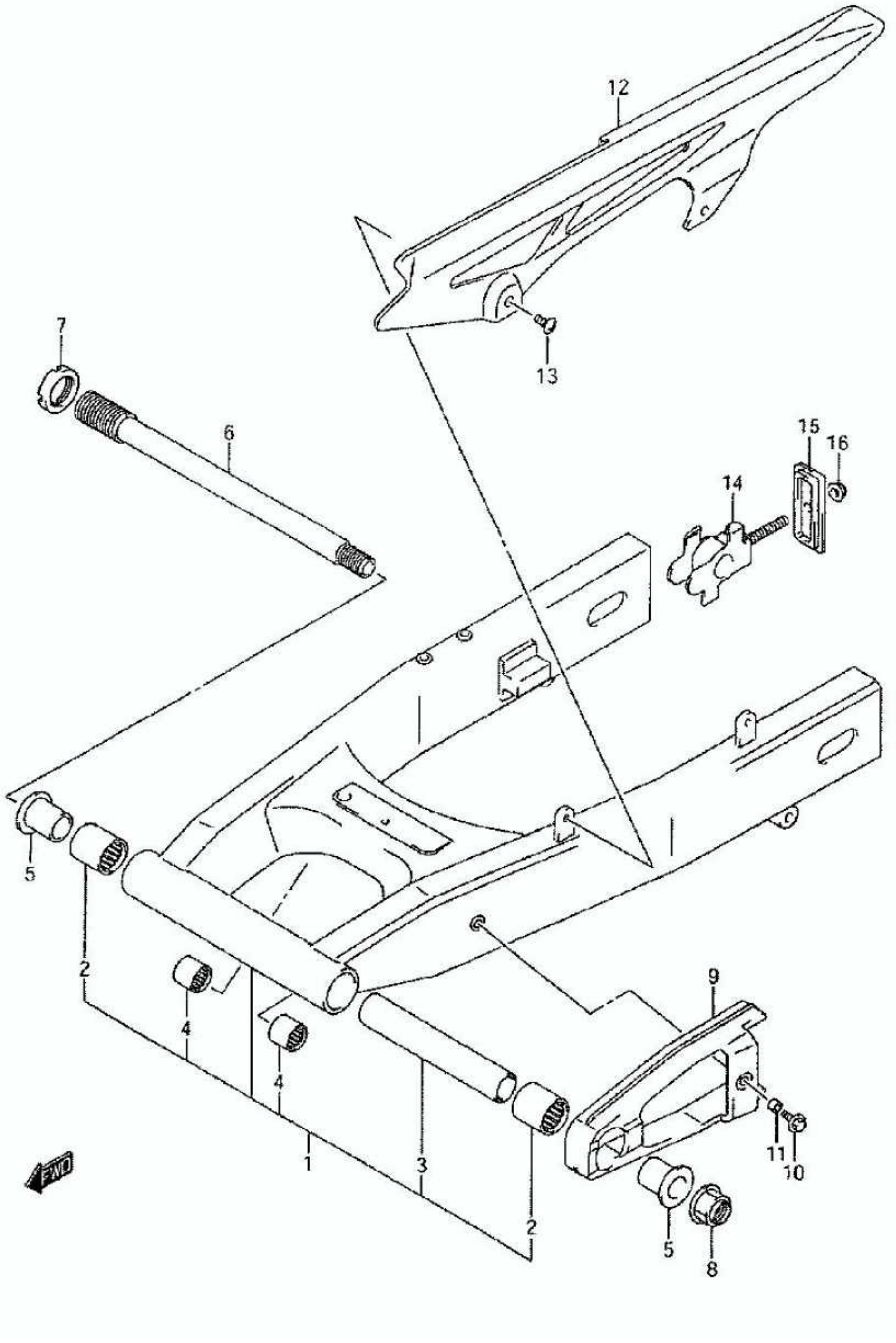
(1)	11103-17G00	HEAD ASSY,CYLIN
(2)	09206-08001	273 COVER DOWEL PIN
(3)	09103-06026	273 CAM SFT HOUSING
(4)	11115-18D72	GUIDE,VALVE
(5)	11141-20F00	GASKET,CYLINDER
(6)	04211-13189	PIN
(7)	09160-10082	WASHER
(8)	09103-10272	BOLT,CYLINDER H
(9)	09103-06103	BOLT 6X70
(10)	07120-06403	BOLT
(11)	01550-10557	BOLT
(12)	07120-06123	BOLT
(13)	09168-06023	GASKET
(14-1)	09482-00456	SPARK PLUG CR8E
(14-2)	09482-00457	SPARK PLUG U24E
(14-3)	09482-00458	SPARK PLUG CR9E
(14-4)	09482-00459	SPARK PLUG U27E
(14-5)	09482-00516	SPARK PLUG CR7E
(14-6)	09482-00515	SPARK PLUG U22E
(15)	13102-17G00	PIPE ASSY,INTAK
(16)	09280-46006	273 O-RING
(17)	02122-06163	SCREW 6X16
(18)	09402-62208	Discontinued
(19)	11172-17G00	COVER,CYLINDER
(20)	11173-19F01	GASKET,CYLINDER
(21)	09106-07009	BOLT,L:5.5
(22)	09106-07010	BOLT,L:19
(23)	09161-11008	WASHER
(24)	11192-13E00	CUSHION,HEAD CO
(25)	09103-10148	BOLT 10 X 110
(26)	11182-35F00	GASKET,2ND AIR
(27)	09206-08007	PIN,6.2X8X16



(1)	63111-16G00-291	FENDER,REAR FRO
(2)	09116-06098	BOLT 6X14
(3)	63112-16G10-291	FENDER,REAR REA
(4)	09116-06098	BOLT 6X14
(5)	08322-01063	WASHER
(6)	63421-16G00	MUD GUARD,RR FE
(7)	02162-06163	SCREW
(8)	09169-06071	WASHER
(9)	09800-21035	TOOL ASSY
(10)	09822-00004	CLAMP WRENCH
(11)	09280-61002	0 RING



(1)	69600-16G00	CYLINDER ASSY,R
(2)	69600-34820	273 PISTON/CUP SET
(3)	69691-00A00	273 273 BOOT
(4)	69692-27A30	273 YOKE
(5)	69670-48B00	273 ROD,PUSH
(6)	69693-05A00	273 NUT
(7)	69672-05A00	273 CONNECTOR
(8)	69686-34200	273 O RING CONNECTO
(9)	02112-74123	273 SCREW
(10)	09139-06028	SCREW 6X20
(11)	09200-06037	PIN
(12)	08322-01063	WASHER
(13)	04111-20158	20 X 15 COTTER
(14)	69740-01D02	TANK ASSY,REAR
(15)	59667-04700	273 DIAPHRAGM,MASTE
(16)	59669-05D00	273 CAP,MASTER CYLI
(17)	69689-04A00	273 SCREW
(18)	09103-06222	BOLT,RESERVOIR
(19)	69750-16G00	BRACKET,RR RSVR
(20)	09159-10111	NUT,RR RESERVOI
(21-1)	69731-16G10	UNAVAILABLE
(21-2)	69731-16G00	HOSE,RR RESERVO
(22)	09401-13417	CLIP
(23-1)	69480-16G10	UNAVAILABLE
(23-2)	69480-16G00	HOSE,REAR BRAKE
(24)	09360-10042	BOLT
(25)	09161-10009	WASHER
(26)	69260-16G00	GUIDE,RR BRAKE
(27)	69270-16G00	UNAVAILABLE
(28)	01547-06163	BOLT
(29-1)	43571-17G00	REINF,FOOTREST
(29-2)	43571-17G10	REINF,FOOTREST
(30)	01550-08203	HEX BOLT 8X20



(1-1)	61000-17G00 UNAVAILABLE
(1-2)	61000-17G10 SWINGINGARM ASS
(2)	09263-25059 273 RN 25X33X35 BRG
(3)	09180-20113 273 SPACER,20.8X27.
(4)	09263-17039 273 RN 17X24X20 BRG
(5)	61251-31E00 SPACER,RR SWGAR
(6)	61211-17G00 SHAFT,RR SWGARM
(7)	61214-19F00 NUT,RR SWGARM P
(8)	08319-31188 NUT 18MM
(9)	61273-17G00 BUFFER,CHAIN TO
(10)	09116-06152 BOLT
(11)	09180-06306 SPACER,6.5X9X5
(12)	61310-19F00 CASE COMP,CHAIN
(13)	09139-06083 SCREW
(14)	61410-17G00 ADJUSTER,CHAIN
(15)	61421-17G00 GUIDE,CHAIN ADJ
(16)	08319-31087

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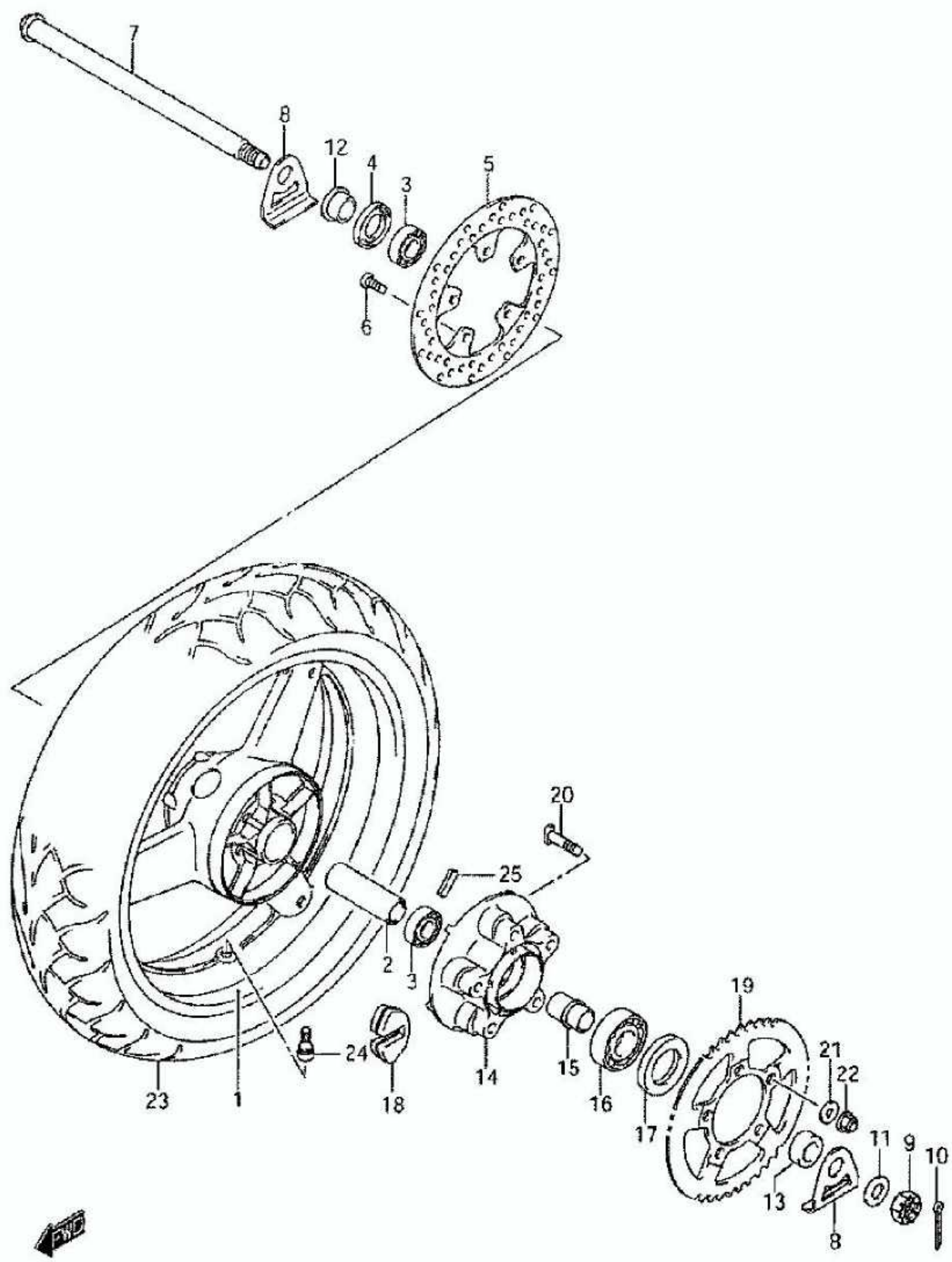
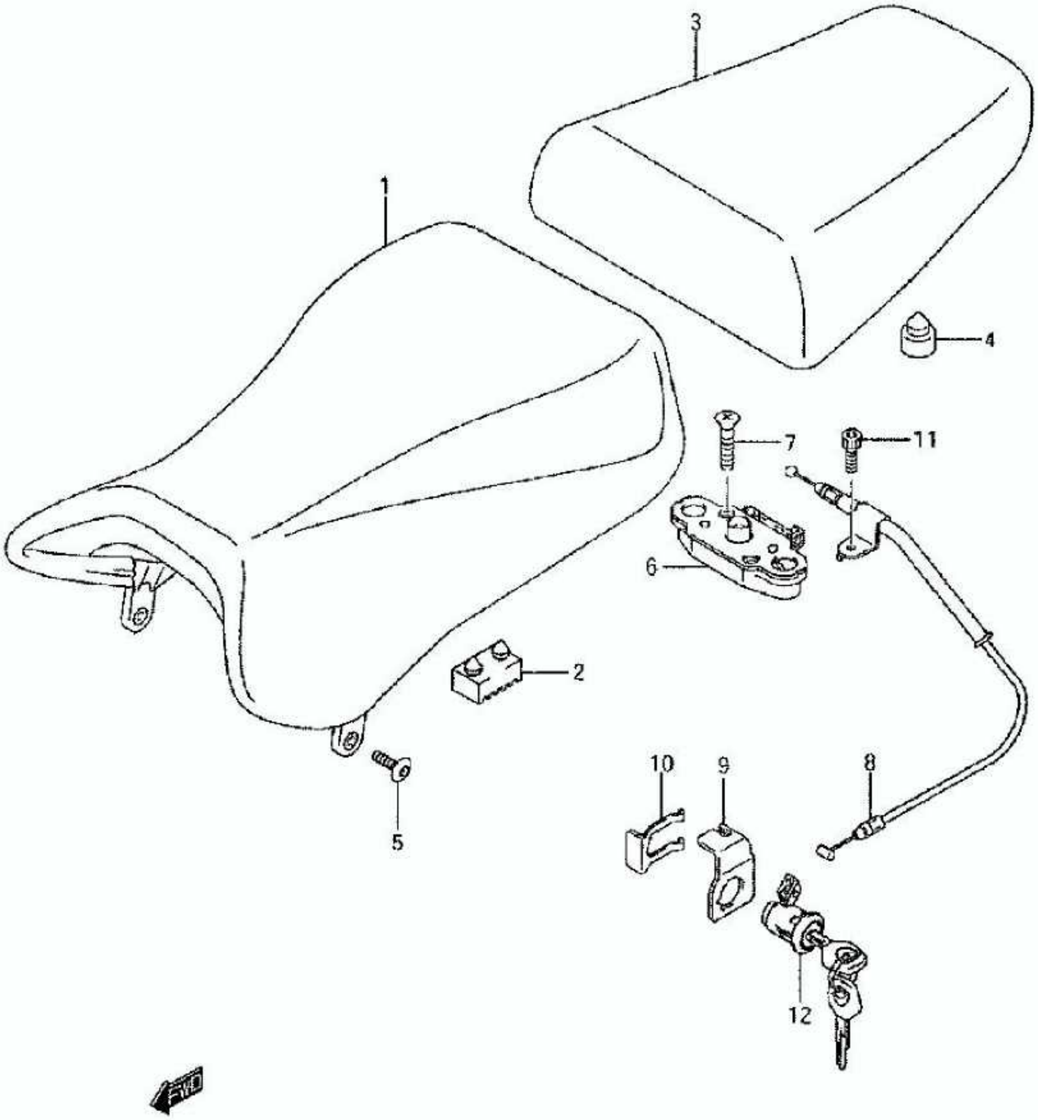
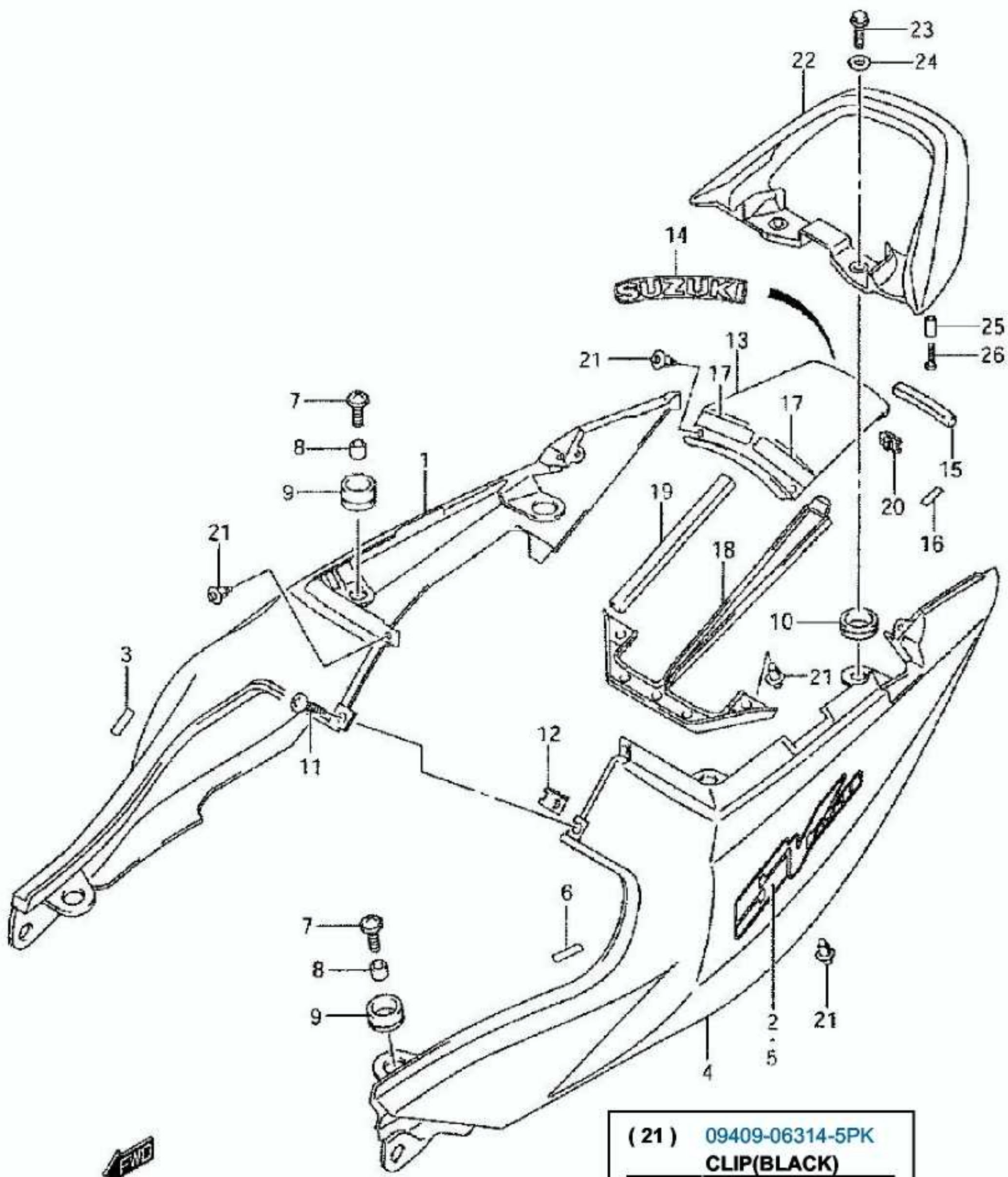


(1)	64111-08F10-Y6G	Discontinued
(2)	09180-20062	RR HUB SPACER
(3)	09262-20042	B1 20X47X14 BEA
(4)	09285-28001	OIL SEAL SPROCK
(5)	69211-40F10	DISC,REAR BRAKE
(6)	09106-08148	BOLT,8X33
(7)	64711-17G00	UNAVAILABLE
(8)	61445-17G00	WASHER,CHAIN AD
(9)	08314-40187	NUT
(10)	04111-40408	40 X 40 COTTER
(11)	09160-18030	WASHER,18.5X28X
(12)	64741-22D00	SPACER,REAR AXL
(13)	64751-26E00	SPACER,REAR AXL
(14)	64611-19F00	DRUM,RR SPROCKE
(15)	64733-27A00	RETAINER,REAR H
(16)	09262-25073	B1 25X62X17 BEA
(17)	09285-35001	SEAL, OIL 35X62
(18)	64651-27A01	ABSORBER, SHOCK
(19-1)	64511-32C00	SPROCKET,REAR,N
(19-2)	64511-33C01	SPROCKET,REAR,N
(20)	09119-10043	BOLT
(21)	09160-10506	WASHER,10.5X22X
(22)	08319-31107	NUT
(23)	65110-17G00	TIRE,REAR,160/6
(24)	43130-24A00	VALVE ASSY
(25-1)	55411-00A00	BALANCER,WHEEL,
(25-2)	55412-00A01	Discontinued

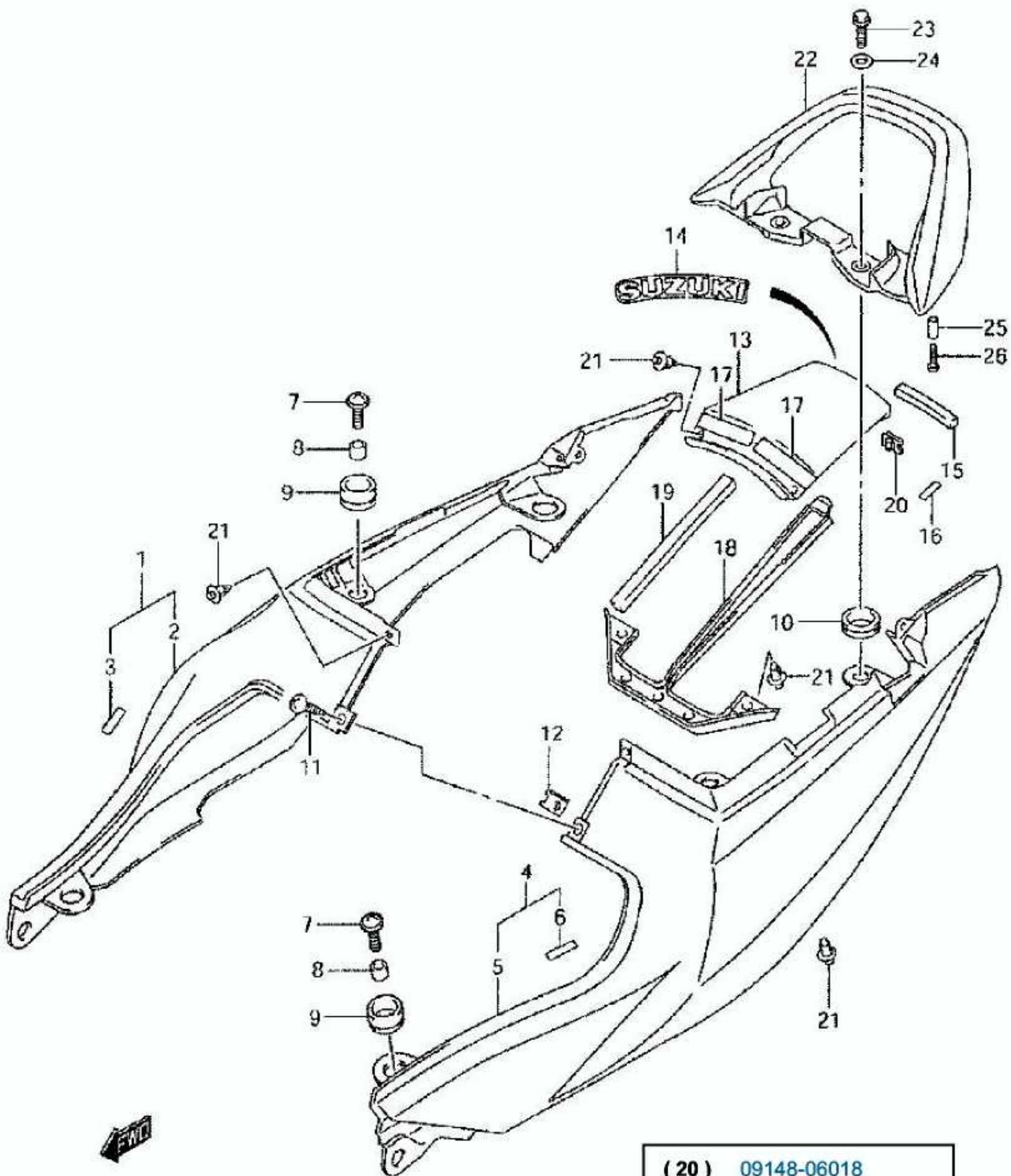


(1)	45100-16G20-W05	SEAT ASSY
(2)	45149-42F00	273 CUSHION
(3)	45300-16G00-W05	SEAT ASSY,PILLI
(4)	09321-10019	273 CUSHION
(5)	09106-06064	BOLT L:18
(6)	45220-20A01	BRACKET SEAT SU
(7)	02122-06303	SCREW
(8)	45280-16G00	CABLE,SEAT LOCK
(9)	45288-14F00	GUIDE,SEAT LOCK
(10)	45289-11F00	PLATE,SEAT LOCK
(11)	07130-06123	BOLT
(12)	95700-14810	LOCK SET,SEAT



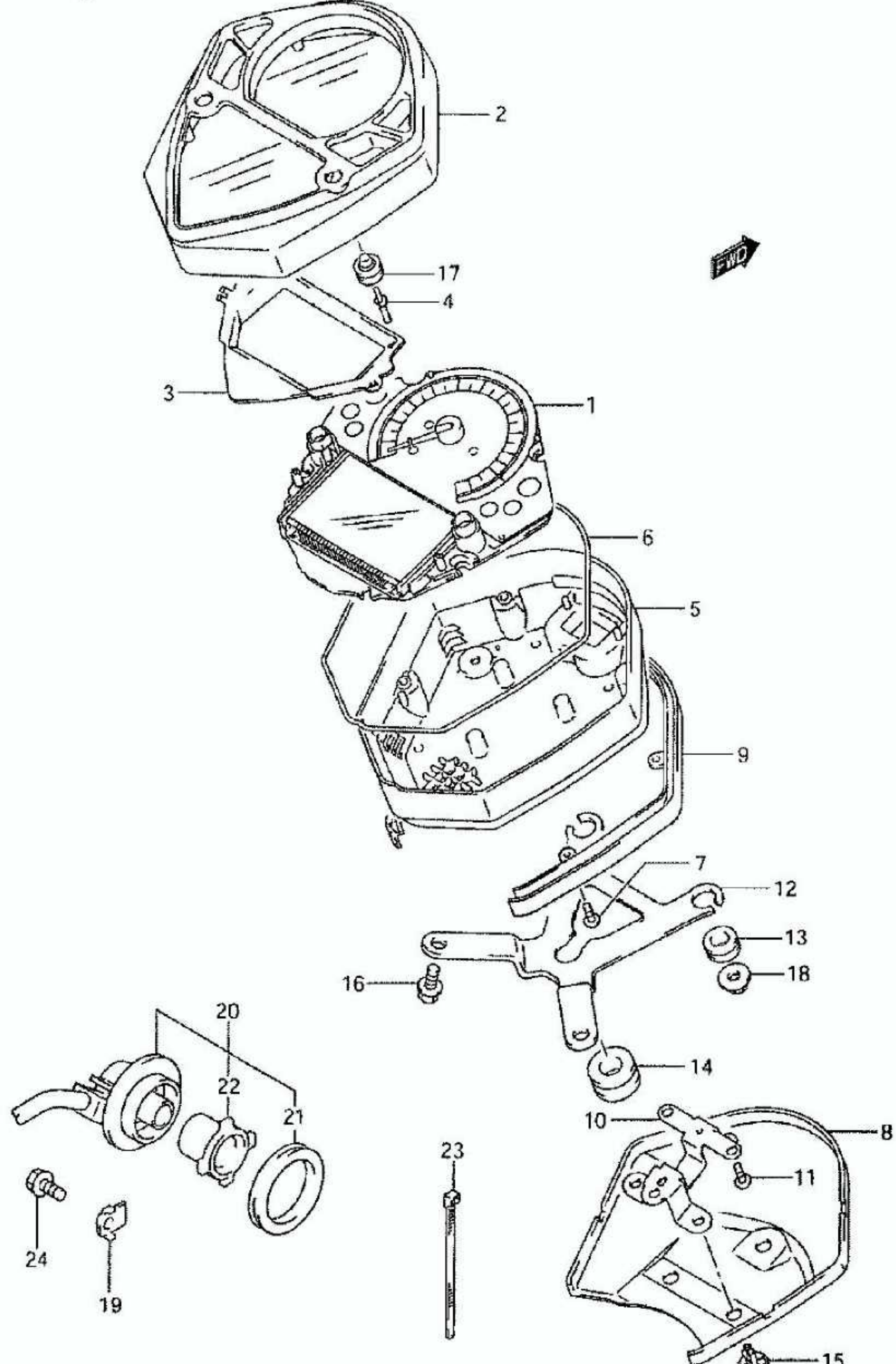
Ref.	Part No.	Description
(1-1)	45501-17G00-YC2	UNAVAILABLE
(1-2)	45501-17G00-YD8	UNAVAILABLE
(1-3)	45501-17G00-33J	UNAVAILABLE
(2-1)	68161-17G00-ML6	273 UNAVAILABLE
(2-2)	68161-17G00-ML4	273 UNAVAILABLE
(2-3)	68161-17G00-ML5	273 UNAVAILABLE
(3)	45516-42F00	273 TAPE,SEAT TAIL
(4-1)	45502-17G00-YC2	UNAVAILABLE
(4-2)	45502-17G00-YD8	UNAVAILABLE
(4-3)	45502-17G00-33J	UNAVAILABLE
(5-1)	68161-17G00-ML6	273 UNAVAILABLE
(5-2)	68161-17G00-ML4	273 UNAVAILABLE
(5-3)	68161-17G00-ML5	273 UNAVAILABLE
(6)	45516-42F00	273 TAPE,SEAT TAIL
(7)	09136-06105	SCREW
(8)	09180-06286	SPACER,6.5X10X9
(9)	09320-10045	CUSHION
(10)	09320-20010	CUSHION,SEAT TA
(11)	03241-15123	SCREW
(12)	09148-05038	NUT,STEERING CO
(13-1)	45503-16G00-YC2	COVER,SEAT TAIL
(13-2)	45503-16G00-YD8	COVER,SEAT TAIL
(13-3)	45503-16G00-33J	UNAVAILABLE
(14-1)	68161-16G00-YD8	273 EMBLEM,"SUZUKI"
(14-2)	68161-16G00-YU8	273 EMBLEM,"SUZUKI"
(15)	45518-16G00	273 CUSHION,SEAT TA
(16)	45517-16G00	273 TAPE,SEAT TAIL
(17)	45516-42F00	273 TAPE,SEAT TAIL
(18-1)	45514-16G00-YC2	COVER,SEAT TAIL
(18-2)	45514-16G00-YD8	COVER,SEAT TAIL
(18-3)	45514-16G00-33J	UNAVAILABLE
(19)	45519-16G00	CUSHION,SEAT TA
(20)	09148-06018	NUT

Ref.	Part No.	Description
(21)	09409-06314-5PK	CLIP(BLACK)
(22-1)	46211-16G00-YC2	HANDLE,PILLION
(22-2)	46211-16G00-YD8	HANDLE,PILLION
(22-3)	46211-16G00-33J	UNAVAILABLE
(23)	01551-08303	BOLT
(24)	09160-08501	WASHER,8.5X24X2
(25)	09180-06271	SPACER,6.5X9X18
(26)	09139-06112	SCREW,PILLION H



(20)	09148-06018 NUT
(21)	09409-06314-5PK CLIP(BLACK)
(22-1)	46211-16G00-YC2 HANDLE,PILLION
(22-2)	46211-16G00-YD8 HANDLE,PILLION
(22-3)	46211-16G00-YAV HANDLE,PILLION
(23)	01551-08303 BOLT
(24)	09160-08501 WASHER,8.5X24X2
(25)	09180-06271 SPACER,6.5X9X18
(26)	09139-06112 SCREW,PILLION H

(1-1)	45501-16G10-YC2 COVER SET, SEAT
(1-2)	45501-16G10-YD8 COVER SET, SEAT
(1-3)	45501-16G10-YAV UNAVAILABLE
(2-1)	45511-16G00-YC2 273 COVER,SEAT TAIL
(2-2)	45511-16G00-YD8 273 COVER,SEAT TAIL
(2-3)	45511-16G00-YAV 273 COVER,SEAT TAIL
(3)	45516-42F00 273 TAPE,SEAT TAIL
(4-1)	45502-16G10-YC2 COVER SET, SEAT
(4-2)	45502-16G10-YD8 COVER SET, SEAT
(4-3)	45502-16G10-YAV UNAVAILABLE
(5-1)	45512-16G00-YC2 273 COVER,SEAT TAIL
(5-2)	45512-16G00-YD8 273 COVER,SEAT TAIL
(5-3)	45512-16G00-YAV 273 COVER,SEAT TAIL
(6)	45516-42F00 273 TAPE,SEAT TAIL
(7)	09136-06105 SCREW
(8)	09180-06286 SPACER,6.5X10X9
(9)	09320-10045 CUSHION
(10)	09320-20010 CUSHION,SEAT TA
(11)	03241-15123 SCREW
(12)	09148-05038 NUT,STEERING CO
(13-1)	45503-16G00-YC2 COVER,SEAT TAIL
(13-2)	45503-16G00-YD8 COVER,SEAT TAIL
(13-3)	45503-16G00-YAV COVER,SEAT TAIL
(14-1)	68161-16G00-YD8 273 EMBLEM,"SUZUKI"
(14-2)	68161-16G00-YU8 273 EMBLEM,"SUZUKI"
(15)	45518-16G00 273 CUSHION,SEAT TA
(16)	45517-16G00 273 TAPE,SEAT TAIL
(17)	45516-42F00 273 TAPE,SEAT TAIL
(18-1)	45514-16G00-YC2 COVER,SEAT TAIL
(18-2)	45514-16G00-YD8 COVER,SEAT TAIL
(18-3)	45514-16G00-YAV COVER,SEAT TAIL
(19)	45519-16G00 CUSHION,SEAT TA



(1-1)	34120-17G10 UNAVAILABLE
(1-2)	34120-17G00 UNAVAILABLE
(2)	34150-16G30 UNAVAILABLE
(3)	34125-16G00 PLATE,SPEEDOMET
(4)	34124-16G00 KNOB,SPEEDOMETE
(5)	34152-16G00 CASE,SPEEDOMETE
(6)	34153-16G00 UNAVAILABLE
(7)	34183-16G30 SCREW,SPEEDOMET
(8)	34156-16G30 UNAVAILABLE
(9)	34157-16G30 UNAVAILABLE
(10)	34195-16G30 UNAVAILABLE
(11)	34149-16B00 SCREW
(12)	34162-16G30 UNAVAILABLE
(13)	34996-43410 CUSHION METER
(14)	34955-13E00 CUSHION,GPS
(15)	09409-07332 CLIP
(16)	07120-06163 BOLT,MAGNETO ST
(17)	34126-16G00 COVER,SPEEDOMET
(18)	09159-05044 NUT
(19)	34938-14F00 GUIDE,SENSOR LE
(20)	34990-17G00 SENSOR,SPEED
(21)	09286-44001 273 SEAL
(22)	34983-21E00 273 ROTOR,SPEEDOMET
(23)	09407-14407 CLAMP
(24)	01547-06123 BOLT 6X12 BLK 8

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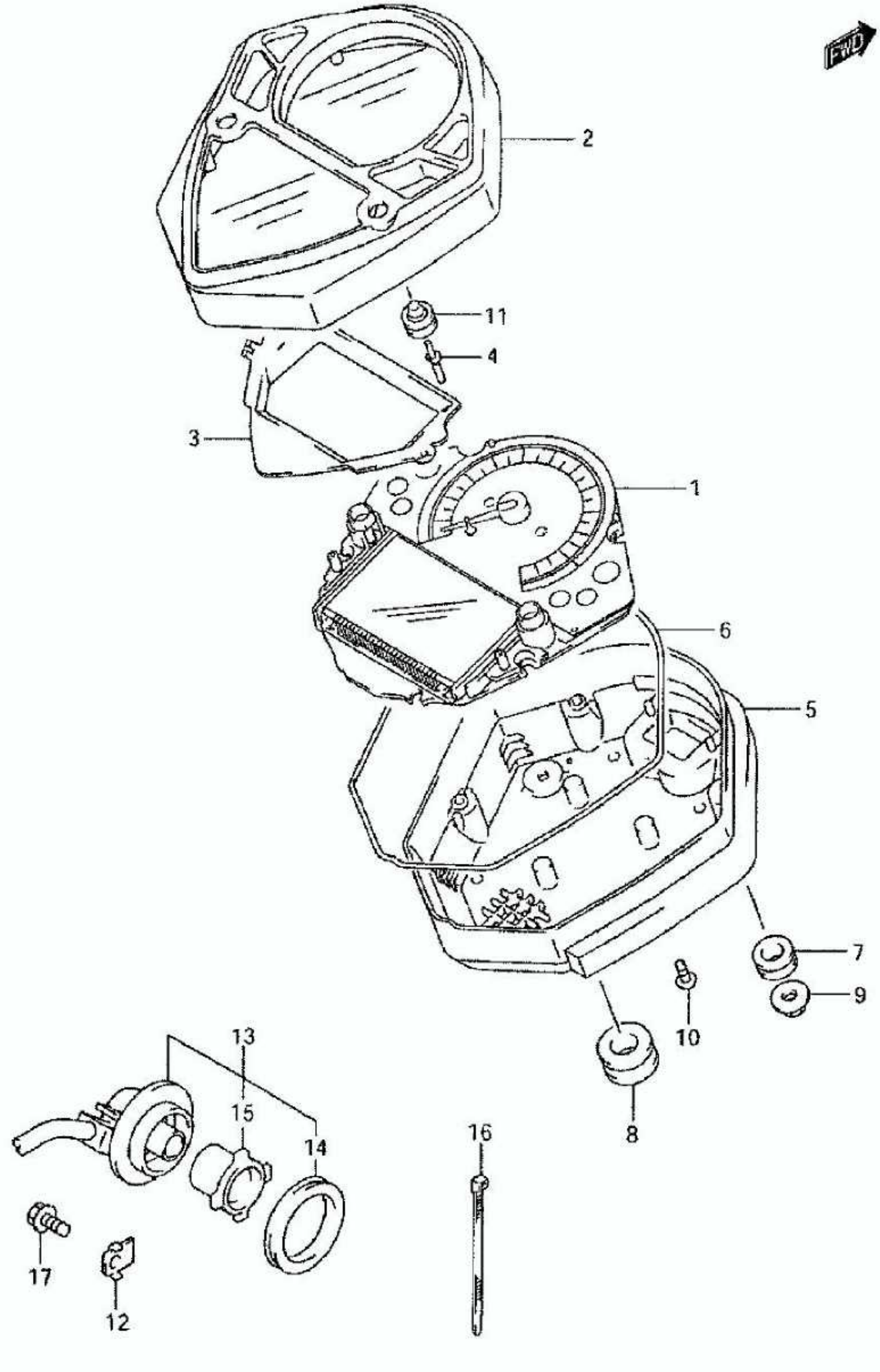
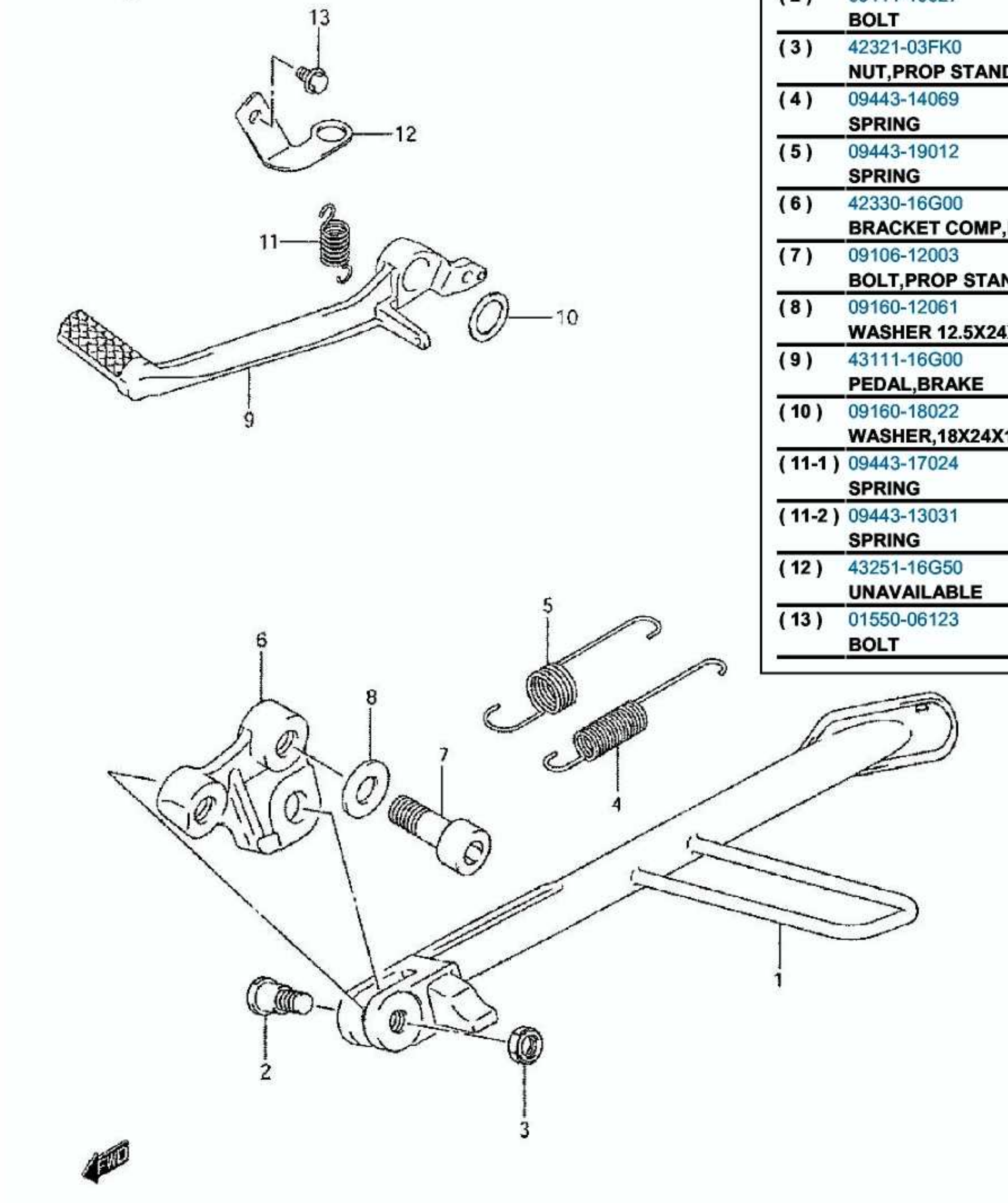
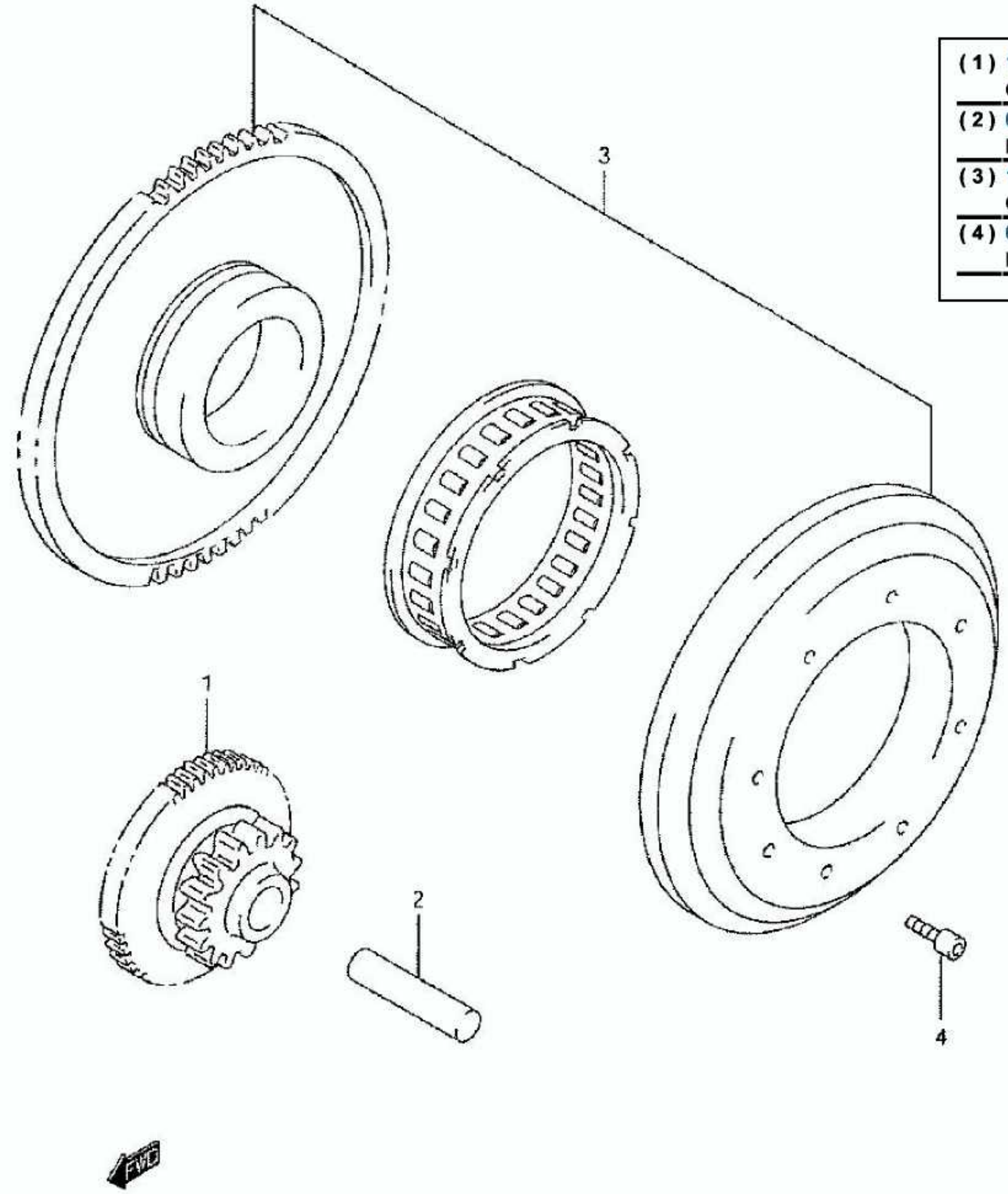


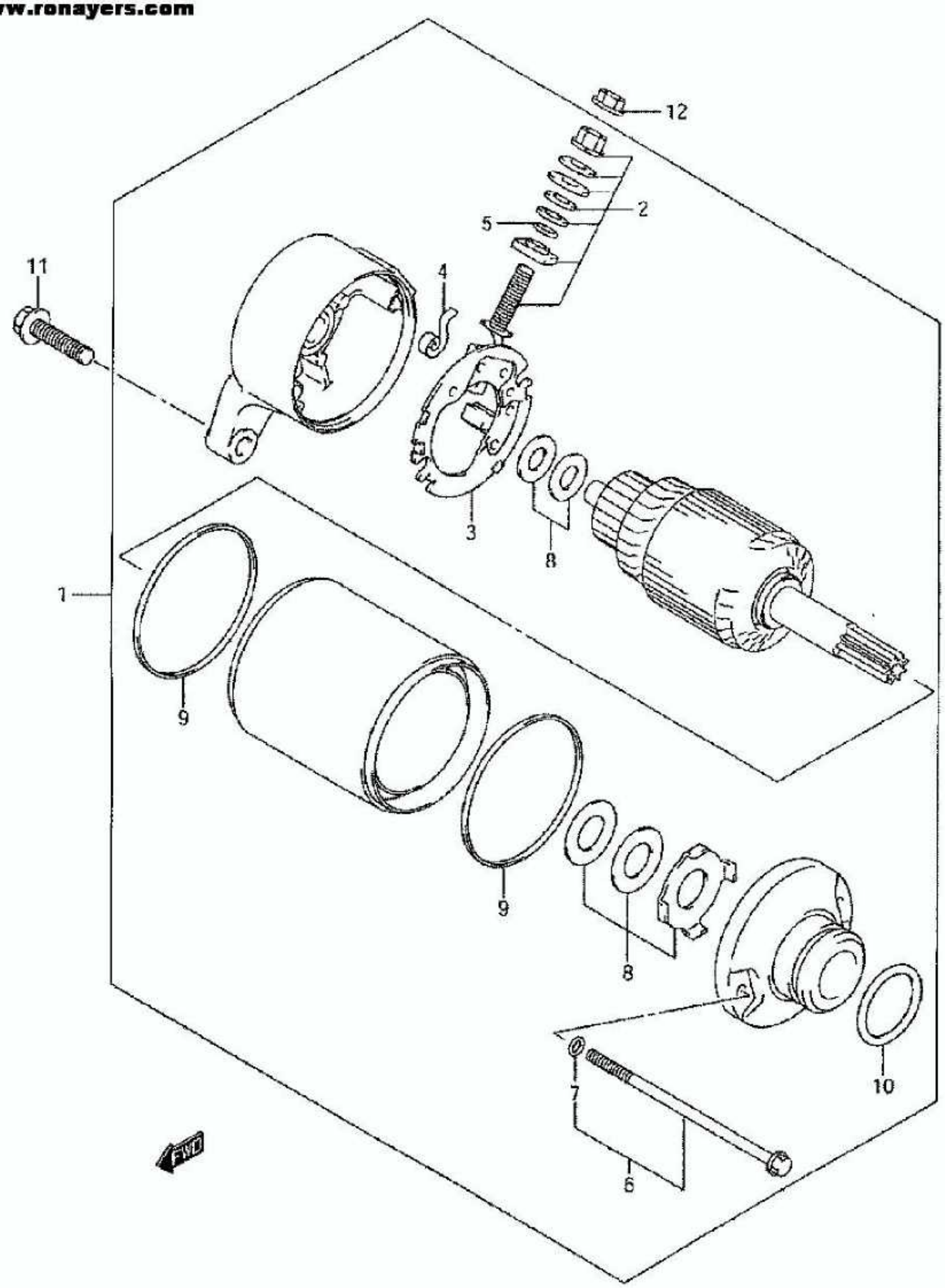
(1-1)	34120-17G10 UNAVAILABLE
(1-2)	34120-17G00 UNAVAILABLE
(2)	34150-16G00 CASE,SPEEDOMETE
(3)	34125-16G00 PLATE,SPEEDOMET
(4)	34124-16G00 KNOB,SPEEDOMETE
(5)	34152-16G00 CASE,SPEEDOMETE
(6)	34153-16G00 UNAVAILABLE
(7)	34189-32B00 CUSHION
(8)	34955-13E00 CUSHION,GPS
(9)	09159-05044 NUT
(10)	34183-16G30 SCREW,SPEEDOMET
(11)	34126-16G00 COVER,SPEEDOMET
(12)	34938-14F00 GUIDE,SENSOR LE
(13)	34990-17G00 SENSOR,SPEED
(14)	09286-44001 273 SEAL
(15)	34983-21E00 273 ROTOR,SPEEDOMET
(16)	09407-14407 CLAMP
(17)	01547-06123 BOLT 6X12 BLK 8



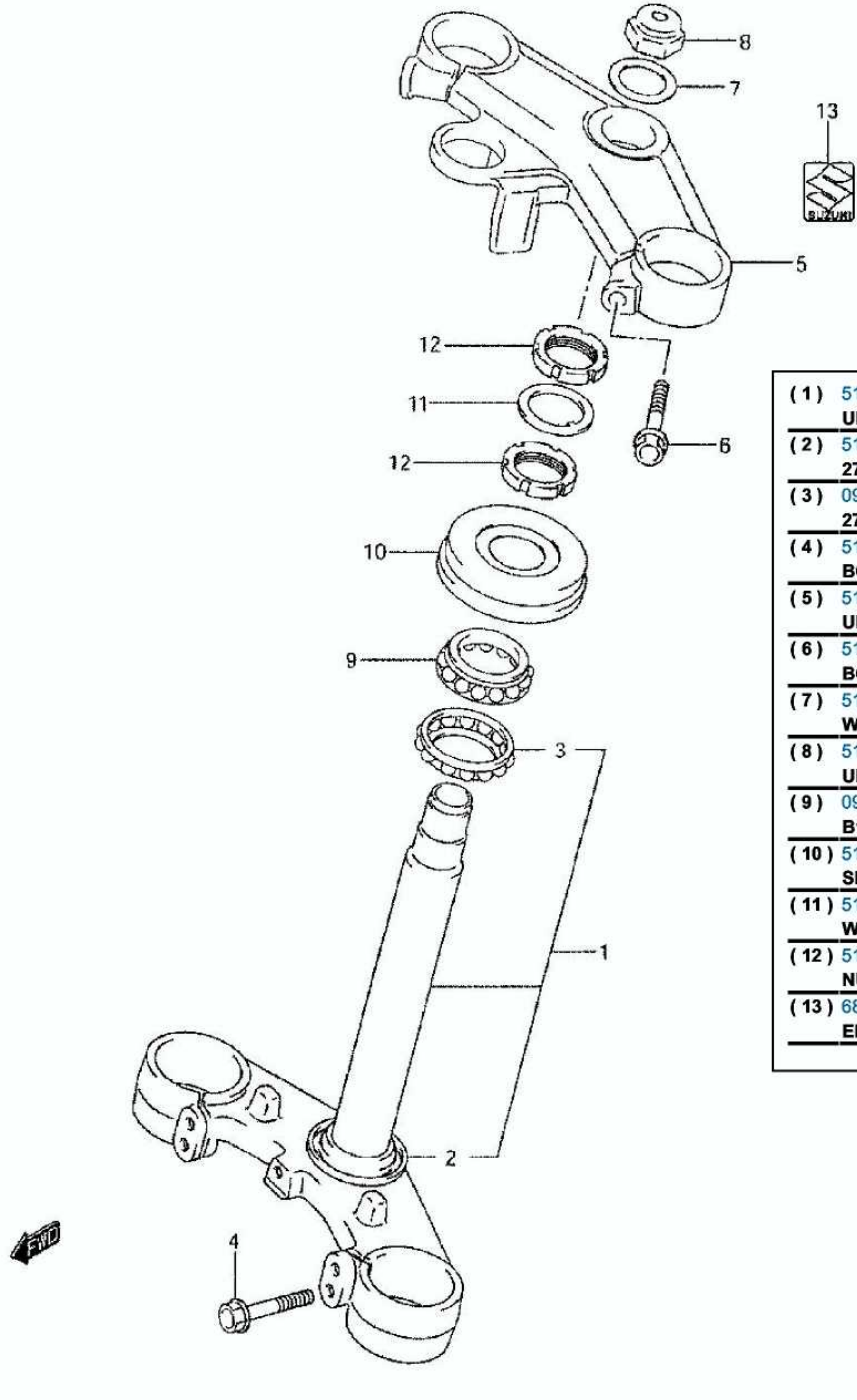
(1)	42310-17G00	STAND COMP,PROP
(2)	09111-10027	BOLT
(3)	42321-03FK0	NUT,PROP STAND
(4)	09443-14069	SPRING
(5)	09443-19012	SPRING
(6)	42330-16G00	BRACKET COMP,PR
(7)	09106-12003	BOLT,PROP STAND
(8)	09160-12061	WASHER 12.5X24X
(9)	43111-16G00	PEDAL,BRAKE
(10)	09160-18022	WASHER,18X24X1
(11-1)	09443-17024	SPRING
(11-2)	09443-13031	SPRING
(12)	43251-16G50	UNAVAILABLE
(13)	01550-06123	BOLT



(1)	12611-20F01	GEAR,STARTER ID
(2)	09206-12006	PIN,STARTER IDL
(3)	12600-06820	CLUTCH SET,STAR
(4)	09106-08095	BOLT



(1)	31100-19F00 MOTOR ASSY,STAR
(2)	31130-13E00 273 BRUSH,TERMINAL
(3)	31132-33E00 273 BRUSH HOLDER SE
(4)	31135-31300 273 SPRING BRUSH
(5)	31143-49040 273 O-RING
(6)	31280-19F00 273 SET BOLT ASSY
(7)	31156-13E00 273 273 O-RING
(8)	31170-19B10 273 SHIM SET,STARTI
(9)	31264-13E00 273 O-RING
(10)	09280-25002 273 O RING,D:3.1,ID
(11)	01547-06253 BOLT
(12)	08361-35068 NUT



(1)	51410-17G20 UNAVAILABLE
(2)	51644-12C00 273 SEAL,STEERING L
(3)	09267-30010 273 B1 BEARING,30X5
(4)	51328-03FK0 BOLT,8X40
(5)	51311-17G20 UNAVAILABLE
(6)	51328-03FK0 BOLT,8X40
(7)	51354-42E00 WASHER
(8)	51353-17G00 UNAVAILABLE
(9)	09267-30010 B1 BEARING,30X5
(10)	51643-33E00 SEAL,STEERING U
(11)	51641-33E00 WASHER,STEERING
(12)	51631-33E00 NUT,STEERING ST
(13)	68281-35F00 EMBLEM,"S"

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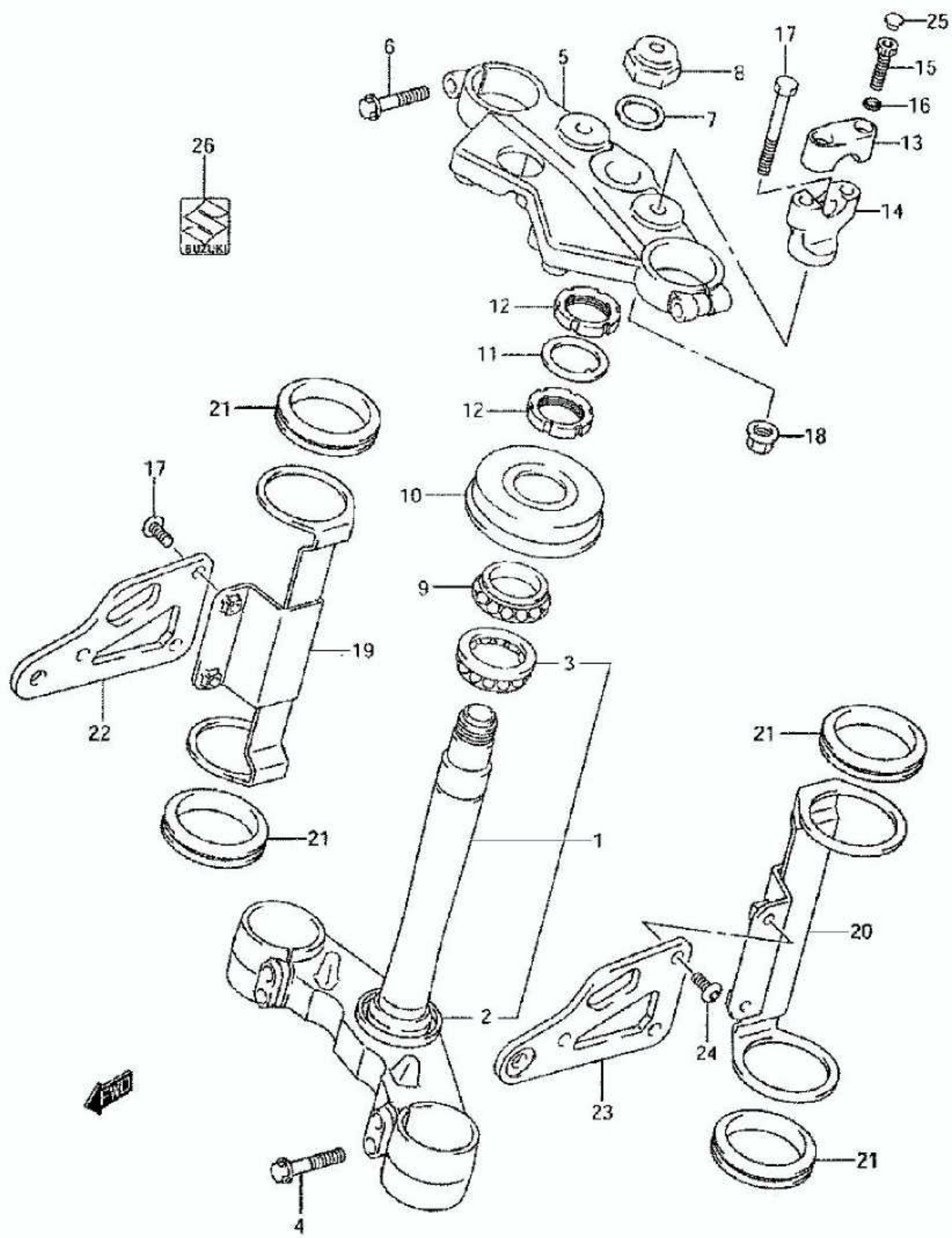
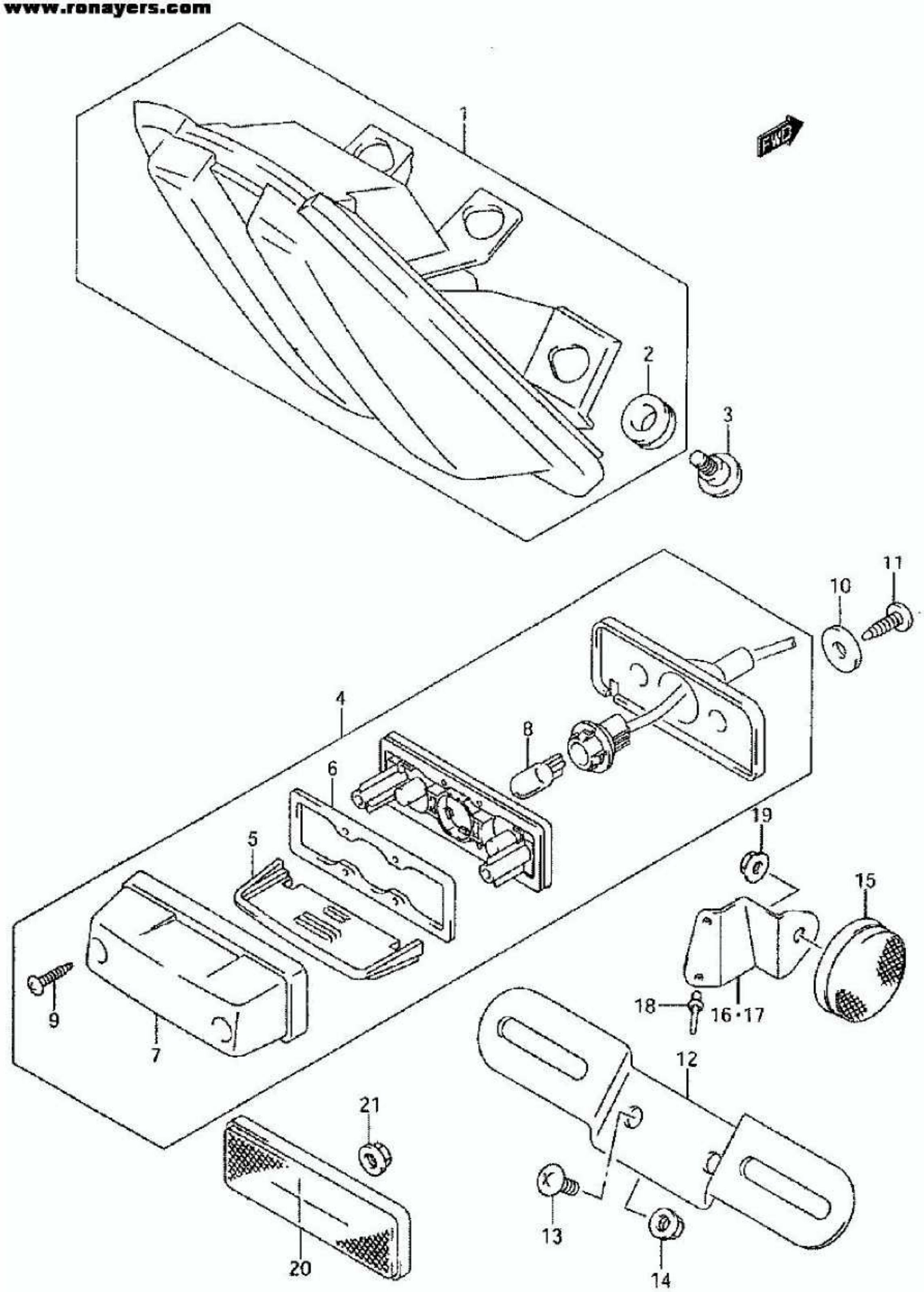
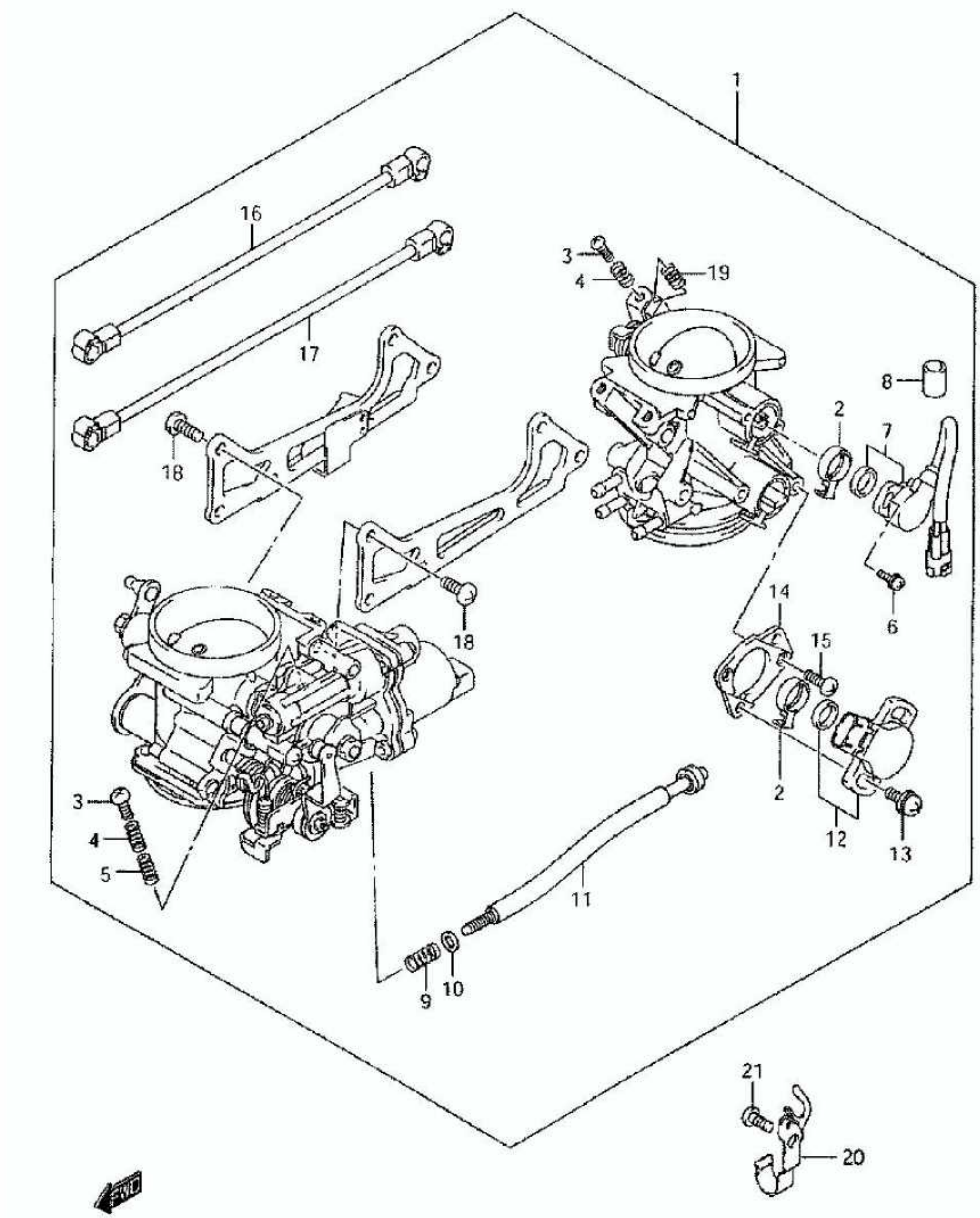


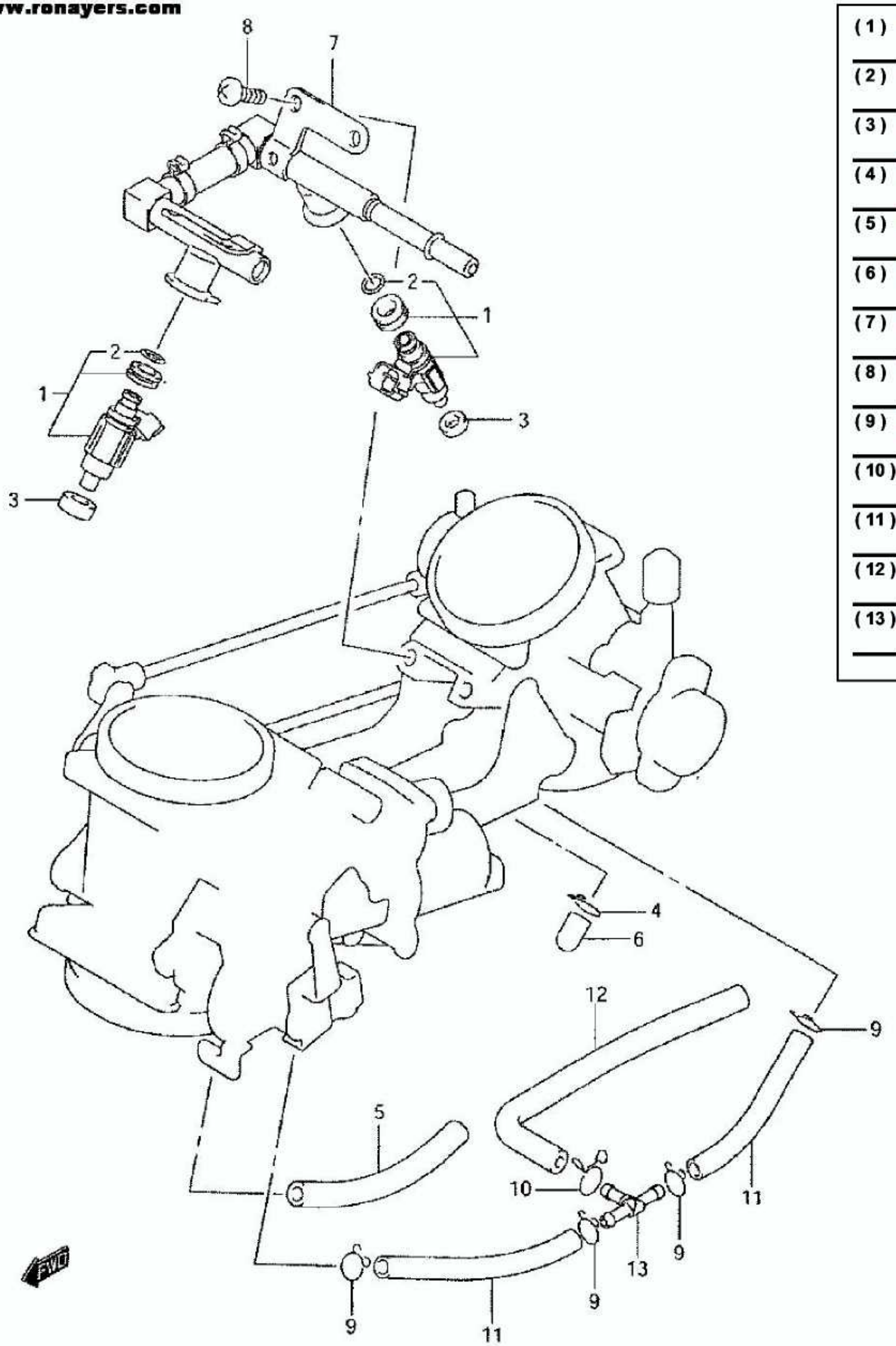
(1)	51410-17G00	UNAVAILABLE
(2)	51644-12C00	273 SEAL,STEERING L
(3)	09267-30010	273 B1 BEARING,30X5
(4)	51328-03FK0	BOLT,8X40
(5)	51311-17G00	UNAVAILABLE
(6)	51328-03FK0	BOLT,8X40
(7)	51354-42E00	WASHER
(8)	51353-17G00	UNAVAILABLE
(9)	09267-30010	B1 BEARING,30X5
(10)	51643-33E00	SEAL,STEERING U
(11)	51641-33E00	WASHER,STEERING
(12)	51631-33E00	NUT,STEERING ST
(13)	56211-17G00-13L	UNAVAILABLE
(14)	56221-17G00-13L	UNAVAILABLE
(15)	07130-08257	BOLT
(16)	09164-08015	WASHER HANDLEBA
(17)	56321-17G00	UNAVAILABLE
(18)	08319-31107	NUT
(19)	51530-17G00	UNAVAILABLE
(20)	51540-17G00	UNAVAILABLE
(21)	51553-38C00	DAMPER,HEAD LAM
(22)	51851-16G00	UNAVAILABLE
(23)	51861-16G00	UNAVAILABLE
(24)	09139-06030	SCREW
(25)	09250-06011	CAP
(26)	68281-35F00	EMBLEM,"S"



(1)	35710-16G30	LAMP ASSY,REAR
(2)	09320-10049	273 CUSHION
(3)	09139-06118	SCREW,HEADLAMP
(4)	35910-16G00	LAMP ASSY,LICEN
(5)	35912-16G00	273 LENS
(6)	35913-16G00	273 GASKET
(7)	35917-16G00	273 COVER
(8)	09471-12216	273 BULB
(9)	03211-04163	273 SCREW, L:16
(10)	09160-05501	WASHER
(11)	03541-05163	SCREW 5 X 16
(12)	35927-16G00	BRACKET,LICENSE
(13)	02142-06123	SCREW M6X1X12
(14)	08316-10063	NUT
(15)	35970-14A20	REFLECTOR ASSY,
(16)	35975-16G00	BRACKET,REAR SI
(17)	35976-16G00	BRACKET,REAR SI
(18)	09229-04050	RIVET
(19)	08316-10053	NUT
(20)	35970-07F00	REFLEX REFLECTO
(21)	08316-10053	NUT



(1-1)	13405-17G00 THROTTLE BODY
(1-2)	13405-17G10 UNAVAILABLE
(2)	13311-06G00 273 RING
(3)	13548-42F00 273 SCREW
(4)	13271-44B00 273 Discontinued
(5)	13268-96111 273 SPRING
(6)	13605-39F00 273 SCREW
(7)	13580-16G00 273 SENSOR ASSY
(8)	13683-39F10 273 HOSE
(9)	13271-93011 273 SPRING CARBURET
(10)	13343-38230 273 UNAVAILABLE
(11)	13270-06G00 273 ADJUST SCREW AS
(12)	13550-13D60 273 THROTTLE VALVE
(13)	13605-02F00 273 BOLT
(14)	13627-16G00 273 PLATE
(15)	02112-04107 273 SCREW
(16)	13552-16G10 273 ROD ASSY
(17)	13552-16G00 273 ROD ASSY
(18)	13602-06128 273 SCREW
(19)	13268-89J00 273 SPRING
(20)	13279-16G00 PLATE,IDLE ADJU
(21)	01500-06123



(1)	15710-17G00
	INJECTOR ASSY
(2)	15717-16G00
	273 UNAVAILABLE
(3)	13672-33E00
	CUSHION,FUEL IN
(4)	09401-06101
	CLIP
(5)	13681-39F00-225
	HOSE,3.2X7.4X22
(6)	13274-84000
	CAP
(7)	15730-17G00
	DELIVERRY PIPE
(8)	13602-06128
	SCREW
(9)	09401-06101
	CLIP
(10)	09401-10410
	CLIP, FUEL HOSE
(11)	13681-39F00-225
	HOSE,3.2X7.4X22
(12)	13683-16G10
	UNAVAILABLE
(13)	13685-04F10
	NIPPLE

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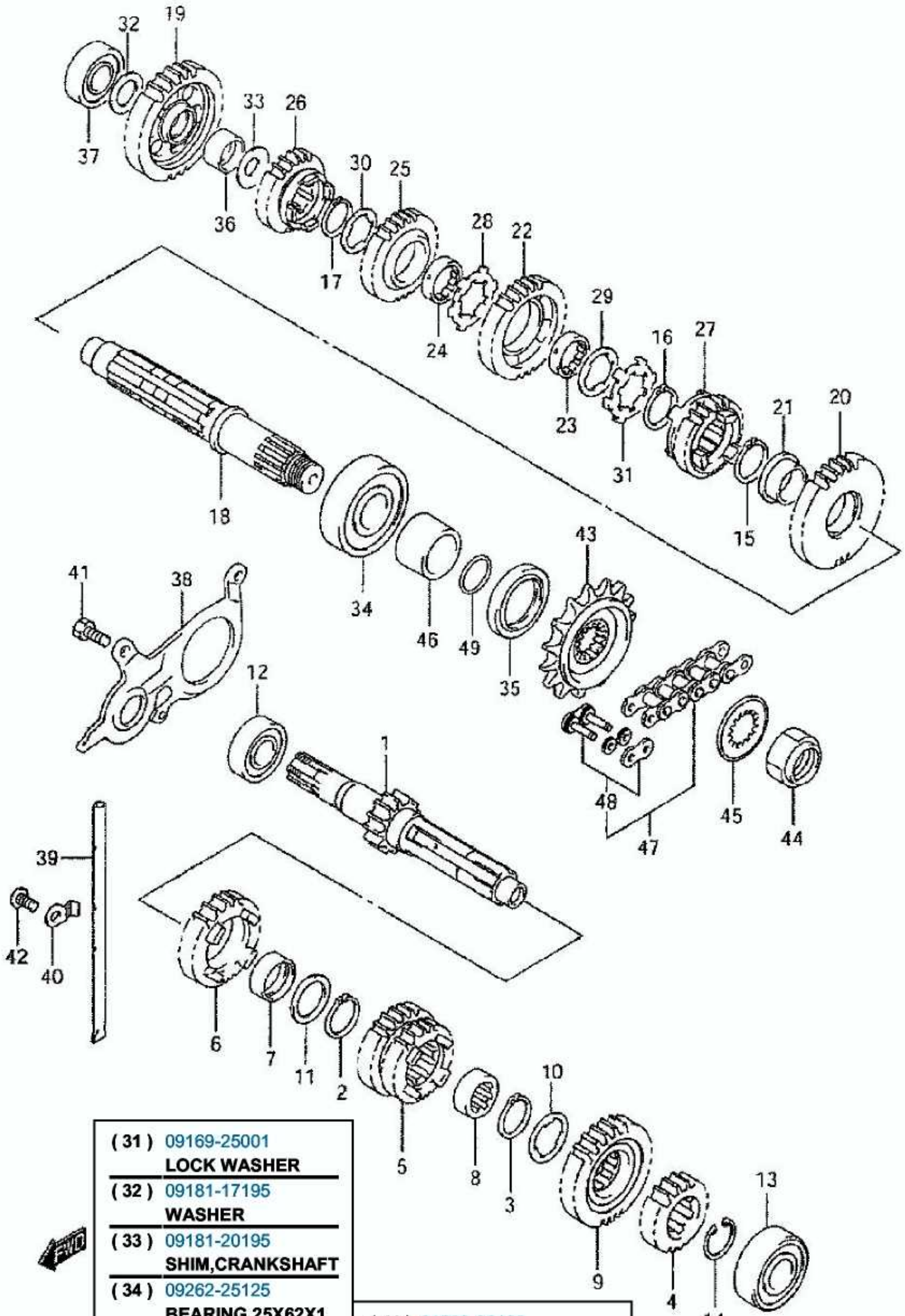

(1)	24120-19F00	SHAFT,COUNTER,N
(2)	24127-19F00	CIRCLIP
(3)	24127-19F00	CIRCLIP
(4)	24221-20F00	GEAR,2ND DRIVE
(5)	24231-20F02	GEAR 3RD & 4TH
(6)	24251-20F01	GEAR,5TH DRIVE
(7)	24252-19F00	BUSH,5TH DRIVE
(8)	24252-38A10	BUSH,6TH DRIVE
(9)	24261-20F00	GEAR,6TH DRIVE
(10)	09167-25021	WASHER
(11)	09181-25167	WASHER,5TH DRIV
(12)	09262-17046	BEARING,17X40X1
(13)	09262-20116	B1 20X52X15 BEA
(14)	09380-25012	CIRCLIP
(15)	24127-19F00	CIRCLIP
(16)	24127-19F00	CIRCLIP
(17)	24127-19F00	CIRCLIP
(18)	24130-19F01	SHAFT,DRIVE
(19)	24311-20F00	GEAR,1ST DRIVEN
(20)	24321-20F00	GEAR,2ND DRIVEN
(21)	24322-19F00	BUSH,2ND DRIVEN
(22)	24331-20F00	GEAR,3RD DRIVEN
(23)	24332-24510	BUSH,3RD/4TH DR
(24)	24332-24510	BUSH,3RD/4TH DR
(25)	24341-20F00	GEAR,4TH DRIVEN
(26)	24351-20F01	GEAR,5TH DRIVEN
(27)	24361-20F00	GEAR,6TH DRIVEN
(28)	09167-25013	LOCK WASHER
(29)	09167-25021	WASHER
(30)	09167-25021	WASHER
(31)	09169-25001	LOCK WASHER
(32)	09181-17195	WASHER
(33)	09181-20195	SHIM,CRANKSHAFT
(34)	09262-25125	BEARING,25X62X1
(35)	09283-36003	OIL SEAL 36X50X
(36)	09300-20032	BUSH
(37)	09262-17023	B1 17X40X12 BEA
(38)	24751-19F00	RETAINER,DRIVE
(39)	24881-12C20	GUIDE,T/M OIL
(40)	24885-12C10	
(41)	01500-06123	SCREW
(42)	02112-06123	SCREW 6X12
(43)	27510-20F00	SPROCKET,ENGINE
(44)	09159-20004	NUT 20MM
(45)	09167-25019	WASHER,LOCK
(46)	27531-19F01	SPACER,ENGINE S
(47-1)	27600-32C10-110	CHAIN ASSY,DRIV
(47-2)	27600-32C10-108	CHAIN ASSY,DRIV
(48)	27620-32C10	273 UNAVAILABLE
(49)	09280-24010	O-RING

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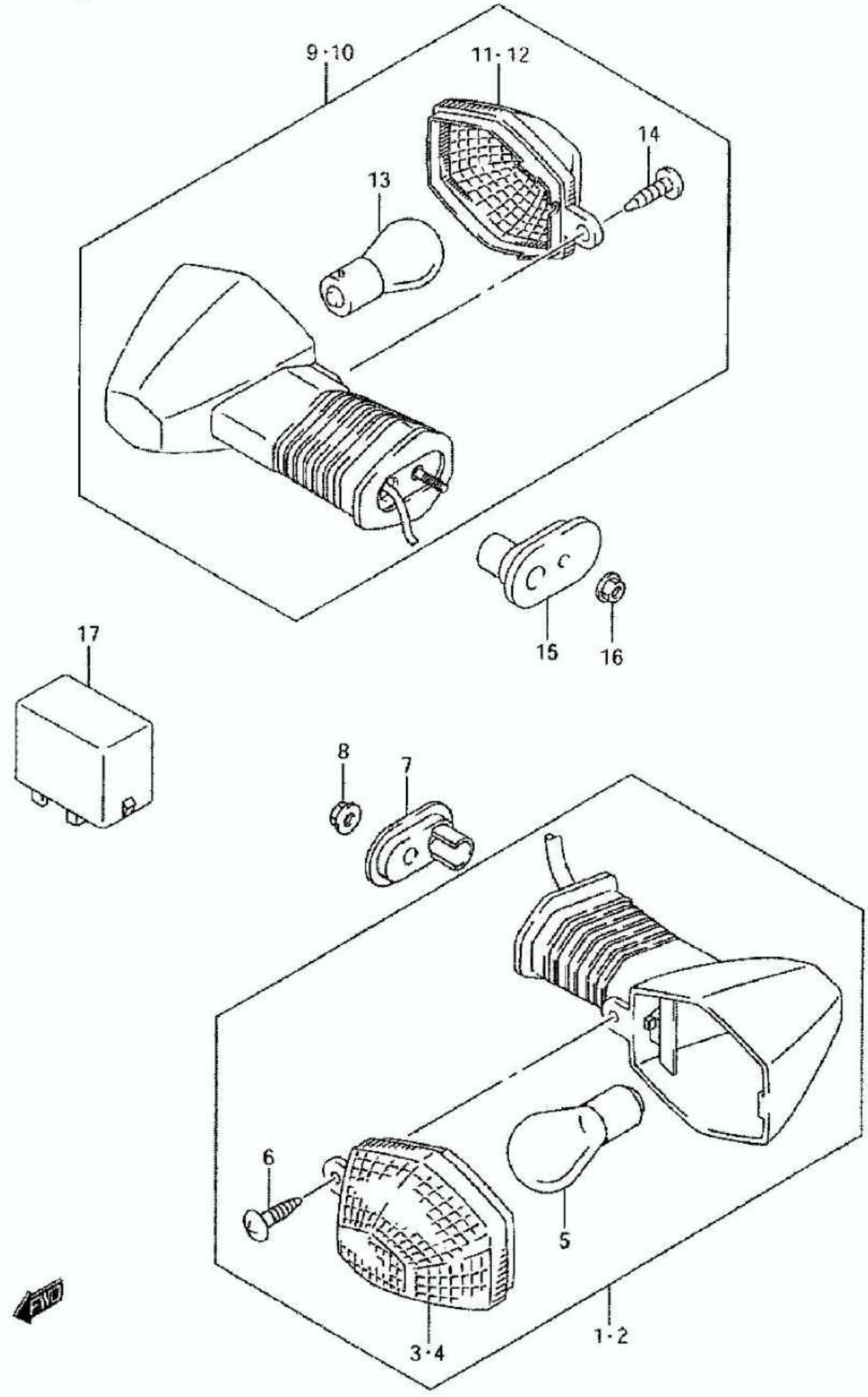
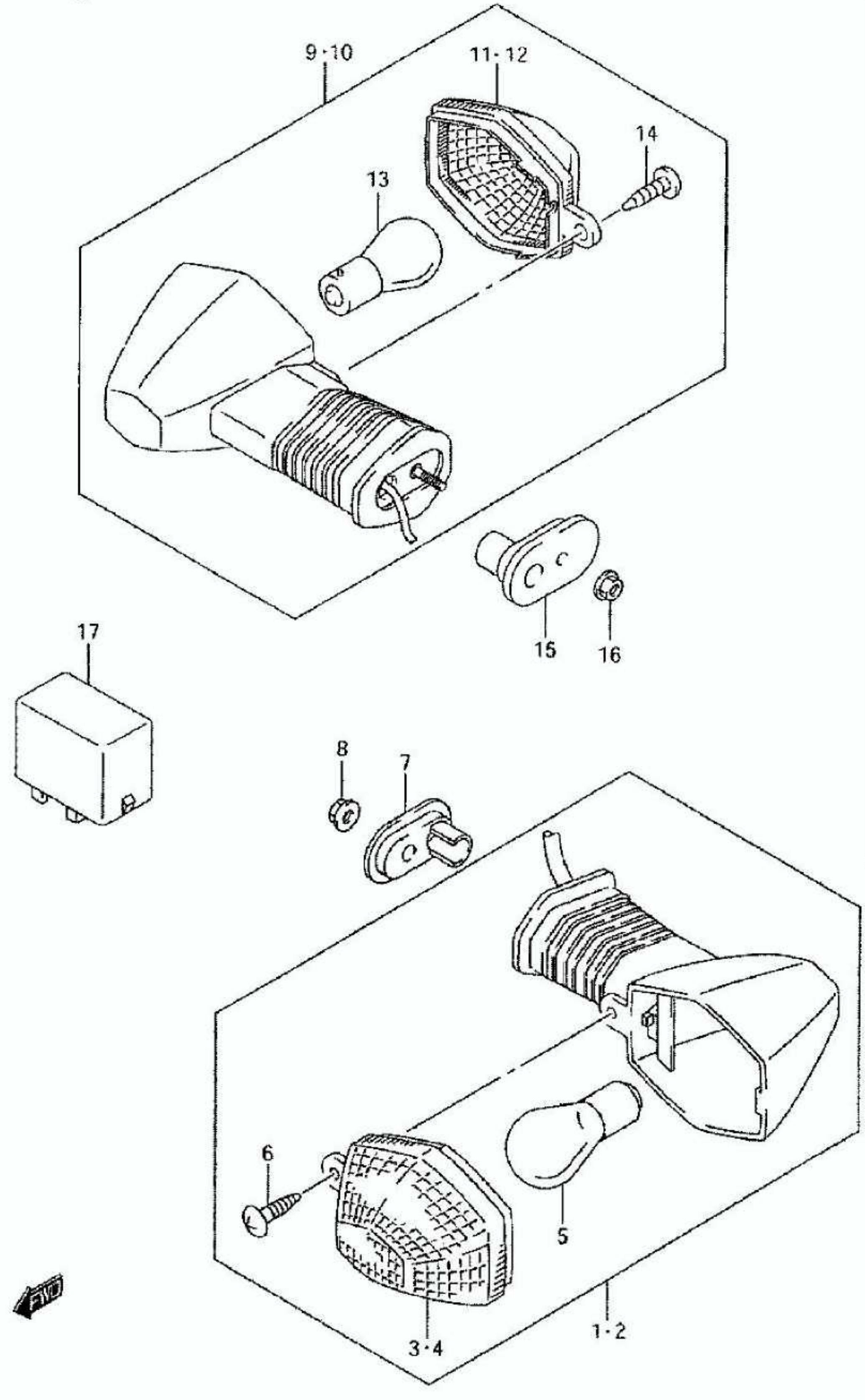
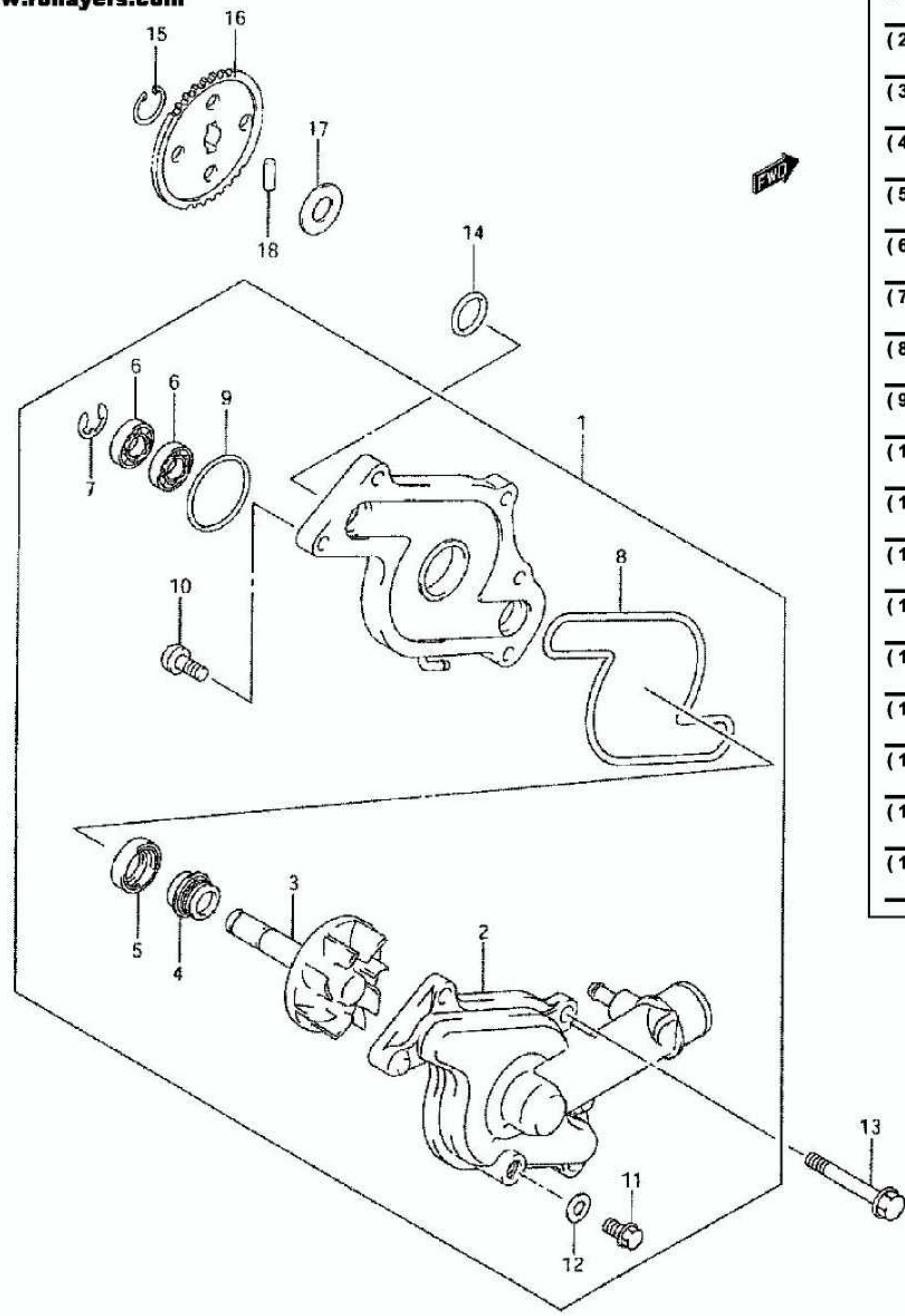


(1)	35601-16G10	LAMP ASSY,FRONT
(2)	35602-16G10	LAMP ASSY,FRONT
(3)	35612-31F30	273 LENS
(4)	35632-31F30	273 LENS
(5)	09471-12045	273 BULB 12V,21W
(6)	03242-04163	273 SCREW
(7)	35629-31F40	PLATE,TURNSIGNA
(8)	08316-10053	NUT
(9)	35603-16G30	LAMP ASSY,REAR
(10)	35604-16G30	LAMP ASSY,REAR
(11)	35632-31F30	273 LENS
(12)	35612-31F30	273 LENS
(13)	09471-12045	273 BULB 12V,21W
(14)	03242-04163	273 SCREW
(15)	35629-31F40	PLATE,TURNSIGNA
(16)	08316-10053	NUT
(17)	38610-03F00	TURNSIG/FUELPMP



(1)	35601-29F60 UNAVAILABLE
(2)	35602-29F60 UNAVAILABLE
(3)	35612-31F30 273 LENS
(4)	35632-31F30 273 LENS
(5)	09471-12045 273 BULB 12V,21W
(6)	03242-04163 273 SCREW
(7)	35629-31F40 PLATE,TURNSIGNA
(8)	08316-10053 NUT
(9)	35603-16G30 LAMP ASSY,REAR
(10)	35604-16G30 LAMP ASSY,REAR
(11)	35632-31F30 273 LENS
(12)	35612-31F30 273 LENS
(13)	09471-12045 273 BULB 12V,21W
(14)	03242-04163 273 SCREW
(15)	35629-31F40 PLATE,TURNSIGNA
(16)	08316-10053 NUT
(17)	38610-03F00 TURNSIG/FUELPMP



(1)	17400-19F40	PUMP ASSY,WATER
(2)	17411-19F40	273 UNAVAILABLE
(3)	17491-19F40	273 UNAVAILABLE
(4)	17470-02F10	273 SEAL,WATER PUMP
(5)	09283-10004	273 OIL SEAL WATER
(6)	08110-69000	273 10X22X6 BEARING
(7)	08332-11086	273 RING
(8)	17418-19F00	273 O RING
(9)	17435-33400	273 O RING,WATER PU
(10)	02112-06163	273 SCREW 6X16
(11)	17415-20920	273 BOLT
(12)	09168-08008	273 CRKC BOLT GASKE
(13)	09103-06238	BOLT
(14)	09280-22001	OIL PLUG O RING
(15)	08331-31106	Discontinued
(16)	17461-19F00	GEAR,WATER PUMP
(17)	09181-10158	SHIM,10X18X0.5
(18)	09261-04002	SHIFTING CAM PI

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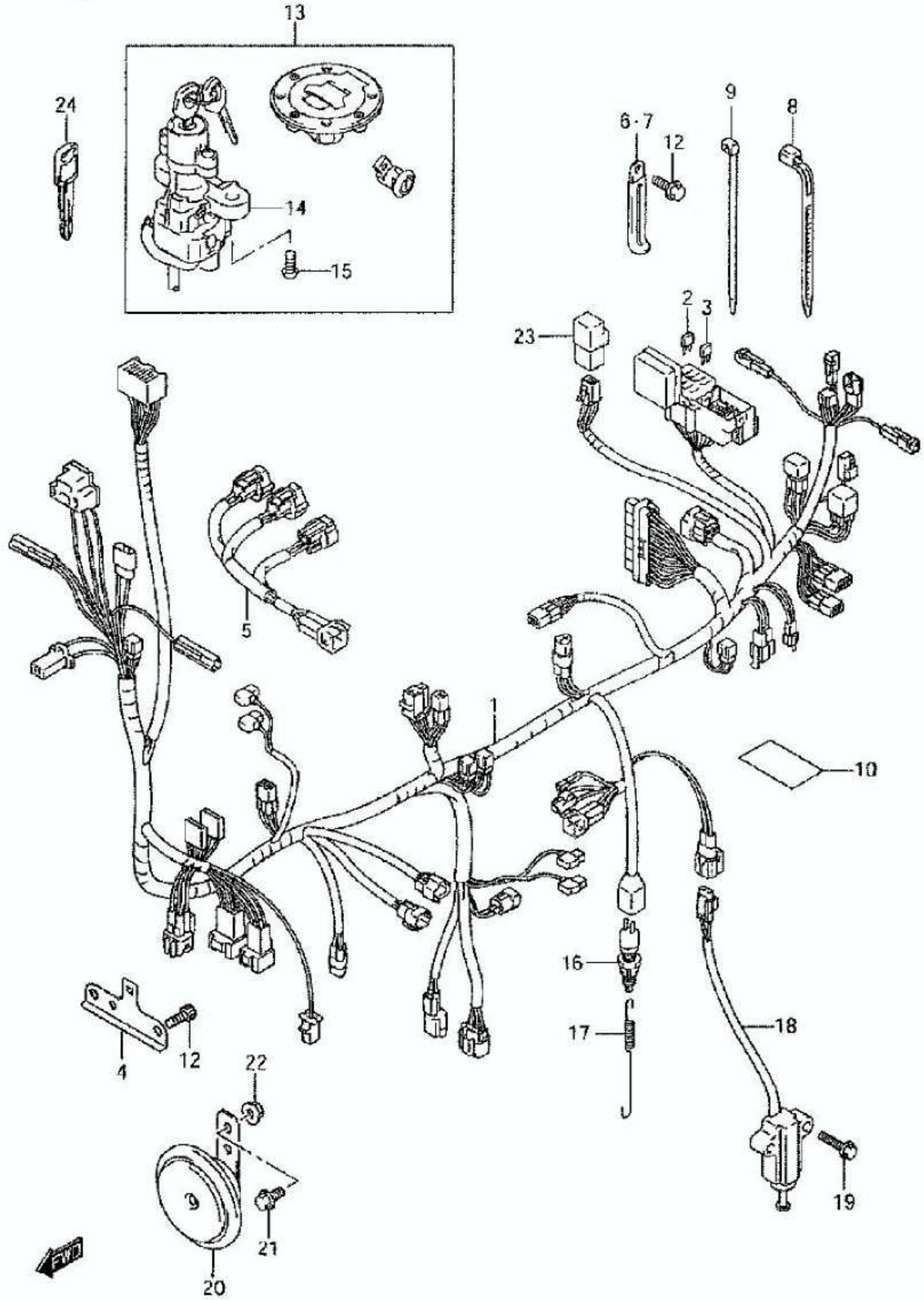
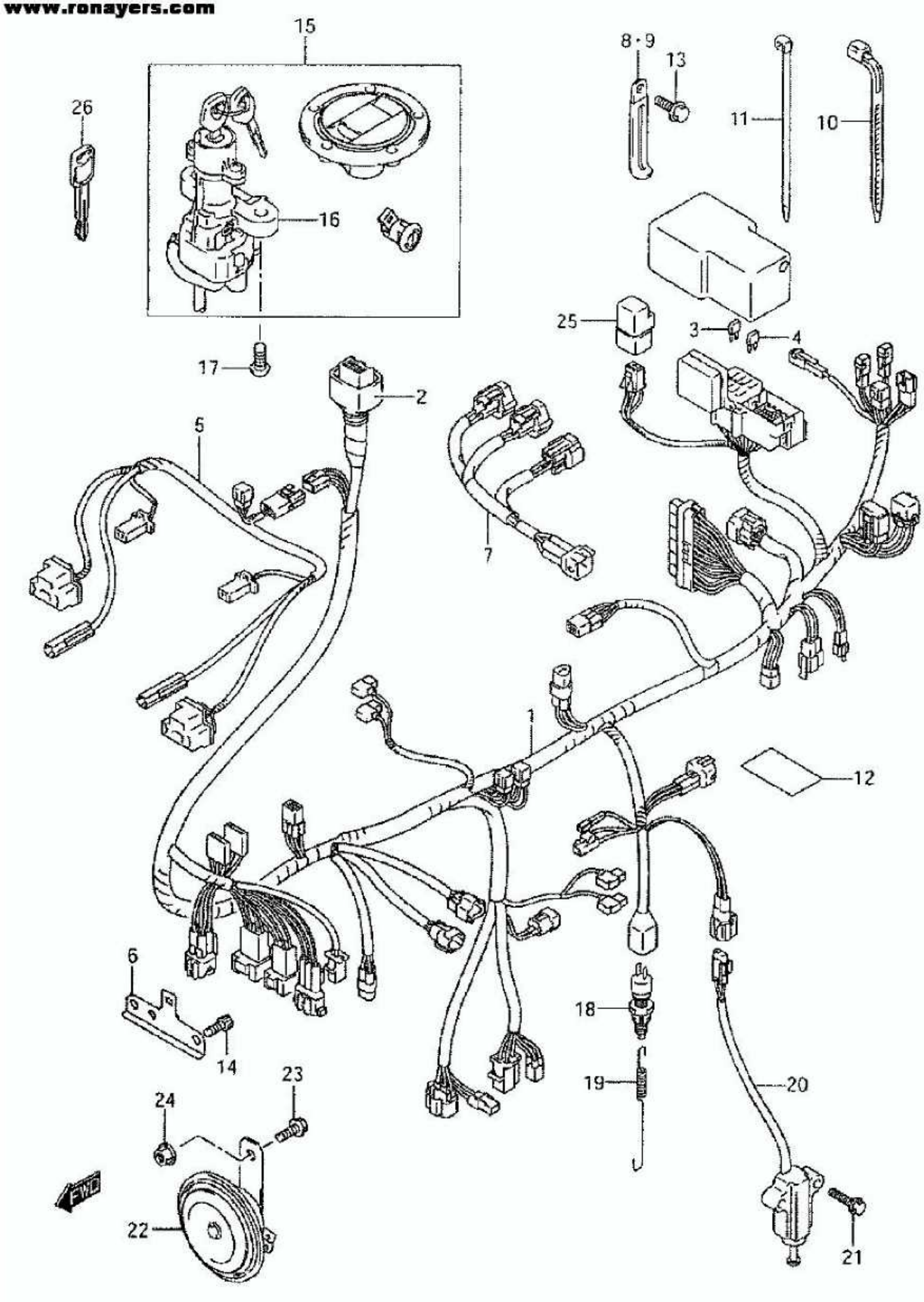


(1)	36610-17G80 UNAVAILABLE
(2)	09481-10501 273 FUSE
(3)	09481-15501 273 FUSE
(4)	36687-17G00 HOLDER,COUPLER
(5)	36859-16G00 WIRE,INJECTOR L
(6-1)	09404-06429 Discontinued
(6-2)	09404-06433 CLAMP,L:95
(7)	09404-08207 CLAMP,L:97
(8)	09407-14403 Discontinued
(9)	09407-14407 CLAMP
(10)	36611-16G00 UNAVAILABLE
(11)	01550-06103 BOLT
(12)	07130-06103 BOLT
(13-1)	37000-16820 UNAVAILABLE
(13-2)	37000-16830 UNAVAILABLE
(14)	37100-16G20 273 UNAVAILABLE
(15)	09139-08016 BOLT
(16)	37740-24A00 SWITCH ASSY,STO
(17)	09443-06005 BK LMP SWITCH S
(18)	37840-26X50 SWITCH ASSY,SD
(19)	09103-06211 BOLT
(20)	38500-17G00 HORN ASSY
(21)	01550-08123 BOLT
(22)	08316-10083 NUT
(23)	38740-24X50 RELAY ASSY,FUEL
(24)	37146-33E00 KEY,BLANK



(1)	36610-17G30	UNAVAILABLE
(2)	36618-33E00	273 COVER,SPEEDOMET
(3)	09481-10501	273 FUSE
(4)	09481-15501	273 FUSE
(5)	36620-16G10	HARNESS,WIRING
(6)	36687-17G00	HOLDER,COUPLER
(7)	36859-16G00	WIRE,INJECTOR L
(8-1)	09404-06429	Discontinued
(8-2)	09404-06433	CLAMP,L:95
(9)	09404-08207	CLAMP,L:97
(10)	09407-14403	Discontinued
(11)	09407-14407	CLAMP
(12)	36611-16G00	UNAVAILABLE
(13)	01550-06103	BOLT
(14)	07130-06103	BOLT
(15-1)	37000-16840	LOCK SET
(15-2)	37000-16850	UNAVAILABLE
(16)	37100-16G00	273 LOCK ASSY,STEER
(17)	09139-08016	BOLT
(18)	37740-24A00	SWITCH ASSY,STO
(19)	09443-06005	BK LMP SWITCH S
(20)	37840-26X50	SWITCH ASSY,SD
(21)	09103-06211	BOLT
(22)	38500-17G00	HORN ASSY
(23)	01550-08123	BOLT
(24)	08316-10083	NUT
(25)	38740-24X50	RELAY ASSY,FUEL
(26)	37146-33E00	KEY,BLANK

YUASA
Technical Manual

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PREFACE

A Practical Understanding of Lead Acid Batteries

Lead acid batteries are relatively simple in design. Dissimilar metal plates are immersed in an electrolyte solution consisting of sulfuric acid and water. These are then insulated from each other with a permeable, non-conductive material, which allows the transfer of ions. The transfer of ions occurs during the discharge and recharge of the battery. Also occurring is the change in specific gravity or density of the electrolyte. During the discharge period, sulfuric acid is drawn from the electrolyte into the pores of the plates. This reduces the specific gravity of the electrolyte and increases the concentration of water. During the recharge, this action is reversed and the sulfuric acid is driven from the plates, back into the electrolyte, increasing the specific gravity.

During the discharge, lead sulfate is being formed on the battery plates. Although this is the normal activity within the battery during discharge, a timely recharge is required to drive out the sulfuric acid into the electrolyte. Without this recharge, the lead sulfate will continue to develop and become difficult if not impossible to breakdown during recharge. Once this advanced sulfation develops, permanent capacity loss or total failure of the battery is likely. Besides the sulfation concerns, many other detrimental actions are taking place inside the battery while in a discharged condition.

The corrosive effect on the lead plates and connections within the battery is greatly increased due to the reduced specific gravity of the electrolyte. The corrosion of the plates will typically result in a gradual reduction in performance followed by battery failure. The corrosion associated with the inter cell connectors and the connecting welds will in many instances result in a sudden battery failure. The corroded connector may have sufficient integrity to support low drain accessories such as lights and instruments, but lack the necessary strength to provide the high discharge current required to start the vehicle. This corrosive effect can also dissolve the lead into solution, which in turn may compromise the plate insulators and result in micro shorts. Another condition that frequently occurs in a discharged battery is freezing. In a deeply discharged battery, the electrolyte has a reduced specific gravity and becomes a higher percentage of water than sulfuric acid. During this condition, the battery may freeze at temperatures as high as 32°F. The electrolyte in a fully charged battery will not freeze in temperatures down to -65°F.

Deep discharge can be created by a multitude of conditions, but the predominant reason is neglect. During long periods of storage, the battery state of charge must be checked and maintained per the battery manufacturers recommendations. Other conditions that can drain the battery are inoperative or inadequate charging systems on vehicles, parasitic or key off drains, loose or dirty terminal connections, etc. Although many of these conditions can be corrected, often the problems you cannot correct may be overcome by a periodic charging schedule. You can establish a routine by which you check and charge your battery or choose to permanently attach a Yuasa Automatic Charger while the vehicle is not in use.

When charging your battery, always refer to the instructions on both the battery and the charger. While maintaining your battery at a full state of charge will insure optimum life, overcharging may significantly reduce it. With a conventional type battery that offers access to the cell compartments, the periodic addition of distilled water may be required. Water loss is normal in these batteries through the process of electrolysis and evaporation. Low electrolyte levels that expose the lead plates to the air will result in permanent damage to the battery. Maintain the electrolyte levels above the minimum fill lines on the battery and at or below the maximum line. A sealed VRLA (Valve Regulated Lead Acid) battery should be maintained with the same care as a conventional type battery with the exception of the addition of distilled water. Sealed VRLA batteries have a predetermined quantity of electrolyte added at the factory or in the field using the acid bottle specified for the battery. Once activated, the battery is permanently sealed and must never be opened.

A little bit of care and understanding of how your battery operates and is maintained will insure maximum service life.

SECTION 1

Battery Basics and Safety

About this book

If you're looking for more than everyday information about batteries, read on.

Maybe you're a retailer, the expert whose battery knowledge and recommendations guide customers every day. Or a service technician or dealer – the person vehicle owners turn to with questions. Or maybe you're an enthusiast set on "knowing everything" about your bike and how to keep it running.

Whatever your reason for wanting to boost your battery IQ, YUASA is pleased to provide this copy of the ultimate battery book.

It's filled with in-depth information: how batteries work, maintenance and installation tips and how to get maximum power and life from your battery. We'll talk about chargers and testers. Of course, we'll also fill you in on the complete line of YUASA batteries, chargers and accessories.

About YUASA

The first thing you need to know about batteries is YUASA. You might say that when it comes to powersports vehicle batteries, we wrote the book! We're the largest manufacturer and distributor of small engine starting batteries in North America.

If you purchased a motorcycle, snowmobile, personal watercraft, ATV, riding mower or garden tractor manufactured in the U.S., chances are the battery that starts it was made by Yuasa. In fact, our batteries are original equipment in just about every major make of powersports vehicles.

If you've bought a replacement battery for your powersports vehicle, most likely it was made by Yuasa. Altogether, we manufacture approximately three million batteries a year for small engine starting applications at our Reading, Pennsylvania plant.

The Lead Acid Battery

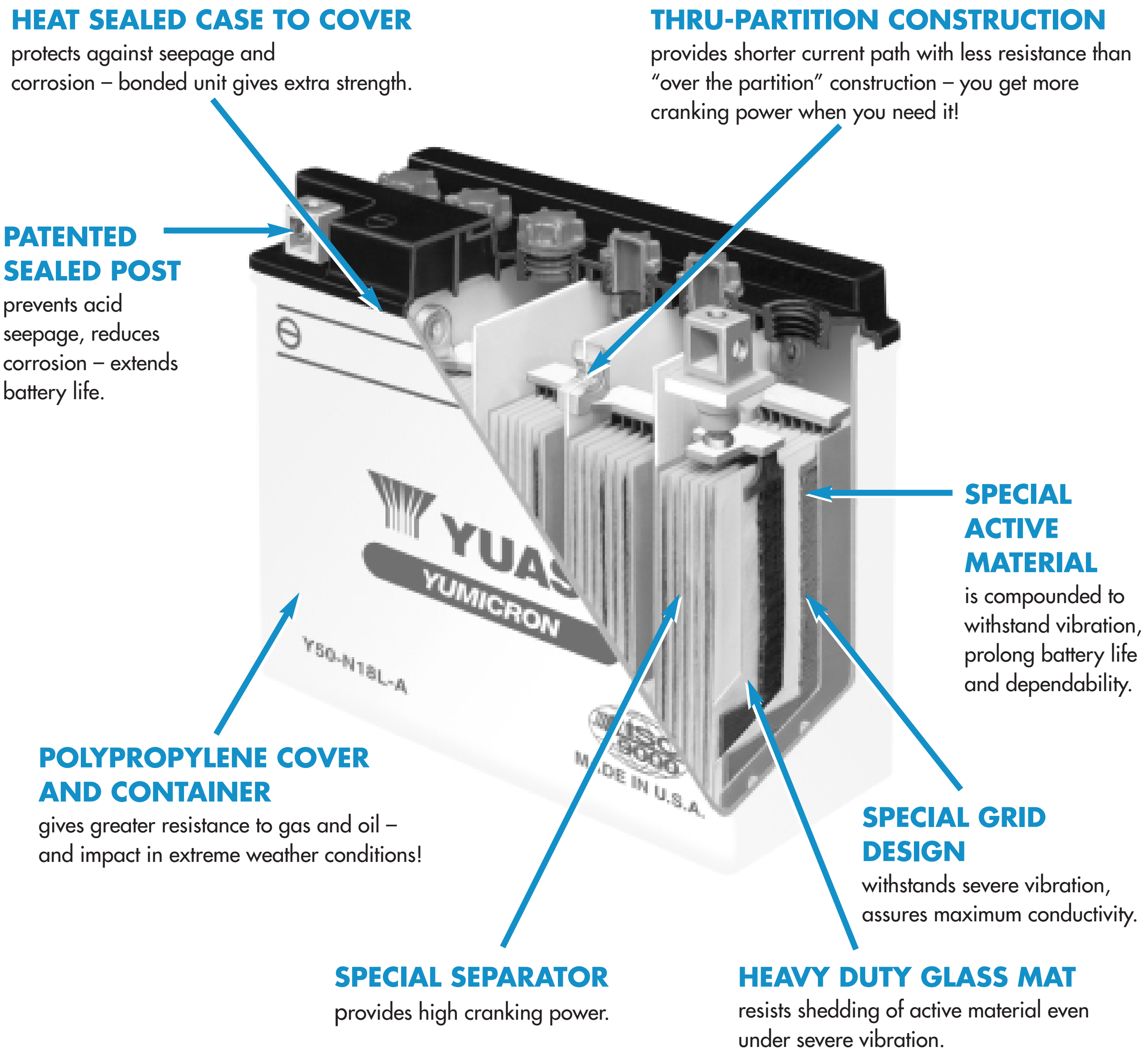
Let's look first at battery basics: what a battery is and how it works.

Lead acid batteries are used as a power source for vehicles that demand a constant and uninterruptible source of energy. Just about every vehicle today does. For example, street motorcycles need lights that operate when the engine isn't running. They get it from the battery. Accessories such as clocks and alarms are battery-driven.

Starting your vehicle depends on a battery.

Technically speaking, the battery is an electrochemical device that converts chemical energy to electrical energy. The first thing you notice inside a battery is the cells. Each cell has about two volts (actually, 2.12 to 2.2 volts, measured on a DC scale). A 6-volt battery will have three cells. A 12-volt battery, six cells.

Standard Features



The cells consist of lead plates that are positive and negative charged. Inside the cell they're stacked alternately – negative, positive, negative. Insulators or separators – usually fiberglass or treated paper – are placed between the plates to prevent contact. Cranking current increases as the plate surface area in the battery increases – the more plates in a cell, or the larger the plates, the greater the current capacity (or flow of electricity). Typically, capacity increases as the amount of active material increases in the battery.

The alternate plates in each cell are connected at the top into two groups, one positive and one negative. Each cell's groups of plates are then connected in series – positive to negative – to those in the next cell.

Basically, that's the internal hardware. Next, a solution of sulfuric acid and distilled water – the electrolyte – is added. And the action starts. A reaction between the lead plates and the electrolyte sets off a chemical change. This in turn creates the electrical charge in a battery.

That's the process, in a nutshell, that makes every battery work. So, are all batteries the same?

Obviously not. Actually, there can be a number of differences, and they go far beyond things like box size or terminal location. That's true for different brands, as well as for different lines produced by the same manufacturer. Take two types of YUASA batteries, for example: our Conventional and YuMicron batteries.

What's different? First there's cranking power: YuMicron has more because YuMicron batteries boost plate surface area with thin, high-tech separators that make room for two extra plates in each cell. YuMicron also has a special intercell connector that minimizes resistance to further maximize power. It has a special glass mat that resists vibration damage.

Just for the record, let's state how the Conventional and YuMicron batteries aren't different: they're both lead-antimony batteries, for openers (other batteries in YUASA's line, including the YuMicron CX, use lead-calcium technology). They have certain things in common that we think should be part of every battery: like sealed posts to resist corrosion, tough polypropylene covers and containers, and heat sealed construction for a strong, bonded unit. And both share certain design features, like special separators and through-partition construction.

Now, does all this mean YuMicron is automatically a better choice than the conventional battery? Of course not. It all depends on what you need to do. Some of the YuMicron features might not be a big deal to a lawn tractor owner, but a feature like our unique cover design that minimizes electrolyte spillage is going to be really important to the guy on a watersport vehicle or ATV.

Each YUASA line of batteries has its unique features that account for differences in price and differences in performance – and that's what makes it the right battery for a particular vehicle. Buy what you need. Don't pay for what you don't need.

POINTS TO REMEMBER

- **A battery converts chemical energy to electrical energy.**
- **Each cell has approximately 2 volts: 3 cells for a 6-volt battery, 6 cells for a 12-volt battery.**
- **Inside each cell are electrically charged positive and negative lead plates, isolated from each other by separators.**
- **Chemical action between plates and electrolyte creates an electrical charge.**
- **Current is the flow of electricity.**

The YUASA battery line...

The right battery for the right job – that's where it all starts. YUASA's comprehensive line has the right small engine starting battery... whatever the vehicle, however tough the application.

YUASA's Conventional Battery

The industry standard for motorcycles, snowmobiles and riding mowers, our Conventional Battery is anything but conventional. This workhorse is engineered to protect against seepage and corrosion... withstand vibration... and deliver high cranking power, even when the weather's dealing its worst. It's the rugged, reliable and dependable battery that customers are looking for!

These features are built into our conventional manifold vented battery... and every battery in the YUASA line:

- **Patented separators** provide high cranking power
- **Through-partition construction** delivers maximum power
- **Unique sealed posts** resist corrosion – for longer battery life
- **Polypropylene cover and container** resist damage from gas, oil, impact
- **Heat-sealed, bonded unit construction** protects against seepage and corrosion

YuMicron

Personal watercraft, snowmobiles and ATVs make special demands – and YUASA's YuMicron Battery meets them head-on. The high-tech, power-boosting design also makes YuMicron ideal for accessory-laden touring bikes and modified machines.

- **Heavy duty glass mat** resists vibration damage
- **Special thin YuMicron Separator** packs in extra plates, delivers up to 30% more cranking power than conventional types
- **Through-the-wall intercell connector** minimizes internal resistance, maximizes power
- **Sulfate Stop** curbs plate sulfation – and provides longer life

YuMicron CX

For top power, less maintenance and longer life, YuMicron CX is the battery of choice. The first motorcycle battery built on lead-calcium technology, YuMicron CX is specially designed for today's big, complex machines, where higher cranking power is a must. It delivers all the features of the standard YuMicron – plus...

- **Unique CX design** for higher cold cranking amps
- **Lead-calcium technology** reduces water loss – and servicing – by 66% compared to lead antimony
- **And, CX substantially reduces self-discharge** – for longer time between charges

Sealed VRLA

Sealed VRLA (Valve Regulated Lead Acid) means a battery that's perfect for people who have better things to do than battery maintenance! Our permanently sealed VRLA battery never needs refilling; however, it still needs periodic charging. Ideal for motorcycles, scooters, ATVs, riding mowers and personal watercraft.

- **Spill-proof design** means virtually no possibility of leaks
- **Advanced lead-calcium technology** pumps up starting power
- **Sulfation retardant** dramatically reduces battery-killing plate sulfation
- **And, sealed VRLA batteries hold voltage** longer and need less charging in standby or storage mode

Battery Safety

As with anything, with batteries you have to know what you're doing. Batteries can be dangerous. But they don't have to be if some simple safety precautions are followed.

Basically, working with batteries poses two hazards: potentially explosive gases that are given off during charging, and sulfuric acid, which is very corrosive.

Here's an 8-point list that'll help keep those hazards under control:

1. ABSOLUTELY NO SMOKING, SPARKS OR OPEN FLAMES AROUND BATTERIES. Batteries can produce hydrogen and oxygen; if they ignite the battery can rupture.

2. On conventional batteries, loosen vent caps when charging and ventilate the entire charging area. A build-up of hydrogen and oxygen levels in the battery – or in the room where it's being charged – can create a hazard.

3. If a battery feels hot to the touch during charging, stop charging and allow it to cool before resuming. Heat damages the plates, and a battery that's too hot can rupture.

4. Never put the red sealing cap back on the battery once you take it off. If you do, gases trapped inside can explode. Make sure the vent tube isn't kinked or blocked, for the same reason.

5. Properly connect charger to battery: positive to positive, negative to negative. Unplug the charger or turn it off before you disconnect the leads; that cuts down on the chance of sparks.

6. Always wear eye protection, protective gloves and protective clothing.

7. Clean up acid spills immediately, using a water and baking soda solution to neutralize (1 lb. baking soda in 1 gal. water).

8. Make sure acid container is clearly marked and the work area is well lighted.

If sulfuric acid is swallowed or splashed in the eyes, take immediate action. While the diluted sulfuric acid used as electrolyte can burn the skin, this type of injury is generally less serious. Sulfuric acid in the eyes can cause blindness. Serious internal injuries or death can result from ingesting sulfuric acid.

Antidotes:

External – flush with water.

Internal – drink large quantities of milk or water, followed by milk of magnesia, vegetable oil or beaten eggs. Call a poison control center or doctor immediately.

Eyes – flush for several minutes with water, get immediate medical attention.

POINTS TO REMEMBER

- ❒ **Ventilate battery charging area.**
- ❒ **Charging gives off gases – no smoking, sparks or flames.**
- ❒ **Safety glasses or face shields protect against eye damage.**
- ❒ **Acid swallowed or in the eyes requires immediate antidotes and medical care.**
- ❒ **All safety considerations are important... review them frequently.**

SECTION 2

Selecting and Installing a New Battery

Selecting the Proper Battery

Selecting the right battery is an important decision. You'd be amazed how often the "problem" with a battery is that it's the wrong one for the application.

To make doubly sure you're on track, you'll need one of two things – either the latest YUASA Battery Specifications and Applications book, or the original equipment (OE) microfiche. Of course, you can always go to the old battery you're replacing. The trick, though, is to make sure it's the original. Otherwise, you may be simply repeating the same problem that caused the battery to need replacing.

OK, let's say you're replacing the battery on an '81 Kawasaki – a KZ1000-C Police, 1000cc.

Referring to the YUASA Battery Specifications and Applications book, you first look under the Kawasaki listing. Then find the right engine size – 1000cc, where you find the KZ1000-C Police. You're looking for an '81, so the place to be is '80 to '81. The chart on this page shows what it looks like.

If this were a sensor-equipped battery – which it isn't – the applications book would mark it with a footnote (†). That tells you to order it with a sensor.

What's the right battery? You'll see there are four of them: a High Performance Sealed VRLA YTX20HL-BS, a Sealed VRLA YTX20L-BS, a YuMicron YB16L-B, and a Conventional 12N16-3B battery. Any of these will do fine. If your machine has increased compression modifications to the engine, for example, you might want the additional cranking power. And if the added benefit of never adding water again appeals to you, go with the High Performance Sealed VRLA or the Sealed VRLA style batteries.

A few words of advice: always double-check that you have the right battery for your application before you charge and install it. If you have any questions, check out our website at **www.yuasabatteries.com** or contact us toll free at **1-866-431-4784.**

Warning: In the event you want to upgrade to a sealed VRLA battery, please ensure you have the proper charging voltage. Always refer to your service manual.

MOTORCYCLE Battery Application

cc	Model	Year	High Performance Sealed VRLA	Sealed VRLA	YuMicron	Conventional
KAWASAKI						
1000	KZ1000-P Police	'02	YTX20HL-BS	YTX20L-BS	-	-
	KZ1000-P Police	'82-'01	-	-	YB18L-A	-
	KZ1000-C Police	'80-'81	YTX20HL-BS *	YTX20L-BS *	YB16L-B	12N16-3B
	KZ1000-C Police, Z1-R	'78-'79	YTX14AHL-BS	-	YB14L-A2	-
	KZ1000, LTD	'77-'80	YTX14AHL-BS	-	YB14L-A2	-
	KZ1000-E ST, Shaft	'79-'80	YTX20HL-BS *	YTX20L-BS *	YB16L-B	12N16-3B
	KZ1000-G Classic	'80	YTX14AHL-BS	-	YB14L-A2	-
	KZ1000, LTD, CSR	'81-'83	-	-	YB18L-A	-
	KZ1000-R Replica	'82-'83	-	-	YB18L-A	-
	ZG1000A Concours	'86-'02	-	-	YB18L-A	-

POINTS TO REMEMBER

- ❒ **Check current Applications Book or microfiche for right replacement battery.**
- ❒ **There may be two or more "right" batteries – choose by performance needs.**
- ❒ **Double check numbers before activation and installation.**

About Sensors

Many of today's motorcycles use batteries equipped with sensors. They're either built in the battery, or packed with it.

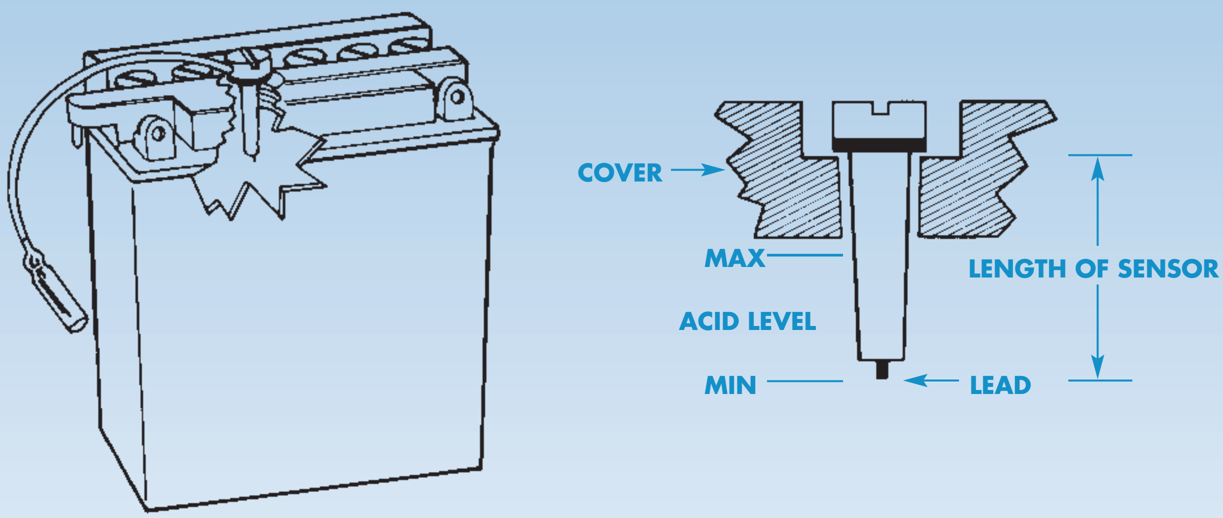
A sensor is a "low fuel" warning light. It tells you when you're getting low – in this case, on electrolyte. The sensor causes a warning light to flash, signaling that it's time to add water to the battery. The cutaway views below show what a sensor looks like.

Sensors are sort of particular: they don't go with just any battery. Which means it's important to replace the old battery and sensor with the correct YUASA sensor battery listed in the applications book. So, sensor rule one is this: replace both battery and sensor at the same time.

"But the sensor's original equipment," you say. Doesn't matter. Being OE doesn't mean it 's OK in another manufacturer's battery. In fact, OE sensor plugs vary considerably in length, size and diameter. A plug that's too long can short out a battery and mess up the electrical system. If the plug's short, the warning light will flash way too early.

Note, too, that even YUASA's sensor batteries are not interchangeable; they have different vent locations, sensor wire lengths and diameter of cylinder connectors.

CUT-AWAY VIEW OF SENSOR



POINTS TO REMEMBER

- ❒ **Replace battery and sensor at same time.**
- ❒ **Original equipment sensor isn't "OK" for a new battery.**
- ❒ **Sensor batteries and sensors are not interchangeable – check Applications Book.**

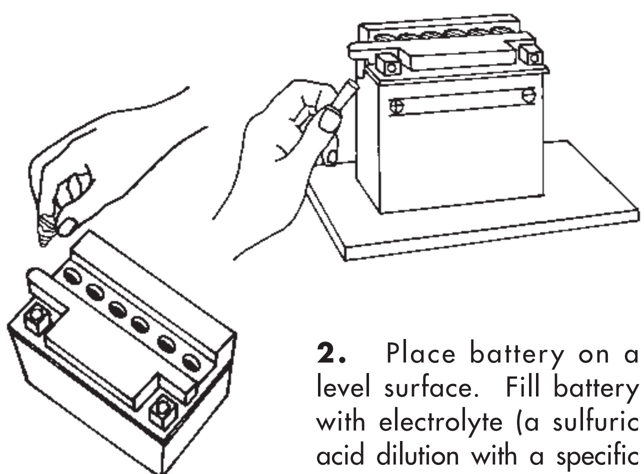
Battery Activation for Conventional and YuMicron Types

Sealed at the factory, a new YUASA battery has an indefinite shelf life as long as it remains sealed, with the red cap in place, and is stored at room temperature. Once it's unsealed, a battery should be activated, charged and installed. The plates of an unsealed, uncharged battery begin to oxidize. That makes it more difficult to charge later. (We talk more about sulfation later in this book.) And if it's charged and sits around, it starts to discharge and sulfate; how fast depends on temperature.

Here are the steps for activating most batteries, including YUASA's Conventional, YuMicron, YuMicron CX. (Sealed VRLA – YT or YI – batteries are activated differently, see page 25.)

Activating Standard Batteries

1. Right before adding electrolyte, remove filling plugs. Also remove the sealing tube – the red cap – and throw it away. (Putting this cap back on after the battery's filled with acid can cause an explosion.)



2. Place battery on a level surface. Fill battery with electrolyte (a sulfuric acid dilution with a specific gravity of 1.265). Do not use water or any other liquid to activate.

Electrolyte should be between 60°F and 86°F before filling. Fill to UPPER LEVEL as indicated on battery.

NOTE: **Never** activate a battery on the vehicle. Electrolyte spillage can cause damage.

3. Let battery stand for at least 30 minutes. Move or gently tap the battery so that any air bubbles between the plates will be expelled. If acid level has fallen, refill with acid to upper level. Note: this is the last time electrolyte should be added, but distilled water should be added as required.

4. A battery must be completely charged before installation. Charge for three to five hours at the current equivalent of 1/10 of its rated capacity found in the Yuasa Applications Book.

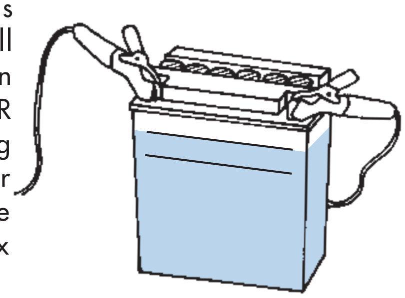
YUMICRON Battery Specifications

BATTERY TYPE	CAPACITY AH (10H-R)	DIMENSIONS – INCHES (± 1/16 IN)		
		L	W	H
YB2.5L-C	2.5	3 3/16	2 3/4	4 1/8
YB2.5L-C-1	2.5	3 3/16	2 3/4	4 1/8
YB3L-A	3	3 7/8	2 1/4	4 3/8
YB3L-B	3	3 7/8	2 1/4	4 3/8
YB4L-A	4	4 3/4	2 3/4	3 5/8
YB4L-B	4	4 3/4	2 3/4	3 5/8
YB5L-B	5	4 3/4	2 3/8	5 1/8

Rated Capacity

5. During charging, batteries can spit electrolyte out the open vent. Take care to loosely refit vent caps.

6. Check during charging to see if electrolyte level has fallen, and if so, fill with distilled or clean water to the UPPER LEVEL. After adding water, charge for another hour at same rate as above to mix water and acid.



7. When charging's done, replace plugs firmly. Do not apply excessive pressure. Finger tighten only. Do not over-tighten.

8. Wash off spilled acid with water and baking soda solution, paying particular attention that any acid is washed off the terminals. Dry the battery case.

SECTION 3

Inspecting, Testing and Charging

The Discharge – Charge Cycle

As we mentioned earlier, an electrochemical action within the battery produces electricity. To understand it, let's look inside a battery again: you'll see cells made up of lead plates. Some plates are positive charged. Others are negative charged. There's also the electrolyte – a sulfuric acid solution that conducts the current. It sets off the chemical process that takes place in the battery.

So what goes on when a battery discharges?

The electrolyte reacts chemically with the lead plates – and it's not exactly a match made in heaven: it turns them into lead sulfate. If sulfate reminds you of sulfation, you're right on target: this build-up of sulfate crystals is exactly what battery-killing sulfation is.

In the process, the electrolyte – which contains hydrogen, sulfur and oxygen – gives up its sulfur and some of its oxygen. The electrolyte turns to water. Now you know why a discharged battery – filled with water instead of electrolyte – can turn into an ice block when the temperature drops even into the 20s. On the other hand, a properly-charged battery won't freeze until the mercury gets way down in the minus range.

The chemical process causes free electrons to slowly gather on the negative plates. They just hang there until a load is placed on the battery – a light or starter's switched on – which causes a swarm of electrons to rush to the positive plates.

If the chemical process just went on and on, unchecked, the lead plates would soon turn totally to lead sulfate, the electrolyte would become pure water, and the chemical and electrical activity inside the battery would come to a standstill. It's bad for a battery. So is allowing a battery to remain discharged for a prolonged period. Recharging becomes hard or impossible.

The good news: except in extreme cases, the process of discharging can be reversed. You work that magic by putting a larger voltage on the battery – for example, 14v on a 12v battery. That's charging.

Here's what goes on when a battery charges:

The electrical charge flowing back in causes the lead sulfates to send their sulfate back into the electrolyte. As a result, both the electrolyte and the plates return to their original composition.

You'll notice bubbles in an actively-charging battery. That's called gassing. It occurs because hydrogen and oxygen gases are liberated as the charging current breaks down the water.

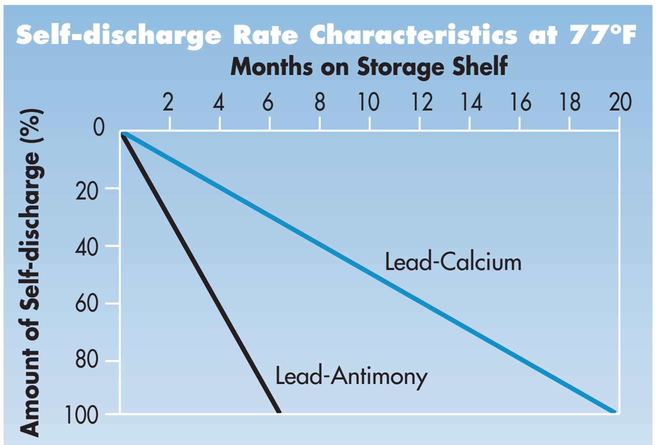
Several things are actually happening here. The process breaks down water into hydrogen and oxygen vapor, which escapes out the vent tube. You have to replace that loss. Add distilled water to each cell after charging. Then give the battery a "mixing charge" for another hour. The hydrogen and oxygen gases that are given off can also build up pressure in the battery – which is why batteries are vented, and why the vent tubes can't be bent or blocked. Very importantly, hydrogen and oxygen are very explosive. It bears repeating that sparks, flames and cigarettes around charging batteries can be a one-way ticket to trouble.

POINTS TO REMEMBER

- ❒ **Deep discharge or prolonged discharge leads to harmful sulfation.**
- ❒ **A discharged battery freezes much faster than a charged battery.**
- ❒ **Charging can reverse discharging.**
- ❒ **Charging gives off hydrogen and oxygen, which are explosive.**

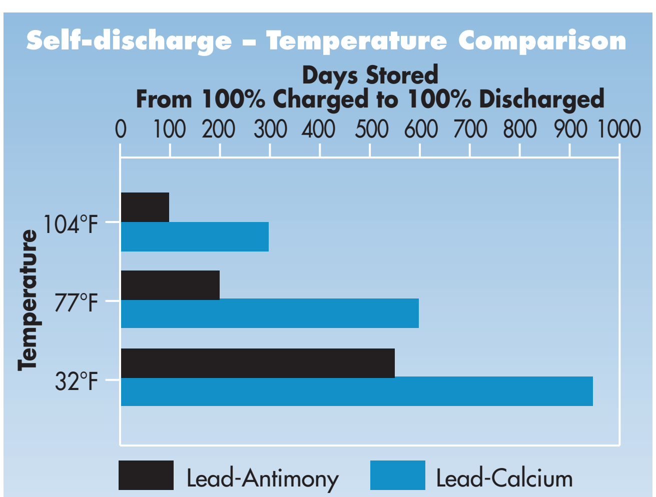
Reasons for Self-discharge

Batteries have a natural tendency to discharge. There are a number of reasons why: self-discharge, high temperatures, drain from electrical accessories on a vehicle, and short trips that aren't enough to recharge the battery.



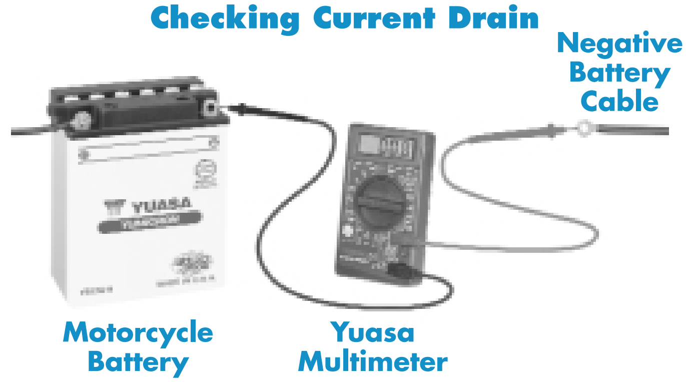
Self-Discharge: Self-discharge goes on all the time. It's a battery fact of life that they get weaker from "just sitting." How rapidly batteries self-discharge depends, first of all, on battery type. Lead-calcium batteries, such as YUASA's CX, YT, YI, discharge more slowly than conventional batteries. At room temperature lead-calcium discharges at 1/300 volt per day. Conventional lead-antimony batteries discharge at 1/100 volt per day.

Temperature: Outside temperature plays a big part, too. As the mercury goes up, batteries discharge faster. Particularly in hot climates, that can mean trouble: every 18°F doubles the discharge rate, so a battery at 95°F discharges twice as fast as one at 77°F. And temperatures of 130°F are battery-killing. Been in a closed-up garage or storage building on a hot summer day recently? In many parts of the country, it's no trick for inside temperatures to reach that.



Accessories: Electrical accessories on some of today's newer and bigger bikes – clocks and computer memory, for example – will discharge the battery continuously, even when the ignition's off. The drain can be considerable. You can find out the drain, in milli-amperes, by disconnecting the negative terminal and putting a multimeter in line. It should look like this:

Checking Current Drain



Keep in mind that at the same time accessories are drawing on the battery, the battery's self-discharging, too. The charts below show how fast a battery is discharged by self-discharge and by current drain:

Self-discharge

Temperature	Approx. Number of Days From 100% Charged to 100% Discharged	
	Lead-Antimony Battery	Lead-Calcium Battery
104°F	100 Days	300 Days
77°F	200 Days	600 Days
32°F	550 Days	950 Days

Current Drain (Y50-N18L-A)

Discharging Ampere	Days From 100% Charged to 50% Discharged	Days From 100% Charged to 100% Discharged
7 mA	60 Days	119 Days
10 mA	42 Days	83 Days
15 mA	28 Days	56 Days
20 mA	21 Days	42 Days
30 mA	14 Days	28 Days

Current Drain

12 Days x 0.030 Amps x 24 Hours = 8.64 AH

8.64 AH ÷ 20 AH (Y50-N18L-A) = **43.0% Available Capacity**

PLUS (+)

Self-discharge

12 Days ÷ 200 Days to 100% Loss = **6.0% Available Capacity**

Total Loss

Current Drain	**43.0% Available Capacity**
Self-discharge	**+6.0% Available Capacity**
Loss in 12 Days	**49.0% Available Capacity**

Let's see what happens as the two work together to discharge a battery:

The battery, starting out 100% charged, has a 30mA discharge rate from electrical accessories on the motorcycle.

At an average outdoor temperature of 77°F a lead-antimony battery loses about half its capacity in only 12 days due to the combination of self-discharge and current drain. In another 12 days, it's completely dead. In other words, it doesn't take long for the double whammy of self-discharge/accessory drain to knock out a battery for good.

If current drain is measurable when the motorcycle is turned off, you can do one of two things: disconnect the battery when the vehicle is in storage, or charge the battery every two weeks to a full charge. However, cycling – or continually recharging the battery – will shorten its life. Check the battery's condition with either a hydrometer or voltmeter (or a multimeter). The section on Testing a Battery has details.

Short Trips: What if you use the vehicle now and then – a couple of times a week for errands, or even daily for a short trip to work?

You can't assume that occasional use or short trips (under 15 or 20 miles) will keep the battery charged. In fact, they're probably going to add to drain, because the bike's charging system doesn't have enough time to make up for losses from normal starting and self-discharge. You're going to have to charge the battery more often. Maybe every month or so, depending on temperature.

Does the surface the vehicle's parked on, or a battery's sitting on, contribute to how well it holds a charge? You sometimes hear "experts" say parking on concrete will accelerate discharge. Bet them it's not so. Then collect. Concrete, macadam, wood, dirt, stones, sand – makes no difference. A battery discharges at the same rate, no matter what surface it's on.

And here's a hint: if a battery suddenly dies and there's no apparent reason for it, check the electrical system before you buy a new battery. One of life's little letdowns is to shell out dollars for a new battery when you didn't need to – and then still have the problem.

POINTS TO REMEMBER

- ❒ **Conventional lead-antimony batteries discharge @ 1/100 volt per day.**
- ❒ **Lead-calcium batteries discharge more slowly @ 1/300 volt per day.**
- ❒ **Higher temperatures mean faster discharge.**
- ❒ **Temperatures over 130°F kill batteries.**
- ❒ **Self-discharge and short trips cause drain.**
- ❒ **The more electrical accessories you add to a bike, the greater the current drain.**

Ampere-Hour and Cold Cranking Amps

There are two battery ratings you need to know: capacity, or ampere-hour rating, and cold cranking amps, or cold start rating.

Ampere-hour rating (in the YUASA Applications book it's abbreviated as AH) is a battery's ability to deliver current for an extended period of time. Because low temperatures slow down the chemical reaction inside a battery, a battery will have a lower ampere-hour rating in cold temperatures than in warm ones.

Most small engine batteries are rated at 10 hours. That says they have to last at a given discharge rate that long. **A 14 ampere-hour battery, for example, discharges at a rate of 1.4 ampere-hours for 10 hours.** At this point, cell voltage has dropped to 1.75v per cell (10.5v for a 12v battery, or 5.25v for a 6v battery). Usually, the larger the plates, the greater the ampere-hour rating.

Cold start rating – the high rate or the cold cranking amps, abbreviated C.C.A. in the YUASA applications book – tells how well a battery can be expected to stand up to low temperatures. This rating depends on the number of plates and their surface area. The rating's arrived at by discharging a cold (0°F) battery at a high rate – for example, 150 amperes – while discharge is monitored with a voltmeter.

Generally, as displacement per cylinder increases, so does the cranking current – but since starting systems differ by model and manufacturer, the best advice is to check the application book for OE replacement. If a special application demands higher cranking power, select an appropriate alternate unit from the YUASA battery line. Once again, match battery features to needs. Cold start rating is important in a snowmobile. A lawn tractor owner probably doesn't care... unless he plows snow, too.

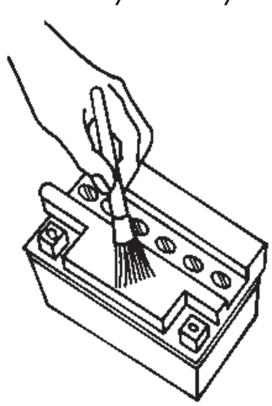
POINTS TO REMEMBER

- ❐ **Capacity or ampere-hour rating: a battery's ability to discharge current over time.**
- ❐ **Cold cranking amps measure battery high rate performance in cold weather.**

Inspecting a Battery

It's good policy to always inspect a battery before you test it. Here's how:

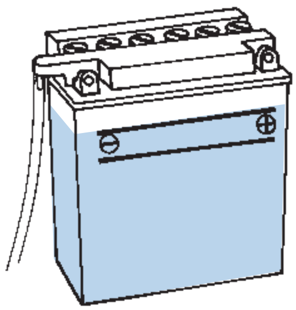
1. Make sure the battery top is clean and dry. That's not just because of looking pretty: a dirty battery actually discharges across the grime on top of the case. Use a soft brush and any grease-cutting soap or baking soda solution. Make sure plugs are finger tight so cleaning materials don't get into cells and neutralize the acid.



2. Inspect battery terminals, screws, clamps and cables for problems: breakage, corrosion or loose connections. Clean the terminals and clamps with a wire brush and coat terminals with no ox grease.

3. Inspect case for obvious damages such as cracks or for leaks; look for discoloration, warping or raised top, which may indicate that battery has overheated or been overcharged.

4. Check electrolyte level and add distilled water if necessary. Don't add acid – only water. Before any tests, charge the battery so the water and electrolyte mix.



5. Check the vent tube. Make sure it's not kinked, pinched or otherwise obstructed. On a motorcycle, it should exit away from the drive chain and from below the swing arm. Small cuts in the tube near the battery vent are OK; they're an "emergency escape" for gas in case the tube becomes obstructed.

POINTS TO REMEMBER

- ❒ **Inspect before you test.**
- ❒ **Dirt on top of case causes discharge.**
- ❒ **Look for obvious damage to battery and connectors.**
- ❒ **Add water if electrolyte is low.**
- ❒ **Make sure vent tube is clear.**

Battery Testing Devices

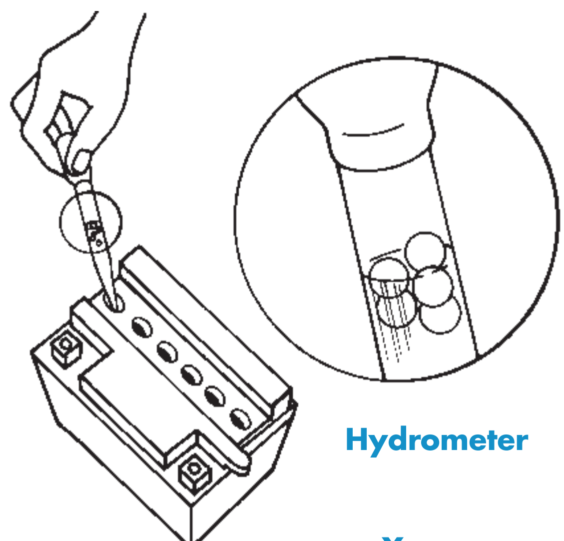
How much of a charge does a battery have? There are two easy and reliable ways to find out:
1) a hydrometer, which comes in floating ball and calibrated float types, or
2) a voltmeter (or multimeter, which gives DC voltage readings).

Which is best?

If you're choosing between two hydrometers, opt for the calibrated float type. It gives you an exact specific gravity reading (that is, the density of the electrolyte compared to water); that's much more accurate than floating balls. For readings on calibrated float and floating ball hydrometers, see "Methods of Checking Battery Condition" chart on the next page.

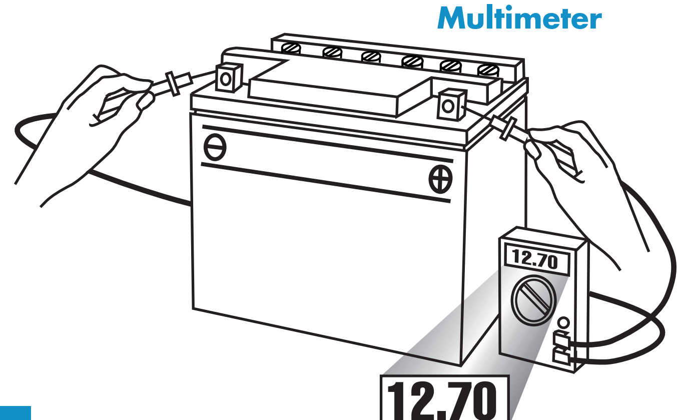
A voltmeter or multimeter can be used where a hydrometer can't. Most sealed VRLA or low maintenance batteries have to be tested with a voltmeter.

Battery testing requires a voltmeter that can measure DC voltage. Remember to always connect a voltmeter parallel to the circuit being tested, observing polarity; otherwise, the pointer will travel in the wrong direction. It's a good idea to periodically check a voltmeter against another one of known accuracy.



Hydrometer

Yuasa Multimeter



Battery Testing

There are two types of battery tests: **unloaded** and **loaded**. An unloaded test is made on a battery without discharging current. It's simplest and most commonly used. If you need a precise reading, loaded testing is the answer. It's more accurate.

UNLOADED TESTING: Check charge condition using either a hydrometer or voltmeter. With a voltmeter, voltage readings appear instantly to show the state of charge. Remember to hook the positive lead to the battery's positive terminal, and the negative lead to the negative terminal.

A hydrometer measures the specific gravity of each cell. **The specific gravity tells the degree of charge; generally, a specific gravity of about 1.265 to 1.280 indicates a full charge.** A reading of 1.230 to 1.260 indicates the battery should be charged before testing. The chart below shows the charge level as measured by syringe float hydrometer, digital voltmeter and five-ball hydrometer.

Methods of Checking Battery Condition

State of Charge	Syringe Hydrometer	Digital Voltmeter	5-Ball Hydrometer
100% Charged w/Sulfate Stop	1.280	12.80v	5 Balls Floating
100% Charged	1.265	12.60v	4 Balls Floating
75% Charged	1.210	12.40v	3 Balls Floating
50% Charged	1.160	12.10v	2 Balls Floating
25% Charged	1.120	11.90v	1 Balls Floating
0% Charged	less than 1.100	less than 11.80v	0 Balls Floating

A battery's specific gravity changes with temperature. Ideally, readings should be taken at 77°F. Is it really going to matter if you're off a couple of degrees one way or another? Probably not. If you're working somewhere that's uncomfortably hot or cold, it's time to use the old conversion factors: add .001 to the specific gravity reading for each 3°F above 77°F or subtract .001 from the specific gravity reading for each 3°F below 77°F. Cell voltage can be found by adding .84 to the specific gravity.

Note, too, that YUASA's "Sulfate Stop," a chemical additive that increases battery life by drastically reducing sulfate buildup, changes the specific gravity readings; they'll be higher than with ordinary batteries.

Test sealed VRLA types with a voltmeter or multimeter. If the stabilized open circuit voltage is below 12.4v, the battery needs charging. For a stabilized open circuit reading, first allow the battery to remain in an open circuit condition for at least 1 - 2 hours.

LOADED TESTING: There are two types of loaded tests for motorcycle batteries. You'll need a voltmeter or multimeter.

Low-load test: Basically, this means turning on the bike's lights and taking a voltage reading at the battery. Remember, hook positive (+) to positive (+), negative (-) to negative (-). The battery in a 12v system should have at least 11.5v DC with the lights on. A 6v system should have at least 5.75v DC. If voltage drops below these levels, it's time to charge.

High-rate discharge test: This is the best test of battery condition under a starting load. Use a load testing device that has an adjustable load. Apply a load of three times the ampere-hour rating.

At 14 seconds into the test, check battery voltage: a good 12v battery will have at least 10.5v, and a good 6v battery, at least 5.25v. If the reading's low, charge.

POINTS TO REMEMBER

- ❒ **Use a voltmeter or hydrometer to test state of charge.**
- ❒ **In extreme cold or heat, you'll have to adjust hydrometer readings.**
- ❒ **Battery can be tested with or without electrical load applied.**
- ❒ **Unloaded testing is simplest.**
- ❒ **Applying a load and reading voltage at battery is more accurate.**

Chargers and Charging

There's a simple rule of thumb about batteries, and if you're a dealer or a mechanic, you know that people ignore it all the time: for a battery to operate the way it's supposed to, it has to be fully charged before it's used... and kept fully charged throughout its life.

A charger basically brings a new battery, or a battery that has been discharged, to full capacity. Plugged into a wall socket, it sends direct current, flowing in the opposite direction of the discharge, into the battery.

Charging actually reverses the destructive chemical process that goes on as a battery discharges: the lead plates and electrolyte, which were being transformed into lead sulfate and water, are restored to their original composition. If a battery has been damaged – for example, it's badly sulfated, or the plates have been damaged from overheating or freezing – it may not accept a charge.

TYPES OF CHARGERS: There are five basic types of battery chargers. With all of them, hook the positive charger lead to the positive battery terminal, and the negative to the negative. Some chargers on the market deliver a low charging voltage that can't fully charge the battery; avoid them if you're buying a charger. A 12 volt, 900 mA charger will meet most needs.

Of course, too much of a charge can be a problem, too – it can "cook" a battery. For small engine starting batteries, don't use a charge greater than 2 to 2.5 amps for maintenance purposes. A badly discharged battery with very high internal resistance may never accept a charge from a standard charger. It would then require special charging equipment.

ALWAYS OBSERVE PROPER SAFETY PRECAUTIONS WHEN CHARGING BATTERIES

TRICKLE CHARGER: This is the charger a consumer – as opposed to a battery retailer or garage – will usually have. It charges the battery at a fixed rate. Different ampere-hour batteries have different charge rates. **For most motorcycle and other small engine starting batteries, charge them at 1/10 of the rated ampere-hour values in the Yuasa Applications Book,** see example on page 11 for ratings.

Battery voltage increases with the amount of charge. Find charging time for a completely discharged battery by multiplying the ampere-hour rating by 1.3 when charging with standard current. The chart on page 20 shows the approximate time needed to fully charge lead-antimony batteries using a trickle or taper charger.

The chart on page 31 shows the approximate time needed to fully charge sealed VRLA batteries.

Test the battery during charging, and continue charging until all cells are gassing. Use either a voltmeter (or multimeter) or hydrometer. The specific gravity of the electrolyte in all cells in a fully-charged battery should come to at least 1.265 in a conventional battery and 1.280 in a YuMicron and sealed VRLA battery with Sulfate Stop.

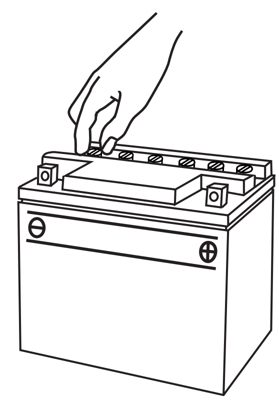
Specific Gravity Reading Using a Hydrometer

State of Charge	Electrolyte Temperature 80°F CX & YuMicron	80°F Conventional	40°F CX & YuMicron	40°F Conventional
100%	1.27/ 1.28	1.26/ 1.27	1.28/ 1.29	1.27/ 1.28
75%	1.22/ 1.23	1.21/ 1.22	1.23/ 1.24	1.22/ 1.23
50%	1.17/ 1.18	1.16/ 1.17	1.18/ 1.19	1.17/ 1.18
25%	1.13/ 1.14	1.12/ 1.13	1.14/ 1.15	1.13/ 1.14
0%	1.11/ or less	1.10/ or less	1.12/ or less	1.11/ or less

During charging, check the electrolyte level periodically and add water – preferably distilled – to keep the electrolyte level up to the line. If the battery becomes hot to the touch, stop charging. Resume after it has cooled.

Note that permanently sealed batteries – YUASA's sealed VRLA battery, for example – generally can be tested only with a voltmeter or multimeter. These batteries are fully charged when the voltage peaks and then begins to fall.

Unless using an automatic charger, do not hook a battery to a trickle charger and leave it unchecked for longer than overnight. After about eight hours maximum, careful monitoring is required.



Caps need to be replaced finger tightened after charging's done.

TAPER CHARGER: Similar to the trickle charger, the automatic taper charger charges at a fixed voltage. As the battery's voltage increases with the amount of charge, the current drops accordingly.

A drawback of both the automatic taper and trickle chargers is speed... they don't have it. As the chart on page 20 shows, it can take days to bring a discharged battery up to 100%. Here, too, check batteries for overheating as they charge.

CONSTANT CURRENT CHARGER: A professional-quality charger, the constant current makes charging simple. It maintains a constant supply of current to the battery at all levels of charging. You select the charging current. As the battery voltage increases with the amount of charge, this charger automatically increases the charging voltage to maintain the current output.

CHARGER/MAINTAINER: This type of charger monitors the voltage constantly during charging and standby modes. When battery voltage reaches a specified low level, the charger/maintainer then delivers a full charge. Then when the battery gets to the specified voltage, it automatically drops to a float charge.

HIGH RATE CHARGER: Not for use with small engine starting batteries. They force a high current into the battery, which can lead to overheating and plate damage.

Battery Voltage Reading Using a Voltmeter

State of Charge	Sealed VRLA	CX & YuMicron	Conventional
100%	13.0v	12.7v	12.6v
75%	12.8v	12.5v	12.4v
50%	12.5v	12.2v	12.1v
25%	12.2v	12.0v	11.9v
0%	12.0v or less	11.9v or less	11.8v or less

POINTS TO REMEMBER

- ❒ **Fully charge battery when new and keep it fully charged.**
- ❒ **Test charging batteries as necessary for overheating, water and state of charge.**
- ❒ **Trickle and taper chargers are generally slow.**
- ❒ **Constant current and pulse chargers are professional quality.**
- ❒ **High rate charger can cause battery damage.**

Charging a New Standard Battery

The most important thing to remember about charging a new battery is do it!

A battery out of the box with only adding electrolyte is approximately 80% charged. Our recommendation is to initial charge, bringing the battery to 100% before use. This completes the electrochemical process. However, a long ride with a regulated charging system may also bring the battery's capacity to a higher level.

Note: See "Section 5" for charging sealed VRLA batteries.

The rule of thumb is to charge a new battery for three to five hours at a rate equal to 1/10 of its rated capacity. But there are a lot of exceptions to that rule, as this table shows:

Quick Charges

What about quick charging? The quick answer is **don't.** We don't recommend it, and here's why: only the surface area of the battery plates can be quick charged. A lower current charges the battery more uniformly. That means better performance. Also, excessive charging rates increase the chance of overheating, which can mean battery damage.

Charging Times

State of Charge	12N10	12N12	12N14	YB18	YB16	Y50
Approximate Charge Times (Hours) Using a "Trickle" (0.25 Amp) Charger						
75%	13	15	18	23	24	25
50%	25	30	35	45	48	50
25%	38	45	53	68	71	75
0%	50	60	70	90	95	100
Approximate Charge Times (Hours) Using a 1 Amp Taper Charger						
75%	6	7	8	10	10	11
50%	11	13	14	18	19	20
25%	15	18	20	26	27	28
0%	20	23	27	34	35	37
Approximate Charge Times (Hours) Using a 1 Amp Constant Current Charger						
75%	3	4	4	6	6	6
50%	6	8	9	11	12	13
25%	9	11	13	17	18	19
0%	13	15	18	23	24	25

(Battery Types: 12N10, 12N12, 12N14, YB18, YB16, Y50)

POINTS TO REMEMBER

- ❒ **A new battery after activation is approximately 80% charged.**
- ❒ **Initial charging is always recommended. NEVER quick charge.**
- ❒ **Charge a new battery at a rate equal to 1/10 of its rated capacity.**

SECTION 4

Maintenance and Storage

Monthly Maintenance for Conventional and YuMicron Types

Batteries don't demand a lot of attention. But not giving your battery the attention it needs can leave you stranded... or poorer by the cost of a new battery.

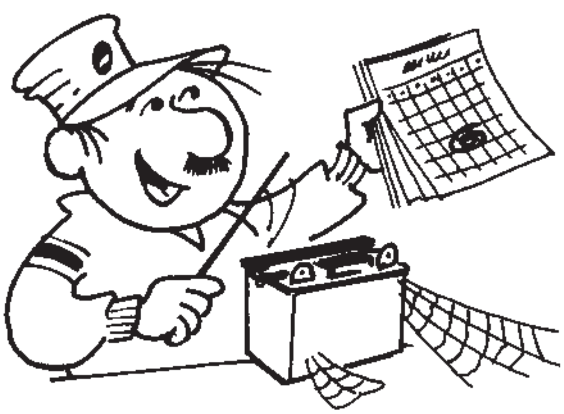
How often should you maintain a battery? About monthly under usual conditions. However, recharging is necessary when lights get dim, when the starter sounds weak, or when the battery isn't used for more than two weeks.

Important as it is, there's really not much to battery maintenance. Basically, just follow the procedure outlined in the section "Inspecting a Battery."

That means:

- Check electrolyte level.
- Keep the top free of grime.
- Check cables, clamps and case for obvious damage or loose connections.
- Clean terminals and connectors as necessary.
- Make sure exhaust tube is free of kinks or clogs.
- Replace caps, **finger tighten only.**

Then, test the battery with either a hydrometer or voltmeter. Keep it charged to 100%.



Storage

If the vehicle is in storage or used infrequently, disconnect the battery cable. That eliminates drain from electrical equipment. Check battery every two weeks and charge as necessary.

For extended storage, remove the battery from the vehicle and charge to 100%. Charge the battery every month if stored at temperatures below 60°F. Charge every two weeks if stored in a warm area (above 60°F). Make sure batteries are stored out of reach of children.

Sulfation and Freezing

Two of the biggest battery killers – sulfation and freezing – aren't a problem if the battery is properly maintained and water level is kept where it should be.
Sulfation: This happens because of 1) continuous discharging, or 2) low electrolyte levels.

Let's back up just a minute: we said earlier that discharge turns the lead plates into lead sulfate. This lead sulfate is actually a crystal. If the discharge continues uninterrupted, the sulfate crystals grow and blossom into sulfation – and a problem. The section titled "Reasons for Self-discharge" has the gory details.

Much the same happens if the fluid level is too low, which exposes the plates to air. Then the active lead material oxidizes and sulfates, and it doesn't take long before it won't hold a charge. (Low electrolyte levels cause another problem, too: acid in the electrolyte becomes more concentrated, causing material to corrode and fall to the bottom. In sufficient quantity, it will short out the battery.)

Keeping a battery charged, disconnecting the battery cable during storage, and keeping electrolyte levels up eliminate the problem. For added protection, YUASA's YuMicron, YuMicron CX and Sealed VRLA batteries are treated with a special chemical formula called "Sulfate Stop." This dramatically reduces sulfate crystal buildup on plates. The result: longer battery life.

How good is Sulfate Stop?

We simulated a constant discharge condition on two batteries with a 10-watt bulb.

Even after being totally drained for a week, the battery with Sulfate Stop made a 90% recovery.

The untreated battery: useless.

Freezing: It shouldn't bother you – unless a battery is inadequately charged. Looking one more time at the discharge process, remember that electrolyte acid becomes water as discharge occurs. Now, it takes Arctic temperatures to freeze acid. But water... as we all know, freezing starts at 32°F. A sign of this is mossing – little red lines on the plates. Freezing can also crack the case and buckle the plates, which means the battery is permanently damaged.

A fully-charged battery can be stored at sub-freezing temperatures with no damage. As the chart at right shows, it takes -75°F to freeze electrolyte in a charged battery. But at just a couple degrees below freezing – at +27°F – a discharged battery's electrolyte turns to ice. That's a difference of more than 100°F between the low temperatures a charged and discharged battery can stand.

At temperatures such as these, incidentally, the self-discharge rate of a battery is so low that a recharge usually isn't needed for months. But to stay on the safe side, test.

Electrolyte Freezing Points

Specific Gravity of Electrolyte	Freezing Point
1.265	-75°F
1.225	-35°F
1.200	-17°F
1.150	+ 5°F
1.100	+18°F
1.050	+27°F

POINTS TO REMEMBER

- ❒ **Monthly maintenance and testing are a must.**
- ❒ **Most important: make sure battery is charged and fluid level is correct.**
- ❒ **Disconnect cables or pull battery for storage.**
- ❒ **Keep fully charged to prevent sulfation and freezing.**

SECTION 5

Sealed VRLA Batteries

New Generation Battery Technology

Yuasa's innovative sealed VRLA (Valve Regulated Lead Acid) batteries are a new generation made possible by advanced gas recombinant technology. These include the YT and YI series batteries. We refer to them as "sealed VRLA batteries" here.

Sealed VRLA batteries are easy to activate and maintain. But, keep these points in mind:

1. There are important differences in activating a sealed VRLA battery. Be sure to follow the instructions in this section.

2. While Yuasa sealed VRLA batteries dramatically reduce the need for maintenance, they do need periodic charging. It's important to remember this and to know how to go about it.

3. When considering upgrading to a sealed VRLA battery that did not come OE in your vehicle, **check to make sure your charging system has a regulated output between 14.0 - 14.8v.**

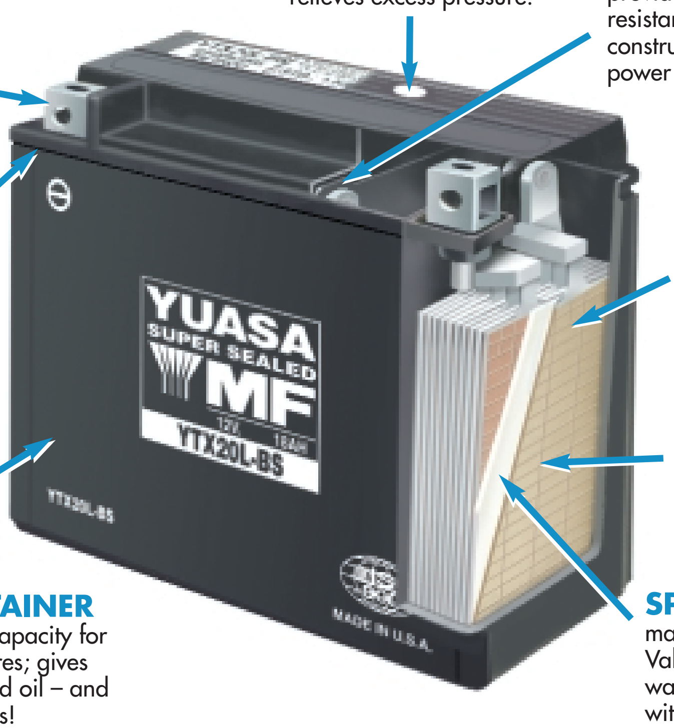
Let's take a closer look at Yuasa's innovative sealed VRLA batteries… and what makes them special.

Features

The sealed VRLA battery is the battery for vehicles that may be stored for long periods (riding mowers, personal watercraft, or scooters or cycles during the off-season, for example), or where spills could be a problem (ATVs or personal watercraft). YUASA's sealed VRLA batteries deliver:

- **No topping** – Fill it just once, to activate. No need to check electrolyte level or add water ever again.
- **Reduced self-discharge** – Grids manufactured from a special lead-calcium alloy hold the charge longer – a real plus with storage or occasional use.
- **Easy, instant activation** – The "one-push" electrolyte container makes filling a snap.
- **Enhanced safety** – A safety valve vents gases produced by overcharging. In case of fire, the flame arrestor disk minimizes explosion risk.

SEALED VRLA BATTERY CONSTRUCTION



SAFETY VALVE/ FLAME ARRESTOR relieves excess pressure.

THRU-PARTITION CONSTRUCTION provides shorter current path with less resistance than "over the partition" construction – you get more cranking power when you need it!

PATENTED SEALED POST prevents acid seepage, reduces corrosion – extends battery life.

HEAT SEALED CASE TO COVER protects against seepage and corrosion – bonded unit gives extra strength.

POLYPROPYLENE COVER AND CONTAINER assures reserve electrolyte capacity for cooler operating temperatures; gives greater resistance to gas and oil – and impact in extreme conditions!

SPECIAL ACTIVE MATERIAL is compounded to withstand vibration, prolong battery life and dependability.

SPECIAL GRID DESIGN withstands severe vibration, assures maximum conductivity.

SPECIAL SEPARATOR makes the battery spill-proof. Valve regulated design eliminates water loss and the need to refill with acid.

- **Compact design** – High efficiency in a small package, with no vulnerable exhaust tubes or other protrusions to break or kink.

How a Sealed VRLA Battery Differs from Conventional Types

Some of a sealed VRLA battery's differences are obvious. It's noticeably more compact. The reason: no free electrolyte, making it more "volume efficient" – a fancy way of saying it can be smaller. Since the battery is filled with electrolyte just once (at activation), then sealed, you won't find a row of filling plugs. Instead, a single sealing plug strip permanently covers filler ports. Also, there are no vent tubes – after all, these batteries are sealed!

But as with any magic, there's more than meets the eye. The heart of a sealed VRLA battery is what you don't see.

1. The plates are comprised of special lead-calcium alloy grids and charged active material. Lead-calcium reduces self-discharge – the battery holds its charge longer. The construction of the sealed VRLA battery causes freed gas to recombine inside the battery instead of being vented… allowing the battery to be sealed.

2. Separators are made of a special fiber with superior heat and acid resistance. These special separators make the battery non-spillable.

3. Sealed VRLA batteries have an internal safety valve. If battery pressure soars due to accidental overcharging, it opens to release excess gas, preventing a battery rupture.

The unique design affects what happens inside the battery. The basic discharge-charge cycle is still going on… that's what makes any battery tick. But to understand what's different, let's do a little review:

A battery is basically a box containing lead plates. Some plates have a positive (+) charge, some negative (-). They're immersed in a current-conducting electrolyte solution that sets off the electrochemical process that produces electricity. Think of a battery as a machine that produces electricity through a continuous process of charging and discharging.

During discharge, sulfuric acid electrolyte solution reacts with the lead plates, turning them into lead sulfate. The electrolyte – sulfuric acid solution made up of hydrogen, sulfur and oxygen – gives up its sulfur and some of its oxygen and turns to water.

$$PbO_2 + Pb + 2\,H_2SO_4 \rightarrow 2\,PbSO_4 + 2\,H_2O$$

The process reverses with charging. Electrolytes and plates return to their original composition. The charging current breaks down water into its component gases: hydrogen (from the negatively charged plate) and oxygen (from the positive plate). Gases escape out the vent tube. With a conventional battery, water is added to replace that loss.

Here's the real secret of a sealed VRLA battery: the negative plate never becomes fully charged… so, no hydrogen gas. The positive plate still makes oxygen, but instead of being forced out the vent tube, it reacts with the charged active material to become water again. That's "gas recombinant technology." That's the magic of YUASA's non-spillable, sealed VRLA battery.

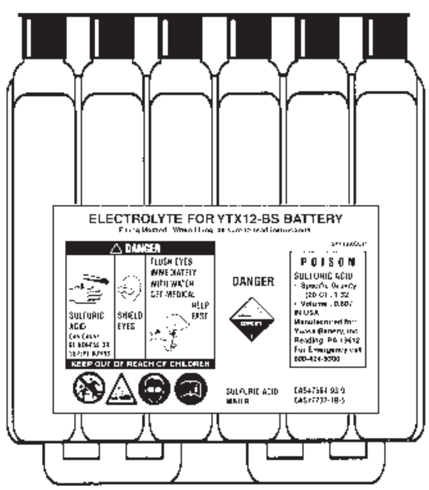
POINTS TO REMEMBER

- ❒ **Gas Recombinant technology produces a more compact battery.**
- ❒ **After activation, no need to check electrolyte or add water.**
- ❒ **Sealing strip is permanently inserted — it's never removed.**
- ❒ **Gas is recombined in the battery; there's no vented gas and vent tube.**

Activation and Installation

Activating sealed VRLA batteries is easy, although a little different from conventional activation. For problem-free start-up and operation, follow the procedure outlined here. A few things to keep in mind before you get rolling:

- **Store the battery in a cool, dry place out of direct sunlight.**
- **Do not remove the foil sheet covering the filler port until activation.**
- **After removing the electrolyte container cap strip, do not peel, pierce or otherwise open the sealed electrolyte receptacles. Don't separate the individual cells.**
- **Read electrolyte handling instruction and precautions on the label.**



- **Use only the electrolyte container that comes with the battery.** Sealed VRLA battery electrolyte is a higher concentration of sulfuric acid. All sealed VRLA battery electrolyte containers aren't the same. Each contains the proper amount of electrolyte for its specific battery.
- **Always wear plastic gloves and protective eyewear.** No Smoking, see page 8 for full safety instructions.Of course, don't forget safety precautions when storing or handling electrolyte solution.

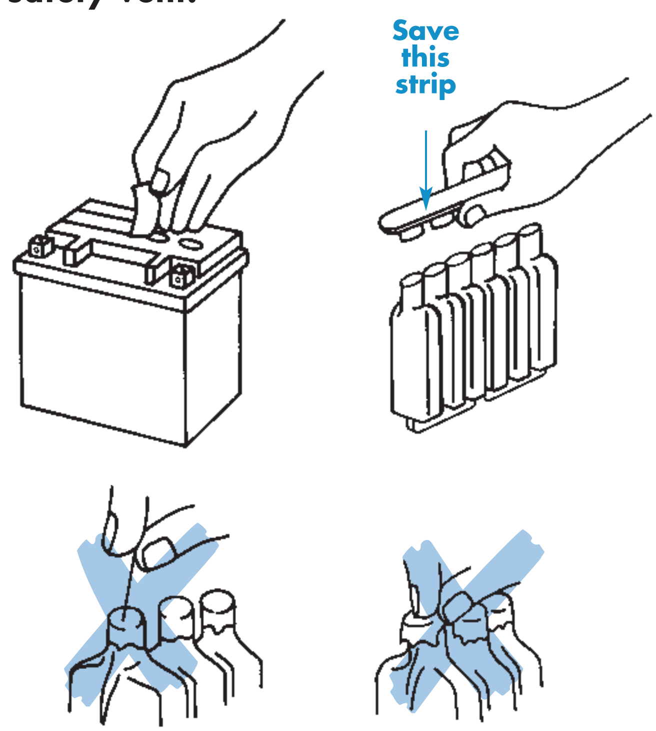
To Activate a Sealed VRLA Battery

1. Place the battery on a level surface. Battery must be out of the vehicle.

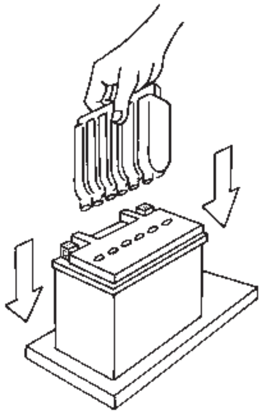
2. Remove electrolyte container from vinyl bag. Pull off the strip of caps. **Put the strip aside – you'll use this later as the battery sealing plug.** Use only the dedicated container that comes with the battery. It contains the proper amount of electrolyte for your specific model – important to service life and operation. Do not pierce or otherwise open the sealed cells of the electrolyte container. Do not attempt to separate individual cells.

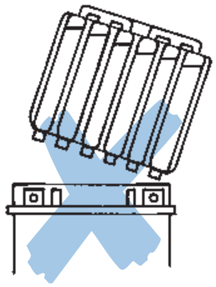
3. Place electrolyte container, sealed top of the cells down, into the filler ports of the battery. Hold the container level, push down to break the seals. You'll see air bubbles as the ports fill. ***Do not tilt the electrolyte container.***

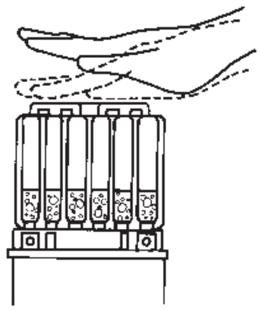
Warning: Improper activation or excessive overchargering (possibly by equipment failure) could cause damage to the battery or vehicle by forcing acid out of the safety vent.



See next page.

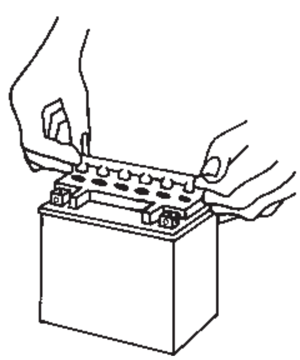


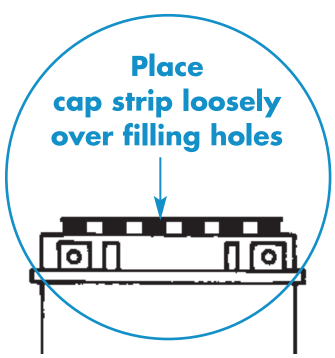




4. Check the electrolyte flow. **Keep the container in place for 20 minutes or longer until it empties completely.** If no air bubbles are coming up from the filler ports, or if container cells haven't emptied completely, tap the container a few times. Don't remove the container from the battery until it's empty. The battery requires all the electrolyte from the container for proper operation. Make sure the electrolyte container empties completely.

5. Remove the container. **For batteries 3 - 12 AH, let stand for at least 30 minutes. For batteries greater than 12 AH, allow the battery to stand a minimum of <u>1 HOUR</u>.** This allows the electrolyte to permeate into the plates for optimum performance. Yuasa sealed VRLA batteries have the amp hours printed right on the front of the battery.





6. Newly activated sealed VRLA batteries require an initial charge. After adding electrolyte, a new battery is approximately 80% charged. Place cap strip loosely over the filling holes as shown in drawing above. Immediately charge your battery after the "stand" period, to bring it to a full state of charge. **<u>See "Charging a Newly Activated Sealed VRLA Battery" on page 30.</u>**

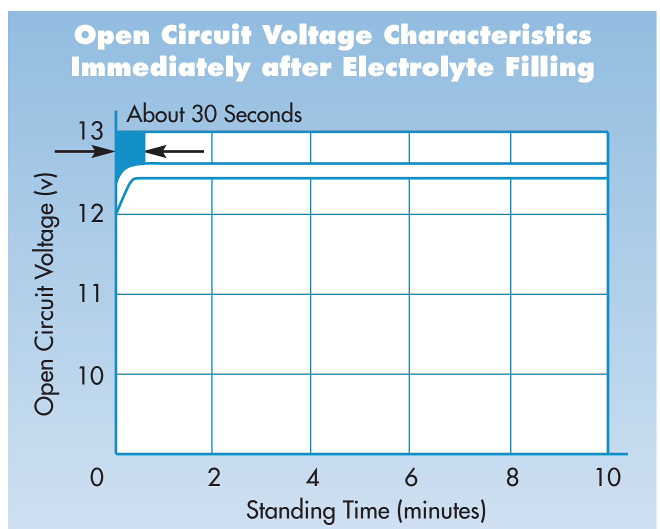
After charging is completed, press down firmly with both hands to seat the caps (<u>don't pound or hammer</u>).

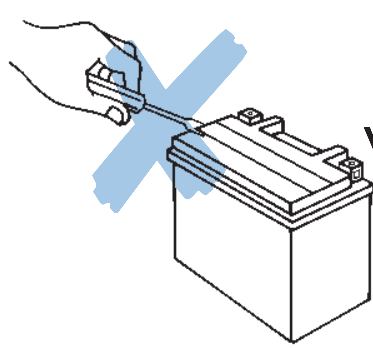
The battery is sealed. There is no need to remove the strip of caps or add electrolyte for the life of the battery.

7. The graph below shows an open circuit voltage characteristic of a sealed VRLA battery just after the electrolyte is filled.

If the battery is only filled with electrolyte, but not being given a supplementary charge, the open circuit voltage will be somewhere around 12.5 to 12.6v, as shown in the graph below. The reasons for the voltage being low are that:

- **<u>The capacity reached by filling with electrolyte is about 80% of the fully charged capacity.</u>**
- The electrolyte around the plates gets its concentration lowered temporarily.





Remember: unlike a conventional battery, the sealed VRLA battery won't be topped off during its life. Never pry off sealing caps: it's dangerous and damaging.

Measuring Voltage

How healthy is your sealed VRLA battery? Since a sealed VRLA battery is sealed – and the sealing caps are never removed – you won't be able to check the state of the charge by the old hydrometer-and-specific-gravity test. Rather, use a voltmeter or multimeter to measure DC voltage. It should be of class 1 accuracy or better. Some basics to keep in mind:

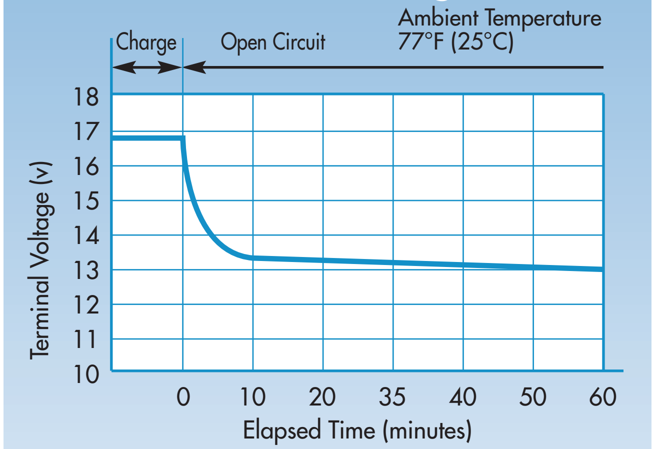
- Check voltage using a voltmeter. Readings for a charged, newly-activated battery should be 12.8v or higher after the battery is charged and **sits for at least 1 - 2 hours.** If less, it needs an additional charge.

- The graph top right shows open circuit characteristics of the sealed VRLA battery after end of charging using a constant current charger set to the standard current of the specific battery. As shown, the open circuit voltage is stabilizing 30 minutes after end of charge.

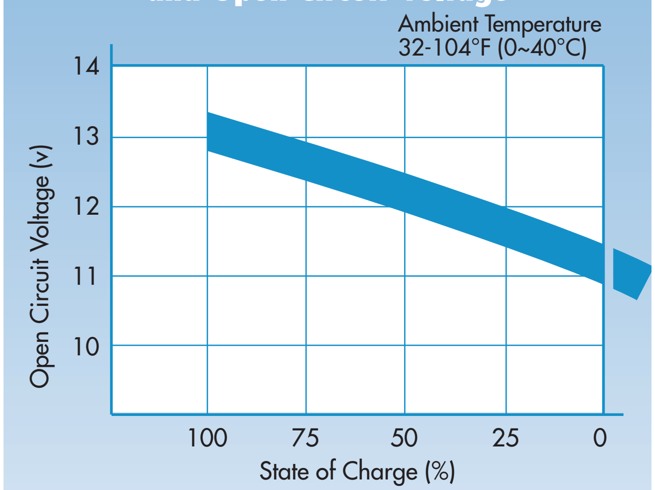
  Therefore, to determine the state of charge and the health of the battery, measure the open circuit voltage 1 hour after end of charge.

- For a battery that has been in use, refer to the graph bottom right to determine state of charge from open circuit voltage.

Open Circuit Voltage Characteristics after End of Charge



Relation between State of Charge and Open Circuit Voltage



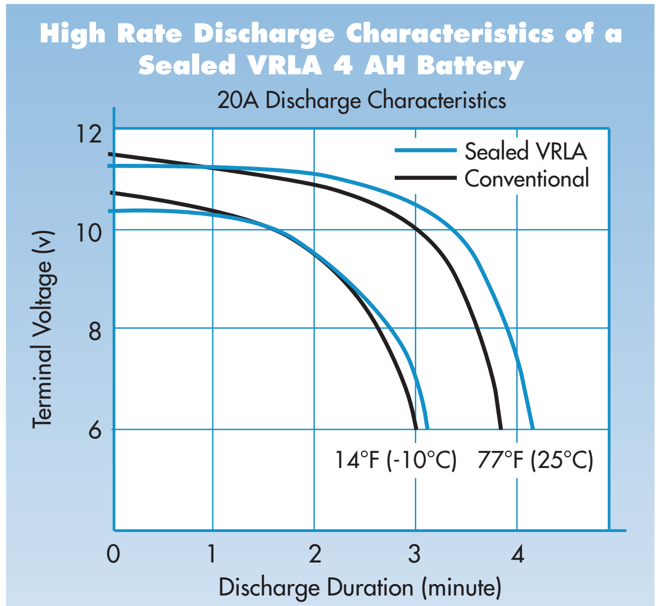
POINTS TO REMEMBER

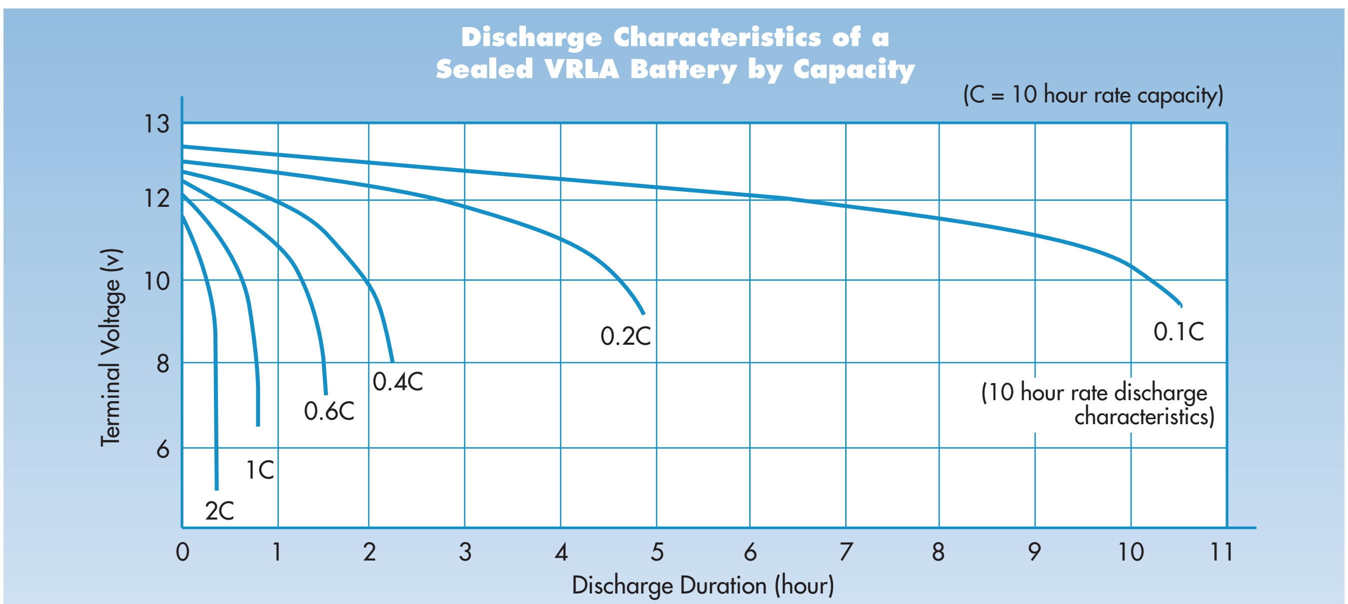
- ❒ **Use a voltmeter to determine state of charge. Because sealing caps are never removed, you can't test specific gravity.**
- ❒ **Don't use a quick charge for initial activation.**
- ❒ **A battery that has just been activated or charged needs to stabilize 1 hour for an accurate voltage reading.**

Discharge Characteristics

Think about what types of vehicles a sealed VRLA battery goes into: most aren't like the family car, driven day-in, day-out. They're probably used once in a while, or maybe even stored for weeks or months at a time.

That demands a special kind of battery – one with extra power to reliably start that engine, every time. In YUASA's sealed VRLA batteries, the plate groups are specially designed to deliver that. The graph to the right shows the increase in discharge time of a sealed VRLA battery compared to a conventional Yumicron battery at both cold and room temperatures. The graph below shows the cold temperature performance of the sealed VRLA battery as the load increases. "C" equals the Amp Hour Capacity Rating of the battery.





Starting the engine is a big part of the battery's job, but not all. Electrical accessories and safety systems – lights and horn – need a stable supply of electricity. Now you're concerned with the battery's "low rate discharge characteristics." This steady, low rate discharge is measured in "10-hour rate discharge." The graph above shows the discharge characteristics of YUASA's YT or YI sealed VRLA batteries at different current rates. Note that battery capacity is a function of the current being used (or discharge current) x time.

Self-discharge

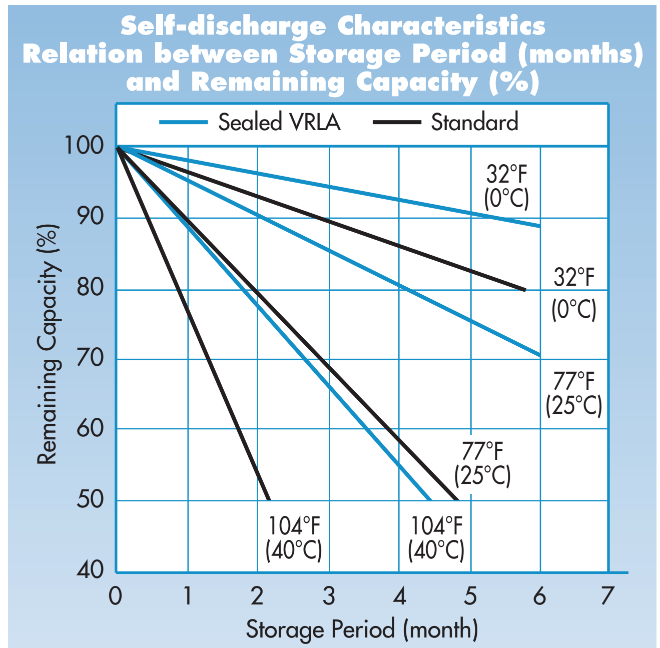
Constant self-discharge is a fact of life for all batteries. They lose strength as they sit there doing nothing. The good news is that lead-calcium technology in a sealed VRLA battery slows down the self-discharge process substantially. Conventional lead-antimony batteries discharge at about 1/100 volt a day… the lead-calcium sealed VRLA battery, 1/300 volt per day. Looking at it another way, a conventional battery fully charged and stored for a month will lose roughly a third of its charge; the sealed VRLA battery handled the same way would lose about 10%.

Remember, too, ambient temperature affects battery discharge. Higher the temperature, quicker the discharge – for all batteries.

So, the sealed garage or storage shed with the sun beating down on it isn't doing any favors to the battery in your vehicle. Excessive heat will prematurely shorten the life of the battery.

Some people figure sealed VRLA batteries are so good, there's no need to worry about routine charges. Flattering, but wrong. Forgetting routine charging can mean a one-way ticket to the battery graveyard.

Lead-calcium technology definitely slows self-discharge, but a combination of heat and idleness will still drain a sealed VRLA battery, like the conventional one. You'll find step-by-step charging instructions later in this section.



POINTS TO REMEMBER

- ❐ **"High rate discharge" sealed VRLA batteries deliver extra starting power.**
- ❐ **Lead-calcium technology substantially slows self-discharge.**
- ❐ **Routine charging is required to maintain a full charge.**

Choosing a Charger

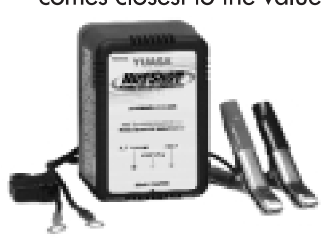
Match your sealed VRLA battery to the right charger. The wrong one can cause permanent damage and poor performance.

Yuasa offers a complete line of chargers to activate and maintain your battery to factory specifications.

- Do not use a larger than recommended amp charger to reduce charging time. That permanently damages the battery and voids the warranty.

- **To find recommended current output in amps, divide battery amp hour capacity rating by 10. Example: 14 AH ÷ 10 = 1.4 amp current.**

Yuasa sealed VRLA batteries have the amp hours printed right on the front of the battery. If you're not sure, refer to application manuals at the dealer. Select the charger that comes closest to the value of that figure.



Yuasa 900 mA Automatic Charger

Yuasa 1.5 Amp Automatic Charger

Charging a Newly Activated Sealed VRLA Battery

Sealed VRLA batteries require an initial charge. If you are using a constant current charger, refer to the standard (STD.) charging method printed on the battery. If you are using an automatic type taper charger, check to make sure that the charger current (amps) is equal to or greater than the standard (STD.) charging method listed on the battery.

CHARGING INSTRUCTIONS FOR NEWLY ACTIVATED SEALED VRLA BATTERIES

These batteries are a sealed VRLA construction – which means:
NEVER REMOVE THE SEALING STRIP AFTER CHARGING IS COMPLETED!
If the battery gets very hot to the touch, cease charging and allow battery to cool down.

Check voltage using a voltmeter. Readings for a charged, newly-activated battery should be 12.8v or higher after the battery is charged and **sits for at least 1 - 2 hours.** If less, it needs an additional charge.

Yuasa Automatic Chargers and Accessories are the safest and most convenient method for error proof charging and battery maintenance.

Routine Charging

The single most important thing to maintaining a sealed VRLA battery is **don't let it sit discharged: keep it fully charged.** A sealed VRLA motorcycle battery should be kept to near fully charged for peak performance. In fact, it can need charging more often than a car battery because it's probably not used routinely and, therefore, not "automatically" charged.

Use the following guidelines for boost charge. Always verify battery condition before charging, and 30 minutes after charging.

- A fully charged battery should read 12.8v or higher after battery has been off the charger 1 - 2 hours.

OVERCHARGING CAN HARM YOUR BATTERY BEYOND RECOVERY.

A word on overcharging: *don't*. Because of the characteristics of a sealed VRLA battery, too much of a boost charge will decrease the volume of electrolyte. The longer the overcharge time, the greater the drop in electrolyte – and starting power.

Water can't be added to the sealed VRLA battery to make up the difference. Overcharging can warp plates, making future charging difficult or impossible. Watch charging times carefully, or ideally, use a Yuasa Automatic Charger. Always stop charging if the battery becomes really warm to the touch. Let it cool down 6 - 12 hours and resume charging.

State of Charge	Voltage	Action	Charge Time* (Using a constant current charger @ std. amps specified on the battery)
100%	12.8v - 13.0v	None Check at 3 months from date of manufacture	None Required
75% -100%	12.5v - 12.8v	May need slight charge, if no charge given, check in 3 months	3 - 6 hours
50% - 75%	12.0v - 12.5v	Needs charge	5 - 11 hours
25% - 50%	11.5v - 12.0v	Needs charge	At least 13 hours verify state of charge
0% - 25%	11.5v or less *(see special instructions on page 32)*	Needs charge	20 hours

* Charging times can vary depending on type of charger. Follow the charger's instructions.

Caution:

Always wear safety glasses and charge in a ventilated area. If battery gets really warm to the touch, discontinue charging and allow battery to cool down. No sparks, flames or smoking when charging.

Charging Instructions for Sealed VRLA Batteries with Voltage of 11.5 or Less

Batteries with voltage below 11.5v may require special equipment and procedures to recharge.

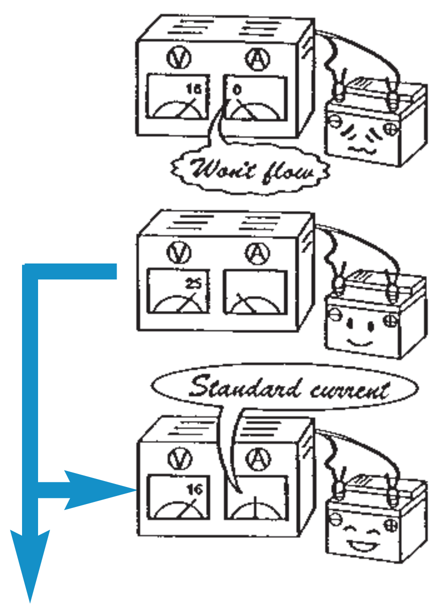
In charging an overdischarged battery having a terminal voltage of 11.5v or lower, its internal resistance may be too high to charge at a normal charge voltage. Therefore, it may be necessary to raise the voltage of the battery initially (25v as a maximum), and charge for approximately 5 minutes. If the ammeter shows no change in current after 5 minutes, you need a new battery.

Current flowing into the battery at high voltage can become excessive. Monitor amperage and adjust voltage as necessary to keep current at the battery's standard amp rating. Charge for approximately 20 hours.

How to determine battery condition after boost charge.

Determine the condition of a sealed VRLA battery at least 1 - 2 hours after the charge by measuring the terminal voltage according to the table below.

Criteria	Judgement
12.8v or higher	Good
12.0 -12.8v or lower	Charge insufficient → Recharge
12.0v or lower	Unserviceable → Replace



Adjust voltage so that current will be at standard amps after 5 minutes.

Routine Maintenance for Sealed VRLA Batteries

Check voltage periodically using a voltmeter.

- Recommended every 3 months from date of activation, or 3 months from date of manufacture for batteries activated at the factory. Keep in mind, higher storage temperatures cause faster self-discharge and require checking more often.
- If you plan to store your vehicle for an extended time, make sure your battery is fully charged.
- Fully charged should read 12.8v - 13.0v after standing 1 - 2 hours.
- When a battery is in storage, check and charge it if the voltage drops below 12.5v for YTX batteries.

Beyond that, maintenance is the same as for any battery, except you don't have to worry about electrolyte:

- Keep the battery top free of grime.
- Check cables, clamps and case for obvious damage or loose connections.
- Clean terminals and connectors as necessary.
- For storage, pull battery or disconnect battery cable.

GLOSSARY

Acid Sulfuric acid, used to describe the electrolyte or liquid in a cell.

Active Materials Materials in a battery that react chemically to produce electrical energy: they are lead peroxide (positive) and sponge lead (negative).

Activation Making a dry cell functional by adding electrolyte.

AGM Absorbed glass mat.

Air Oxidized A charged negative plate that has been removed from electrolyte and permitted to discharge in an air atmosphere. Plates must then be recharged before they are capable of producing useful electrical energy.

Alloy A combination of two or more metals. See **Antimonial Lead Alloy** and **Calcium Lead Alloy.**

Ambient Temperature The surrounding temperature, usually refers to room temperature.

Alternating Current A pulsating electric current in which direction of flow is rapidly changed, so the terminal becomes in rapid succession positive, then negative. Abbreviated *AC*.

Ammeter An instrument for measuring electrical current.

Ampacity Current carrying capacity in amperes.

Ampere The unit of electrical current equal to the steady state current produced by one volt applied across a resistance of one ohm.

Ampere-Hour A measure of the volume of electricity, being one ampere for one hour. It is used to express battery capacity, and is registered by an ampere-hour meter; it can be obtained by multiplying the current in amperes by length of time that the current is maintained.

Ampere-Hour Capacity The number of ampere-hours that can be delivered by a storage battery under specified conditions as to temperature, rate of discharge and final voltage.

Ampere-Hour Efficiency The electrochemical efficiency of a storage battery expressed as the ratio of ampere-hours output to the ampere-hours input required for recharge.

Ampere-Hour Meter An instrument that registers the quantity of electricity in ampere-hours.

Anode An electrode through which current enters any non-metallic conductor. Specifically, an electrolytic anode is an electrode at which negative ions are discharged, positive ions are formed, or at which other oxidizing reactions occur.

Antimonial Lead Alloy A commonly used alloy in battery castings. The percentage of antimony varies from 1/2% to 12%. Other substances are present in small quantities, either as inescapable impurities or by design to improve the properties of the cast part.

Antimony A hard, brittle, silver-white metal with a high luster from the arsenic family.

Assembly 1. Combining various parts into a finished battery. 2. Any particular arrangement of cells, connectors and terminals to form a battery.

Automotive Battery SLI battery of 3 or 6 cells used for starting, lighting and ignition of cars, trucks, buses, etc.

Average Voltage A storage battery's average value of voltage during a period of charge or discharge.

Battery (Storage) A connected group of two or more storage cells. Common usage applies this term to a single cell used independently.

Bridge The ribbed supporting structure in the bottom of a battery container that provides sediment space under the elements, thereby preventing short circuits.

Burning Welding together two or more lead or lead alloy parts such as plates, straps, connectors.

Burning Center The center-to-center distance between adjacent plates of the same polarity.

Burning Stick A lead or lead alloy stick used as a supply of joining material in lead burning.

Cadmium A metallic element highly resistant to corrosion, used as a protective plating on certain parts and fittings.

Cadmium Electrode A third electrode for separate measurements of the electrode potential of positive and negative plate groups.

Calcium Lead Alloy A lead base alloy that is sometimes used for battery parts in place of antimonial lead alloys.

Capacity See **Ampere Hour Capacity.**

Capacity Test A test that discharges the battery at constant current at room temperature to a cutoff voltage of usually 1.75 volts/cell.

Cast Forming a molten substance into a shape by introducing the material into a mold and allowing it to solidify.

Casting A metallic item, such as one or more grids, straps or connectors, formed by pouring a molten substance into a mold and allowing it to solidify.

Cast-On Strap A multiple connector that had been cast onto the plates directly in a combination mold/burning jig; contrasts with burning of plates and prefabricated straps.

Cathode An electrode through which current leaves any non-metallic conductor. Specifically, an electrolytic cathode is an electrode at which positive ions are discharged, or negative ions are formed, or at which other reducing actions occur.

Cell (Primary) A cell designed to produce electric current through an electrochemical reaction that is not efficiently reversible and hence the cell, when discharged, cannot be efficiently recharged by an electric current.

Cell (Storage) An electrolytic cell for generation of electric energy, in which the cell after discharge may be restored to a charged condition by an electric current flowing in a direction opposite to the flow of current when the cell discharges.

Charged A storage cell at maximum ability to deliver current. The positive plates contain a maximum of lead oxide and a minimum of lead sulfate, and the negative plates contain a maximum of sponge lead and a minimum of sulfate, and the electrolyte is at maximum specific gravity.

Charged and Dry A battery assembled with dry,charged plates and no electrolyte.

Charged and Wet A fully-charged battery containing electrolyte and ready to deliver current.

Charging The process of converting electrical energy to stored chemical energy. In the lead acid battery, it converts lead sulfate in the plates to lead peroxide (positive) or lead (negative).

Charging Rate The current, expressed in amperes, at which a battery is charged.

Circuit A system of electrical components through which an electric current is intended to flow. The continuous path of an electric current.

Cold Crank Test A test that applies a high rate of discharge to a battery at 0°F, and the 30 second cell voltage must be above 7.2v.

Constant Current Charge A charge that maintains the current at a constant value. For some types of batteries this may involve two rates, called a starting and a finishing rate.

Constant Potential Charge or Constant Voltage Charge A charge that holds the voltage at the terminals at a constant value.

Container Housing for one or more cells, commonly called a "jar."

Cover The lid of an enclosed cell, generally made of the same material as the container and through which the posts and vent plug extend.

Cover Inserts Lead or lead alloy rings molded or sealed into the cell cover, and that the element posts are burned to, thereby creating an effective acid creep-resistant seal.

Creepage Travel of electrolyte up the surface of electrodes of other parts of the cell above the level of the main body of the electrolyte.

Curing Chemical conversion process that changes lead oxides and sulfuric acid to mixtures of basic lead sulfates, basic lead carbonates, etc., which consequently forms the desired structures of lead or lead sulfate on negative and positive plates during formation.

Current The time rate of flow of electricity, normally expressed as amperes, like the flow of a stream of water.

Cut-Off Voltage See **Final Voltage.**

Cutting (of acid) Dilution of solution of sulfuric acid to a lower concentration.

Cycle A discharge and its subsequent recharge.

Cycle Service Battery operation that continuously subjects a battery to successive cycles of charge and discharge, e.g., motive power service.

Deep Discharge Removal of up to 80% of the rated capacity of a cell or battery.

Dielectric Test An electric test performed on jars, containers and other insulating materials to determine their dielectric breakdown strength.

Diffusion The intermingling or distribution of particles or molecules of a liquid.

Direct Current A one-direction current. Abbreviated *DC.*

Discharge Conversion of a battery's chemical energy into electrical energy.

Discharged A storage cell when, as a result of delivering current, the plates are sulfated, the electrolyte is exhausted, and there is little or no potential difference between the terminals.

Discharge Rate Any specified amperage rate at which a battery is discharged.

Dry Charged Battery plates that have been subjected to the dry charging process.

Dry Charging Manufacturing process in which tank-formed battery plates are washed free of acid and then dried.

Efficiency The ratio of the output of a cell or battery to the input required to restore the initial state of charge under specified conditions of temperature, current rate and final voltage.

Electrode A conductor through which current passes in or out of a cell.

Electrode (Electrolyte) Potential The difference in potential between the electrode and the immediately adjacent electrolyte, expressed in terms of some standard electrode potential difference.

Electrolysis Electrochemical reaction that causes the decomposition of a compound.

Electrolyte Any substance that disassociates into two or more ions when dissolved in water. Solutions of electrolyte conduct electricity and are decomposed by it. For batteries, electrolyte implies a dilute solution of sulfuric acid.

Electromotive Force (EMF) Electrical pressure or potential, expressed in volts.

Element An assembly of a positive plate group, negative plate group and separators.

End Gravity The specific gravity of a cell at the end of a prescribed discharge.

Energy Density Ratio of battery energy content in watt hours to battery weight in volume.

Envelope A separator folded and wrapped around a battery plate during assembly.

Equalizing Charge An extended charge given to a storage battery to ensure complete restoration of active materials in all the plates of the cells.

Expander An ingredient in the negative paste that delays shrinking and solidifying of the sponge lead of the finished plate, thereby enhancing negative plate capacity.

Ferroresonant Charger A constant volt power supply containing a special transformer-capacitor combination that changes operating characteristics as the draw is varied, ensuring that voltage output remains constant.

Filling Gravity The specific gravity of acid used to fill batteries.

Final Voltage The cut-off voltage of a battery. The prescribed voltage reached when the discharge is considered complete.

Finishing Rate The rate of charge, in amperes, to which charging current is reduced near the end of the charge for some types of batteries to prevent gassing and temperature rise.

Fixed Resistance Discharge Discharge of a cell or battery through a fixed resistive load, the current being allowed to fall off as the terminal voltage decreases.

Float Plate A pasted plate.

Float Charging A recharge at a very low rate, accomplished by connection to a buss whose voltage is slightly higher than the open circuit voltage of the battery.

Foot Projections from the grid at the bottom edge, used to support the plate group.

Formation or Forming Charge An initial charging process that electrochemically converts the raw paste of the plates into charged active material, lead peroxide in the positive plates and sponge lead in the negative plates.

Formed Plates that have undergone formation.

Freshening Charge A charge given batteries in storage to replace the standing loss and ensure that every plate is periodically brought up to full charge.

Full Charge Gravity Specific gravity of the electrolyte when cells are fully charged and properly leveled.

Gang Vent Vents for usually six adjacent cells that are connected to a common manifold.

Gassing Bubbles from gases being released at one or more of the electrodes during electrolysis.

Glass Mat Fabric made from glass fibers with a polymeric binder such as styrene or acrylic which is used to help retain positive active material.

Gravity Specific gravity.

Gravity Drop The number of points reduction or drop of specific gravity of the electrolyte from cell discharge.

Grid A metallic framework used in a battery for conducting electric current and supporting the active material.

Group One or more plates of one type – positive or negative – burned to a post or strap.

H_2SO_4 Sulfuric Acid.

High Rate On charge, any rate higher than the normal finishing rate.

Hydration (Lead) Reaction between water and lead or lead compounds. Gravities lower than those found in discharged cells are apt to produce hydration, which appears as a white coating on plate groups and separators in a cell.

Hydrometer A device used to measure density or specific gravity of electrolyte solutions.

Hydroset Curing process for plates that oxidizes the lead paste, reducing free lead to a few percent of total.

Initial Voltage The closed circuit voltage at the beginning of a discharge. It is usually measured after current has flowed for a period sufficient for the voltage rate of change to become practically constant.

Insert A bushing of lead or lead alloy molded or sealed into cell covers, and to which the post is burned to create a creep-resistant, cover-to-post seal.

Intercell Connector Conductor of lead or lead alloy used to connect two battery cells.

Internal Resistance Resistance within a cell or battery to the flow of electric current, measured by the ratio of the change in voltage to a specified change in current for a short period of time.

Jar Housing, or container, for one or more cells.

Jar Formation Forming of plates in the cell jar.

Jumper A short length of conductor used to connect or cut out part of an electrical circuit.

Kilovolt One thousand volts.

Kilowatt One thousand watts.

Kilowatt Hours A measure of energy or work accomplished, being 1000 watt hours.

Lead (Pb) Chemical element used in lead acid batteries.

Lead Burning Welding of lead or alloy parts.

Lead Hydrate A white lead compound formed by reaction of very dilute electrolyte or water and metallic lead or lead alloys.

Lead Oxide A general term for any of the lead oxides used to produce batteries.

Lead Peroxide A brown lead oxide which is the positive material in a fully formed positive plate.

Lead Plated Part Hardware that has a thin protective layer of lead electrode deposited on the surface.

Lead Sponge The chief component of the active material of a fully-charged negative plate.

Lead Sulfate A compound that results from the chemical action of sulfuric acid on oxides of lead or on lead metal.

Level Lines Horizontal lines molded or painted near tops of battery containers indicating maximum and minimum electrolyte levels.

Litharge A yellow-red oxide of lead sometimes used in making active material.

Local Action A battery's loss of otherwise usable chemical energy by currents that flow within the cell of a battery regardless of its connection to an external circuit.

Loss of Charge Capacity loss in a cell or battery standing on open circuit as a result of local action.

Lug A portion of the grid used for support of the plate group, usually a hanging lug on the top edge of the grid. Also, a tab on the grid used for connection of plate to strap and other plates.

Machine Casting A fully or semi-automatic grid or small parts casting operation.

MF (Maintenance Free Battery) A VRLA sealed absorbed glass mat (AGM) battery.

Manual Discharge Capacity test in which the operator disconnects the battery from the test load after all cells have reached the prescribed final voltage. With fixed resistance loads, boost cells are used to keep the discharge rate fairly constant as the test cell voltages drop rapidly near the final voltage. Electronic load manual discharges generally do not require boost cells.

Microporous Separator A veneer or grooved-type separator made of any material that has many microscopically small pores.

Milliampere One thousandth of an ampere.

Millivolt One thousandth of a volt.

Modified Constant Voltage Charge A charge in which charging current voltage is held substantially constant while a fixed resistance is inserted in the battery circuit, producing a rising voltage characteristic at the battery terminals as the charge progresses.

Mold A cast iron or steel form used to produce a casting of definite shape or outline.

Mold Coat A spray applied to metal molds that acts as a release agent and an insulator against rapid heat transfer.

Moss Lead crystals that can grow at high current density areas of negative plates— along edges, at feet or at plate lugs— and cause short circuiting.

Negative Plate The grid and active material that current flows to from the external circuit when a battery is discharging.

Negative Terminal The terminal from which current flows through the external circuit to the positive terminal when the cell discharges.

OHM A unit of electrical resistance.

Oil of Vitriol Concentrated commercial sulfuric acid, abbreviated OV or O.V.

Open Circuit The state of a battery when not connected to either a charging source or a load circuit.

Open Circuit Voltage The voltage at a battery terminal when no appreciable current is flowing.

Oxide (of lead) A compound of lead and oxygen in one of several proportions used to prepare battery paste.

Panel A casting consisting of two or more grids made simultaneously in a single mold.

Pb Chemical symbol for lead.

PbO Chemical symbol for litharge.

PbO_2 Chemical symbol for lead peroxide.

Pellet The portion of pasted material contained in a grid section framed by adjacent horizontal and vertical members exclusive of forming bars.

Peroxide See **Lead Peroxide**.

Pig A cast bar of lead or lead alloy.

Pig Lead A grade of highly refined, unalloyed lead.

Plate A pasted grid.

Plate Centers Distance between center lines of adjoining plates of opposite polarity in a cell. One half the size of a strap center upon which the plates of like polarity are burned.

Polarization Change in voltage at terminals when a specified current is flowing; equal to the difference between the actual and the equilibrium (constant open circuit condition) potentials of the plates, exclusive of the internal resistance drop.

Porosity The ratio of open spaces or voids in a material to the volume of its mass.

Positive Plates The grid and active materials of a storage battery from which current flows to the external circuit when the battery is discharging.

Positive Terminal The terminal that current flows toward in the external circuit from the negative terminal.

Post Terminal or other conductor that connects the plate group strap to the outside of the cell.

Pure Lead Pig Lead.

Rated Capacity Ampere hours of discharge that can be removed from a fully charged cell or battery, at a specific constant discharge rate at a specified temperature and at a specified cut-off voltage.

Rate of Charge See **Starting Rate** and **Finishing Rate.**

Raw Plate An unformed plate.

Rectifier A device that converts alternating (ac) current into unidirectional (dc) current because of a characteristic that permits appreciable flow of current in only one direction.

Red Lead A red oxide of lead used in making active material.

Reference Electrode Electrode used to measure acid concentration or plate state of charge.

Resistance The opposition of a conductor to the passage of an electrical current, usually expressed in ohms.

Resistor A device used to introduce resistance into an electrical circuit.

Retainer A sheet of glass mat, perforated or slotted rubber, plastic or some other material installed on each face of the positive plates in certain types of cells, to deter loss of active material.

Reversal A change in the normal polarity of a cell or battery.

Rib A vertical or nearly vertical ridge of a grooved separator or spacer.

Secondary Lead Reclaimed as opposed to virgin lead.

Sediment The sludge or active material shed from plates that drops to the bottom of cells.

Sediment Space The portion of a container beneath the element; sediment from the wearing of the plates collects here without short-circuiting.

Self-discharge Loss of charge due to local action.

Separator A device in a storage battery that prevents metallic contact between plates of opposite polarity in a cell.

Series Cells All cells in a battery other than pilot cells. They are so called because the cells are usually connected in series.

Series Parallel Connection Cells arranged in a battery so two or more strings of series connected cells, each containing the same number of cells, are connected in parallel; this increases battery capacity.

Short Circuit Current The current that flows when the two terminals of a cell or battery are inadvertently connected to each other.

Side Terminal SLI battery design with two through-the-container current connections on one side instead of two posts on top.

SLI Battery A battery for automotive use in starting, lighting and ignition.

Sliver, Slyver Extremely fine parallel glass fibers used in retainers next to positive plates to retard shedding.

Smelting The primary process for recovering lead and antimony from scrapped batteries and scrap from battery manufacture.

Soaking A manufacturing process following pasting that soaks certain types of lead plates in sulfuric acid. This provides a protective surface and also sulfate helpful in container and tank formation.

Soda Ash Sodium Carbonate (Na_2CO_3) used in neutralizing sulfuric acid in spills or effluents.

Spalling Shedding of active material, usually from positives, during formation due to incomplete or improper plate curing.

Sponge Lead (Pb) A porous mass of lead crystals and the chief material of a full-charged negative plate.

Stacking A cell assembly operation, alternately piling plates and separators in a burning box prior to attachment of straps and posts.

Standard Battery Any of Conventional, YuMicron or YuMicron CX batteries consisting of flooded electrolyte and cell accessible construction.

Standing Loss Loss of charge by an idle cell or battery, resulting from local action.

Starting Rate A beginning charging rate that does not produce gassing or temperatures in excess of 110°F.

State of Charge The amount of electrochemical energy left in a cell or battery.

Strap Precast or cast-on piece of lead or lead alloy used to connect plates into groups and to connect groups to the post.

Strap Center Spacing between centers of adjacent plates in a group.

Stratification Layering of high specific gravity electrolyte in lower portions of a cell, where it does not circulate normally and is of no use.

Sulfated A plate or cell whose active materials contain an appreciable amount of lead sulfate.

Sulfation Formation of lead sulfate on a plate or cell as a result of discharge, self-discharge or pickling.

Sulfuric Acid (H_2SO_4) The principal acid compound of sulfur, sulfuric acid in dilute and highly pure form is the electrolyte of lead acid storage cells.

Tack Burn A shallow burn used to tack together two lead parts.

Tank Formation Electrolytic processing of plates prior to assembly in large tanks of acid.

Temperature Correction In storage cells, specific gravity and charging voltage vary inversely with temperature, while the open circuit voltage varies directly though slightly with temperature.

Terminals The points on a battery to which the external circuit is connected.

Terminal Cable A length of insulated cable, one end connected to the battery terminal post, and the other fitted with a plug, receptacle, lug or other device for connection to an external circuit.

Top Pour A method of casting in which molten metal is poured, usually by hand, into a top gated mold.

Treeing Growth of a lead dendrite or filament through a crack or hole of a separator, short-circuiting the cell.

Trickle Charge A low-rate continuous charge approximately equal to a battery's internal losses and capable of maintaining the battery in a fully-charged state.

TVR A temperature compensating voltage relay used in charging equipment.

Unformed A plate that has not been electrolytically formed.

Useful Acid The acid above the lower edges of the plates that takes part in the discharge reactions that occur within a cell.

Vent An opening that permits the escape of gas from a cell or mold.

Vent Plug The seal for the vent and filling well of a cell cover, containing a small hole for escape of gas.

Vent Well The hole or holes in a cell cover that allow fluids to be checked, electrolyte to be added, and gas to escape. The vent plug fits into the vent well.

Verticals The members in a plate grid.

Volt The unit of measurement of electromotive force, being the force needed to send a current or one ampere through a conductor with a resistance of one ohm.

Volt Efficiency The ratio of the average voltage of a cell or battery during discharge to the average voltage during subsequent recharge.

Voltage The difference in electrical potential that exists between the terminals of a cell or battery or any two points of an electrical circuit.

Voltage Range The difference between maximum and minimum cell voltages within a battery or string of cells when all cells are charging and discharging.

Voltmeter An instrument for measuring voltage.

VRLA (Valve Regulated Lead Acid) Sealed batteries which feature a safety valve venting system designed to release excessive internal pressure, while maintaining sufficient pressure for recombination of oxygen and hydrogen into water.

Watering Adding water to battery electrolyte to replace loss from electrolysis and evaporation.

Watt A unit of electric power, equal to a current of one ampere under one volt of pressure.

Watthour A unit of electrical energy or work, equal to one watt acting for one hour.

Watthour Capacity The number of watthours a storage battery can deliver under specific conditions of temperature, rate of discharge and final voltage.

Watthour Efficiency A storage battery's energy efficiency expressed as ratio of watthour output to the watthours of the recharge.

Watthour Meter An electric motor that measures and registers electrical energy in watthours.

Wet Shelf Life The time a wet secondary cell can be stored before its capacity falls to the point that the cell cannot be easily recharged.

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