

YAMAHA

TDM850 '96

4TX-AE1

SERVICE MANUAL

EB000000

**TDM850 '96
SERVICE MANUAL**

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NOTICE

This manual was written by the Yamaha Motor Company primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha motorcycles have a basic understanding of the mechanical concepts and procedures inherent in motorcycle repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit to use and/or unsafe.

Yamaha Motor Company, Ltd. is continually striving to improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

PARTICULARLY IMPORTANT INFORMATION

This material is distinguished by the following notation.



The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!



Failure to follow WARNING instructions could result in severe injury or death to the motorcycle operator, a bystander, or a person inspecting or repairing the motorcycle.

CAUTION:

A CAUTION indicates special precautions that must be taken to avoid damage to the motorcycle.

NOTE:

A NOTE provides key information to make procedures easier or clearer.

HOW TO USE THIS MANUAL

MANUAL ORGANIZATION

This manual consists of chapters for the main categories of subjects. (See “Illustrated symbols”)

1st title ①: This is the title of the chapter with its symbol in the upper right corner of each page.

2nd title ②: This title indicates the section of the chapter and only appears on the first page of each section. It is located in the upper left corner of the page.

3rd title ③: This title indicates a sub-section that is followed by step-by-step procedures accompanied by corresponding illustrations.

EXPLODED DIAGRAMS

To help identify parts and clarify procedure steps, there are exploded diagrams at the start of each removal and disassembly section.

1. An easy-to-see exploded diagram ④ is provided for removal and disassembly jobs.
2. Numbers ⑤ are given in the order of the jobs in the exploded diagram. A number that is enclosed by a circle indicates a disassembly step.
3. An explanation of jobs and notes is presented in an easy-to-read way by the use of symbol marks ⑥. The meanings of the symbol marks are given on the next page.
4. A job instruction chart ⑦ accompanies the exploded diagram, providing the order of jobs, names of parts, notes in jobs, etc.
5. For jobs requiring more information, the step-by-step format supplements ⑧ are given in addition to the exploded diagram and the job instruction chart.

②

CLUTCH

①

ENG

④

⑥

CLUTCH
CRANKCASE COVER (RIGHT)

⑤

Order	Job name/Part name	Qty	Remarks
Crankcase cover (right) removal			
	Engine oil		Remove the parts in the order below. Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 2.
1	Clutch cable	1	NOTE: Loosen the bolts in a crisscross pattern.
2	Crankcase cover (right)	1	
3	Gasket	1	For installation, reverse the removal procedure.
4	Dowel pin	2	
5	Crutch	1	
6	Plain washer	1	
7	Pull lever	1	
8	Torsion spring	1	
9	Plain washer	1	

⑦

③

REMOVAL

1. Straighten the lock washer tab.
2. Remove:
 - Clutch boss nut ①
 - Lock washer ②
 - Clutch boss ③

NOTE:
Loosen the clutch boss nut ① while holding the clutch boss ③ with the universal clutch holder.

⑧

Universal clutch holder:
④⑤⑥⑦⑧⑨

3. Remove:
 - Spacer ①
 - Bearing ②

NOTE:
Install 6 mm bolts ③ onto the spacer. Then remove the spacer by pulling.

INSPECTION

1. Measure:
 - Friction plate thickness
 - Out of specification → Replace friction plates as a set.
 - Measure at four points.

Thickness:
2.9 – 3.1 mm
<Limit>: 2.8 mm

2. Measure:
 - Clutch plate warpage
 - Out of specification → Replace clutch plate as a set.
 - Use a surface plate and feeler gauge ③.








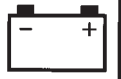





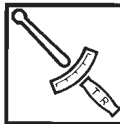










Warp limit:
Less than 0.1 mm

3. Measure:
 - Free length (clutch spring) ③
 - Out of specification → Replace springs as a set.

Free length (clutch spring):
55 mm
<Limit>: 53 mm

4-29

4-31

① GEN INFO 	② SPEC 	
③ INSP ADJ 	④ ENG 	
⑤ COOL 	⑥ CARB 	
⑦ CHAS 	⑧ ELEC 	
⑨ TRBL SHTG 	⑩ 	
⑪ 	⑫ 	
⑬ 	⑭ 	
⑮ 	⑯ 	⑰ 
⑱ 	⑲ 	⑳ 
㉑ 	㉒ 	㉓ 
㉔ 	㉕ New	

EB003000

ILLUSTRATED SYMBOLS

Illustrated symbols ① to ⑨ are printed on top right of each page and indicate the subject of each chapter.

- ① General information
- ② Specifications
- ③ Periodic inspections and adjustments
- ④ Engine
- ⑤ Cooling system
- ⑥ Carburetion
- ⑦ Chassis
- ⑧ Electrical
- ⑨ Troubleshooting

Illustrated symbols ⑩ to ⑰ are used to identify the specifications appearing in the text.

- ⑩ Can be serviced with engine mounted
- ⑪ Filling fluid
- ⑫ Lubricant
- ⑬ Special tool
- ⑭ Torque
- ⑮ Wear limit, clearance
- ⑯ Engine speed
- ⑰ Ω , V, A









Illustrated symbols ⑱ to ㉓ in the exploded diagrams indicate the types of lubricants and lubrication points.

- ⑱ Apply engine oil
- ⑲ Apply gear oil
- ⑳ Apply molybdenum disulfide oil
- ㉑ Apply wheel bearing grease
- ㉒ Apply lightweight lithium soap base grease
- ㉓ Apply molybdenum disulfide grease

Illustrated symbols ㉔ to ㉕ in the exploded diagrams indicate where to apply a locking agent ㉔ and when to install new parts ㉕.

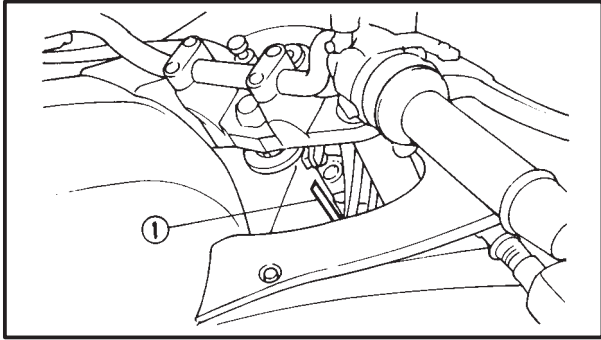
- ㉔ Apply locking agent (LOCTITE®)
- ㉕ Replace

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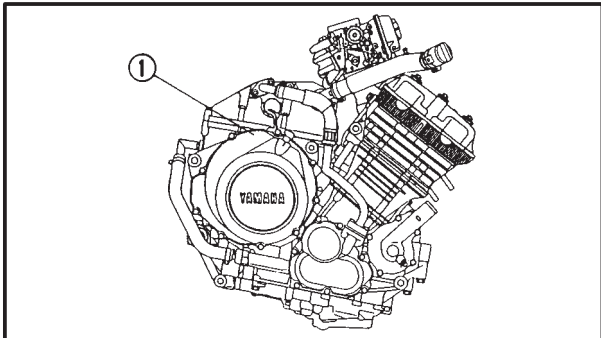
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GENERAL INFORMATION MOTORCYCLE IDENTIFICATION VEHICLE IDENTIFICATION NUMBER

The vehicle identification number ① is stamped into the right side of the steering head.

NOTE:

The vehicle identification number is used to identify the motorcycle and may be used to register the motorcycle with a licensing authority.



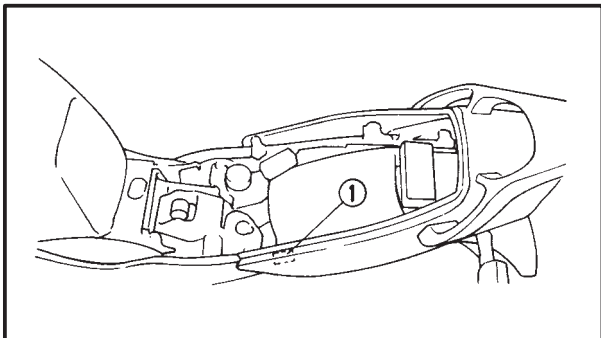
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ENGINE SERIAL NUMBER

The engine serial number ① is stamped into the crankcase.

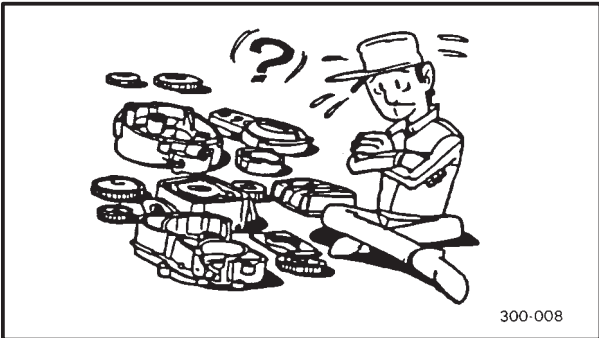
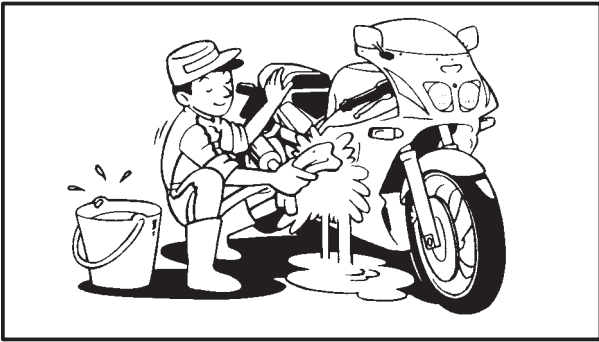
NOTE:

The first three digits of the engine serial number indicate the model type; the remaining digits are the unit production number.



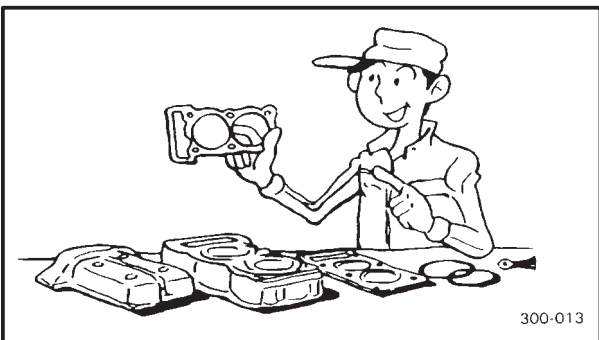
MODEL LABEL

The model label ① is affixed to the frame. This information will be needed to order spare parts.



IMPORTANT INFORMATION PREPARATION FOR REMOVAL

1. Remove all dirt, mud dust, and foreign material before removal and disassembly.
2. Use proper tools and cleaning equipment. Refer to "SPECIAL TOOLS".
3. When disassembling the motorcycle keep mated parts together. This includes gears, cylinders, pistons, and other mated parts that have been "mated" through normal wear. Mated parts must be reused as an assembly or replaced.
4. During the motorcycle disassembly, clean all parts and place them in trays in the order of disassembly. This will speed up assembly time and help assure that all parts are correctly reinstalled.
5. Keep away from fire.

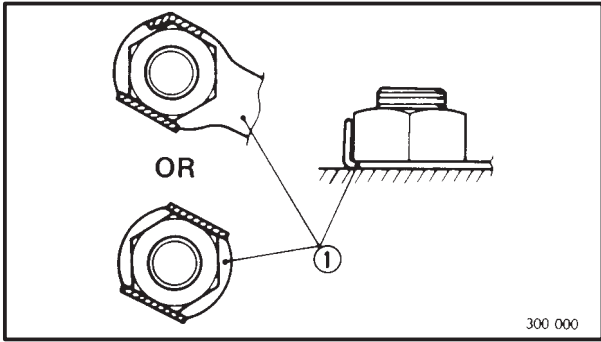


ALL REPLACEMENT PARTS

1. Use only genuine Yamaha parts for all replacements. Use oil and/or grease recommended by Yamaha for assembly and adjustment. Other brands may be similar in function and appearance, but inferior in quality.

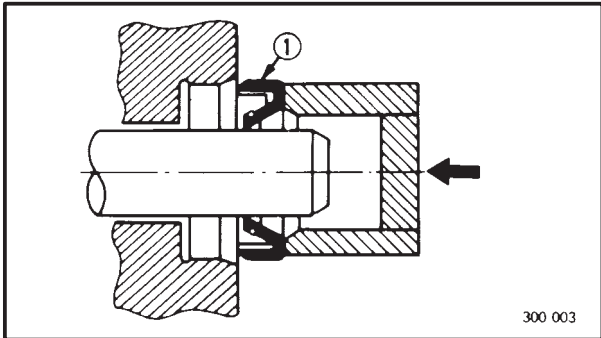
GASKETS, OIL SEALS, AND O-RINGS

1. All gaskets, seals and O-rings should be replaced when an engine is overhauled. All gaskets surfaces, oil seal lips and O-rings must be cleaned.
2. Properly oil all mating parts and bearing during reassembly. Apply grease to the oil seal lips.



LOCK WASHERS/PLATES AND COTTER PINS

1. All lock washers/plates ① and cotter pins must be replaced when they are removed. Lock tab(s) should be bent along the bolt or nut flat(s) after the bolt or nut has been properly tightened.



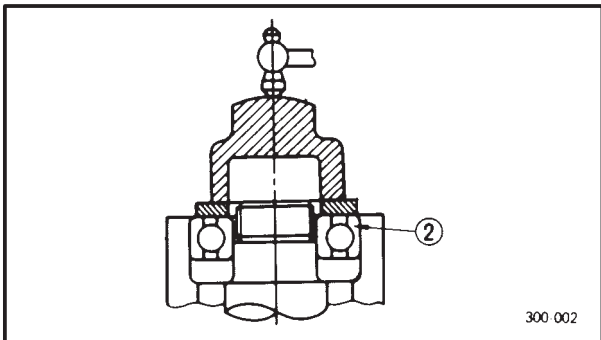
BEARINGS AND OIL SEALS

1. Install the bearing(s) and oil seal(s) with their manufacturer's marks or numbers facing outward. (In other word, the stamped letters must be on the side exposed to view.) When installing oil seal(s), apply a light coating of light-weight lithium base grease to the seal lip(s). Oil the bearings liberally when installing.

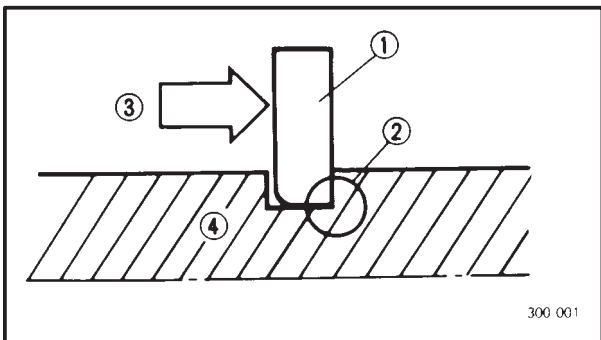
- ① Oil seal

CAUTION:

Do not use compressed air to spin the bearings dry. This causes damage to the bearing surfaces.



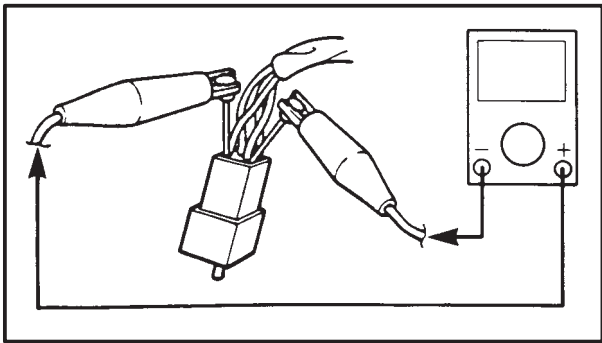
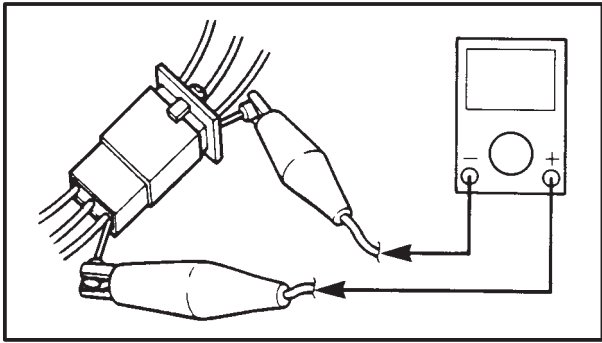
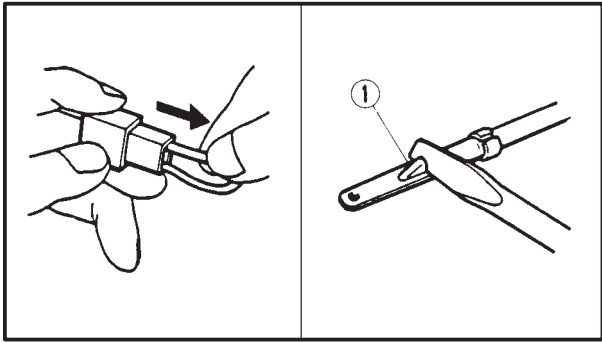
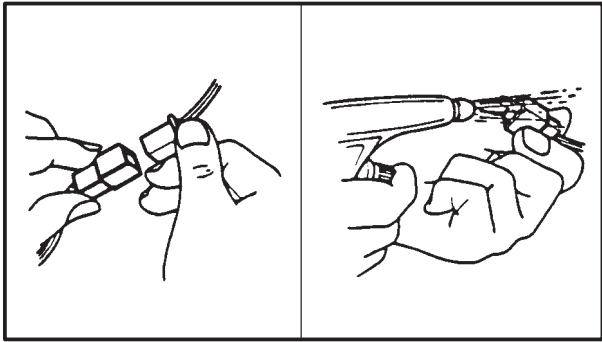
- ② Bearing



CIRCLIPS

1. All circlips should be inspected carefully before reassembly. Always replace piston pin clips after one use. Replace distorted circlips. When installing a circlips ①, make sure that the sharp edged corner ② is positioned opposite to the thrust ③ it receives. See the sectional view.

- ④ Shaft



CHECKING OF CONNECTIONS

Dealing with stains, rust, moisture, etc. on the connector.

1. Disconnect:

- Connector

2. Dry each terminal with an air blower.

3. Connect and disconnect the connector two or three times.

4. Pull the lead to check that it will not come off.

5. If the terminal comes off, bend up the pin ① and reinsert the terminal into the connector.

6. Connect:

- Connector

NOTE: _____

The two connectors “click” together.

7. Check for continuity with a tester.

NOTE: _____

- If there is no continuity, clean the terminals.

- Be sure to perform the steps 1 to 7 listed above when checking the wireharness.

- For a field remedy, use a contact revitalizer available on the market.

- Use the tester on the connector as shown.

HOW TO USE THE CONVERSION TABLE



HOW TO USE THE CONVERSION TABLE

All specification data in this manual are listed in SI and METRIC UNITS.

Use this table to convert METRIC unit data to IMPERIAL unit data.

Ex.

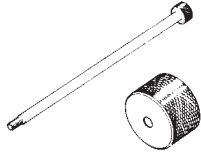
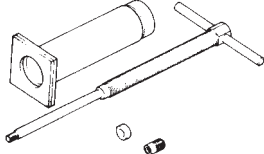

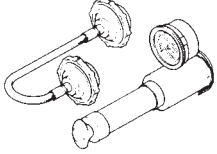
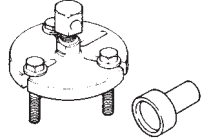
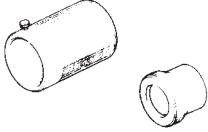
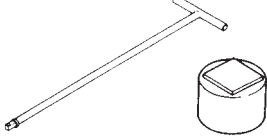

METRIC	MULTIPLIER	IMPERIAL
**mm ×	0.03937 =	**in
2 mm ×	0.03937 =	0.08 in

CONVERSION TABLE

METRIC TO IMPERIAL			
	Metric unit	Multiplier	Imperial unit
Torque	m•kg	7.233	ft•lb
	m•kg	86.794	in•lb
	cm•kg	0.0723	ft•lb
	cm•kg	0.8679	in•lb
Weight	kg	2.205	lb
	g	0.03527	oz
Speed	km/hr	0.6214	mph
Dis- tance	km	0.6214	mi
	m	3.281	ft
	m	1.094	yd
	cm	0.3937	in
	mm	0.03937	in
Volume/ Capacity	cc (cm ³)	0.03527	oz (IMP liq.)
	cc (cm ³)	0.06102	cu•in
	lit (liter)	0.8799	qt (IMP liq.)
	lit (liter)	0.2199	gal (IMP liq.)
Miscel- laneous	kg/mm	55.997	lb/in
	kg/cm ²	14.2234	psi (lb/in ²)
	Centigrade (°C)	9/5+32	Fahrenheit (°F)

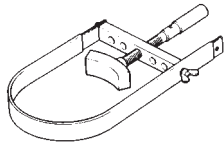
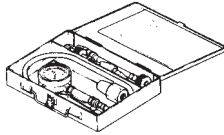
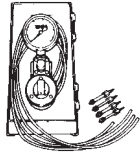
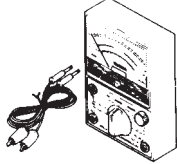
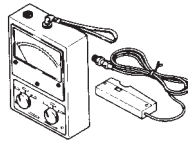
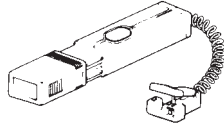
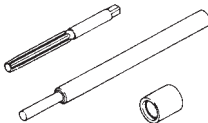
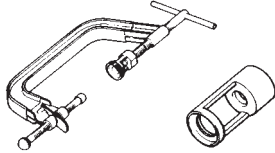
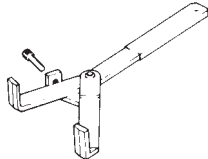
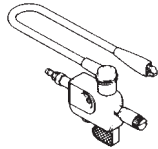
SPECIAL TOOLS

The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help prevent damage caused by the use of improper tools or improvised techniques. The shape and part number used for the special tool differ by country, so two types are provided. Refer to the list provided to avoid errors when placing an order.

Tool No.	Tool name/How to use	Illustration
90890-01083 90890-01084	Slide hammer bolt Weight These tools are used to remove the main axle assembly cover.	
90890-01304	Piston pin puller This tool is used to remove the piston pin.	
90890-01312	Fuel level gauge This gauge is used to measure the fuel level in the float chamber.	
90890-01325 90890-01352	Radiator cap tester Adapter This tester is needed for checking the cooling system.	
90890-01362 90890-01382	Flywheel puller Crankshaft protector These tools are used to remove the A.C. magneto.	
90890-01367 90890-01374	Fork seal driver weight Adapter These tools are used when installing the fork seal.	
90890-01326 90890-01465	T-handle Damper rod holder These tools are used to loosen and tighten the front fork damper rod holding bolt.	
90890-01403	Ring nut wrench This tool is used to loosen and tighten the steering ring nut.	

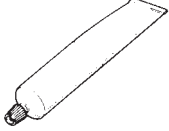
SPECIAL TOOLS



Tool No.	Tool name/How to use	Illustration
90890-01701	<p>Sheave holder</p> <p>This tool is used to hold the rotor when loosening and tightening the rotor bolt.</p>	
90890-03081	<p>Compression gauge</p> <p>This gauge is used to measure the engine compression.</p>	
90890-03094	<p>Vacuum gauge</p> <p>This gauge is needed for carburetor synchronization.</p>	
90890-03112	<p>Pocket tester</p> <p>This instrument is invaluable for checking the electrical system.</p>	
90890-03113	<p>Engine tachometer</p> <p>This tool is needed for detecting engine rpm.</p>	
90890-03141	<p>Timing light</p> <p>This tool is necessary for checking ignition timing.</p>	
90890-04016	<p>Valve guide remover, installer and reamer (5.5 mm)</p> <p>These tools are used to remove, install and rebores the valve guide.</p>	
90890-04019 90890-04108	<p>Valve spring compressor Attachment</p> <p>These tools are needed to remove and install the valve assemblies.</p>	
90890-04086	<p>Universal clutch holder</p> <p>This tool is used to hold the clutch when removing or installing the clutch boss nut.</p>	
90890-06754	<p>Ignition checker</p> <p>This instrument is necessary for checking the ignition system components.</p>	

SPECIAL TOOLS



Tool No.	Tool name/How to use	Illustration
90890-85505	Yamaha bond No. 1215 This sealant (bond) is used on crankcase mating surfaces, etc.	

CHAPTER 2. SPECIFICATIONS

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SPEC





SPECIFICATIONS

GENERAL SPECIFICATIONS

Item	Standard
Model:	TDM850
Model code:	4TX1
Dimensions: Overall length Overall width Overall height Seat height Wheelbase Minimum ground clearance Minimum turning radius	2,165 mm, 2,200 mm (D, DK, SF, N, S) 790 mm 1,285 mm 805 mm 1,475 mm 165 mm 2,900 mm
Basic weight (With oil and full fuel tank):	229 kg
Engine: Engine type Cylinder arrangement Displacement Bore × stroke Compression ratio Compression pressure (STD) Starting system	Liquid-cooled 4-stroke, DOHC, 5 valve Forward-inclined parallel 2-cylinder 0.849 L 89.5 × 67.5 mm 10.5 : 1 1,200 kPa (12 kg/cm ² , 12 bar) at 300 r/min Electric starter
Lubrication system:	Dry sump
Oil type or grade: Engine oil	<p>API Standard: API SE or higher grade</p>
Oil capacity: Engine oil Periodic oil change With oil filter replacement Total amount	3.5 L 3.6 L 4.2 L

GENERAL SPECIFICATIONS

SPEC



Item	Standard
Air filter:	Dry type element
Fuel: Type Fuel tank capacity Fuel reserve amount	Regular unleaded gasoline 20 L 3.1 L
Carburetor: Type/quantity Manufacturer	BDST38/2 MIKUNI
Spark plug: Type Manufacturer Spark plug gap	DPR8EA-9/X24EPR-U9 NGK/NIPPONDENSO 0.8 ~ 0.9 mm
Clutch type:	Wet, multiple-disc
Transmission: Primary reduction system Primary reduction ratio Secondary reduction system Secondary reduction ratio Transmission type Operation Gear ratio	Spur gear 67/39 (1.718) Chain drive 42/17 (2.471) Constant mesh 5-speed Left foot operation 1st 37/13 (2.846) 2nd 37/20 (1.850) 3rd 30/21 (1.429) 4th 27/23 (1.174) 5th 28/27 (1.037)
Chassis: Frame type Caster angle Trail	Diamond 24.5° 103 mm
Tire: Type Size Manufacturer Type	Tubeless 110/80 ZR18 150/70 ZR17 BRIDGESTONE/PIRELLI/MICHELIN BRIDGESTONE/PIRELLI/MICHELIN BT54F/MTR03/MACADAM90X BT54R/MTR04/MACADAM90X

GENERAL SPECIFICATIONS

SPEC



Item		Standard
Tire pressure (cold tire):		
Maximum load-except motorcycle		180 kg
Loading condition A*		0 ~ 90 kg
	front	225 kPa (2.25 kg/cm ² , 2.25 bar)
	rear	275 kPa (2.75 kg/cm ² , 2.75 bar)
Loading condition B*		90 ~ 180 kg
	front	225 kPa (2.25 kg/cm ² , 2.25 bar)
	rear	275 kPa (2.75 kg/cm ² , 2.75 bar)
High speed riding		
	front	225 kPa (2.25 kg/cm ² , 2.25 bar)
	rear	275 kPa (2.75 kg/cm ² , 2.75 kg/cm ²)
Brake:		
Front brake	type	Dual disc brake
	operation	Right hand operation
Rear brake	type	Single disc brake
	operation	Right foot operation
Suspension:		
Front suspension		Telescopic fork
Rear suspension		Swingarm (monocross)
Shock absorber:		
Front shock absorber		Coil spring/Oil damper
Rear shock absorber		Coil spring/Gas-oil damper
Wheel travel:		
Front wheel travel		149 mm
Rear wheel travel		144 mm
Electrical:		
Ignition system		T.C.I. (digital)
Generator system		A.C. magneto
Battery type		GT12B-4
Battery capacity		12 V 10 AH
Headlight type:		Quartz bulb (halogen)
Bulb wattage × quantity:		
Headlight		12 V 55 W × 2
Auxiliary light		12 V 5 W × 1
Tail/brake light		12 V 5/21 W × 2
Flasher light		12 V 21 W × 4
Meter light		12 V 3.4 W × 1
		12 V 1.7 W × 2
		12 V 3.0 W × 1
Indicator lights		
Neutral		12 V 3.4 W × 1
Turn		12 V 3.4 W × 1
High beam		12 V 3.4 W × 1

* Load is total weight of cargo, rider, passenger and accessories



MAINTENANCE SPECIFICATIONS

ENGINE

Item	Standard	Limit
Cylinder head: Warp limit	...	0.03 mm
Cylinder: Bore size Taper limit Out of round limit	89.500 ~ 89.505 mm	89.6 mm 0.05 mm 0.03 mm
Camshaft: Drive method Camshaft cap inside diameter Camshaft outside diameter Camshaft-to-cap clearance Cam dimensions	Timing chain (right) 25.000 ~ 25.021 mm 24.967 ~ 24.980 mm 0.020 ~ 0.054 mm
Intake	"A" 35.95 ~ 36.05 mm "B" 27.95 ~ 28.05 mm "C" 7.9 ~ 8.1 mm	35.85mm 27.85mm ...
Exhaust	"A" 35.95 ~ 36.05 mm "B" 27.95 ~ 28.05 mm "C" 7.9 ~ 8.1 mm	35.85 mm 27.85 mm ...
Camshaft runout limit	...	0.03 mm
Cam chain: Cam chain type/No. of links Cam chain adjustment method	82RH2015/138 Automatic
Valve, valve seat, valve guide: Valve clearance (cold) IN EX Valve dimensions:	0.15 ~ 0.20 mm 0.25 ~ 0.30 mm
"A" head diameter	IN 25.9 ~ 26.1 mm EX 27.9 ~ 28.1 mm

MAINTENANCE SPECIFICATIONS

SPEC

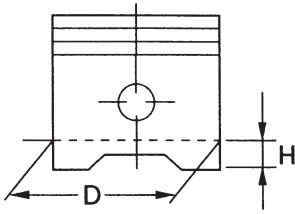
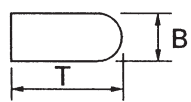
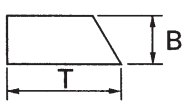
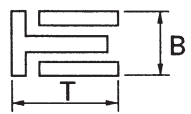


Item		Standard	Limit
"B" face width	IN	2.06 ~ 2.46 mm	...
	EX	2.06 ~ 2.46 mm	...
"C" seat width	IN	0.9 ~ 1.1 mm	...
	EX	0.9 ~ 1.1 mm	...
"D" margin thickness	IN	0.8 ~ 1.2 mm	...
	EX	0.8 ~ 1.2 mm	...
Stem outside diameter	IN	5.475 ~ 5.490 mm	5.445 mm
	EX	5.460 ~ 5.475 mm	5.43 mm
Guide inside diameter	IN	5.500 ~ 5.512 mm	5.55 mm
	EX	5.500 ~ 5.512 mm	5.55 mm
Stem-to-guide clearance	IN	0.010 ~ 0.037 mm	0.08 mm
	EX	0.025 ~ 0.052 mm	0.10 mm
Stem runout limit		...	0.01 mm
Valve seat width	IN	0.9 ~ 1.1 mm	1.6 mm
	EX	0.9 ~ 1.1 mm	1.6 mm
Valve spring:			
Free length	IN	37.29 mm	35.2 mm
	EX	37.29 mm	35.2 mm
Set length (valve closed)	IN	30.39 mm	...
	EX	30.39 mm	...
Compressed pressure (installed)	IN		...
	EX	10.0 ~ 11.6 kg	...
Tilt limit	IN	10.0 ~ 11.6 kg	...
	EX	...	2.5°/1.7 mm
	EX	...	2.5°/1.7 mm
Direction of winding (top view)	IN	Clockwise	...
	EX	Clockwise	...

MAINTENANCE SPECIFICATIONS

SPEC

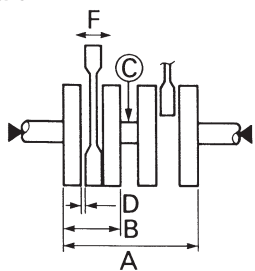


Item	Standard	Limit
<p>Piston:</p> <p>Piston to cylinder clearance</p> <p>Piston size "D"</p>  <p>Measuring point "H"</p> <p>Piston off-set</p> <p>Piston off-set direction</p> <p>Piston pin bore inside diameter</p> <p>Piston pin outside diameter</p>	<p>0.065 ~ 0.085 mm</p> <p>89.420 ~ 89.435 mm</p> <p>4.5 mm</p> <p>1 mm</p> <p>IN side</p> <p>20.002 ~ 20.013 mm</p> <p>19.991 ~ 20.000 mm</p>	<p>0.15 mm</p> <p>•••</p> <p>•••</p> <p>•••</p> <p>•••</p> <p>20.043 mm</p> <p>19.975 mm</p>
<p>Piston rings:</p> <p>Top ring:</p>  <p>Type</p> <p>Dimensions (B × T)</p> <p>End gap (installed)</p> <p>Side clearance (installed)</p> <p>2nd ring:</p>  <p>Type</p> <p>Dimensions (B × T)</p> <p>End gap (installed)</p> <p>Side clearance (installed)</p> <p>Oil ring:</p>  <p>Dimensions (B × T)</p> <p>End gap (installed)</p>	<p>Barrel</p> <p>1.0 × 3.5 mm</p> <p>0.30 ~ 0.45 mm</p> <p>0.035 ~ 0.070 mm</p> <p>Taper</p> <p>1.0 × 3.5 mm</p> <p>0.30 ~ 0.45 mm</p> <p>0.035 ~ 0.070 mm</p> <p>2.00 × 2.85 mm</p> <p>0.2 ~ 0.7 mm</p>	<p>•••</p> <p>•••</p> <p>0.7 mm</p> <p>0.12 mm</p> <p>•••</p> <p>•••</p> <p>0.8 mm</p> <p>0.12 mm</p> <p>•••</p> <p>•••</p>
<p>Connecting rod:</p> <p>Oil clearance</p>	<p>0.026 ~ 0.050 mm</p>	<p>0.09 mm</p>

MAINTENANCE SPECIFICATIONS

SPEC



Item	Standard	Limit
<p>Crankshaft:</p>  <p>Assembly width "A" Crank width "B" Runout limit "C" Big end side clearance "D" Small end free play "F" Journal oil clearance</p>	<p>153.6 ~ 154.4 mm 64.75 ~ 65.25 mm ••• 0.160 ~ 0.272 mm 0.8 ~ 1.0 mm 0.020 ~ 0.038 mm</p>	<p>••• ••• 0.035 mm 0.5 mm ••• 0.1 mm</p>
<p>Balancer: Balancer drive method</p>	<p>Gear</p>	<p>•••</p>
<p>Clutch: Friction plate thickness Quantity Clutch plate thickness Quantity Warp limit Clutch spring free length Quantity Clutch release method</p>	<p>2.9 ~ 3.1 mm 9 1.9 ~ 2.1 mm 8 ••• 55 mm 6 Outer pull, rack & pinion pull</p>	<p>2.8 mm ••• ••• ••• 0.1 mm 53 mm •••</p>
<p>Transmission: Main axle deflection limit Drive axle deflection limit</p>	<p>••• •••</p>	<p>0.08 mm 0.08 mm</p>
<p>Shifter: Shifter type Guide bar bending limit</p>	<p>Guide bar •••</p>	<p>••• 0.1 mm</p>
<p>Carburetor: I.D.mark Main jet (M.J) Main air jet (M.A.J) Jet needle (J.N) Needle jet (N.J) Pilot air jet 1 (P.A.J.1) Pilot air jet 2 (P.A.J.2) Pilot outlet (P.O) Pilot jet (P.J) Bypass 1 (B.P.1) Bypass 2 (B.P.2) Bypass 3 (B.P.3) Pilot screw (P.S)</p>	<p>4TX 00 #142.5 #60 5EI85-2/3 Y-2 #70 1.4 0.9 #45 0.8 0.9 0.8 2.0</p>	<p>••• ••• ••• ••• ••• ••• ••• ••• ••• ••• ••• ••• ••• •••</p>

MAINTENANCE SPECIFICATIONS

SPEC


Item	Standard	Limit
Valve seat size (V.S)	1.7	...
Starter jet 1 (G.S.1)	#75	...
Starter jet 2 (G.S.2)	0.8	...
Throttle valve size (Th. V)	#130	...
Fuel level (F.L)	15.8 ~ 16.8 mm	...
Engine idle speed	1,050 ~ 1,250 r/min	...
Intake vacuum	36.0 ~ 38.7 kPa (270 ~ 290 mmHg)	...
Fuel pump:		
Type	Vacuum type	...
Model/manufacturer	4NX/MIKUNI	...
Output pressure	10 kPa (0.1 kg/cm ² , 0.1 bar)	...
Lubrication system:		
Oil filter type	Paper type	...
Oil pump type	Trochoid type	...
Tip clearance	0 ~ 0.12 mm	0.17 mm
Side clearance	0.03 ~ 0.08 mm	0.15 mm
Bypass valve setting pressure	39 ~ 78 kPa (0.4 ~ 0.8 kg/cm ² , 0.4 ~ 0.8 bar)	...
Relief valve operating pressure	343 ~ 441 kPa (3.5 ~ 4.5 kg/cm ² , 3.5 ~ 4.5 bar)	...
Cooling system:		
Radiator core size		
Width/height/thickness	300/180.6/27 mm	...
Radiator cap opening pressure	75 ~ 105 kPa (0.75 ~ 1.05 kg/cm ² , 0.75 ~ 1.05 bar)	...
Reservoir tank capacity	0.3 L	...
<From low to full level>	0.2 L	...
Water pump		
Type	Single suction centrifugal pump	...
Reduction ratio	44/44 × 38/27 (1.407)	...

MAINTENANCE SPECIFICATIONS

SPEC



Tightening torques

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				Nm	m•kg	
Camshaft cap	Flange bolt	M6	16	10	1.0	
Cylinder head	Nut	M10	6	40	4.0	
	Bolt	M6	2	10	1.0	
Cylinder head cover	Bolt	M6	8	10	1.0	
Coolant drain bolt (cylinder body)	Bolt	M6	1	10	1.0	
Spark plug	—	M12	2	18	1.8	
Connecting rod	Nut	M9	4	48	4.8	
Rotor	Flange bolt	M12	1	130	13.0	
Camshaft sprocket	Flange bolt	M7	4	24	2.4	
Timing chain tensioner	Bolt	M6	2	10	1.0	
Radiator	Flange bolt	M6	4	7	0.7	
Delivery hose (crankcase-cylinder)	Bolt	M10	2	21	2.1	
	Bolt	M6	2	10	1.0	
Oil pump assembly	Screw	M6	6	6	0.6	
Oil baffle plate	Flange bolt	M6	2	10	1.0	
Drain bolt (oil pan)	Bolt	M14	1	35	3.5	
Oil strainer	Screw	M6	4	7	0.7	Stake
Stay (relief valve)	Flange bolt	M6	1	10	1.0	
Oil filter cover	Flange bolt	M10	1	30	3.0	
	Flange bolt	M6	1	10	1.0	
Ring nut (exhaust pipe)	Nut	M8	4	20	2.0	
Exhaust pipe (CO test)	Bolt	M6	2	10	1.0	
Exhaust pipe and frame	Flange bolt	M8	1	24	2.4	
Exhaust pipe and muffler	Screw	M8	1	20	2.0	
Muffler	Bolt	M10	2	24	2.4	
Crankcase	Flange bolt	M10	6	40	4.0	
	Flange bolt	M6	12	12	1.2	
	Flange bolt	M8	11	24	2.4	
Balancer shaft	Screw	M6	2	12	1.2	
Balancer holder	Flange bolt	M6	4	10	1.0	
Chain cover	Flange bolt	M6	2	5	0.5	
Drive sprocket cover	Flange bolt	M6	5	5	0.5	
Oil tank case 2	Flange bolt	M6	2	10	1.0	
Engine bracket	Flange bolt	M8	2	24	2.4	
Crankcase cover (left)	Flange bolt	M6	1	10	1.0	
Starter clutch	Bolt	M6	3	10	1.0	
Clutch spring	Screw	M6	6	8	0.8	
Clutch boss	Nut	M20	1	70	7.0	Use lock washer
Main axle bearing housing	Screw	M6	3	12	1.2	
Drive sprocket	Nut	M18	1	70	7.0	Use lock washer
Drive axle cover plate	Bolt	M6	5	10	1.0	
Shift cam stopper lever	Bolt	M6	1	10	1.0	
Shift fork guide	Flange bolt	M6	2	12	1.2	
Shift arm	Flange bolt	M6	1	12	1.2	
Shift rod	Nut	M6	2	8	0.8	
Shift pedal	Bolt	M8	1	22	2.2	
Stopper bolt	Bolt	M8	1	22	2.2	

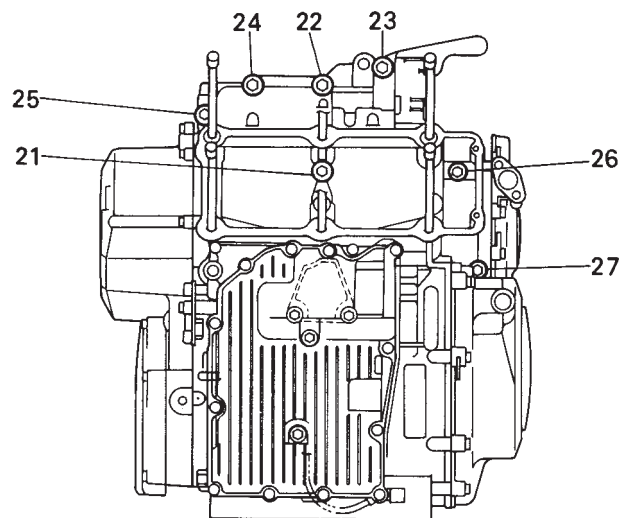
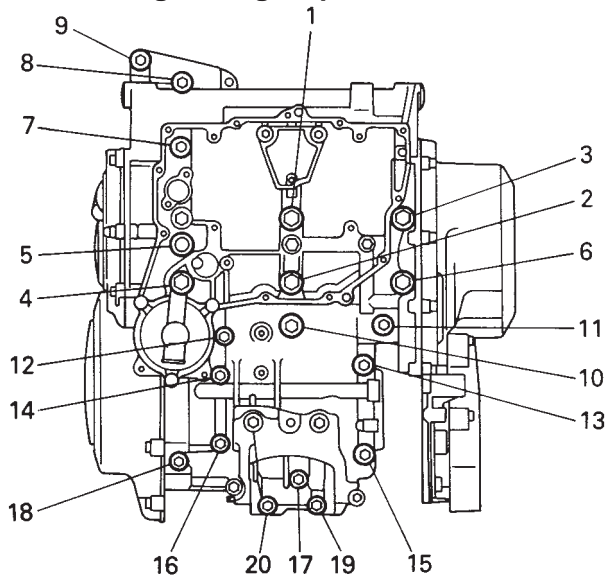
MAINTENANCE SPECIFICATIONS

SPEC



Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				Nm	m•kg	
Stator coil	Screw	M6	3	7	0.7	
Starter motor	Flange bolt	M6	2	10	1.0	
Thermo switch	—	M6	1	28	2.8	
Thermo switch housing	—	PT1/8	1	15	1.5	

Crankcase tightening sequence:



MAINTENANCE SPECIFICATIONS

SPEC



CHASSIS

Item	Standard	Limit
Steering system: Steering bearing type	Angular bearing	•••
Front suspension: Front fork travel	149 mm	•••
Fork spring free length	505 mm	500 mm
Spring rate (K1)	6.4 N/mm (0.64 kg/mm)	•••
Stroke (K1)	0 ~ 149 mm	•••
Optional spring	No	•••
Oil capacity (per fork tube)	0.515 L	•••
Oil level	130 mm	•••
Oil grade	Fork oil 01 or equivalent	•••
Rear suspension: Shock absorber travel	47 mm	•••
Spring free length (K1/K2)	144 mm/69 mm	•••
Fitting length (K1/K2)	136 mm/65 mm	•••
Spring rate (K1/K2)	260 N/mm (26.0 kg/mm)/182 N/mm (18.2 kg/mm)	•••
Stroke (K1/K2)	0 ~ 30/30 ~ 47 mm	•••
Optional spring	No	•••
Swingarm: Free play limit	end side	1 mm 0.3 mm
Front wheel: Type	Cast wheel	•••
Rim size	18 × MT3.00	•••
Rim material	Aluminum	•••
Rim runout limit	radial	1 mm
	lateral	0.5 mm
Rear wheel: Type	Cast wheel	•••
Rim size	17 × MT4.00	•••
Rim material	Aluminum	•••
Rim runout limit	radial	1 mm
	lateral	0.5 mm
Drive chain: Type/manufacturer	525HV/DAIDO	•••
No. of links	114	•••
Chain slack	40 ~ 50 mm	•••

MAINTENANCE SPECIFICATIONS

SPEC



Item	Standard	Limit
Front disc brake:		
Type	Dual	•••
Disc outside diameter × thickness	298 × 4 mm	•••
Disc deflection limit	•••	0.2 mm
Pad thickness inner	5.5 mm	0.5 mm
Pad thickness outer	5.5 mm	0.5 mm
Master cylinder inside diameter	15.8 mm	•••
Caliper cylinder inside diameter	33.96 + 30.23 mm	•••
Brake fluid type	DOT 4	•••
Rear disc brake:		
Type	Single	•••
Disc outside diameter × thickness	245 × 5 mm	•••
Disc deflection limit	•••	0.15 mm
Pad thickness inner	5.5 mm	0.5 mm
Pad thickness outer	5.5 mm	0.5 mm
Master cylinder inside diameter	14 mm	•••
Caliper cylinder inside diameter	42.8 mm	•••
Brake fluid type	DOT 4	•••
Controls:		
Brake lever slack (at lever pivot)	0 mm	•••
Brake pedal height	29 mm	•••
Brake pedal slack	0 mm	•••
Clutch lever slack (at lever end)	10 ~ 15 mm	•••
Throttle cable slack	3 ~ 5 mm	•••



Tightening torques

Part to be tightened	Thread size	Tightening torque		Remarks
		Nm	m•kg	
Upper bracket and inner tube	M8	23	2.3	See "NOTE"
Upper bracket and steering stem	M22	108	10.8	
Steering stem and ring nut	M25	16	1.6	
Inner tube and under bracket	M10	30	3.0	
Horn bracket and brake hose holder	M6	10	1.0	
Brake hose holder and under bracket	M6	10	1.0	
Front brake hose union bolt	M10	30	3.0	
Cowling stay and frame	M8	30	3.0	
Meter and cowling stay	M6	7	0.7	
Handlebar and grip end	M16	26	2.6	
Front master cylinder	M6	9	0.9	
Upper bracket and handlebar holder (upper)	M8	23	2.3	
Upper bracket and cable holder	M6	7	0.7	
Upper bracket and cable guide	M6	7	0.7	
Engine mount (rear-upper)	M10	89	8.9	
Engine mount (rear-lower)	M10	64	6.4	
Engine bracket and frame	M8	30	3.0	
Engine bracket and engine (upper)	M10	60	6.0	
Engine bracket and engine (rear-lower)	M8	30	3.0	
Pivot shaft and nut	M14	90	9.0	
Rear shock absorber and swingarm	M10	64	6.4	
Rear shock absorber and frame	M12	64	6.4	
Chain case and swingarm	M6	7	0.7	
Chain protector	M6	7	0.7	
Swingarm and brake hose guide	M6	7	0.7	
Rear fender cover and swingarm	M6	7	0.7	
Fuel cock and fuel tank	M6	7	0.7	
Fuel tank bracket and fuel tank	M6	7	0.7	
Fuel tank bracket and frame	M8	16	1.6	
Fuel tank (rear) and frame	M8	16	1.6	
Ignition coil and frame	M5	4	0.4	
Vacuum pump stay and vacuum pump	M6	7	0.7	
Vacuum pump stay and frame	M6	7	0.7	
Fuel cock and frame	M6	7	0.7	
Tail cover and frame (front)	M6	7	0.7	
Battery box and frame	M6	7	0.7	
Coolant reservoir tank and frame	M6	7	0.7	
Rear fender and frame	M6	7	0.7	
Taillight bracket and frame	M8	23	2.3	
Taillight	M6	7	0.7	
Rectifier/regulator and cowling stay	M6	7	0.7	
Side cover and frame	M6	7	0.7	
Rear fender stay and taillight bracket	M8	16	1.6	
Sidestand	M10	46	4.6	
Sidestand bolt and locknut	M10	39	3.9	
Footrest bracket and frame	M8	30	3.0	
Rear footrest bracket and frame	M8	30	3.0	
Rear master cylinder and frame	M8	23	2.3	
Footrest bracket and footrest	M10	64	6.4	
Footrest and footrest tab	M8	16	1.6	
Brake pedal and brake shaft	M6	8	0.8	
Front wheel axle	M16	58	5.8	
Rear wheel axle and nut	M16	107	10.7	
Front brake caliper and front fork	M10	40	4.0	
Rear brake caliper and caliper bracket	M10	40	4.0	

MAINTENANCE SPECIFICATIONS

SPEC



Part to be tightened	Thread size	Tightening torque		Remarks
		Nm	m•kg	
Caliper bracket and swingarm	M10	35	3.5	
Brake disc and wheel hub (front and rear)	M8	20	2.0	
Driven sprocket and rear hub	M10	60	6.0	
Bleed screw and brake caliper	M8	6	0.6	
Rear brake hose union bolt	M10	30	3.0	
Front wheel axle pinch bolt	M8	19	1.9	
Brake hose joint and brake hose	M10	14	1.4	
Chain puller and locknut	M8	16	1.6	
Front fender and front fork	M6	9	0.9	
Brake hose joint and front fork	M6	10	1.0	
Rear brake caliper and brake hose joint	M10	40	4.0	

NOTE:

1. First, tighten the ring nut approximately 48 Nm (4.8 m•kg) by using the torque wrench, then loosen the ring nut completely.
2. Retighten the ring nut to specification.

MAINTENANCE SPECIFICATIONS

SPEC


ELECTRICAL

Item	Standard	Limit
Voltage:	12 V	...
Ignition system: Ignition timing (B.T.D.C.) Advancer type	10° at 1,150 r/min Electrical type
T.C.I.: Pickup coil resistance/color T.C.I. unit model/manufacture	192 ~ 288 Ω at 20°C/Blue/Yellow – Green/White TNDF33/NIPPONDENSO
Ignition coil: Model/manufacture Minimum spark gap Primary winding resistance Secondary winding resistance	J0300/NIPPONDENSO 6 mm 3.4 ~ 4.6 Ω at 20°C 10.4 ~ 15.6 kΩ at 20°C
Spark plug cap: Type Resistance	Resin type 10 kΩ
Charging system: Type Model/manufacture Normal output Stator coil resistance	A.C. magneto LNZ29/NIPPONDENSO 14 V 25 A at 5,000 r/min 0.23 ~ 0.35 Ω at 20°C/W-W
Rectifier: Model/manufacture Withstand voltage	SH650A-12/SHINDENGEN 240 V
Battery: Specific gravity	1.320	...
Electric starter system: Type Starter motor: Model/manufacture Output Armature coil resistance Brush overall length Spring force Commutator diameter Mica undercut	Constant mesh type SM-13/MITSUBA 0.8 kW 0.01 Ω at 20°C 12.5 mm 570 ~ 920 g 28 mm 0.7 mm 5 mm ... 27 mm ...
Starter relay: Model/manufacture Amperage rating Coil winding resistance	9768042/JIDECO 100 A 4.2 ~ 4.6 Ω at 20°C

MAINTENANCE SPECIFICATIONS

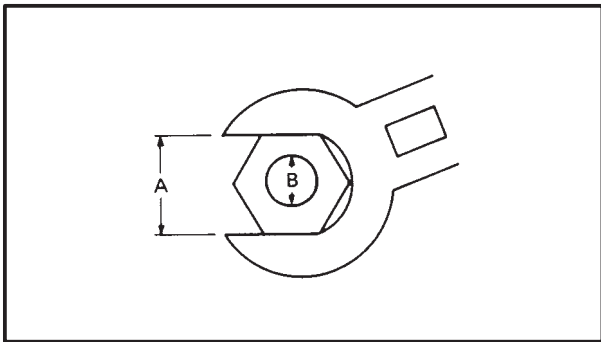
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Item	Standard	Limit
Horn: Type Quantity Model/manufacture Maximum amperage	Plane type 1 YF-12/NIKKO 2.5 A
Flasher relay: Type Model/manufacture Self cancelling device Flasher frequency Wattage	Semi transistor type FE246BH/NIPPONDENSO No 75 ~ 95 cycle/min 21 W × 2 + 3.4 W
Starting circuit cut off relay: Model/manufacture Coil winding resistance Diode	G8R-30Y-F/OMRON 180 ~ 270 Ω at 20°C Yes
Thermostatic switch: Model/manufacture	2EL/NIHON THERMOSTAT	...
Thermo unit: Model/manufacture	11H/NIPPON SEIKI	...
Circuit breakers: Type Amperage for individual circuits Main fuse Headlight fuse Signal system fuse Ignition fuse Radiator fan fuse Reserve fuse Reserve fuse Reserve fuse	Fuse 30 A × 1 15 A × 1 15 A × 1 7.5 A × 1 7.5 A × 1 30 A × 1 15 A × 2 7.5 A × 1

GENERAL TORQUE SPECIFICATIONS

This chart specifies torque for standard fasteners with standard I.S.O. pitch threads.

Torque specifications for special components or assemblies are included in the applicable sections of this book. To avoid warpage, tighten multi-fastener assemblies in a crisscross fashion, in progressive stages, until full torque is reached. Unless otherwise specified, torque specifications call for clean, dry threads. Components should be at room temperature.



A: Distance across flats

B: Outside thread diameter

A (Nut)	B (Bolt)	General torque specifications	
		Nm	m•kg
10 mm	6 mm	6	0.6
12 mm	8 mm	15	1.5
14 mm	10 mm	30	3.0
17 mm	12 mm	55	5.5
19 mm	14 mm	85	8.5
22 mm	16 mm	130	13.0

LUBRICATION POINT AND GRADE OF LUBRICANT

SPEC



LUBRICATION POINT AND GRADE OF LUBRICANT ENGINE

Lubrication point	Lubricant type
Oil seal lips	
O-ring	
Bearing	
Crankshaft (big end)	
Piston surface	
Piston pin	
Cylinder	
Piston ring, oil ring	
Connecting rod bolt	
Crankshaft journal	
Balancer (bearing/shaft)	
Camshaft, camshaft cap	
Valve stem (IN/EX)	
Valve stem end	
Water pump impeller shaft	
Oil pump assembly (inner)	
Oil strainer assembly	
Push rod	
Idle gear surface	
Starter clutch ball	
Primary driven gear	
Transmission gear (wheel/pinion)	
Axle (main/drive)	
Shift cam	
Shift fork, guide bar	
Shift shaft assembly	
Shift boss (inner)	

LUBRICATION POINT AND GRADE OF LUBRICANT

SPEC



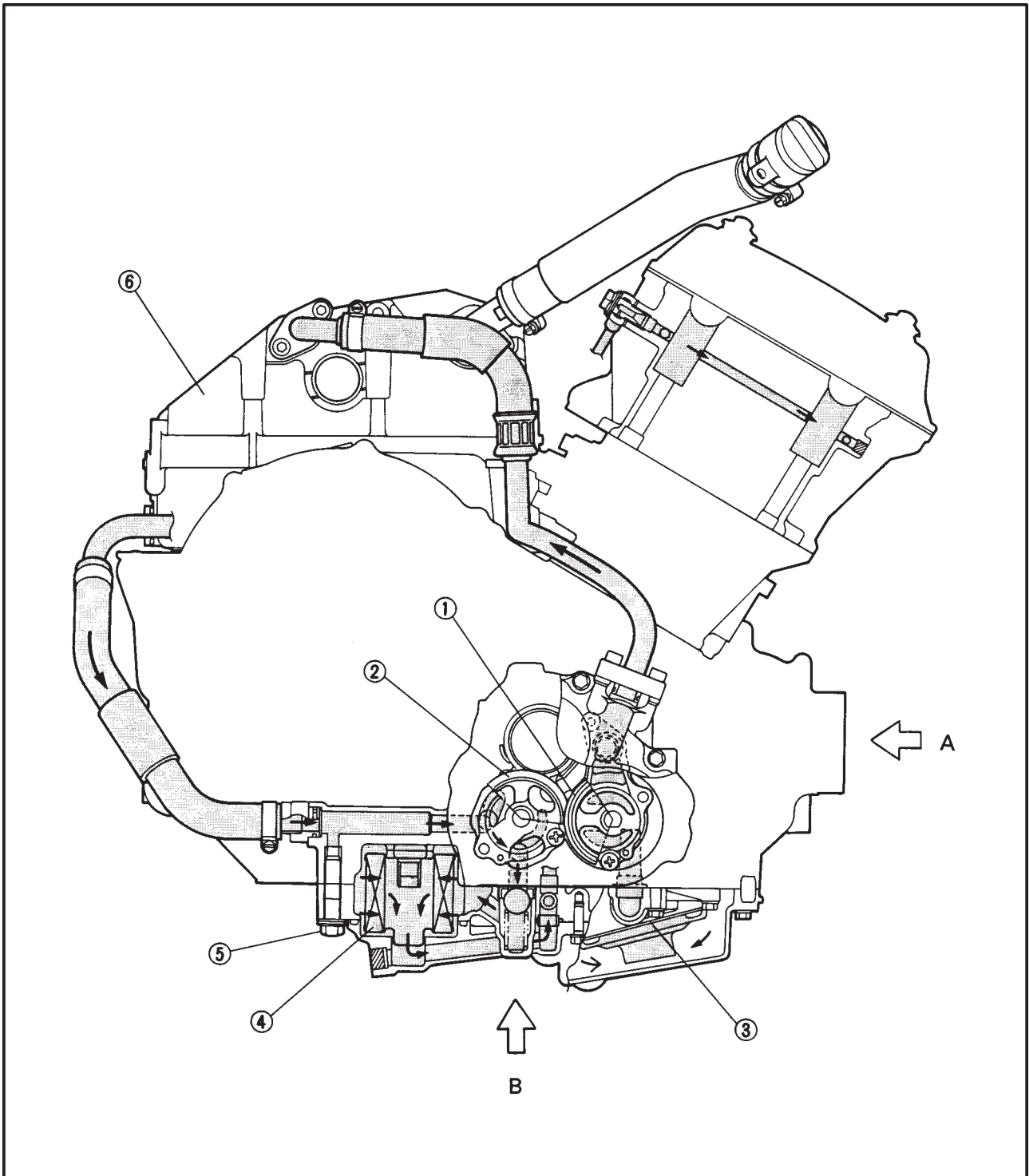
CHASSIS

Lubrication point	Lubricant type
Steering bearing and bearing race (upper/lower)	
Front wheel oil seal (right/left)	
Rear wheel oil seal	
Clutch hub oil seal	
Clutch hub fitting area	
Rear brake pedal shaft	
Sidestand sliding surface	
Tube guide (throttle grip) inner surface	
Brake lever bolt, sliding surface	
Clutch lever bolt, sliding surface	
Rear shock absorber (lower)	
Swingarm pivot bearing	
Pivot shaft	
Thrust cover (inner)	



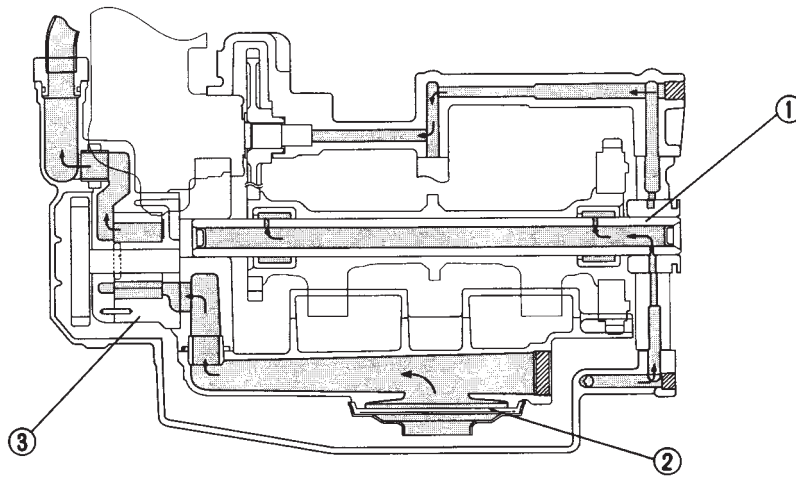
LUBRICATION DIAGRAMS

- ① Oil pump (for pumping oil to the oil tank)
- ② Oil pump (for lubricating the engine parts)
- ③ Oil strainer
- ④ Oil filter
- ⑤ Drain bolt
- ⑥ Oil tank

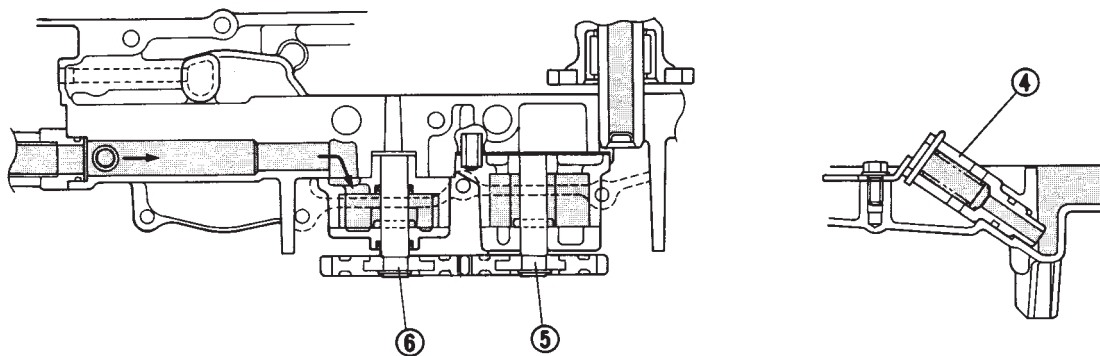




- ① Front balancer
- ② Oil strainer
- ③ Oil pump
- ④ Relief valve
- ⑤ Oil pump (for pumping oil to the oil tank)
- ⑥ Oil pump (for lubricating the engine parts)



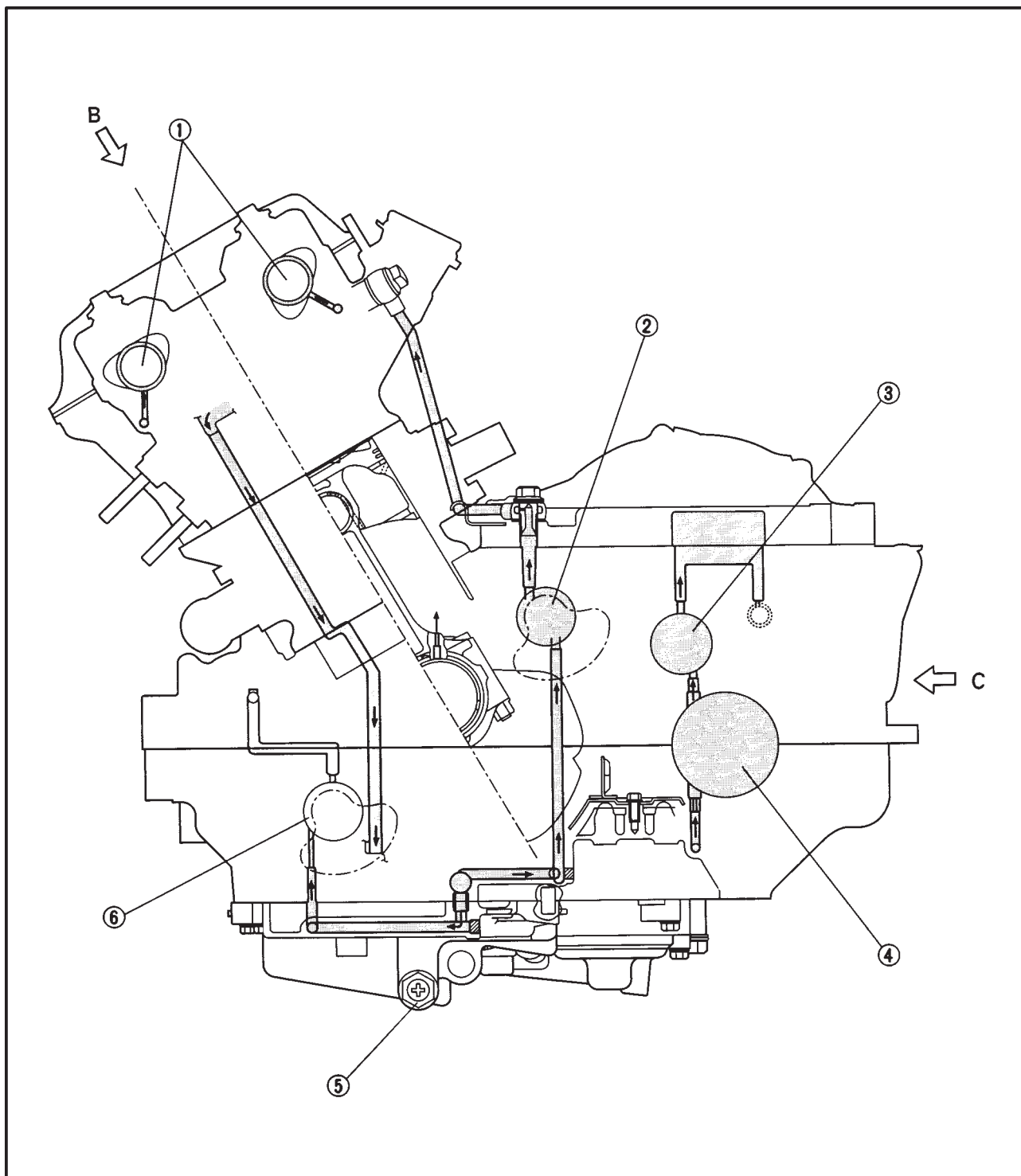
A



B

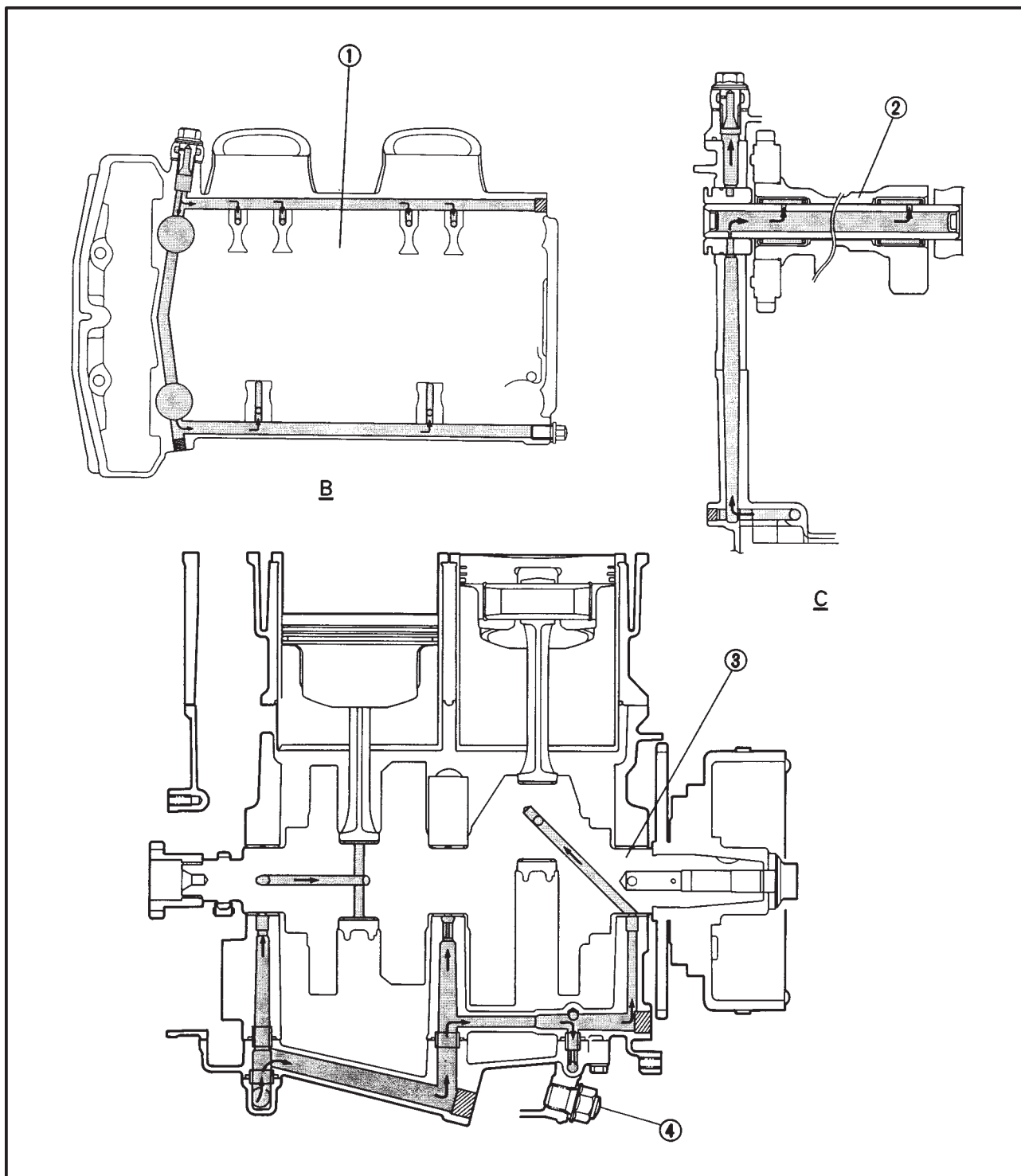


- ① Camshaft
- ② Rear balancer
- ③ Main axle
- ④ Drive axle
- ⑤ Drain bolt
- ⑥ Front balancer



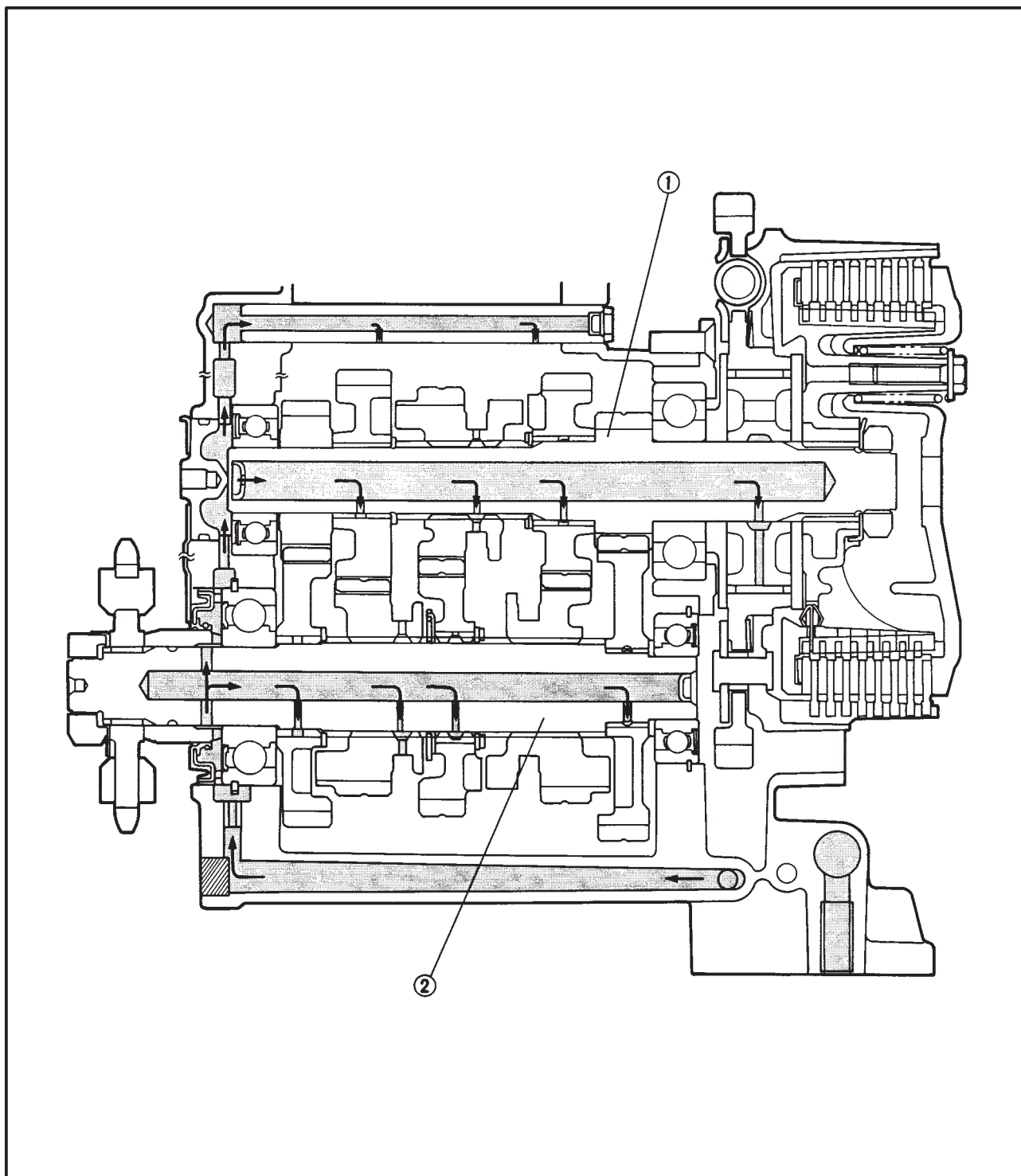


- ① Cylinder head
- ② Rear balancer
- ③ Crankshaft
- ④ Drain bolt





- ① Main axle
- ② Drive axle



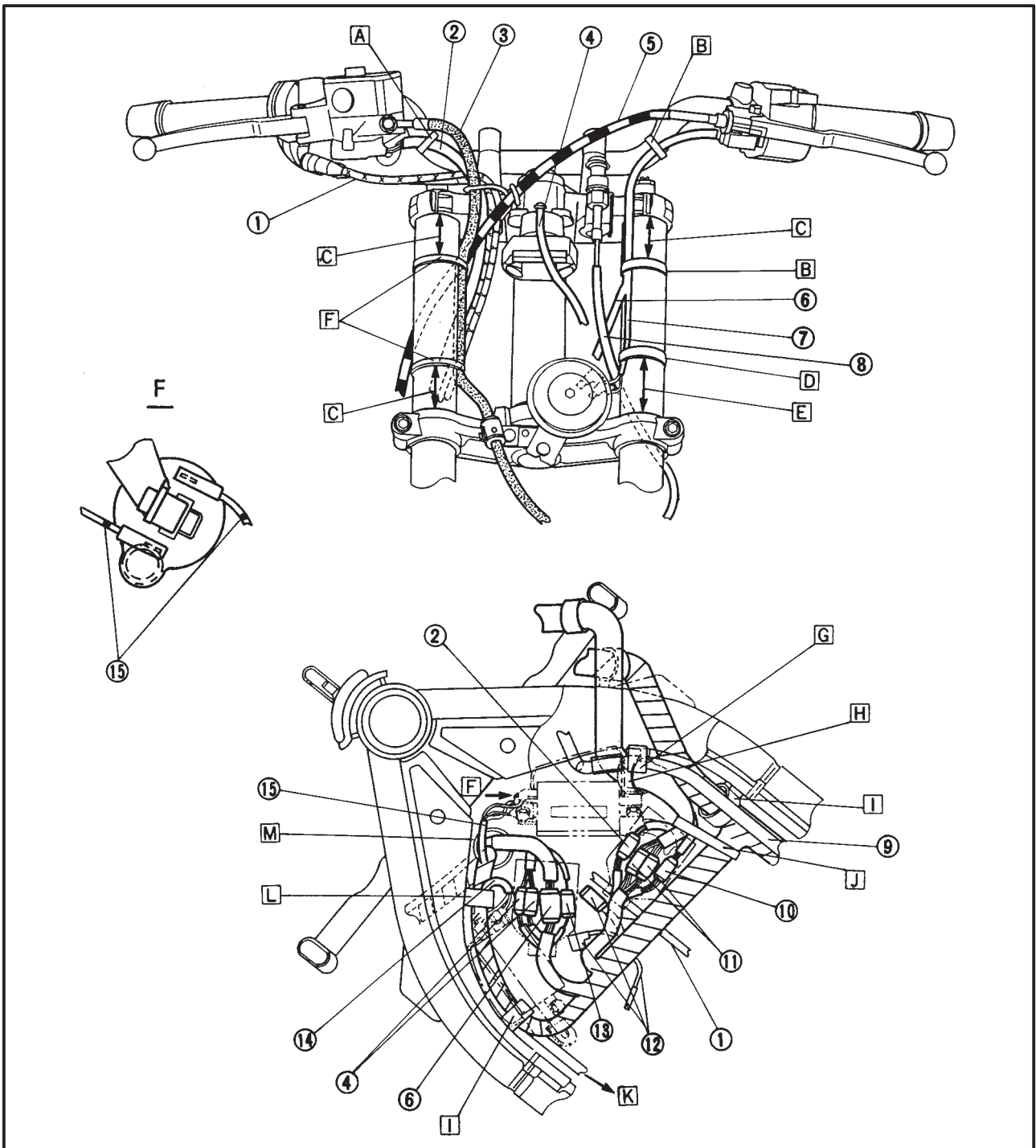


CABLE ROUTING

- ① Throttle cable
- ② Right handlebar switch lead
- ③ Brake hose
- ④ Main switch lead
- ⑤ Clutch cable
- ⑥ Left handlebar switch lead
- ⑦ Horn lead
- ⑧ Starter cable
- ⑨ Coolant reservoir hose
- ⑩ Headlight lead

- ⑪ Meter light lead
- ⑫ Thermo switch lead
- ⑬ Fan motor lead
- ⑭ Ignition coil (left) lead
- ⑮ Ignition coil (right) lead

- A Fasten the right handlebar switch lead with a plastic band.
- B Fasten the left handlebar switch lead with a plastic band.
- C 50 mm

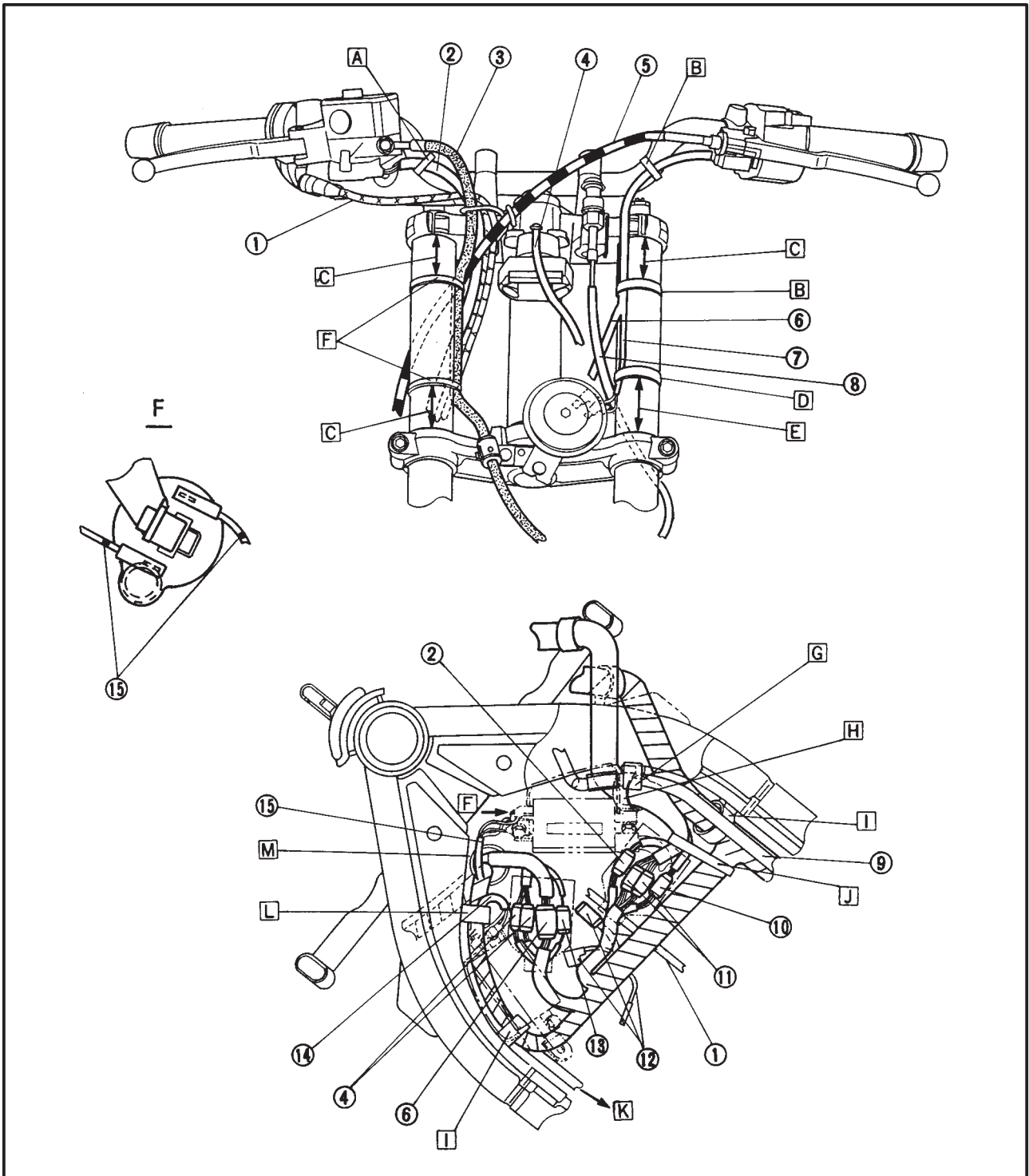


CABLE ROUTING

SPEC



- D** Fasten the horn lead with a plastic band.
- E** 60 mm
- F** Fasten the brake hose with plastic bands.
- G** Fasten the coolant reservoir hose with a plastic clamp.
- H** Fasten the right handlebar switch lead, meter light lead and headlight lead with a plastic clamp
- I** Fasten the wire harness with a plastic clamp..
- J** Fasten the wire harness, right handlebar switch lead, meter light lead and headlight lead with a plastic band.
- K** To the throttle position sensor.
- L** Fasten the wire harness and ignition coil (left) lead with a plastic clamp.
- M** Fasten the wire harness, right handlebar switch lead, main switch lead and fan motor lead with a plastic clamp.

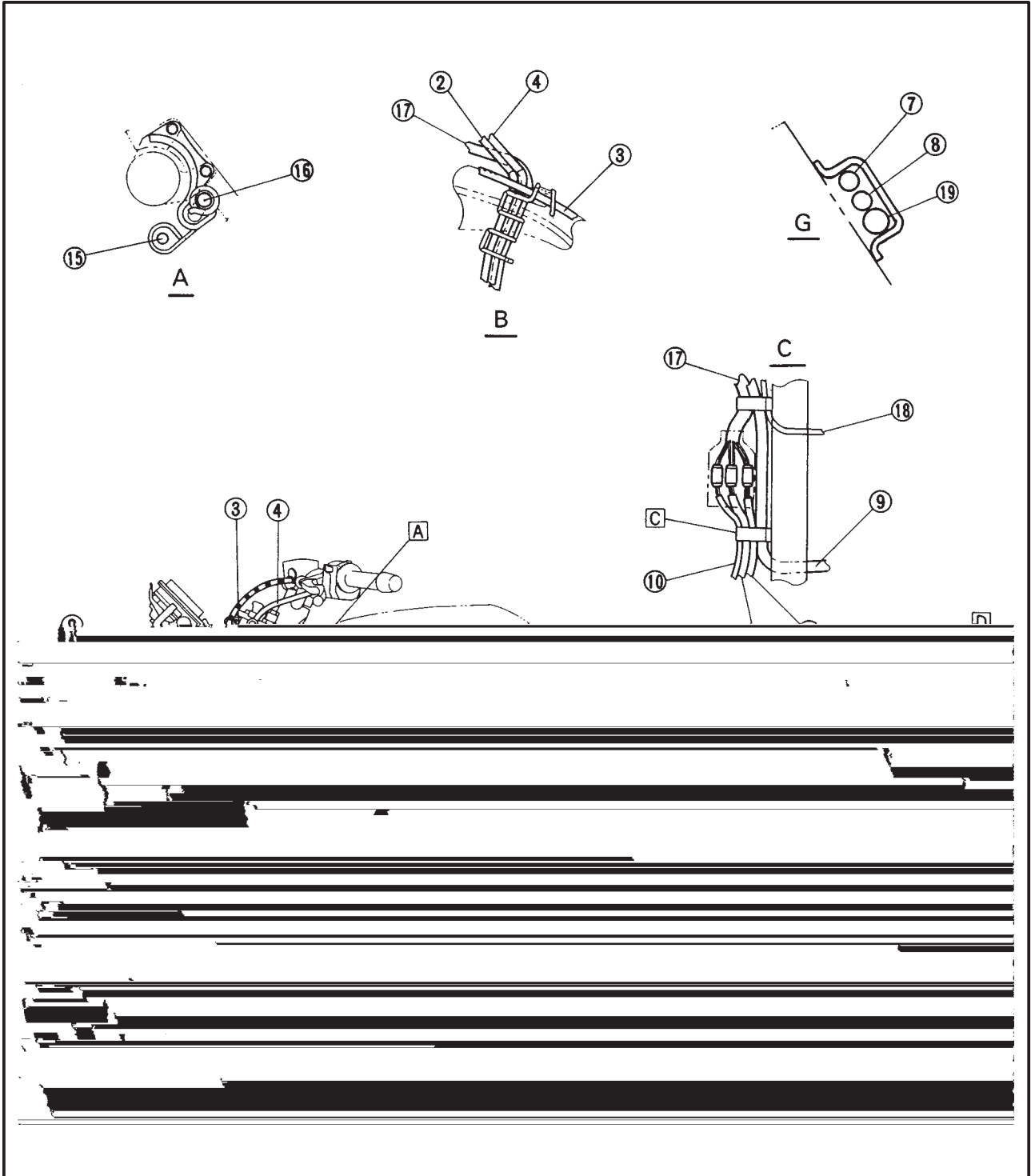


CABLE ROUTING

SPEC



- ① Front flasher light (left) lead
- ② Main switch lead
- ③ Starter cable
- ④ Left handlebar switch lead
- ⑤ Spark plug lead
- ⑥ Carburetor breather hose
- ⑦ Fuel hose
- ⑧ Vacuum hose (#2)
- ⑨ Coolant reservoir hose
- ⑩ Sidestand switch lead
- ⑪ Neutral switch lead
- ⑫ A.C. magneto lead
- ⑬ Air filter case breather hose
- ⑭ Carburetor heater hose
- ⑮ Speedometer cable
- ⑯ Brake hose
- ⑰ Wire harness
- ⑱ Flasher relay lead
- ⑲ Fuel hose 5

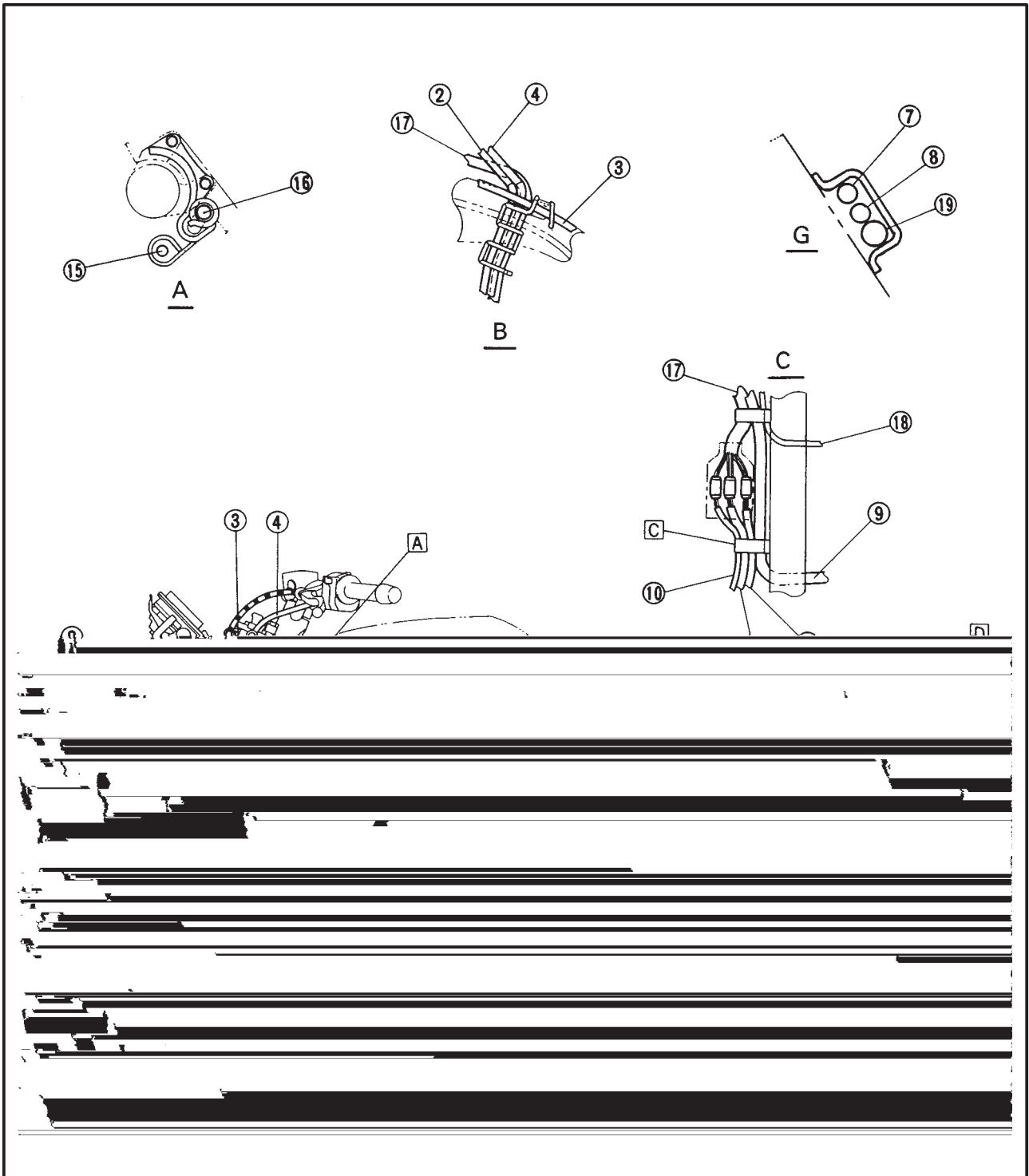


CABLE ROUTING

SPEC



- A Fasten the left handlebar switch lead and main switch lead with a plastic clamp.
- B To the air filter case.
- C Fasten the coolant reservoir hose, A.C. magneto lead, neutral switch lead and sidestand switch lead with a plastic clamp.
- D Fasten the rear flasher light (left) lead with a plastic clamp.
- E Fasten the sidestand switch lead, neutral switch lead and A.C. magneto lead with a plastic clamp.
- F Fasten the sidestand switch lead and air filter case breather hose with a metal band.
- G Pass the air filter case breather hose over the carburetor heater hose.
- H Pass the speedometer cable through the guides.



CABLE ROUTING

SPEC



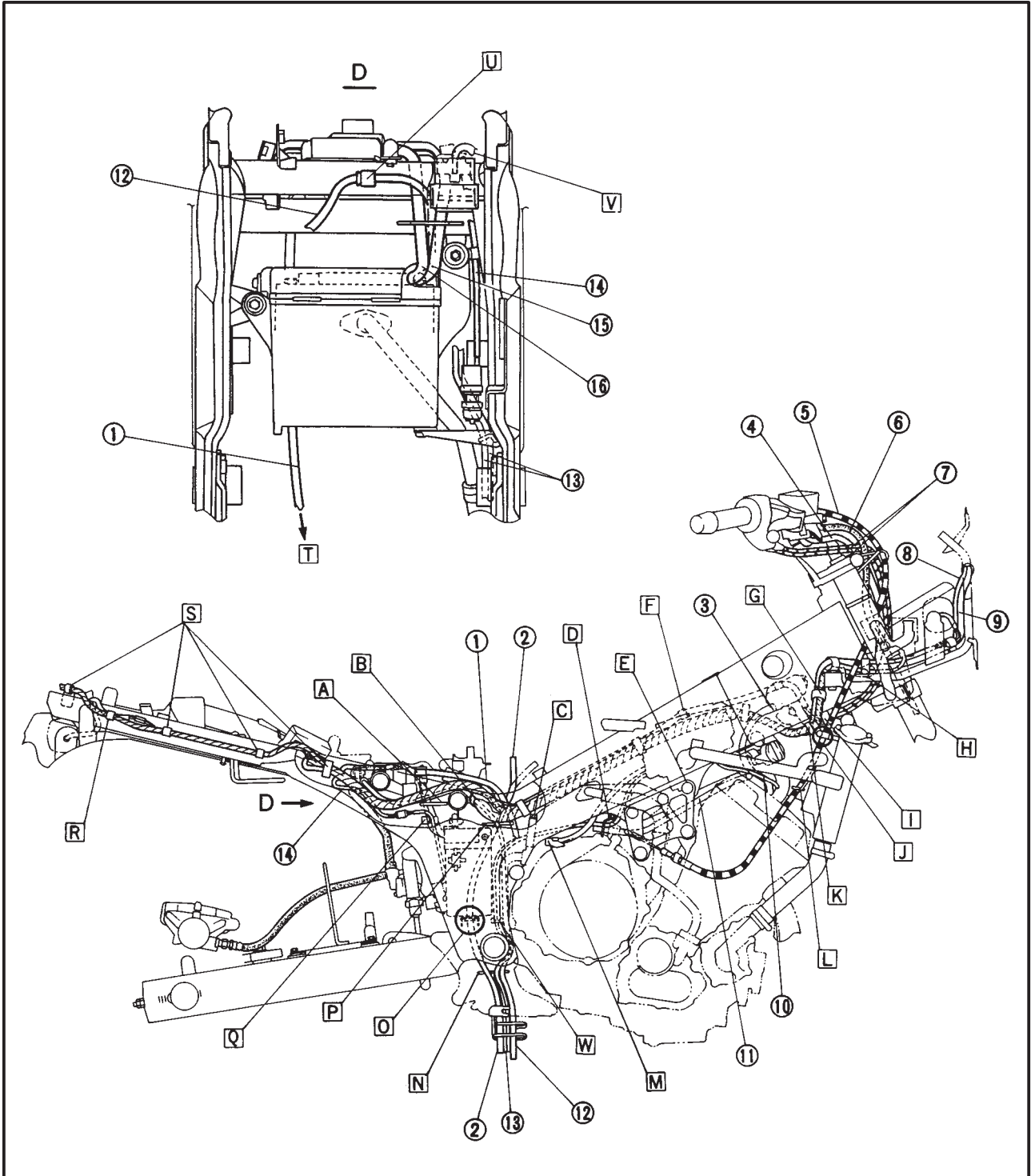
- ① Starter motor lead
- ② Fuel tank breather hose
- ③ Spark plug lead
- ④ Right handlebar switch lead
- ⑤ Clutch cable
- ⑥ Brake hose
- ⑦ Throttle cable
- ⑧ Headlight lead
- ⑨ Meter light lead
- ⑩ Carburetor heater hose
- ⑪ Vacuum hose (#1)

- ⑫ Coolant reservoir breather hose
- ⑬ Carburetor breather hose
- ⑭ Rear brake switch lead
- ⑮ Battery positive lead
- ⑯ Battery negative lead

A Pass the battery positive lead and battery negative lead through the guide.

B Fasten the wire harness coolant reservoir hose and flasher relay lead with a plastic clamp.

C Pass the carburetor breather hoses through the metal band.

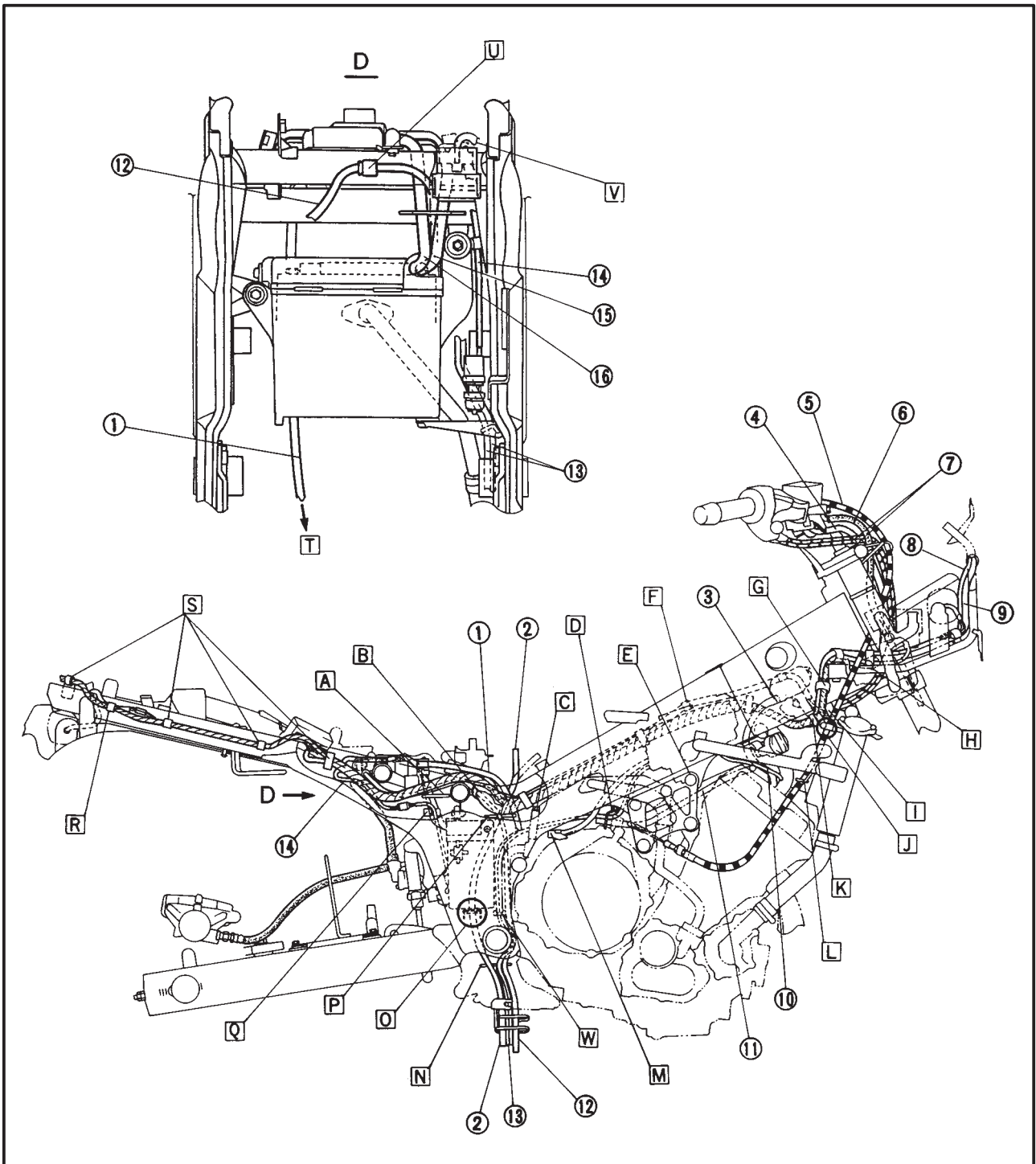


CABLE ROUTING

SPEC



- D** Pass the carburetor breather hoses and vacuum hose (#1) through the guide.
- E** Pass the vacuum hose (#1) through the guide.
- F** Fasten the coolant reservoir hose with a plastic clamp.
- G** Fasten the wire harness, right handlebar switch lead, meter light lead and headlight lead with a plastic clamp.
- H** Fasten the right handlebar switch lead with a plastic clamp.
- I** Fasten the throttle cables with a plastic clamp.
- J** Pass the coolant reservoir hose over the throttle cables.
- K** Fasten the wire harness, right handlebar switch lead, meter light lead and headlight lead with a plastic band.
- L** Pass the clutch cable through the guide.
- M** Pass the carburetor air vent hose through the guide.
- N** Pass the coolant reservoir breather hose, fuel tank breather hose and carburetor breather hoses through the guide.

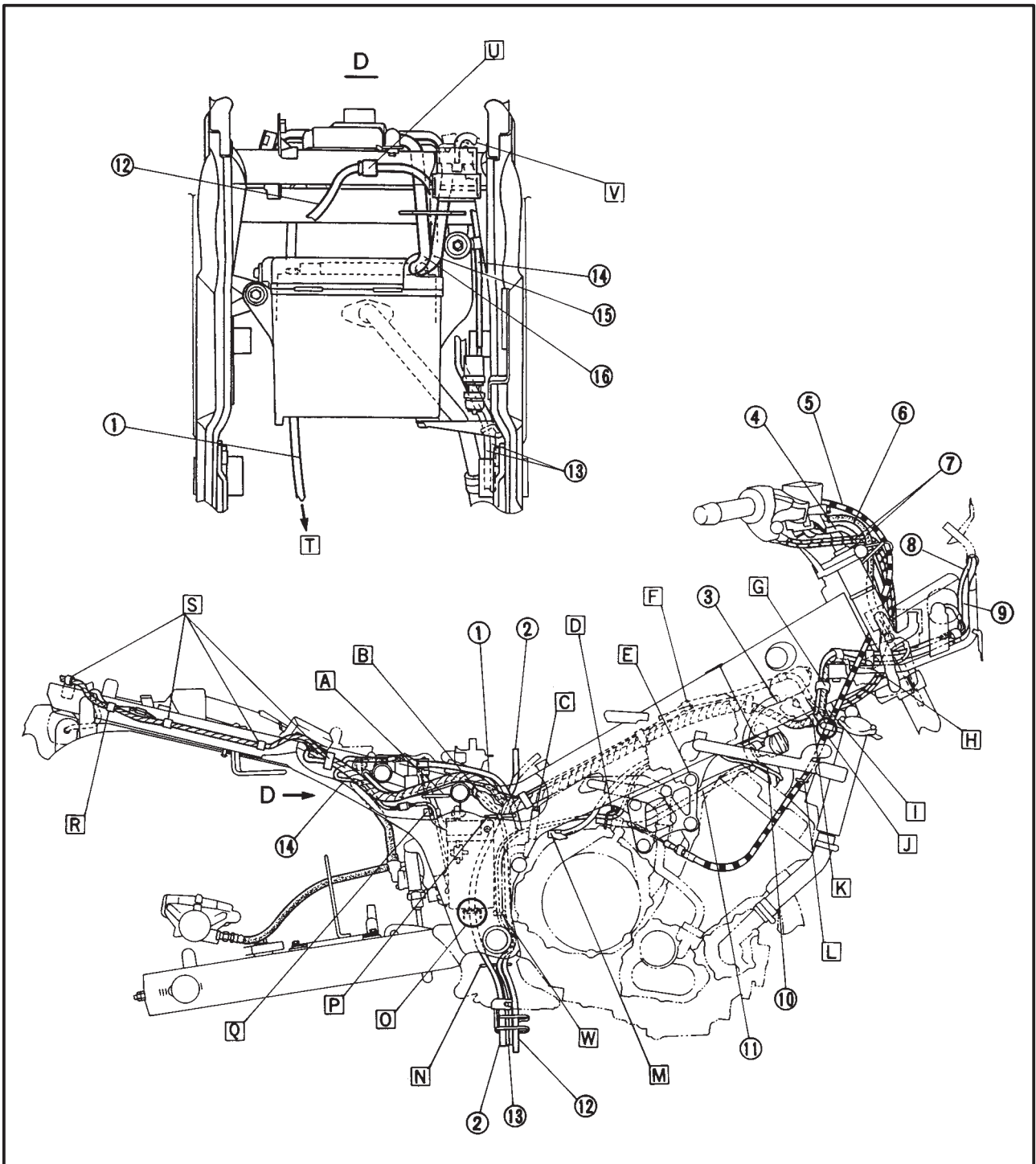


CABLE ROUTING

SPEC



- Pass the fuel tank breather hose through the hole of the frame bracket.
- Pass the coolant reservoir breather hose and fuel tank breather hose through the guide.
- Pass the rear brake switch lead through the guide.
- Fasten the wire harness and rear flasher light (right) lead with a plastic clamp.
- Fasten the wire harness with plastic clamps.
- To the engine.
- Fasten the coolant reservoir breather hose with a plastic clamp.
- To the starter relay.
- Pass the carburetor breather hoses through the guide.



CABLE ROUTING

SPEC



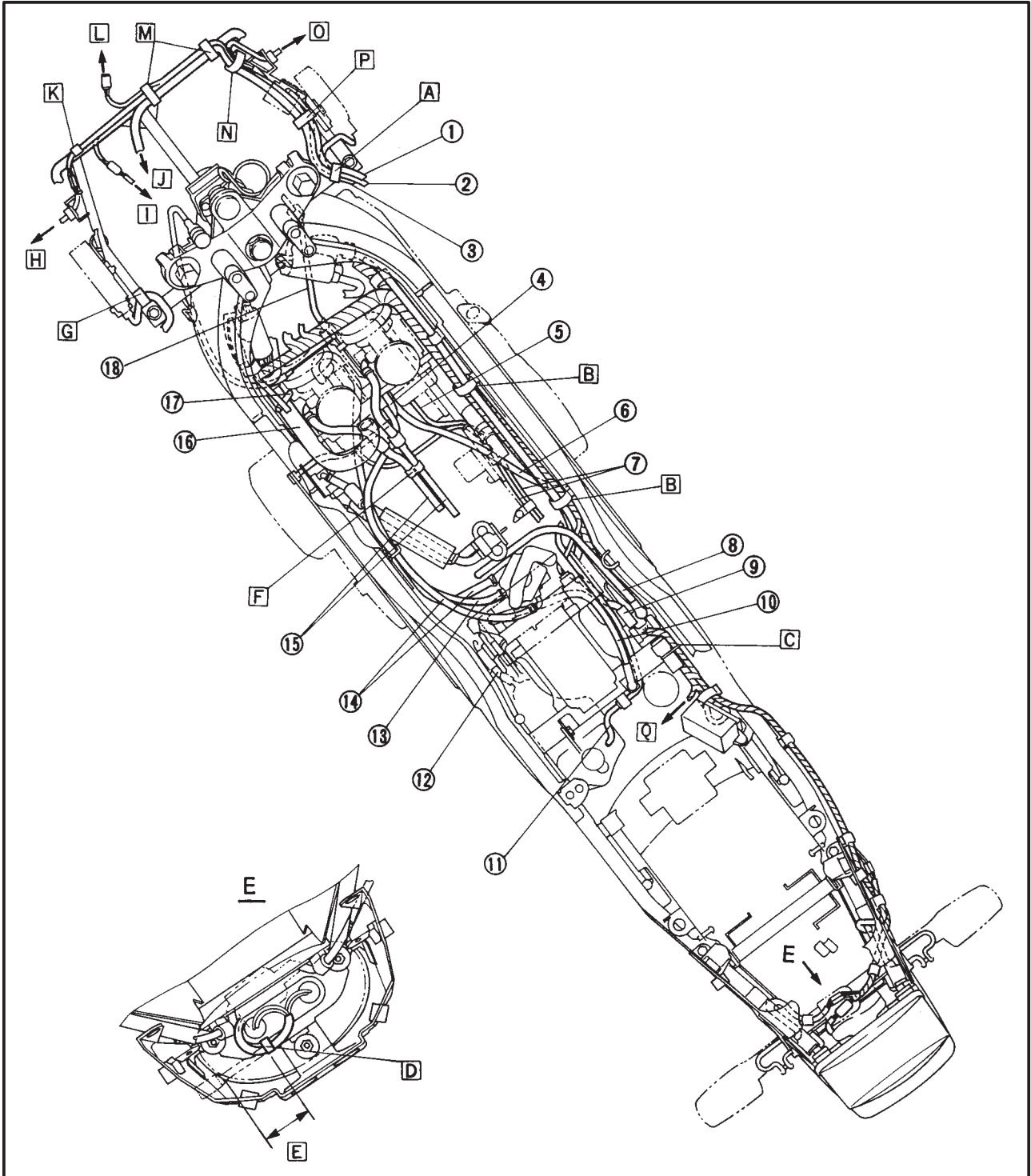
- ① Headlight lead
- ② Wire harness
- ③ Meter light lead
- ④ Throttle stop screw cable
- ⑤ Vacuum hose (#1)
- ⑥ Carburetor air vent hose
- ⑦ Carburetor breather hose
- ⑧ Starter motor lead
- ⑨ Battery positive lead
- ⑩ Battery negative lead
- ⑪ Coolant reservoir breather hose

- ⑫ Coolant reservoir hose
- ⑬ Vacuum hose (#2)
- ⑭ Fuel hose
- ⑮ Carburetor breather hose
- ⑯ Cylinder head breather hose
- ⑰ Air filter case breather hose
- ⑱ Throttle cable

A Fasten the meter light lead, headlight lead and wire harness with a plastic clamp.

B Fasten the wire harness and coolant reservoir hose with a plastic clamp.

C Pass the starter relay lead through the guide.

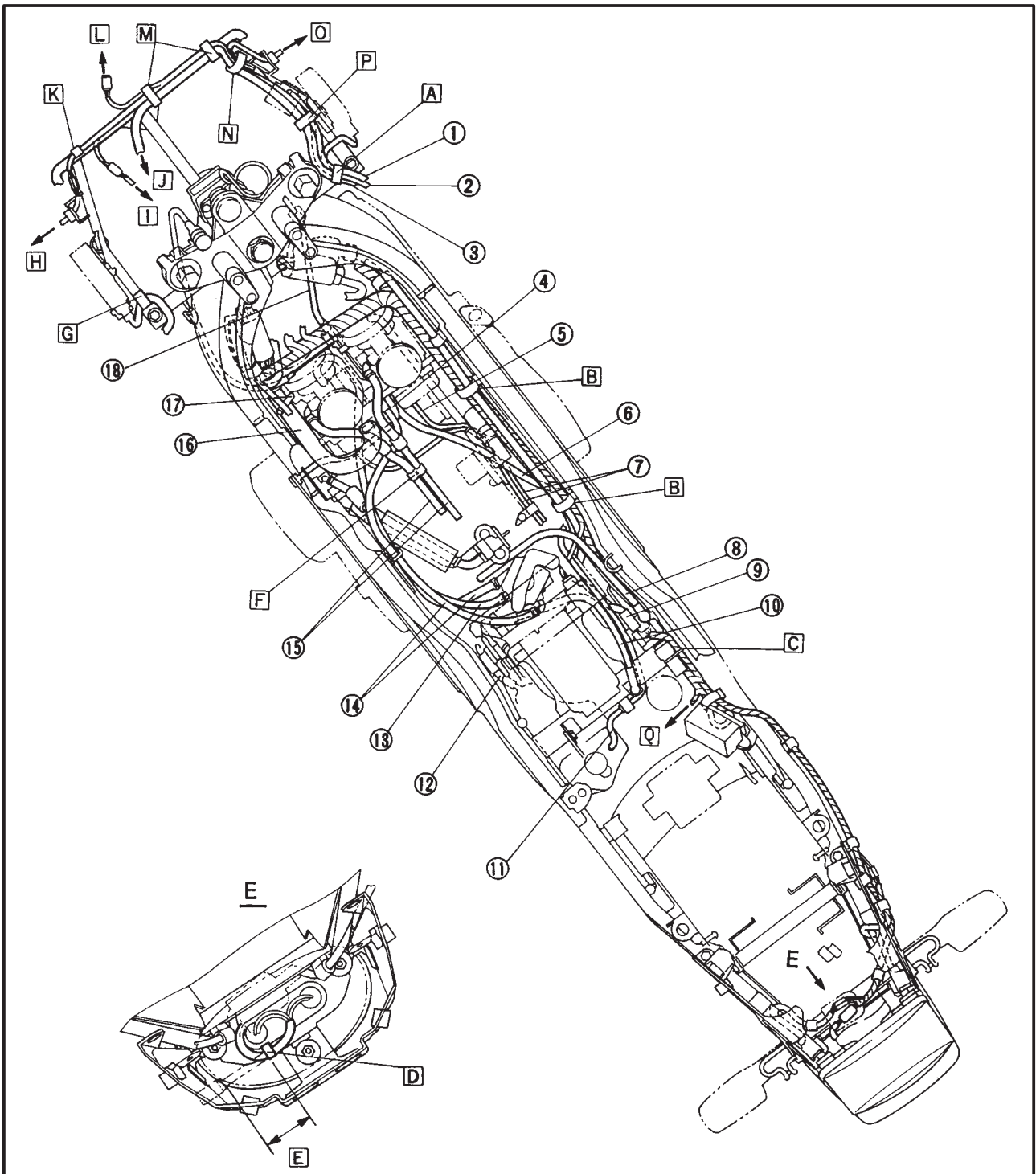


CABLE ROUTING

SPEC



- D** Fasten the taillight lead with a plastic band to the tail-light bracket.
- E** 50 mm
- F** Fasten the carburetor breather hoses with a plastic clamp.
- G** Fasten the wire harness with a plastic clamp.
- H** To the front flasher light (left).
- I** To the headlight.
- J** To the meter light.
- K** Fasten the headlight lead with a plastic clamp.
- L** To the auxiliary light.
- M** Fasten the meter light lead and headlight lead with plastic clamps.
- N** Fasten the meter light lead, headlight lead and front flasher light lead connector with a plastic clamp.
- O** To the front flasher light (right).
- P** Fasten the meter light lead, headlight lead, starting circuit cut-off relay lead and front flasher light (right) lead with a plastic clamp.
- Q** To the rear brake switch.



SPEC



CHAPTER 3. PERIODIC INSPECTION AND ADJUSTMENT

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PERIODIC INSPECTION AND ADJUSTMENT

INTRODUCTION

This chapter includes all information necessary to perform recommended inspections and adjustments. These preventive maintenance procedures, if followed, will ensure more reliable vehicle operation and a longer service life. The need for costly overhaul work will be greatly reduced. This information applies to vehicles already in service as well as new vehicles that are being prepared for sale. All service technicians should be familiar with this entire chapter.

PERIODIC MAINTENANCE/LUBRICATION INTERVALS

ITEM	ROUTINE	BRAKE-IN 1,000 km	EVERY	
			6,000 km or 6 months	12,000 km or 12 months
Valves*	<ul style="list-style-type: none"> • Check valve clearance. • Adjust if necessary. 	EVERY 42,000 km or 42 months		
Spark plugs	<ul style="list-style-type: none"> • Check condition. • Clean or replace if necessary. 	○	○	○
Air filter	<ul style="list-style-type: none"> • Clean. • Replace if necessary. 		○	○
Carburetor*	<ul style="list-style-type: none"> • Check idle speed/synchronization/starter operation. • Adjust if necessary. 	○	○	○
Fuel line*	<ul style="list-style-type: none"> • Check fuel hose and vacuum pipe for cracks or damage. • Replace if necessary. 		○	○
Engine oil	<ul style="list-style-type: none"> • Replace (Warm engine before draining). 	○	○	○
Engine oil filter*	<ul style="list-style-type: none"> • Replace. 	○		○
Brake*	<ul style="list-style-type: none"> • Check operation/fluid leakage/See NOTE. • Correct if necessary. 		○	○
Clutch	<ul style="list-style-type: none"> • Check operation. • Adjust if necessary. 		○	○
Swingarm pivot*	<ul style="list-style-type: none"> • Check swingarm assembly for looseness. • Correct if necessary. • Moderately repack every 24,000 km or 24 months.*** 			○
Wheels*	<ul style="list-style-type: none"> • Check balance/damage/runout. • Replace if necessary. 		○	○
Wheel bearings*	<ul style="list-style-type: none"> • Check bearing assembly for looseness/damage. • Replace if damaged. 		○	○
Steering bearings*	<ul style="list-style-type: none"> • Check bearing assembly for looseness. • Correct if necessary. • Moderately repack every 24,000 km or 24 months.** 	○		○
Front forks*	<ul style="list-style-type: none"> • Check operation/oil leakage. • Repair if necessary. 		○	○
Rear shock absorber*	<ul style="list-style-type: none"> • Check operation/oil leakage. • Repair if necessary. 		○	○
Cooling system	<ul style="list-style-type: none"> • Check coolant leakage. • Repair if necessary. • Replace coolant every 24,000 km or 24 months 		○	○
Drive chain	<ul style="list-style-type: none"> • Check chain slack/alignment. • Adjust if necessary. • Clean and lube. 	EVERY 500 km		
Fittings/Fasteners*	<ul style="list-style-type: none"> • Check all chassis fittings and fasteners. • Correct if necessary. 	○	○	○
Sidestand*	<ul style="list-style-type: none"> • Check operation. • Repair if necessary. 	○	○	○
Sidestand switch*	<ul style="list-style-type: none"> • Check operation. • Replace if necessary. 	○	○	○

* : If is recommended that these items be serviced by a Yamaha dealer.

** : Lithium soap base grease.

*** : Molybdenum disulfide grease.

PERIODIC MAINTENANCE/LUBRICATION INTERVALS

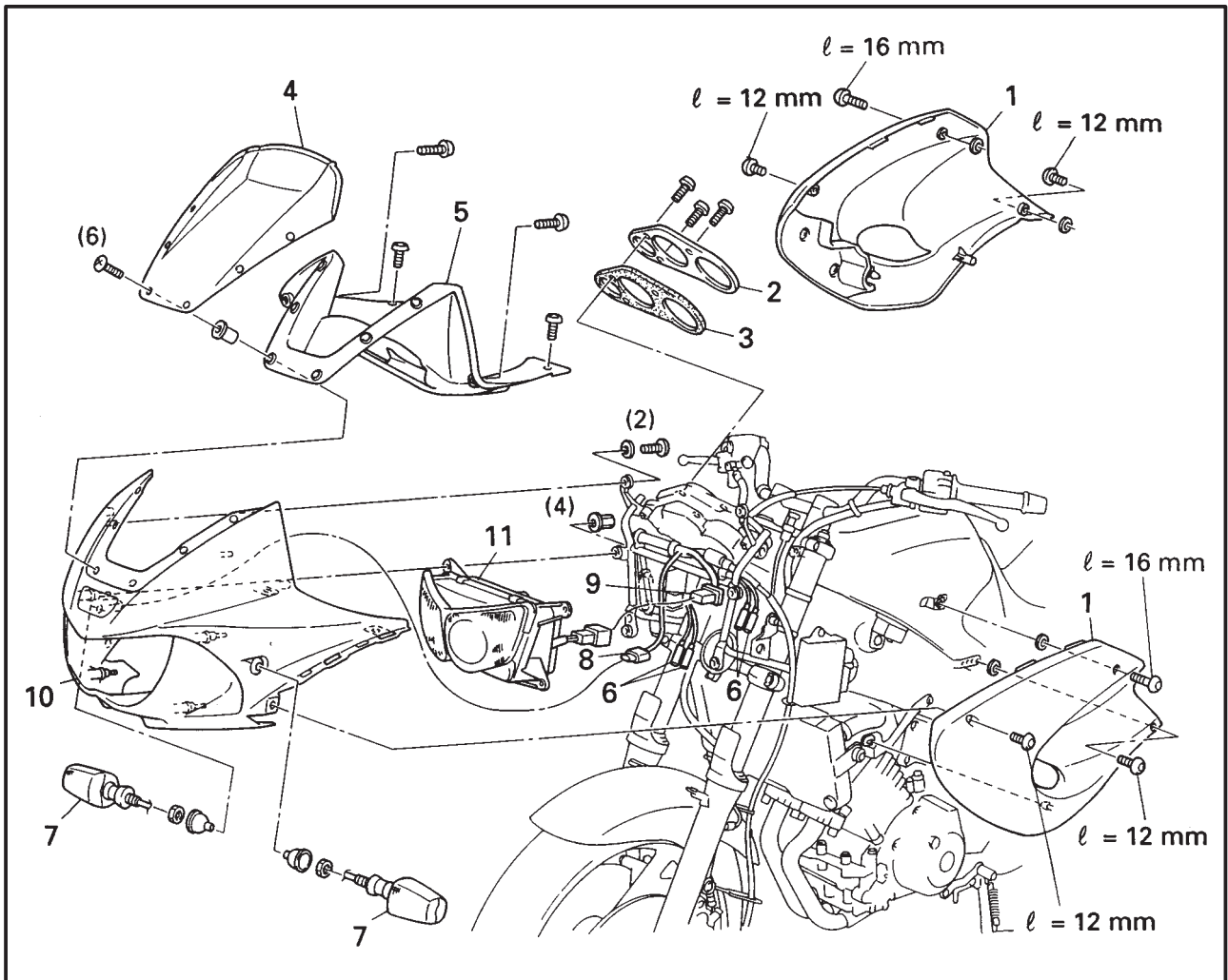


NOTE: _____

Brake fluid replacement:

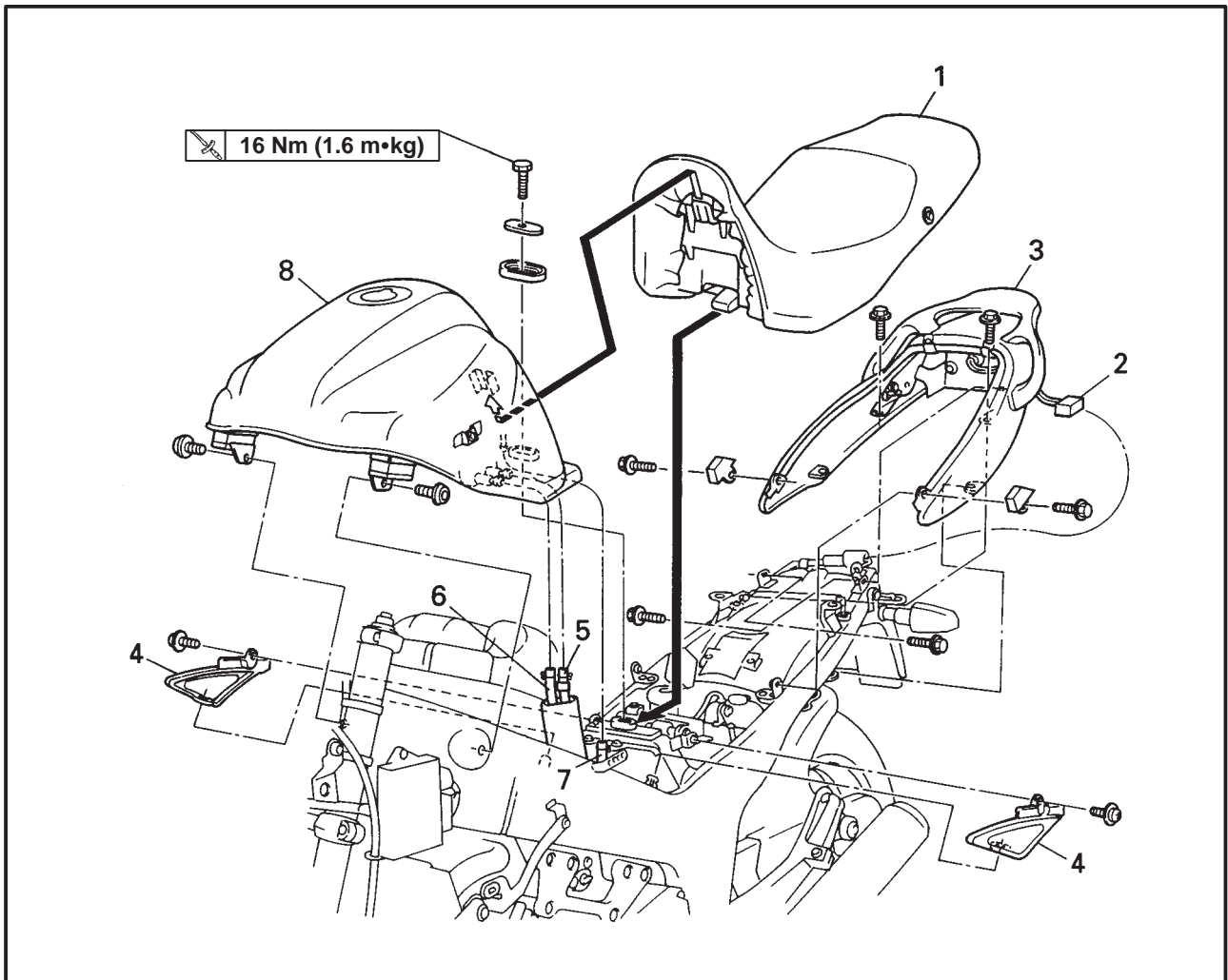
1. When disassembling the master cylinder or caliper cylinder, replace the brake fluid. Normally check the brake fluid level and add the fluid as required.
 2. On the inner parts of the master cylinder and caliper cylinder, replace the oil seals every two years.
 3. Replace the brake hoses every four years, or if cracked or damaged.
-

COWLINGS, SEAT, TAIL COVER AND FUEL TANK
COWLINGS



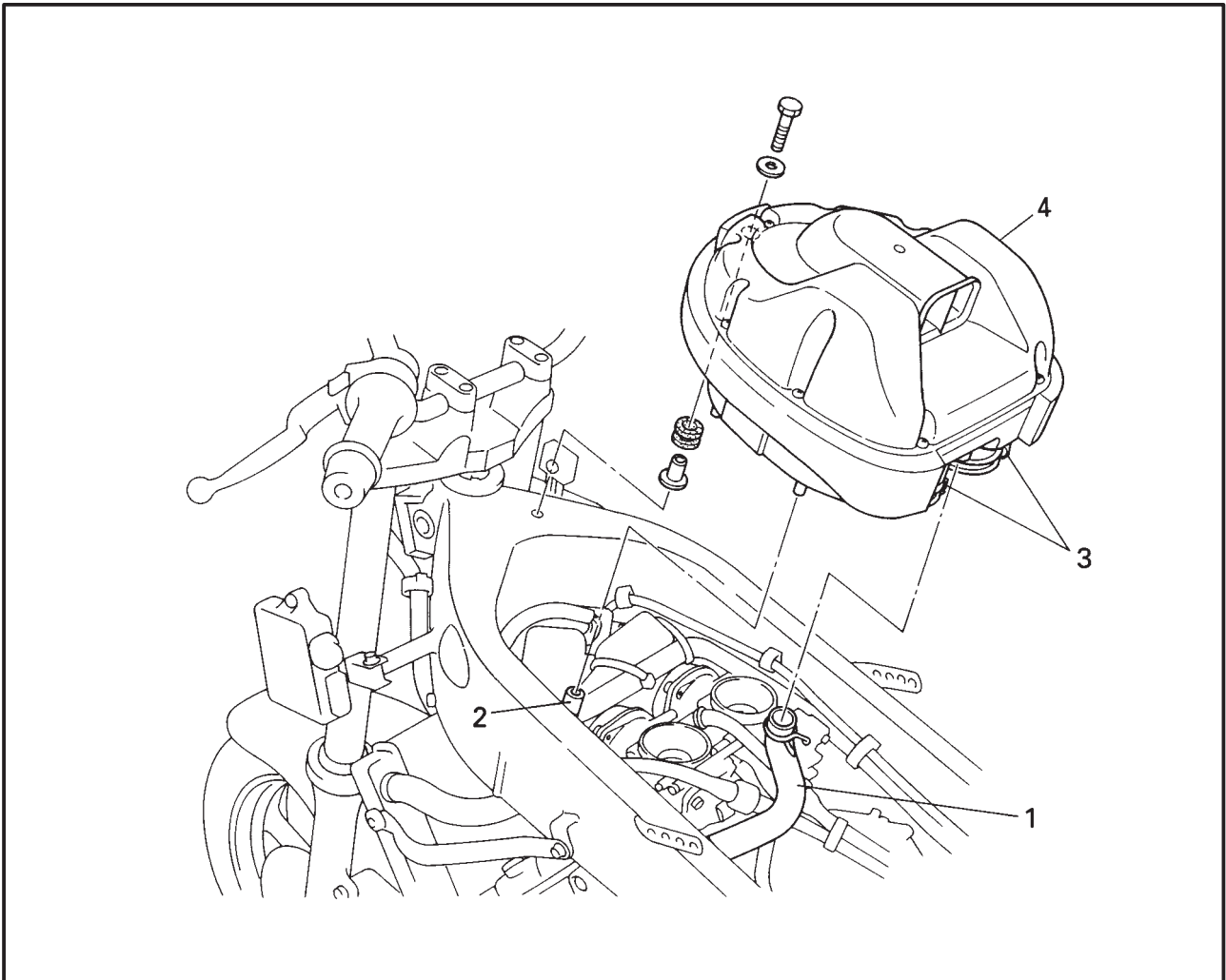
Order	Job name/Part name	Q'ty	Remarks
	Cowlings removal		Remove the parts in the order below.
1	Side cowling (left and right)	2	
2	Meter panel	1	
3	Damper	1	
4	Wind shield	1	
5	Inner panel	1	
6	Front flasher light lead	4	Disconnect
7	Front flasher light (left and right)	2	
8	Auxiliary light lead coupler	1	Disconnect
9	Headlight lead coupler	1	Disconnect
10	Front cowling	1	
11	Headlight unit	1	
			For installation, reverse the removal procedure.

SEAT, TAIL COVER AND FUEL TANK



Order	Job name/Part name	Q'ty	Remarks
	Seat, tail cover and fuel tank removal		Remove the parts in the order below. Refer to "COWLINGS".
1	Side cowling		
1	Seat	1	
2	Taillight lead coupler	1	Disconnect
3	Tail cover	1	
4	Side cover	2	
5	Fuel hose (RES)	1	NOTE: _____
6	Fuel hose (ON)	1	Set the fuel cock (fuel tank side) to "OFF" before disconnecting the fuel hoses.
7	Fuel tank breather hose	1	
8	Fuel tank	1	
			For installation, reverse the removal procedure.

AIR FILTER CASE
AIR FILTER CASE



Order	Job name/Part name	Q'ty	Remarks
	Air filter case removal Side cowling, seat, side cover and fuel tank		Remove the parts in the order below. Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
1	Cylinder head breather hose	1	
2	Air filter case breather hose	1	
3	Carburetor clamp	2	Loosen
4	Air filter case	1	
			For installation, reverse the removal procedure.

ENGINE VALVE CLEARANCE ADJUSTMENT

NOTE:

- The valve clearance should be adjusted when the engine is cool to touch.
- The piston must be at Top Dead Center (T.D.C.) on compression stroke to check or adjust the valve clearance.

1. Remove:

- Side cowling
- Seat
- Side cover
- Fuel tank

Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".

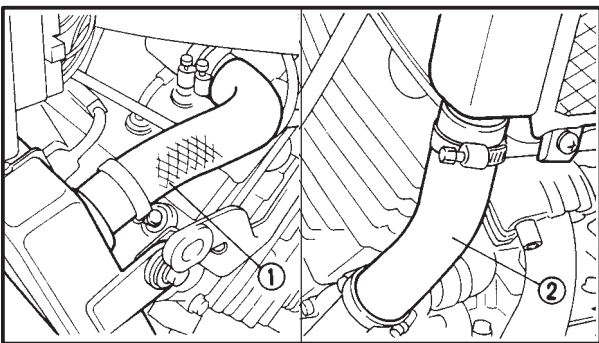
- Air filter case

Refer to "AIR FILTER CASE".

2. Drain:

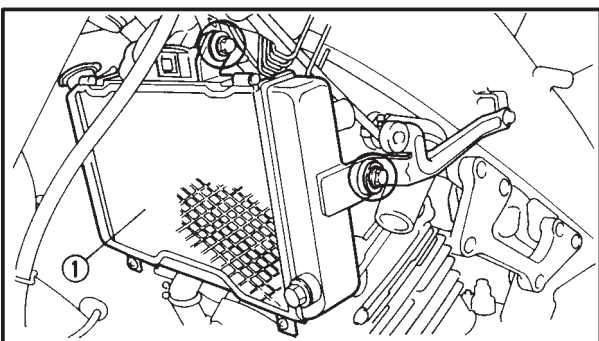
- Coolant

Refer to "COOLANT REPLACEMENT".



3. Disconnect:

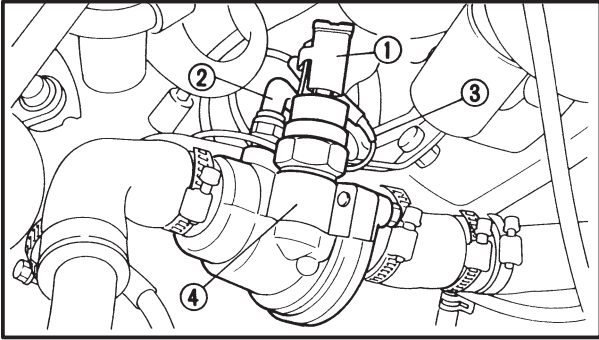
- Hose 2 ①
- Hose 3 ②
- Coolant reservoir hose (from radiator side)
- Fan motor lead coupler



4. Remove:

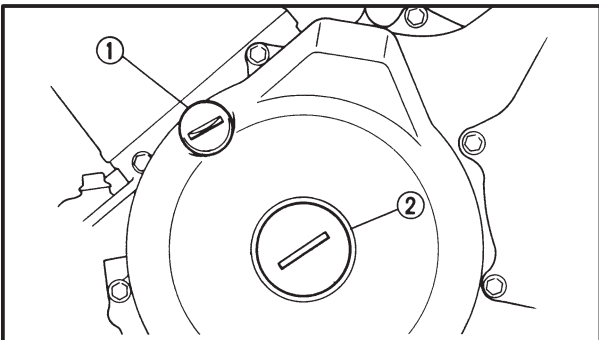
- Radiator ①

VALVE CLEARANCE ADJUSTMENT



5. Disconnect:
 - Thermo unit lead ①
 - Thermo switch lead ②
 - Ground lead ③
 - Thermostatic valve housing ④

6. Remove:
 - Spark plug caps
 - Spark plugs
 - Cylinder head cover



7. Remove:
 - Timing plug ①
 - Straight plug ②
 - O-ring

8. Check:
 - Valve clearance
 Out of specification → Adjust.



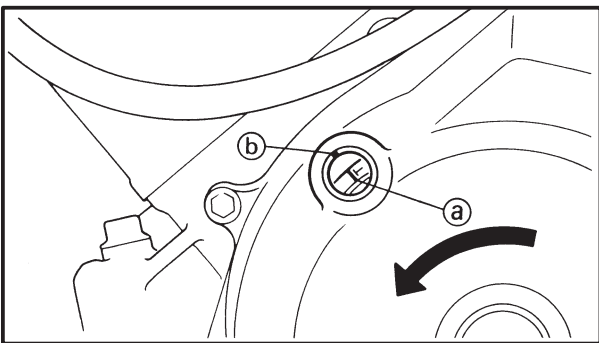
Valve clearance (cold):

Intake valve:

0.15 ~ 0.20 mm

Exhaust valve:

0.25 ~ 0.30 mm

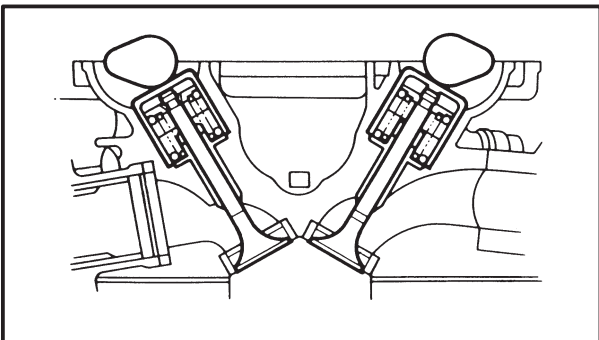


Checking steps:

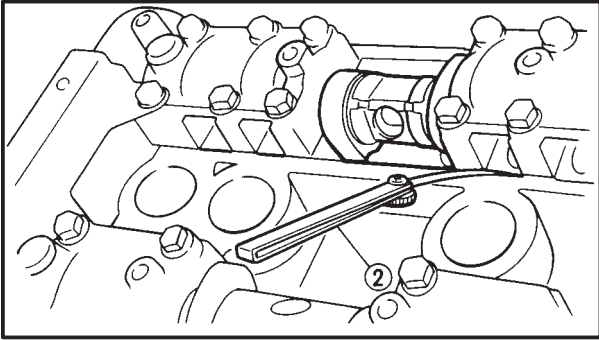
- Turn the crankshaft counterclockwise with a wrench.
- Align the T.D.C. mark (a) on the rotor with the align mark (b) on the crankcase cover when #1 piston is at T.D.C. on compression stroke.

NOTE:

TDC on compression stroke can be found when the cam lobes are opposite each other as shown.



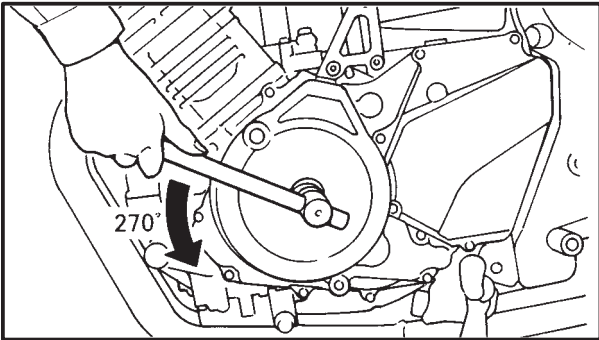
VALVE CLEARANCE ADJUSTMENT



- Measure the valve clearance using a feeler gauge (2).

NOTE: _____

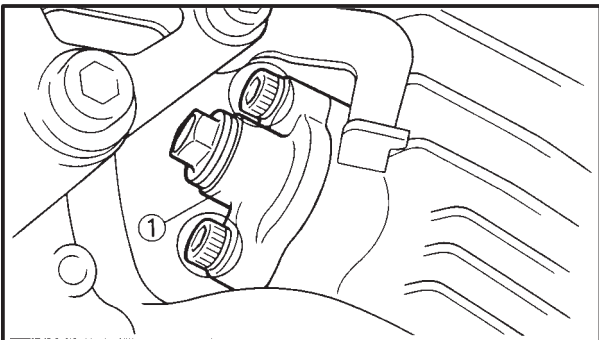
- Record the measured reading if the clearance is incorrect.



- Rotate the crankshaft 270° counterclockwise and check the clearance of piston #2.

NOTE: _____

Make sure that the camshaft lobes are opposite each other when the piston is at TDC on the compression stroke.



9. Adjust:
- Valve clearance

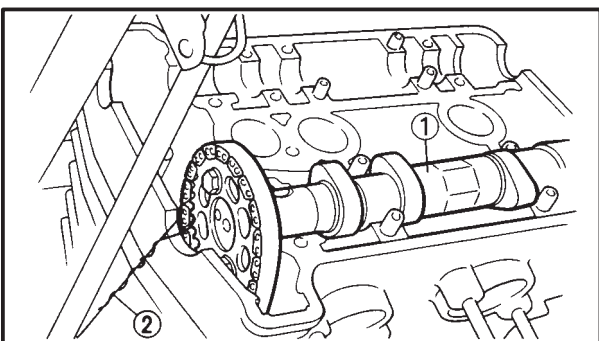
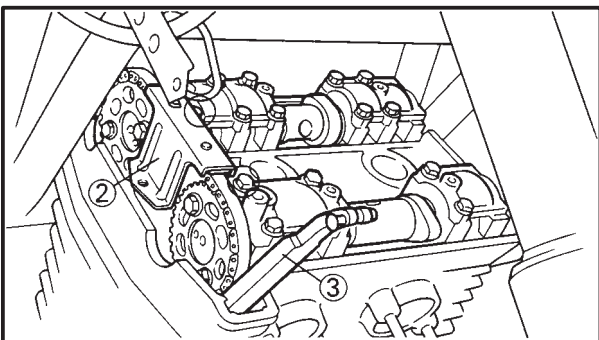


Adjustment steps:

- Loosen the timing chain tensioner cap bolt.
- Remove the timing chain tensioner (1), timing chain guide (upper) (2), timing chain guide (exhaust side) (3) and camshaft caps.

NOTE: _____

Remove the camshaft cap bolts in a crisscross pattern from the outside working inwards.

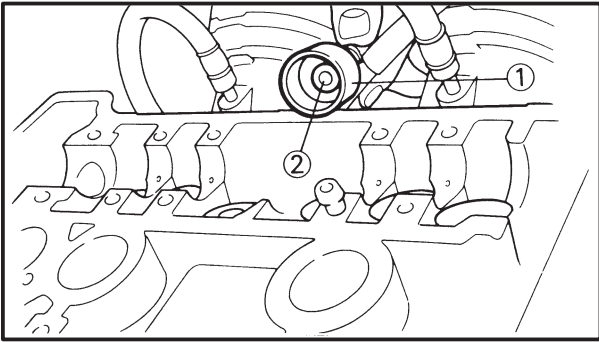


- Remove the camshaft (intake and exhaust) (1).

NOTE: _____

Attach a wire (2) to the timing chain to prevent it from falling into the crankcase.

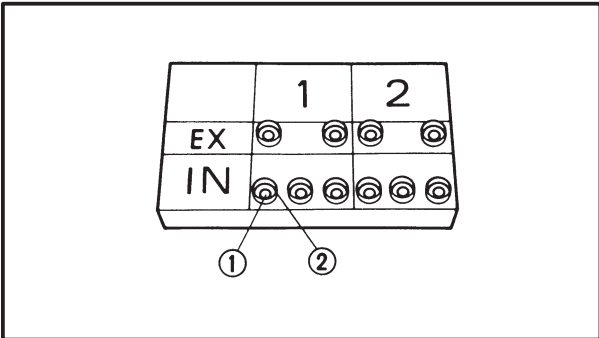
VALVE CLEARANCE ADJUSTMENT



- Remove the valve lifters ① and the pads ②.

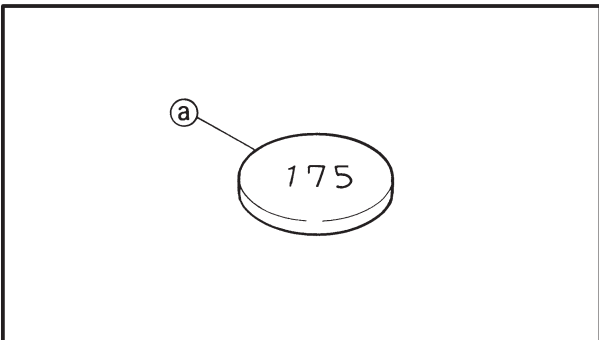
NOTE: _____

- Place a rag in the timing chain space to prevent pads from falling into the crankcase.
- Identify each valve lifter ① and pad ② position very carefully so that they can be reinstalled in their original place.



- Select the proper pad using the pad selecting table:

Pad range		Pad Availability: 25 increments
No. 120	1.20 mm	Pads are available in 0.05 mm increments
~	~	
No. 240	2.40 mm	



NOTE: _____

The thickness ① of each pad is indicated in hundredths of millimeters on the pad upper surface.

- Round off the last digit of the installed pad number to the nearest increment.

Last digit of pad number	Rounded value
0 or 2	0
5	(NOT ROUNDED OFF)
8	10

EXAMPLE:

Installed pad number = 148
Rounded off value = 150

NOTE: _____

Pads can only be selected in 0.05 mm increments.

VALVE CLEARANCE ADJUSTMENT

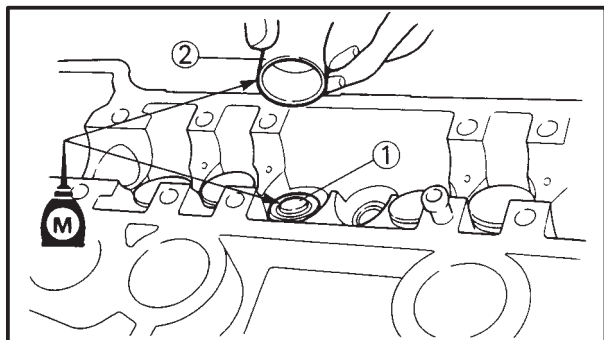
INSP
ADJ



- Locate the rounded-off value and the measured valve clearance in the chart “PAD SELECTION TABLE”. The field where these two coordinates intersect shows the new pad number to use.

NOTE: _____

Use the new pad number only as a guide when verifying the valve clearance adjustment.



- Install the new pads ① and the valve lifters ②.

NOTE: _____

- Lubricate the valve lifters and pads with molybdenum disulfide oil.
- Valve lifter must turn smoothly when rotated with a finger.
- Be careful to reinstall valve lifters and pads in their original place.
- Install the new pads so that the side with the pad number faces up (toward the valve lifter).

- Install the camshafts (exhaust and intake), the timing chain and the camshaft caps.



10 Nm (1.0 m•kg)

NOTE: _____

- Lubricate the cylinder head mating surfaces cam lobes and camshaft journals.
- Install the exhaust camshaft first.
- Align the matching marks.
- Turn the crankshaft counterclockwise several turns so that the installed parts settle into the right position.

Refer to “CAMSHAFT” in CHAPTER 4.

VALVE CLEARANCE ADJUSTMENT



INTAKE

MEASURED CLEARANCE	INSTALLED PAD NUMBER																								
	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240
0.00 ~ 0.04				120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225
0.05 ~ 0.09			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230
0.10 ~ 0.14		120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235
0.15 ~ 0.20	STANDARD CLEARANCE																								
0.21 ~ 0.25	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	
0.26 ~ 0.30	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240		
0.31 ~ 0.35	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240			
0.36 ~ 0.40	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240				
0.41 ~ 0.45	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240					
0.46 ~ 0.50	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240						
0.51 ~ 0.55	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240							
0.56 ~ 0.60	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240								
0.61 ~ 0.65	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240									
0.66 ~ 0.70	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240										
0.71 ~ 0.75	175	180	185	190	195	200	205	210	215	220	225	230	235	240											
0.76 ~ 0.80	180	185	190	195	200	205	210	215	220	225	230	235	240												
0.81 ~ 0.85	185	190	195	200	205	210	215	220	225	230	235	240													
0.86 ~ 0.90	190	195	200	205	210	215	220	225	230	235	240														
0.91 ~ 0.95	195	200	205	210	215	220	225	230	235	240															
0.96 ~ 1.00	200	205	210	215	220	225	230	235	240																
1.01 ~ 1.05	205	210	215	220	225	230	235	240																	
1.06 ~ 1.10	210	215	220	225	230	235	240																		
1.11 ~ 1.15	215	220	225	230	235	240																			
1.16 ~ 1.20	220	225	230	235	240																				
1.21 ~ 1.25	225	230	235	240																					
1.26 ~ 1.30	230	235	240																						
1.31 ~ 1.35	235	240																							
1.36 ~ 1.40	240																								

VALVE CLEARANCE (cold):
 0.15 ~ 0.20 mm
 Example: Installed is 175
 Measured clearance is 0.27 mm
 Replace 175 pad with 185 pad
 Pad number: (example)
 Pad No. 175 = 1.75 mm
 Pad No. 185 = 1.85 mm

EXHAUST

MEASURED CLEARANCE	INSTALLED PAD NUMBER																								
	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240
0.00 ~ 0.04						120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215
0.05 ~ 0.09					120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220
0.10 ~ 0.14				120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225
0.15 ~ 0.19			120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230
0.20 ~ 0.24		120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235
0.25 ~ 0.30	STANDARD CLEARANCE																								
0.31 ~ 0.35	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240	
0.36 ~ 0.40	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240		
0.41 ~ 0.45	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240			
0.46 ~ 0.50	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240				
0.51 ~ 0.55	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240					
0.56 ~ 0.60	150	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240						
0.61 ~ 0.65	155	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240							
0.66 ~ 0.70	160	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240								
0.71 ~ 0.75	165	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240									
0.76 ~ 0.80	170	175	180	185	190	195	200	205	210	215	220	225	230	235	240										
0.81 ~ 0.85	175	180	185	190	195	200	205	210	215	220	225	230	235	240											
0.86 ~ 0.90	180	185	190	195	200	205	210	215	220	225	230	235	240												
0.91 ~ 0.95	185	190	195	200	205	210	215	220	225	230	235	240													
0.96 ~ 1.00	190	195	200	205	210	215	220	225	230	235	240														
1.01 ~ 1.05	195	200	205	210	215	220	225	230	235	240															
1.06 ~ 1.10	200	205	210	215	220	225	230	235	240																
1.11 ~ 1.15	205	210	215	220	225	230	235	240																	
1.16 ~ 1.20	210	215	220	225	230	235	240																		
1.21 ~ 1.25	215	220	225	230	235	240																			
1.26 ~ 1.30	220	225	230	235	240																				
1.31 ~ 1.35	225	230	235	240																					
1.36 ~ 1.40	230	235	240																						
1.41 ~ 1.45	235	240																							
1.46 ~ 1.50	240																								

VALVE CLEARANCE (cold):
 0.25 ~ 0.30 mm
 Example: Installed is 175
 Measured clearance is 0.37 mm
 Replace 175 pad with 185 pad
 Pad number: (example)
 Pad No. 175 = 1.75 mm
 Pad No. 185 = 1.85 mm

VALVE CLEARANCE ADJUSTMENT



- Recheck the valve clearance.
- If the clearance is still incorrect, repeat all the clearance adjustment steps until the specified clearance is obtained.





10. Install:
- All removed parts

NOTE: _____
Install all removed parts in reversed order of their removal. Note the following points.

11. Install:
- Chain guide (exhaust side)
 - Chain guide (upper)
 - Timing chain tensioner
- Refer to “CAMSHAFT” in CHAPTER 4.

12. Install:
- Cylinder head cover
 - Spark plugs

	10 Nm (1.0 m•kg)
	18 Nm (1.8 m•kg)

CARBURETOR SYNCHRONIZATION

NOTE: _____

Valve clearance and idling speed should be adjusted properly before synchronizing the carburetors.

1. Place the motorcycle on a level surface.

NOTE: _____

Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.

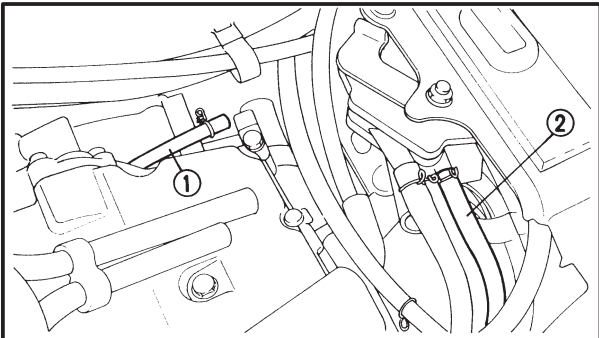
2. Remove:

- Side cowling
- Seat
- Side cover
- Fuel tank

Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".

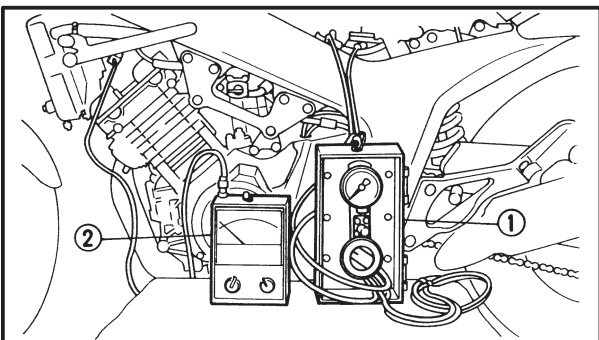
3. Remove:

- Vacuum hose 1 (#1 carburetor) ①
- Vacuum hose 2 (#2 carburetor) ②



4. Attach:

- Adapters
- Vacuum gauge ①
- Engine tachometer ② (to #1 spark plug lead)



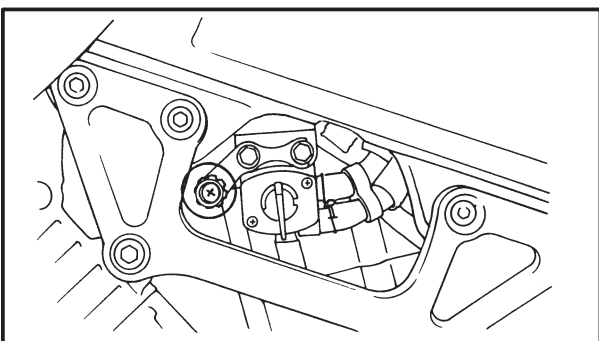
Vacuum gauge:
90890-03094

Engine tachometer:
90890-03113

5. Start the engine and let it warm up for several minutes.

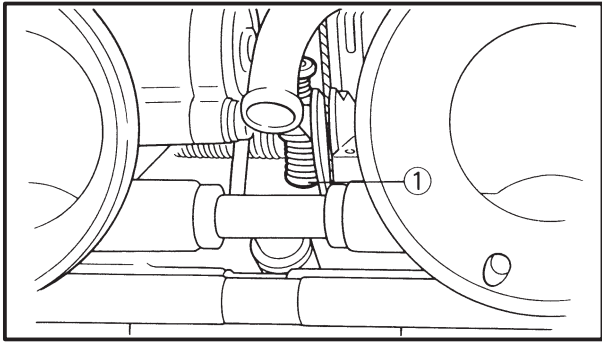
6. Check:

- Engine idling speed
Out of specification → Adjust.
Refer to "ENGINE IDLING SPEED ADJUSTMENT".



Engine idling speed:
1,050 ~ 1,250 r/min

CARBURETOR SYNCHRONIZATION



7. Adjust:
- Carburetor synchronization



Adjustment steps:

- Synchronize carburetor #1 to carburetor #2 by turning synchronizing screw ① until both gauges read the same.
- Race the engine for less than a second, two or three times and check the synchronization again.

Intake vacuum at idle speed:
36.0 ~ 38.7 kPa (270 ~ 290 mm Hg)

NOTE: _____
The difference between both carburetors should be 0.67 kPa (5 mm Hg) or less.



8. Check:
- Engine idling speed
Out of specification → Adjust.
9. Stop the engine and detach the measuring equipment.

10. Adjust:
- Throttle cable free play
Refer to "THROTTLE CABLE FREE PLAY ADJUSTMENT".

 **Free play:**
3 ~ 5 mm
At throttle grip flange

11. Install:
- Fuel tank
 - Side cover
 - Seat
 - Side cowling
- Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".

IDLING SPEED ADJUSTMENT

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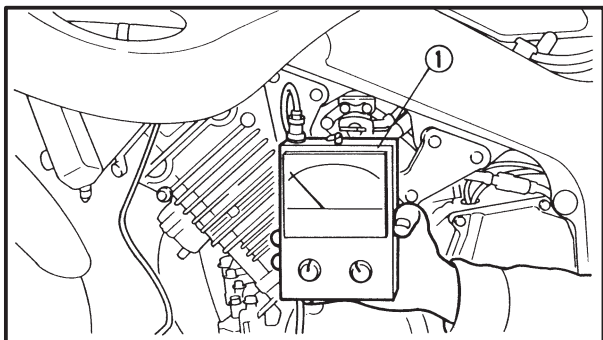


IDLING SPEED ADJUSTMENT

NOTE:

The carburetor synchronization should be adjusted properly before adjusting the idling speed.

1. Start the engine and let it warm up for several minutes.



2. Attach:
 - Engine tachometer ① (to the #1 spark plug lead).



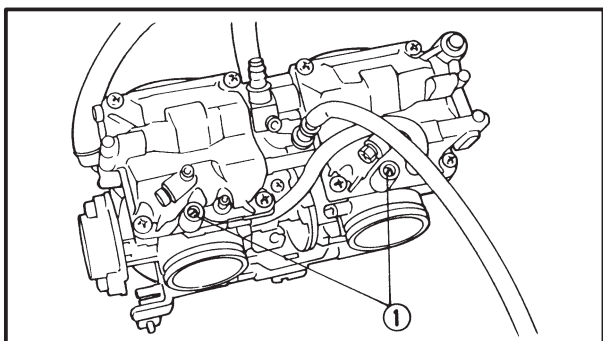
Engine tachometer:
90890-03113

3. Check:
 - Engine idling speed
Out of specification → Adjust.



Engine idling speed:
1,050 ~ 1,250 r/min

4. Remove:
 - Side cowling
 - Seat
 - Side cover
 - Fuel tank
Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
 - Air filter case
Refer to "AIR FILTER CASE".
5. Adjust:
 - Engine idling speed



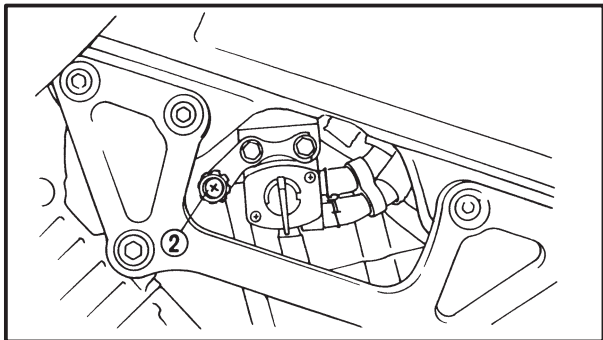
Adjustment steps:

- Turn the pilot screw ① until it is lightly seated.
- Turn out the pilot screw for the specified number of turns.

Pilot screw: 2.0 turns out

IDLING SPEED ADJUSTMENT/ THROTTLE CABLE ADJUSTMENT

INSP
ADJ



- Turn the throttle stop screw (2) in or out until specified idling speed is obtained.

Turning in:	Idling speed is increased.
Turning out:	Idling speed is decreased.



6. Adjust:
- Throttle cable free play
Refer to "THROTTLE CABLE FREE PLAY ADJUSTMENT".

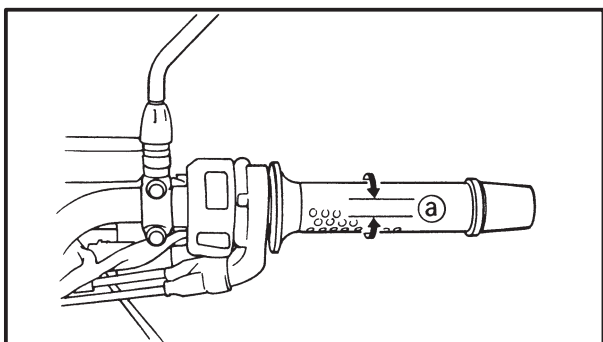


Free play:
3 ~ 5 mm
At throttle grip flange

THROTTLE CABLE ADJUSTMENT

NOTE: _____

Engine idling speed and carburetor synchronization should be adjusted properly before adjusting the throttle cable free play.



1. Check:
- Throttle cable free play (a)
Out of specification → Adjust.



Free play:
3 ~ 5 mm
At throttle grip flange

2. Remove:
- Side cowling
 - Seat
 - Side cover
 - Fuel tank
Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
 - Air filter case
Refer to "AIR FILTER CASE".

SPARK PLUG INSPECTION

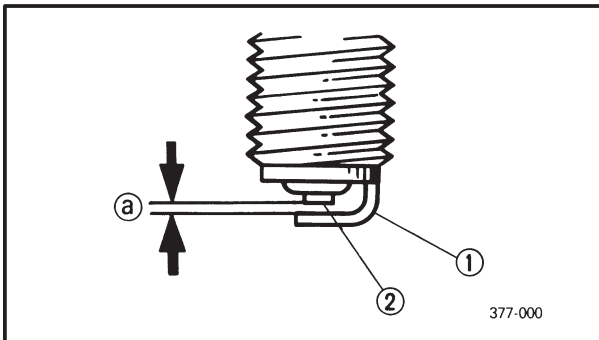
1. Remove:
 - Spark plug caps
 - Spark plugs

CAUTION:

Before completely removing the spark plug, use compressed air to clean the cylinder head cover areas to prevent dirt from falling into the engine.

2. Inspect:
 - Spark plug type
Incorrect → Replace.

Standard spark plug:
 DPR8EA-9 (NGK)
 X24EPR-U9 (NIPPONDENSO)




3. Inspect:
 - Electrode ①
Wear/Damage → Replace.
 - Insulator ②
Abnormal color → Replace.
Normal color is a medium-to-light tan color.
4. Clean:
 - Spark plug
(with spark plug cleaner or wire brush)
5. Measure:
 - Spark plug gap ③
Use a wire gauge.
Out of specification → Adjust.



Spark plug gap:
0.8 ~ 0.9 mm

6. Install:
 - Spark plug

 **18 Nm (1.8 m•kg)**

NOTE:

Before installing a spark plug, clean the gasket surface and plug surface.



COMPRESSION PRESSURE MEASUREMENT

NOTE:

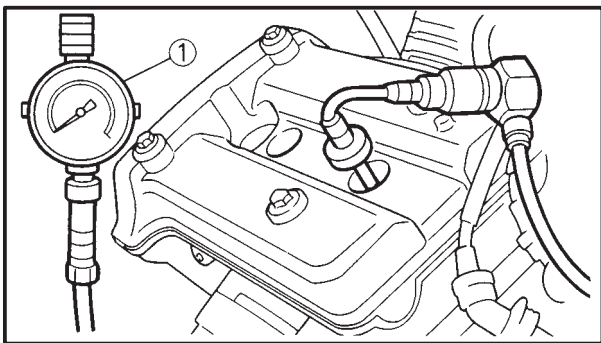
Insufficient compression pressure will result in performance loss.

1. Check:
 - Valve clearance
Out of specification → Adjust.
Refer to “VALVE CLEARANCE ADJUSTMENT”.
2. Start the engine and let it warm up for several minutes.
3. Stop the engine.

4. Remove:
 - Spark plug caps
 - Spark plugs

CAUTION:

Before completely removing the spark plug, use compressed air to clean the cylinder head cover areas to prevent dirt from falling into the engine.



5. Attach:
 - Compression gauge ①
 - Adapter



Compression gauge:
90890-03081

6. Measure:
 - Compression pressure

Above the maximum pressure:
Inspect the cylinder head, valve surfaces, and piston crown for carbon deposits.

Below the minimum pressure:
Squirt a few drops of oil into the affected cylinder and measure again.
- Refer to the table below.

Compression pressure (With oil applied into cylinder)	
Reading	Diagnosis
Higher than without oil	Worn or damaged pistons/piston rings → Repair
Same as without oil	Defective ring(s), valves, cylinder head gasket or piston is possible → Repair

Compression pressure (at sea level): Standard: 1,200 kPa (12.0 kg/cm ² , 12.0 bar) Minimum: 1,000 kPa (10.0 kg/cm ² , 10.0 bar) Cylinder difference: 100 kPa (1.0 kg/cm ² , 1.0 bar)



Measurement steps:

- Crank over the engine with the throttle wide-open until the reading on the compression gauge stabilizes.

 WARNING

Before cranking the engine, ground all spark plug leads to prevent sparking.

- Repeat the previous steps for the other cylinders.


NOTE:

The difference of compression pressure between the highest and lowest cylinder compression readings should be 100 kPa (1 kg/cm², 1 bar) or less.



7. Install:

- Spark plugs
- Spark plug caps

 **18 Nm (1.8 m•kg)**

ENGINE OIL LEVEL INSPECTION

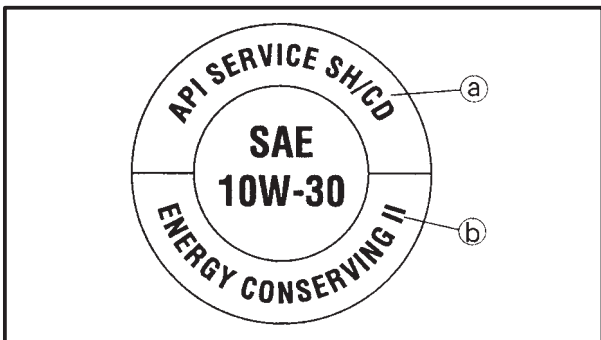
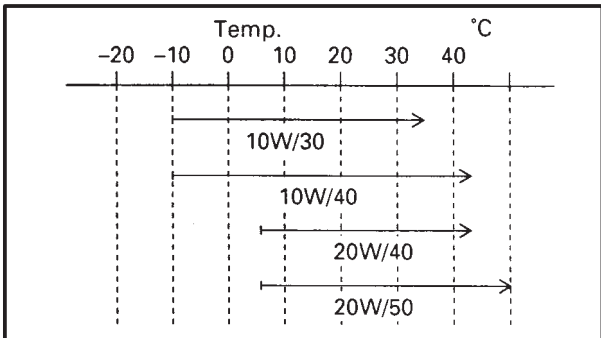
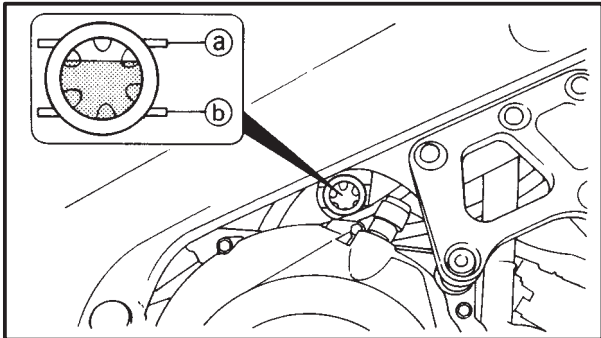
NOTE: _____

Position the motorcycle straight up when inspecting the oil level.


1. Place the motorcycle on a level surface.

NOTE: _____

- After idling the engine for 15 minutes, be sure the motorcycle is vertical, then check that the oil level is between the maximum and minimum marks.
- Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.



2. Inspect:
 - Oil level
Oil level should be between the maximum (a) and minimum (b) marks.
Oil level is below the minimum mark → Add oil up to the proper level.



Recommended oil:
Refer to the following chart for selection of oils which are suited to the atmospheric temperatures.
Recommended engine oil classification:
API STANDARD:
API "SE" or higher grade

CAUTION: _____

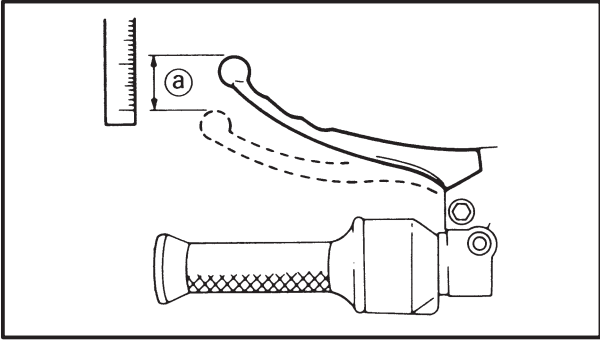
- Do not put in any chemical additives or use oils with a grade of CD (a) or higher.
- Be sure not to use oils labeled "ENERGY CONSERVING II" (b) or higher. Engine oil also lubricates the clutch and additives could cause clutch slippage.
- Be sure no foreign material enters the crankcase.

3. Start the engine and let it warm up for several minutes.
4. Turn off the engine and check the oil level again.

NOTE: _____

Before checking the oil level, wait a few minutes until the oil settles.

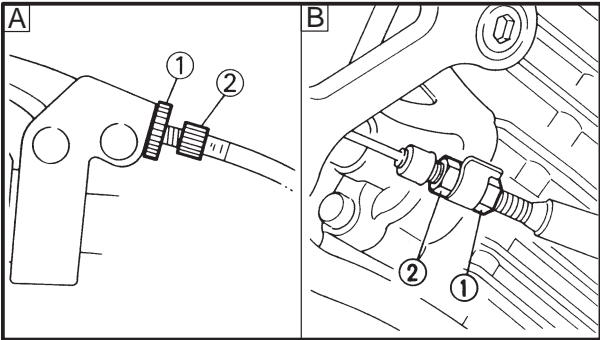
CLUTCH ADJUSTMENT/ AIR FILTER CLEANING



CLUTCH ADJUSTMENT

1. Check:
 - Clutch cable free play ①
Out of specification → Adjust.

	Free play:
	10 ~ 15 mm
	At clutch lever end



2. Adjust:
 - Clutch cable free play

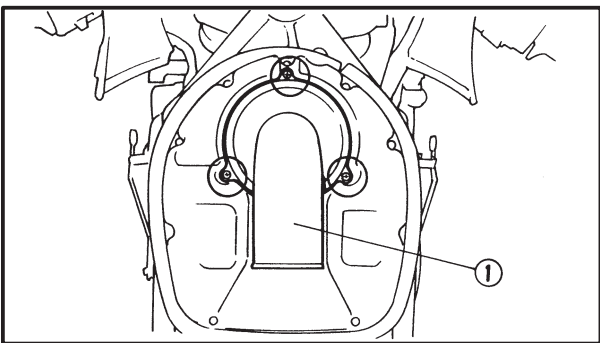
Adjustment steps:

- Loosen the locknut(s) ①.
- Turn the adjuster(s) ② in or out until the specified free play is obtained.

Turning in:	Free play is increased.
Turning out:	Free play is decreased.

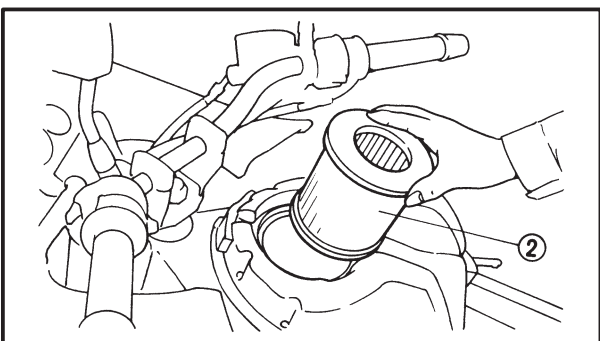
- Tighten the locknut(s).

- A Handlebar side
- B Engine side



AIR FILTER CLEANING

1. Remove:
 - Side cowling
 - Seat
 - Side cover
 - Fuel tank
Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
 - Air filter case cover ①.



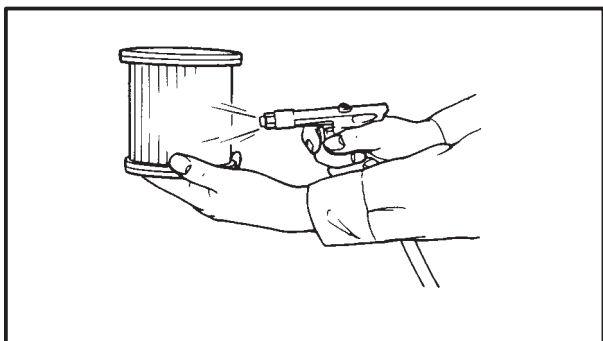
2. Remove:
 - Air filter element ②

CAUTION:

The engine should never be run without the air filter element, otherwise excessive piston and/or cylinder wear may result.

AIR FILTER CLEANING/ CARBURETOR JOINT INSPECTION

INSP
ADJ



3. Inspect:
 - Air filter element
Damage → Replace.
4. Clean:
 - Air filter element
Blow off dust from the outer surface of the element with compressed air.

5. Install:
 - Air filter element
 - Air filter case cover

NOTE: _____

Make sure the element is properly seated in the filter case.

6. Install:
 - All removed parts

NOTE: _____

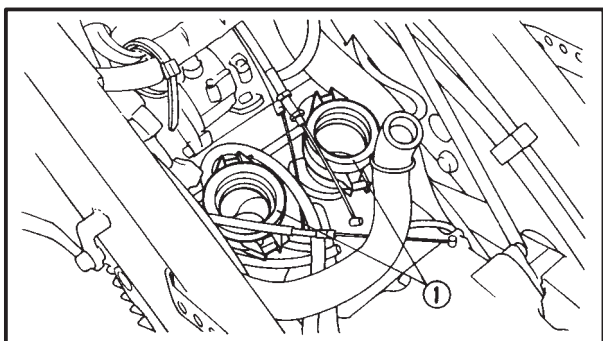
Install all removed parts in reversed order of their removal.

CARBURETOR JOINT INSPECTION

1. Remove:
 - Side cowling
 - Seat
 - Side cover
 - Fuel tank
Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
 - Air filter case
Refer to "AIR FILTER CASE".
2. Inspect:
 - Carburetor joints ①
Cracks/Damage → Replace.
Refer to "CARBURETOR" in CHAPTER 6.
3. Install:
 - All removed parts

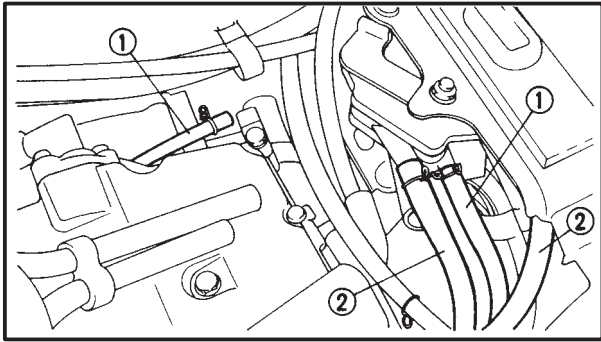
NOTE: _____

Install all removed parts in reversed order of their removal.



FUEL LINE INSPECTION/ BREATHER HOSE INSPECTION

INSP
ADJ



FUEL LINE INSPECTION

1. Remove:
 - Side cowling
 - Seat
 - Side cover
 - Fuel tank
Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
2. Inspect:
 - Vacuum hoses ①
 - Fuel hoses ②
Cracks/Damage → Replace.
Loose connection → Connect properly.

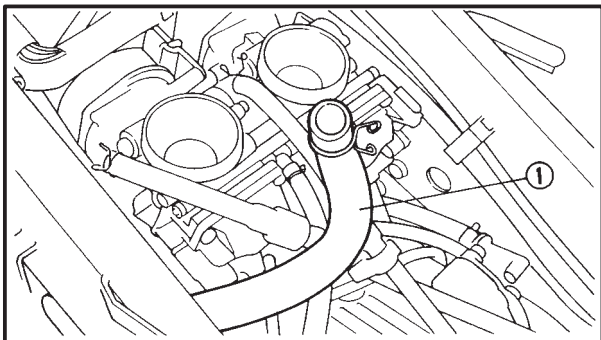
NOTE:

Drain and flush the fuel tank if abrasive damage to any components is evident.

3. Install:
 - All removed parts

NOTE:

Install all removed parts in reversed order of their removal.



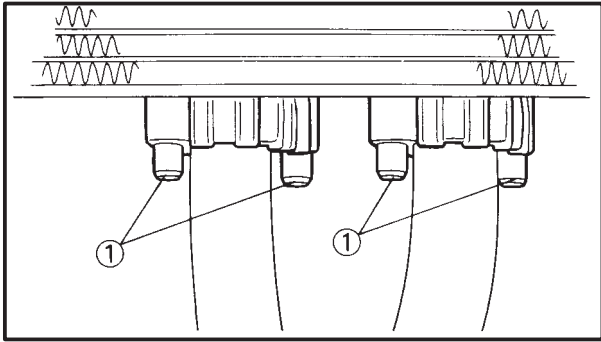
BREATHER HOSE INSPECTION

1. Remove:
 - Side cowling
 - Seat
 - Side cover
 - Fuel tank
Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
 - Air filter case
Refer to "AIR FILTER CASE".
2. Inspect:
 - Breather hose ①
Cracks/Damage → Replace.
Loosen connection → Connect properly.
3. Install:
 - All removed parts

NOTE:

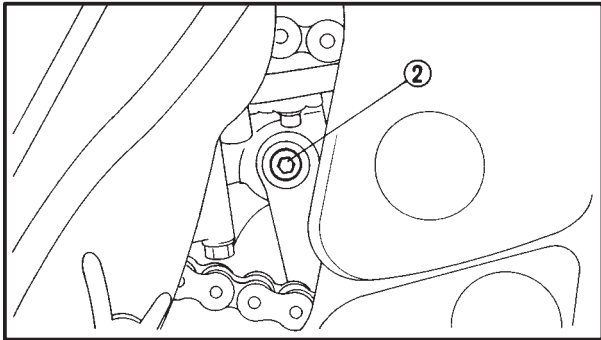
Install all removed parts in reversed order of their removal.

EXHAUST SYSTEM INSPECTION/ COOLANT LEVEL INSPECTION



EXHAUST SYSTEM INSPECTION

- Inspect:
 - Exhaust pipes
 - Mufflers
Cracks/Damage → Replace.
 - Gaskets
Exhaust gas leaks → Replace.



2. Check:

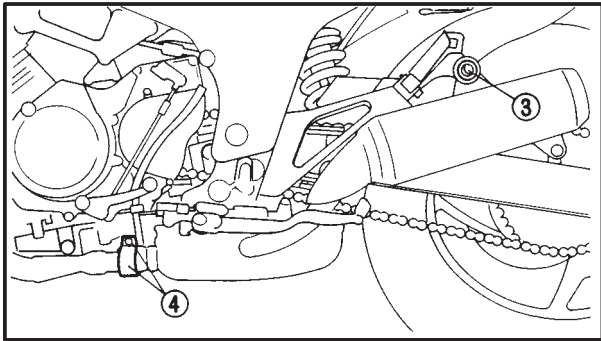
- Exhaust pipe nut ①

	20 Nm (2.0 m•kg)
--	-------------------------
- Exhaust pipe bolt ②

	24 Nm (2.4 m•kg)
--	-------------------------
- Muffler bolt ③

	24 Nm (2.4 m•kg)
--	-------------------------
- Bolt (exhaust pipe and muffler) ④

	20 Nm (2.0 m•kg)
--	-------------------------



COOLANT LEVEL INSPECTION

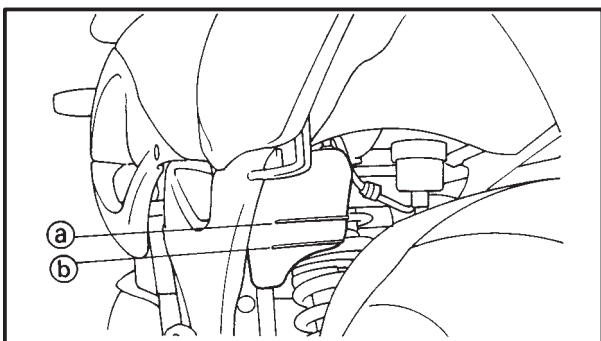
NOTE: _____

Position the motorcycle straight up when inspecting the coolant level.

- Place the motorcycle on a level surface.

NOTE: _____

Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.



2. Inspect:

- Coolant level
Coolant level should be between maximum (a) and minimum (b) marks.
Coolant level low → Add soft water (tap water) to proper level.



CAUTION:

Hard water or salt water is harmful to the engine parts; use boiled or distilled water if you can't get soft water.

COOLANT REPLACEMENT

1. Remove:

- Side cowling (right)
- Seat

Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".

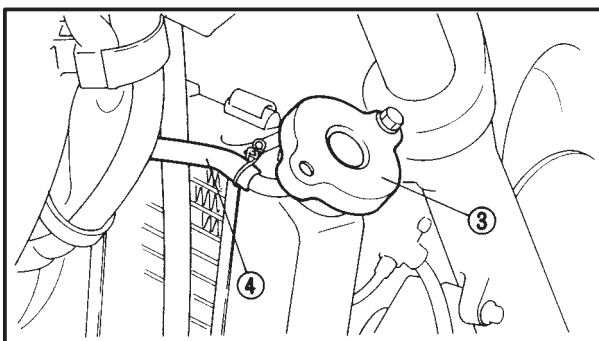
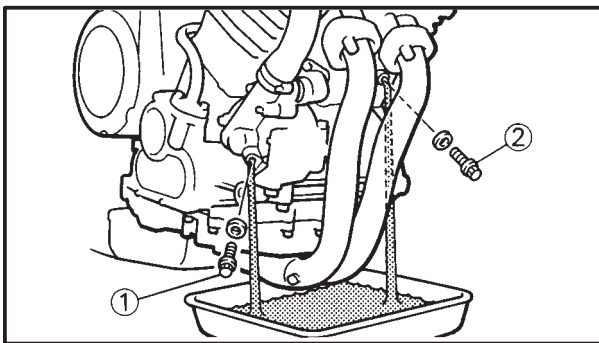
! WARNING

Do not remove the radiator cap when the engine and radiator are hot. Scalding hot fluid and steam may be blown out under pressure, which could cause serious injury. When the engine has cooled, open the radiator cap by following this procedure:

Place a thick rag or a towel over the radiator cap. Slowly rotate the cap counterclockwise to the detent. This allows any residual pressure to escape. When the hissing sound has stopped, press down on the cap while turning counterclockwise and remove it.

NOTE:

Position the motorcycle straight up when replacing the coolant.



2. Place the motorcycle on a level surface.

NOTE:

Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.

3. Remove:

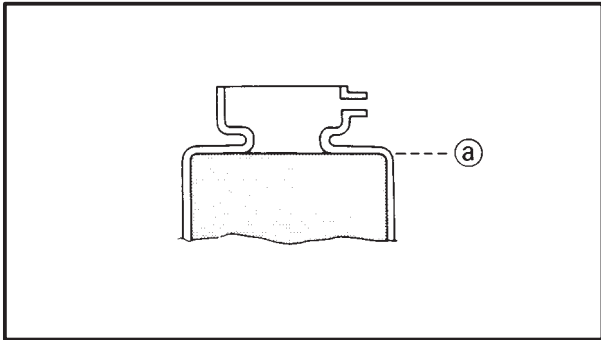
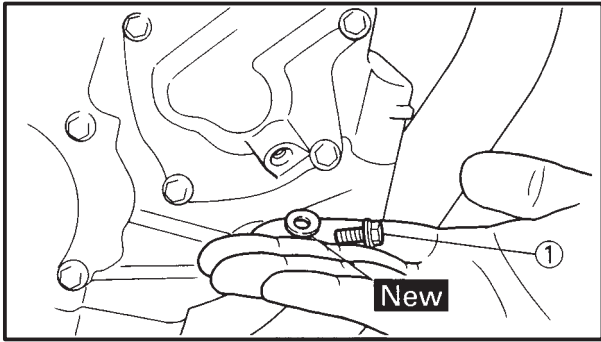
- Water pump drain bolt (with gasket) (1)
- Cylinder drain bolt (with gasket) (2)
- Radiator cap (3)

Drain the radiator and engine of its coolant.

4. Disconnect:

- Coolant reservoir hose (4)

COOLANT REPLACEMENT



5. Install:

- Gaskets **New**
- Drain bolt ①
- Cylinder drain bolt

	10 Nm (1.0 m•kg)
	10 Nm (1.0 m•kg)

6. Connect:

- Coolant reservoir hose

7. Fill:

- Cooling system (radiator and engine) (to specified level ②)



Recommended coolant:

High quality ethylene glycol anti-freeze containing corrosion inhibitors for aluminum engines

Coolant and water mix ratio:

50% – 50%

Radiator capacity

(including all routes):

1.7 L

Reservoir tank capacity:

0.3 L

From lower to upper level:

0.2 L

NOTE:

Put the sidestand down so the motorcycle leans to the side and fill with coolant. To help dissipate the coolant throughout the cooling system, hold the motorcycle in the upright position for a few seconds. Then lean it back to the side and continue filling with coolant.

Handling notes for coolant:

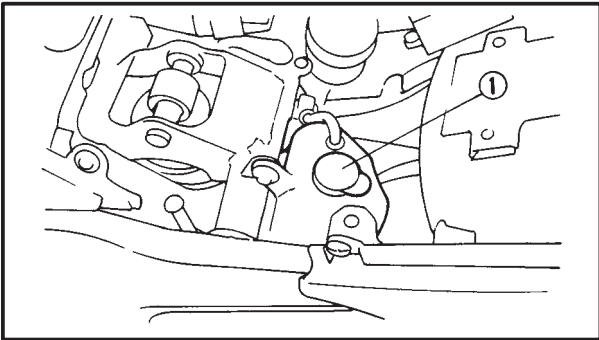
Coolant is harmful and should be handled with special care.

⚠ WARNING

- If coolant splashes in your eyes:
Thoroughly wash your eyes with water and see a doctor.
- If coolant splashes on your clothes.
Quickly wash it away with water and then with soap.
- If coolant is swallowed.
Quickly make the patient vomit and take him to a doctor.

CAUTION:

- Hard water or salt water is harmful to the engine parts. Use boiled or distilled water if you can't get soft water.
- Do not use water containing impurities or oil.
- Take care that no coolant splashes onto painted surfaces. If it does, wash it away with water immediately.
- Do not mix different types of ethylene glycol antifreeze containing corrosion inhibitors for aluminium engines.

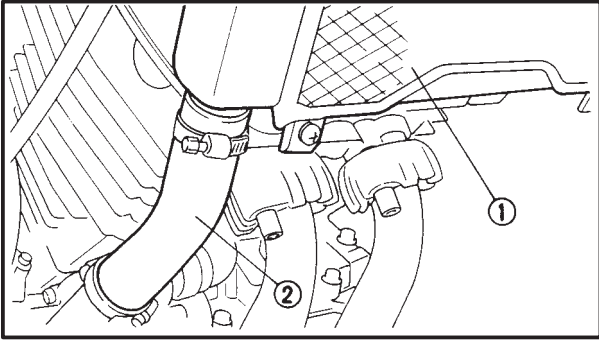


8. Install:
 - Radiator cap
9. Fill:
 - Coolant reservoir ①
(to upper level mark)
10. Install:
 - Coolant reservoir cap
11. Start the engine and let it warm up for several minutes.
12. Stop the engine and inspect the level.
Refer to "COOLANT LEVEL INSPECTION".

NOTE:

Wait a few minutes until the coolant settles before inspecting the coolant level.

13. Install:
 - Seat
 - Side cowling (right)Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".



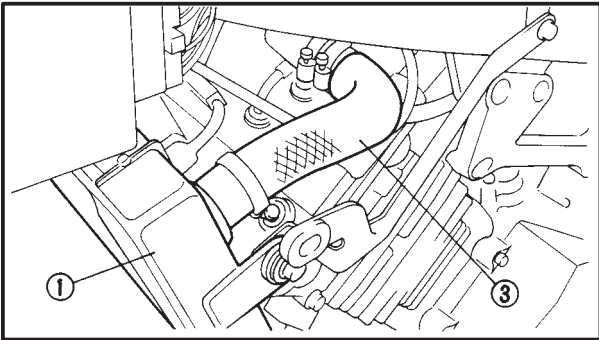
COOLING SYSTEM INSPECTION

1. Inspect:

- Radiator ①
- Hose 2 ②
- Hose 3 ③

Cracks/Damage → Replace.

Refer to "RADIATOR" in CHAPTER 5.



BRAKE FLUID LEVEL INSPECTION

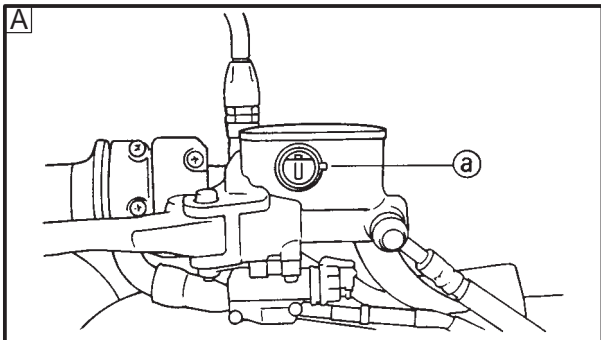
NOTE: _____

Position the motorcycle straight up when inspecting the fluid level.

1. Place the motorcycle on a level surface.

NOTE: _____

Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.



2. Inspect:

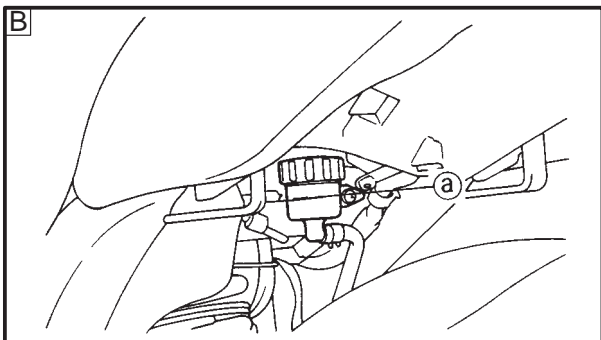
- Fluid level

Fluid level is under "LOWER" level line (a) →
Fill to proper level.

A Front

B Rear

	Recommended fluid: DOT 4
---	---



NOTE: _____

When inspecting the fluid level in the reservoir on the handlebar, make sure the master cylinder top is horizontal.

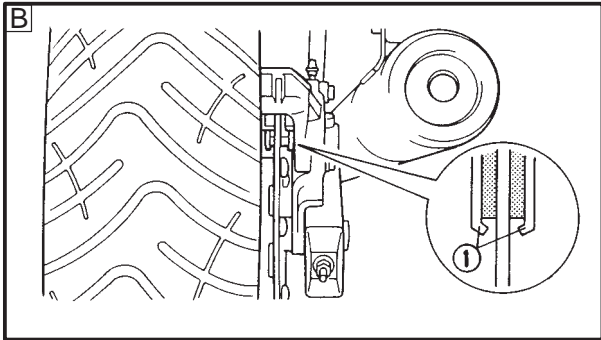
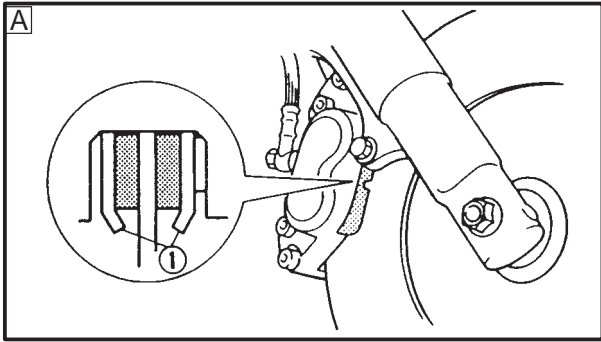
CAUTION: _____

Brake fluid may corrode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

⚠ WARNING _____

- Use only the designated quality fluid. Otherwise, the rubber seals may deteriorate causing leakage and poor brake performance.
- Refill with the same type of fluid. Mixing fluids may result in a harmful chemical reaction leading to poor brake performance.
- Be careful that water does not enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and could cause vapor lock.

BRAKE PAD INSPECTION/ BRAKE LIGHT SWITCH ADJUSTMENT



BRAKE PAD INSPECTION

1. Activate the brake lever or brake pedal.
2. Inspect:
 - Brake pad
Wear indicator ① almost contacting the brake disc → Replace brake pad as a set.
Refer to "FRONT AND REAR BRAKE" in CHAPTER 7.

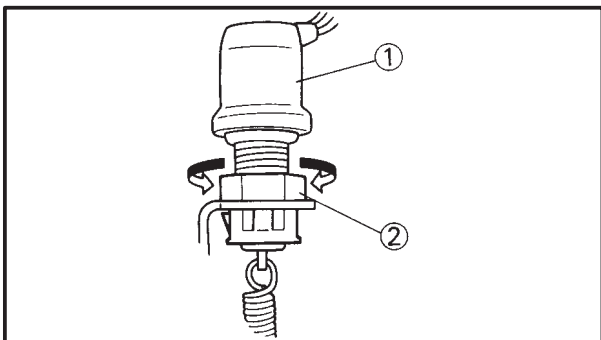
- A** Front
- B** Rear

BRAKE LIGHT SWITCH ADJUSTMENT

NOTE:

The brake light switch is operated by movement of the brake pedal.

Proper adjustment is achieved when the brake light comes on just before the brake begins to take effect.



1. Check:
 - Brake light operation
Incorrect → Adjust.
2. Adjust:
 - Brake light operating timing

Adjustment steps:

- Hold the main body ① of the switch with your hand so that it does not rotate, and turn the adjuster ② in or out until the operating timing is correct.

Turning in:	Brake light on later.
Turning out:	Brake light on sooner.

AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)/ SHIFT PEDAL ADJUSTMENT



- d. Place the other end of the hose into a container.
- e. Slowly apply the brake lever or pedal several times.
- f. Pull the lever in or push down on the pedal. Hold the lever or pedal in position.
- g. Loosen the bleed screw and allow the lever or pedal to travel towards its limit.
- h. Tighten the bleed screw when the lever or pedal limit has been reached, then release the lever or pedal.
- i. Repeat steps (e) to (h) until all air bubbles have disappeared from the fluid.
- j. Tighten the bleed screw.



Bleed screw:
6 Nm (0.6 m•kg)

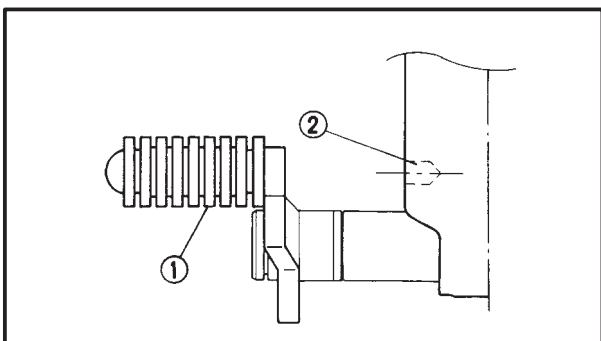
NOTE:

If bleeding is difficult, it may be necessary to let the brake fluid settle for a few hours. Repeat the bleeding procedure when the tiny bubbles in the system have disappeared.

- k. Add brake fluid to proper level. Refer to "BRAKE FLUID LEVEL INSPECTION".

⚠ WARNING

Check the operation of the brake after bleeding the brake system.



EB304080

SHIFT PEDAL ADJUSTMENT

- 1. Check:
 - Shift pedal positionThe top of the shift pedal ① should be aligned with the crankcase ②.



DRIVE CHAIN LUBRICATION

The chain consists of many parts that work with each other. If the chain is not maintained properly, it will wear out rapidly.

Therefore, form the habit of periodically servicing the chain. This service is especially necessary when riding in dusty conditions.

This motorcycle has a drive chain with small rubber O-rings between the chain plates. Steam cleaning, high-pressure washes, and certain solvents can damage these O-rings. Use only kerosene to clean the drive chain. Wipe dry, and thoroughly lubricate it with SAE30 ~ 50W motor oil. Do not use any other lubricants on the drive chain. They may contain solvents that could damage the O-rings.



Recommended lubricant:

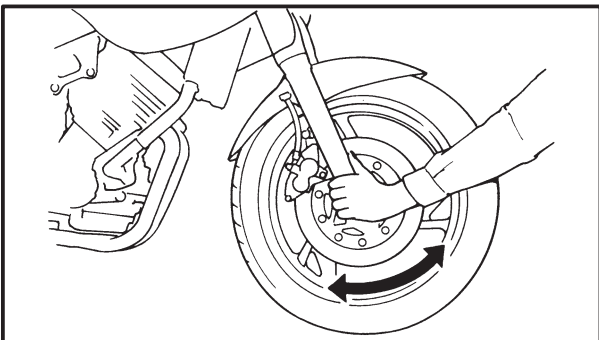
SAE30 ~ 50W motor oil or chain lubricant suitable for O-ring chains.

STEERING HEAD INSPECTION

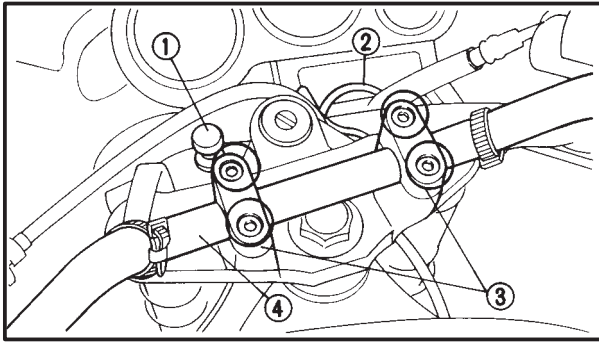
WARNING

Securely support the motorcycle so there is no danger of it falling over.

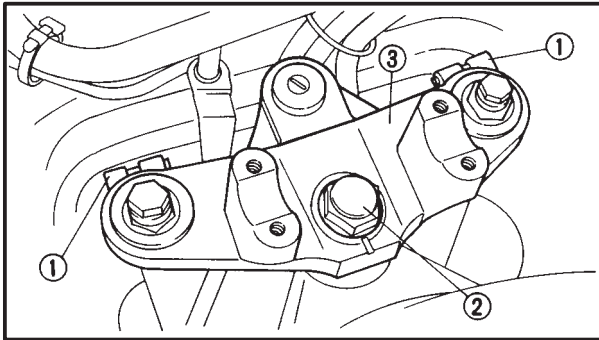
1. Place the motorcycle on a level place.
2. Elevate the front wheel by placing a suitable stand under the engine.
3. Check:
 - Steering assembly bearings
Grasp the bottom of the front forks and gently rock the fork assembly back and forth.
Looseness → Adjust the steering head.



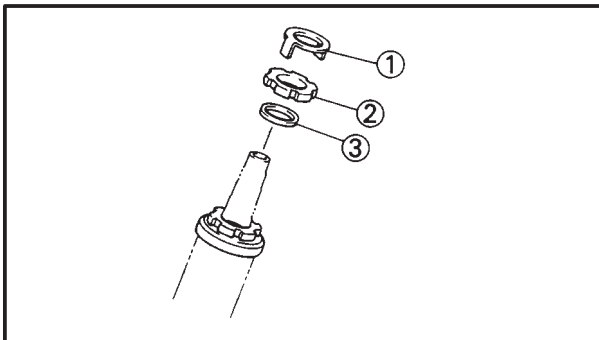
STEERING HEAD INSPECTION



4. Remove:
- Starter cable holder ①
 - Cable guide ②
 - Handlebar holder (upper) ③ (with plugs)
 - Handlebar ④



5. Loosen:
- Upper bracket pinch bolts ①
6. Remove:
- Handle crown nut ②
 - Upper bracket ③



7. Adjust:
- Steering head

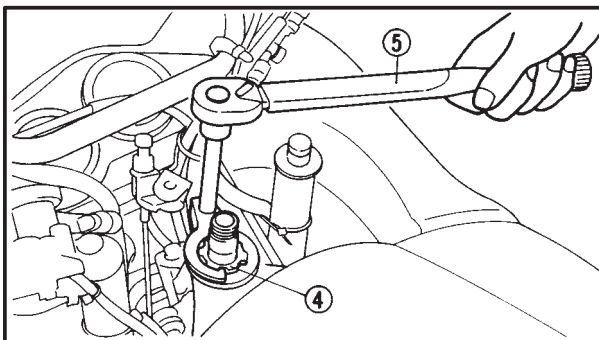


Adjustment steps:


- Remove the special washer ①, ring nut (upper) ② and rubber washer ③.
- Loosen the ring nut (lower) ④.
- Tighten the ring nut (lower) using the ring nut wrench ⑤.

NOTE:


Set the torque wrench to the ring nut wrench so that they form a right angle.



	Ring nut wrench: 90890-01403
---	--

	Ring nut (initial tightening) 48 Nm (4.8 m•kg)
---	--

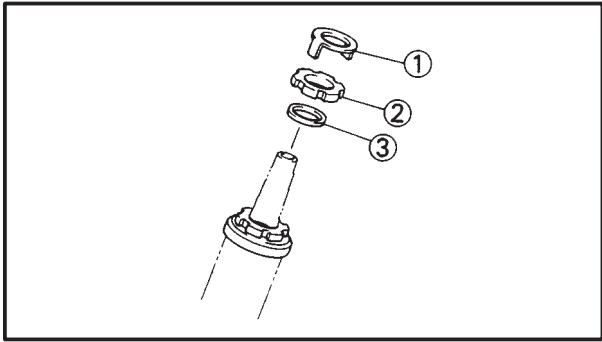
- Loosen the ring nut (lower) ④ completely, then retighten it to specification.

	Ring nut (final tightening) 16 Nm (1.6 m•kg)
---	--

WARNING

Do not overtighten.

STEERING HEAD INSPECTION/ FRONT FORK INSPECTION








- Check the steering head by turning it lock to lock. If it binds, remove the steering stem assembly and inspect the steering bearings. Refer to “STEERING HEAD” in CHAPTER 7.
- Install the rubber washer ③.
- Install the ring nut (upper) ②.
- Finger tighten the ring nut (upper) ②, then align the slots of both ring nuts. If necessary, hold the ring nut (lower) and tighten the ring nut (upper) until their slots are aligned.
- Install the special washer ①.

NOTE: _____
Make sure the special washer tabs sit correctly in the slots.



8. Install:

- Upper bracket
- Handle crown nut  **108 Nm (10.8 m•kg)**
- Upper bracket pinch bolts  **23 Nm (2.3 m•kg)**
- Handlebar
- Handlebar holder (upper) bolts (with plugs)  **23 Nm (2.3 m•kg)**
- Cable guide  **7 Nm (0.7 m•kg)**
- Starter cable holder  **7 Nm (0.7 m•kg)**

FRONT FORK INSPECTION

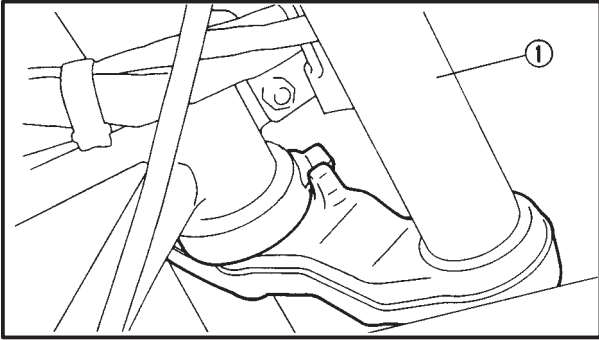
 **WARNING** _____

Securely support the motorcycle so there is no danger of it falling over.

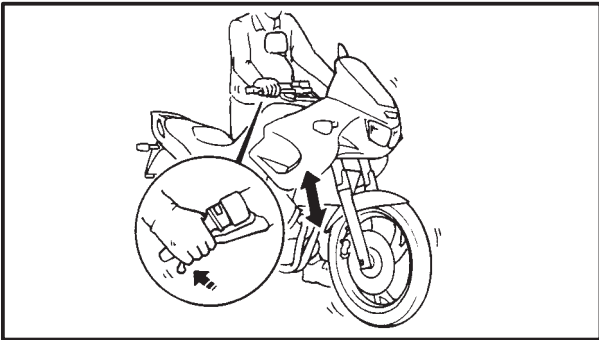
1. Place the motorcycle on a level place.

FRONT FORK INSPECTION/ FRONT FORK ADJUSTMENT

INSP
ADJ



2. Check:
 - Inner tube ①
Scratches/Bent/Damage → Replace.
 - Oil seal
Excessive oil leakage → Replace.



3. Hold the motorcycle in an upright position and apply the front brake.
4. Check:
 - Operation
Pump the front fork up and down for several times.
Unsmooth operation → Repair.
Refer to "FRONT FORK" in CHAPTER 7.

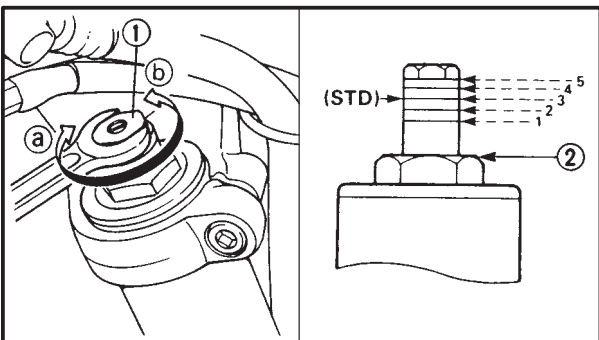
FRONT FORK ADJUSTMENT

⚠ WARNING

- Always adjust each fork to the same setting. Uneven adjustment can cause poor handling and loss of stability.
- Securely support the motorcycle so there is no danger of it falling over.

Spring preload

1. Adjust:
 - Spring preload
Turn the adjuster ① in or out.



Turning in (a) :	Spring preload is increased.
Turning out (b) :	Spring preload is decreased.

Adjuster position:

Standard: 3
Minimum: 1
Maximum: 5

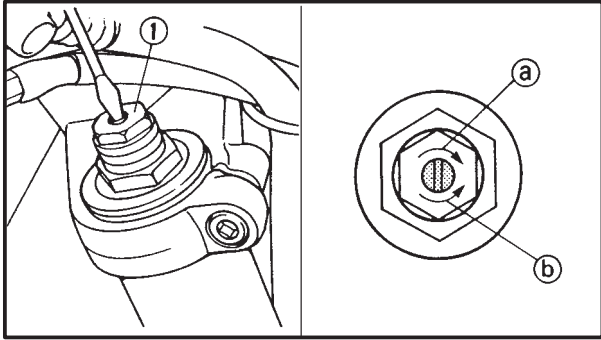
② Setting position

CAUTION:

- Grooves are provided to show the adjusting level.
- Always keep the adjustment level equal on both forks.
- Never turn the adjuster beyond the maximum or minimum setting.

FRONT FORK ADJUSTMENT/ REAR SHOCK ABSORBER ADJUSTMENT

**INSP
ADJ**



Damping force

1. Adjust:

- Damping force

Turn the adjuster ① in or out.

Turning in (a) :	Damping force is increased.
Turning out (b) :	Damping force is decreased.

Adjuster position:

Standard: 4 clicks out

Minimum: 5 clicks out

Maximum: 0 clicks out

*: From the fully turned-in position.

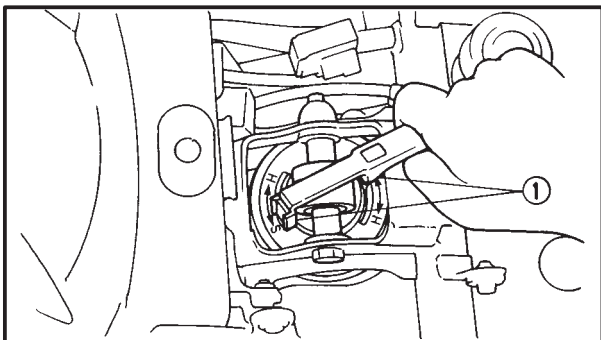
CAUTION:

- Always keep the adjustment level equal on both forks.
- Never turn the adjuster beyond the maximum or minimum setting.

REAR SHOCK ABSORBER ADJUSTMENT

⚠ WARNING

Securely support the motorcycle so there is no danger of it falling over.



Spring preload

1. Adjust:

- Spring preload

Coarse adjustment (top)

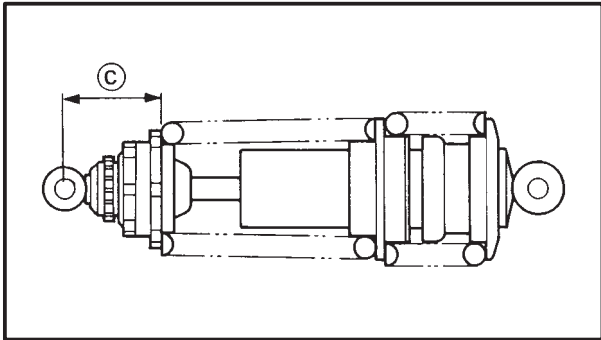
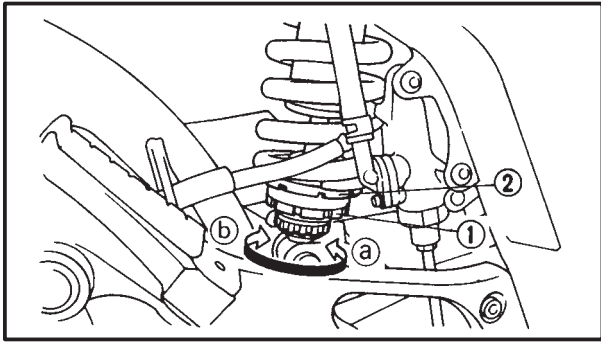
Turn the adjuster ① "S" or "H".

Adjuster position:

Rider only = S

Rider and passenger = H

REAR SHOCK ABSORBER ADJUSTMENT



2. Adjust:
- Spring preload
Fine adjustment (bottom)




Adjustment steps:

- Loosen the locknut ①.
- Turn the adjuster ② in or out.

Turning in (a) :	Spring preload is increased.
Turning out (b) :	Spring preload is decreased.

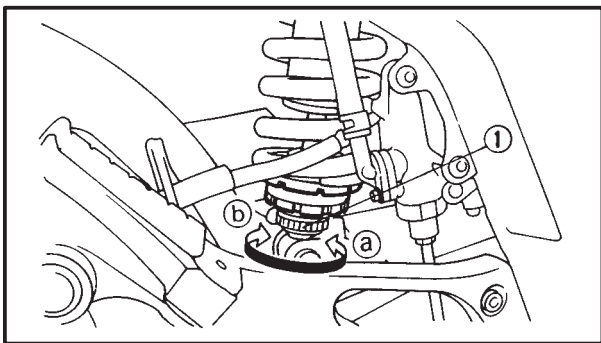
Measurement length (c) :
Standard: 61 mm
Minimum: 59 mm
Maximum: 63 mm

- Tighten the locknut.

	Lock nut: 70 Nm (7.0 m•kg)
---	-------------------------------

CAUTION: _____

Always tighten the locknut against the spring adjusting nut and tighten the locknut to the specified torque.



Damping force

1. Adjust:
- Damping force
Turn the adjuster ① in or out.

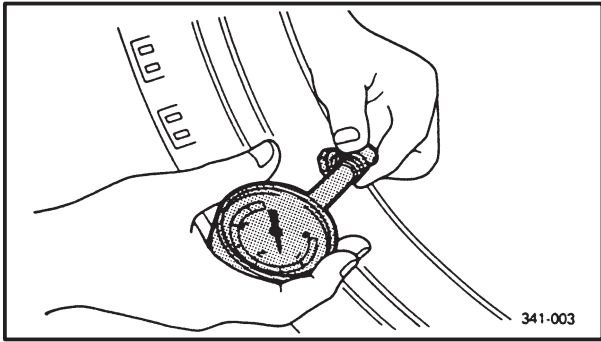
Turning in (a) :	Damping force is increased.
Turning out (b) :	Damping force is decreased.

Adjuster position:
Standard: 20 clicks out
Minimum: 10 clicks out
Maximum: 0 clicks out

*: From the fully turned-in position.

CAUTION: _____

Never turn the adjuster beyond the maximum or minimum setting.



TIRE INSPECTION

1. Measure:

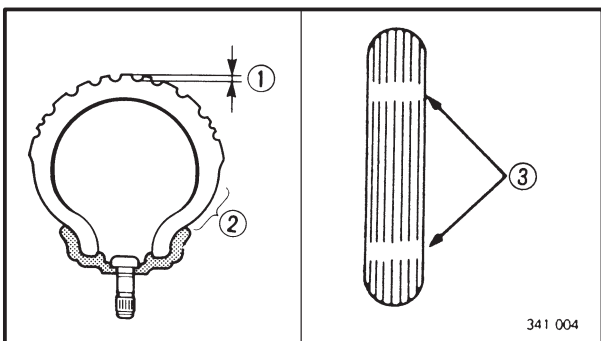
- Tire pressure
Out of specification → Adjust.

! WARNING

- Tire inflation pressure should only be checked and adjusted when the tire temperature equals the ambient air temperature. Tire inflation pressure and suspension must be adjusted according to the total weight of the cargo, rider, passenger and accessories (fairing, saddlebags, etc. if approved for this model), and according to whether the motorcycle will be operated at high speed or not. **NEVER OVERLOAD THE MOTORCYCLE.**
- Operation of an overloaded motorcycle could cause tire damage, accident or injury.


Basic weight: With oil and full fuel tank	229 kg	
Maximum load*:	180 kg	
Cold tire pressure:	Front	Rear
Up to 90 kg load*	225 kPa (2.25 kg/cm², 2.25 bar)	275 kPa (2.75 kg/cm², 2.75 bar)
90 kg ~ Maximum load*	225 kPa (2.25 kg/cm², 2.25 bar)	275 kPa (2.75 kg/cm², 2.75 bar)
High speed riding	225 kPa (2.25 kg/cm², 2.25 bar)	275 kPa (2.75 kg/cm², 2.75 bar)

*: Load is the total weight of cargo, rider, passenger, and accessories.

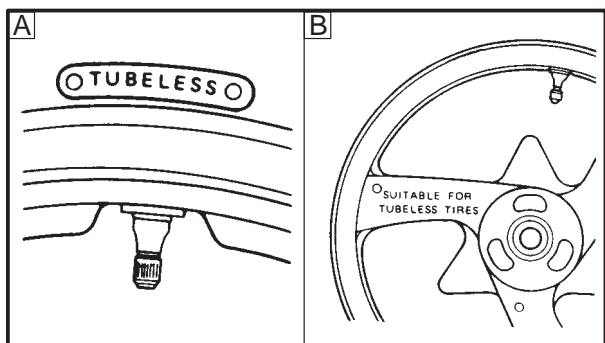


2. Inspect:

- Tire surfaces
Wear/Damage → Replace.

	Minimum tire tread depth: (front and rear): 1.6 mm
---	---

- ① Tread depth
- ② Side wall
- ③ Wear indicator



⚠ WARNING

- It is dangerous to ride with a worn-out tire. When a tire tread begins to show lines, replace the tire immediately.
- Do not use tubeless tires on a wheel designed for tube type tires only. Tire failure and personal injury may result from sudden deflation.

- A Tire
- B Wheel

Tube type wheel	Tube type tire only.
Tubeless type wheel	Tube type or tubeless tire.

- Be sure to install the correct tube when using tube type tires.

⚠ WARNING

After extensive tests, the tires mentioned below have been approved by Yamaha Motor Co. Ltd. for this model. No guarantee for handling characteristics can be given if a tire combinations other than the approved is used on this motorcycle. The front and rear tires should always be of the same manufacture and design.

FRONT TIRE:

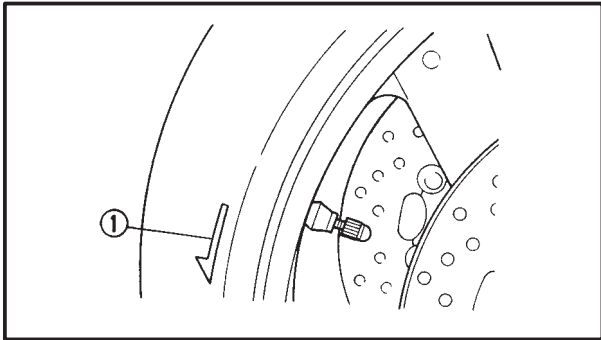
Manufacture	Size	Type
BRIDGE-STONE	110/80 ZR18	BT54F
PIRELLI	110/80 ZR18	MTR03
MICHELIN	110/80 ZR18	MACADAM 90X

REAR TIRE:

Manufacture	Size	Type
BRIDGE-STONE	150/70 ZR17	BT54R
PIRELLI	150/70 ZR17	MTR04
MICHELIN	150/70 ZR17	MACADAM 90X

TIRE INSPECTION/WHEEL INSPECTION/ CABLE INSPECTION AND LUBRICATION

INSP
ADJ



NOTE:

For tires with a "DRIVE" mark ①:

- Install the wheel with the "DRIVE" mark pointing in direction in which the wheel will rotate.

⚠ WARNING

After mounting a tire, ride conservatively for a while to give the tire time to seat itself properly in the rim. Failure to do so could lead to an accident with possible injury to the rider or damage to the motorcycle.

WHEEL INSPECTION

1. Inspect:

- Wheels
Damage/Bends → Replace.

NOTE:

Always balance the wheel when a tire or wheel has been changed or replaced.

⚠ WARNING

Never attempt to make any repairs to the wheel.

CABLE INSPECTION AND LUBRICATION

⚠ WARNING

Damaged cable sheaths may cause corrosion and interfere with the cable movement. Replace damaged cables as soon as possible.

1. Inspect:

- Cable sheath
Damage → Replace.

2. Check:

- Cable operation
Unsmooth operation → Lubricate.



Recommended lubricant:
Engine oil

NOTE:

Hold cable end up and pour a few drops of lubricant into the cable sheath.

LEVER AND PEDAL LUBRICATION/SIDESTAND LUBRICATION/REAR SUSPENSION LUBRICATION

INSP
ADJ



LEVER AND PEDAL LUBRICATION

Lubricate levers and pedals at their pivoting points.



Recommended lubricant:
Engine oil

SIDESTAND LUBRICATION

Lubricate the sidestand at pivoting points.



Recommended lubricant:
Engine oil

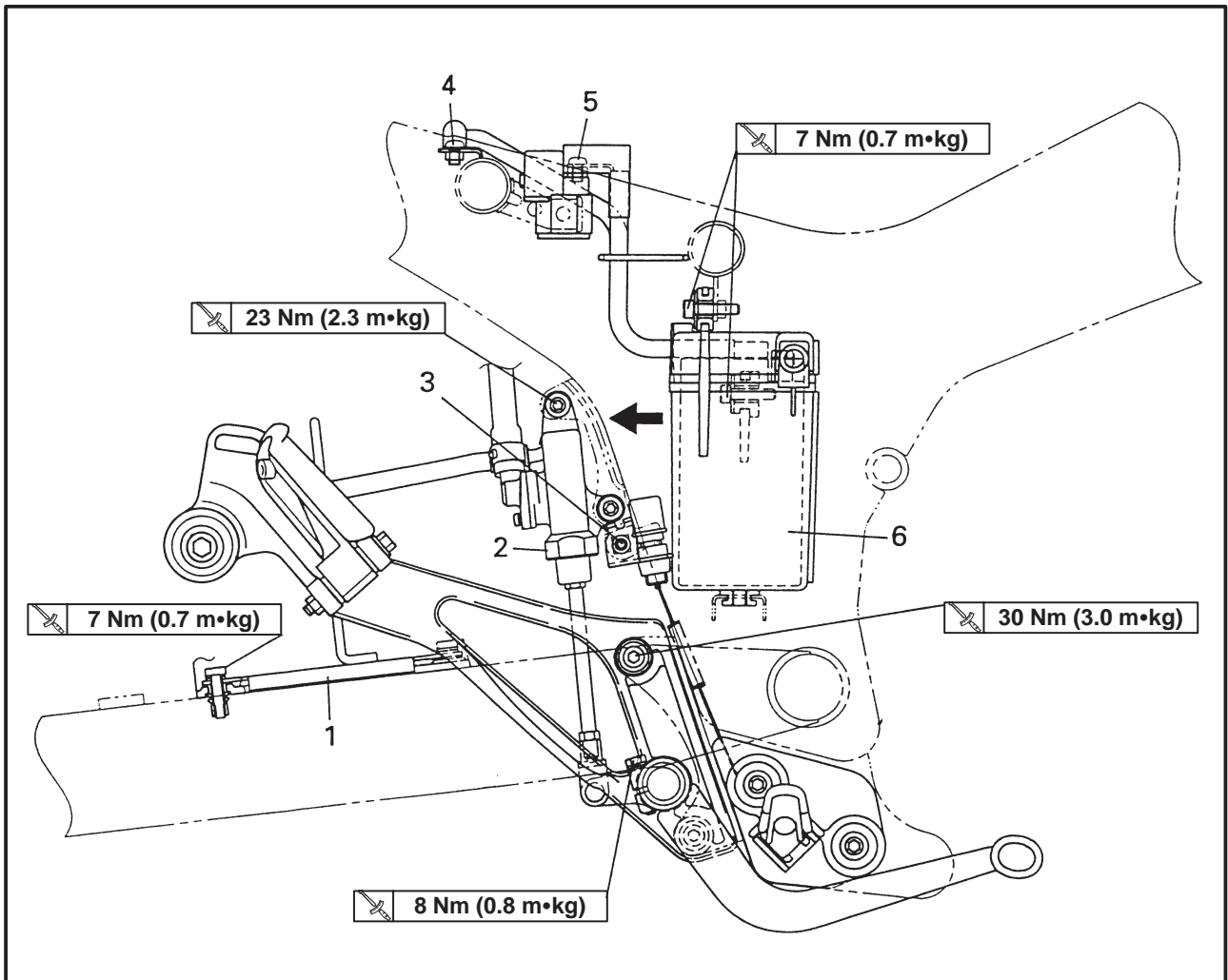
REAR SUSPENSION LUBRICATION

Lubricate the rear suspension at pivoting points.

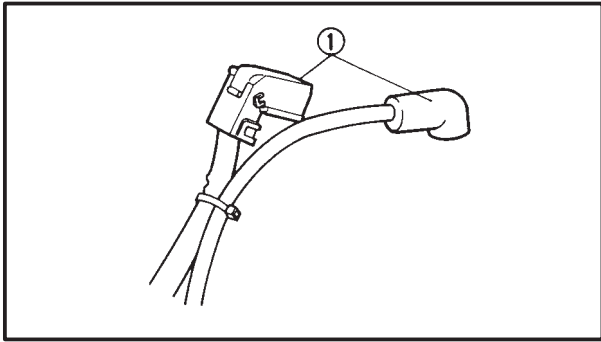


Recommended lubricant:
Molybdenum disulfide grease

ELECTRICAL
BATTERY



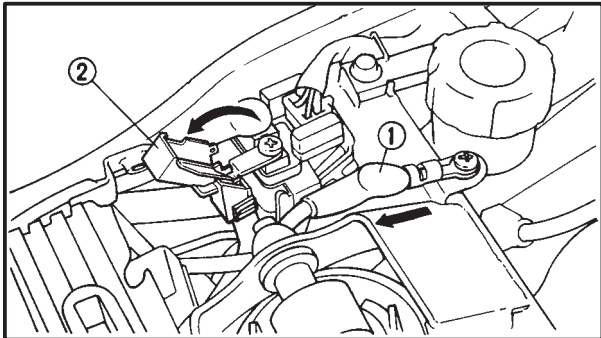
Order	Job name/Part name	Q'ty	Remarks
	Battery removal Seat		Remove the parts in the order below. Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
1	Brake hose guide	1	Refer to "Battery removal". For installation, reverse the removal procedure.
2	Rear master cylinder	1	
3	Rear brake switch	1	
4	Battery negative lead terminal	1	
5	Battery positive lead terminal	1	
6	Battery assembly	1	



REMOVAL

⚠ WARNING

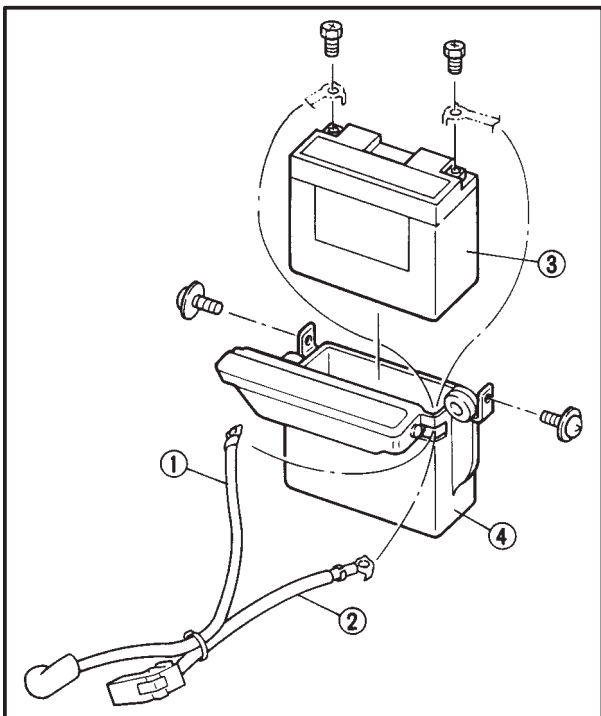
Immediately after removing the battery leads, securely cover the terminals with the covers ① to prevent the battery leads from being shorted.



1. Remove:
 - Seat
Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".
2. Remove:
 - Negative terminal cover ①
 - Positive terminal cover ②

⚠ WARNING

First disconnect the negative lead ①, then disconnect the positive lead ②.

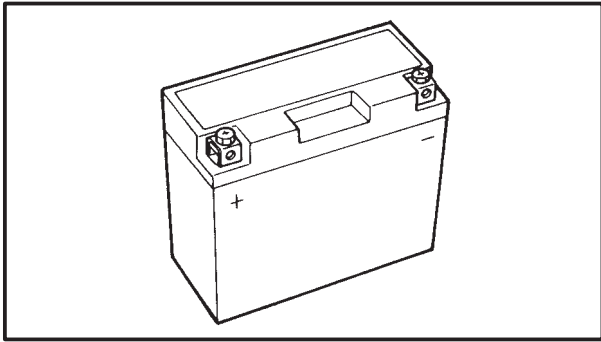


3. Remove:
 - Battery assembly

NOTE:

Slide the battery assembly around the right side of the shock absorber and then pull it outward to remove.

4. Remove:
 - Battery negative lead ①
 - Battery positive lead ②
 - Battery ③
 - Battery box ④

**INSPECTION****NOTE:** _____

Since the MF battery is a sealed type battery, it is not possible to measure the specific gravity of the electrolyte in order to check the charge state of the battery. Therefore the charge of the battery has to be checked by measuring the voltage at the battery terminals.

CAUTION: _____

- This is a sealed type battery. Never remove the sealing caps. If the sealing caps have been removed, the balance will not be maintained and battery performance will deteriorate.
- Charging time, charging current and charging voltage for the MF battery are different from those of general type batteries. The MF battery should be charged as explained in "CHARGING METHOD". If the battery is overcharged, the electrolyte level will drop considerably. Therefore, take special care when charging the battery.

⚠ WARNING _____

Batteries generate explosive hydrogen gas. Always follow the following preventive measures:

- Charge batteries in a well-ventilated area.
- Keep batteries away from fire, sparks or open flames (e.g., welding equipment, lighted cigarettes, etc.)
- DO NOT SMOKE when charging or handling batteries.

KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.

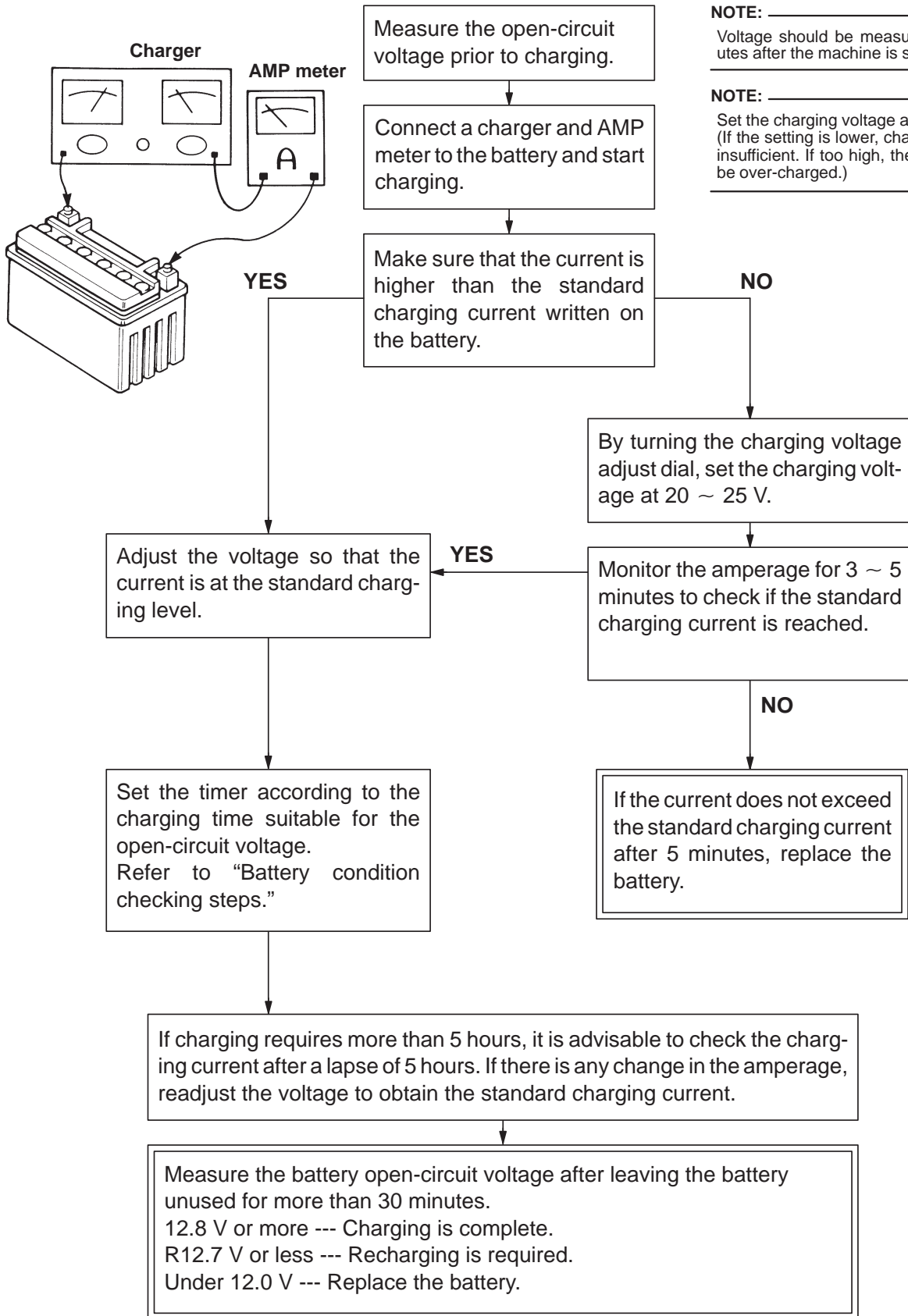
- Before removing the clips from the battery terminals, be sure to turn off the charger's power switch.
- The open-circuit voltage variation for the MF battery after charging is shown below. As shown in the figure, the open circuit voltage stabilizes about 30 minutes after charging has been completed. Therefore, wait 30 minutes after charging is completed before measuring the opencircuit voltage.



 **WARNING**

Do not quick charge the battery.

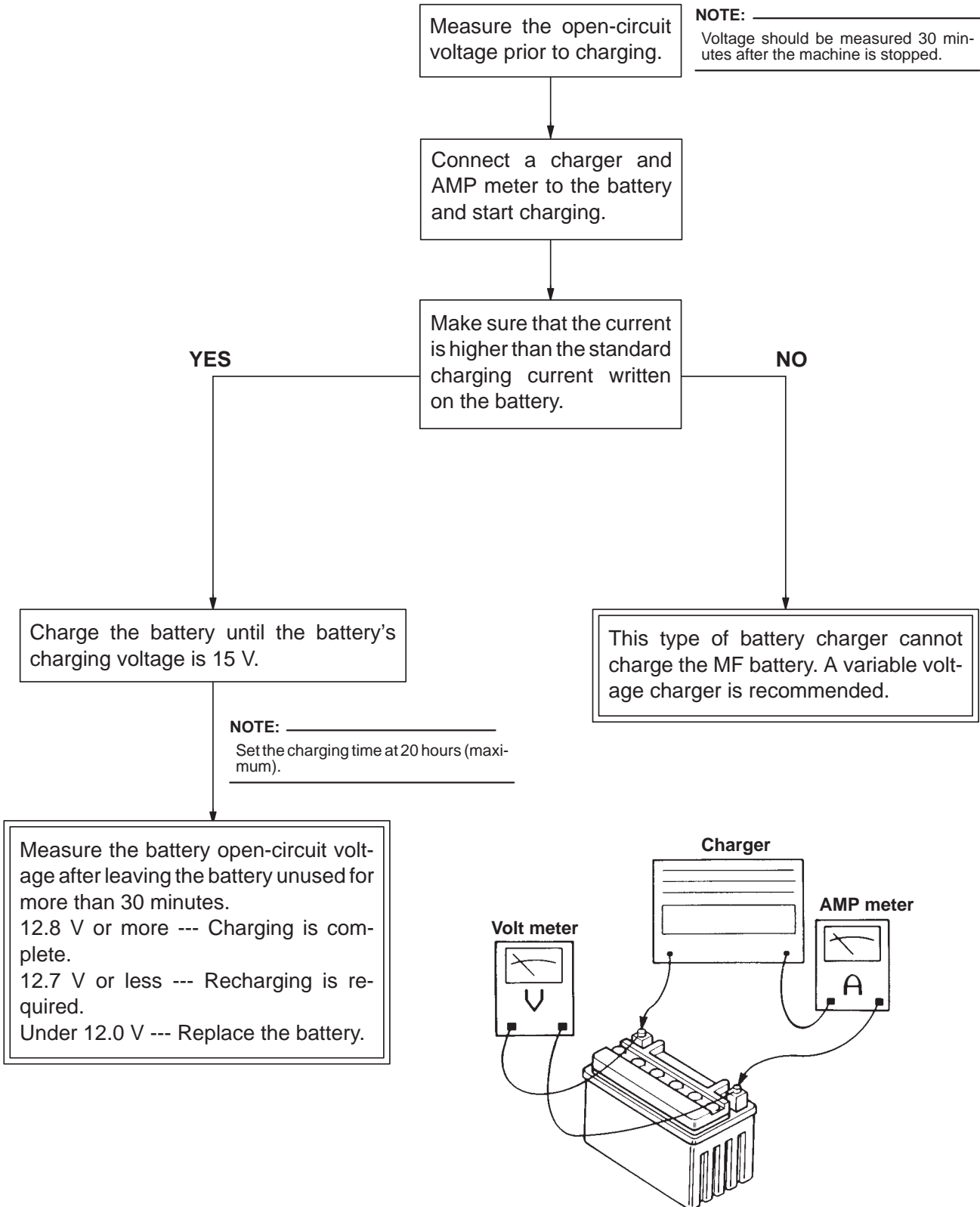
Charging method using a variable-current (voltage) type charger



NOTE: _____
Voltage should be measured 30 minutes after the machine is stopped.

NOTE: _____
Set the charging voltage at 16 ~ 17 V. (If the setting is lower, charging will be insufficient. If too high, the battery will be over-charged.)

Charging method using a constant-voltage type charger

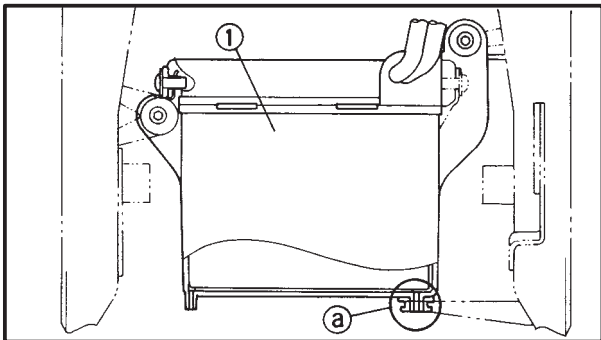


Charging method using a constant-current type charger

This type of battery charger cannot charge the MF battery.

2. Inspect:
 - Battery terminal
 - Dirty → Clean with a wire brush.
 - Poor connection → Correct.

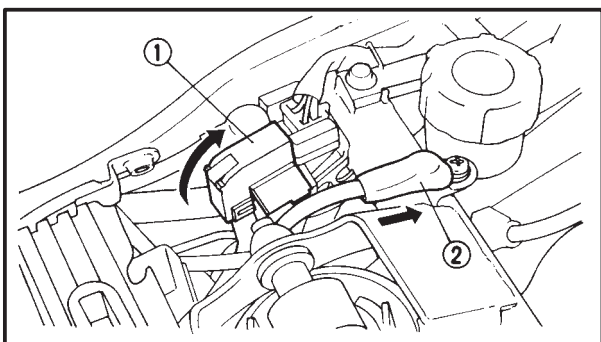
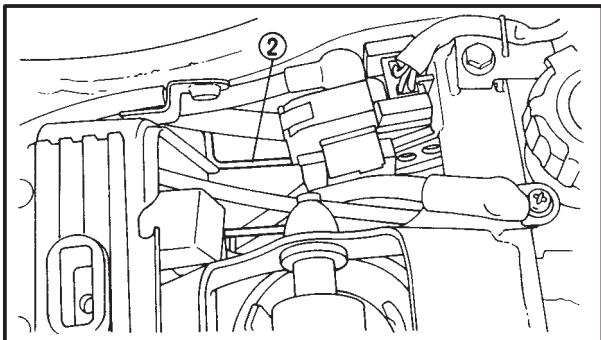
NOTE: _____
 After cleaning the terminals, grease them lightly.



INSTALLATION

1. Install:
 - Battery assembly ①

NOTE: _____
 • During installation, be sure the projection (a) on the battery box aligns with the grommet on the frame.
 • Pass the battery leads through the cable guide ②.



2. Install:
 - Positive terminal cover ①
 - Negative terminal cover ②

NOTE: _____
 • Connect the battery positive lead first and then the negative lead.
 • After connecting the leads, securely cover the terminals with the covers.

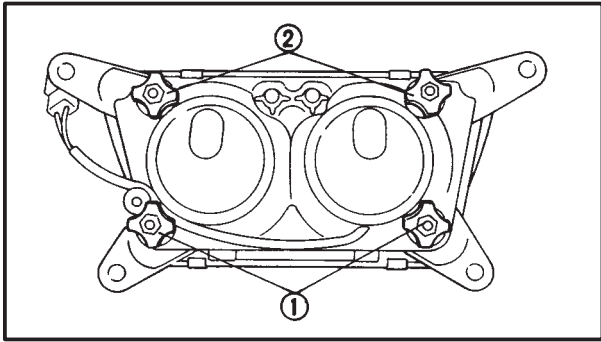
FUSE INSPECTION

CAUTION:

Always turn off the main switch when checking or replacing the fuse. Otherwise, a short circuit may occur.

1. Remove:
 - Seat
 - Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK".

HEADLIGHT BEAM ADJUSTMENT/ HEADLIGHT BULB REPLACEMENT



EB305021

HEADLIGHT BEAM ADJUSTMENT

- Adjust:
 - Headlight beam (vertically)
Turn the adjuster ① in or out.

Turning in:	Headlight beam is lowered.
Turning out:	Headlight beam is raised.

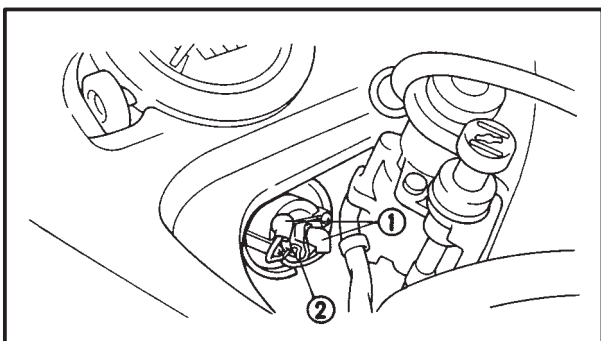
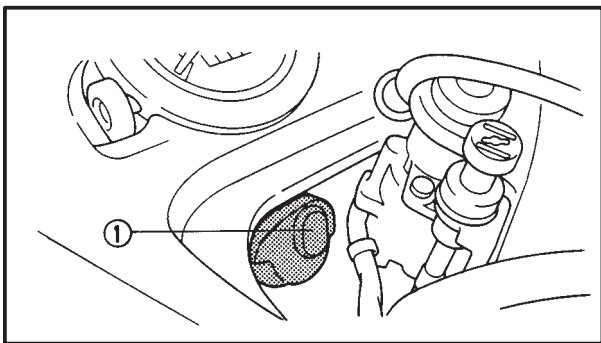
- Adjust:
 - Headlight beam (horizontally)
Turn the adjuster ② in or out.

Right headlight:

Turning in:	Headlight beam is to the right.
Turning out:	Headlight beam is to the left.

Left headlight:

Turning in:	Headlight beam is to the left.
Turning out:	Headlight beam is to the right.



HEADLIGHT BULB REPLACEMENT

- Remove:
 - Cover ①
- Disconnect:
 - Headlight leads ①
- Unhook:
 - Bulb holder ②
- Remove:
 - Bulb

! WARNING

Keep flammable products and your hands away from the bulb while it is on, as it will be hot. Do not touch the bulb until it has cooled down.



5. Install:

- Bulb **New**

Secure the new bulb with the bulb holder.

CAUTION: _____

Avoid touching the glass part of the bulb. Keep it free from oil; otherwise, the transparency of the glass, life of the bulb, and luminous flux will be adversely affected. If oil gets on the bulb, thoroughly clean it with a cloth moistened with alcohol or lacquer thinner.

6. Hook:

- Bulb holder

7. Connect:

- Headlight leads

8. Install:

- Cover



CHAPTER 4. ENGINE OVERHAUL

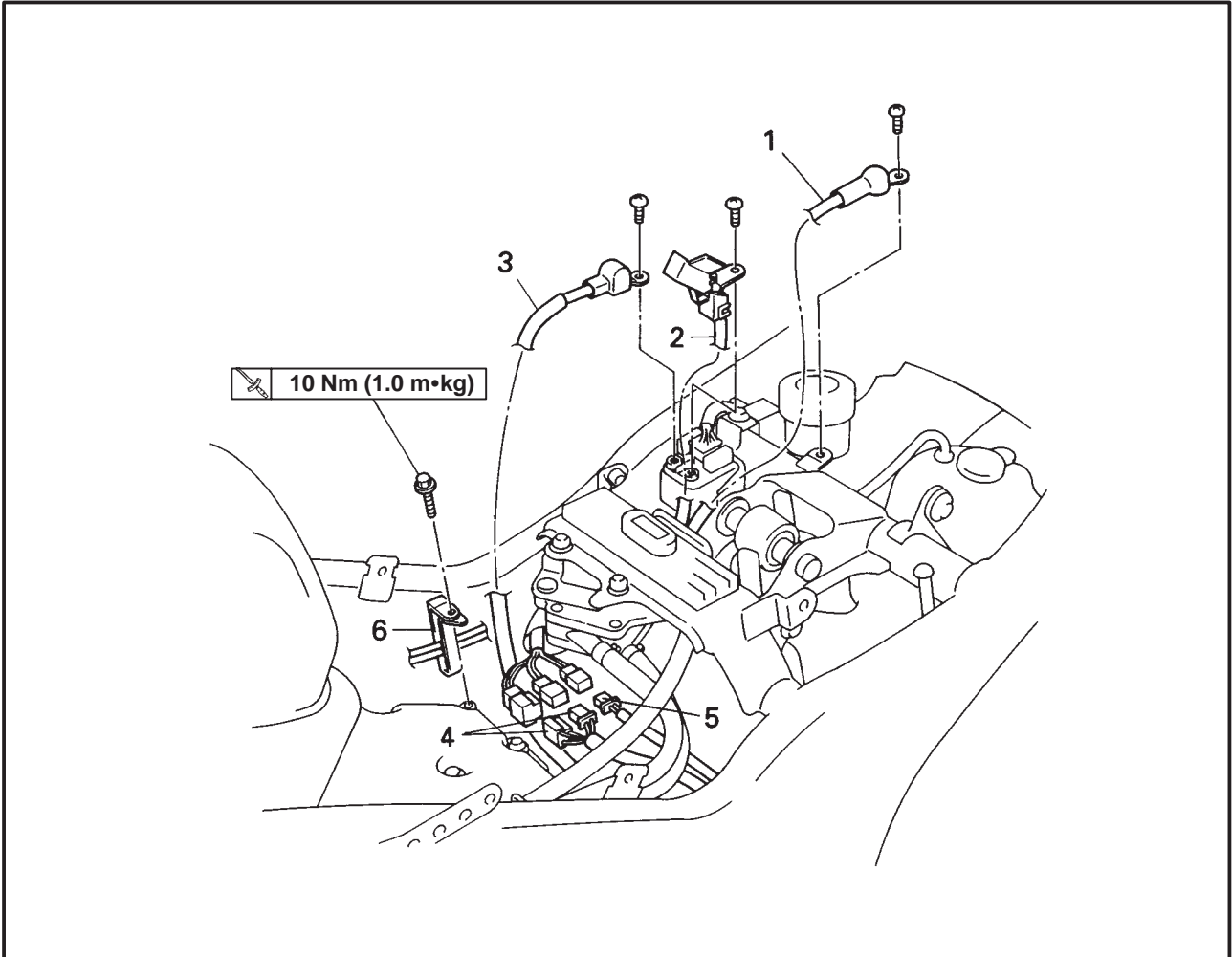
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ENGINE OVERHAUL

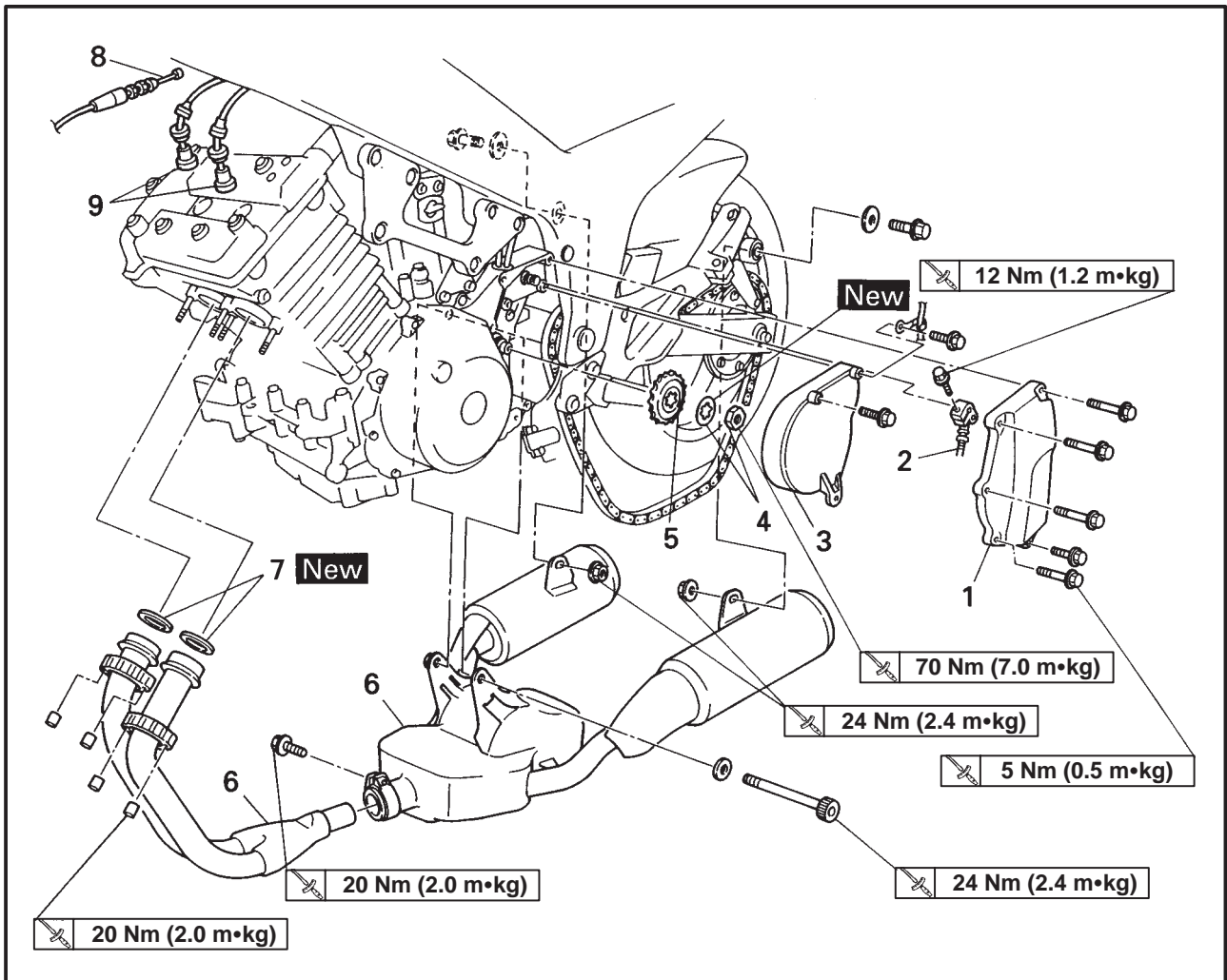
ENGINE ASSEMBLY
LEADS



Order	Job name/Part name	Q'ty	Remarks
	Leads disconnect Side cowling, seat, side cover and fuel tank.		Disconnect the parts in the order below. Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK" in CHAPTER 3.
1	Battery negative lead	1	<div style="border: 1px solid black; padding: 2px; display: inline-block;">⚠ WARNING</div> <ul style="list-style-type: none"> • Disconnect the negative lead first and then disconnect the positive lead. • Immediately after removing the battery leads, securely cover the terminals with the covers ① to prevent the battery leads from being shorted
2	Battery positive lead	1	
3	Starter motor lead	1	
4	Startor coil lead/pickup coil lead coupler	1/1	Disconnect
5	Neutral switch lead coupler	1	Disconnect
6	Clamp	1	
			For connecting, reverse the disconnection procedure.



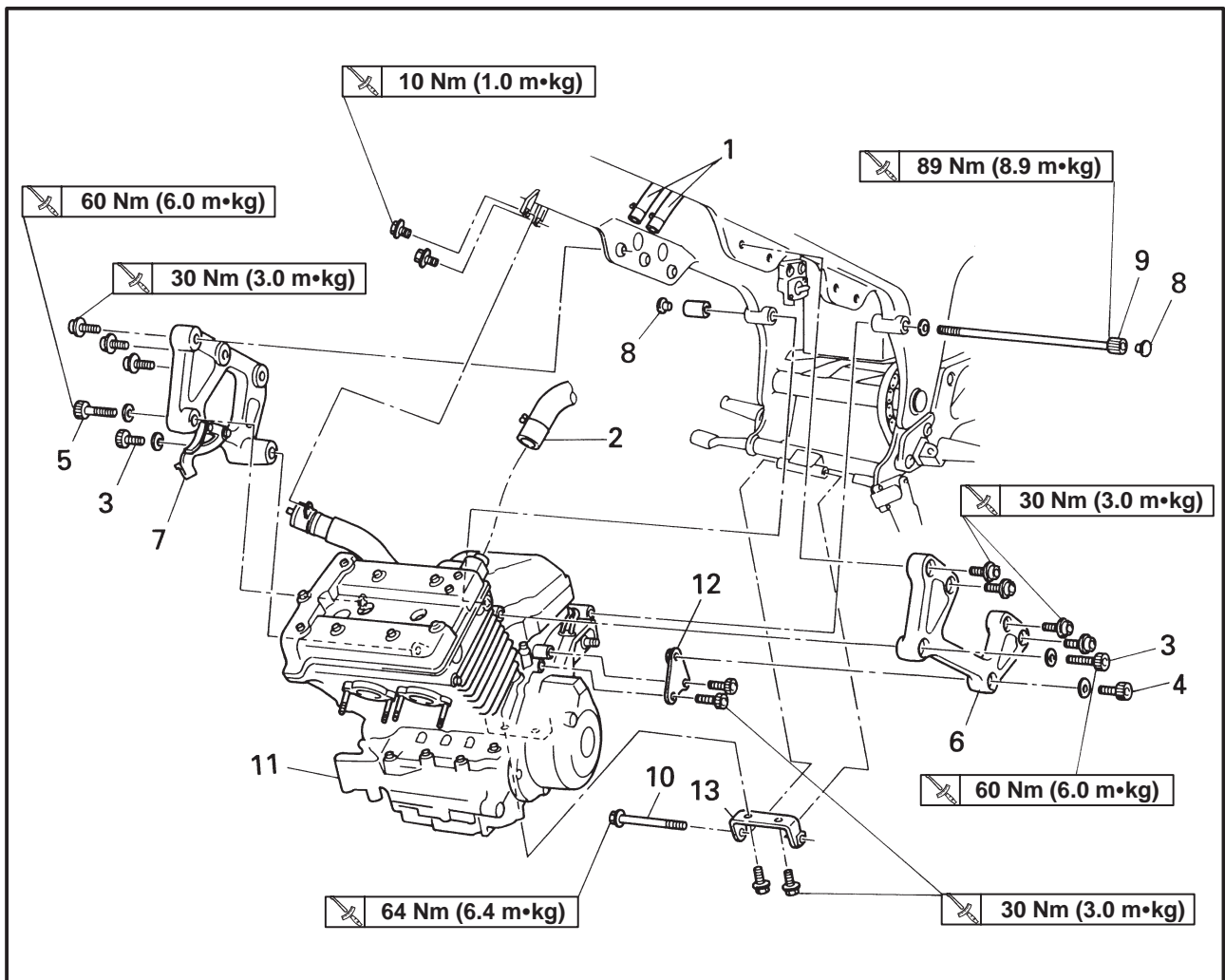
DRIVE SPROCKET AND EXHAUST PIPE/MUFFLER



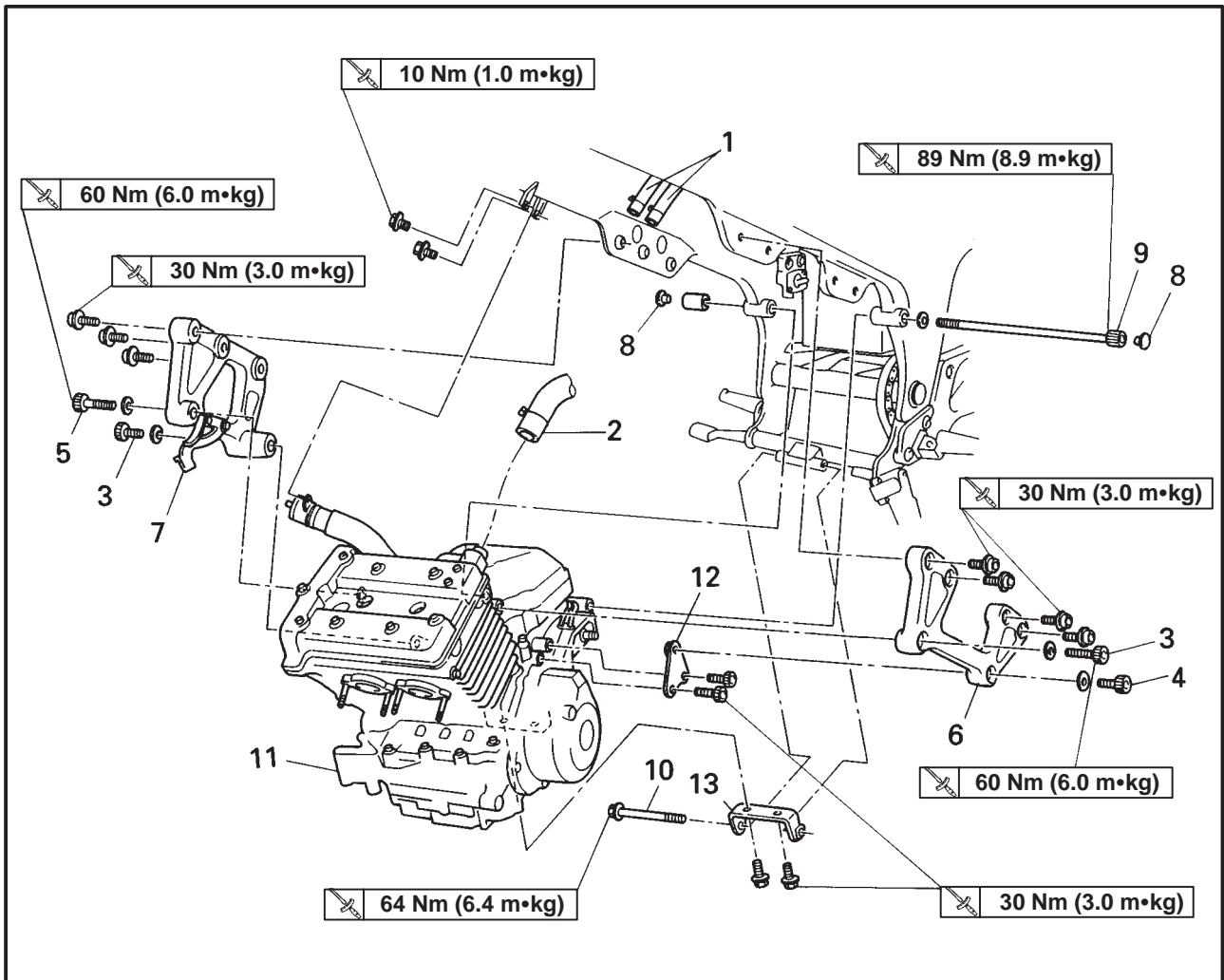
Order	Job name/Part name	Q'ty	Remarks
	Drive sprocket and exhaust pipe/muffler removal		Remove the parts in the order below.
	Air filter case		Refer to "AIR FILTER CASE" in CHAPTER 3.
	Carburetor assembly		Refer to "CARBURETOR" in CHAPTER 6.
	Radiator assembly		Refer to "RADIATOR" in CHAPTER 5.
	Thermostatic valve assembly		Refer to "THERMOSTATIC VALVE" in CHAPTER 5.
1	Drive sprocket cover 1	1	
2	Shift arm	1	
3	Drive sprocket cover 2	1	
4	Nut/Lock washer	1/1	
5	Drive sprocket/Drive chain	1/1	
6	Exhaust pipe/Muffler	1/1	
7	Exhaust pipe gasket	2	
8	Clutch cable	1	
9	Spark plug caps	2	
			For installation, reverse the removal procedure.



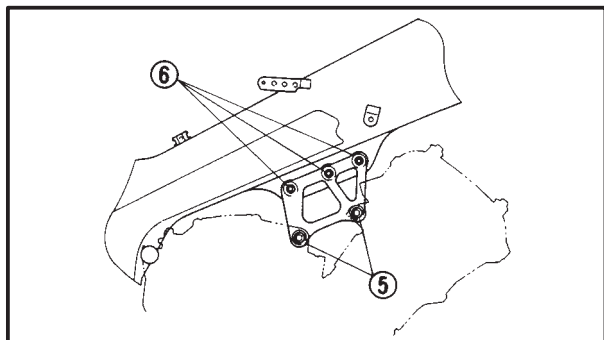
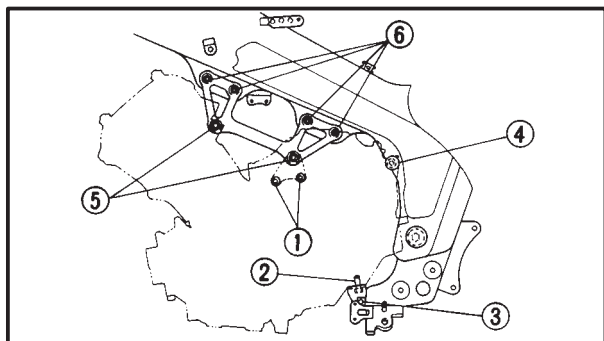
ENGINE ASSEMBLY



Order	Job name/Part name	Q'ty	Remarks
	Engine removal		Remove the parts in the order below. NOTE: _____ Place suitable stand under the frame and engine.
	Starter motor	1	Refer to "STARTER MOTOR" in CHAPTER 8.
1	Vacuum hose	2	
2	Breather hose	1	
3	Bolt	2	$l = 45 \text{ mm}$
4	Bolt	1	$l = 25 \text{ mm}$
5	Bolt	1	$l = 60 \text{ mm}$
6	Engine bracket (left)	1	
7	Engine bracket (right)	1	
8	Plug	2	
9	Bolt	1	$l = 230 \text{ mm}$
10	Bolt	1	$l = 115 \text{ mm}$
11	Engine assembly	1	Refer to "INSTALLATION".



Order	Job name/Part name	Q'ty	Remarks
12	Engine stay (left)	1	For installation, reverse the removal procedure.
13	Engine bracket (lower)	1	



INSTALLATION

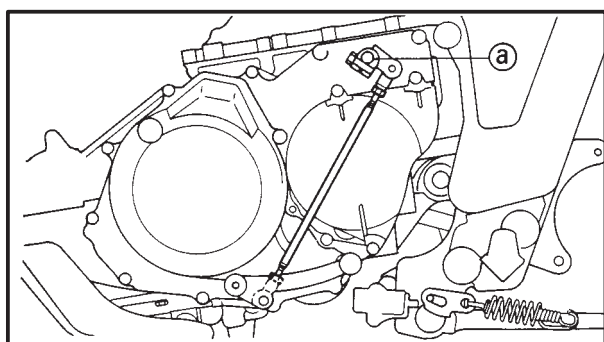
1. Install:
 - Bolt ① ~ ⑥

NOTE:

Do not fully tighten.

2. Tighten:
 - Tighten the bolts in the order below.

1	Bolt ①	30 Nm (3.0 m•kg)
2	Bolt ②	30 Nm (3.0 m•kg)
3	Bolt ③	64 Nm (6.4 m•kg)
4	Bolt ④	89 Nm (8.9 m•kg)
5	Bolt ⑤	60 Nm (6.0 m•kg)
6	Bolt ⑥	30 Nm (3.0 m•kg)

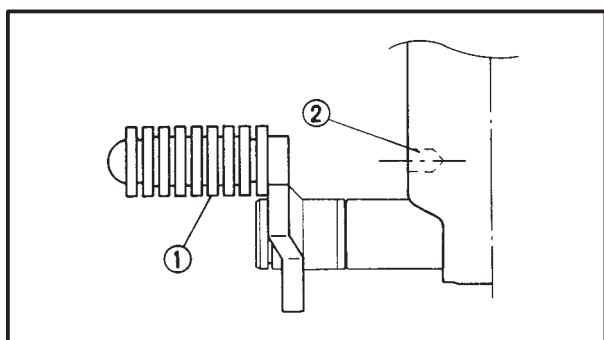


3. Install:
 - Shift arm ①

12 Nm (1.2 m•kg)

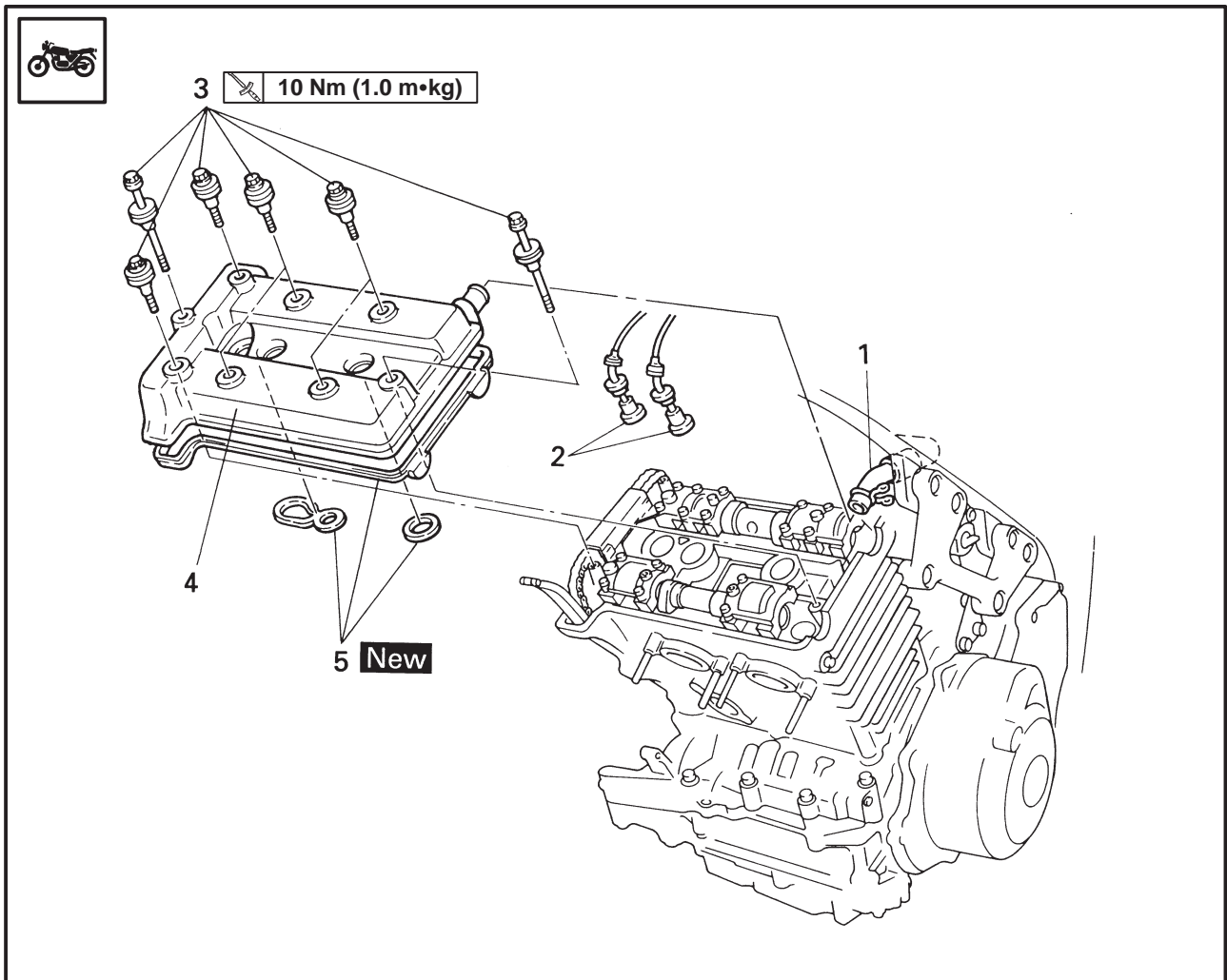
NOTE:

- Align the punched mark (a) on the shift shaft with the slot on the shift arm.
- The top of the shift pedal ① should be aligned with the crankcase ②.





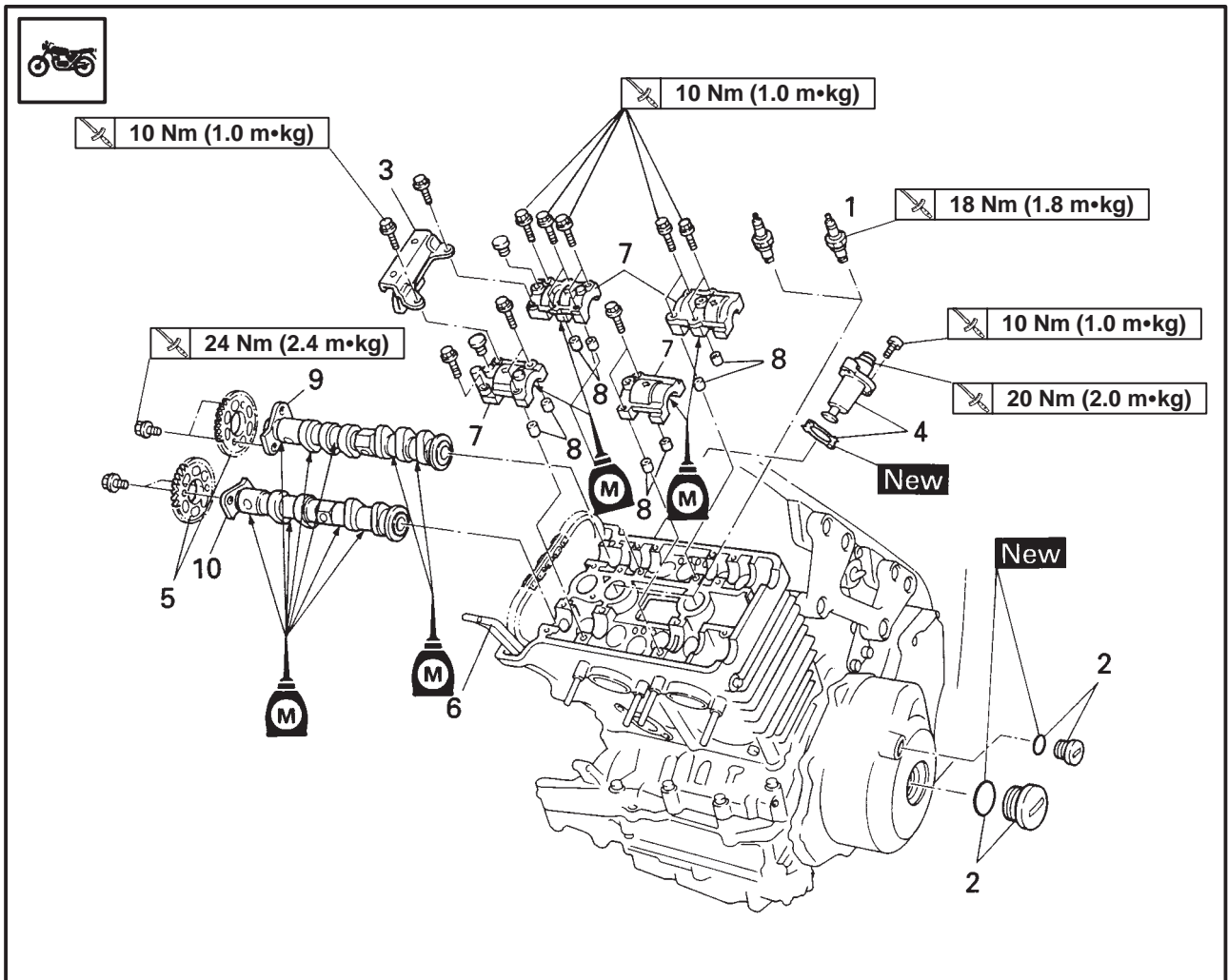
CAMSHAFT
CYLINDER HEAD COVER



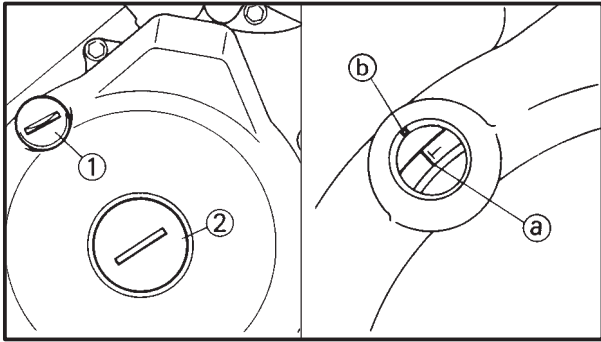
Order	Job name/Part name	Q'ty	Remarks
	Cylinder head cover removal		Remove the parts in the order below.
	Side cowling, seat, side cover and fuel tank		Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK" in CHAPTER 3.
	Air filter case		Refer to "AIR FILTER CASE" in CHAPTER 3.
	Coolant		Refer to "COOLANT REPLACEMENT" in CHAPTER 3.
	Radiator		Refer to "RADIATOR" in CHAPTER 5.
	Carburetor assembly		Refer to "CARBURETOR" in CHAPTER 6.
	Thermostatic assembly		Refer to "THERMOSTATIC VALVE" in CHAPTER 5.
1	Breather hose	1	
2	Spark plug cap	2	
3	Bolt	1/6/1	$\ell = 68/27/58$ mm
4	Cylinder head cover	1	
5	Cylinder head cover gasket	3	
			For installation, reverse the removal procedure.



CAMSHAFT



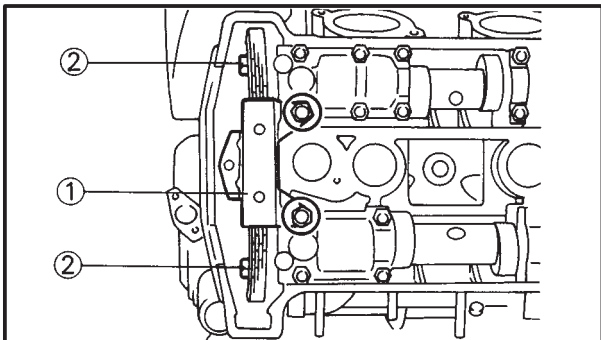
Order	Job name/Part name	Q'ty	Remarks
	Camshaft removal		Remove the parts in the order below.
1	Spark plug	2	Refer to "REMOVAL", and "INSTALLATION".
2	Plug/O-ring	2/2	
3	Timing chain guide (upper)	1	
4	Timing chain tensioner/Gasket	1/1	
5	Camshaft sprocket	2	
6	Timing chain guide (exhaust)	1	
7	Camshaft cap	4	
8	Dowel pin	8	
9	Intake camshaft	1	
10	Exhaust camshaft	1	
			For installation, reverse the removal procedure.

**REMOVAL**

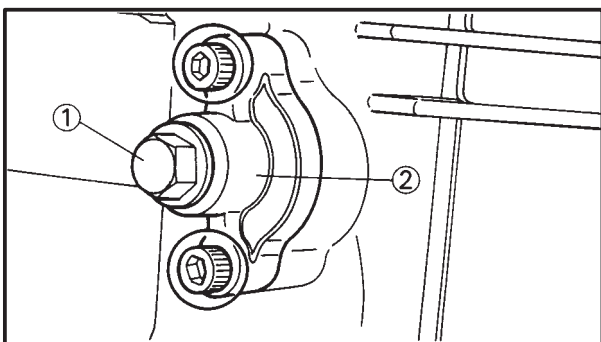
1. Remove:
 - Timing plug ①
 - Straight plug ②
2. Align:
 - "T" mark
 - (with stationary pointer)

NOTE:

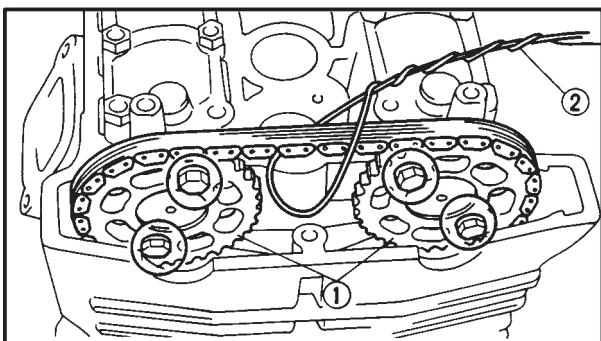
- Turn the crankshaft counterclockwise and align the "T" mark (a) with the stationary pointer (b) when #1 piston is at TDC on compression stroke.
- The #1 piston is in compression stroke TDC when the cam lobes are turned away from each other.



3. Remove:
 - Timing chain guide (upper) ①
4. Loosen:
 - Camshaft sprocket bolts ②



5. Loosen:
 - Tensioner cap bolt ①
6. Remove:
 - Timing chain tensioner ②



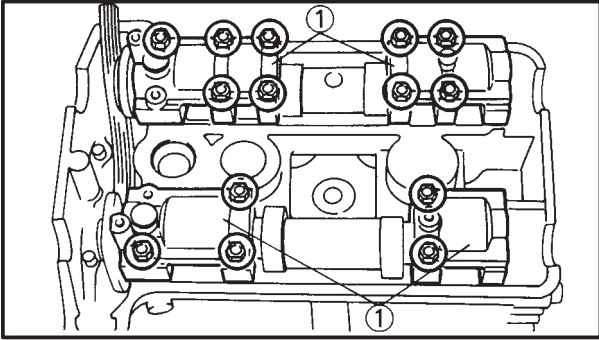
7. Remove:
 - Camshaft sprockets ①

NOTE:

- Attach a wire (2) to the timing chain to prevent it from falling into the crankcase.

CAMSHAFT

ENG



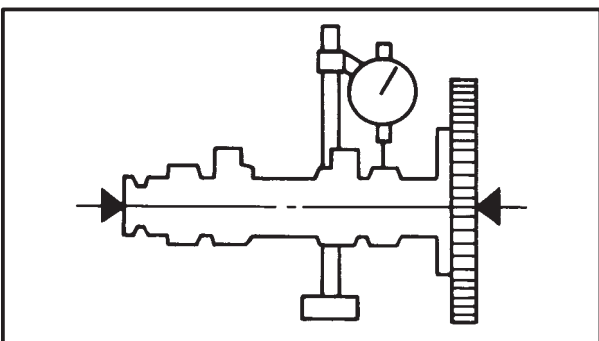
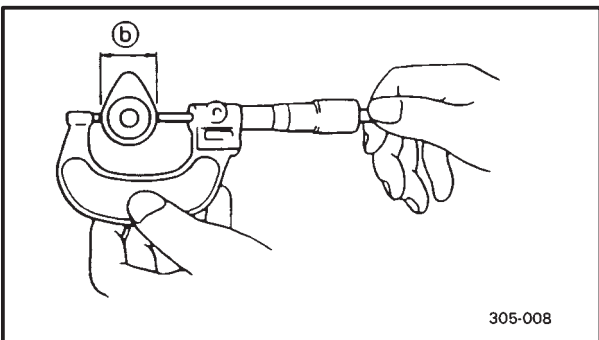
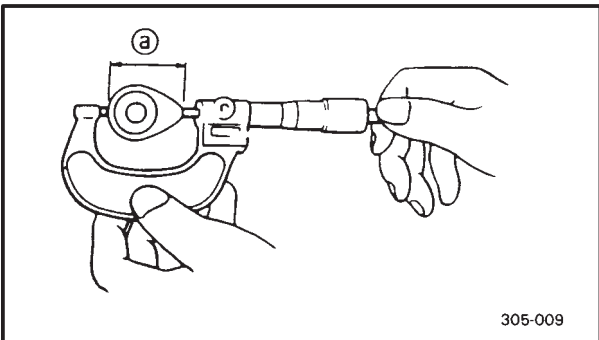
8. Remove:
- Timing chain guide (exhaust)
 - Camshaft cap ①

NOTE:

Remove the camshaft cap bolts in a crisscross pattern, working from the inside to the outside.

CAUTION:

The bolts (camshaft caps) must be removed evenly to prevent damage to the cylinder head, camshafts or camshaft caps.



INSPECTION

1. Inspect:
- Cam lobes
Pitting/Scratches/Blue discoloration → Replace.
2. Measure:
- Cam lobes length ① and ②
Out of specification → Replace.



Cam lobes length limit:

Intake:

① 35.85 mm

② 27.85 mm

Exhaust:

① 35.85 mm

② 27.85 mm

3. Measure:
- Runout (camshaft)
Out of specification → Replace.



Runout (camshaft):

Less than 0.03 mm

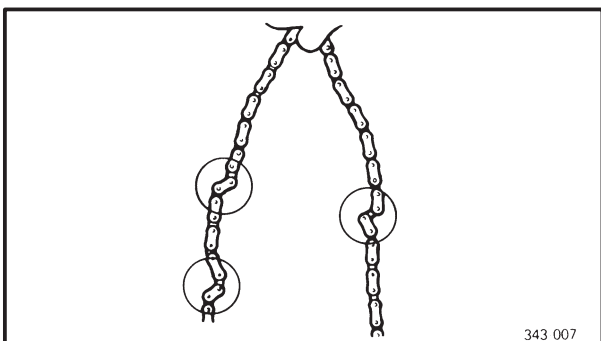
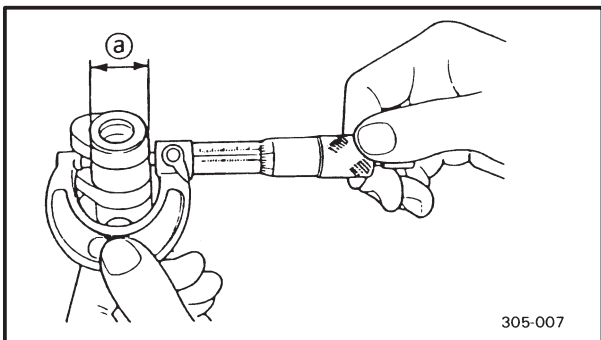
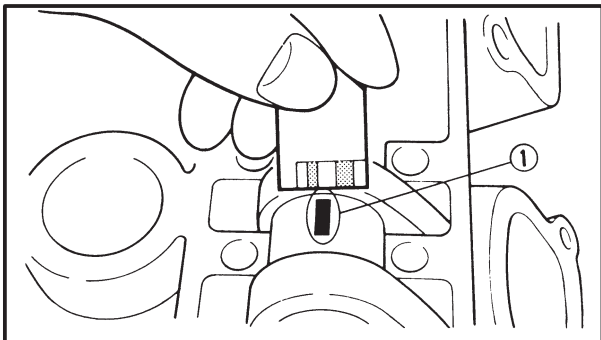
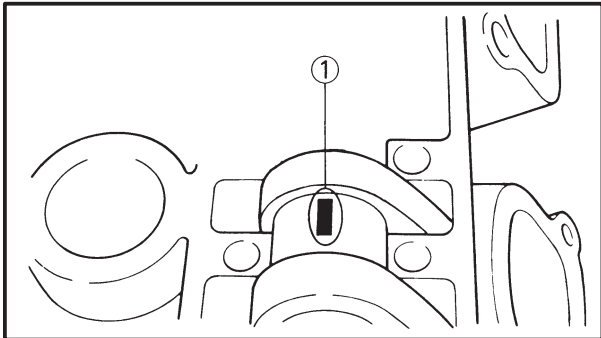


4. Measure:

- Camshaft-to-cap clearance
Out of specification → Measure bearing diameter (camshaft)



Camshaft-to-cap clearance:
0.020 ~ 0.054 mm



Measurement steps:

- Install the camshaft onto the cylinder head.
- Position a strip of Plastigauge® (1) onto the camshaft.
- Install the dowel pins and camshaft caps.

10 Nm (1.0 m•kg)

NOTE:

- Tighten the bolts (camshaft cap) in a crisscross pattern from innermost to outer caps.
- Do not turn the camshaft when measuring clearance with the Plastigauge®.

- Remove the camshaft caps and measure the width of the Plastigauge® (1).

5. Measure:

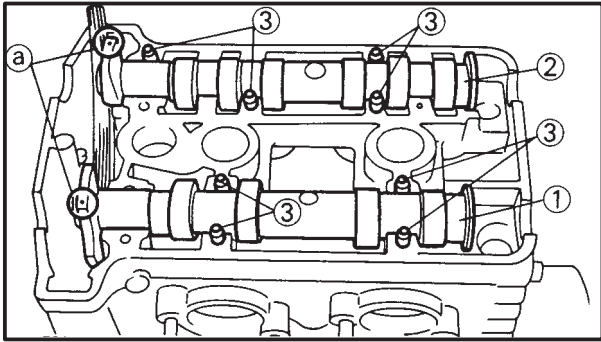
- Outside diameter (camshaft) (a)
Out of specification → Replace the camshaft.
Within specification → Replace camshaft case and camshaft caps as a set.



Outside diameter (camshaft):
24.967 ~ 24.980 mm

6. Inspect:

- Timing chain
Stiffness/damage → Replace the chain and the sprockets as a set.



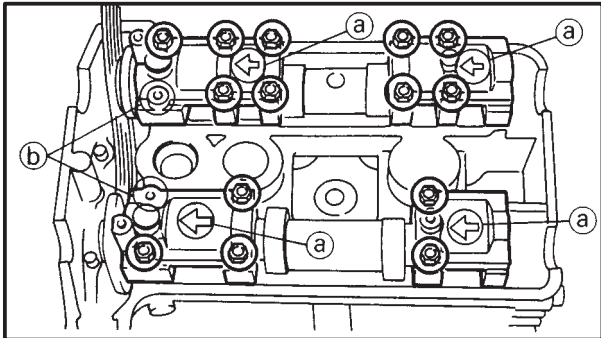
INSTALLATION

1. Install:

- Exhaust camshaft ①
- Intake camshaft ②
(with camshaft sprocket temporarily tighten)
- Dowel pins ③

NOTE:

Install the camshaft with the punch mark (a) facing upward.



2. Install:

- Camshaft caps

10 Nm (1.0 m•kg)

NOTE:

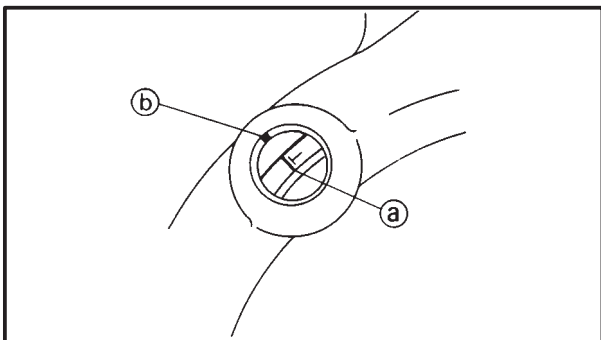
- Install the camshaft cap with the arrow mark (a) embossed facing timing chain of the engine.
- Tighten the camshaft cap bolts in a crisscross pattern from the inside to outwards.
- Do not install the bolts at (b) marked place in this stage.

CAUTION:

The camshaft cap bolts must be tightened evenly or damage to the cylinder head, camshaft caps and camshaft will result.

3. Install:

- Camshaft sprockets

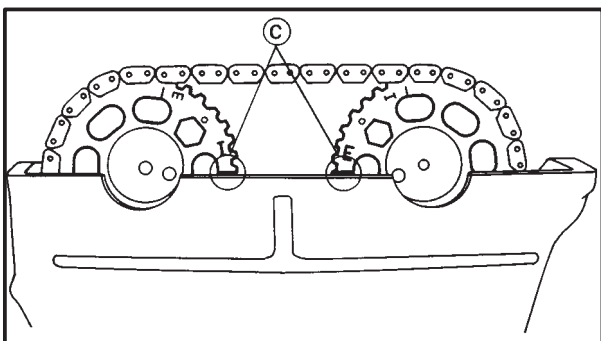


Installation steps:

- Turn the crankshaft counterclockwise until the "T" mark (a) on the A.C. magneto is aligned with the stationary pointer (b) on the crankcase cover (left) when #1 piston is at TDC.
- Fit the timing chain onto both camshaft sprockets and install the camshaft sprockets on the camshafts.

NOTE:

When installing the camshaft sprockets, start with the exhaust camshaft to keep the timing chain as tense as possible on the exhaust side, and set the match marks (c) to be parallel with the case surface on the corresponding sides.



"I": Intake side

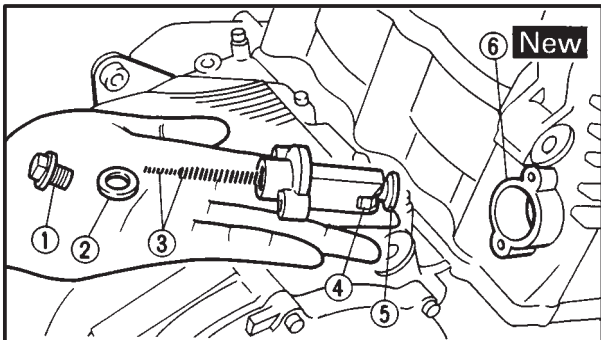
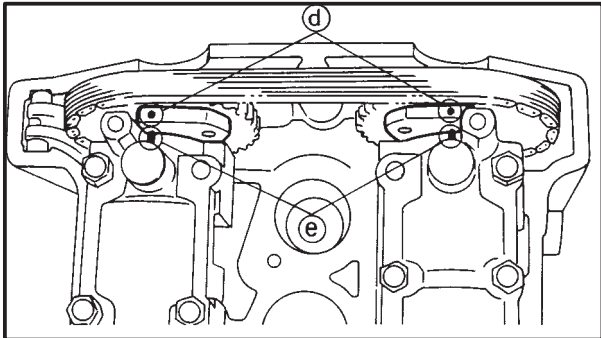
"E": Exhaust side



CAUTION:

Do not turn the crankshaft during the camshaft installation. Damage or improper valve timing will result.

- Make sure that marks (d) and (e) are aligned after the crankshaft is rotated twice and the piston is at TDC.



4. Install:
 - Timing chain guide (exhaust)
5. Install:
 - Timing chain tensioner



Installation steps:

- Remove the tensioner cap bolt (1), washer (2) and springs (3).
- Release the timing chain tensioner one-way cam (4) and push the tensioner rod (5) all the way in.
- Install a gasket (6). **New**
- Install the timing chain tensioner.



Timing chain tensioner:
10 Nm (1.0 m•kg)

- Install the springs (3) and washer (2).
- Install the tensioner cap bolt (1).



Cap bolt:
20 Nm (2.0 m•kg)



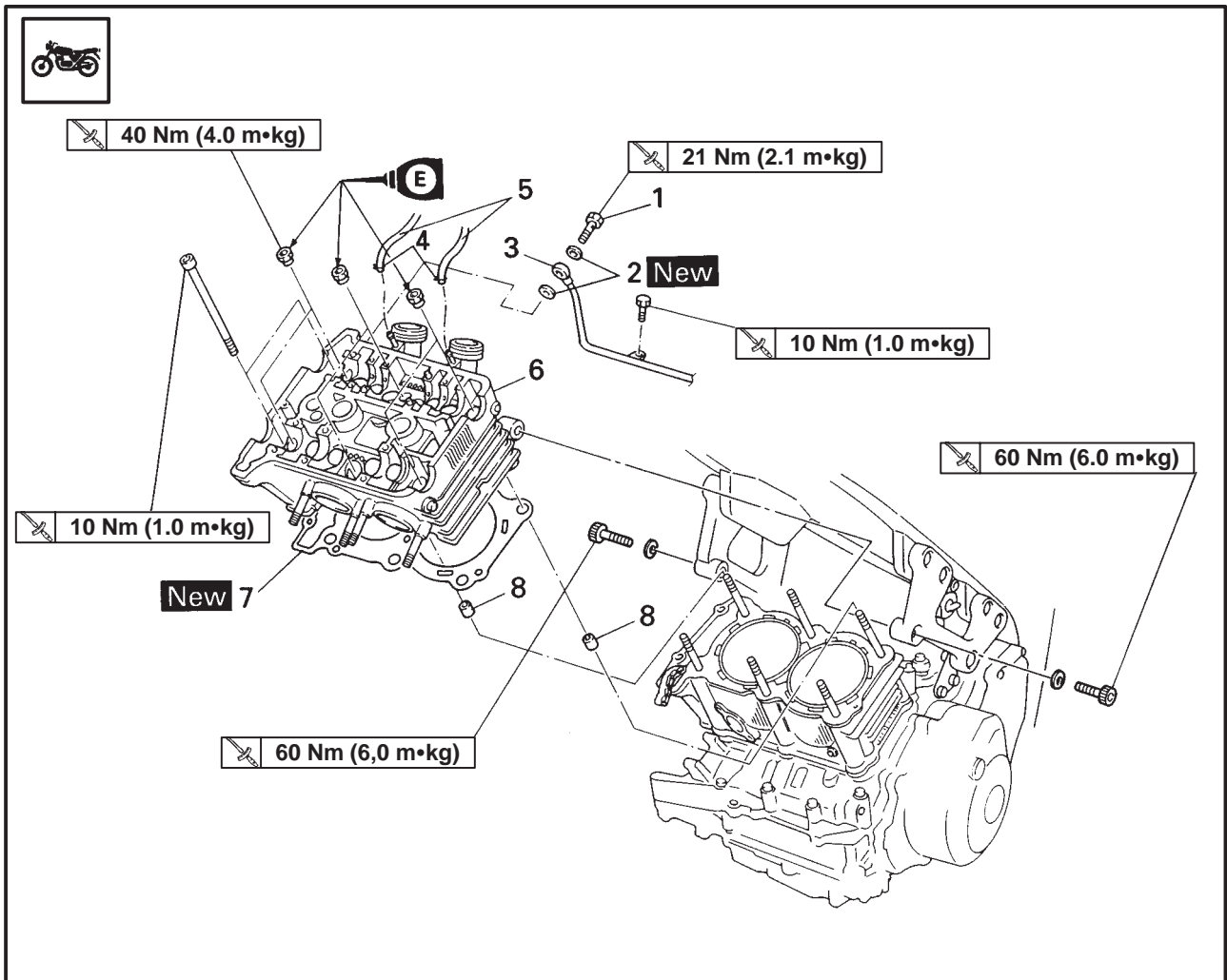
6. Turn:
 - Crankshaft
Counterclockwise several turns
7. Check:
 - A.C. magneto "T" mark
Align with the crankcase stationary pointer.
 - Camshaft punched marks
Align with the camshaft cap embossed marks.
Out of alignment → Adjust.
8. Tighten:
 - Camshaft sprocket bolts.



24 Nm (2.4 m•kg)

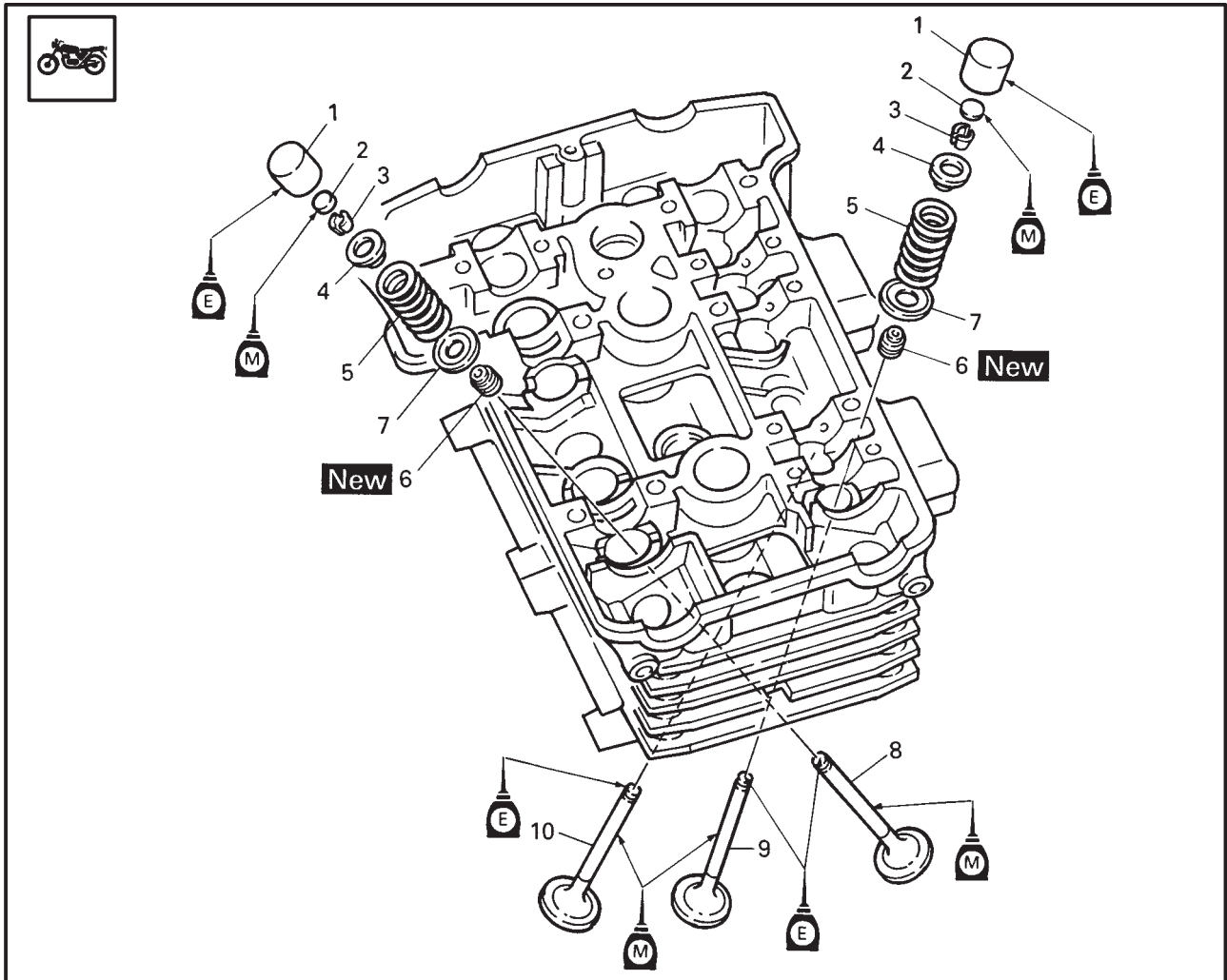


CYLINDER HEAD

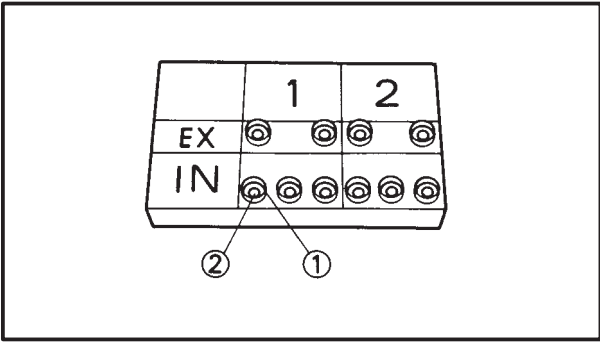


Order	Job name/Part name	Q'ty	Remarks
	Cylinder head removal		Remove the parts in the order below.
	Exhaust pipe		Refer to "ENGINE ASSEMBLY".
	Camshaft		Refer to "CAMSHAFT".
1	Union bolt	1	
2	Copper washer	2	
3	Oil delivery pipe	1	
4	Clip	2	
5	Vacuum hose	2	
6	Cylinder head	1	
7	Cylinder head gasket	1	Refer to "INSTALLATION".
8	Dowel pin	2	For installation, reverse the removal procedure.

VALVE AND VALVE SPRING



Order	Job name/Part name	Q'ty	Remarks
	Valve and valve spring removal		Remove the parts in the order below. Refer to "CYLINDER HEAD COVER". Refer to "CYLINDER HEAD".
1	Valve lifter	5	Refer to "REMOVAL", and "INSTALLATION".
2	Adjusting pad	5	
3	Valve cotter	10	
4	Valve retainer	5	
5	Valve spring	5	
6	Stem seal	5	
7	Valve spring seat	5	
8	Exhaust valve	2	
9	Intake valve (center)	1	
10	Intake valve (left and right)	2	
			For installation, reverse the removal procedure.

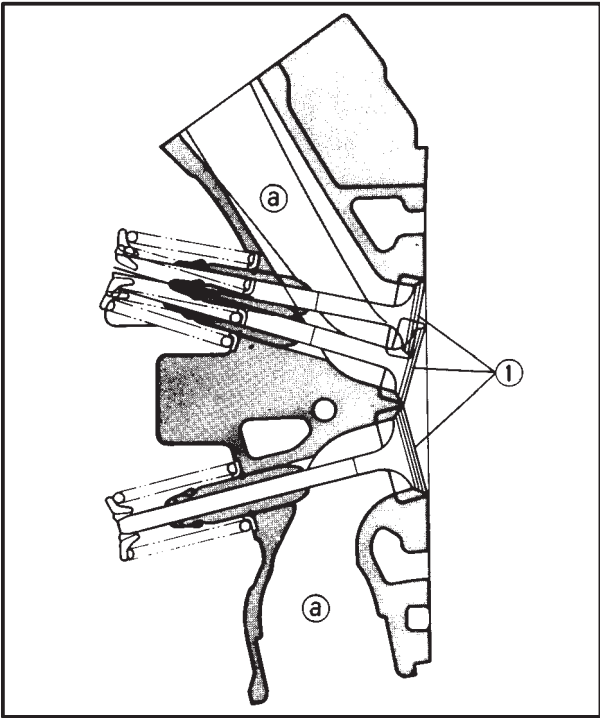


REMOVAL

1. Remove:
 - Valve lifters ①
 - Pads ②

NOTE:

Identify each lifter ① and pad ② position very carefully so that they can be reinstalled in their original place.

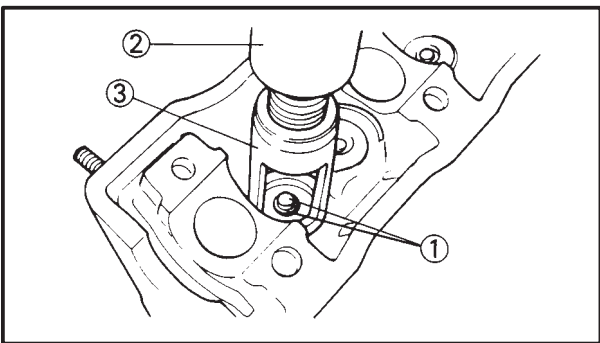


2. Check:

- Valve sealing
Leakage at valve seat → Inspect the valve face, valve seat and the valve seat width.

Checking steps:

- Pour a clean solvent (a) into the intake and exhaust ports.
- Check the valve seating.
There should be no leakage at the valve seat ①.



3. Remove:
 - Valve cotters ①

NOTE:

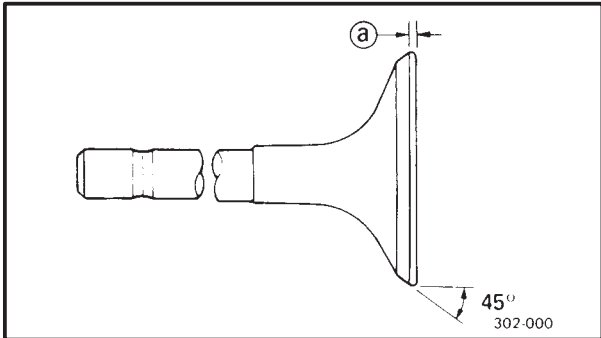
Attach the valve spring compressor ② and attachment ③ between the valve spring retainer and cylinder head to remove the valve cotters.



Valve spring compressor:
90890-04019
Attachment:
90890-04108



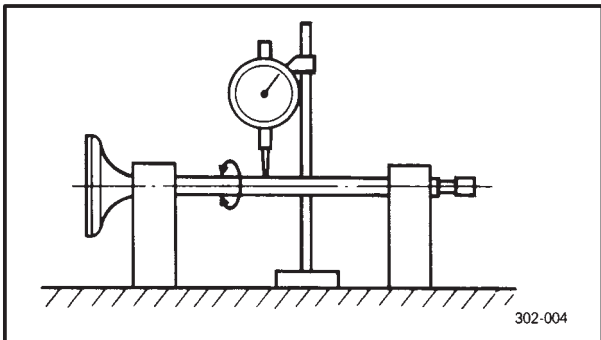
3. Eliminate:
 - Carbon deposit (from valve face)
4. Inspect:
 - Valve face
Pitting/Wear → Reface the face.
 - Valve stem end
Mushroom shape or diameter larger than rest of stem → Replace.



5. Measure:
 - Margin thickness (a)
Out of specification → Replace.



Margin thickness:
0.8 ~ 1.2 mm



6. Measure:
 - Runout (valve stem)
Out of specification → Replace.

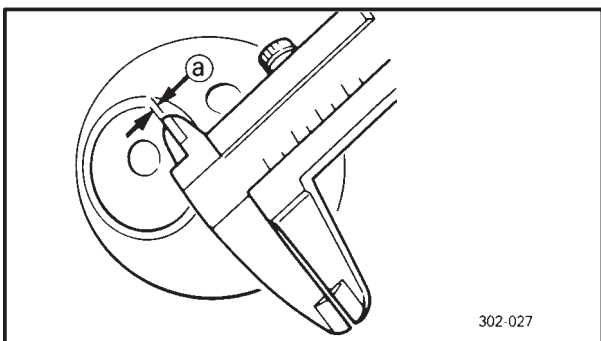


Runout limit:
0.01 mm

NOTE:

- Always replace the guide if the valve is replaced.
- Always replace the oil seal if the valve is removed.

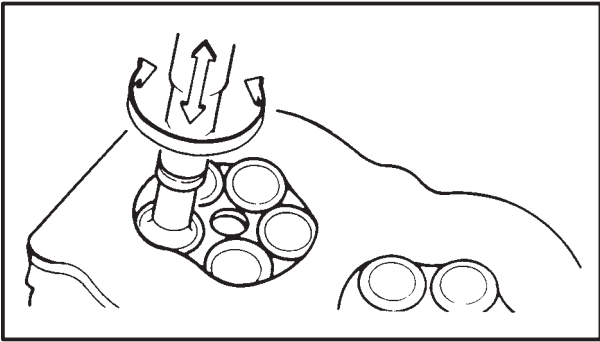
7. Eliminate:
 - Carbon deposit (from valve face and valve seat)
8. Inspect:
 - Valve seat
Pitting/Wear → Reface valve seat.



9. Measure:
 - Valve seat width (a)
Out of specification → Reface valve seat.

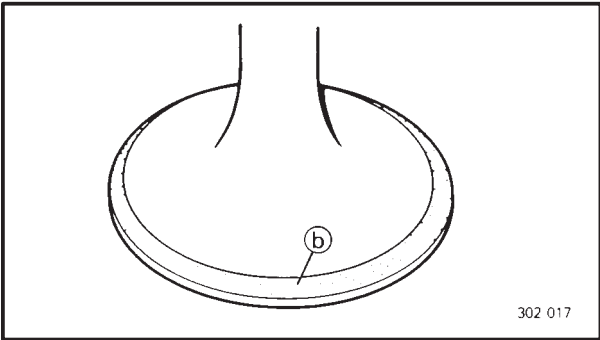


Valve seat width:
Intake: 0.9 ~ 1.1 mm
Exhaust: 0.9 ~ 1.1 mm



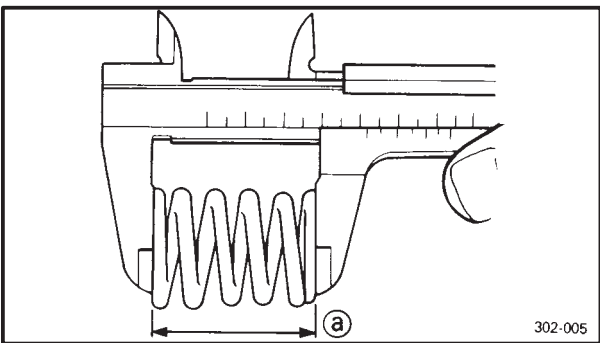
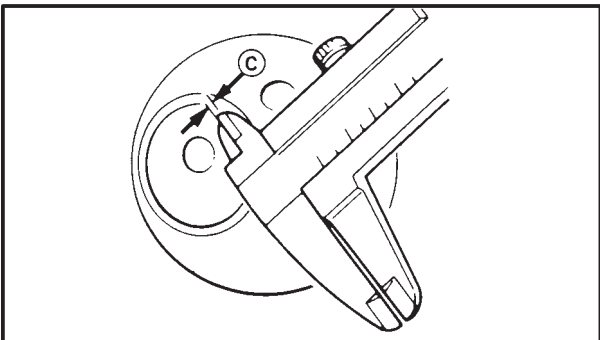
NOTE:
To obtain the best lapping result, lightly tap the valve seat while rotating the valve back and forth between your hand.

- Apply a fine lapping compound to the valve face and repeat the above steps.



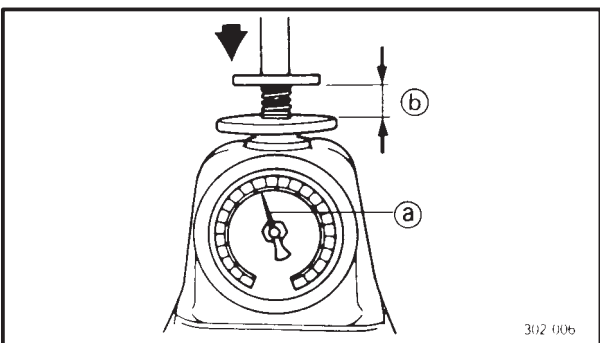
NOTE:
Be sure to clean off all compound from the valve face and valve seat after every lapping operation.

- Apply the Mechanic's blueing dye (Dykem) (b) to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width (c) again. If the valve seat width is out of specification, reface and lap the valve seat.



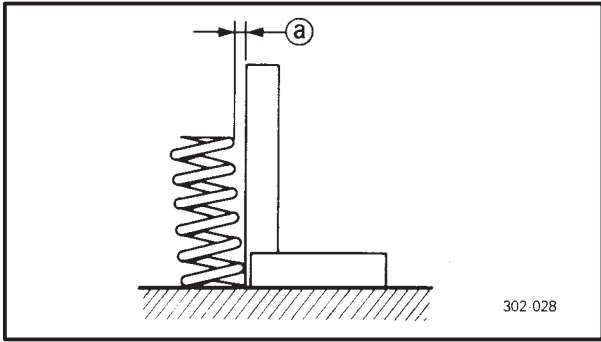
11. Measure:
- Free length (valve spring) (a)
Out of specification → Replace.

	Free length (valve spring):
	37.29 mm
	<Limit> 35.20 mm



12. Measure:
- Compressed force (valve spring) (a)
Out of specification → Replace.
 - (b) Installed length

	Compressed force:
	10.0 ~ 11.6 kg at 30.39 mm



13. Measure:

- Spring tilt (a)

Out of specification → Replace.



Spring tilt limit:
2.5° / 1.7 mm

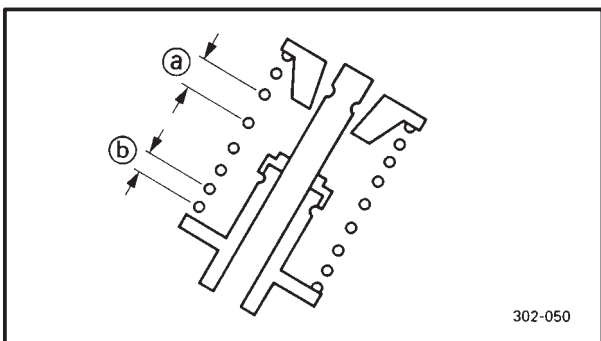
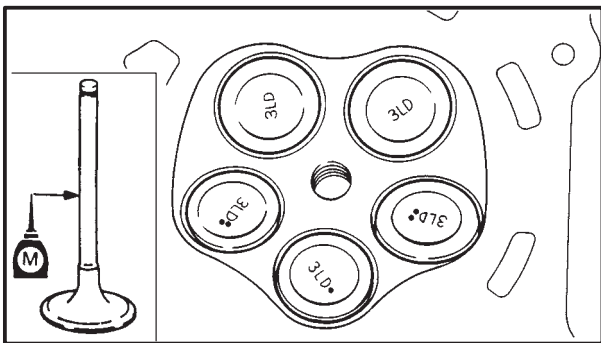
INSTALLATION

1. Install:

- Stem seal **New**
- Valve
- Spring seat
- Valve spring
- Valve retainer
(into cylinder head)

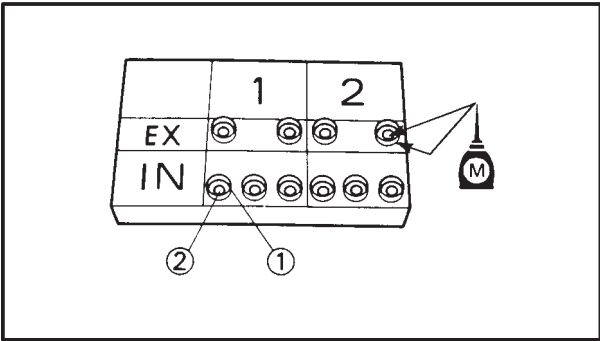
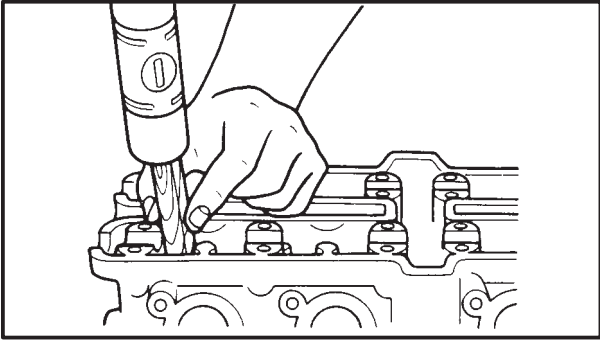
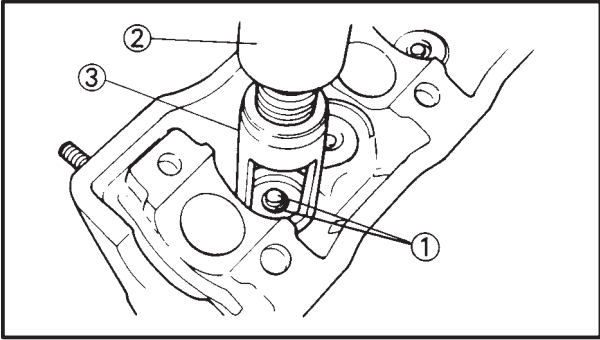
NOTE:

- Make sure that each valve is installed in its original place, also referring to the embossed mark as follows:
 - Intake (right/left): "3LD."
 - Intake (middle): "3LD."
 - Exhaust "3LD"
- Install the valve spring with the larger pitch (a) facing upwards.




(b) Smaller pitch

VALVE AND VALVE SPRING



2. Install:
• Valve cotters ①

NOTE: _____
Install the valve cotters while compressing the valve spring with the valve spring compressor.



Valve spring compressor ②:
90890-04019
Attachment ③:
90890-04108

3. Secure the valve cotters ① onto the valve stem by tapping lightly with a piece of wood.

NOTE: _____
Do not hit so much as to damage the valve.

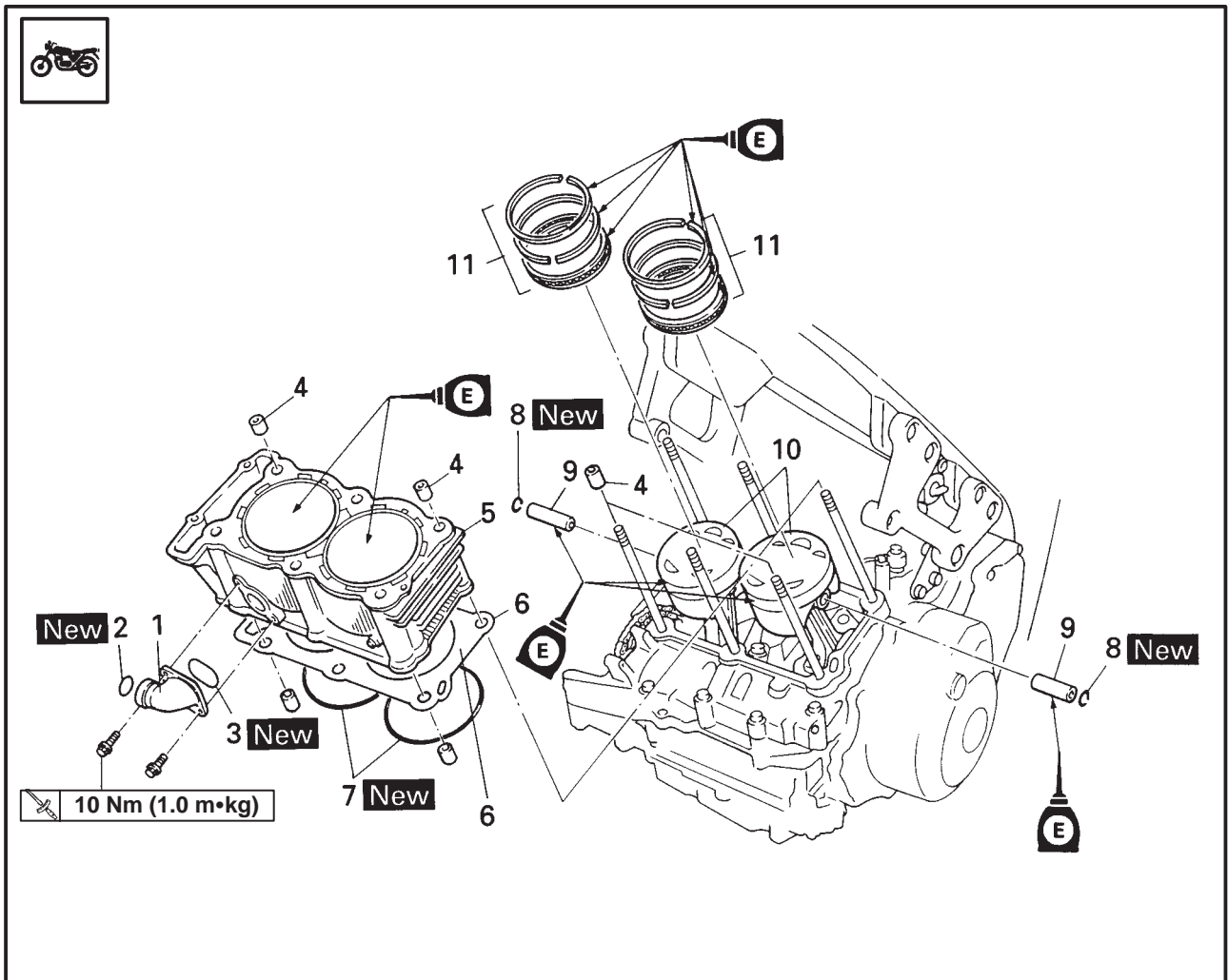
4. Install:
• Pads ①
• Valve lifters ②

NOTE: _____
• The valve lifters must move smoothly when rotated with the finger.
• Each valve lifter and pad must be reinstalled in their original position.

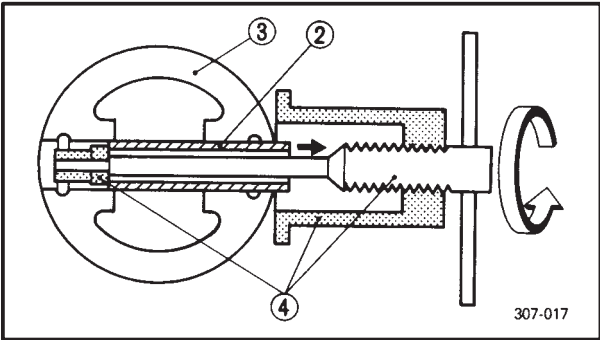
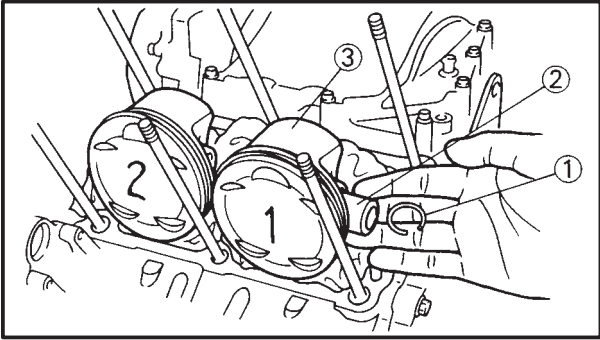
Refer to "VALVE CLEARANCE ADJUSTMENT" in CHAPTER 3.



CYLINDER AND PISTON



Order	Job name/Part name	Q'ty	Remarks
	Cylinder and piston removal		Remove the parts in the order below. Refer to "CYLINDER HEAD".
1	Joint	1	Refer to "REMOVAL", and "INSTALLATION".
2	O-ring	1	
3	O-ring	1	
4	Dowel pin	4	
5	Cylinder	1	
6	Cylinder gasket	1	
7	O-ring	2	
8	Circlip	4	
9	Piston pin	2	
10	Piston	2	
11	Piston ring set	2	
			For installation, reverse the removal procedure.



REMOVAL

- Remove:
 - Piston circlips ①
 - Piston pins ②
 - Pistons ③

NOTE:

- Before removing the piston pin clip, cover the crankcase with a clean rag to prevent the piston pin clip from falling into the crankcase cavity.
- Put identification marks on each piston head for reference during reinstallation.
- Before removing the piston pin, deburr the clip groove and pin hole area. If the piston pin groove is deburred and piston pin is still difficult to remove, use the piston pin puller ④.



Piston pin puller:
90890-01304

CAUTION:

Do not use a hammer to drive the piston pin out.

INSPECTION

- Inspect:
 - Cylinder and piston walls
Vertical scratches → Rebore or replace cylinder and piston.
- Measure:
 - Piston-to-cylinder clearance

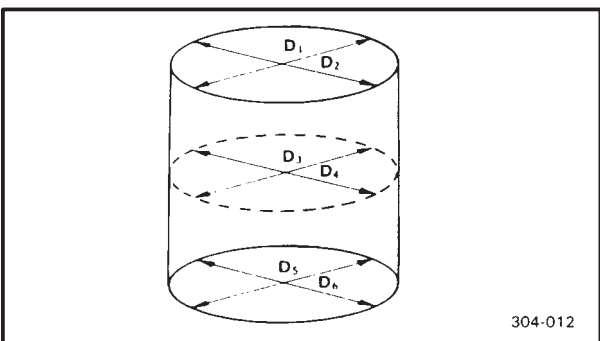
Measurement steps:

1st step:

- Measure the cylinder bore "C" with a cylinder bore gauge.

NOTE:

Measure the cylinder bore "C" in parallel to and at right angles to the crankshaft. Then, find the average of the measurements.

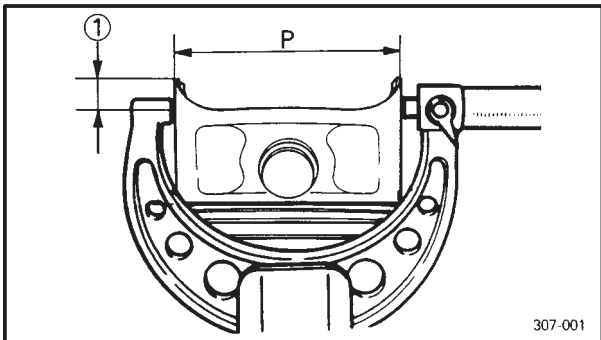




Cylinder bore "C"	89.500 ~ 89.505 mm
Taper limit "T"	0.05 mm
Out of round "R"	0.03 mm

"C" = Maximum D
"T" = (Maximum D ₁ , or D ₂) – (Maximum D ₅ or D ₆)
"R" = (Maximum D ₁ , D ₃ or D ₅) – (Minimum D ₂ , D ₄ or D ₆)

- If out of specification, rebore or replace the cylinder, and replace the piston and piston rings as set.



2nd step:

- Measure the piston skirt diameter "P" with a micrometer.
- Ⓐ 5.5 mm from the piston bottom edge.

	Piston size P
Standard	89.420 ~ 89.435 mm
Over size 2	0.50 mm
Over size 4	1.00 mm

- If out of specification, replace the piston and piston rings as a set.

3rd step:

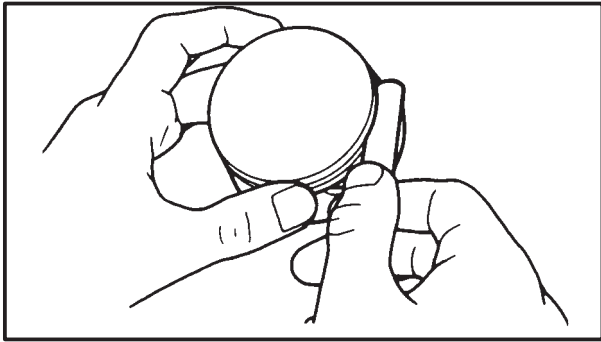
- Calculate the piston-to-cylinder clearance with following formula:

Piston-to-cylinder clearance = Cylinder bore "C" – Piston skirt diameter "P"

	Piston-to-cylinder clearance: 0.065 ~ 0.085 mm <Limit>: 0.15 mm
--	--

- If out of specification, rebore or replace the cylinder, and replace the piston and piston rings as set.





3. Measure:

- Side clearance

Out of specification → Replace piston and rings as a set.

NOTE:

Eliminate the carbon deposits from the piston ring grooves and rings before measuring the side clearance.



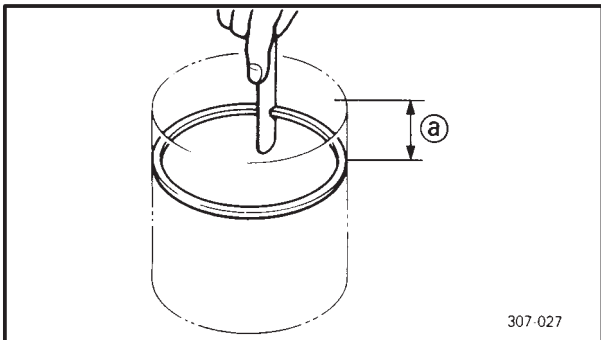
Side clearance:

Top ring:

0.035 ~ 0.070 mm

2nd ring:

0.035 ~ 0.070 mm



4. Position:

- Piston ring
(into cylinder)

NOTE:

Push the ring with the piston crown so that the ring will be at a right angle to the cylinder bore.

Ⓐ 5 mm

5. Measure:

- End gap

Out of specification → Replace.

NOTE:

You cannot measure the end gap on the expander spacer of the oil control ring. If the oil control ring rails show excessive gap, replace all three rings.



End gap:

Top ring:

0.30 ~ 0.45 mm

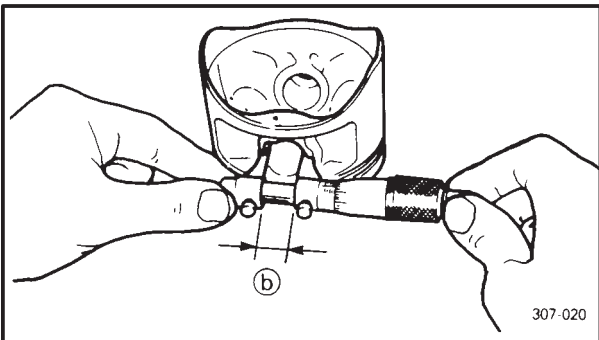
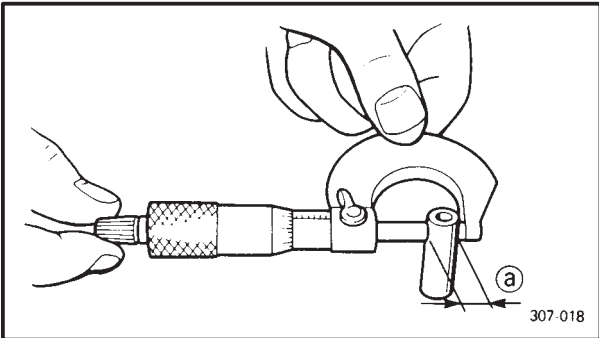
2nd ring:

0.30 ~ 0.45 mm

Oil ring:

0.20 ~ 0.70 mm

6. Inspect:
 - Piston pin
Blue discoloration/Grooves → Replace, then inspect lubrication system.
7. Measure:
 - Piston pin-to-piston clearance



Measurement steps:

- Measure the piston pin outside diameter (a).
If out of specification, replace the piston pin.

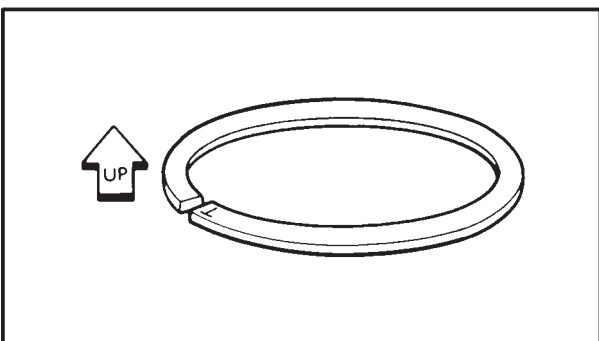
Outside diameter (piston pin):
19.991 ~ 20.000 mm
<Limit>: 19.975 mm

- Measure the piston inside diameter (b).
- Calculate the piston pin-to-piston clearance with following formula:

Piston pin-to-piston clearance =
Bore size (piston pin) (b) –
Outside diameter (piston pin) (a)

- If out of specification, replace the piston.

Piston pin-to-piston clearance =
0.002 ~ 0.022 mm
<Limit>: 0.07 mm

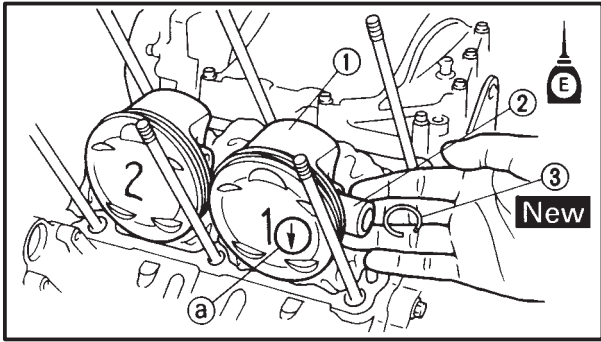


INSTALLATION

1. Install:
 - Piston rings

NOTE: _____

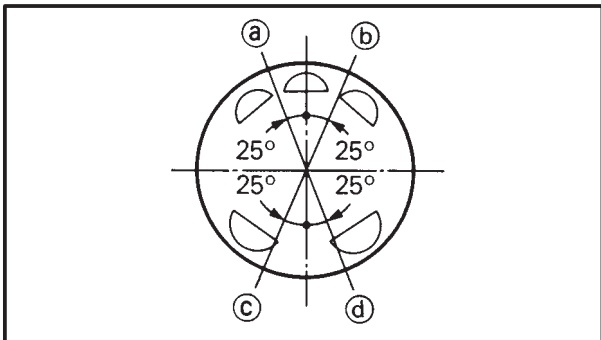
Be sure to install rings so that "T" mark is located on the upper side of the rings. Oil the pistons and rings liberally.



2. Install:
- Piston pins ①
 - Pistons ②
 - Piston circlips ③

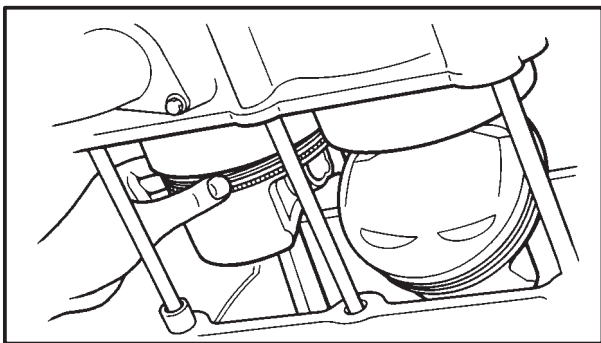
NOTE:

- Apply engine oil to the piston pins.
- Be sure that the arrow mark (a) on the piston points to the exhaust side of the engine.
- Before installing the piston, cover the crankcase with a clean rag to prevent the piston from falling into the crankcase.



3. Position:
- Top ring
 - 2nd ring
 - Oil ring
- Offset the piston ring end gaps as shown.

- ① Top ring end
- ② Oil ring end (lower)
- ③ Oil ring end (upper)
- ④ 2nd ring end



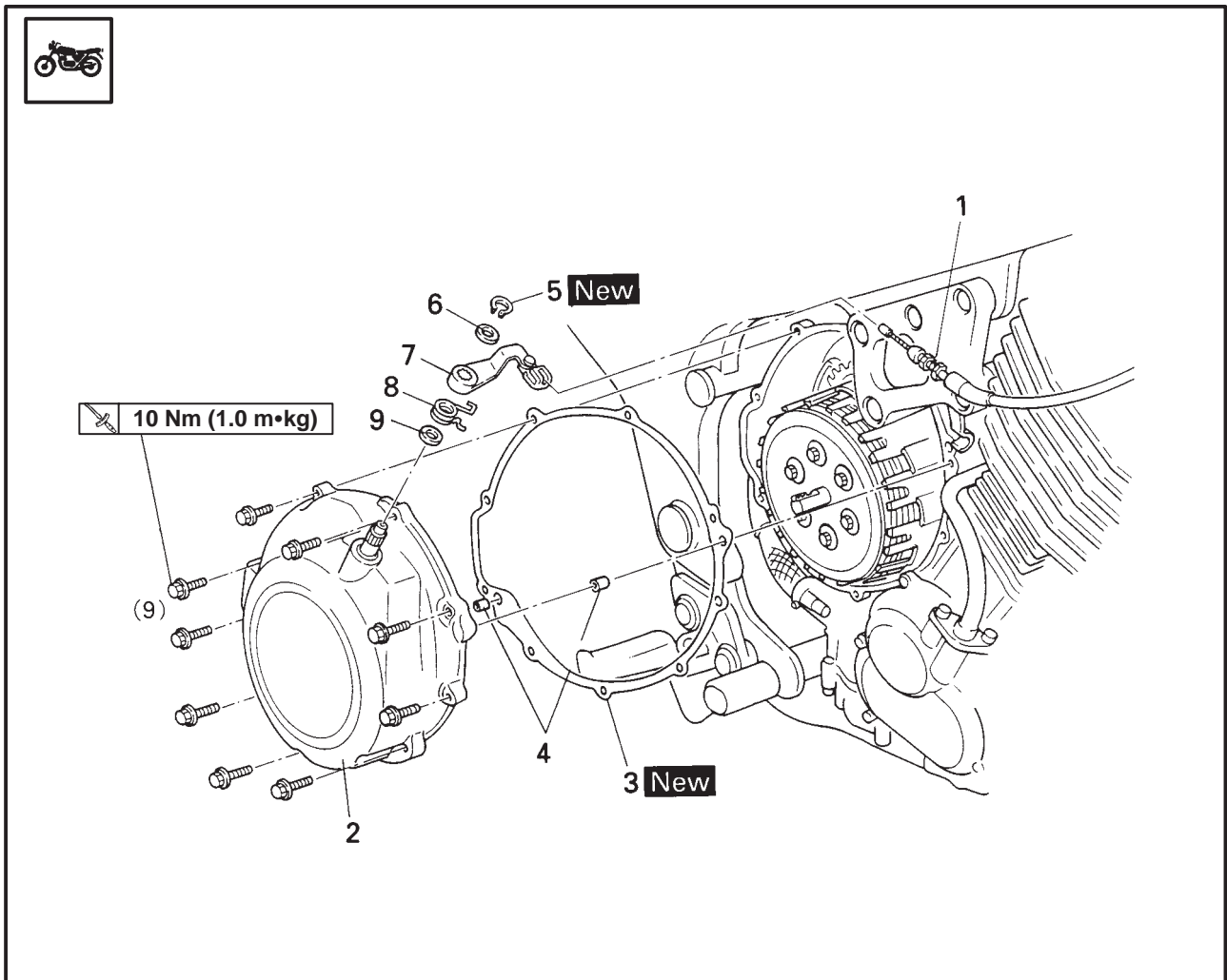
4. Install:
- Dowel pins
 - O-rings **New**
 - Cylinder gasket **New**
 - Cylinder

NOTE:

- Install the cylinder with one hand while compressing the piston rings with the other hand.
- Pass the timing chain and timing chain guide (intake) through the timing chain cavity.



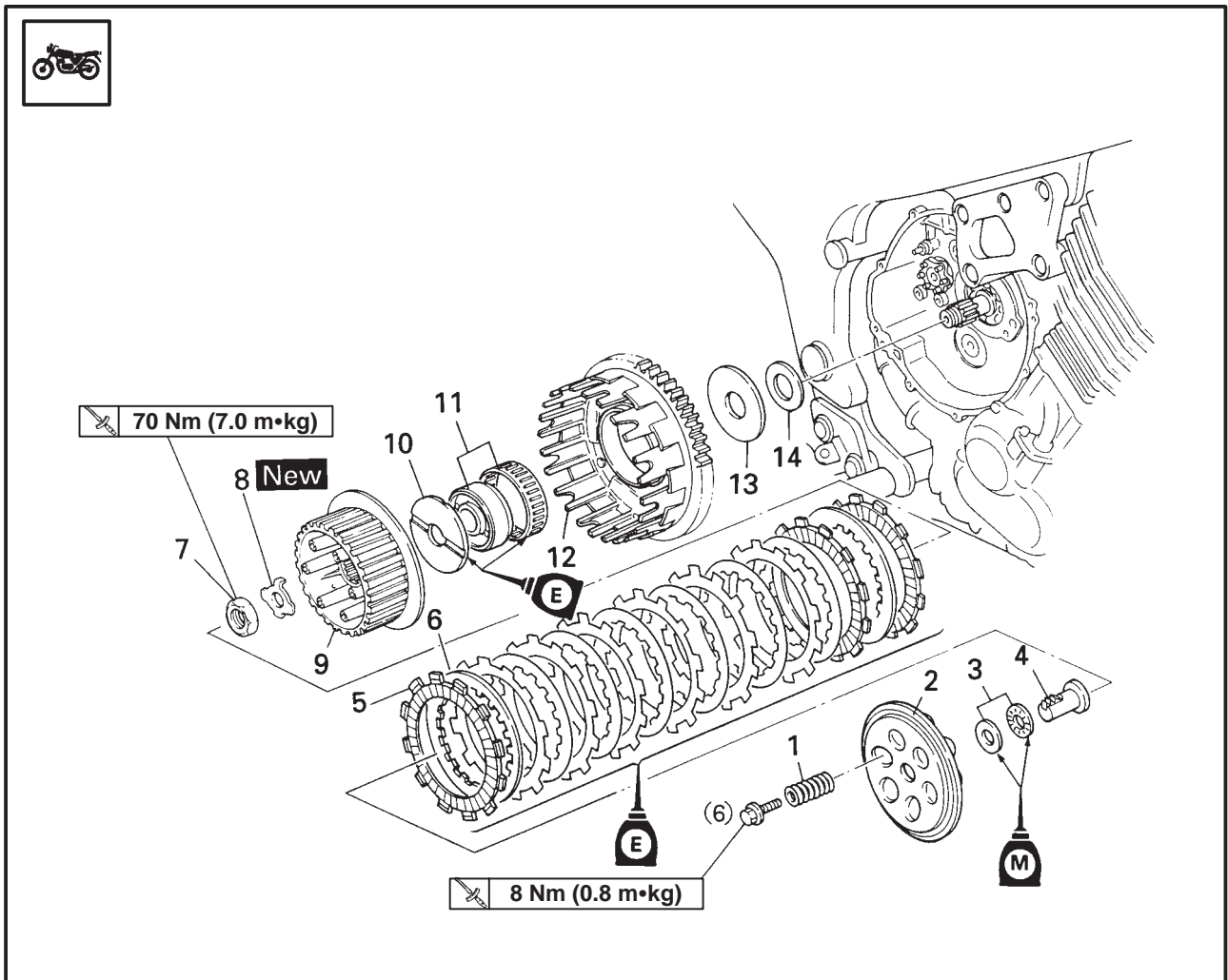
CLUTCH
CRANKCASE COVER (RIGHT)



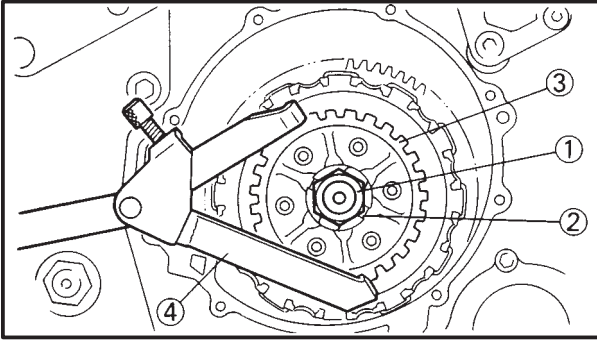
Order	Job name/Part name	Q'ty	Remarks
	Crankcase cover (right) removal Engine oil		Remove the parts in the order below. Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.
1	Clutch cable	1	NOTE: _____ Loosen the bolts in a crisscross pattern. _____ For installation, reverse the removal procedure.
2	Crankcase cover (right)	1	
3	Gasket	1	
4	Dowel pin	2	
5	Circlip	1	
6	Plain washer	1	
7	Pull lever	1	
8	Torsion spring	1	
9	Plain washer	1	



CLUTCH



Order	Job name/Part name	Q'ty	Remarks
	Clutch removal		Remove the parts in the order below.
1	Clutch spring	6	Refer to "REMOVAL", and "INSTALLATION".
2	Pressure plate	1	
3	Plain washer/Bearing	1/1	
4	Pull rod	1	
5	Friction plate	9	
6	Clutch plate	8	
7	Clutch boss nut	1	
8	Lock washer	1	
9	Clutch boss	1	
10	Thrust plate	1	
11	Spacer/Bearing	1/1	
12	Clutch housing	1	
13	Thrust plate 2	1	
14	Thrust plate 1	1	
			For installation, reverse the removal procedure.



REMOVAL

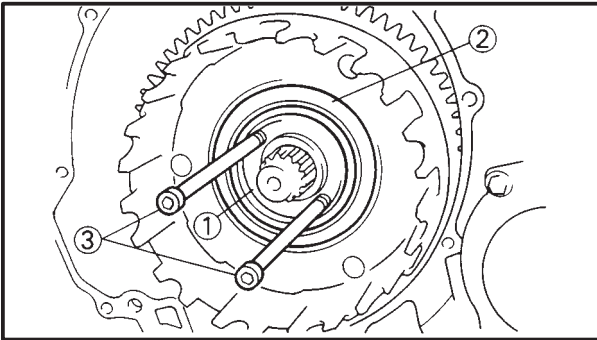
1. Straighten the lock washer tab.
2. Remove:
 - Clutch boss nut ①
 - Lock washer ②
 - Clutch boss ③

NOTE:

Loosen the clutch boss nut ① while holding the clutch boss ③ with the universal clutch holder.



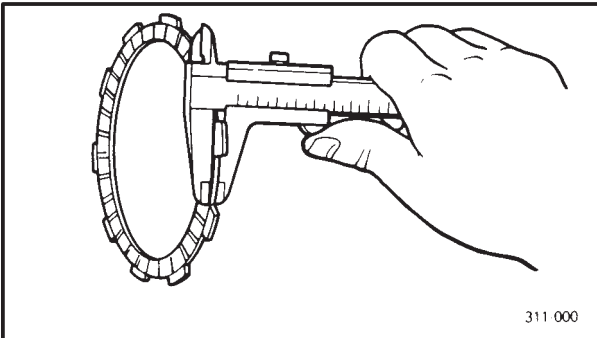
Universal clutch holder:
90890-04086



3. Remove:
 - Spacer ①
 - Bearing ②

NOTE:

Install 6 mm bolts ③ onto the spacer. Then remove the spacer by pulling.



311 000

INSPECTION

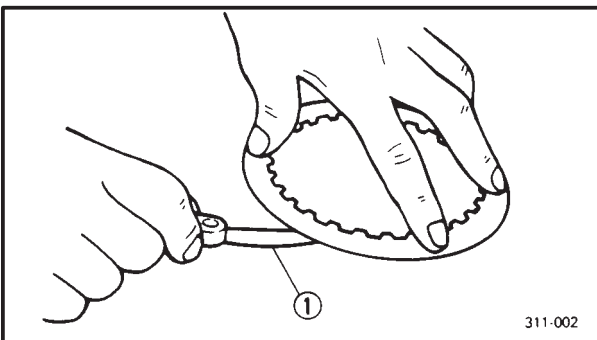
1. Measure:
 - Friction plate thickness

Out of specification → Replace friction plates as a set.

Measure at four points.



Thickness:
2.9 ~ 3.1 mm
<Limit>: 2.8 mm



311 002

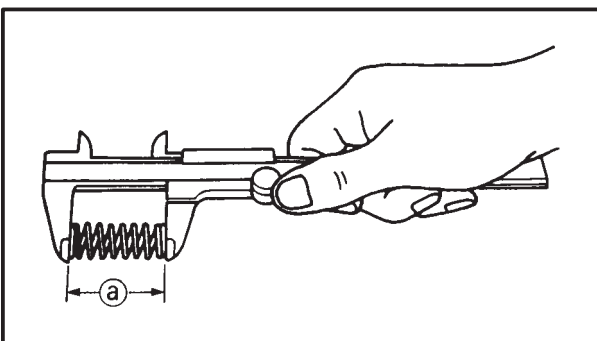
2. Measure:
 - Clutch plate warpage

Out of specification → Replace clutch plate as a set.

Use a surface plate and feeler gauge ①.



Warp limit:
Less than 0.1 mm

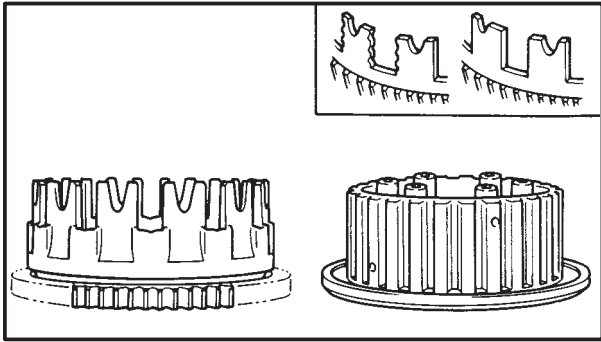


3. Measure:
 - Free length (clutch spring) ②

Out of specification → Replace springs as a set.



Free length (clutch spring):
55 mm
<Limit>: 53 mm



4. Inspect:

- Dogs
(on the clutch housing)
Pitting/Wear/Damage → Deburr or replace.
- Clutch housing bearing
Wear/Damage → Replace clutch housing.

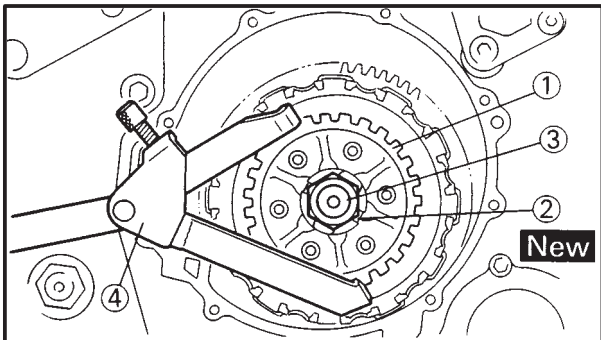
NOTE:

Pitting on the clutch housing dogs will cause erratic operation.

- Clutch boss splines
Pitting/Wear/Damage → Replace clutch boss.

NOTE:

Pitting on the clutch boss splines will cause erratic operation.



INSTALLATION

1. Install:

- Clutch boss ①
- Lock washer ② **New**
- Clutch boss nut ③

70 Nm (7.0 m•kg)

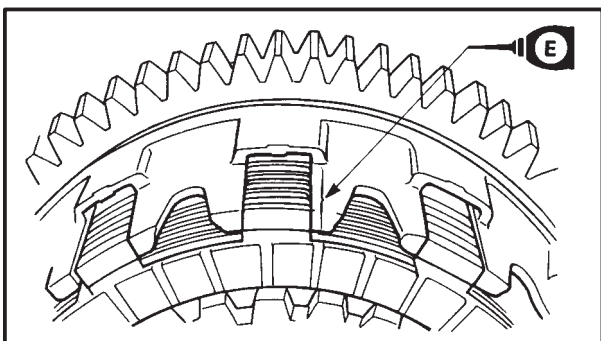
NOTE:

Tighten the clutch boss nut while holding the clutch boss with the universal clutch holder ④.



**Universal clutch holder:
90890-04086**

- #### 2. Bend the lock washer tab along a flat side of the nut.

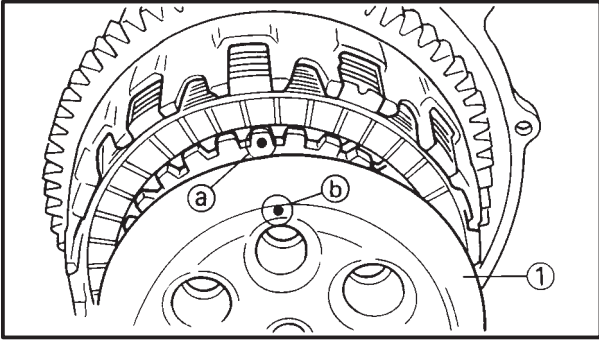


3. Install:

- Friction plates
- Clutch plates

NOTE:

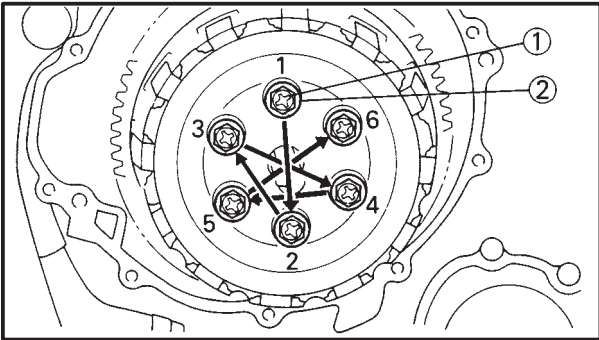
- Mount friction and clutch plate alternately.
- Lubricate the friction plates with engine oil.



4. Install:
- Pressure plate

NOTE:

Align the punched mark (a) on the clutch boss with the punched mark (b) on the pressure plate.

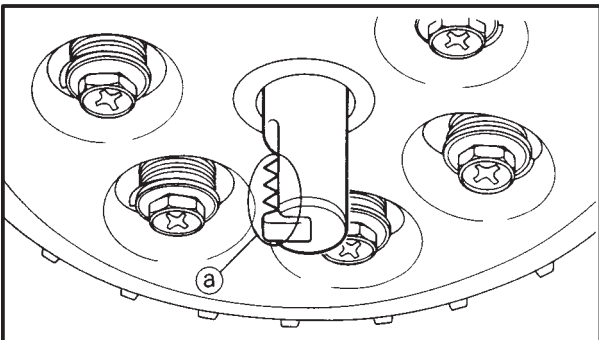


5. Install:
- Clutch springs (1)
 - Clutch spring bolts (2)

8 Nm (0.8 m•kg)

NOTE:

Tighten the clutch spring bolts in stage, using a crisscross pattern.

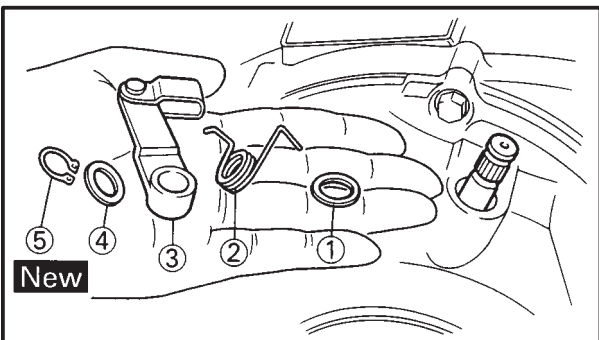


6. Install:
- Dowel pins
 - Gasket **New**
 - Crankcase cover (right)

10 Nm (1.0 m•kg)

NOTE:

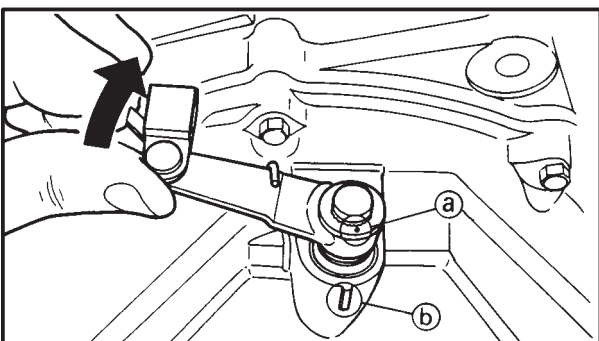
Install the pull rod so that the splines (a) are toward the back, then install the crankcase cover (right).



7. Install:
- Plain washer (1)
 - Torsion spring (2)
 - Pull lever (3)
 - Plain washer (4)
 - Circlip (5) **New**

NOTE:

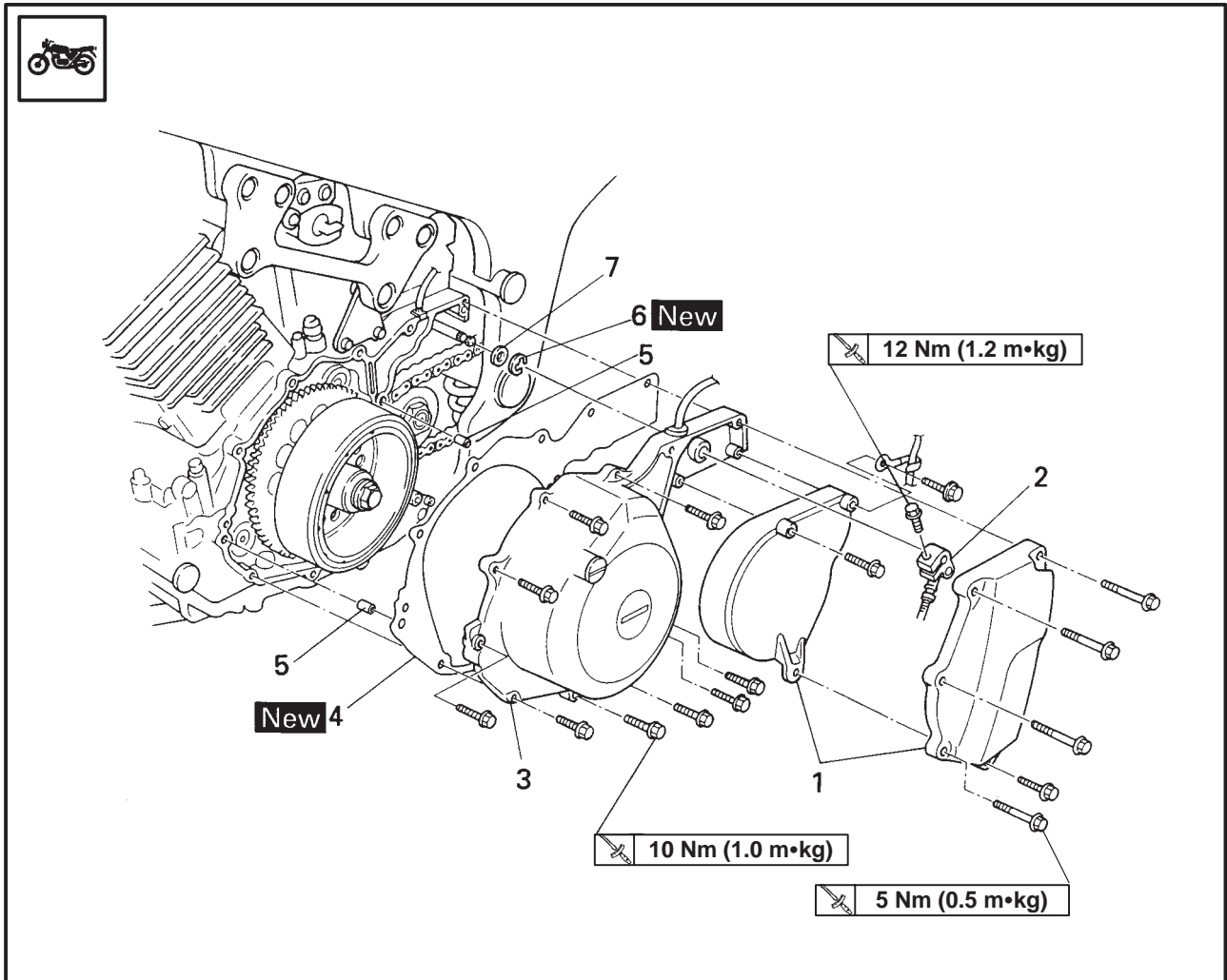
Align the punched mark (a) on the clutch pull lever shaft with the mark (b) on the crankcase cover.



CRANKCASE COVER (LEFT)

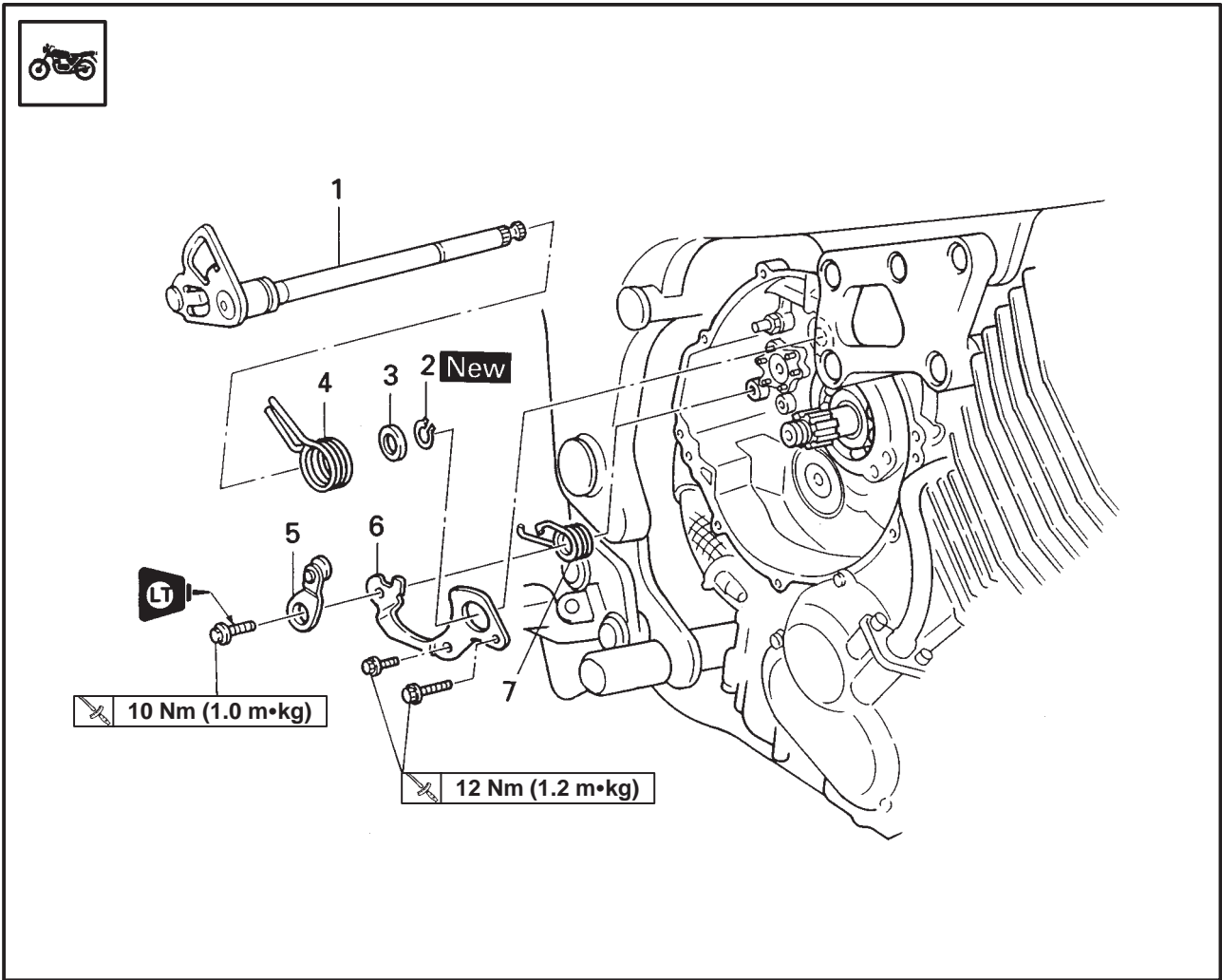


CRANKCASE COVER (LEFT)

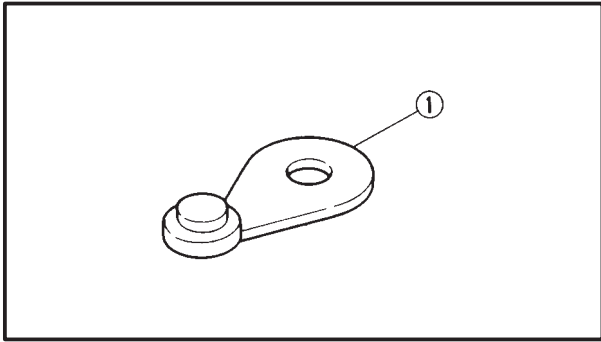


Order	Job name/Part name	Q'ty	Remarks
	Crankcase cover (left) removal Engine oil		Remove the parts in the order below. Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.
1	Drive sprocket cover 1/2	1/1	NOTE: _____ Loosen the bolts in a crisscross pattern. _____ For installation, reverse the removal procedure.
2	Shift arm	1	
3	Crankcase cover (left)	1	
4	Gasket	1	
5	Dowel pin	2	
6	Circlip	1	
7	Plain washer	1	

SHIFT SHAFT



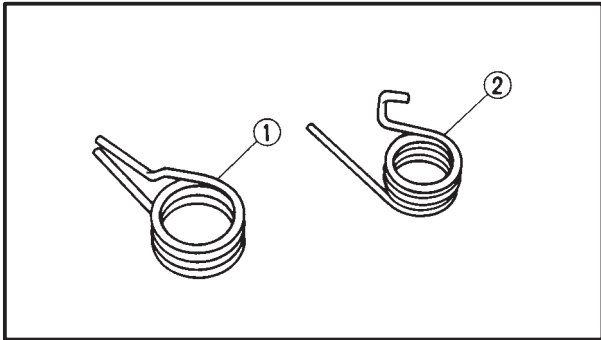
Order	Job name/Part name	Q'ty	Remarks
	Shift shaft removal		Remove the parts in the order below. Refer to "CLUTCH".
	Clutch		Refer to "CRANKCASE COVER (LEFT)".
1	Shift shaft	1	Refer to "INSTALLATION".
2	Circlip	1	
3	Plain washer	1	
4	Torsion spring	1	
5	Stopper level	1	
6	Bearing retainer	1	
7	Torsion spring	1	
			For installation, reverse the removal procedure.



INSPECTION

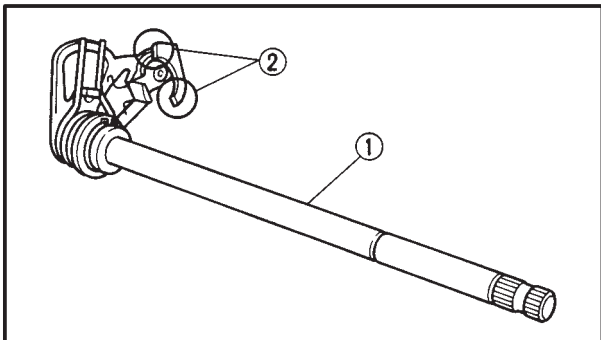
1. Inspect:

- Stopper lever (1)
Roller turns roughly → Replace.
Bends/Damage → Replace.



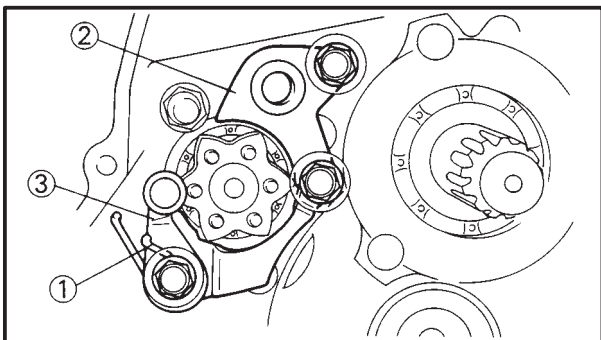
2. Inspect:

- Torsion spring (shift shaft) (1)
- Torsion spring (stopper lever) (2)
Wear/Damage → Replace.



3. Inspect:

- Shift shaft (1)
- Shift pawls (2)
Bends/Wear/Damage → Replace.



INSTALLATION

1. Install:

- Return spring (1)
- Bearing retainer (2)
- Stopper lever (3)

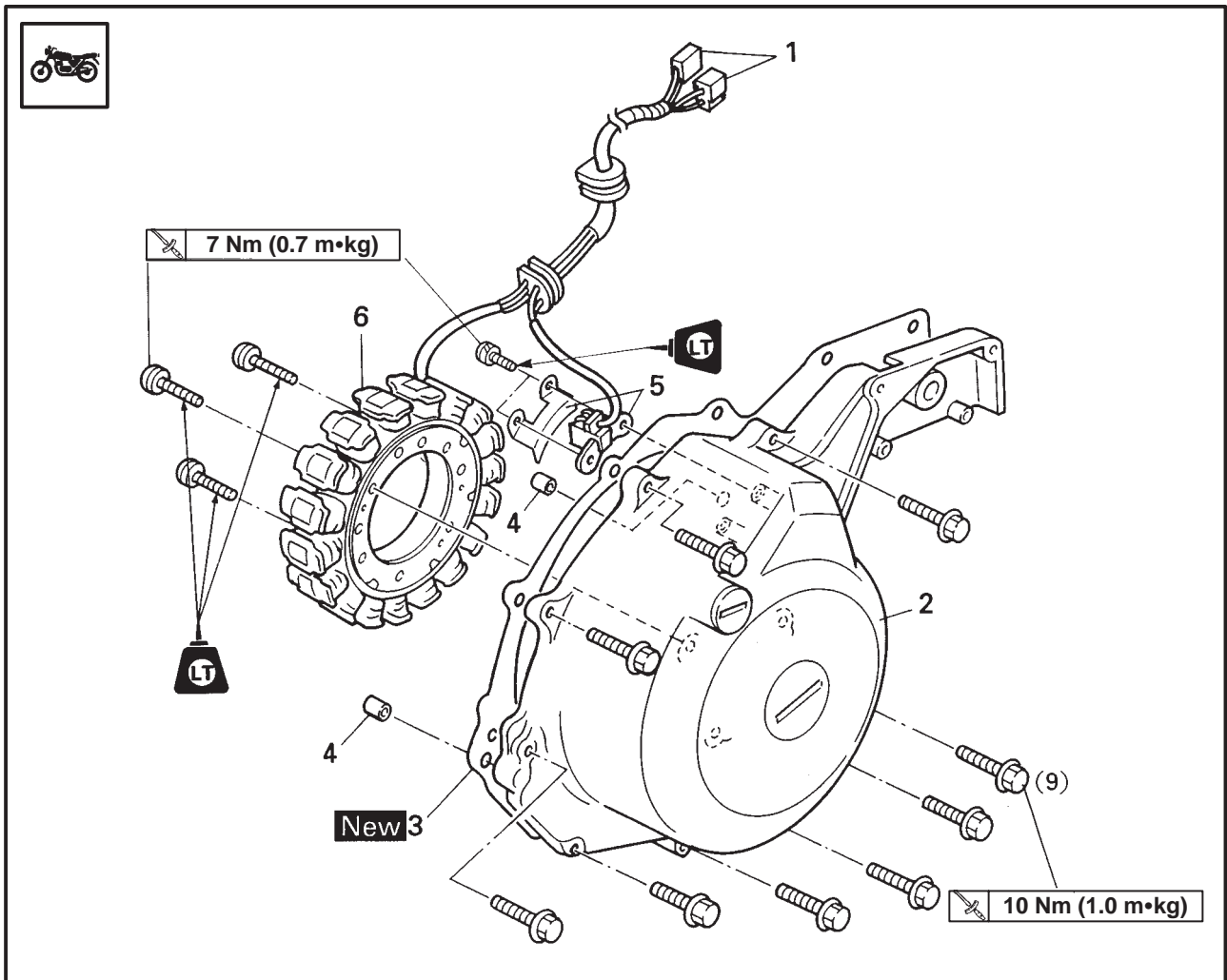
	12 Nm (1.2 m•kg)
	10 Nm (1.0 m•kg)

NOTE:

Be sure the stopper lever roller fits into the shift cam segment.



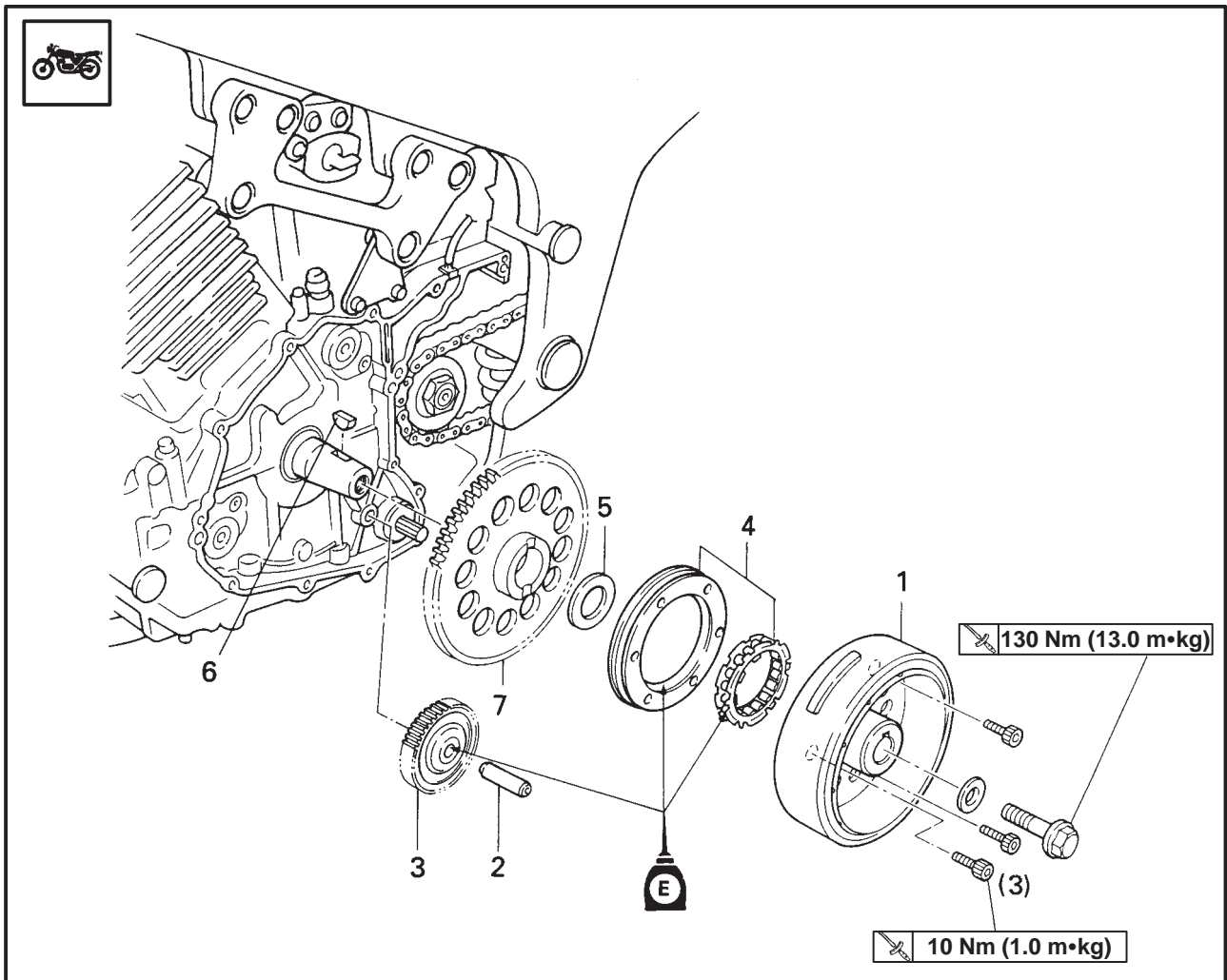
A.C. MAGNETO AND STARTER WHEEL GEAR STATOR COIL



Order	Job name/Part name	Q'ty	Remarks
	Stator coil removal		
	Engine oil		Remove the parts in the order below. Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.
	Crankcase cover (left)		Refer to "CRANKCASE COVER (LEFT)".
1	Stator coil lead/Pickup coil lead	1/1	
2	Crankcase cover (left)	1	
3	Gasket	1	
4	Dowel pin	2	
5	Clamp/Pickup coil	1/1	
6	Stator coil	1	
			For installation, reverse the removal procedure.



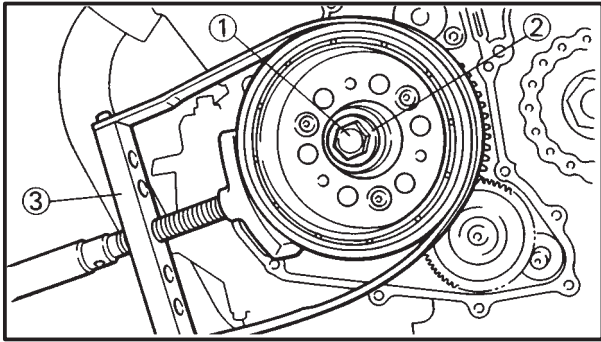
A.C. MAGNETO AND STARTER WHEEL GEAR



Order	Job name/Part name	Q'ty	Remarks
	A.C. magneto and starter wheel gear removal		Remove the parts in the order below.
1	Rotor	1	Refer to "REMOVAL" and "INSTALLATION".
2	Shaft	1	
3	Starter idle gear	1	
4	Starter clutch	1	
	NOTE:		After reassembling the starter clutch stake the top of the bolts.
5	Plate washer	1	
6	Woodruff key	1	
7	Starter wheel gear	1	
			For installation, reverse the removal procedure.

A.C. MAGNETO AND STARTER WHEEL GEAR

ENG



REMOVAL

- Remove:
 - Bolt (rotor) ①
 - Washer ②

NOTE:

- Loosen the bolt (rotor) ① while holding the magneto with the sheave holder ③.
- Do not allow the sheave holder ③ to touch the projection on the rotor.

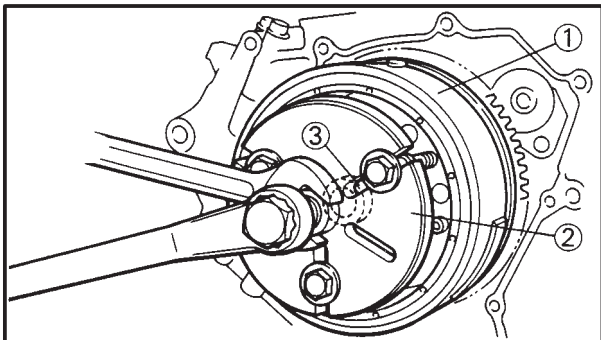


Sheave holder:
90890-01701

- Remove:
 - A.C. magneto ①

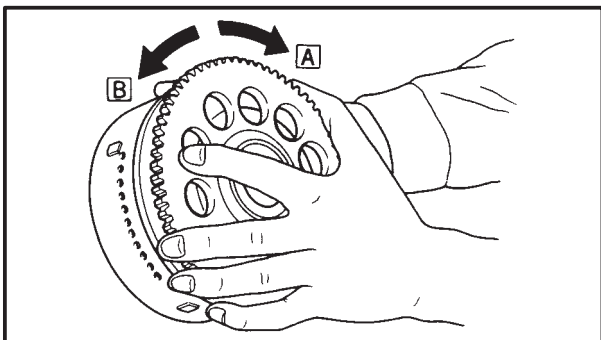
NOTE:

- Remove the rotor ① using the rotor puller ② and crankshaft protector ③.
- Fully tighten the tool holding bolts, but make sure the tool body is parallel with the magneto. If necessary, one screw may be backed out slightly to level tool body.



Flywheel puller:
90890-01362

Crankshaft protector:
90890-01382



INSPECTION

- Check:
 - Starter clutch operation



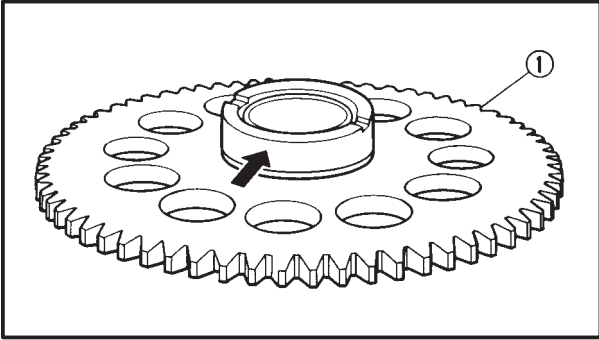
Clutch operation checking steps:

- Install the starter wheel gear to the starter clutch, and hold the starter clutch.
- When turning the starter wheel gear clockwise [A], the starter clutch and the wheel gear should be engaged.
If not, the starter clutch is faulty. Replace it.
- When turning the starter wheel gear counter-clockwise [B], the starter wheel gear should turn freely.
If not, the starter clutch is faulty. Replace it.



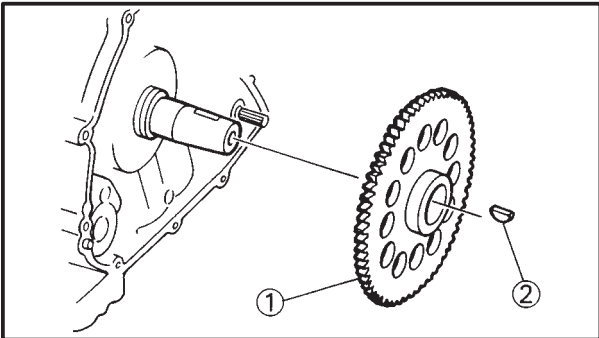
A.C. MAGNETO AND STARTER WHEEL GEAR

ENG



2. Inspect:

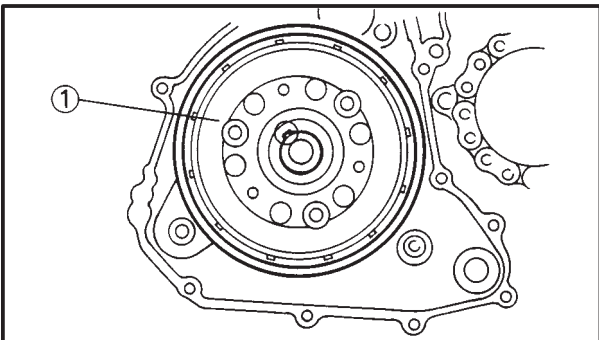
- Starter wheel gear ①
(contacting surfaces)
Pitting/Wear/Damage → Replace.



INSTALLATION

1. Install:

- Starter wheel gear ①
- Woodruff key ②

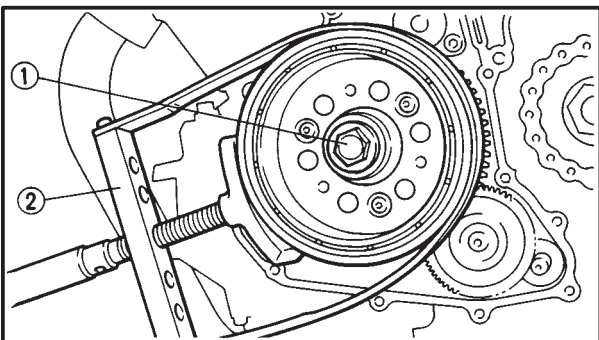


2. Install:

- Plate washer
- Rotor ①
- Washer

NOTE:

- Clean the tapered portions of the crankshaft and rotor.
- When installing the magneto, make sure the woodruff key is properly seated in the key way of the crankshaft.



3. Install:

- Bolt (rotor) ①

130 Nm (13.0m•kg)

NOTE:

- Tighten the bolt (rotor) ① while holding the magneto with the sheave holder ②.
- Do not allow the sheave holder ② to touch the projection on the rotor.

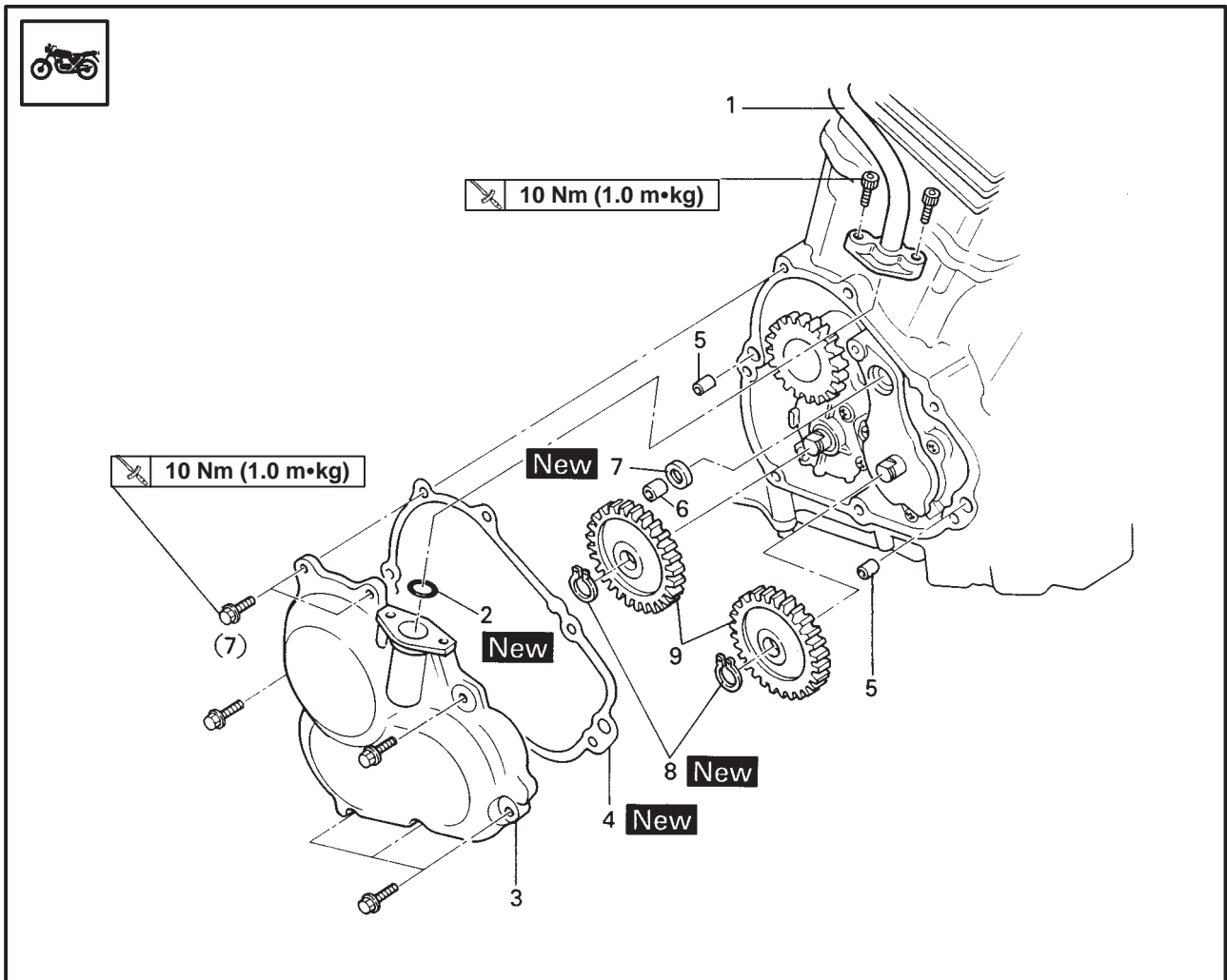


Sheave holder:
90890-01701



OIL PUMP

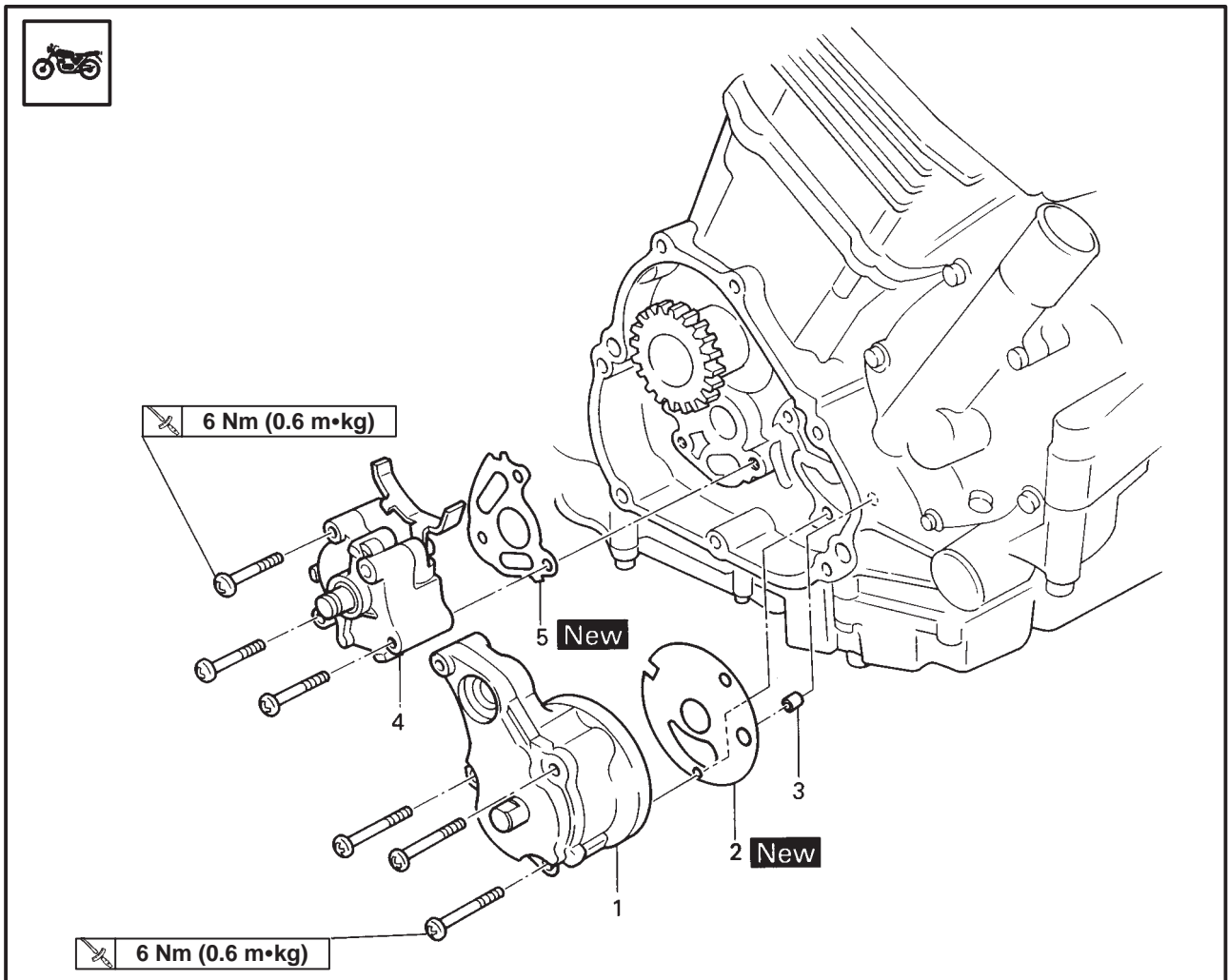
OIL PUMP COVER AND OIL PUMP DRIVEN GEARS



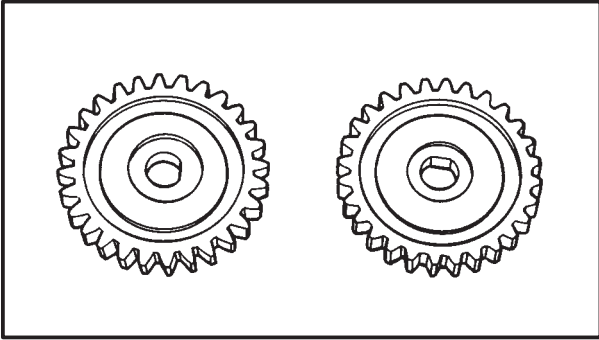
Order	Job name/Part name	Q'ty	Remarks
	Oil pump cover and oil pump driven gear removal Engine oil	1	Remove the parts in the order below. Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.
1	Oil pipe	1	
2	O-ring	1	
3	Oil pump cover	1	
4	Gasket	2	
5	Dowel pin	1	
6	Collar	1	
7	Gasket	2	
8	Circlip	2	
9	Oil pump driven gear		For installation, reverse the removal procedure.



OIL PUMP



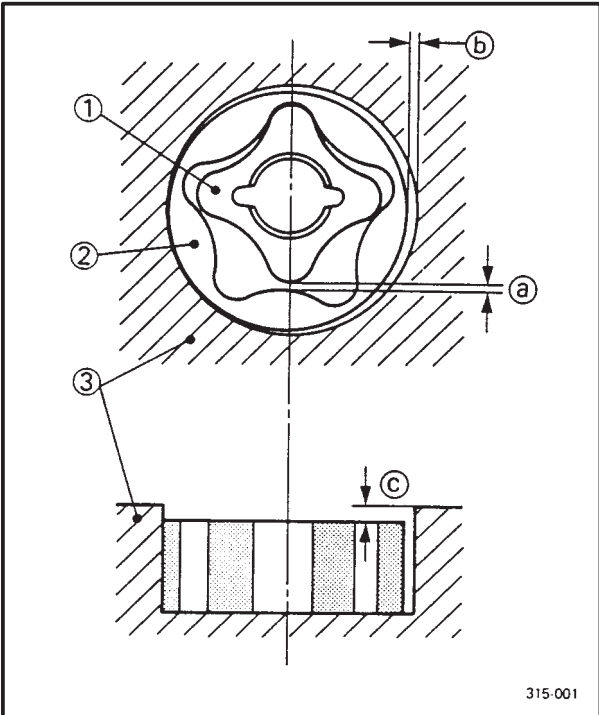
Order	Job name/Part name	Q'ty	Remarks
	Oil pump removal		
1	Oil pump assembly 1 (For pumping oil to the oil tank)	1	Remove the parts in the order below.
2	Gasket	1	
3	Dowel pin	1	
4	Oil pump assembly 2 (For lubricating the engine parts)	1	
5	Gasket	1	
			For installation, reverse the removal procedure.



INSPECTION

1. Inspect:

- Oil pump driven gears
- Wear/Cracks/Damage → Replace.



2. Measure:

- Tip clearance (a)
(between the inner rotor (1) and the outer rotor (2))
- Side clearance (b)
(between the outer rotor (2) and the pump housing (3))
(between the inner rotor (1)/outer rotor (2) and the pump housing (3))
- Side clearance (c)
Out of specification → Replace the oil pump assembly.



Tip clearance (a):

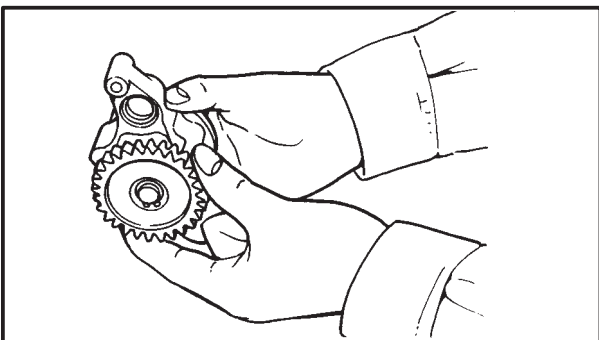
0 ~ 0.12 mm

Side clearance (b):

0.03 ~ 0.08 mm

Side clearance (c):

0.03 ~ 0.08 mm

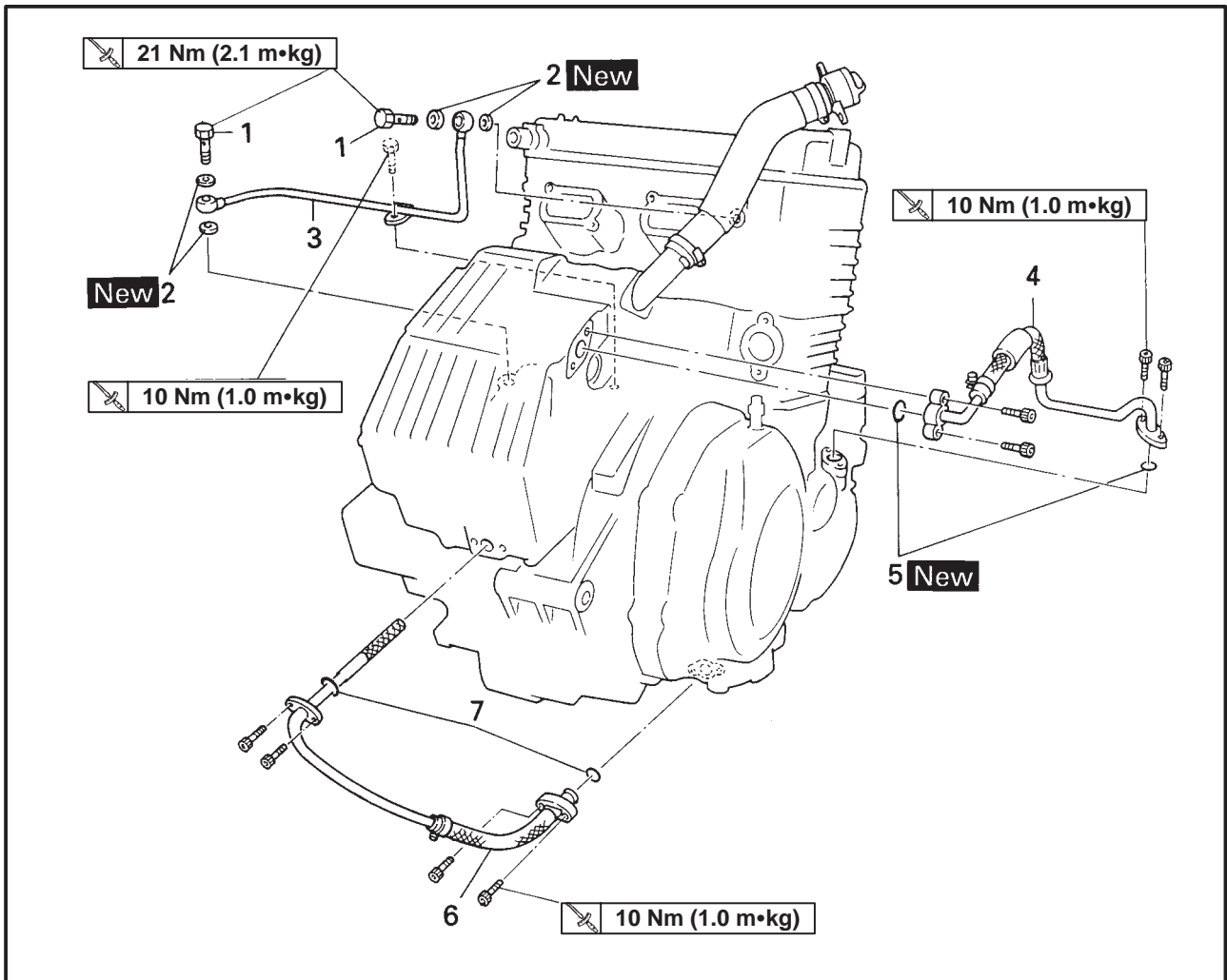


3. Check:

- Oil pump operation
- Unsmooth → Repeat steps 1 and 2 or replace defective parts.



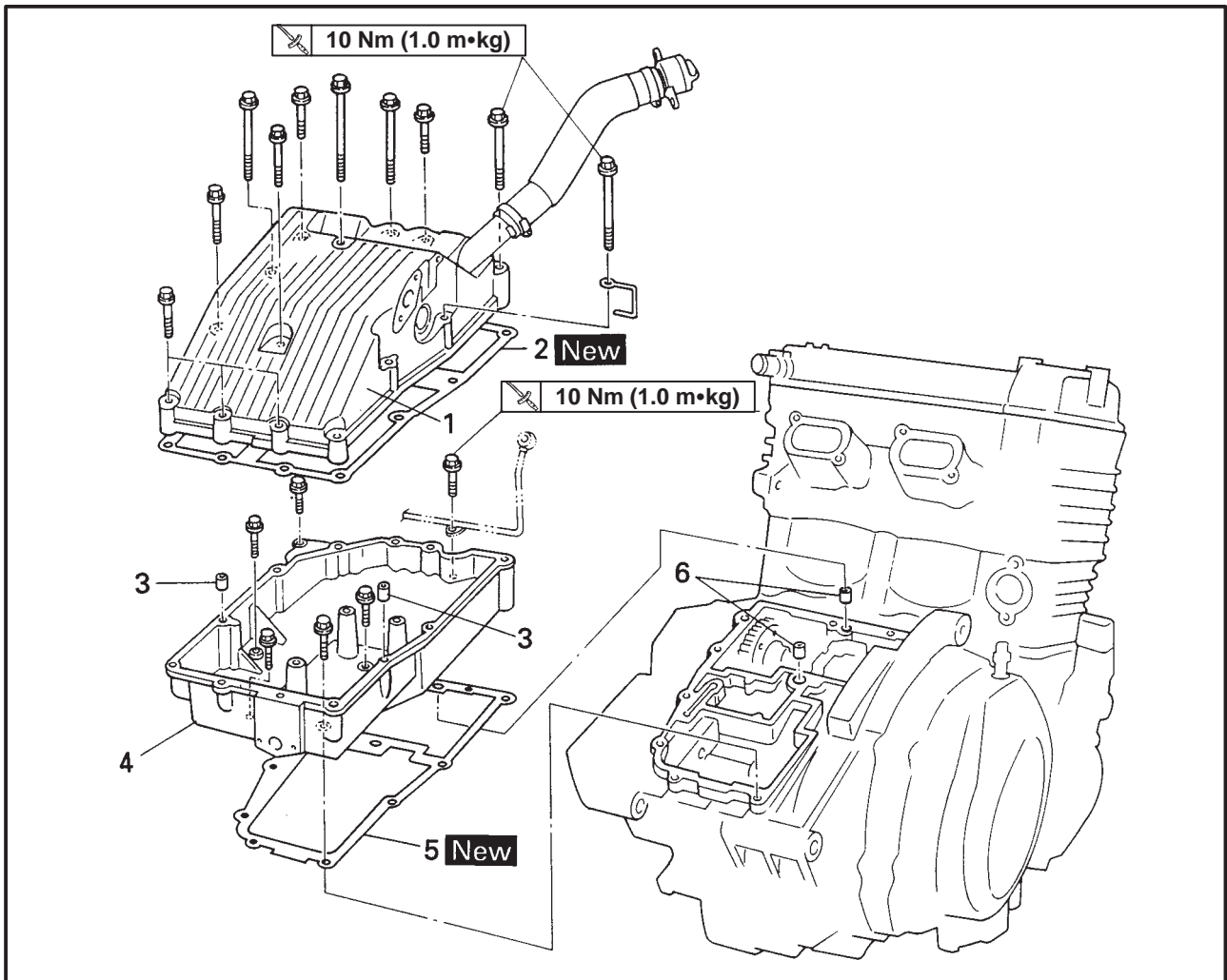
OIL TANK
OIL HOSE



Order	Job name/Part name	Q'ty	Remarks
	Oil hose removal		Remove the parts in the order below. Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3. Refer to "ENGINE ASSEMBLY". For installation, reverse the removal procedure.
	Engine oil		
	Engine		
1	Union bolt	2	
2	Copper washer	4	
3	Oil delivery pipe	1	
4	Oil hose	1	
5	O-ring	2	
6	Oil pipe	1	
7	O-ring	2	



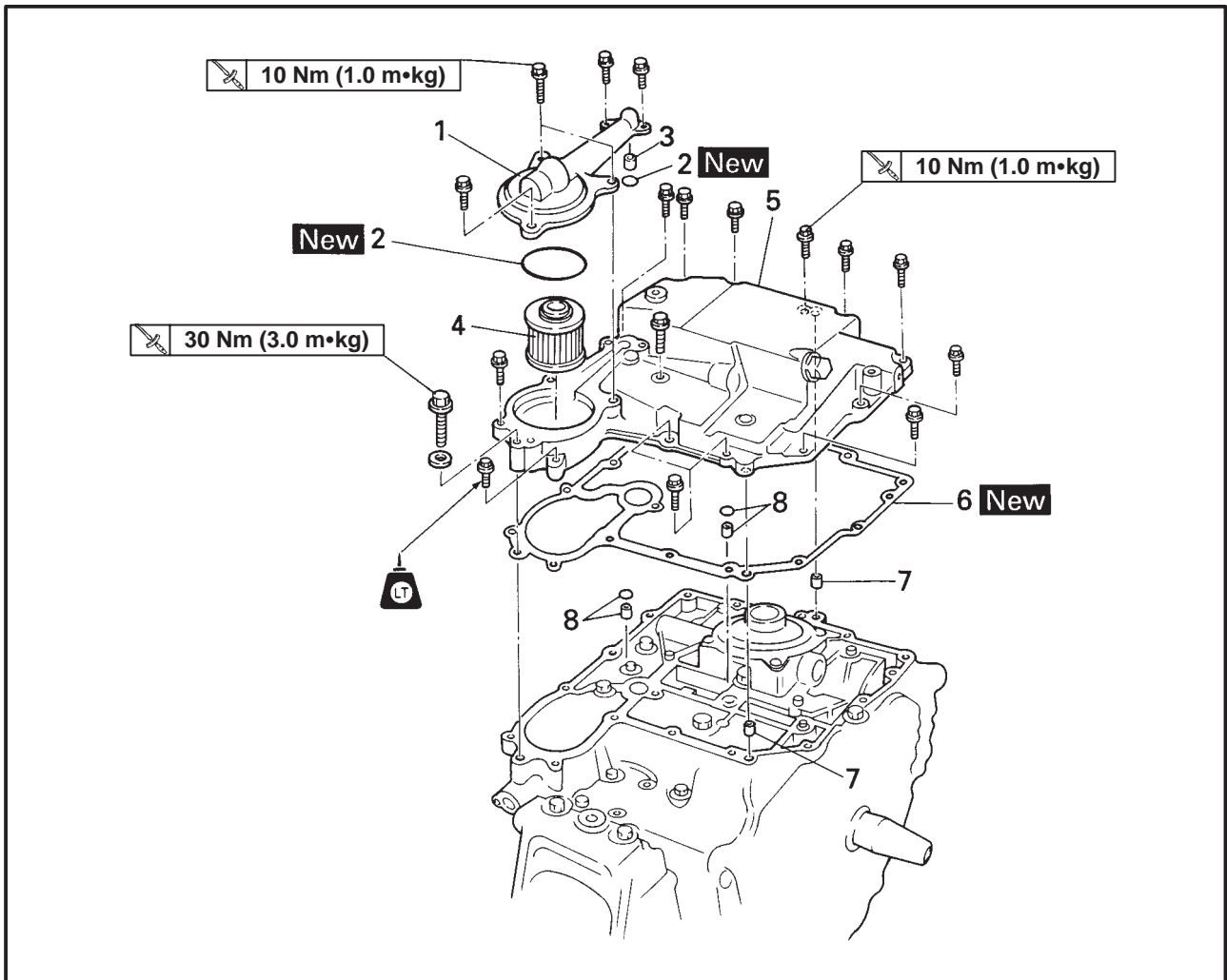
OIL TANK



Order	Job name/Part name	Q'ty	Remarks
	Oil tank removal		Remove the parts in the order below. Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3. Refer to "ENGINE ASSEMBLY". For installation, reverse the removal procedure.
	Engine oil		
	Engine		
1	Oil tank case (upper)	1	
2	Gasket	1	
3	Dowel pin	2	
4	Oil tank case (lower)	1	
5	Gasket	2	
6	Dowel pin	2	



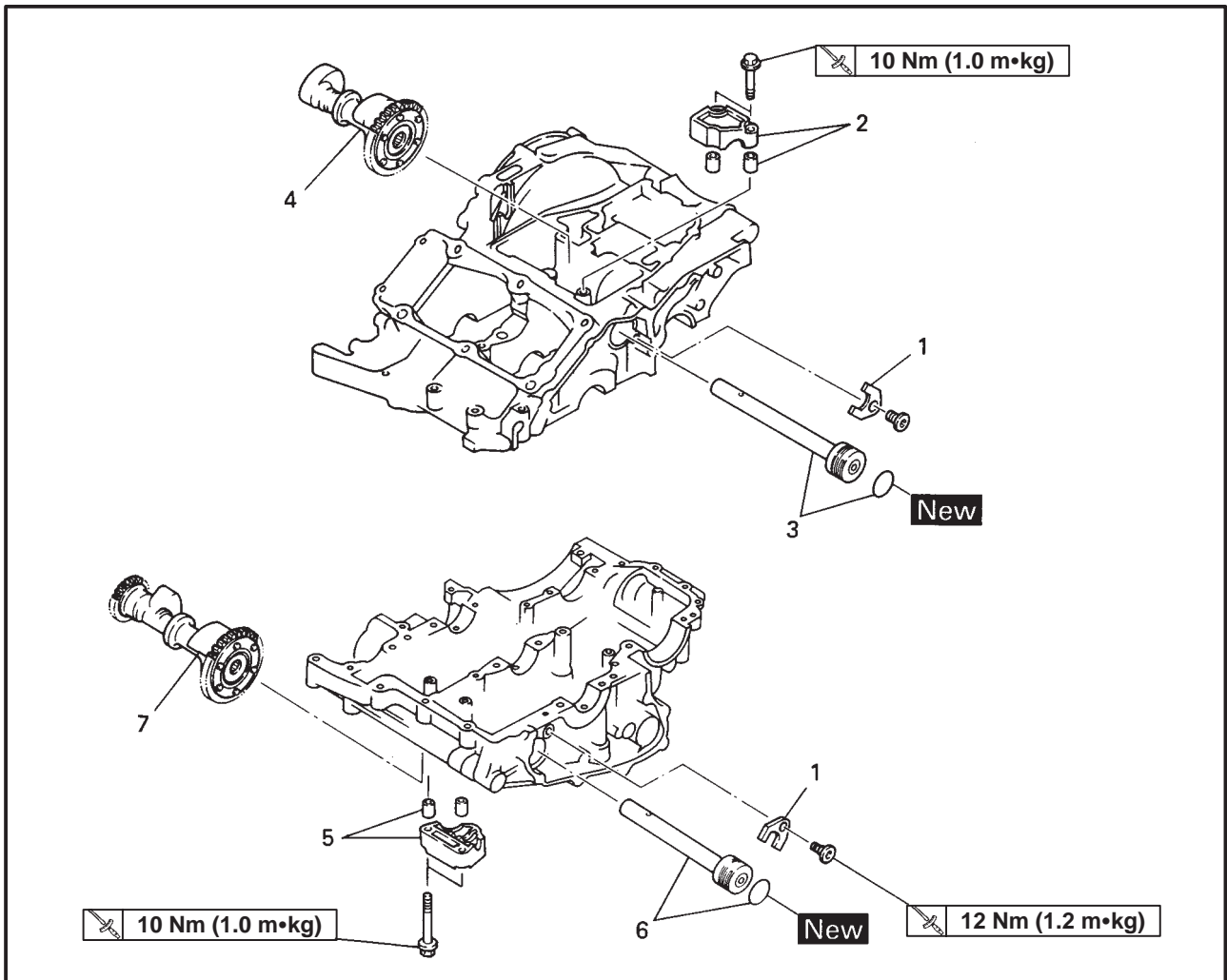
OIL PAN
OIL PAN



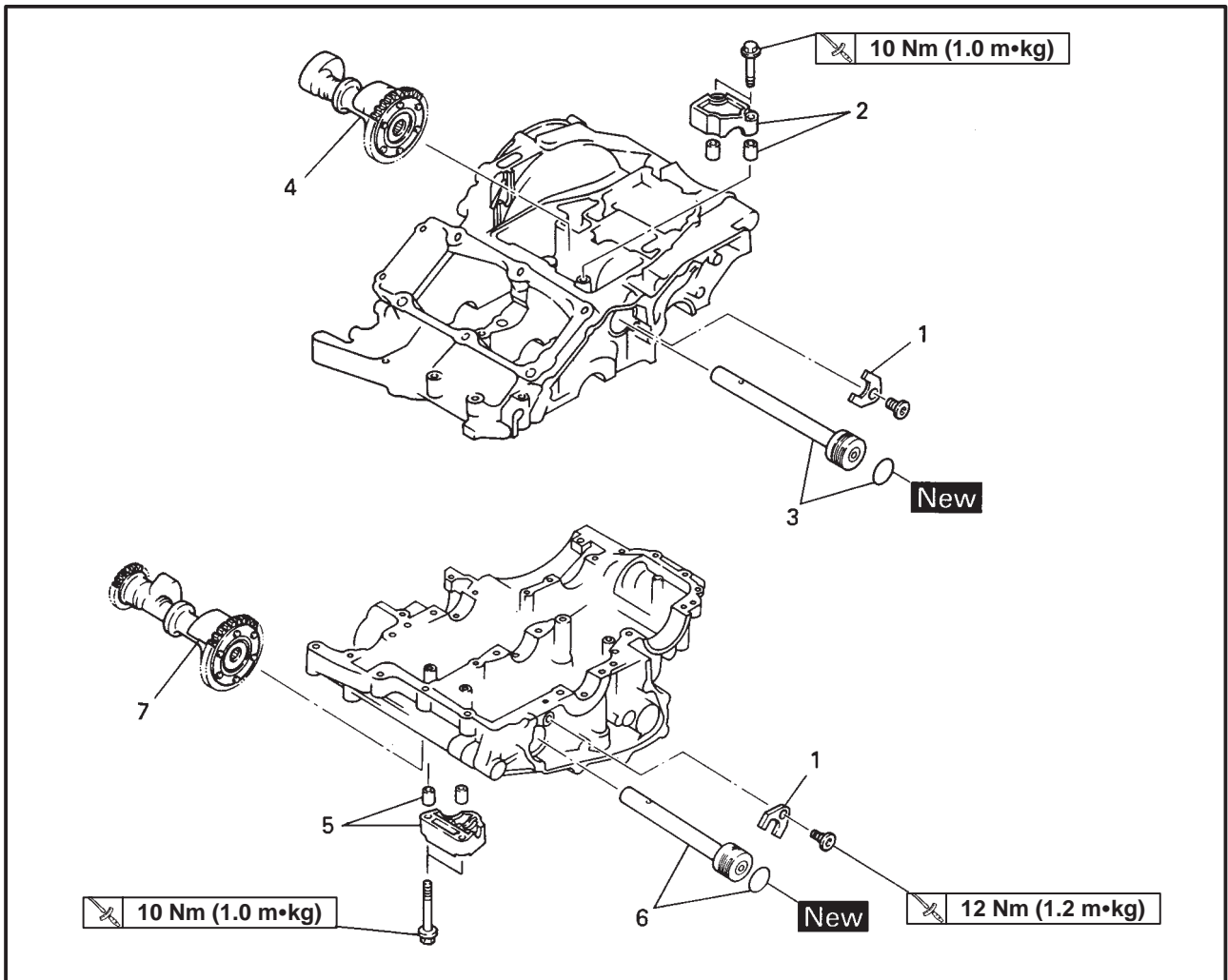
Order	Job name/Part name	Q'ty	Remarks
	Oil pan removal		Remove the parts in the order below. Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3. Refer to "ENGINE ASSEMBLY". Refer to "OIL TANK". NOTE: _____ Install the oil filter with the projection towards the oil filter cover. _____ For installation, reverse the removal procedure.
	Engine oil		
	Engine		
	Oil hose		
1	Oil filter cover	1	
2	O-ring	2	
3	Collar	1	
4	Oil filter	1	
5	Oil pan	1	
6	Gasket	1	
7	Dowel pin	2	
8	O-ring/collar	2/2	



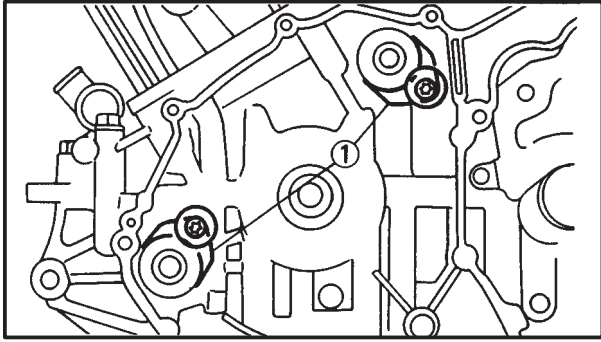
BALANCER



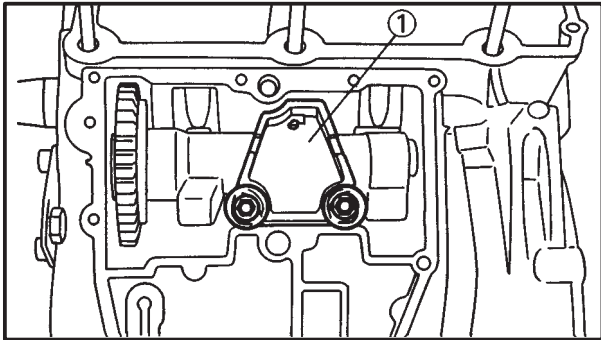
Order	Job name/Part name	Q'ty	Remarks
	Balancer weight removal		Remove the parts in the order below.
	Engine oil		Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.
	Engine		Refer to "ENGINE ASSEMBLY".
	Piston		Refer to "CYLINDER AND PISTON".
	Shift shaft		Refer to "SHIFT SHAFT".
	A.C. magneto		Refer to "A.C. MAGNETO AND STARTER WHEEL GEAR".
	Oil pump assembly		Refer to "OIL PUMP".
	Oil tank		Refer to "OIL TANK".
	Oil pan		Refer to "OIL PAN".
1	Plate	2	
2	Rear balancer holder/Dowel pin	1/2	
3	Rear balancer shaft/O-ring	1/1	Refer to "INSTALLATION".



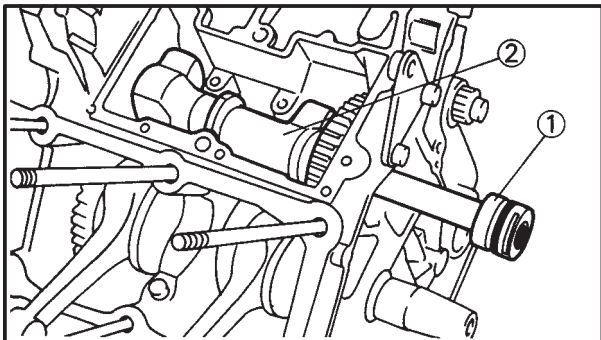
Order	Job name/Part name	Q'ty	Remarks
4	Rear balancer weight	1	Refer to "REMOVAL" and "INSTALLATION". For installation, reverse the removal procedure.
5	Front balancer holder/Dowel pin	1/2	
6	Front balancer shaft/O-ring	1/1	
7	Front balancer weight	1	

**REMOVAL**

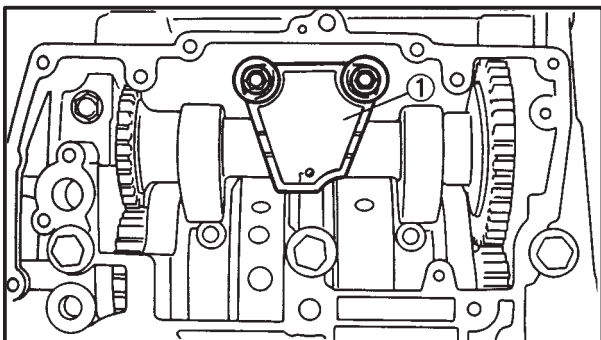
1. Remove:
 - Plate ①



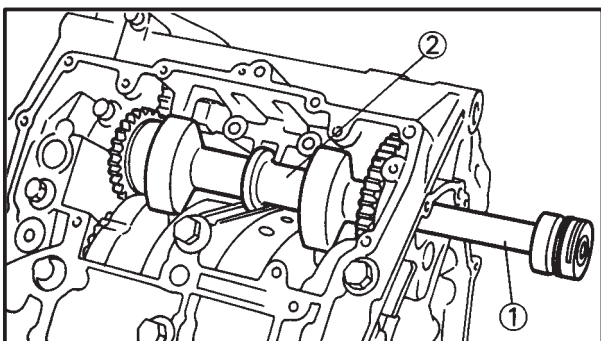
2. Remove:
 - Rear balancer holder ①
 - Dowel pins



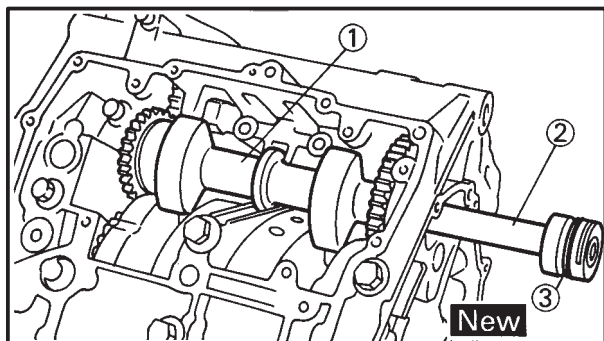
3. Remove:
 - Rear balancer shaft ①
 - Rear balancer weight ②



4. Remove:
 - Front balancer holder ①
 - Dowel pins



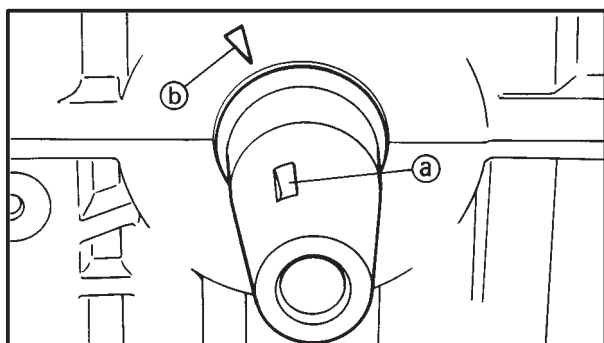
5. Remove:
 - Front balancer shaft ①
 - Front balancer weight ②



INSTALLATION

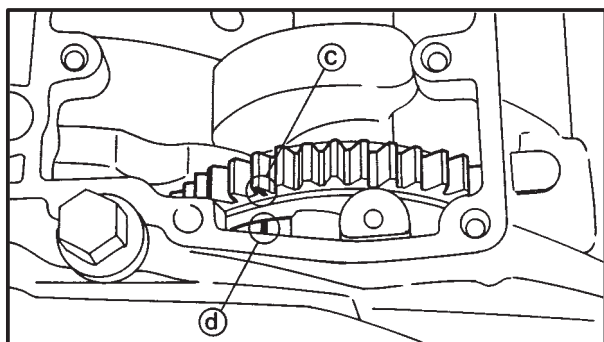
1. Install:
 - Front balancer weight ①
 - Front balancer shaft ②
 - O-ring ③ **New**
 - Plate (balancer shaft)

12 Nm (1.2 m•kg)

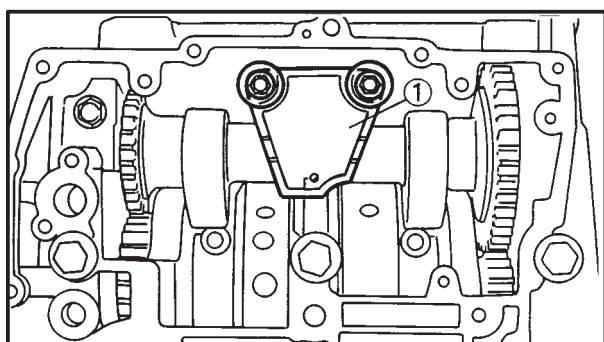


Installation steps:

- Turn the crankshaft until the keyway (a) is aligned with the embossed mark (b) on the crankcase.

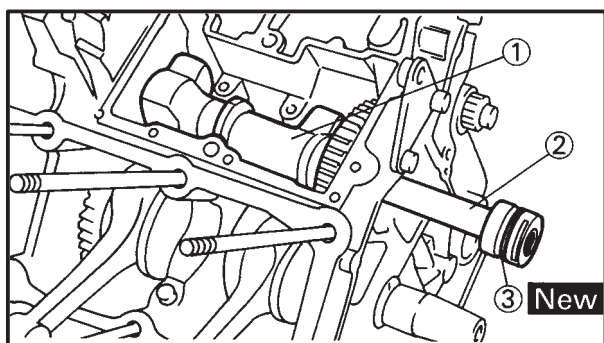


- While holding the crankshaft, install the balancer weight and align the mark (c) on the front balancer gear with the embossed mark (d) on the crankcase.
- Install the front balancer shaft.



2. Install:
 - Dowel pins
 - Front balancer holder ①

10 Nm (1.0 m•kg)

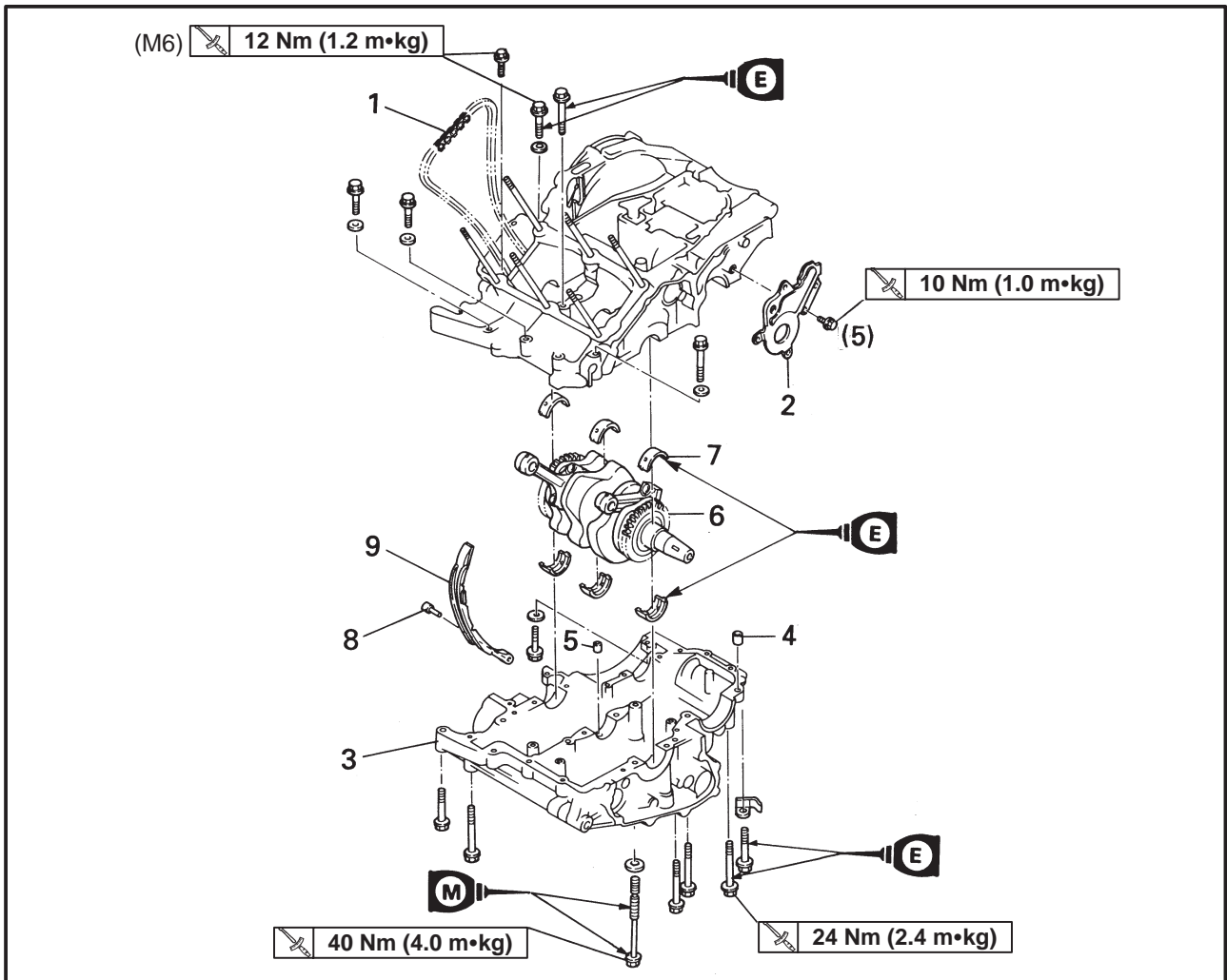


3. Install:
 - Rear balancer weight ①
 - Rear balancer shaft ②
 - O-ring ③ **New**
 - Plate (balancer shaft)

12 Nm (1.2 m•kg)

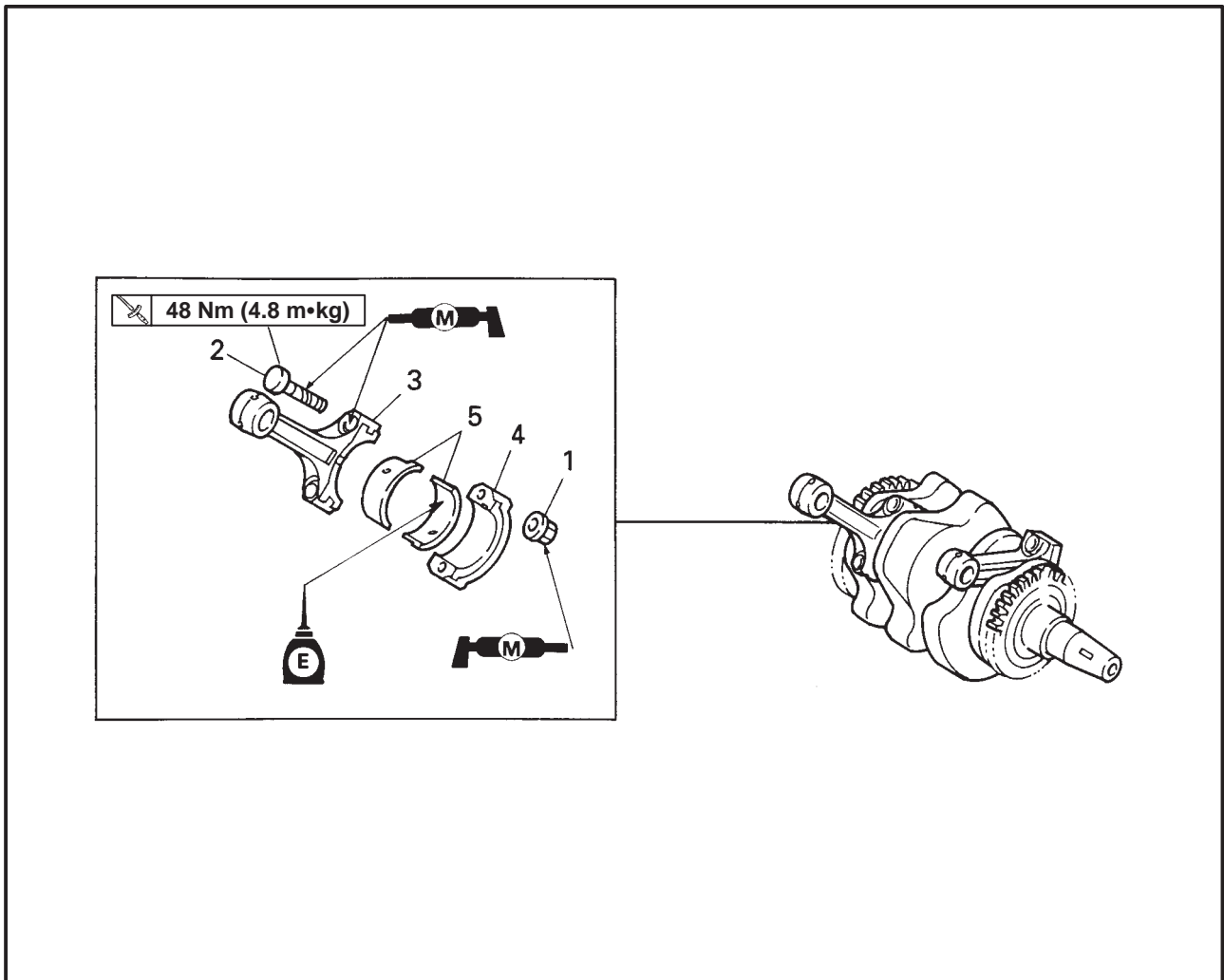


CRANKSHAFT
CRANKSHAFT ASSEMBLY

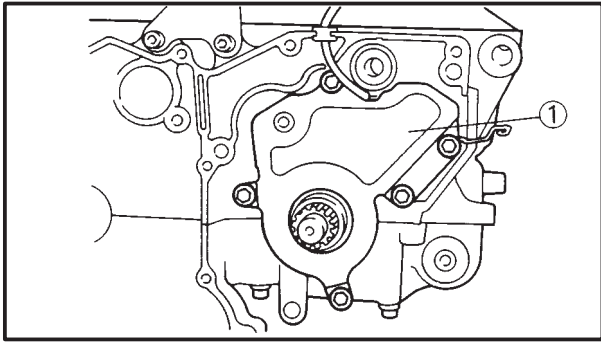


Order	Job name/Part name	Q'ty	Remarks
	Crankshaft removal		Remove the parts in the order below.
	Balancer weight		Refer to "BALANCER".
	Water pump		Refer to "WATER PUMP" in CHAPTER 5.
1	Timing chain	1	Refer to "REMOVAL", and "INSTALLATION". For installation, reverse the removal procedure.
2	Cover plate	1	
3	Lower crankcase	1	
4	Dowel pin	1	
5	Nozzle	1	
6	Crankshaft assembly	1	
7	Main journal bearing	6	
8	Pin	1	
9	Timing chain guide (intake)	1	

CONNECTING ROD

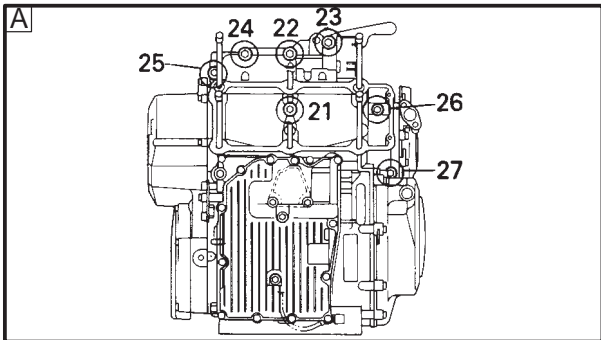


Order	Job name/Part name	Q'ty	Remarks
	Connecting rod removal		Remove the parts in the order below.
1	Nut	4	Refer to "REMOVAL", and "INSTALLATION".
2	Connecting rod bolt	4	
3	Connecting rod	2	
4	Connecting rod cap	2	
5	Connecting rod bearing	4	
			For installation, reverse the removal procedure.



REMOVAL

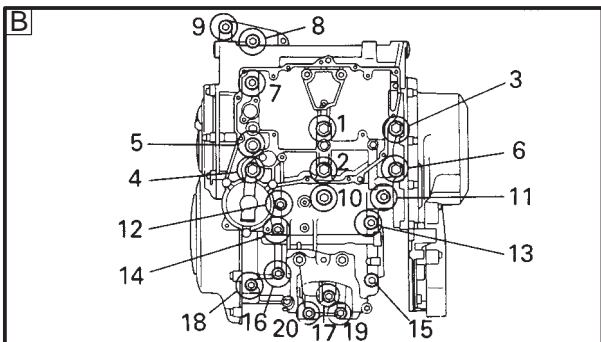
1. Remove:
 - Cover plate ①



2. Remove:
 - Upper crankcase
 - Lower crankcase
 - Dowel pins

NOTE:

- Loosen the bolts 1/4 turn each and remove them after all are loosened.
- Remove the bolts starting with the highest numbered one.
- The embossed numbers in the crankcase designate the crankcase tightening sequence.

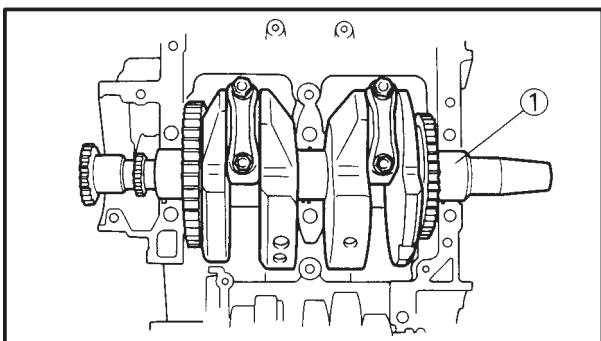


A Upper crankcase

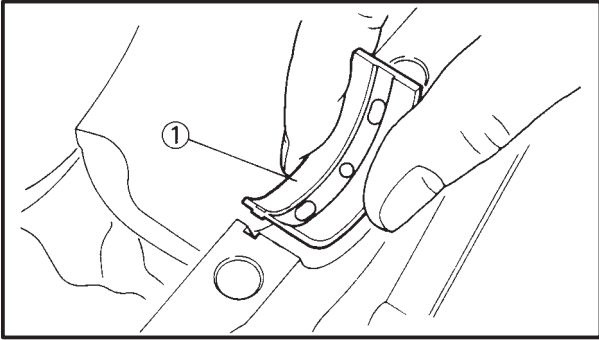
B Lower crankcase

CAUTION:

Use a soft hammer to tap on the case half. Tap only on reinforced portions of the case. Do not tap on the gasket mating surface. Work slowly and carefully. Make sure that the case halves separate evenly.



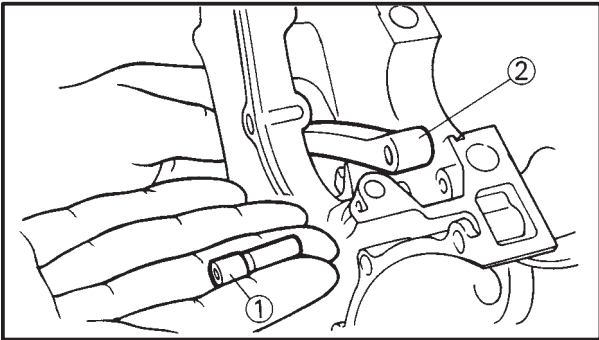
3. Remove:
 - Crankshaft assembly ①



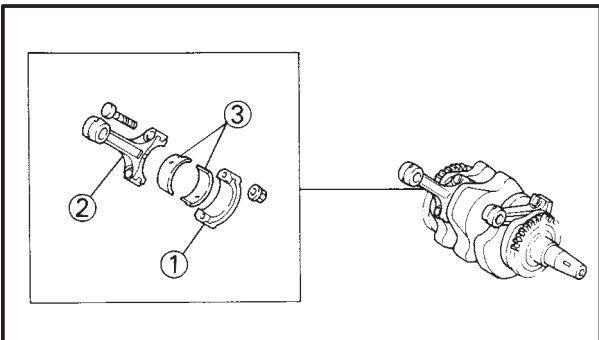
4. Remove:
- Main journal bearings ①

NOTE: _____

Identify each plain bearing position very carefully so that it can be reinstalled in its original place.



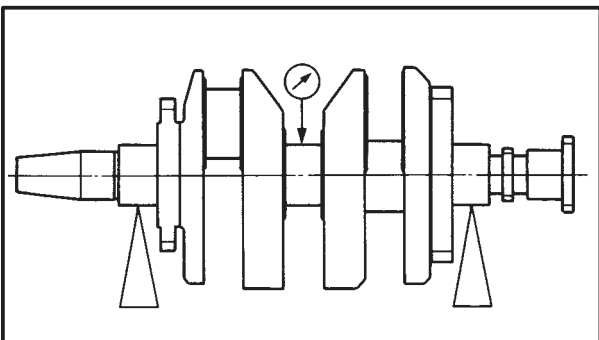
5. Remove:
- Pin ①
 - Timing chain guide (intake) ②



6. Remove:
- Connecting rod cap ①
 - Connecting rod ②
 - Connecting rod bearing ③

NOTE: _____

Identify each bearing position very careful so that it can be reinstalled in its original place.



INSPECTION

1. Measure:
- Runout (crankshaft)
- Out of specification → Replace.

	<p>Runout: Less than 0.035 mm</p>
--	--

2. Inspect:
- Main journal surfaces
 - Crank pin surfaces
 - Bearing surfaces
- Wear/Scratches → Replace.



3. Measure:

- Oil clearance (main journal)
Out of specification → Replace bearing.

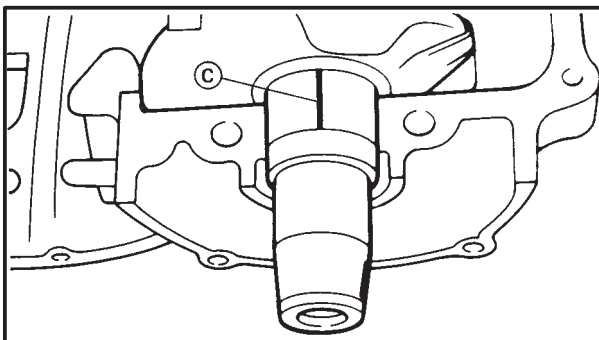
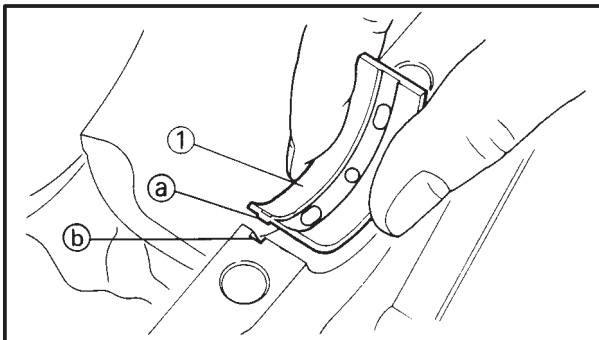


Oil clearance:
0.020 ~ 0.038 mm
<Limit>: 0.1 mm

Measurement steps:

CAUTION:

Do not interchange the bearings and connecting rod. They must be installed in their original positions, or the correct oil clearance may not be obtained causing engine damage.



- Clean the bearings, main journals and bearing portions of the crankcase.
- Place the upper crankcase on a bench in an upside down position.
- Install the upper half of the bearings ① and the crankshaft into the upper crankcase.

NOTE:

Align the projection (a) of the bearing with the notch (b) in the crankcase.

- Put a piece of Plastigauge® (c) on each main journal.

NOTE:

Do not put the Plastigauge® over the oil hole in the main journal of the crankshaft.

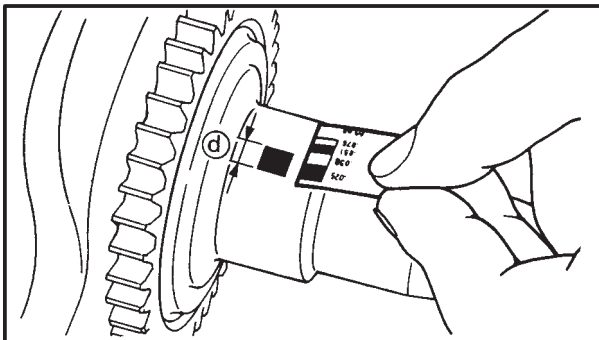
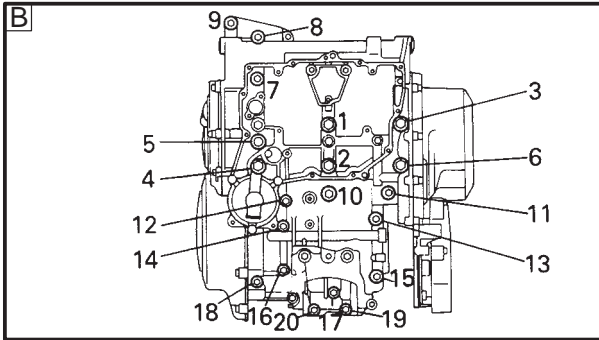
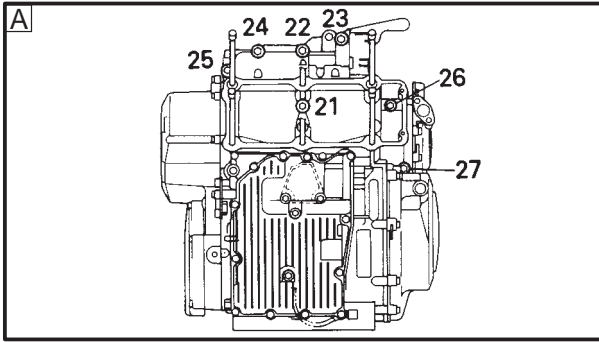
- Install the lower half of the bearings into the lower crankcase and assemble the crankcase halves.

NOTE:

- Align the projection of the bearing with the notch in the crankcase.
- Do not move the crankshaft until the oil clearance has been completed.

CRANKSHAFT

ENG



• Tighten the bolt to specification in the tightening sequence cast on the crankcase.



- ① ~ ⑥ (M10):
40 Nm (4.0 m•kg)
- ⑦ ~ ⑩, ⑬, ⑮, ⑳ ~ ㉔ (M8)
24 Nm (2.4 m•kg)
- ⑪, ⑫, ⑭, ⑯ ~ ⑲, ㉒, ㉔ (M6)
12 Nm (1.2 m•kg)

A Upper crankcase

B Lower crankcase

NOTE:

- Lubricate the threads of bolts ① ~ ⑥ with molybdenum disulfide motor oil.
- Lubricate the threads of bolts ⑦ ~ ㉔ with engine oil.

- Remove the lower crankcase and lower half of the bearing.
 - Measure the compressed Plastigauge® width ① on each main journal.
- If oil clearance is out of specification, select a replacement bearing.

4. Measure:
- Oil clearance (crank pin)
- Out of specification → Replace bearing.



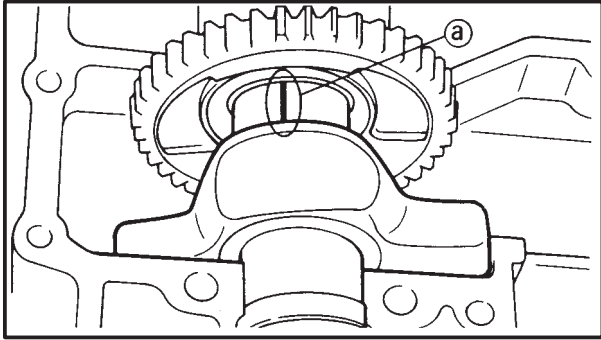
Oil clearance:
0.020 ~ 0.038 mm
<Limit>: 0.1 mm

Measurement steps:

CAUTION:

Do not interchange the bearings and connecting rod. They must be installed in their original positions, or the correct oil clearance may not be obtained causing engine damage.

- Clean the bearings, crank pins and bearing portions of the connecting rods.



- Install the upper half of the bearing into the connecting rod and lower half of the bearing into the connecting rod cap.
- Put a piece of Plastigauge® **a** on the crank pin.
- Assemble the connecting rod halves.

NOTE:

- Do not move the connecting rod or crankshaft until the oil clearance measurement has been completed.
- Apply molybdenum disulfide grease to the bolts, threads and nut seats.
- Make sure the “Y” marks on the connecting rods face the left side of the crankshaft.
- Make sure that the letters on both components align to form a perfect character.

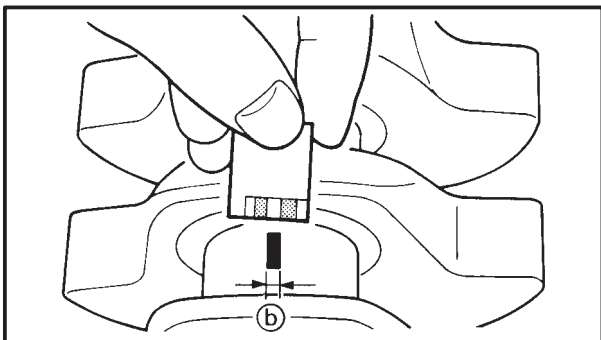
- Tighten the nuts.



Nut (connecting rod):
48 Nm (4.8 m•kg)

CAUTION:

When you reach 35 Nm (3.5 m•kg), keep tightening until the final torque is obtained. Apply continuous torque until the specified torque is obtained.



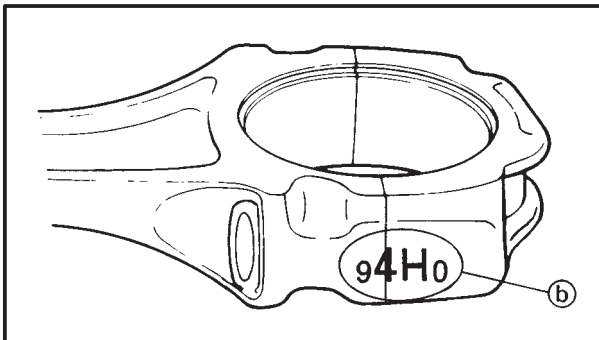
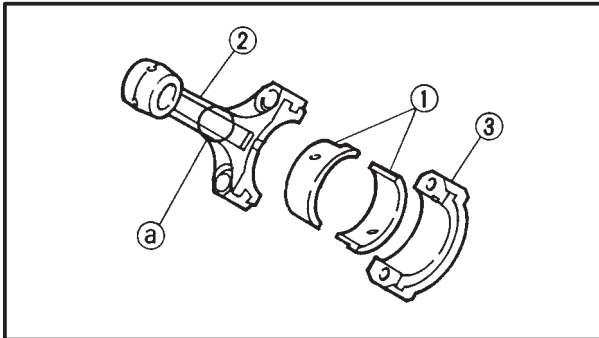
- Remove the connecting rods and bearings.
 - Measure the compressed Plastigauge® width **b** on each crank pin.
- If oil clearance is out of specification, select a replacement bearing.





INSTALLATION

- Apply:
 - Molybdenum disulfide grease
(onto threads of bolts and nut seats)
 - Engine oil
(onto crank pins and inner surfaces of connecting rod bearings)




- Install:
 - Connecting rod bearings (1)
 - Connecting rods (2)
 - Connecting rod caps (3)
(onto crank pins)

NOTE:

- Align the projection of bearing with the groove of the caps and connecting rod.
- Make sure to reinstall each connecting rod bearing in its original place.
- The stamped "Y" mark (a) on the connecting rods should face towards the left of the crankshaft.
- Be sure that the letter (b) on both components align to form a perfect character.

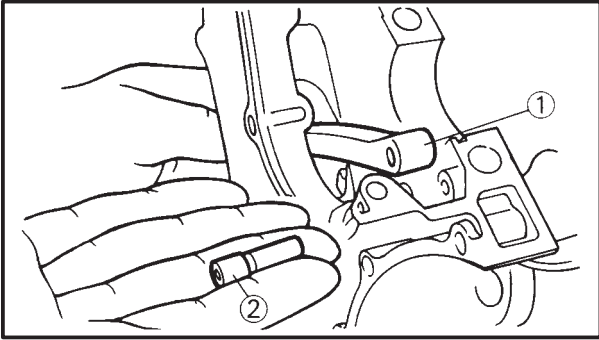
- Align:
 - Bolt head
(with connecting rod cap)

- Tighten:
 - Connecting rod nuts

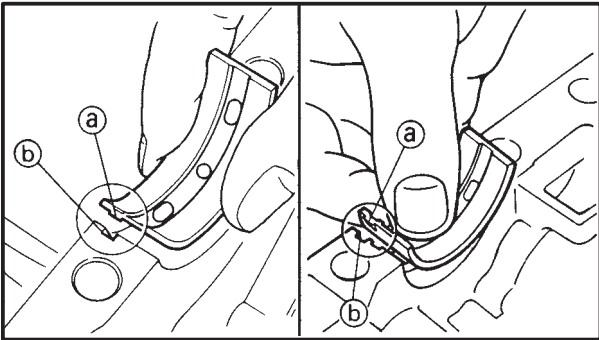
 **48 Nm (4.8 m•kg)**

CAUTION:

When you reach 3.5 Nm (3.5 m•kg), keep tightening until the final torque is obtained. Apply continuous torque until the specified torque is obtained.



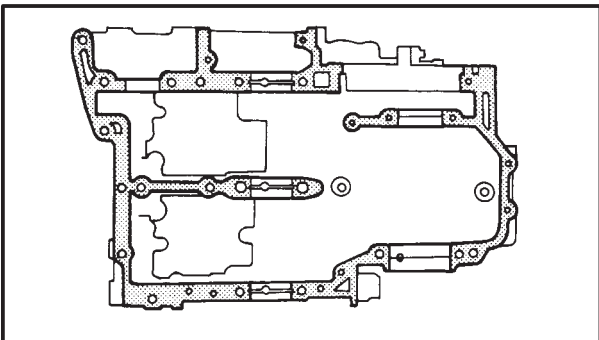
5. Install:
- Timing chain guide (intake)
 - Pin



6. Install:
- Main journal bearings

NOTE:

- Align the projection (a) of the bearing with the notch (b) in the crankcase.
- Install each bearing in its original place.



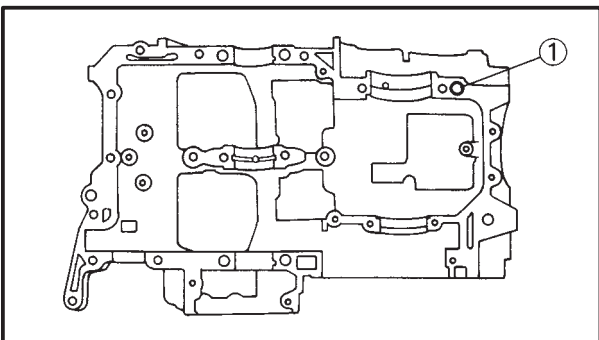
7. Apply:
- Engine oil
(onto inner surfaces of main journal bearings)
 - Sealant
(onto crankcase mating surfaces)



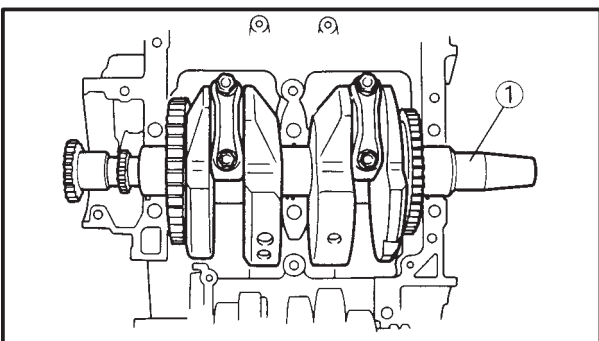
**Yamaha bond No. 1215:
90890-85505**

NOTE:

DO NOT ALLOW any sealant to come in contact with the oil gallery or crankshaft bearings.



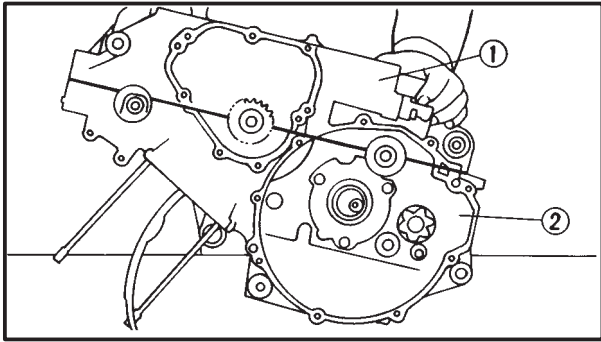
8. Install:
- Dowel pin (1)



9. Install:
- Crankshaft assembly (1)
(onto upper crankcase)

CRANKSHAFT

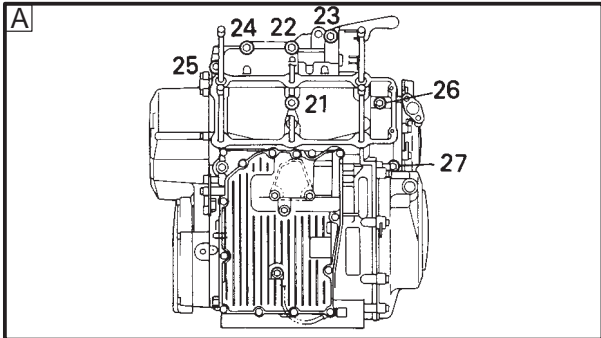
ENG



10. Install:

- Lower crankcase ①
(onto upper crankcase ②)

Place the lower crankcase assembly onto the upper crankcase assembly.



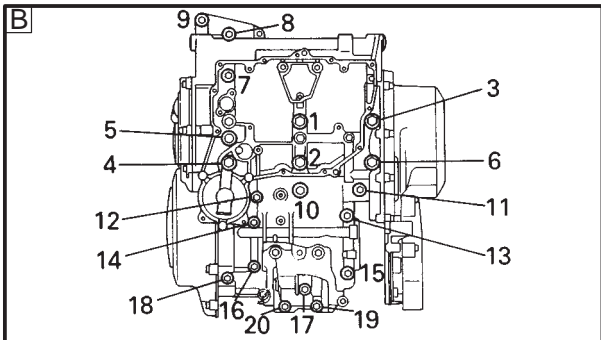
CAUTION:

Before tightening the crankcase bolts, check the following point:

- Be sure the gears shift correctly when the shift cam is turned by hand.

11. Tighten:

- Lower crankcase bolt
(follow the proper tightening sequence)
- Upper crankcase bolt



- ① ~ ⑥ (M10):
40 Nm (4.0 m•kg)
- ⑦ ~ ⑩, ⑬, ⑮, ⑳ ~ ㉔ (M8)
24 Nm (2.4 m•kg)
- ⑪, ⑫, ⑬, ⑮ ~ ⑲, ㉒, ㉔ (M6)
12 Nm (1.2 m•kg)

A Upper crankcase

B Lower crankcase

NOTE:

- Lubricate the threads of bolts (No. ① ~ ⑥) with molybdenum disulfide motor oil.
- Lubricate the threads of bolts (No. ⑦ ~ ㉔) with engine oil.
- Install a copper washer on bolts No. ⑱, ㉒, ㉔, ㉔.
- Install a lead holder on bolt No. ⑳.
- Tighten the bolts in the tightening sequence cast on the crankcase.

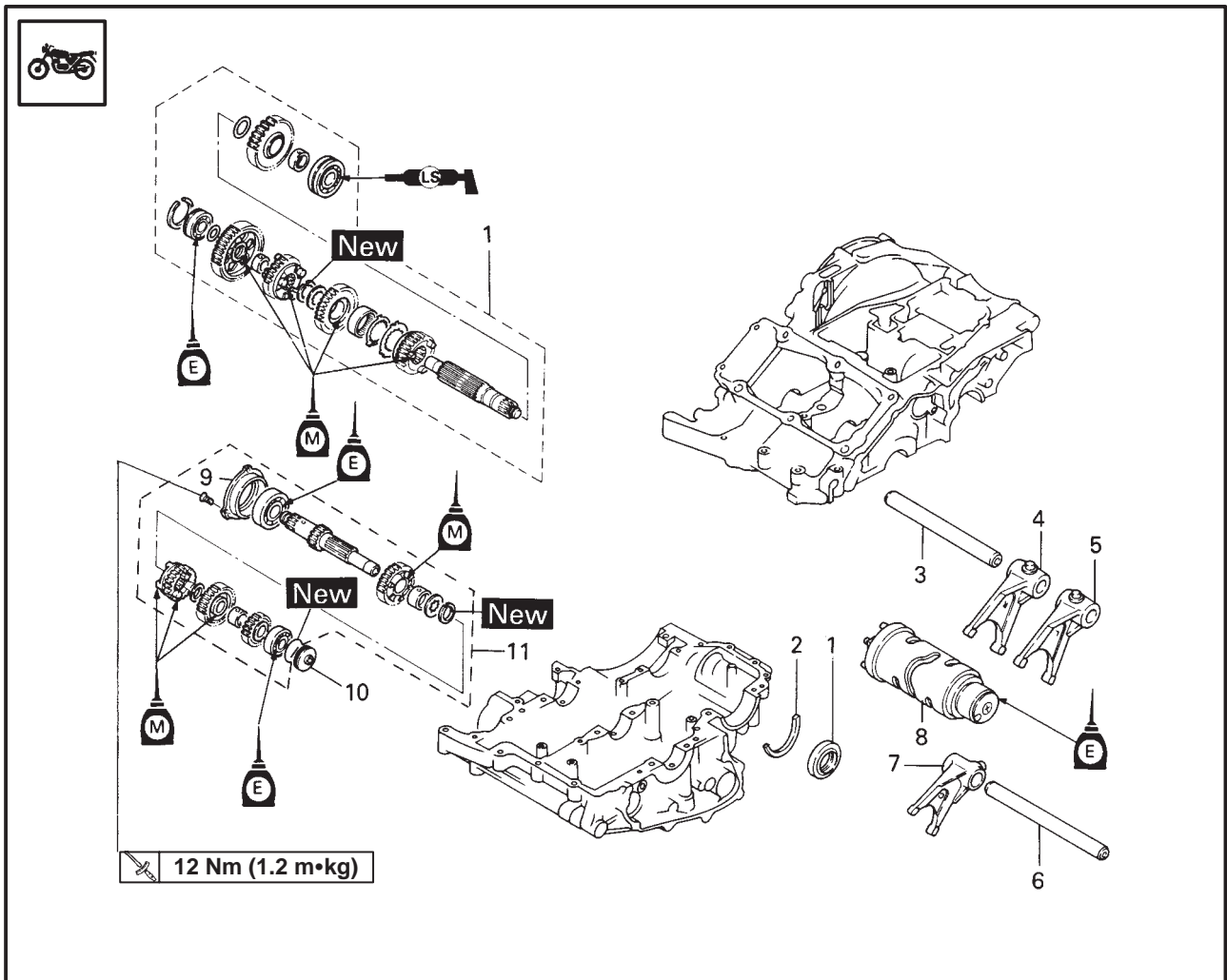
12. Install:

- Cover plate

10 Nm (1.0 m•kg)



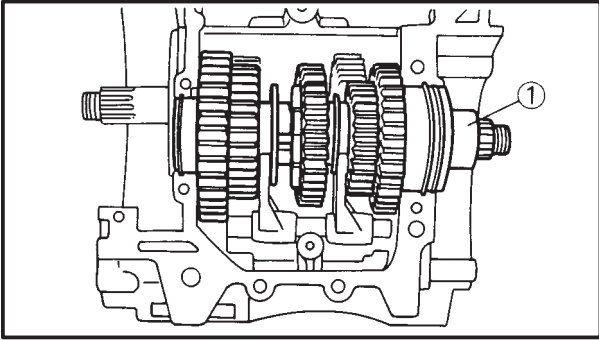
TRANSMISSION, SHIFT CAM AND SHIFT FORK



Order	Job name/Part name	Q'ty	Remarks
	Transmission, shift cam and shift fork removal		Remove the parts in the order below.
	Lower crankcase		Refer to "CRANKSHAFT".
1	Drive axle assembly/Oil seal	1/1	Refer to "REMOVAL", and "INSTALLATION".
2	Circlip	1	
3	Shift fork guide bar 2	1	
4	Shift fork "R"	1	
5	Shift fork "L"	1	
6	Shift fork guide bar 1	1	
7	Shift fork "C"	1	
8	Shift cam	1	
9	Bearing housing	1	
10	Cover	1	
11	Main axle assembly	1	
			For installation, reverse the removal procedure.

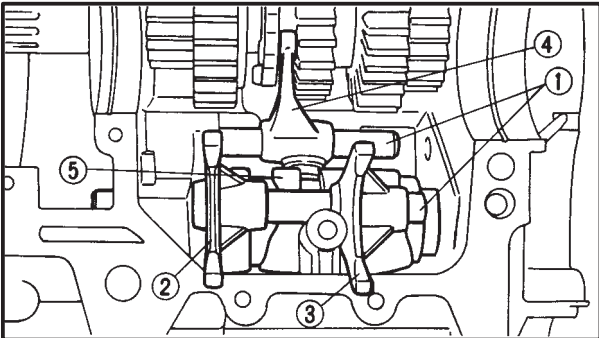
TRANSMISSION, SHIFT CAM AND SHIFT FORK

ENG

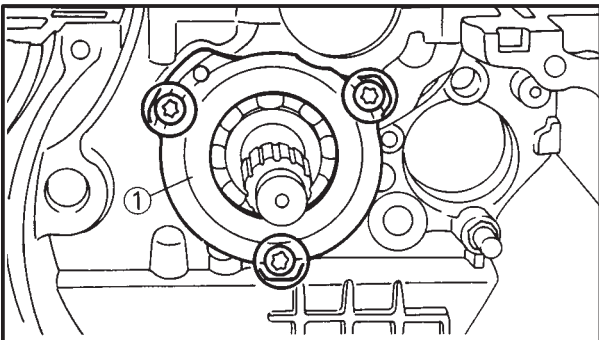


REMOVAL

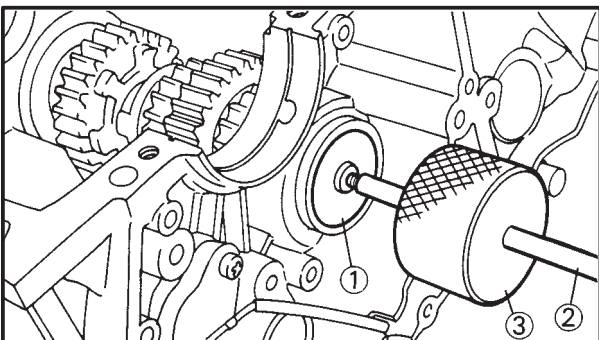
1. Remove:
 - Drive axle assembly ①



2. Remove:
 - Shift fork guide bars ①
 - Shift fork "R" ②
 - Shift fork "L" ③
 - Shift fork "C" ④
 - Shift cam ⑤



3. Remove:
 - Bearing housing ①
(use the torx wrench)



4. Remove:
 - Cover ①

NOTE:

Attach the slide hammer bolt ② and weight ③ into the cover, then remove the cover by pulling.

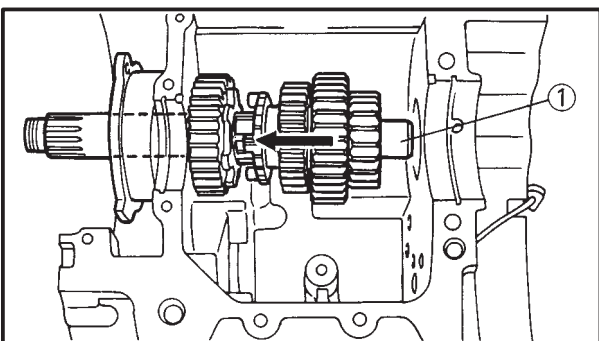


Slide hammer bolt:

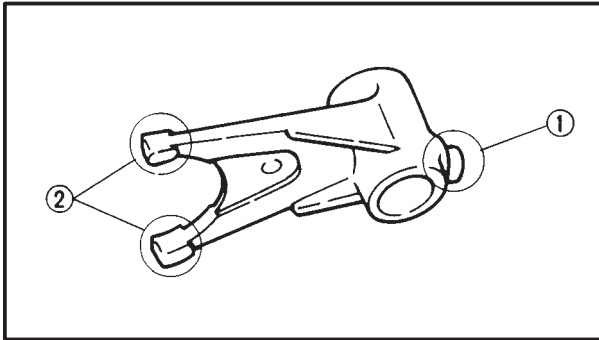
90890-01083

Weight:

90890-01084



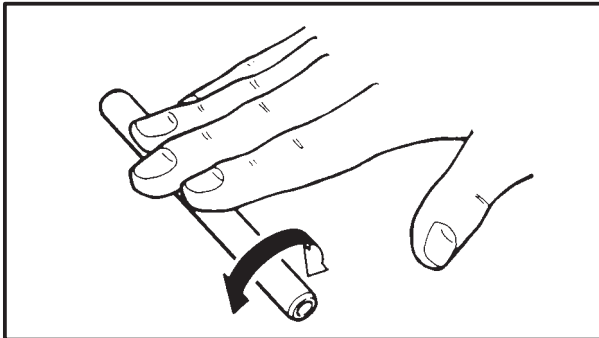
5. Remove:
 - Main axle assembly ①
(Push out of clutch side)



INSPECTION

1. Inspect:

- Shift fork cam follower ①
 - Shift fork pawl ②
- Scoring/Bends/Wear/Damage → Replace.

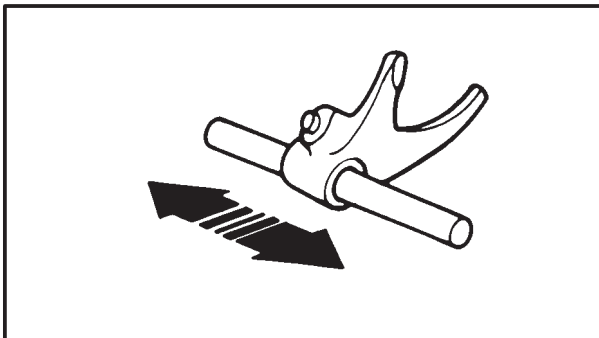


2. Inspect:

- Guide bar
- Roll the guide bar on a flat surface.
Bends → Replace.

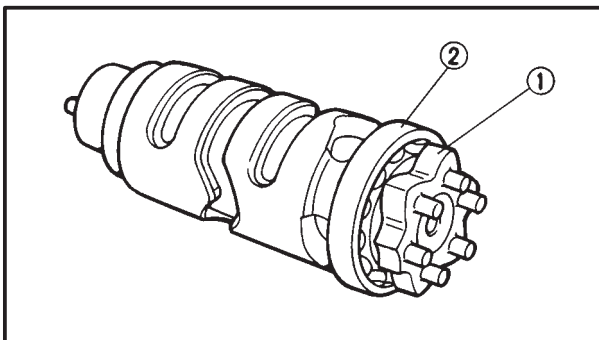
⚠ WARNING

Do not attempt to straighten a bent guide bar.



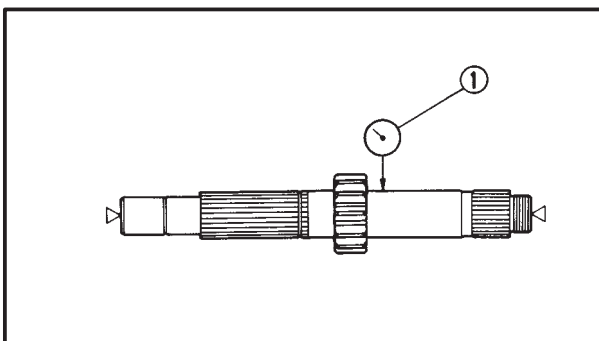
3. Check:

- Shift fork movement
(on its guide bar)
- Unsmooth operation → Replace the fork and guide bar.



4. Inspect:

- Shift cam grooves
- Wear/Damage/Scratches → Replace.
- Shift cam segment ①
- Damage/Wear → Replace.
- Shift cam bearing ②
- Pitting/Damage → Replace.



5. Measure:

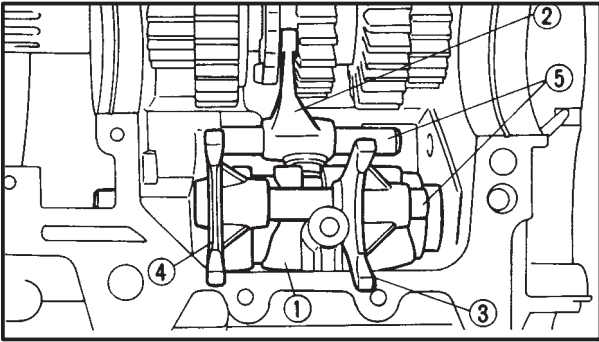
- Axle runout (main and drive)
- Use a centering device and dial gauge ①.
Out of specification → Replace.



**Runout limit:
0.08 mm**

TRANSMISSION, SHIFT CAM AND SHIFT FORK

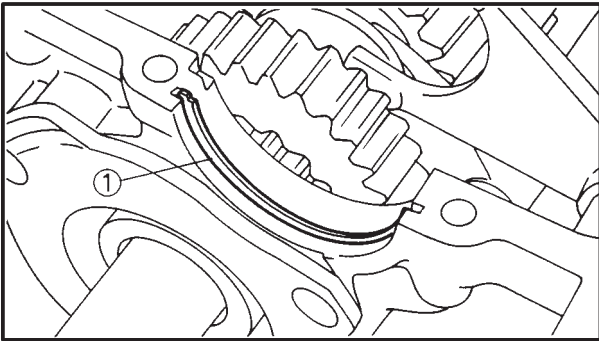
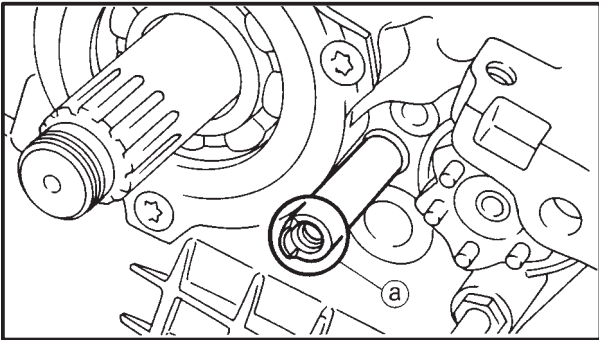
ENG



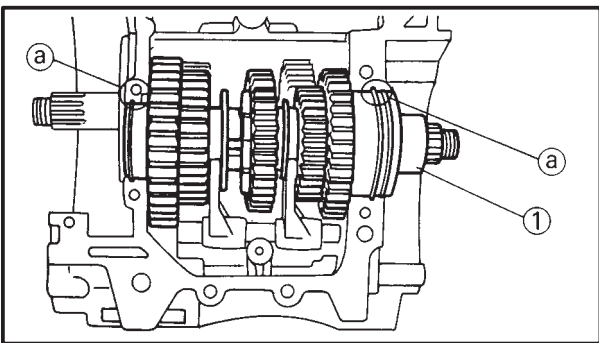
3. Install:
- Shift cam ①
 - Shift fork "C" ②
 - Shift fork "L" ③
 - Shift fork "R" ④
 - Shift for guide bars ⑤

NOTE:

- Install the shift forks with the embossed mark to the right and in sequence (R, C, L) beginning from the right.
- Install the shift fork guide bars with the tapered end (a) toward the clutch.



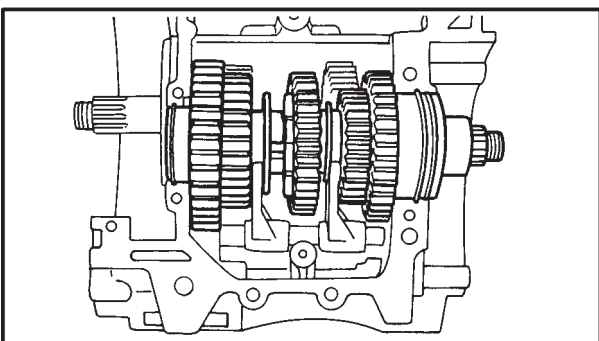
4. Install:
- Circlip ①



5. Install:
- Drive axle assembly ①

NOTE:

- The drive axle bearing pin must point to the front side of the crankcase.
- Be sure that the drive axle bearing circlips are inserted into the upper crankcase positioning grooves (a).



6. Check:
- Transmission
Unsmooth rotation → Repair.

NOTE:

Oil each gear and bearing thoroughly.

ENG



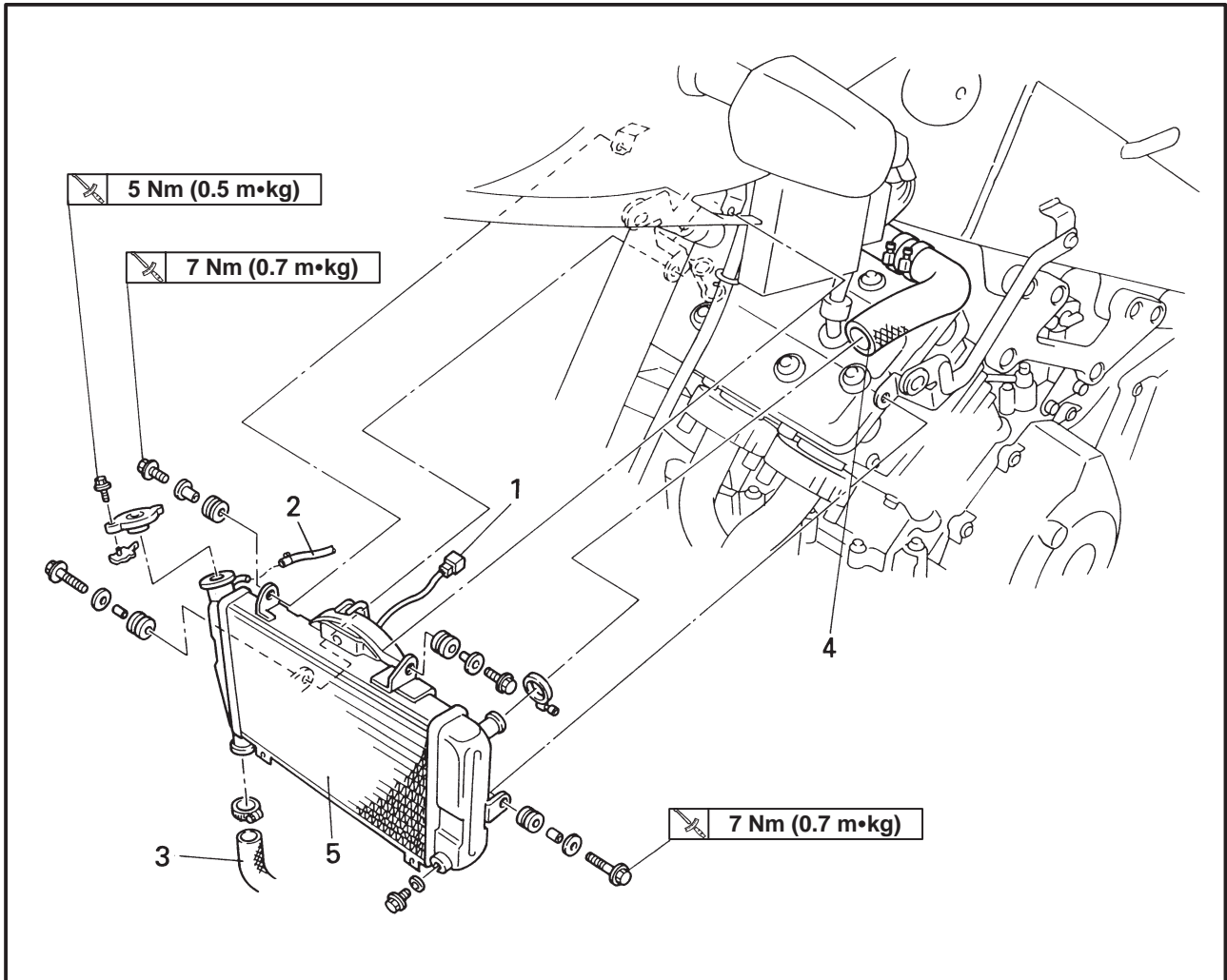
CHAPTER 5. COOLING SYSTEM

RADIATOR	5-1
INSPECTION	5-2
INSTALLATION	5-3
THERMOSTATIC VALVE	5-4
THERMOSTATIC VALVE ASSEMBLY	5-4
THERMOSTATIC VALVE	5-5
INSPECTION	5-6
ASSEMBLY	5-6
WATER PUMP	5-7
WATER PUMP	5-7
INSTALLATION	5-8



COOLING SYSTEM

RADIATOR




Order	Job name/Part name	Q'ty	Remarks
	Radiator removal		Remove the parts in the order below.
	Coolant		Refer to "COOLANT REPLACEMENT" in CHAPTER 3.
	Side cowling, seat, side cover and fuel tank		Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK" in CHAPTER 3.
	Air filter case		Refer to "AIR FILTER CASE" in CHAPTER 3.
1	Fan motor lead	1	Disconnect
2	Coolant reservoir hose	1	Disconnect
3	Coolant hose 3	1] Refer to "INSTALLATION".
4	Coolant hose 2	1	
5	Radiator assembly	1	
			For installation, reverse the removal procedure.



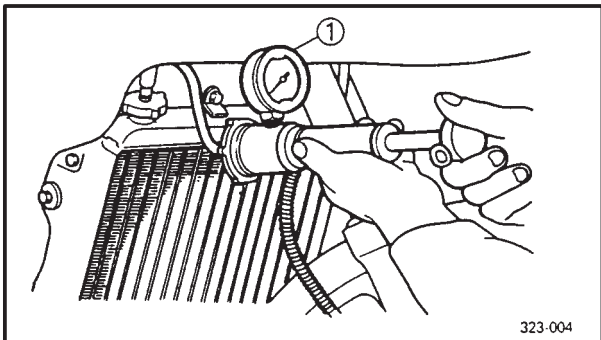
INSTALLATION

Reverse the "REMOVAL" procedure.
Note the following points.

- 1. Install:
 - Radiator assembly

 **7 Nm (0.7 m•kg)**

- 2. Fill:
 - Cooling system
Refer to "COOLANT REPLACEMENT" in CHAPTER 3.




- 3. Inspect:
 - Cooling system
Decrease of pressure (leaks) → Repair as required.



Inspection steps:

- Attach the radiator cap tester ① to the radiator.

	Radiator cap tester: 90890-01325
	Adapter: 90890-01352

- Apply 100 kPa (1.0 kg/cm², 1.0 bar) pressure.

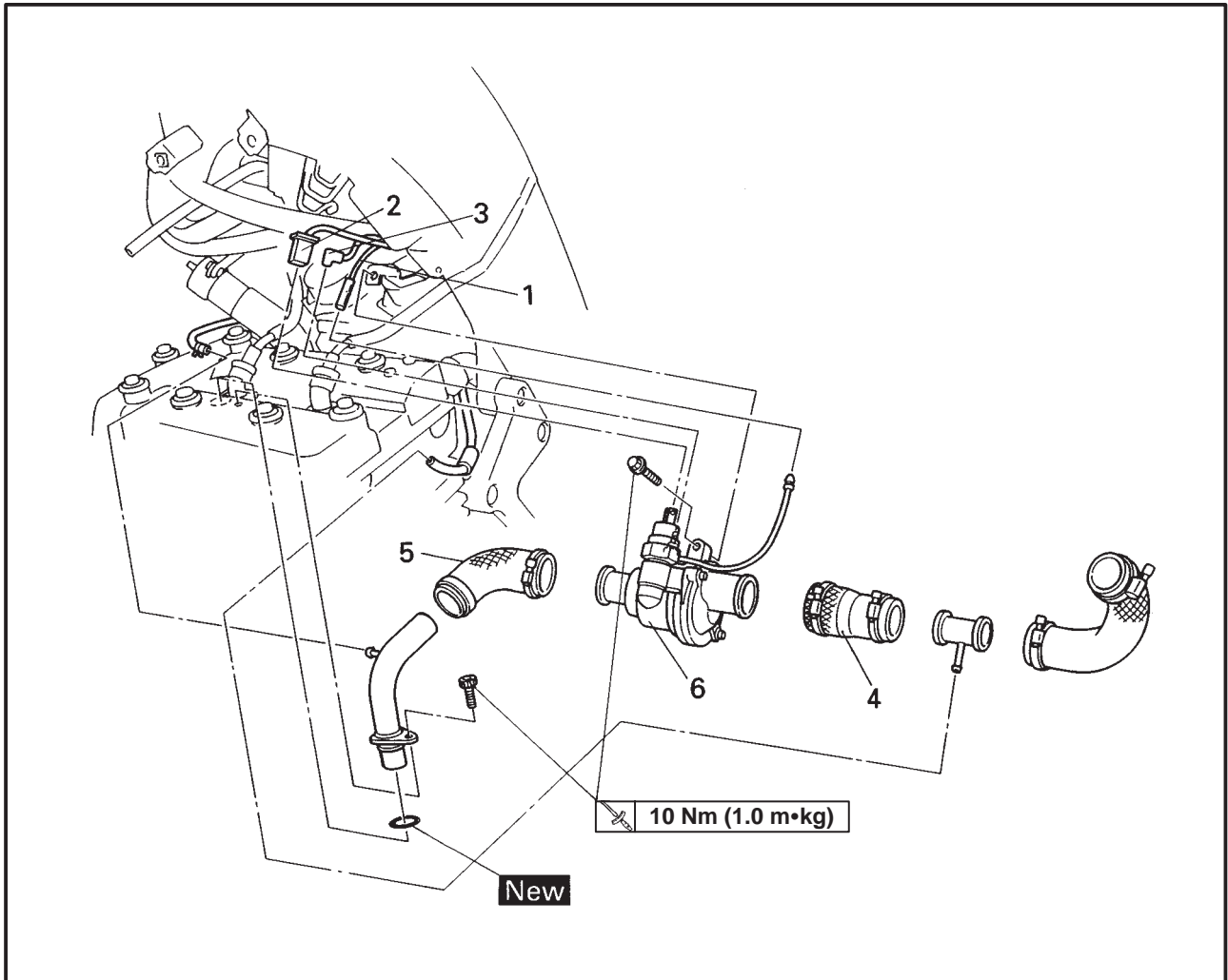
CAUTION: _____

Do not apply pressure that is more than the specification mentioned above.

- Measure the indicated pressure with the gauge.
-



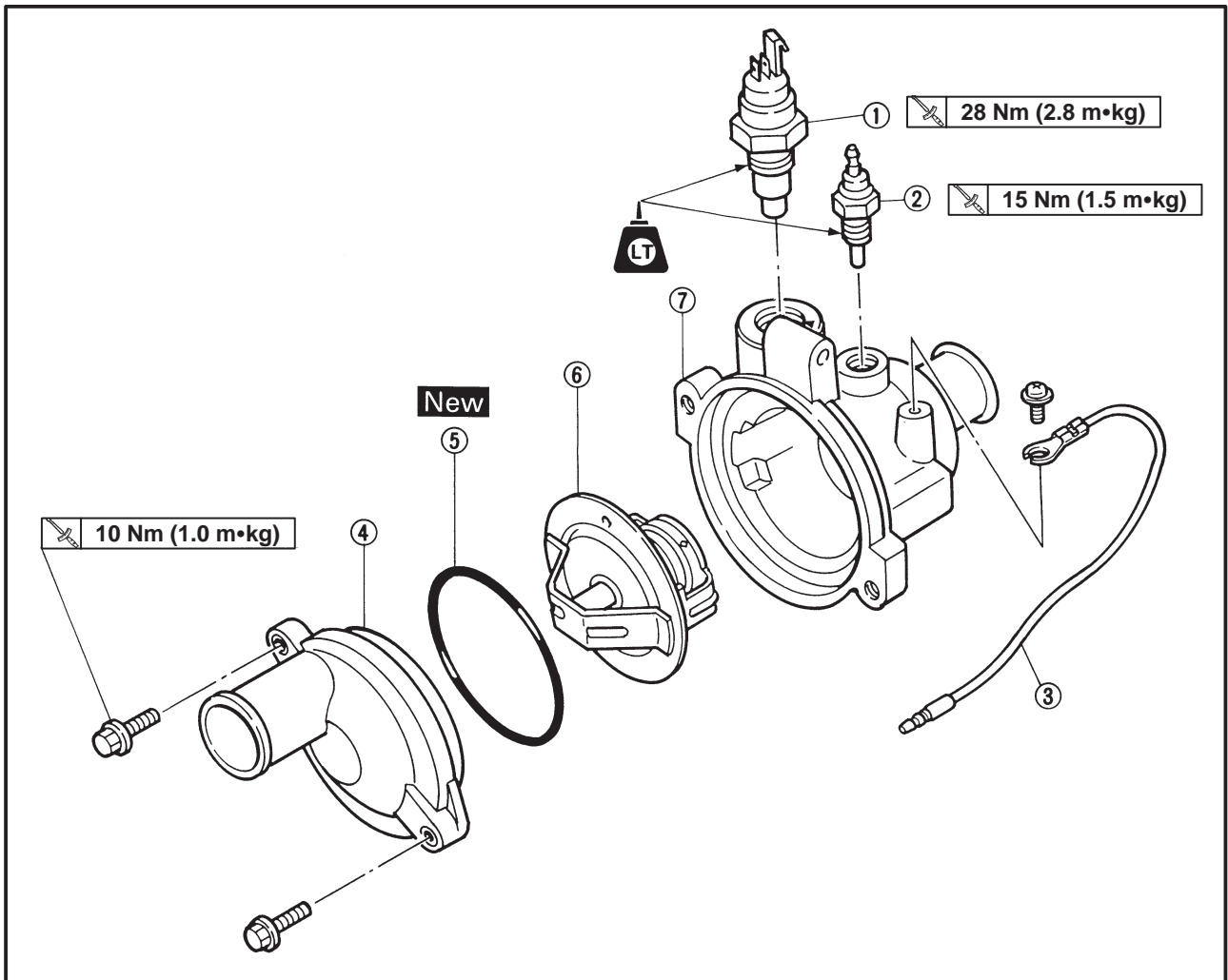
THERMOSTATIC VALVE
THERMOSTATIC VALVE ASSEMBLY



Order	Job name/Part name	Q'ty	Remarks
	Thermostatic valve assembly removal		Remove the parts in the order below.
	Coolant		Refer to "COOLANT REPLACEMENT" in CHAPTER 3.
	Side cowling, seat, side cover and fuel tank		Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK" in CHAPTER 3.
	Air filter case		Refer to "AIR FILTER CASE" in CHAPTER 3.
	Radiator assembly		Refer to "RADIATOR".
1	Ground lead	1	Disconnect
2	Thermo switch lead coupler	1	Disconnect
3	Thermo unit lead	1	Disconnect
4	Coolant hose 1	1	
5	Coolant hose 4	1	
6	Thermostatic valve assembly	1	
			For installation, reverse the removal procedure.



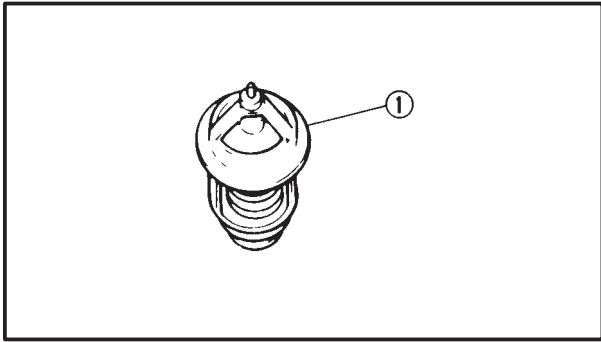
THERMOSTATIC VALVE



Order	Job name/Part name	Q'ty	Remarks
	Thermostatic valve housing disassembly		Remove the parts in the order below.
①	Thermo switch	1	Refer to "ASSEMBLY".
②	Thermo unit	1	
③	Ground lead	1	
④	Thermostatic valve cover	1	
⑤	O-ring	1	
⑥	Thermostatic valve	1	
⑦	Thermostatic valve housing	1	
			For installation, reverse the removal procedure.

THERMOSTATIC VALVE

COOL



INSPECTION

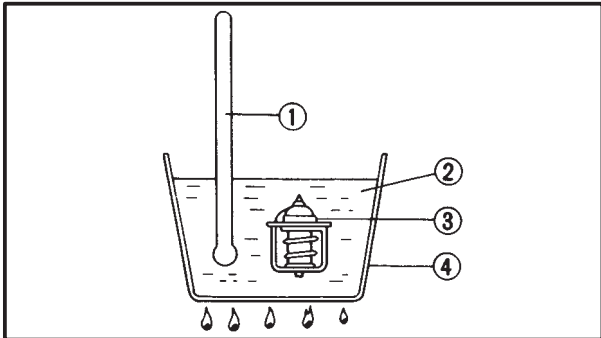
1. Inspect:

- Thermostatic valve ①

Valve does not open at 80 ~ 84°C → Replace.

Inspection steps:

- Suspend thermostatic valve in a vessel.
- Place reliable thermometer in a water.
- Observe thermometer, while stirring water continually.

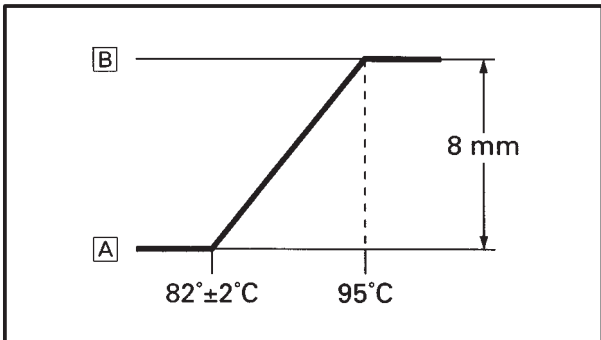


① Thermometer

② Water

③ Thermostatic valve

④ Vessel

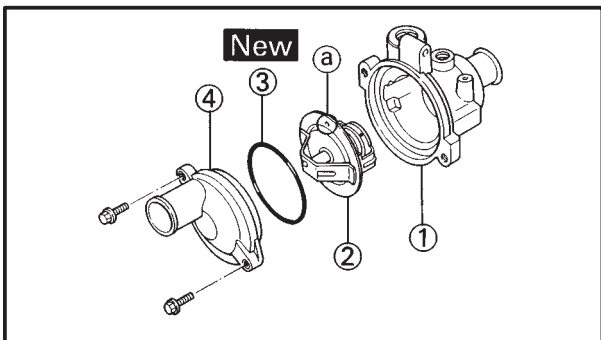


Ⓐ CLOSE

Ⓑ OPEN

NOTE:

Thermostatic valve is sealed and its setting is specialized work. If its accuracy is in doubt, replace it. A faulty unit could cause serious overheating or over-cooling.



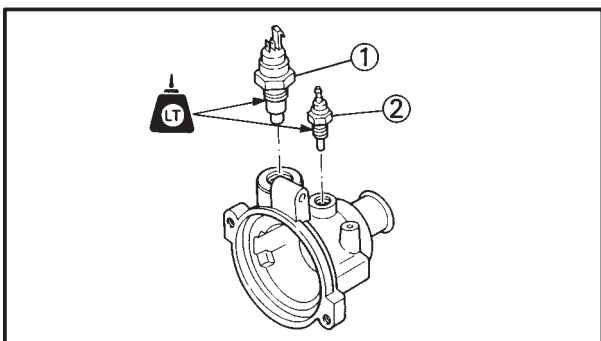
ASSEMBLY

1. Install:

- Thermostatic valve housing ①
- Thermostatic valve ②
- O-ring ③
- Thermostatic valve cover ④

NOTE:

Install the thermostatic valve with the breather hole (a) facing up.



2. Install:

- Thermo switch ①
- Thermo unit ②

28 Nm (2.8 m•kg)

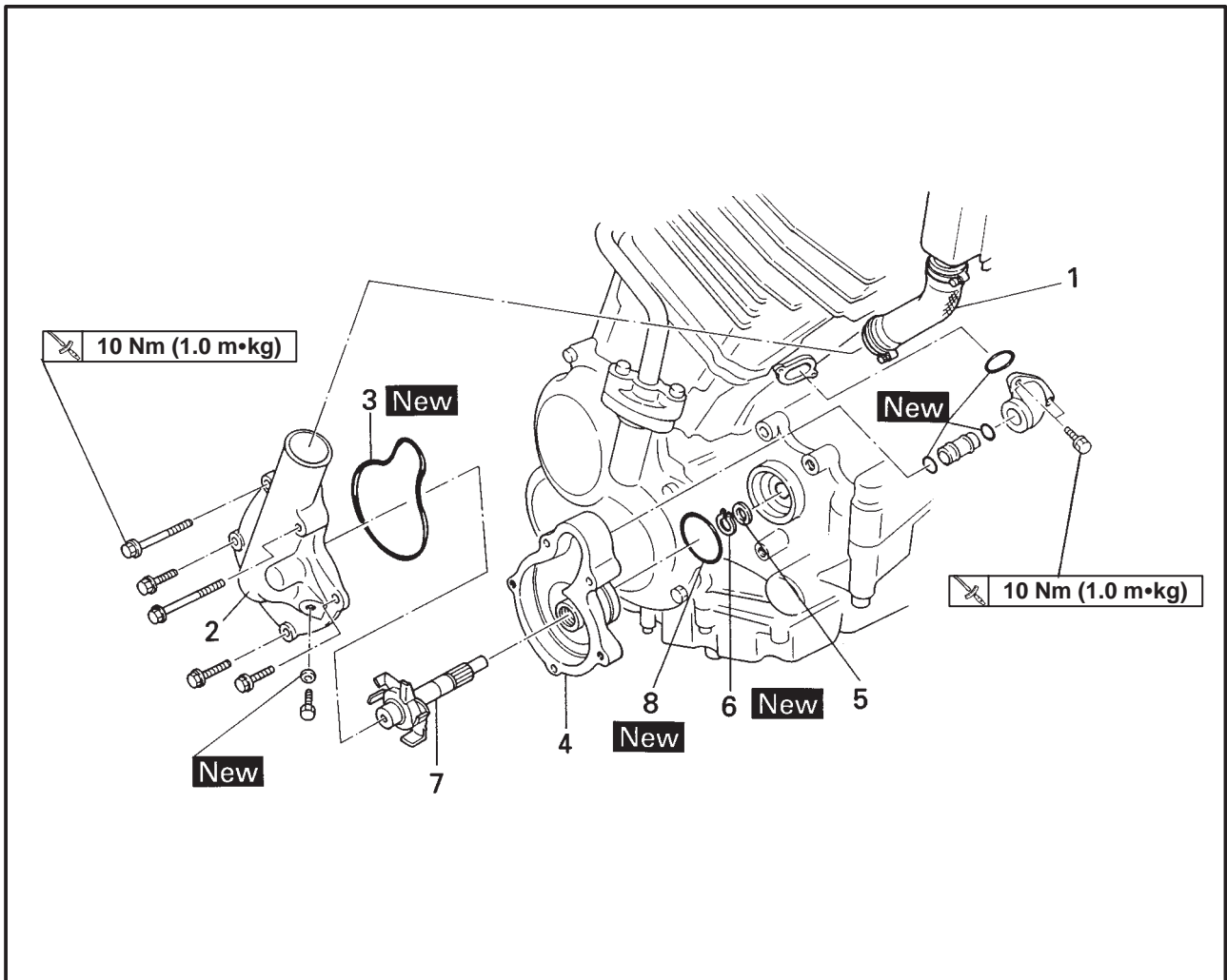
15 Nm (1.5 m•kg)

CAUTION:

Be very careful when handling the thermo switch and thermo unit. Replace parts that were subjected to impacts or were dropped.



WATER PUMP
WATER PUMP



Order	Job name/Part name	Q'ty	Remarks
	Water pump removal		
	Coolant		Remove the parts in the order below. Refer to "COOLANT REPLACEMENT" in CHAPTER 3.
1	Coolant hose 3	1	Refer to "INSTALLATION".
2	Water pump cover	1	
3	O-ring	1	
4	Water pump housing	1	
5	Washer	1	
6	Circlip	1	
7	Impeller	1	
8	O-ring	1	
			For installation, reverse the removal procedure.

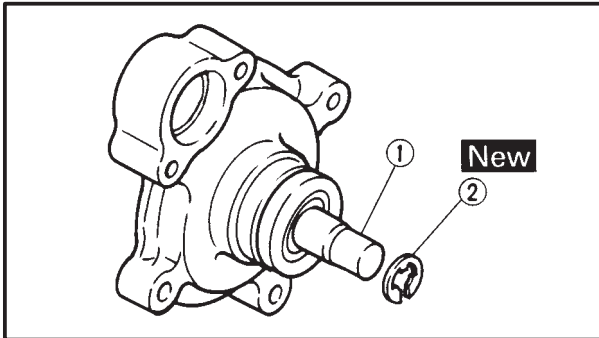


INSTALLATION

Reverse the "REMOVAL" procedure.
Note the following points.

NOTE:

- It is not necessary to remove and inspect the water pump if the coolant is not unusually low or if it has no engine oil mixed in it.
- Always replace the entire water pump.

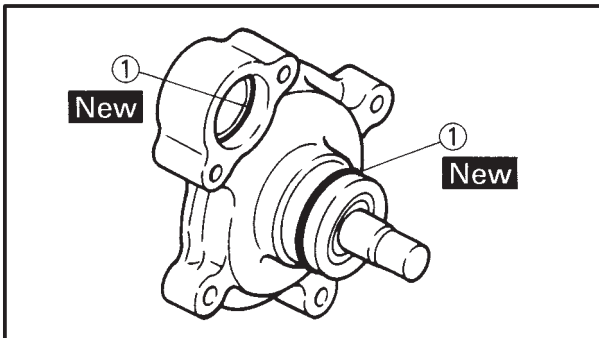


1. Install:

- Impeller ①
- Circlip ② **New**

NOTE:

After installation, check that the impeller shaft rotates smoothly.




2. Install:

- O-ring ① **New**

3. Install:

- Water pump housing
- Water pump cover
- Coolant hose ③

 **10 Nm (1.0 m•kg)**



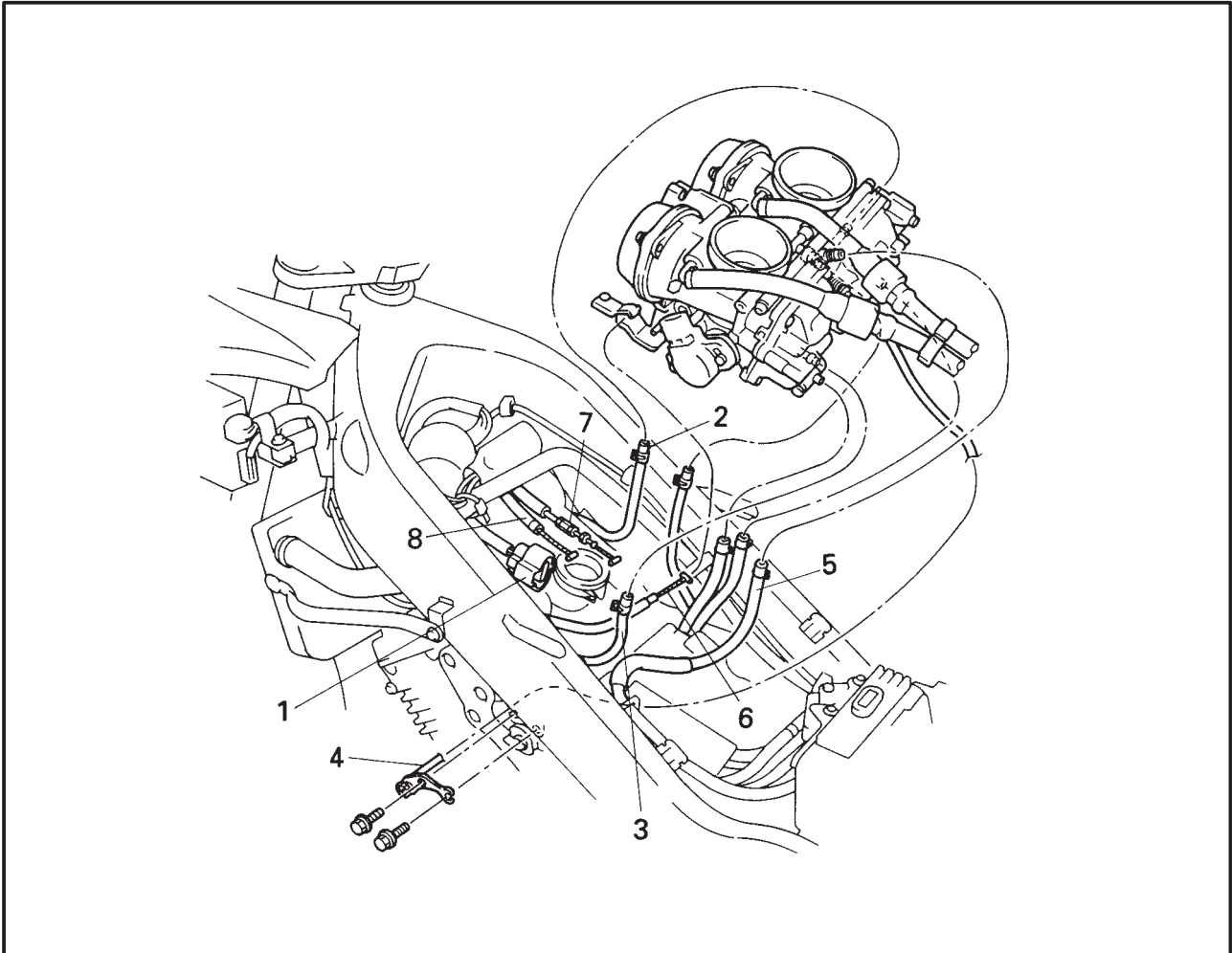
CHAPTER 6. CARBURETION

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TPS (THROTTLE POSITION SENSOR) ADJUSTMENT AND INSPECTION	6-5



CARBURETION

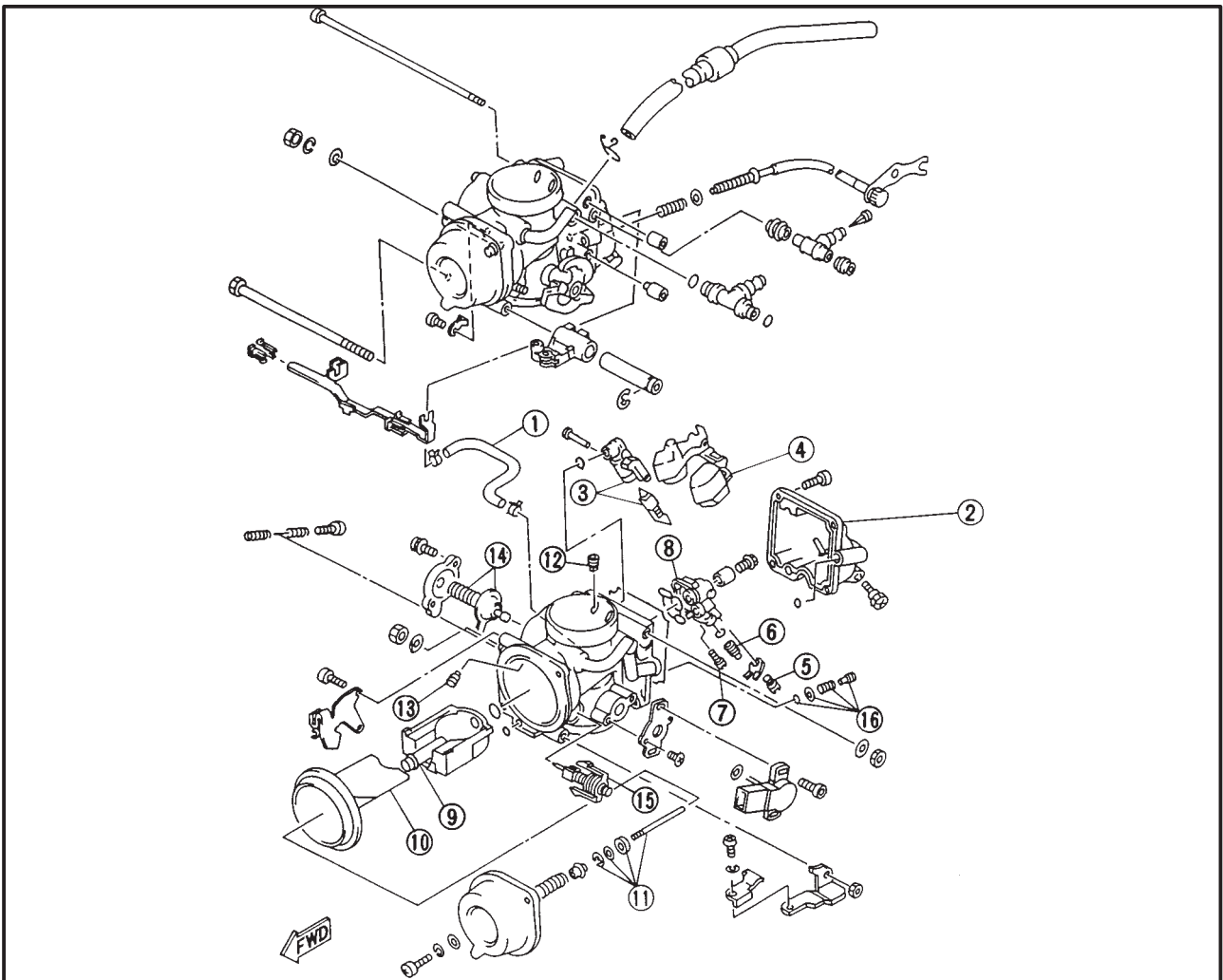
CARBURETOR
CARBURETOR ASSEMBLY



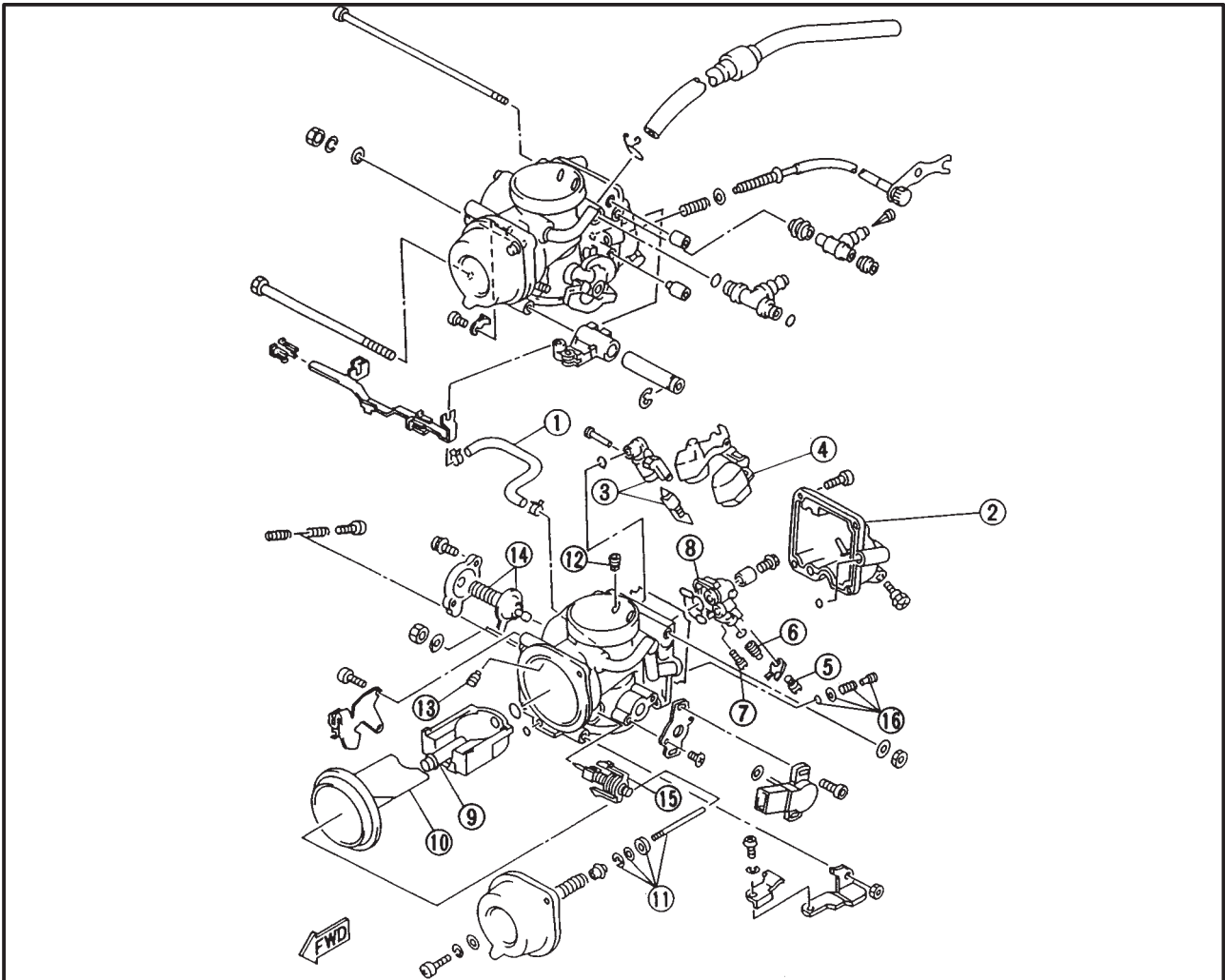
Order	Job name/Part name	Q'ty	Remarks
	Carburetor assembly removal Side cowling, seat, side cover and fuel tank		Remove the parts in the order below. Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK" in CHAPTER 3. Refer to "AIR FILTER CASE" in CHAPTER 3. Disconnect
	Air filter case		
1	Throttle position sensor lead coupler	1	
2	Carburetor heater hose (inlet)	1	
3	Carburetor heater hose (outlet)	1	From frame
4	Throttle stop screw	1	
5	Fuel hose	1	
6	Starter cable	1	
7	Throttle cable (pull)	1	NOTE: _____ After loosening the throttle cable locknut and removing the carburetor assembly, remove the throttle cables. _____ For installation, reverse the removal procedure.
8	Throttle cable (push)	1	



CARBURETOR



Order	Job name/Part name	Q'ty	Remarks
	Carburetor disassembly		Disassemble the parts in the order below.
①	Carburetor heater hose	1	Refer to "INSTALLATION".
②	Float chamber	1	
③	Needle valve	1	
④	Float	1	
⑤	Starter jet	1	
⑥	Main jet	1	
⑦	Pilot jet	1	
⑧	Jet housing	1	
⑨	Jet needle	1	
⑩	Throttle valve	1	



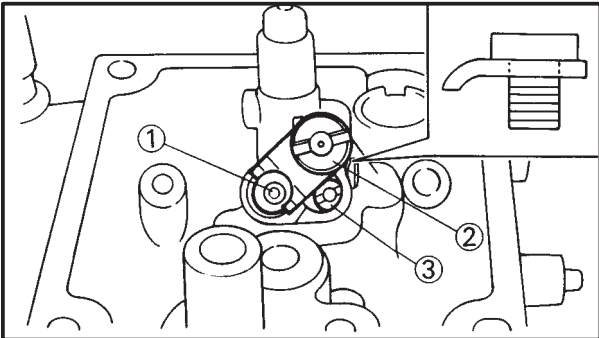
Order	Job name/Part name	Q'ty	Remarks
⑪	Needle jet	1	For assembly, reverse the disassembly procedure.
⑫	Pilot air jet 1	1	
⑬	Main air jet 2	1	
⑭	Diaphragm	1	
⑮	Starter plunger	1	
⑯	Pilot screw	1	



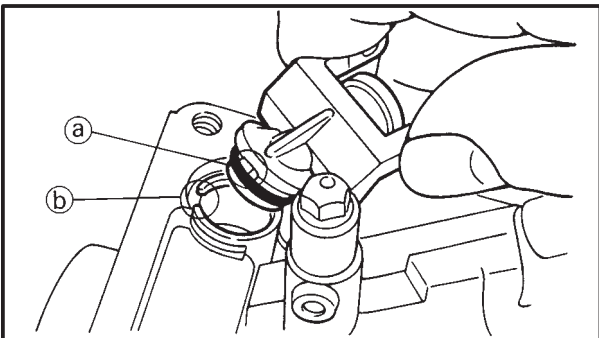
ASSEMBLY

CAUTION:

- Before reassembling, wash all parts in clean petroleum based solvent.
- Always use a new gasket.



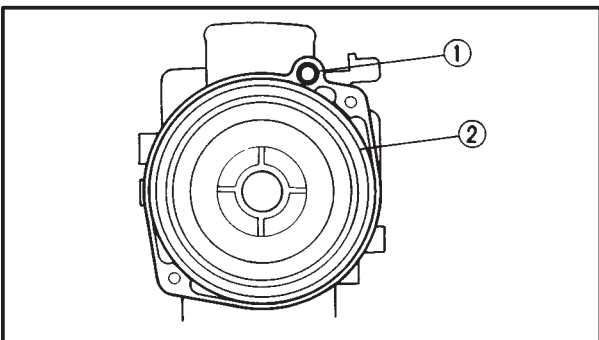
1. Install:
 - Main jet ①
 - Starter jet ②
 - Pilot jet ③



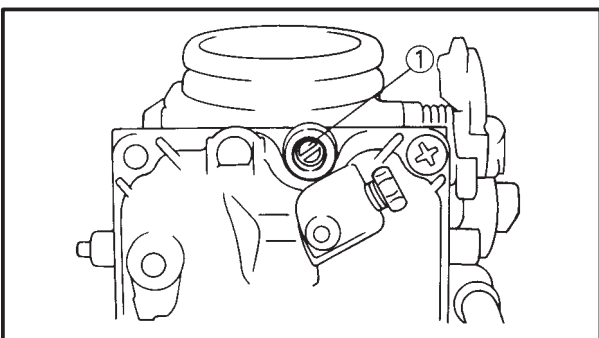
2. Install:
 - Valve seat

NOTE:

Make sure that projection (a) on the valve seat is aligned with the slot (b) on the carburetor body.



3. Install:
 - O-ring ①
 - Diaphragm ②

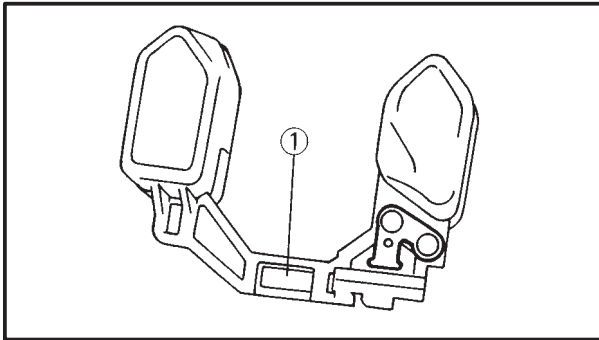
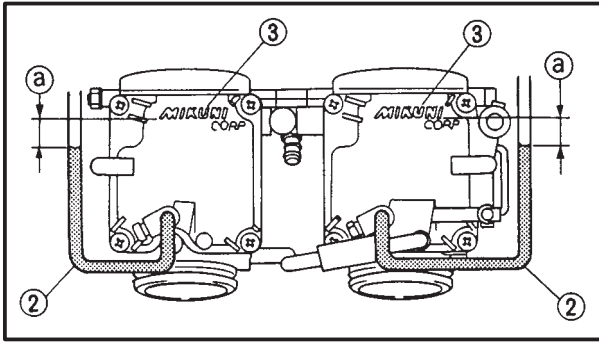


4. Install:
 - Pilot screw ①

Pilot screw (turns out):
2.0

CARBURETOR

CARB



FUEL LEVEL ADJUSTMENT

1. Measure:
 - Fuel level (a)



Fuel level:
15.8 ~ 16.8 mm
Below the MIKUNI mark

Out of specification → Adjust.

NOTE:

Adjust the float level by slightly bending the float tang (1).

Fuel level measurement and adjustment steps:

- Place the motorcycle on a level surface.
- Use a garage jack under the engine to ensure that the carburetors are positioned vertically.
- Connect the fuel level gauge (2) to the drain pipe.



Fuel level gauge:
90890-01312

- Loosen the drain screw.
- Hold the gauge vertically next to the MIKUNI mark (3).
- Measure the fuel level (a) with the gauge.

THROTTLE POSITION SENSOR (TPS) ADJUSTMENT AND INSPECTION

NOTE:

- Idle speed should be adjusted properly before adjusting the TPS (throttle position sensor).
- When installing the TPS (throttle position sensor), observe the display on the tachometer and adjust the angle accordingly. Refer to the adjustment procedure below.



CHAPTER 7. CHASSIS

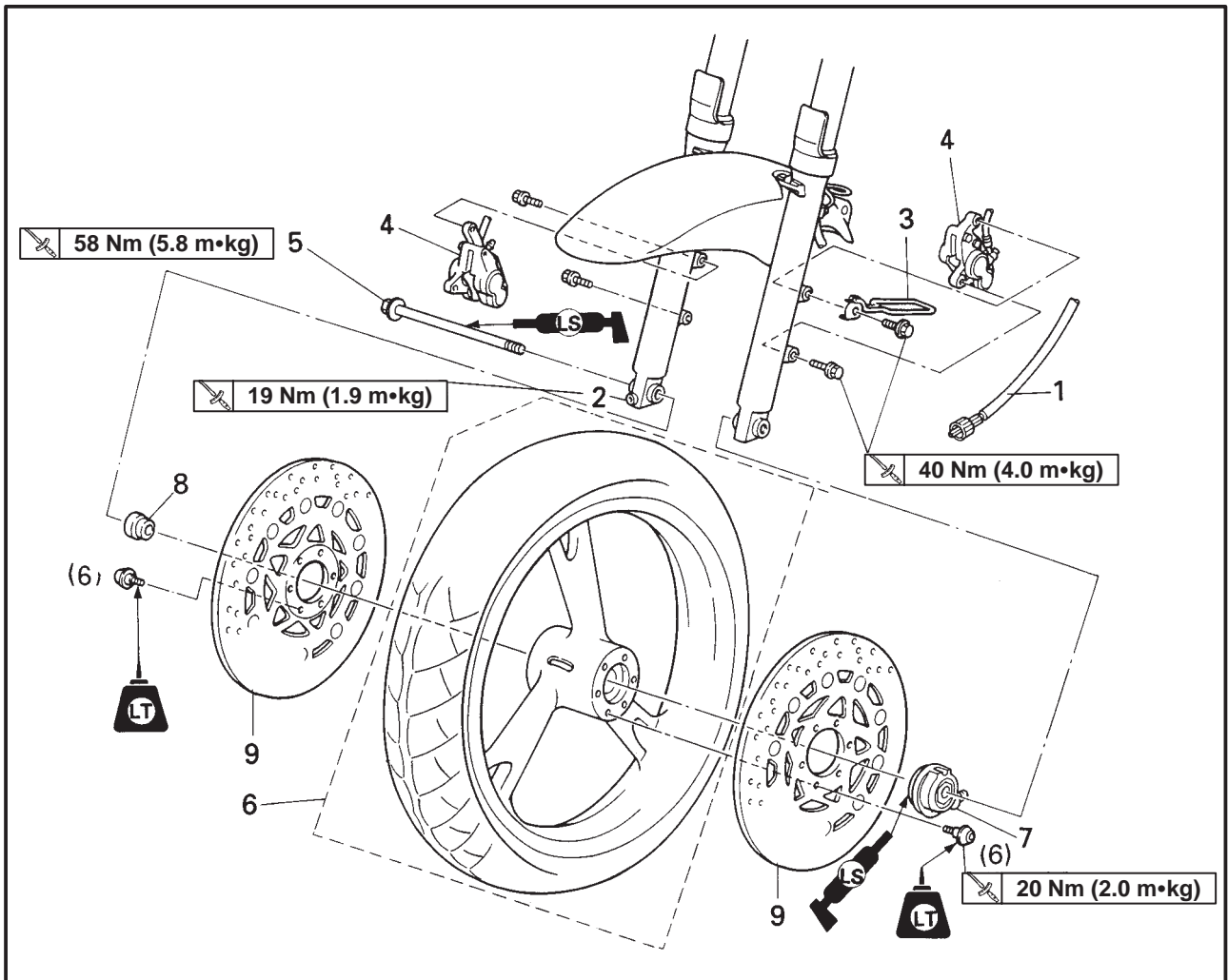
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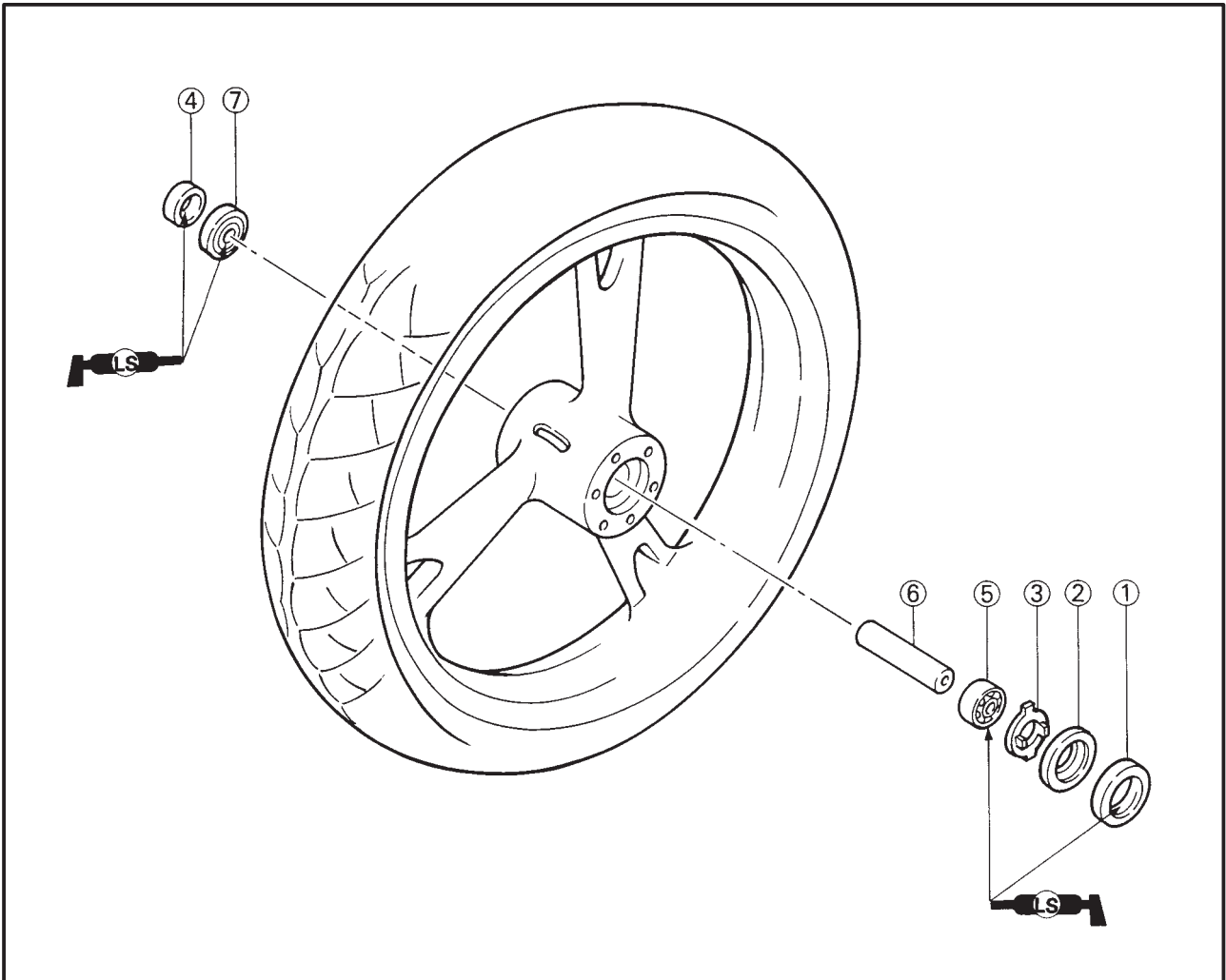
CHASSIS

FRONT WHEEL AND BRAKE DISCS

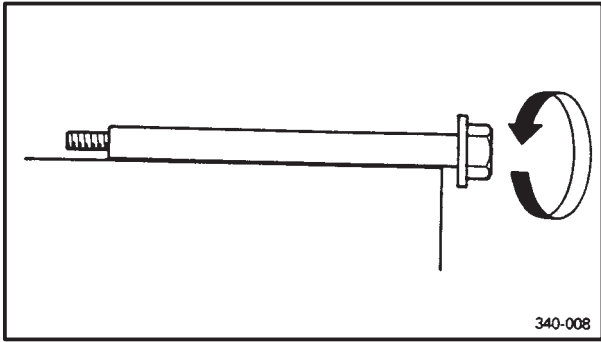


Order	Job name/Part name	Q'ty	Remarks
	Front wheel and brake disc removal		Remove the parts in the order below. NOTE: _____ Elevate the front wheel by placing a suitable stand under the engine.
1	Speedometer cable	1	Disconnect
2	Pinch bolt (front wheel axle)	1	Loosen
3	Cable guide	1	
4	Brake caliper (left/right)	1/1	Refer to "INSTALLATION".
5	Front wheel axle	1	
6	Front wheel	1	
7	Speedometer gear unit	1	
8	Collar	1	
9	Brake disc (left/right)	1/1	For installation, reverse the removal procedure.

FRONT WHEEL AND BRAKE DISCS



Order	Job name/Part name	Q'ty	Remarks
	Front wheel disassembly		Disassemble the parts in order below.
①	Oil seal	1	Refer to "ASSEMBLY".
②	Clutch retainer	1	
③	Meter clutch	1	
④	Oil seal	1	
⑤	Bearing	1	
⑥	Spacer	1	
⑦	Bearing	1	
			For assembly, reverse the disassembly procedure.

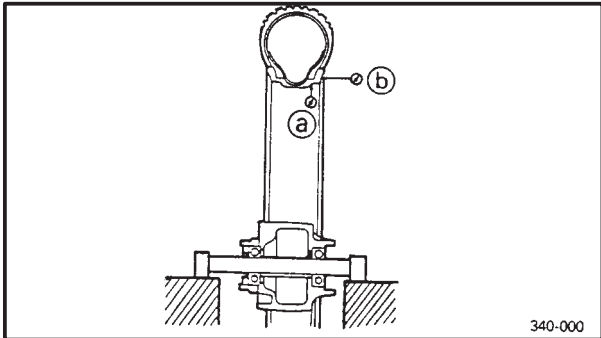


INSPECTION

1. Inspect:
 - Front wheel axle. Roll it on a flat surface.
Bends → Replace.

WARNING

Do not attempt to straighten a bent axle.



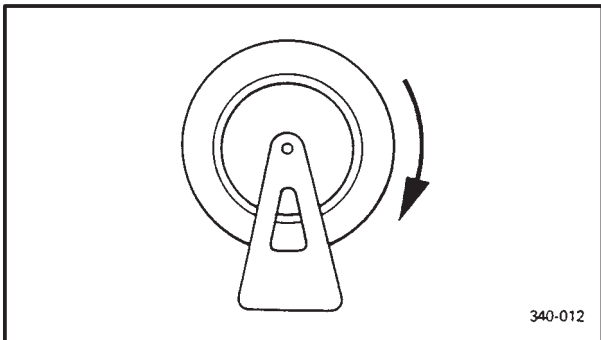
2. Measure:
 - Wheel runout
 - Over the specified limit → Replace.



Rim runout limits:

Radial (a): 1 mm

Lateral (b): 0.5 mm



3. Inspect:
 - Wheel bearings
Bearings allow free play in the wheel hub or wheel turns roughly → Replace.
 - Oil seals
Wear/Damage → Replace.

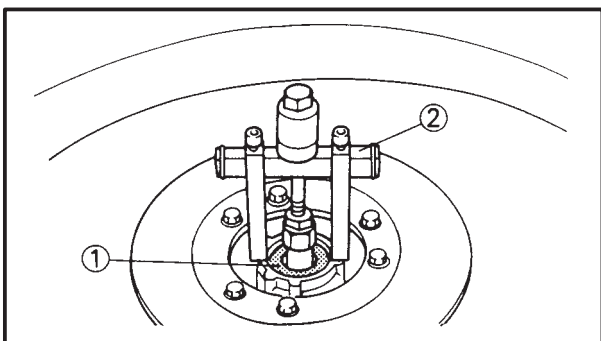
Wheel bearing and oil seal replacement steps:

- Clean the outside of the wheel hub.
- Remove the oil seals using a flat-head screw driver.

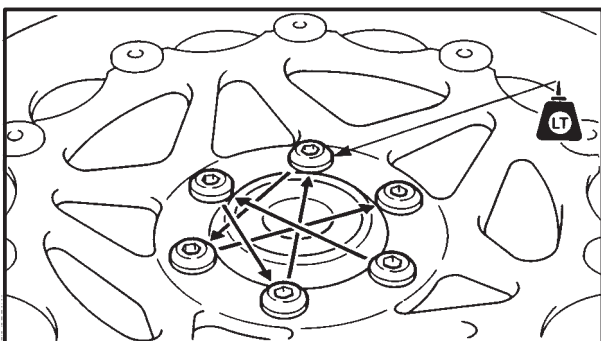
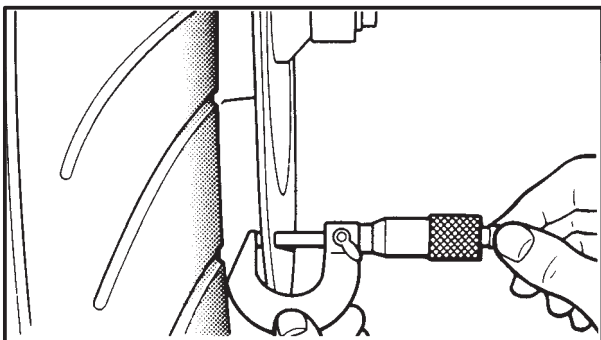
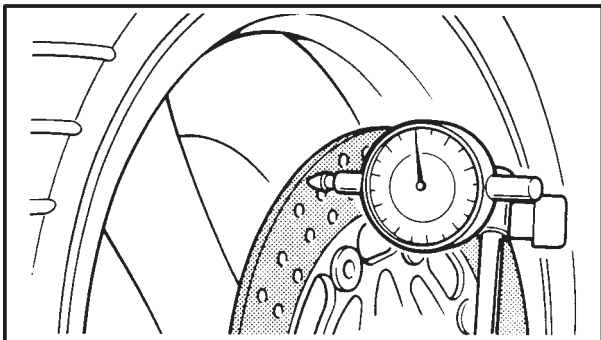
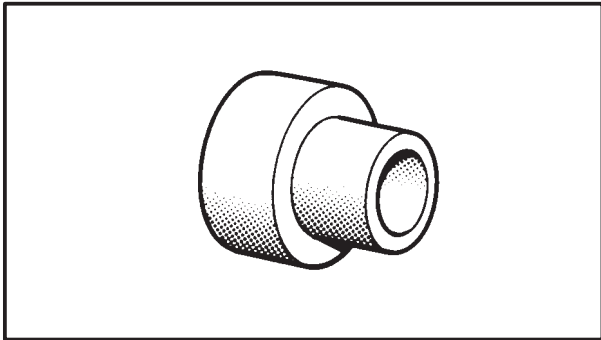
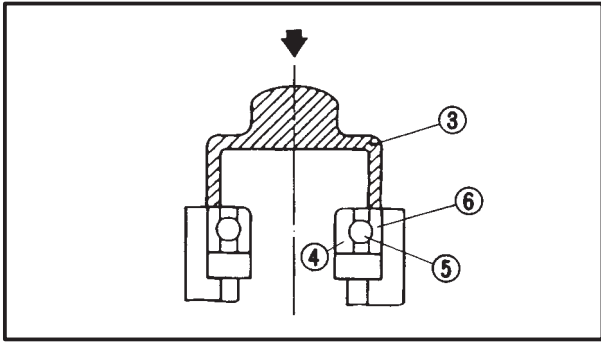
NOTE:

Place a rag on the outer edge to prevent damage.

- Remove the bearing ① using a general bearing puller ②.
- Install the new bearing and oil seal by reversing the previous steps.



FRONT WHEEL AND BRAKE DISCS



NOTE: _____
 Use a socket ③ that matches the outside diameter of the race of the bearing and oil seal.

CAUTION: _____
 Do not strike the center race ④ or balls ⑤ of the bearing. Contact should be made only with the outer race ⑥.



4. Inspect:
 - Collar
Wear/Damage → Replace collar and oil seal as set.
5. Measure:
 - Brake disc deflection
Out of specification → Inspect wheel runout. If wheel runout is in good condition, replace the brake disc(s).

NOTE: _____
 Remove the brake caliper before inspecting the brake disc deflection.

	Maximum deflection: 0.2 mm
--	---

- Brake disc thickness
Out of specification → Replace.

	Minimum thickness: 3.5 mm
--	--

Measuring point 1 ~ 3 mm



- Replacement steps:**
- Remove the brake disc(s).
 - Install the new brake disc(s).

	Brake disc: 20 Nm (2.0 m•kg)
--	---

NOTE: _____
 Tighten the bolts (brake disc) in stage using a crisscross pattern.



ASSEMBLY

Reverse the “DISASSEMBLY” procedure.
Note the following points.

- Lubricate:
 - Bearings
 - Oil seals (lips)

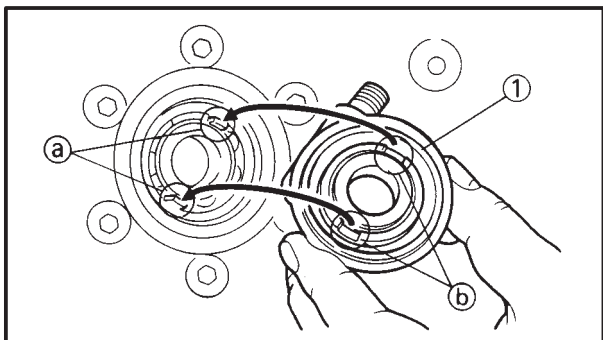
	Recommended lubricant: Lithium soap base grease
---	---

INSTALLATION

Reverse the “REMOVAL” procedure.
Note the following points.

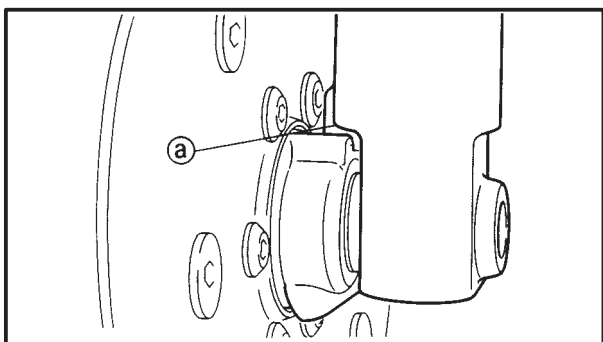
- Lubricate:
 - Front wheel axle
 - Drive/Driven gear (speedometer)

	Recommended lubricant: Lithium soap base grease
---	---





- Install:
 - Speedometer gear unit ①

NOTE: _____
Be sure that two projections (a) inside the wheel hub mesh with the two slots (b) in the gear unit assembly.



- Install:
 - Front wheel
 - Front wheel axle  **58 Nm (5.8 m•kg)**

NOTE: _____
Be sure that the projection (torque stopper) (a) of the gear unit housing is positioned correctly.

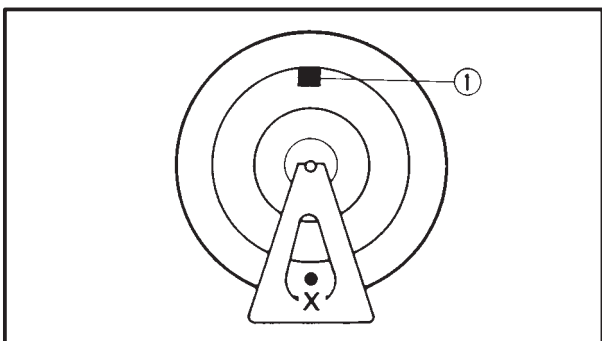
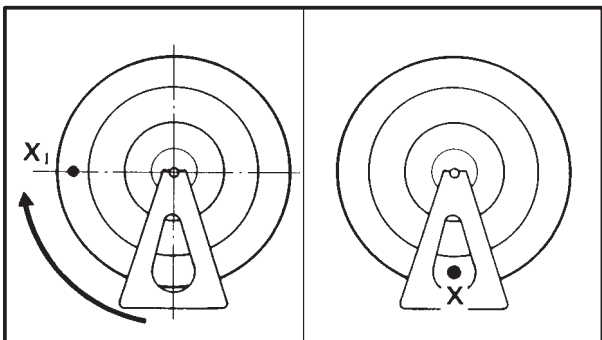
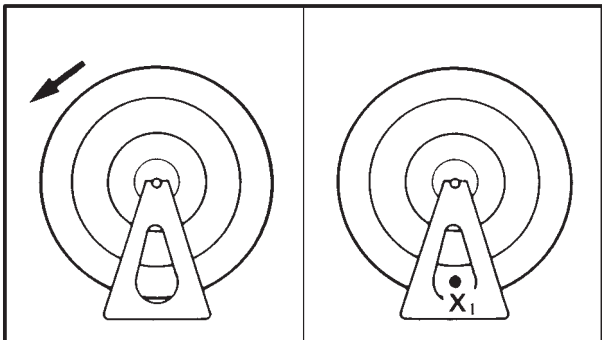
- Install:
 - Pinch bolt  **19 Nm (1.9 m•kg)**
 - Brake caliper (left/right) and cable guide  **40 Nm (4.0 m•kg)**

STATIC WHEEL BALANCE ADJUSTMENT

NOTE: _____

- After replacing the tire and/or rim, wheel balance should be adjusted.
- Adjust the wheel balance with brake disk installed.

1. Remove:
 - Balancing weight
2. Set the wheel on a suitable stand.



3. Find:
 - Heavy spot



Procedure:

- a. Spin the wheel and wait for it to rest.
- b. Put an "X₁" mark on the wheel bottom spot.
- c. Turn the wheel so that the "X₁" mark is 90° up.
- d. Let the wheel fall and wait for it to rest. Put an "X₂" mark on the wheel bottom spot.
- e. Repeat the above b., c., and d. several times until these marks come to the same spot.
- f. This spot is the heavy spot "X".



4. Adjust:
 - Wheel balance



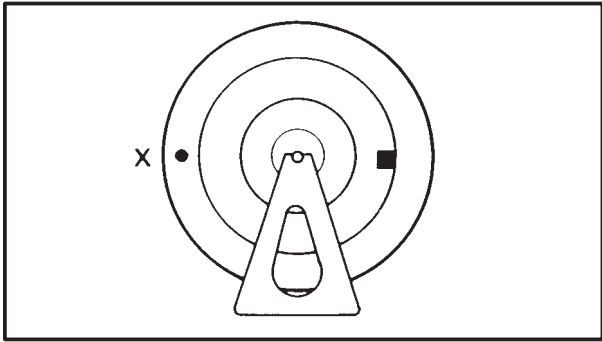
Adjusting steps:

- Install a balancing weight ① on the rim exactly opposite to the heavy spot "X".

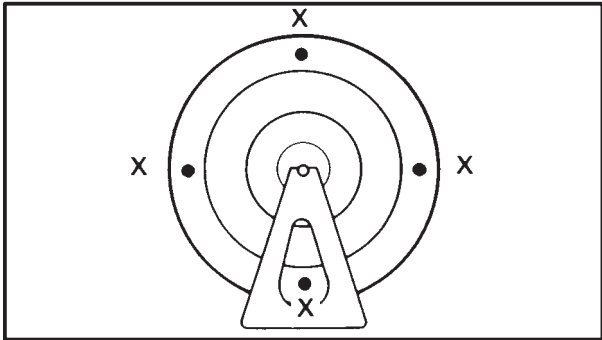
NOTE: _____

Start with the smallest weight.

FRONT WHEEL AND BRAKE DISCS



- Turn the wheel so that the heavy spot is 90° up.
 - Check that the heavy spot is at rest there.
- If not, try another weight until the wheel is balanced.



5. Check:

- Wheel balance



Checking steps:

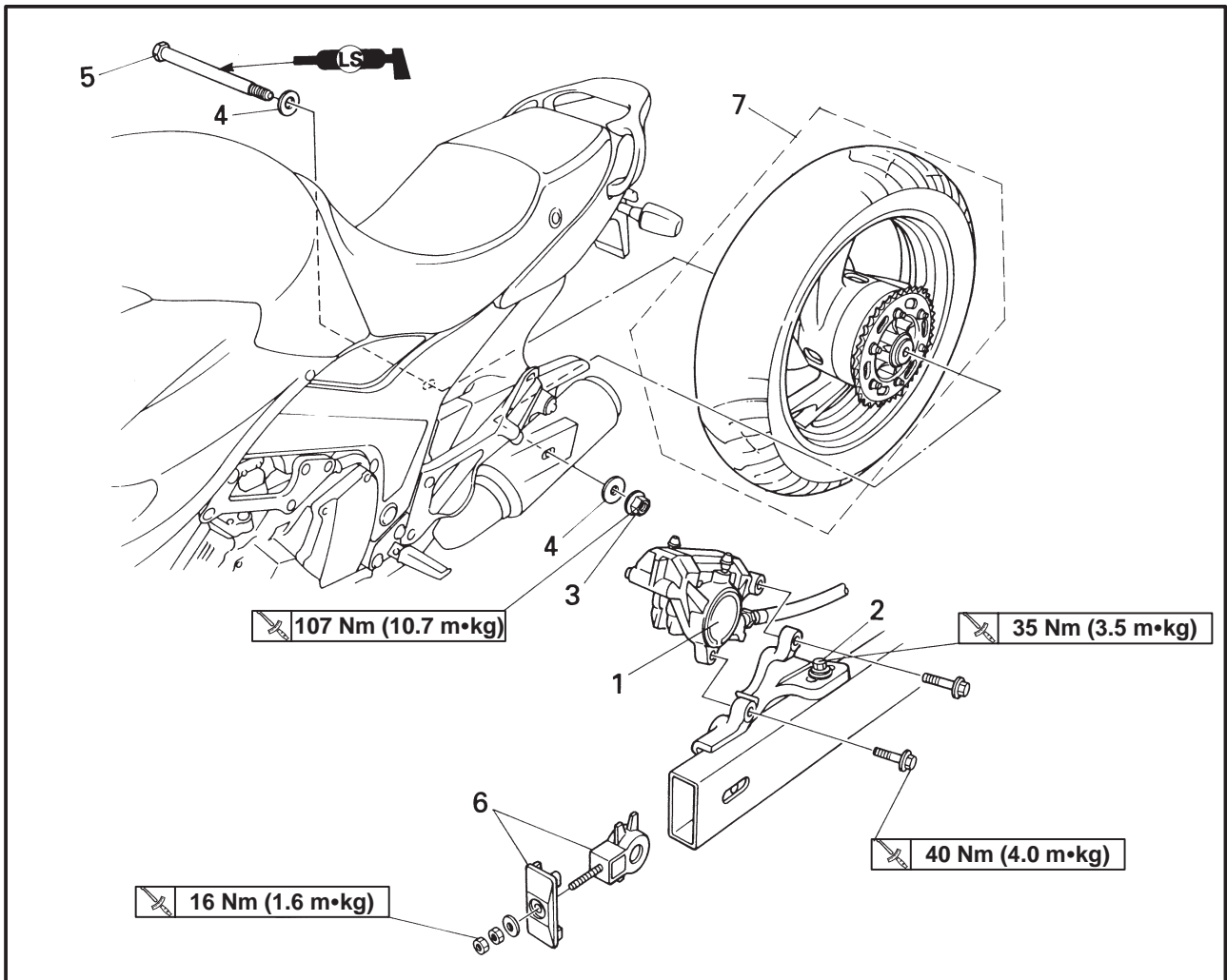
- Turn the wheel so that it comes to each point as shown.
- Check that the wheel is at rest at each point. If not, readjust the wheel balance.



REAR WHEEL, BRAKE DISC AND DRIVEN SPROCKET

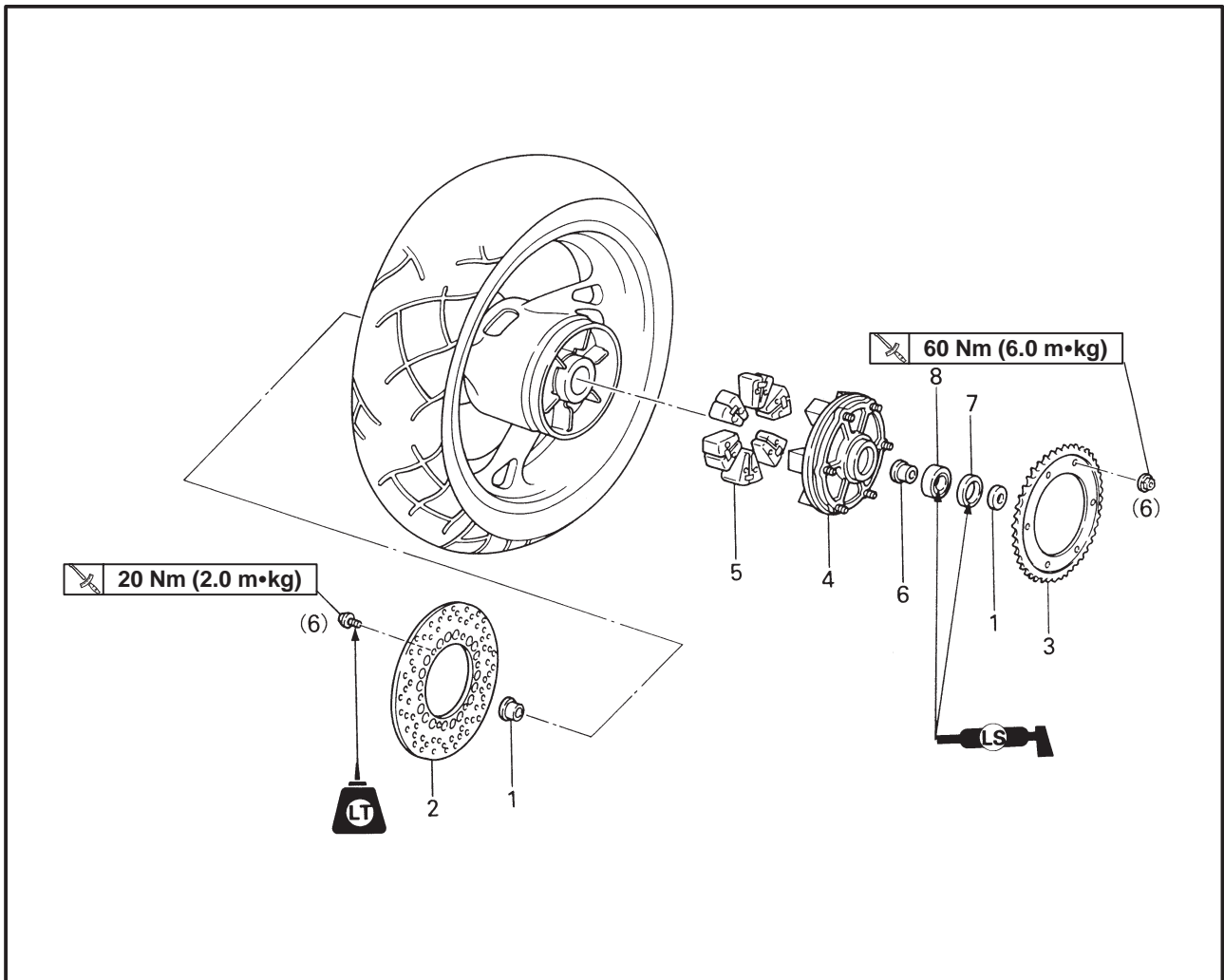


REAR WHEEL, BRAKE DISC AND DRIVEN SPROCKET REAR WHEEL



Order	Job name/Part name	Q'ty	Remarks
	Rear wheel removal		Remove the parts in the order below. NOTE: _____ Elevate the rear wheel by placing a suitable stand under the engine.
1	Brake caliper	1	Loosen
2	Caliper bracket bolt	1	
3	Rear wheel axle nut	1	
4	Plain washer	2	
5	Rear wheel axle	1	
6	Chain puller	2	
7	Rear wheel	1	
			For installation, reverse the removal procedure.

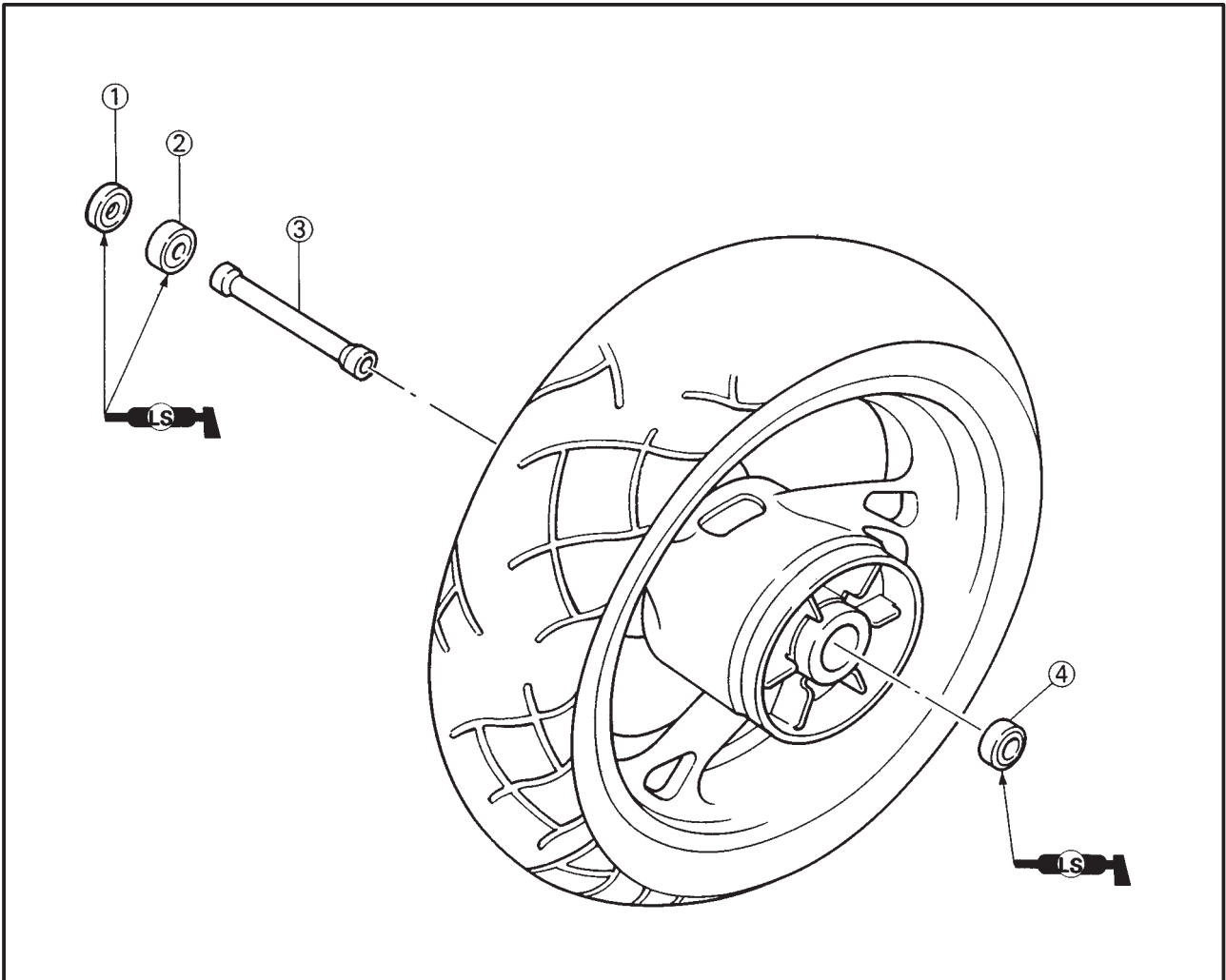
BRAKE DISC AND DRIVEN SPROCKET



Order	Job name/Part name	Q'ty	Remarks
	Brake disc and driven sprocket removal		Remove the parts in the order below.
1	Collar (left/right)	1/1	
2	Brake disc	1	
3	Driven sprocket	1	
4	Clutch hub	1	
5	Rubber damper	6	
6	Collar	1	
7	Oil seal	1	
8	Bearing	1	
			For installation, reverse the removal procedure.

REAR WHEEL, BRAKE DISC AND DRIVEN SPROCKET

CHAS



Order	Job name/Part name	Q'ty	Remarks
	Rear wheel disassembly		Disassembly the parts in the order below.
①	Oil seal	1	
②	Bearing	1	
③	Collar	1	
④	Bearing	1	
			For assembly, reverse the disassembly procedure.

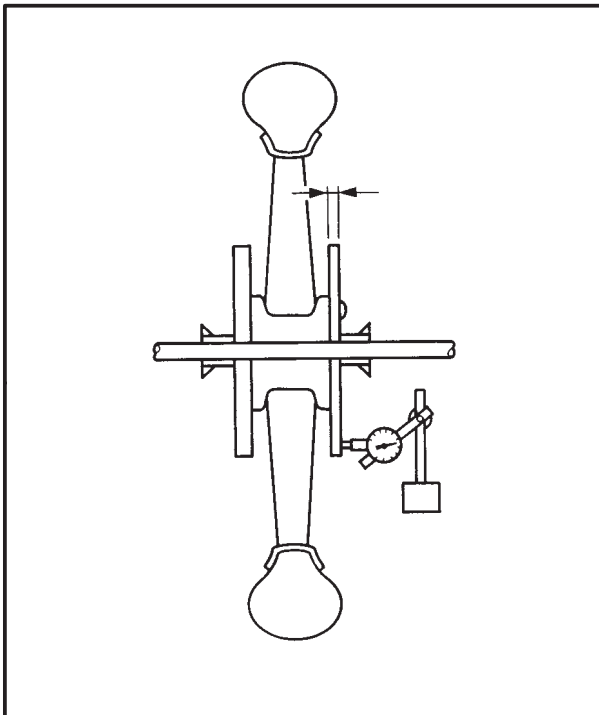


INSPECTION

1. Inspect:
 - Rear wheel axle
Refer to "FRONT WHEEL AND BRAKE DISC".
2. Measure:
 - Wheel runout
Refer to "FRONT WHEEL AND BRAKE DISC".
3. Install:
 - Wheel bearings
 - Oil seals
 - Collars
Refer to "FRONT WHEEL AND BRAKE DISC".
4. Measure:
 - Brake disc deflection
Out of specification → Inspect wheel runout.
If wheel runout is in good condition, replace the brake disc(s).

NOTE:

Remove the brake caliper before inspecting the brake disc deflection.



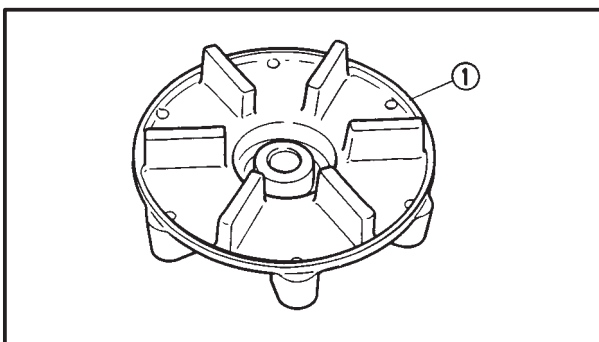
Maximum deflection:
0.15 mm

- Brake disc thickness
Out of specification → Replace.

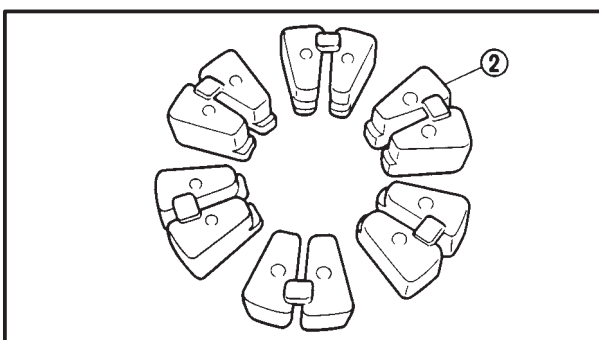


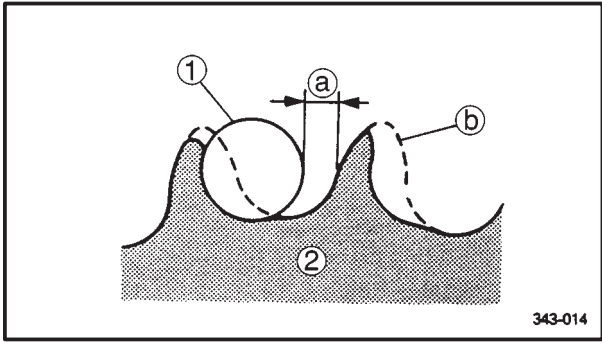
Minimum thickness:
4.5 mm

Measuring point 1 ~ 3 mm



5. Inspect:
 - Clutch hub ①
Cracks/Damage → Replace.
 - Rubber dampers ②
Wear/Damage → Replace.





6. Inspect:
- Driven sprocket
 - More than 1/4 teeth (a) wear → Replace sprocket.
 - Bent teeth → Replace sprocket.
 - (b) Correct
 - (1) Roller
 - (2) Sprocket



Driven sprocket replacement steps:

- Remove the self locknuts and driven sprocket.
- Clean the hub, especially on the surfaces in contact with the sprocket, using a clean cloth.
- Install the new driven sprocket.

	<p>Driven sprocket: 60 Nm (6.0 m•kg)</p>
---	---

NOTE: _____

Tighten the self locknuts in stage, using a criss-cross pattern.



STATIC WHEEL BALANCE ADJUSTMENT

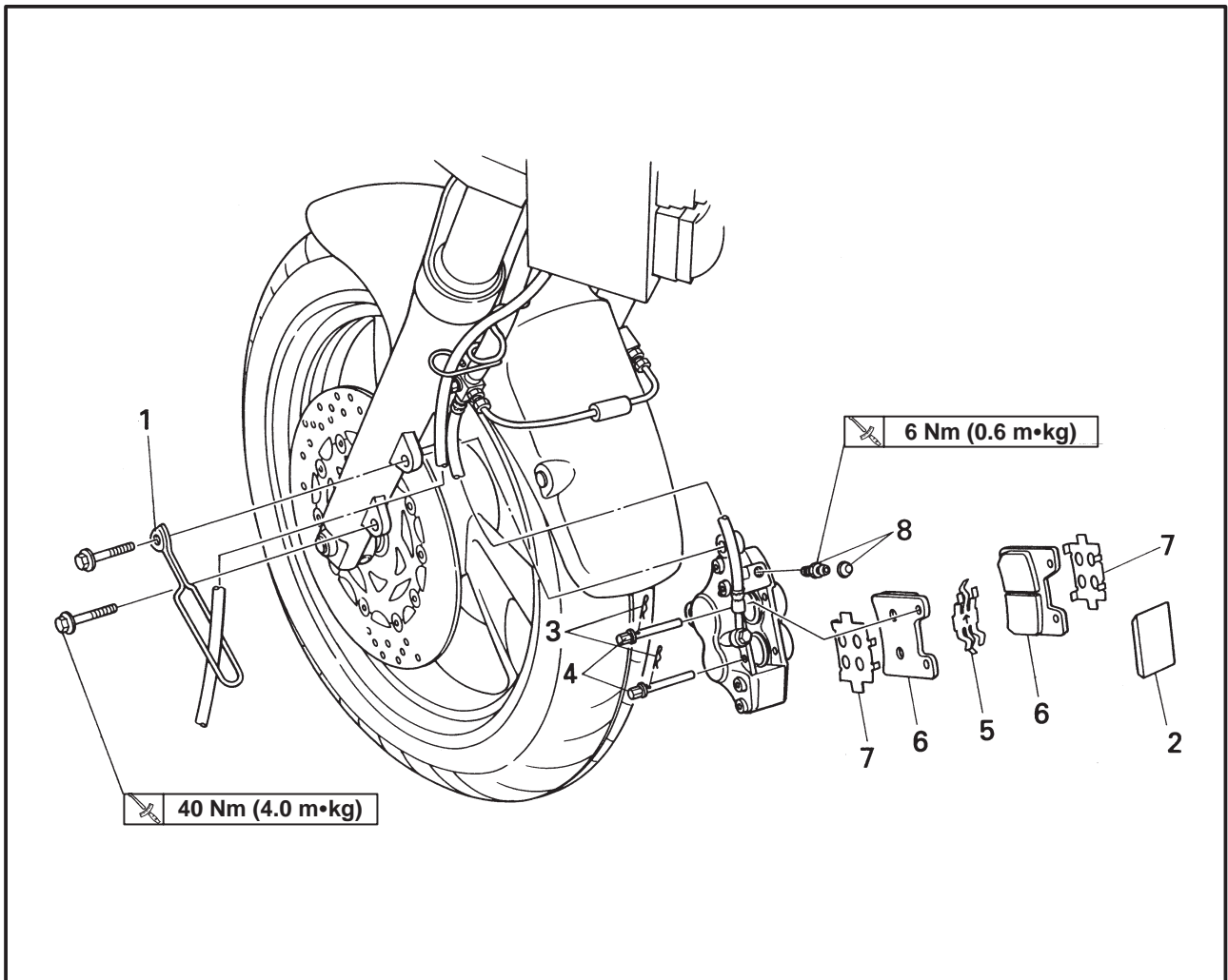
NOTE: _____

- After replacing the tire and/or rim, wheel balance should be adjusted.
- Adjust the wheel balance with brake disc and hub installed.



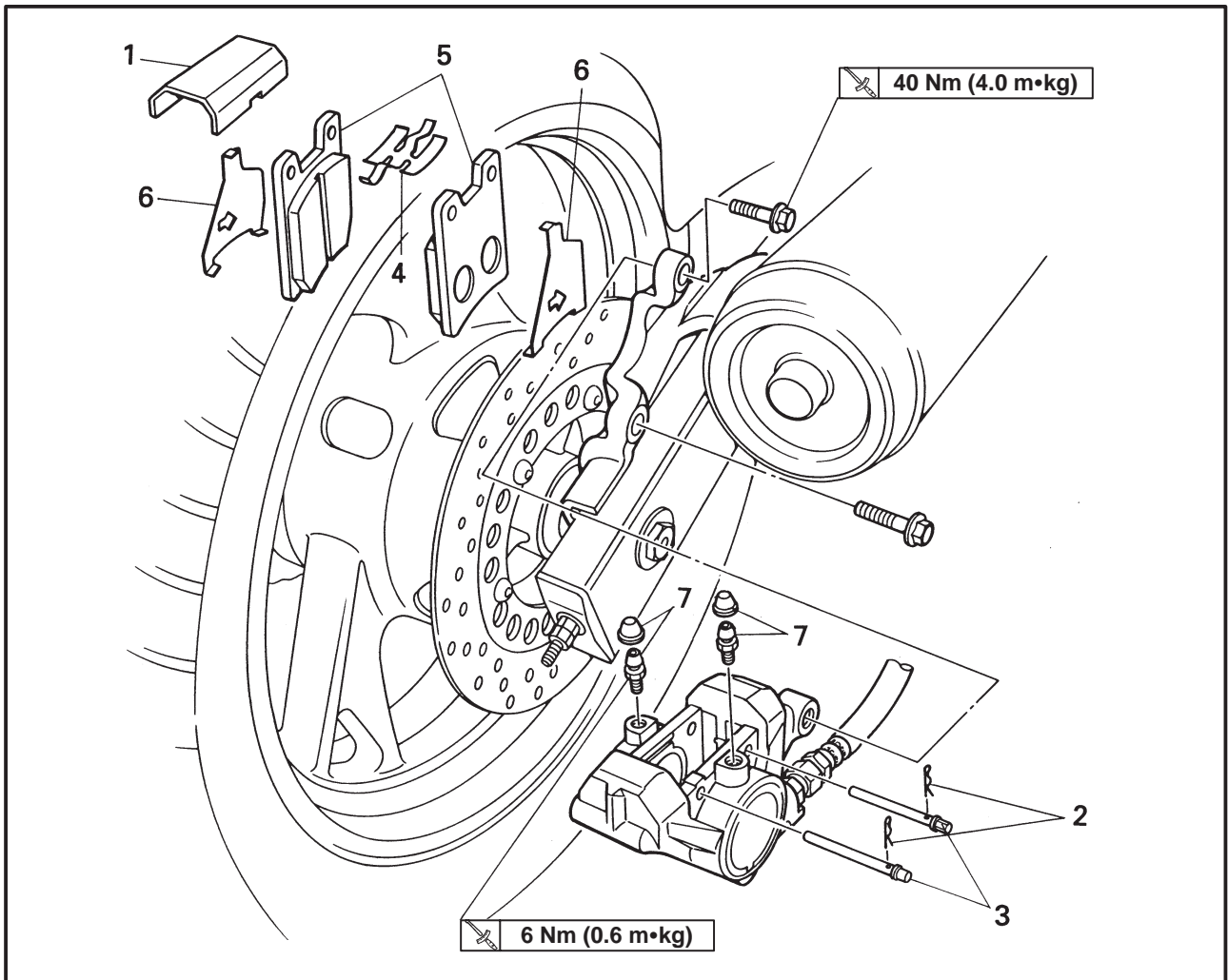
1. Adjust:
- Wheel balance
 - Refer to “FRONT WHEEL AND BRAKE DISCS”.

FRONT AND REAR BRAKE
FRONT BRAKE PAD



Order	Job name/Part name	Q'ty	Remarks
	Front brake pad removal		Remove the parts in the order below.
1	Cable guide	1	Refer to "BRAKE PAD REPLACEMENT". For installation, reverse the removal procedure.
2	Pad cover	1	
3	Retaining clip	2	
4	Retaining pin	2	
5	Pad spring	1	
6	Brake pad	2	
7	Pad shim	2	
8	Bleed screw	1	

REAR BRAKE PAD



Order	Job name/Part name	Q'ty	Remarks
	Rear brake pad removal		Remove the parts in the order below.
1	Pad cover	1	
2	Retaining clip	2	
3	Retaining pin	2	
4	Pad spring	1	
5	Brake pad	2	
6	Pad shim (left/right)	1/1	
7	Bleed screw	2	
			For installation, reverse the removal procedure.

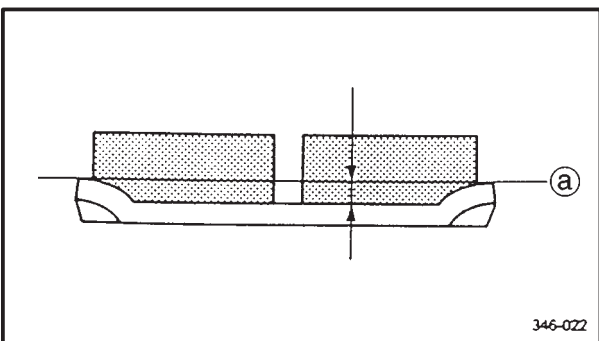
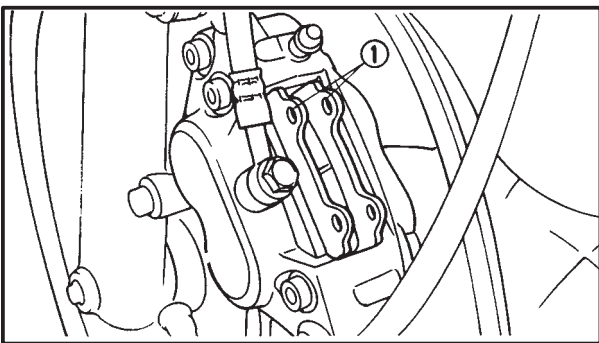
**CAUTION:**

Disc brake components rarely require disassembly. **DO NOT:**

- Disassemble components unless absolutely necessary.
- Use solvents on internal brake components.
- Use contaminated brake fluid for cleaning. Use only clean brake fluid.
- Allow brake fluid to come in contact with the eyes, otherwise eye injury may occur.
- Allow brake fluid to contact painted surfaces or plastic parts otherwise damage may occur.
- Disconnect any hydraulic connection otherwise the entire system must be disassembled, drained, cleaned, and then properly filled and bled after reassembly.

BRAKE PAD REPLACEMENT**NOTE:**

It is not necessary to disassemble the brake caliper and brake hose to replace the brake pads.

**Front brake**

1. Remove:
 - Brake pads ①

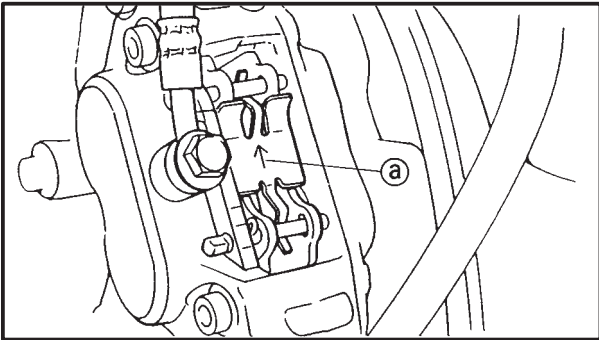
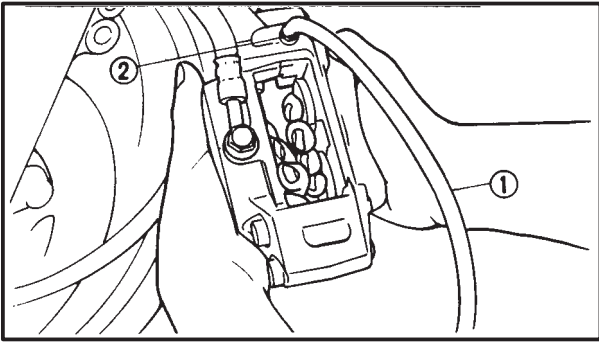
NOTE:

- Do not depress the brake lever when the wheel is off the motorcycle otherwise the brake pads will be forced shut.
- Install new brake pad spring and shims when the brake pads have to be replaced.
- Replace the pads as a set if either is found to be worn to the wear limit (a).



Wear limit (a):
0.5 mm

346-022



2. Install:
 - Pad shims **New**
(onto brake pads)
 - Brake pads **New**
 - Pad spring **New**



Installation steps:

- Connect a suitable hose ① tightly to the caliper bleed screw ②. Put the other end of this hose into an open container.
- Loosen the caliper bleed screw and push the pistons into the caliper with the finger.
- Tighten the caliper bleed screw ②.



Bleed screw:
6 Nm (0.6 m•kg)

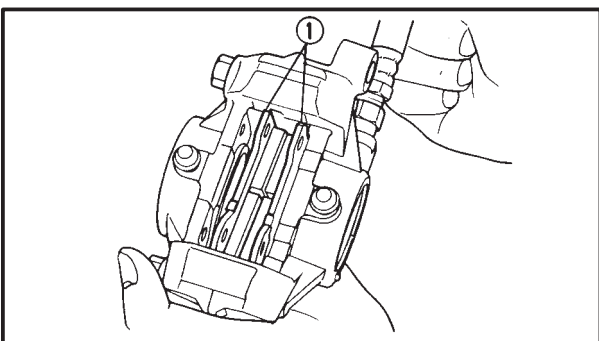
- Install the pad shims on the brake pad.
- Install the brake pads and pad spring.

NOTE: _____

- The arrow mark (a) of the pad spring must point in the direction of the disc rotation.
- After installing the retaining clip, turn the retaining pin so that the heads of the retaining clips face towards the center of the brake pad spring.



3. Inspect:
 - Brake fluid level
Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.
4. Check:
 - Brake lever operation
A soft or spongy feeling → Bleed brake system.
Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.

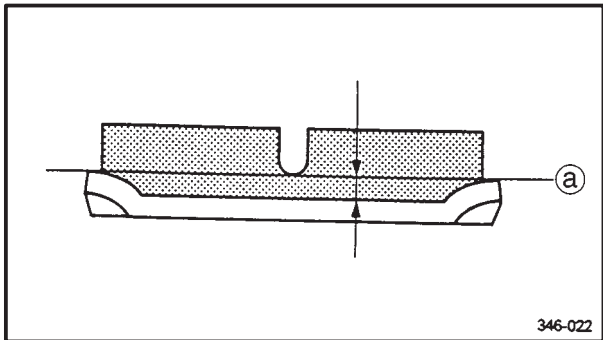


Rear brake


1. Remove:
 - Brake pads ①

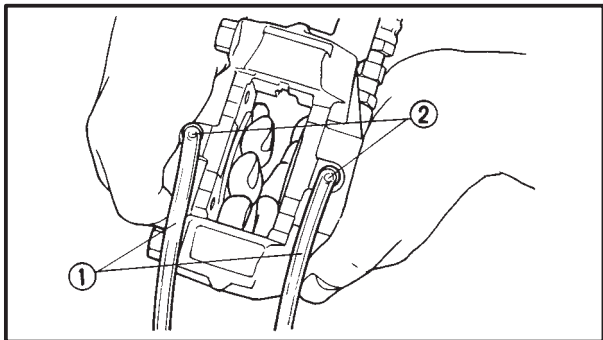
NOTE: _____

- Do not depress the brake pedal while the caliper is removed.
- When pads replacement is required, also replace the pad spring and shims.



- Replace the pads as a set if either is found to be worn to the wear limit (a).

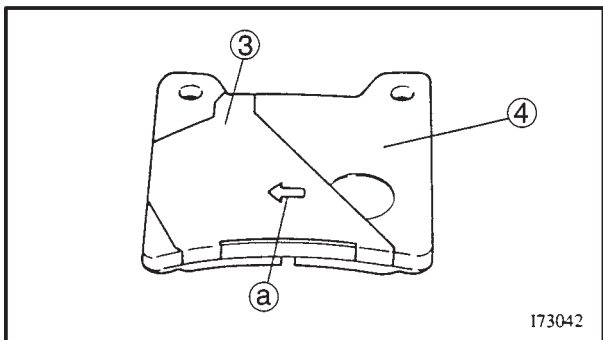
	Wear limit (a): 0.5 mm
---	---



2. Install:
 - Pad shims **New** (onto brake pads)
 - Brake pads **New**
 - Pad spring **New**

Installation steps:

- Connect a suitable hose (1) tightly to the caliper bleed screw (2). Then, place the other end of this hose into an open container.
- Loosen the caliper bleed screw and push the pistons into the caliper with the finger.
- Tighten the caliper bleed screw (2).

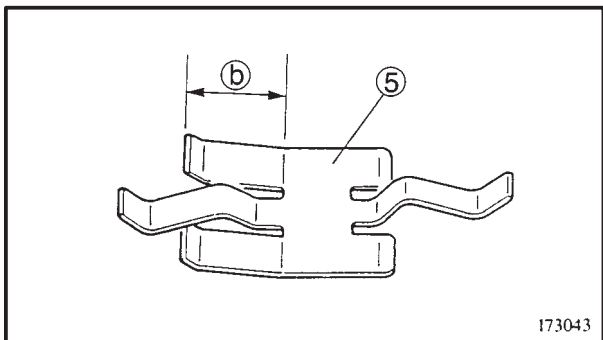


	Bleed screw: 6 Nm (0.6 m•kg)
---	---

- Install the pad shims (3) on the brake pad (4).

NOTE:

The arrow mark (a) on the pad shim must point in the direction of the disc rotation.



- Install the brake pads and pad spring (5).

NOTE:

The longer tangs (b) of the pad spring must point in the direction of the disc rotation.

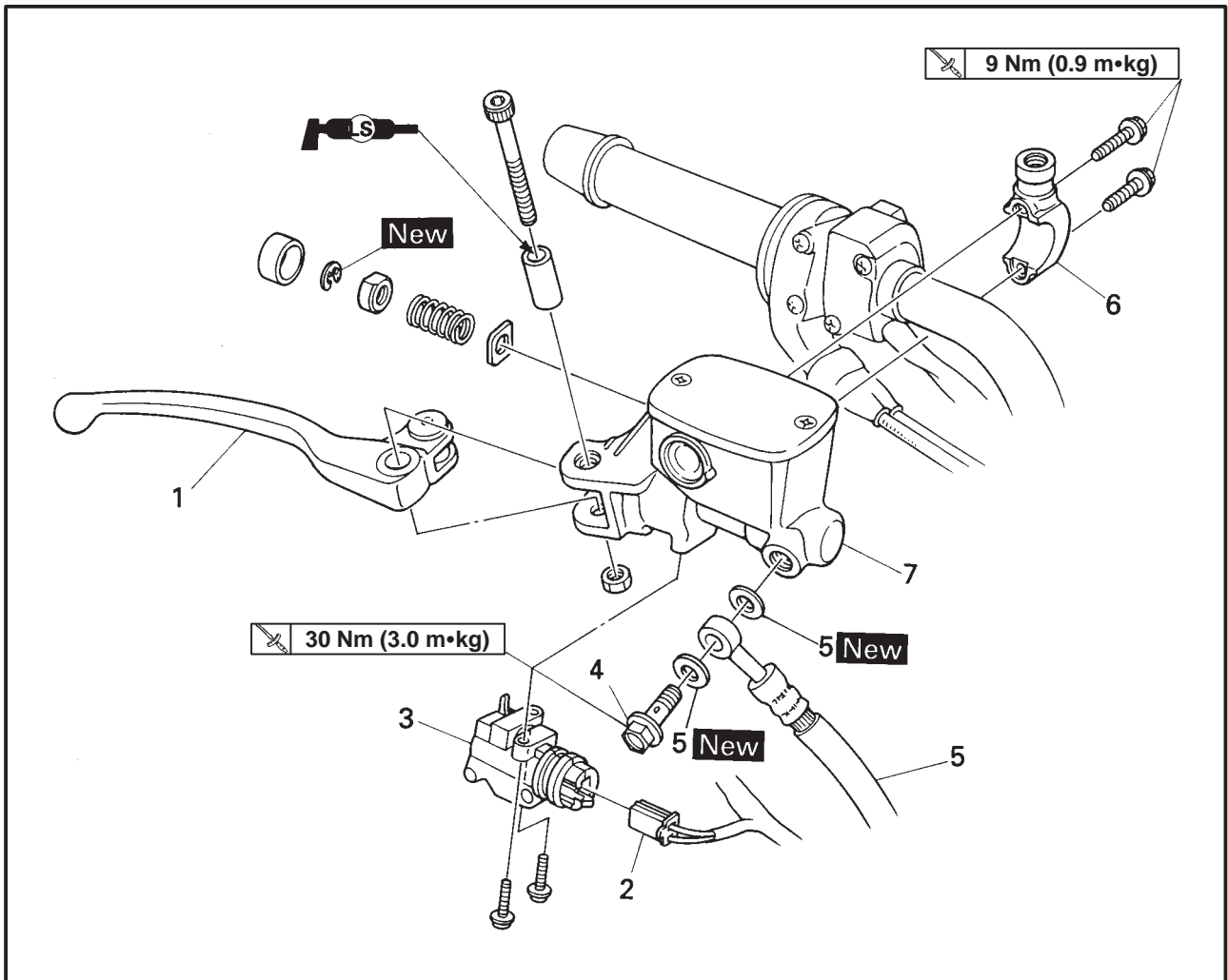
3. Inspect:

- Brake fluid level
Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.

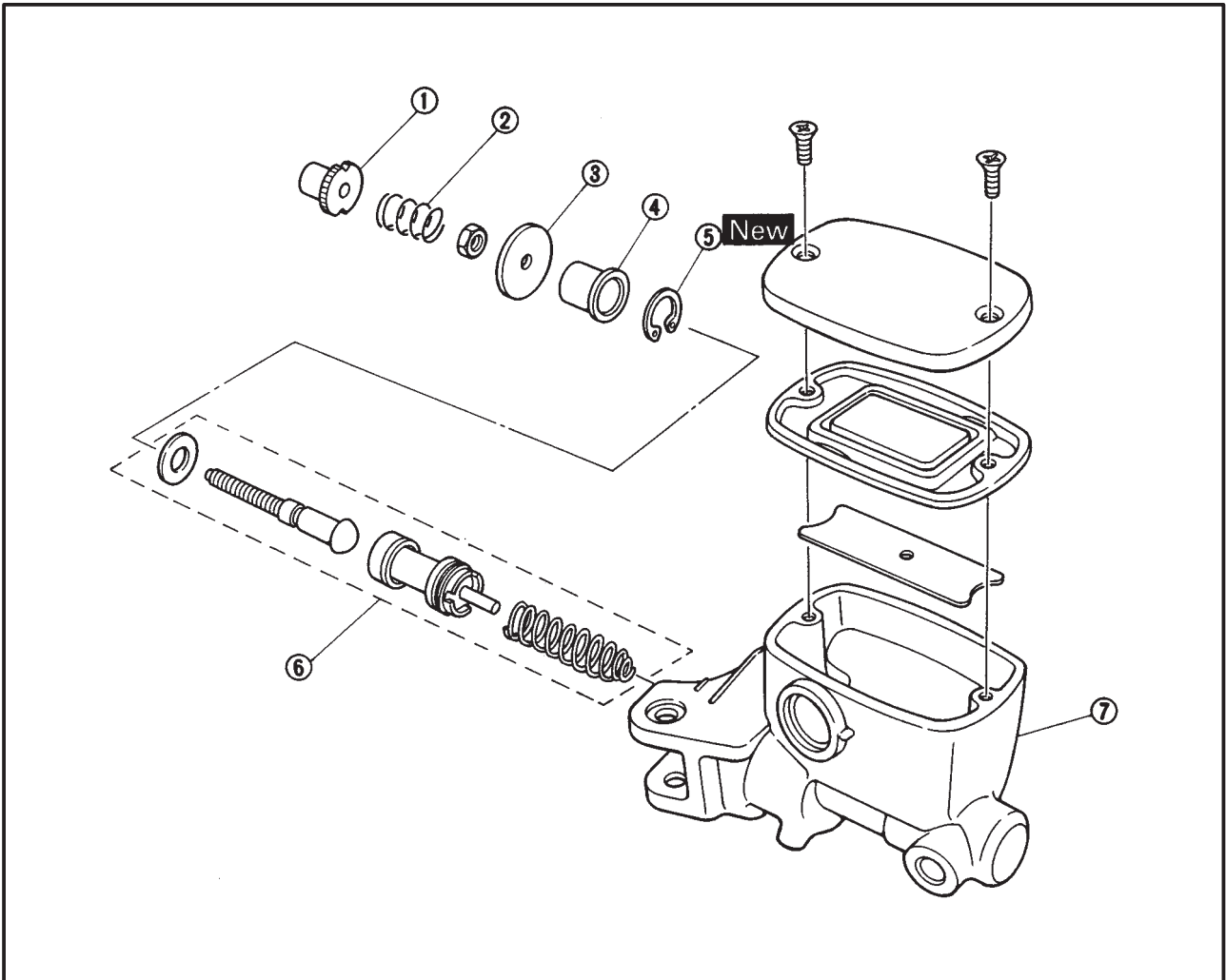
4. Check:

- Brake pedal operation
A soft or spongy feeling → Bleed brake system. Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.

FRONT BRAKE MASTER CYLINDER

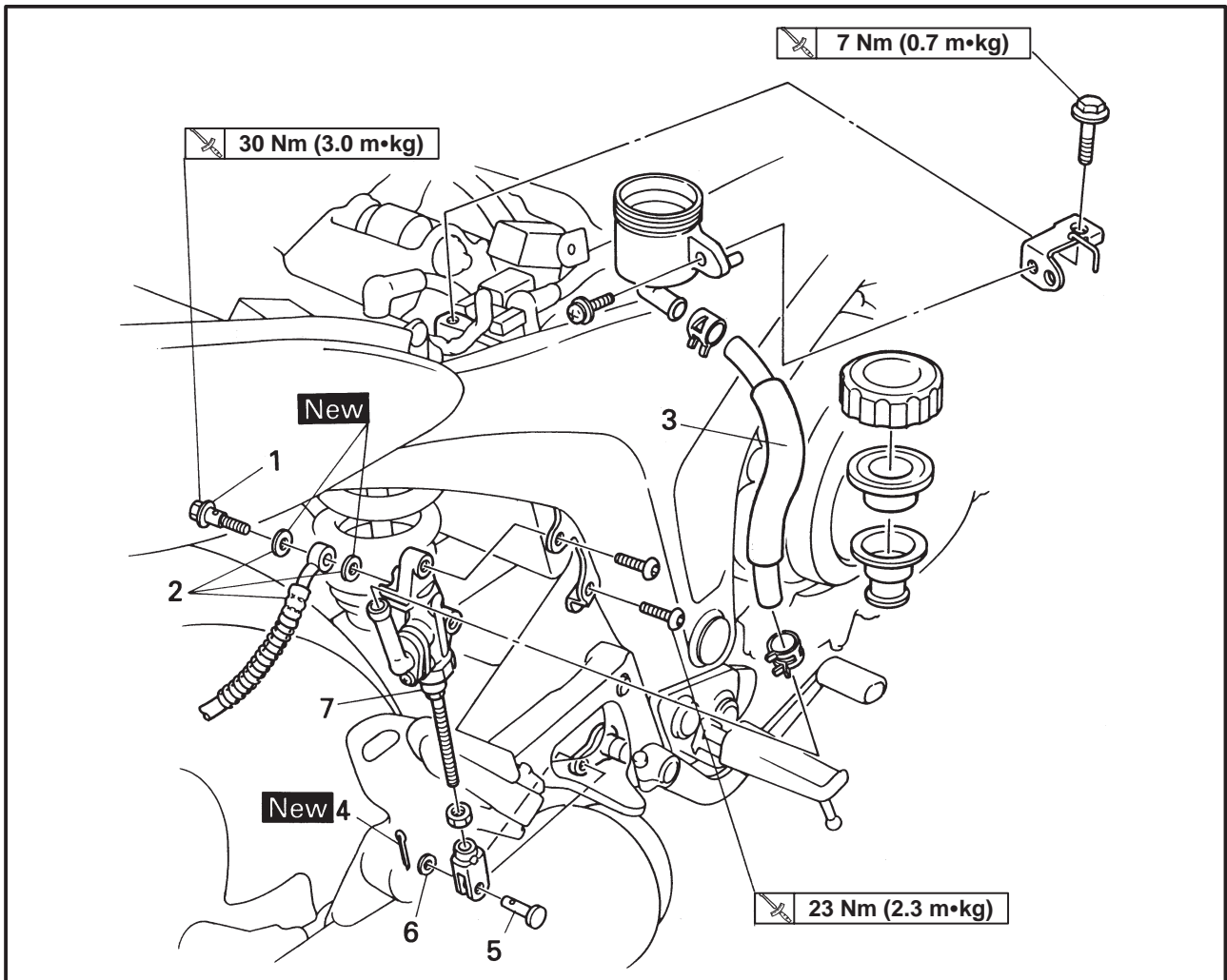


Order	Job name/Part name	Q'ty	Remarks
	Front brake master cylinder removal		Remove the parts in the order below.
	Brake fluid		Drain
1	Brake lever	1	
2	Front brake switch lead coupler	1	Disconnect
3	Front brake switch	1	
4	Union bolt	1	
5	Copper washer/Brake hose	2/1	
6	Master cylinder bracket	1	
7	Master cylinder assembly	1	Refer to "MASTER CYLINDER ASSEMBLY". For installation, reverse the removal procedure.

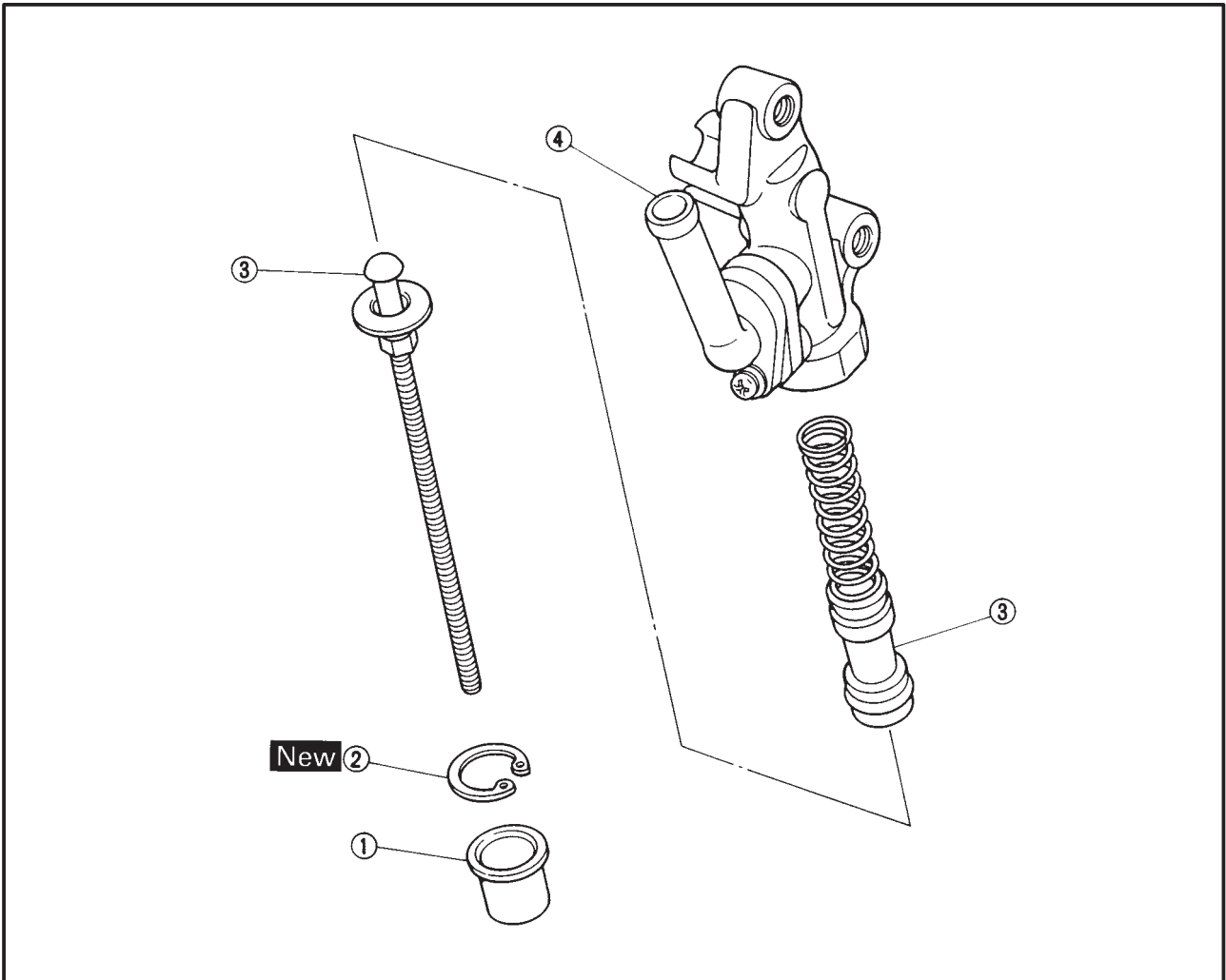


Order	Job name/Part name	Q'ty	Remarks
	Front brake master cylinder disassembly		Disassemble the parts in the order below.
①	Adjuster	1	
②	Spring	1	
③	Plate	1	
④	Boot	1	
⑤	Circlip	1	
⑥	Master cylinder kit	1	
⑦	Master cylinder body	1	
			For assembly, reverse the disassembly procedure.

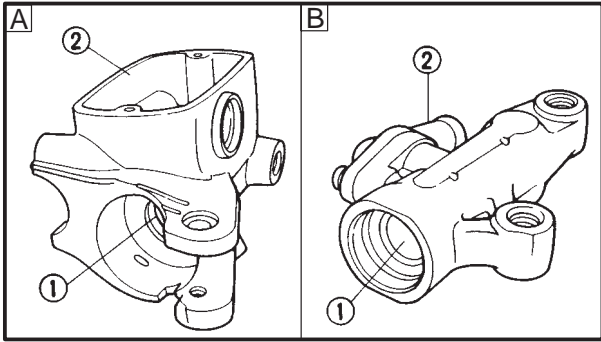
REAR BRAKE MASTER CYLINDER



Order	Job name/Part name	Q'ty	Remarks
	Rear brake master cylinder removal		Remove the parts in the order below. Drain
1	Brake fluid		
1	Union bolt	1	
2	Copper washer/Brake hose	2/1	
3	Brake reservoir hose	1	
			NOTE: _____ Remove from the master cylinder side. _____
4	Cotter pin	1	
5	Clevis pin	1	
6	Plain washer	1	
7	Master cylinder	1	Refer to "MASTER CYLINDER ASSEMBLY". For installation, reverse the removal procedure.



Order	Job name/Part name	Q'ty	Remarks
	Rear brake master cylinder disconnection		Disconnect the parts in the order below.
①	Boot	1	
②	Circlip	1	
③	Master cylinder kit	1	
④	Master cylinder body	1	
			For assembly, reverse the disconnection procedure.



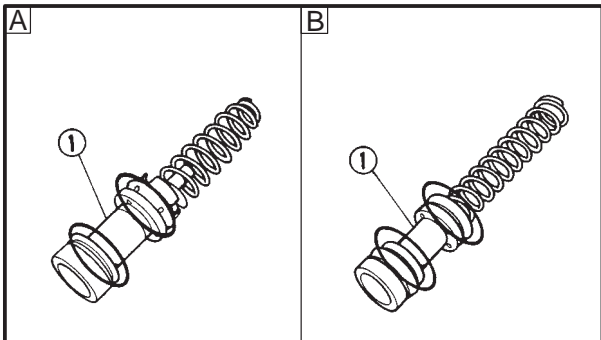
MASTER CYLINDER INSPECTION

1. Inspect:

- Master cylinder ①
Wear/Scratches → Replace the master cylinder assembly.
- Master cylinder body ②
Cracks/Damage → Replace.
- Oil delivery passage (master cylinder body)
Blow out with compressed air.

A Front

B Rear



2. Inspect:

- Master cylinder kit ①
Scratches/Wear/Damage → Replace as a set.

A Front

B Rear

MASTER CYLINDER ASSEMBLY

WARNING

- All internal parts should be cleaned in new brake fluid only.
- Internal parts should be lubricated with brake fluid when installed.

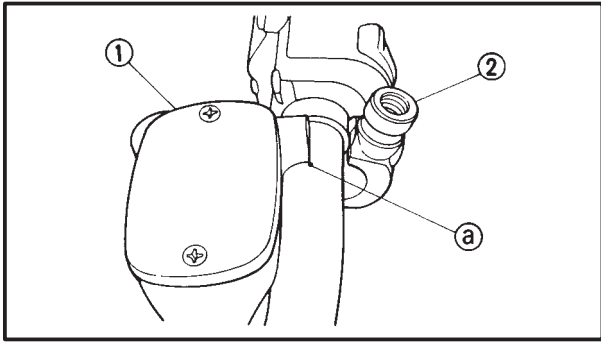


**Recommended brake fluid:
DOT 4**

- Replace the piston seals and dust seals whenever a caliper is disassembled.

FRONT AND REAR BRAKE

CHAS



Front brake

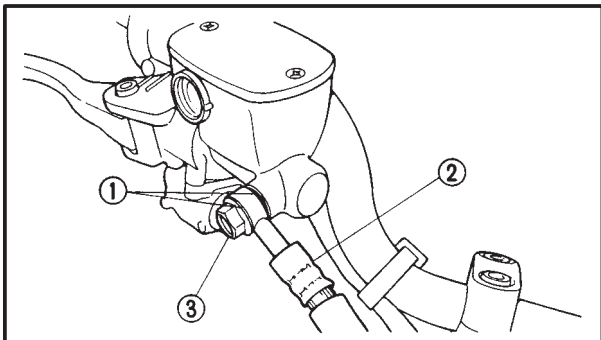
1. Install:

- Master cylinder ①
- Master cylinder bracket ②

9 Nm (0.9 m•kg)

CAUTION:

- Align the end of the holder with the punch mark ① on the handlebar.
- Tighten first the upper bolt, then the lower bolt.



2. Install:

- Copper washers ① **New**
- Brake hose ②
- Union bolt ③

30 Nm (3.0 m•kg)

⚠ WARNING

- Proper hose routing is essential to insure safe motorcycle operation. Refer to "CABLE ROUTING".
- Always use new copper washers.

3. Fill:

- Brake reservoir



Recommended brake fluid:
DOT 4

CAUTION:

Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.



⚠ WARNING

- Use only the designated quality brake fluid: otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.
- Refill with the same type of brake fluid: mixing fluids may result in a harmful chemical reaction and lead to poor performance.
- Be careful that water does not enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and may result in vapor lock.

4. Air bleed:

- Brake system

Refer to “AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)” in CHAPTER 3.

5. Inspect:

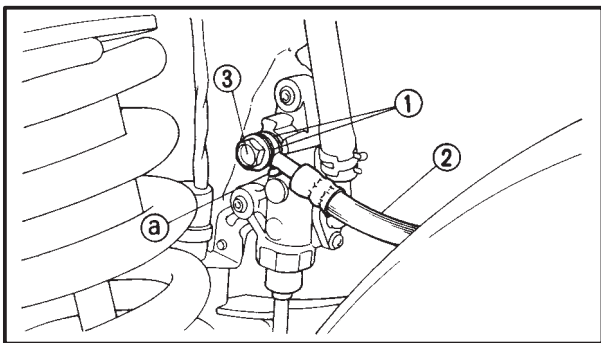
- Brake fluid level

Refer to “BRAKE FLUID LEVEL INSPECTION” in CHAPTER 3.

6. Check:

- Brake level operation

A soft or spongy feeling → Bleed brake system. Refer to “AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)” in CHAPTER 3.



Rear brake

1. Install:

- Copper washer ① **New**
- Brake hose ②
- Union bolt ③

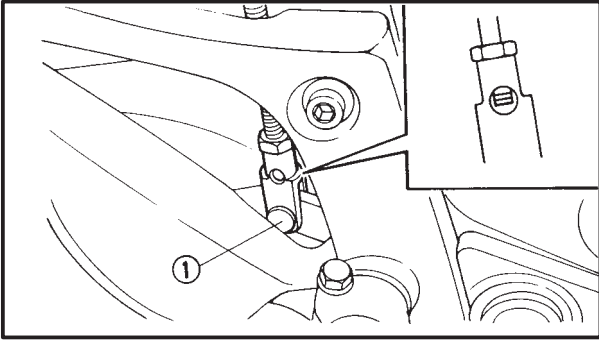
30 Nm (3.0 m•kg)

CAUTION:

When installing the brake hose on the master cylinder, take care that the pipe touches the projection ① as shown.

⚠ WARNING

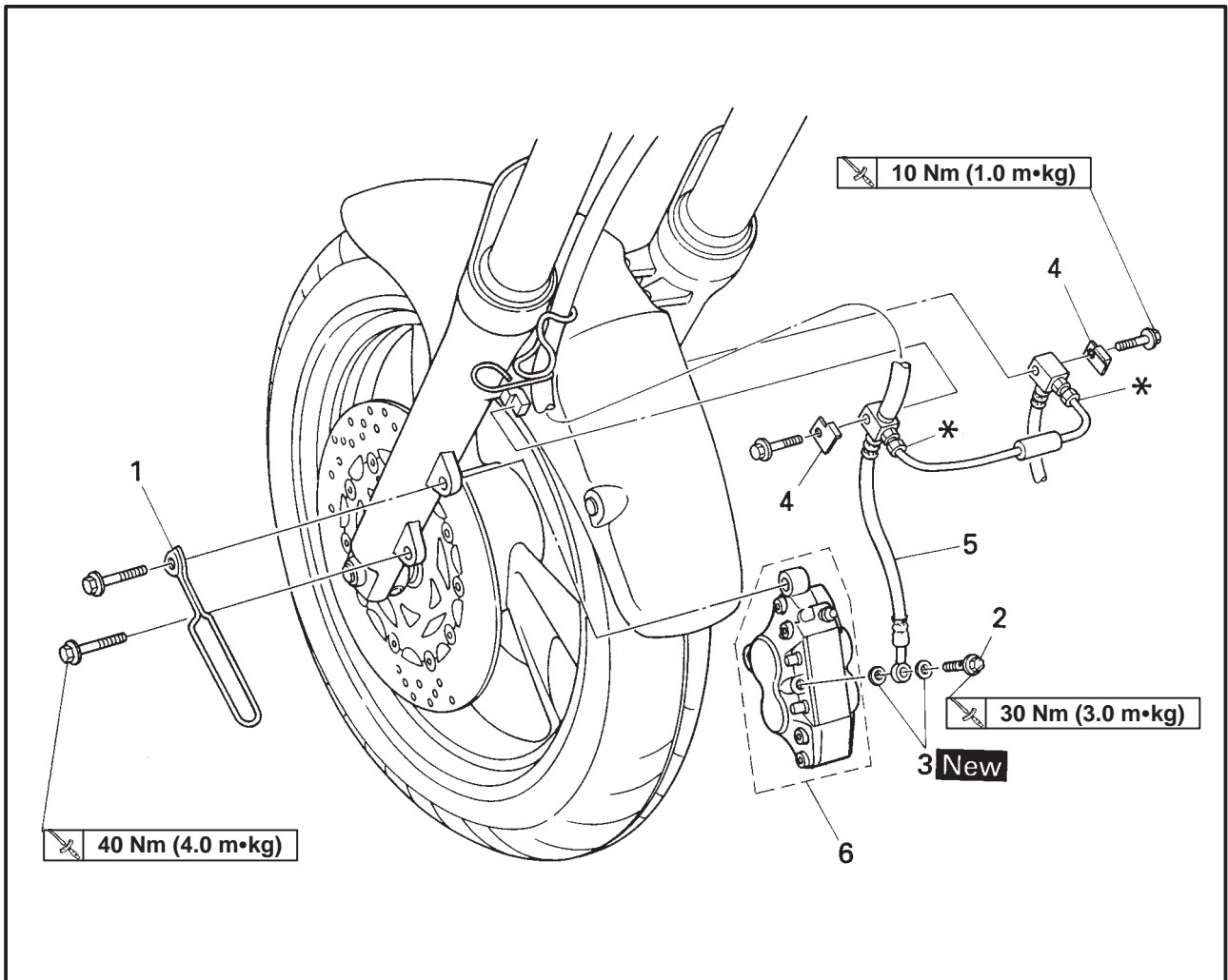
- Proper hose routing is essential to insure safe motorcycle operation. Refer to “CABLE ROUTING”.
- Always use new copper washers.



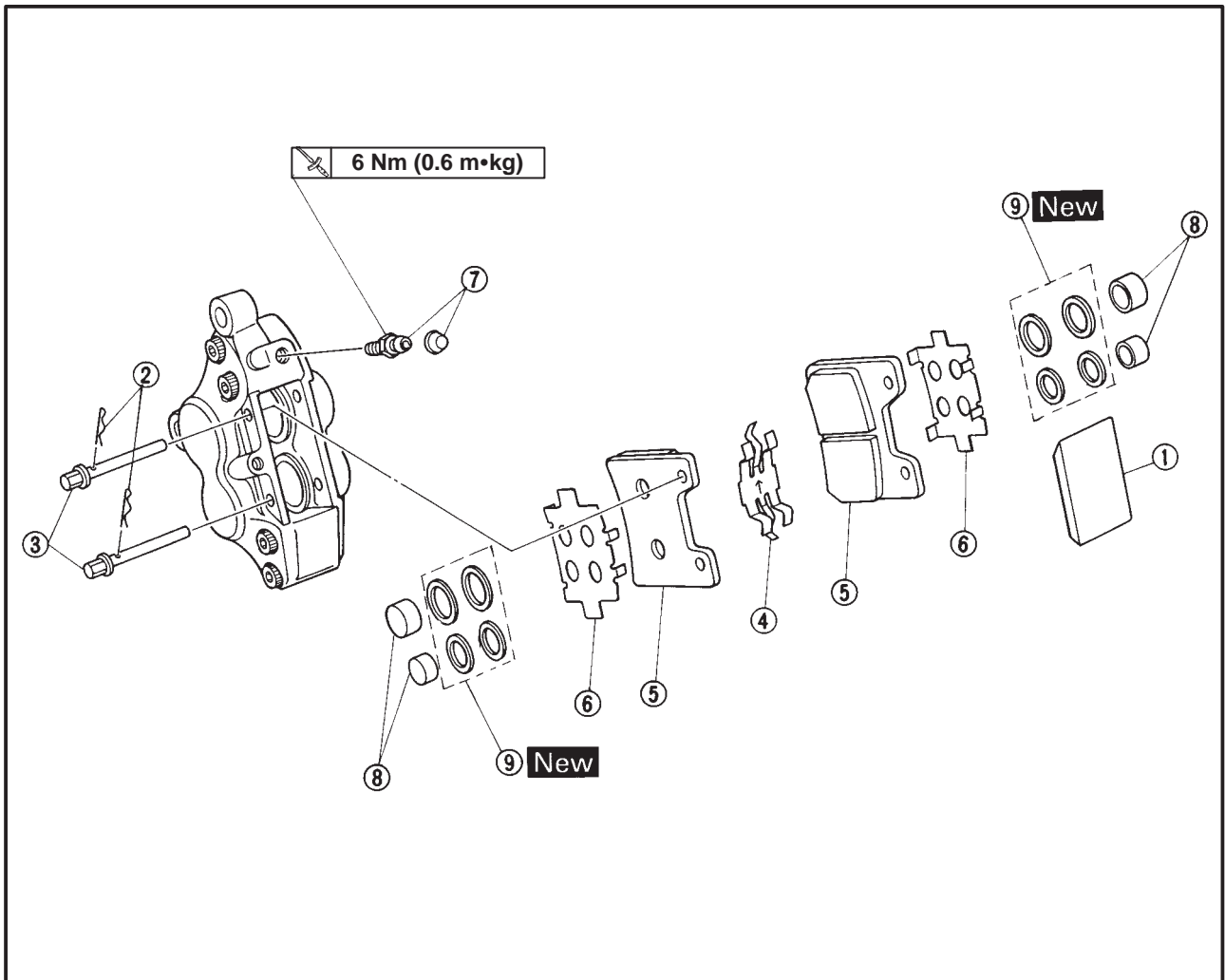
2. Install:
 - Clevis pin ①
 - Washer
 - Cotter pin **New**

3. Fill:
 - Brake reservoir
Refer to "MASTER CYLINDER ASSEMBLY – Front brake".
4. Inspect:
 - Brake fluid level
Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.
5. Check:
 - Brake pedal operation
A soft or spongy feeling → Bleed brake system.
Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.
6. Adjust:
 - Brake pedal height
Refer to "REAR BRAKE ADJUSTMENT" in CHAPTER 3.
7. Adjust:
 - Brake light switch
Refer to "BRAKE LIGHT SWITCH ADJUSTMENT" in CHAPTER 3.

FRONT BRAKE CALIPER

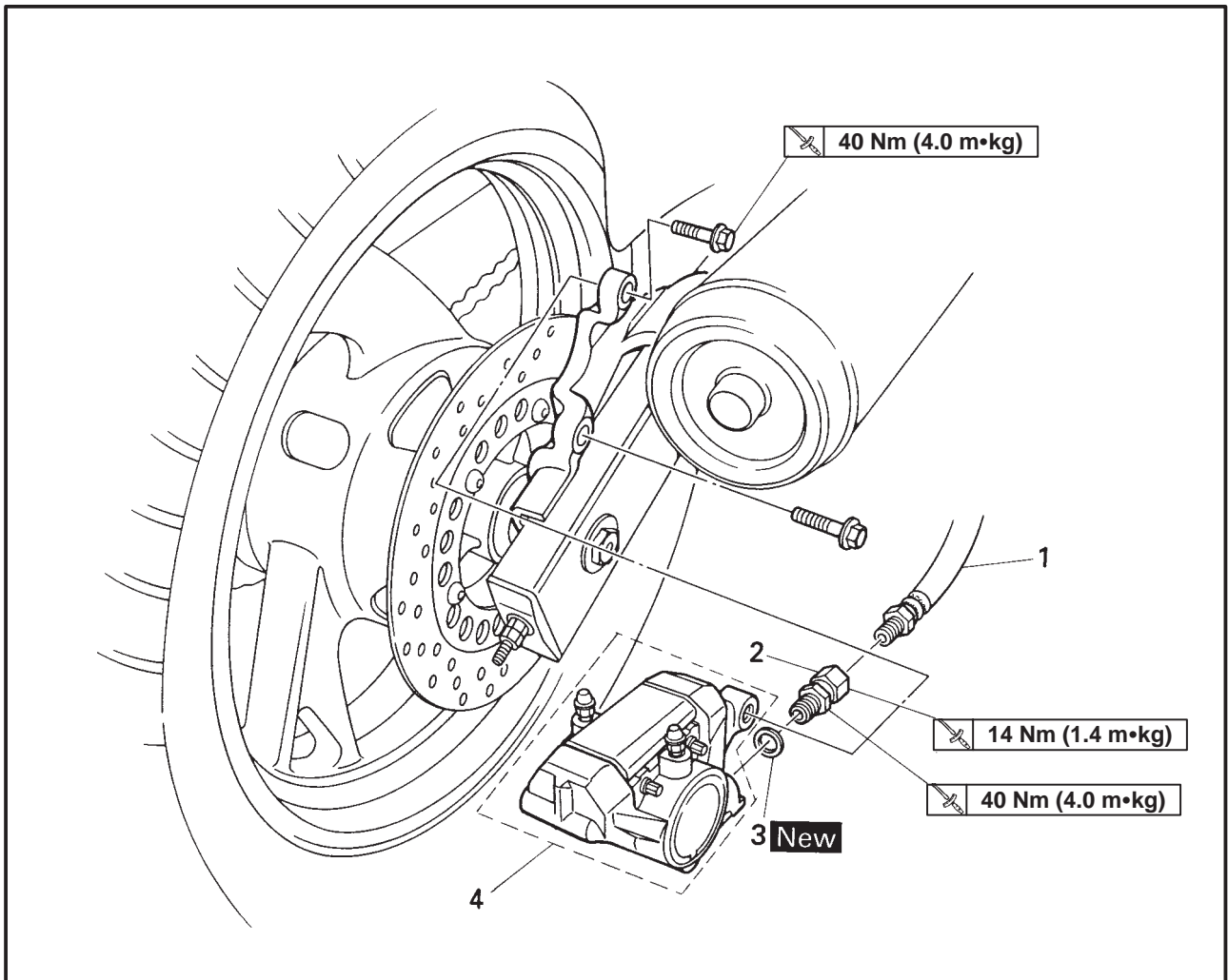


Order	Job name/Part name	Q'ty	Remarks
	Front brake caliper removal		Remove the parts in the order below. Drain
1	Brake fluid		
1	Cable guide	1	
2	Union bolt	1	
3	Copper washer	2	Refer to "CALIPER INSTALLATION".
4	Stay		
			⚠ WARNING
			The brake pipe must not be disassembled. Do not loosen the bolts indicated by “*”.
5	Brake hose and brake pipe	1	
6	Brake caliper assembly	1	
			For installation, reverse the removal procedure.

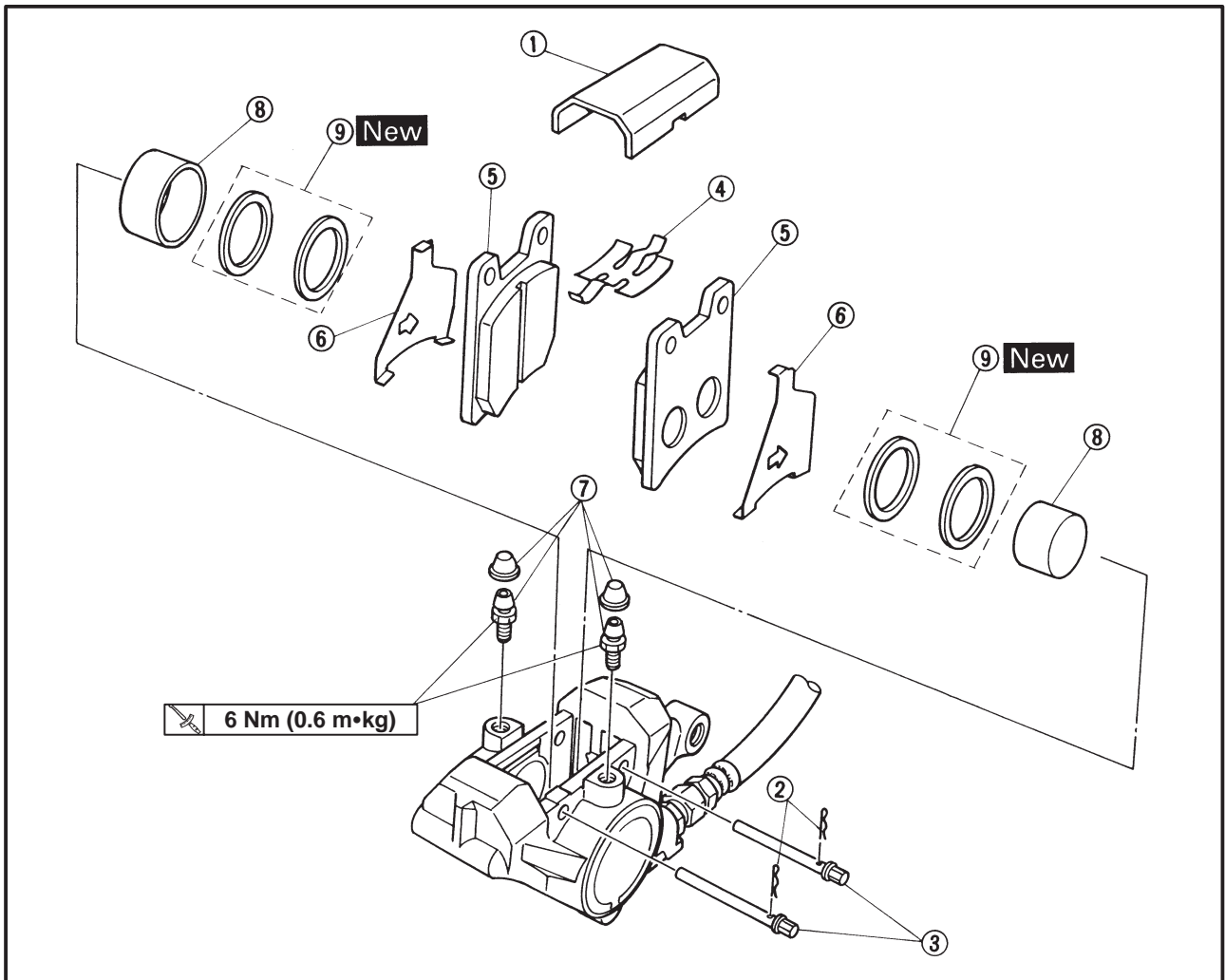


Order	Job name/Part name	Q'ty	Remarks
	Front brake caliper disassembly		Disassemble the parts in the order below.
①	Pad cover	1	Refer to "CALIPER DISASSEMBLY" and "CALIPER ASSEMBLY".
②	Retaining clip	2	
③	Retaining pin	2	
④	Pad spring	1	
⑤	Brake pad	2	
⑥	Pad shim	2	
⑦	Bleed screw	1	
⑧	Brake caliper piston	4	
⑨	Piston seal	8	
			For assembly, reverse the disassembly procedure.

REAR BRAKE CALIPER



Order	Job name/Part name	Q'ty	Remarks
	Rear brake caliper removal		Remove the parts in the order below. Drain
1	Brake fluid	1	Refer to "CALIPER INSTALLATION".
1	Brake hose	1	
2	Brake hose joint	1	
3	Copper washer	1	
4	Brake caliper assembly	1	For installation, reverse the removal procedure.



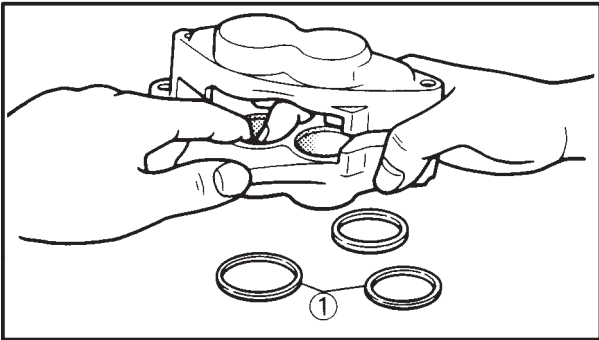
Order	Job name/Part name	Q'ty	Remarks
	Rear brake caliper disassembly		Disassemble the parts in the order below.
①	Pad cover	1	Refer to "CALIPER DISASSEMBLY" and "CALIPER ASSEMBLY". For assembly, reverse the disassembly procedure.
②	Retaining clip	2	
③	Retaining pin	2	
④	Pad spring	1	
⑤	Brake pad	2	
⑥	Pad shim	2	
⑦	Bleed screw	2	
⑧	Brake caliper piston	2	
⑨	Piston seal	4	



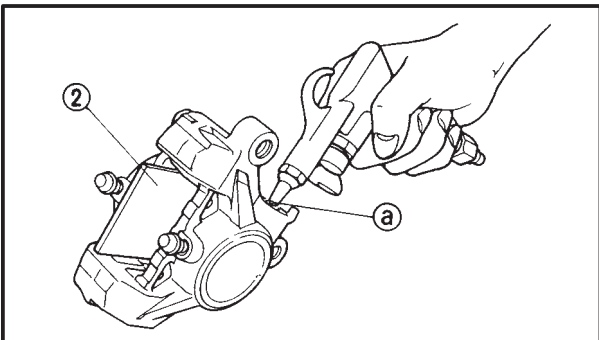
CALIPER DISASSEMBLY

NOTE:

Before disassembling the front brake caliper or rear brake caliper, drain the brake hose, master cylinder, brake caliper and brake reservoir of their brake fluid.



1. Remove:
 - Pistons
 - Piston seals ①

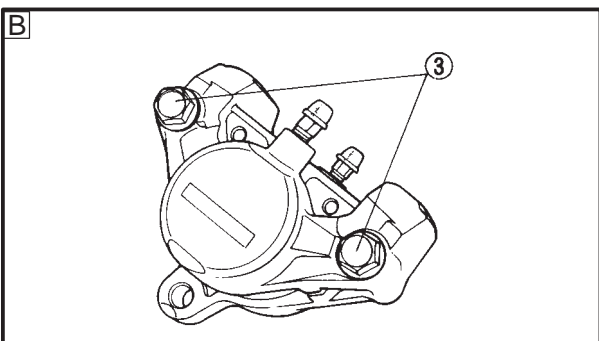
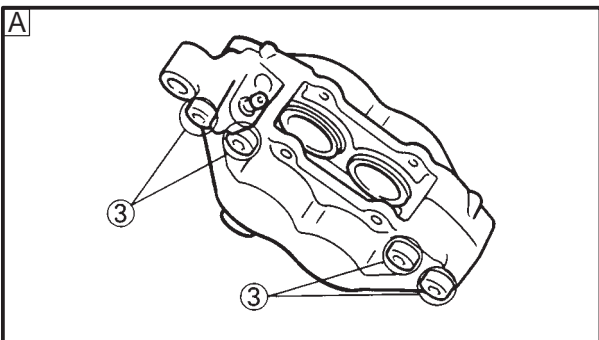


Removal steps:

- Using a wood piece ②, lock the right side piston.
- Blow compressed air into the hose joint opening ① to force out the left side piston from the caliper body.
- Remove the piston seals and reinstall the piston.
- Repeat previous step to force out the right side piston from the caliper body.

⚠ WARNING

- Never try to pry out the piston.
- Do not loosen the bolts ③.



A Front

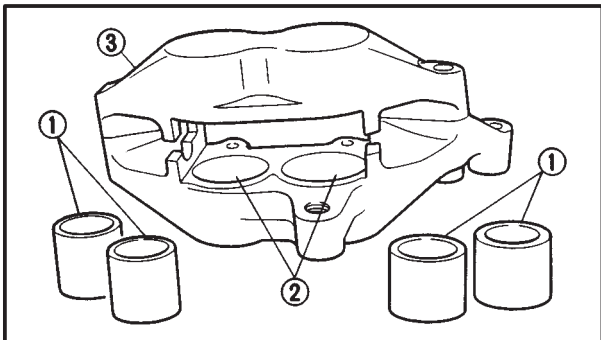
B Rear

CALIPER INSPECTION AND REPAIR

Recommended brake component replacement schedule:	
Brake pads	As required
Piston seal, dust seal	Every two years
Brake hoses	Every two years
Brake fluid	Replace only when brakes are disassembled.

⚠ WARNING

All internal brake components should be cleaned in new brake fluid only. Do not use solvents as they will cause seals to swell and distort.



1. Inspect:

- Caliper piston ①
Scratches/Rust/Wear → Replace caliper assembly.
- Caliper cylinder ②
Wear/Scratches → Replace caliper assembly.
- Caliper body ③
Cracks/Damage → Replace.
- Oil delivery passage (caliper body)
Blow out with compressed air.

⚠ WARNING

Replace the piston seals and dust seals whenever the caliper is disassembled.

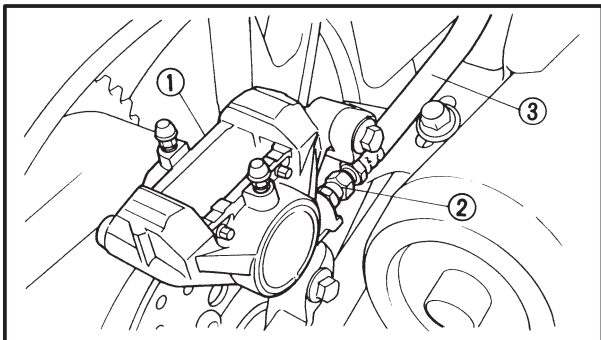
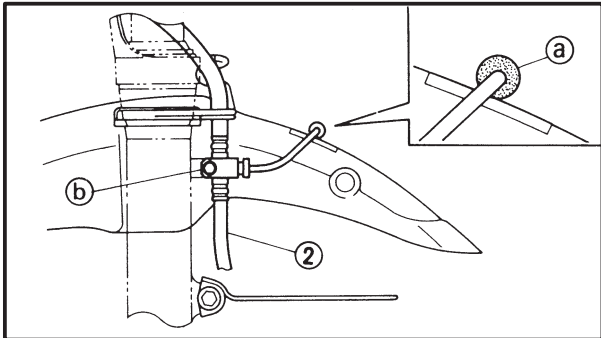
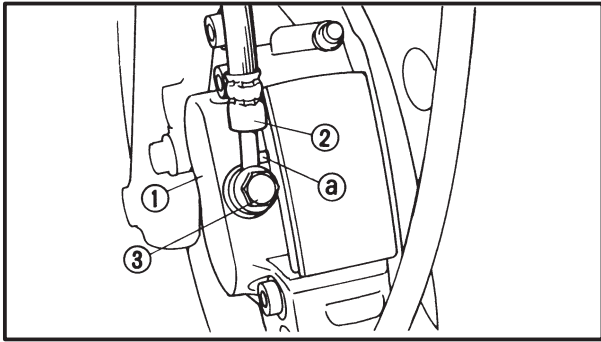
CALIPER ASSEMBLY

⚠ WARNING

- All internal parts should be cleaned in new brake fluid only.
- Internal parts should be lubricated with brake fluid when installed.

	Recommended brake fluid: DOT 4
---	-----------------------------------

- Replace the piston seals and dust seals whenever a caliper is disassembled.



CALIPER INSTALLATION

1. Install:

- Front brake
- Brake caliper ① (temporarily)
- Copper washers **New**
- Brake hose ②
- Union bolt ③

30 Nm (3.0 m•kg)

CAUTION:

When installing the brake hose on the caliper ①, take care that the pipe touches the projection ① on the brake caliper.

NOTE:

Make sure that the damper of the brake pipe is in contact with the front fender. If it's not in contact, loosen holding bolt (B) (left and right) and move the brake pipe so that the damper contacts the fender. Then tighten the holding bolt.

Rear brake

- Brake caliper ① (temporarily)
- Copper washer
- Brake hose joint ②
- Brake hose ③

40 Nm (4.0 m•kg)

14 Nm (1.4 m•kg)

⚠ WARNING

- Proper hose routing is essential to insure safe motorcycle operation. Rear to "CABLE ROUTING".
- Always use new copper washers.

2. Install:

- Pad shims (onto brake pads)
- Brake pads
- Pad spring
- Retaining pins
- Retaining clips
- Pad cover
- Brake caliper

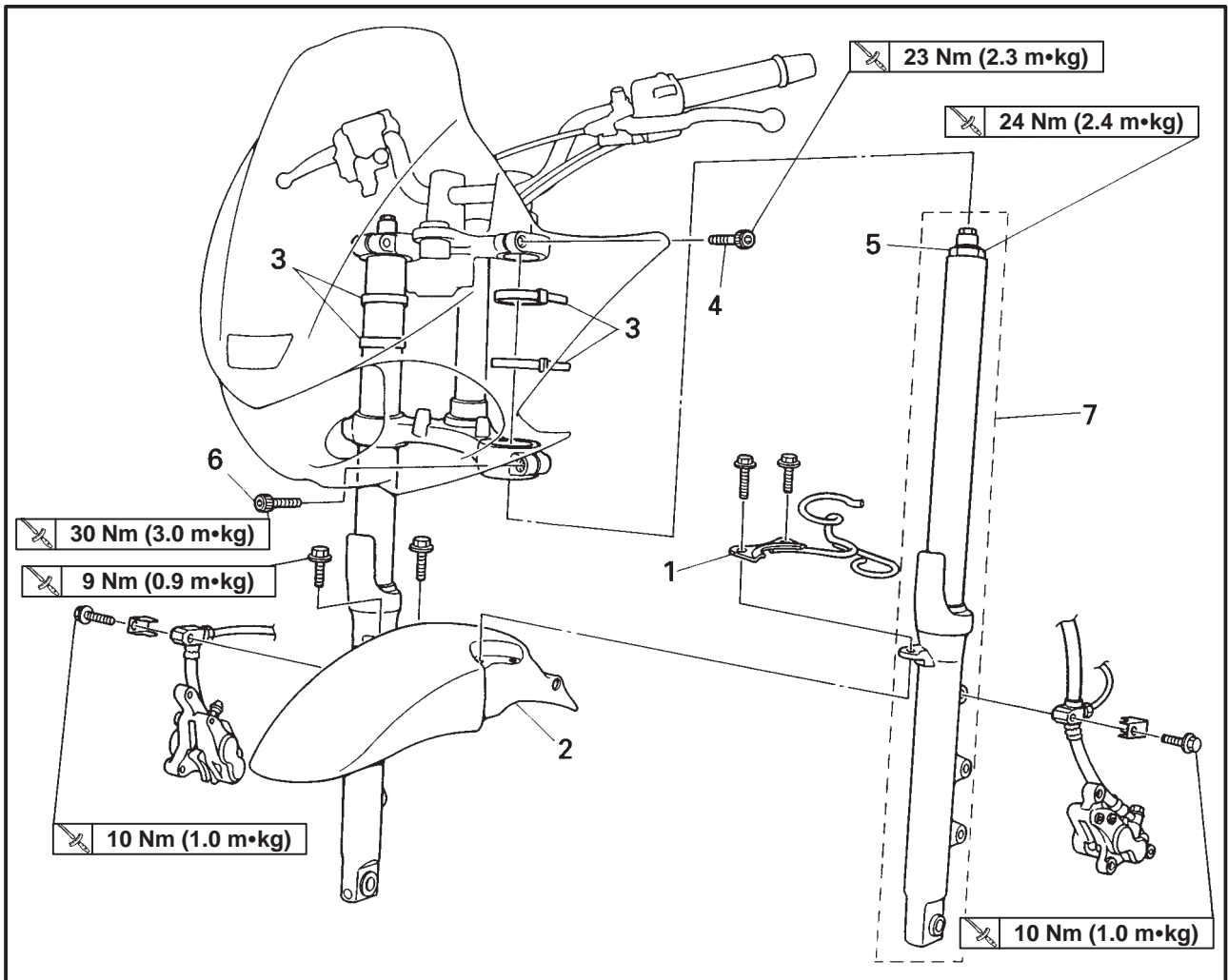
40 Nm (4.0 m•kg)

Refer to "BRAKE PAD REPLACEMENT".

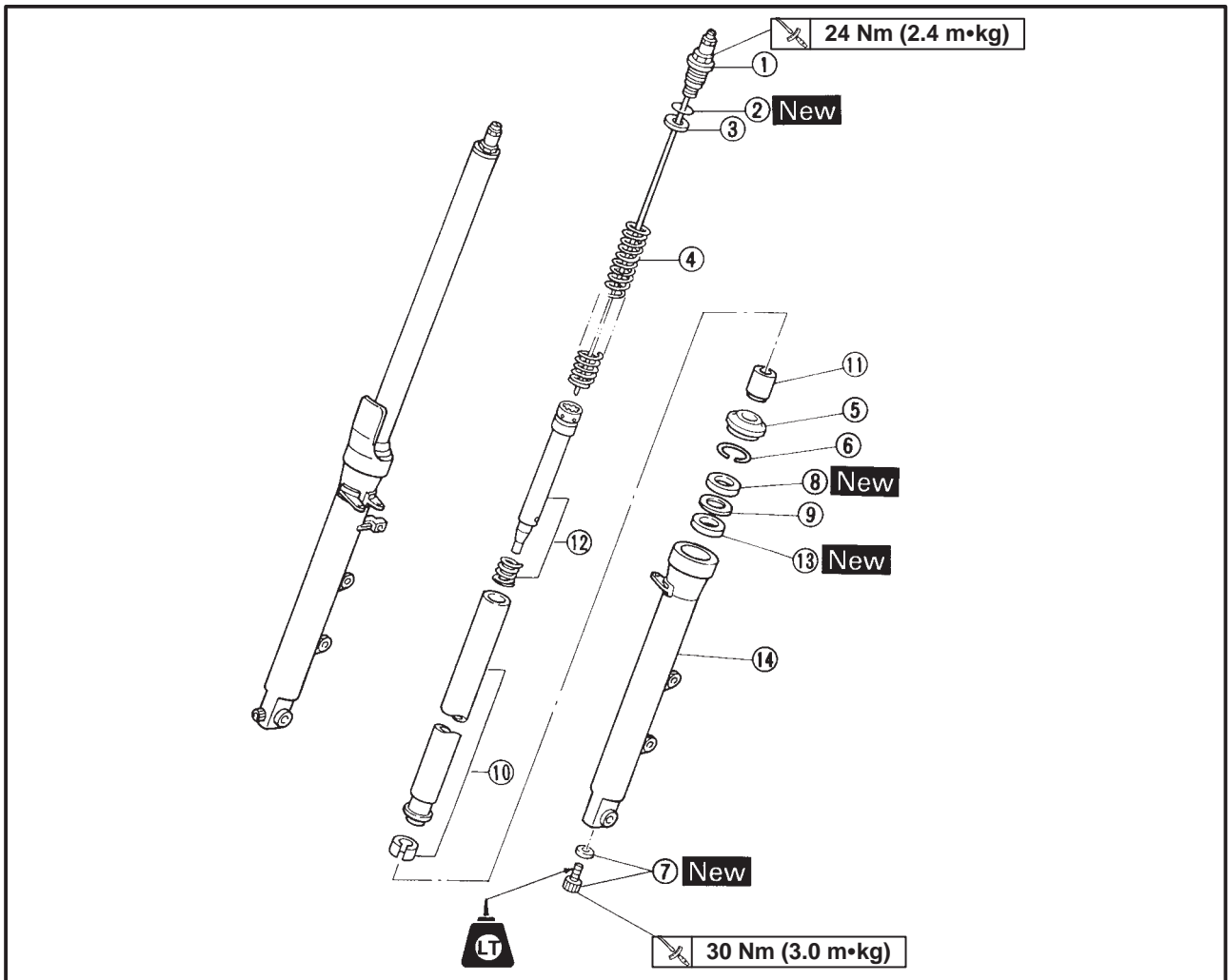
3. Fill:

- Brake reservoir
- Refer to "MASTER CYLINDER ASSEMBLY – Front brake".

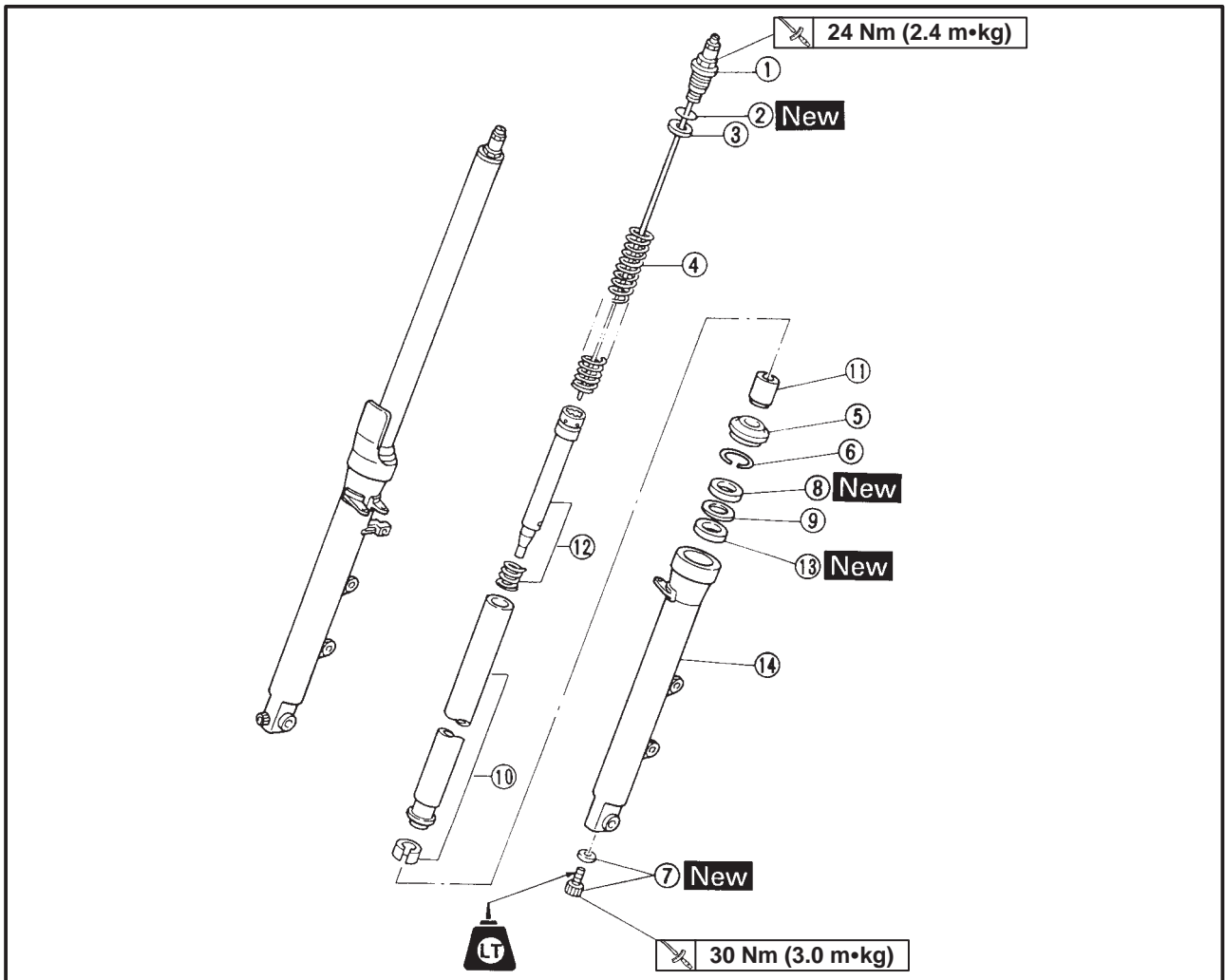
FRONT FORK



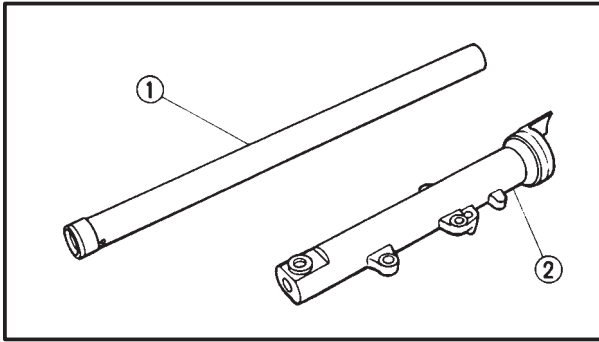
Order	Job name/Part name	Q'ty	Remarks
	Front fork removal		
	Front wheel		Remove the parts in the order below. Refer to "FRONT WHEEL AND BRAKE DISCS".
1	Cable guide	1] Refer to "INSTALLATION".
2	Front fender	1	
3	Plastic band		
4	Pinch bolt (upper bracket)	2	
5	Cap bolt	2	
6	Pinch bolt (lower bracket)	2	
7	Front fork (left/right)	1/1	
			For installation, reverse the removal procedure.



Order	Job name/Part name	Q'ty	Remarks
	Front fork disassembly		Disassemble the parts in the order below.
①	Cap bolt	1	Drain the fork oil Refer to "DISASSEMBLY" and "ASSEMBLY".
②	O-ring	1	
③	Washer	1	
④	Fork spring	1	
⑤	Dust seal	1	
⑥	Retaining clip	1	
⑦	Damper rod bolt/Gasket	1/1	
⑧	Oil seal	1	
⑨	Plain washer	1	



Order	Job name/Part name	Q'ty	Remarks
⑩	Inner tube/Piston metal	1/1	Refer to "DISASSEMBLY" and "ASSEMBLY". For assembly, reverse the disassembly procedure.
⑪	Oil lock piece	1	
⑫	Damper rod/Damper rod spring	1/1	
⑬	Slide metal	1	
⑭	Outer tube	1	



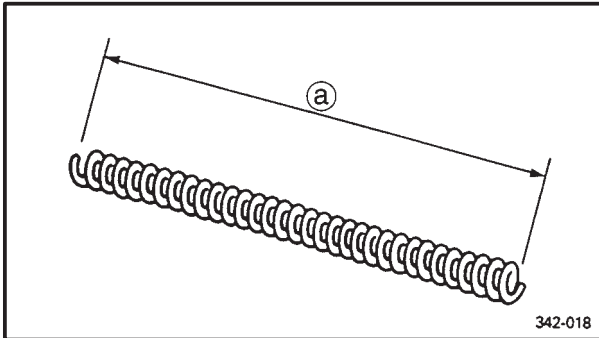
INSPECTION

1. Inspect:

- Inner fork tube ①
 - Outer fork tube ②
- Scratches/Bends/Damage → Replace.

! WARNING

Do not attempt to straighten a bent inner fork tube as this may dangerously weaken the tube.

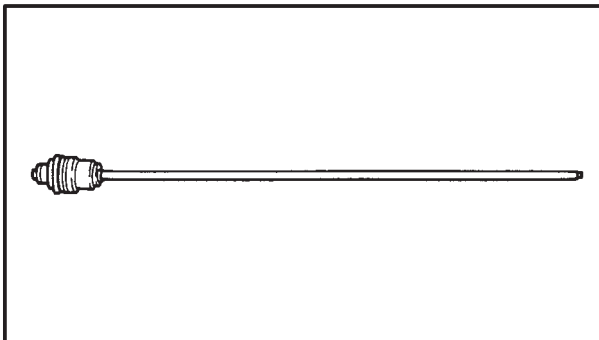


2. Measure:

- Fork spring free length (a)
- Over specified limit → Replace.



Fork spring free length (limit):
500 mm



3. Inspect:

- Cap bolt
- Bend/Damage → Replace.

ASSEMBLY

1. Install:

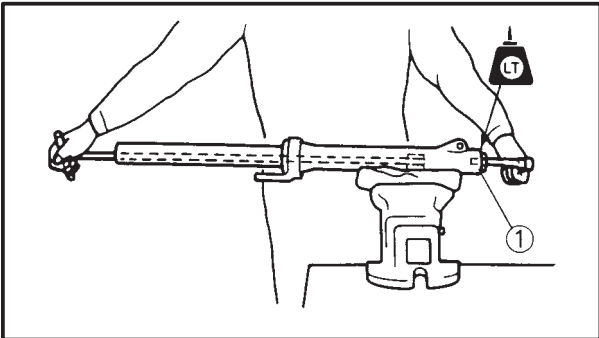
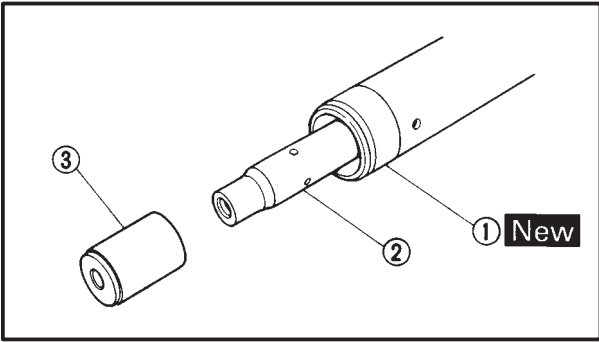
- Damper rod

CAUTION:

Allow the damper rod to slide slowly down the inner tube until it protrudes from the bottom, being careful not to damage the inner tube.

FRONT FORK

CHAS



2. Lubricate:
- Inner fork tube (outer surface)

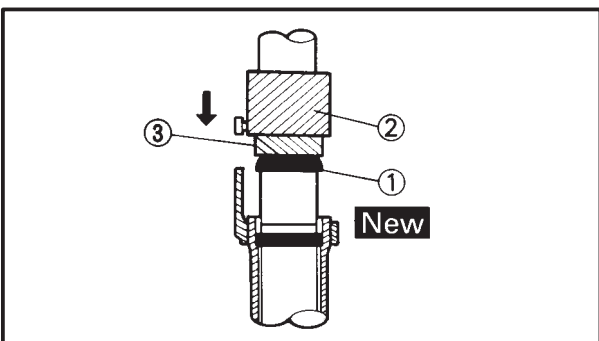
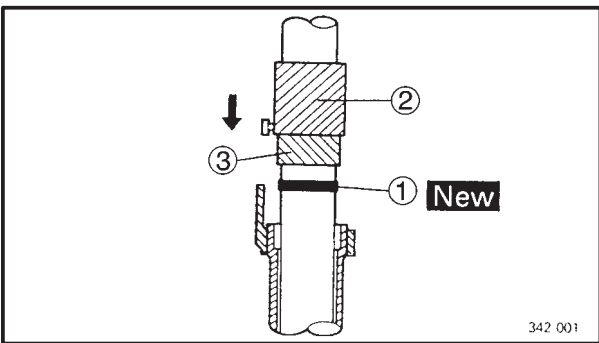
	Recommended lubricant: Fork oil 10W or equivalent
--	---

3. Install:
- Piston metal ① **New**
 - Damper rod ②
 - Oil lock piece ③
4. Tighten:
- Damper bolt ①

30 Nm (3.0 m•kg)

NOTE: _____
Tighten the damper rod bolt while holding the damper rod with the T-handle and holder.

	T-handle: 90890-01326
	Damper rod holder: 90890-01465



5. Install:
- Slide metal ① **New**
 - Plain washer
- Use the fork seal driver weight ② and adapter ③.

6. Install:
- Oil seal ① **New**
- Use the fork seal driver weight ② and adapter ③.

	Fork seal driver weight: 90890-01367
	Adapter: 90890-01374

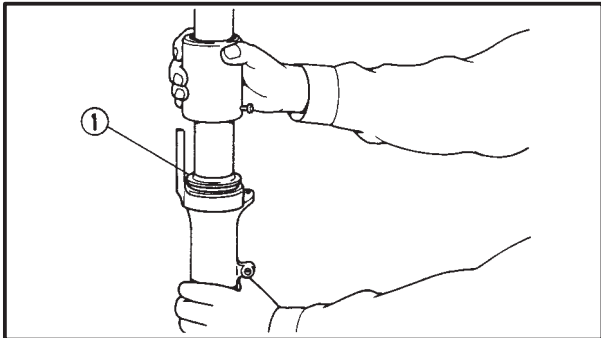


NOTE:

Before installing the oil seal, apply the lithium soap base grease onto the oil seal lips.

CAUTION:

Be sure that the oil seal numbered side face upward.



7. Install:

- Dust seal ①
Use the fork seal driver weight.



Fork seal driver weight:
90890-01367

8. Fill:

- Fork oil



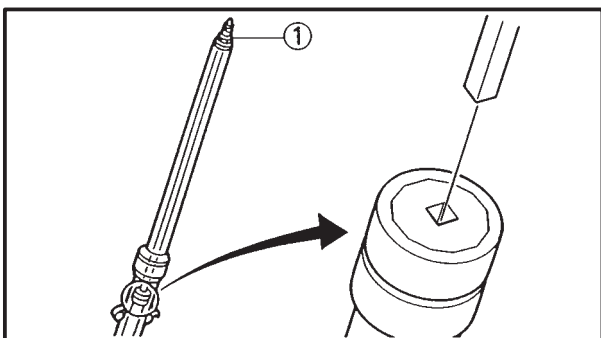
Each fork:
0.515 L
For oil 10W or equivalent. After filling, slowly pump the fork up and down to distribute oil.



Oil level:
130 mm
(from the top of inner tube fully compressed without spring)

NOTE:

Place the fork on upright position.

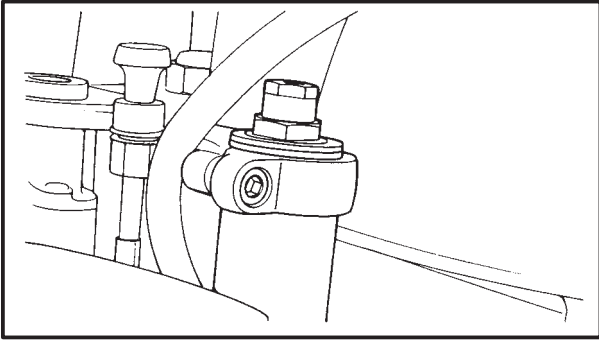


9. Install:

- O-ring **New**
- Cap bolt ①

NOTE:

Align the end of the cap bolt rod with the hole in the damper rod, then install the cap bolt rod and temporarily install the cap bolt.



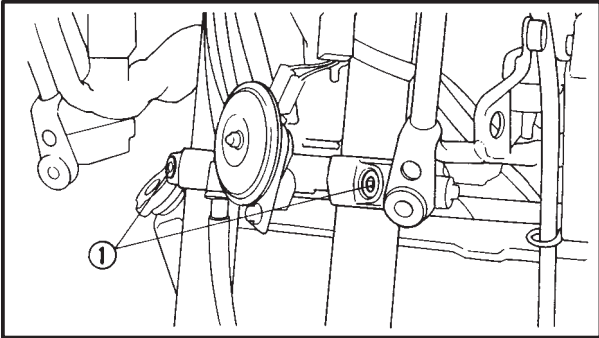
INSTALLATION

1. Install:

- Front fork(s)
Temporarily tighten the pinch bolts.

CAUTION:

Make sure that the inner tube end is flush with the top of the upper bracket.



2. Tighten:

- Pinch bolts (lower bracket) ①

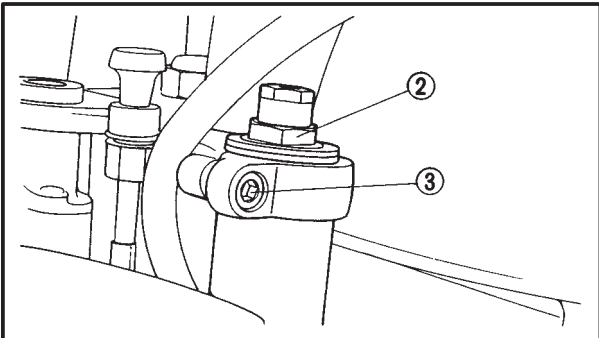
	30 Nm (3.0 m•kg)
--	-------------------------

- Cap bolts ②

	24 Nm (2.4 m•kg)
--	-------------------------

- Pinch bolts (upper bracket) ③

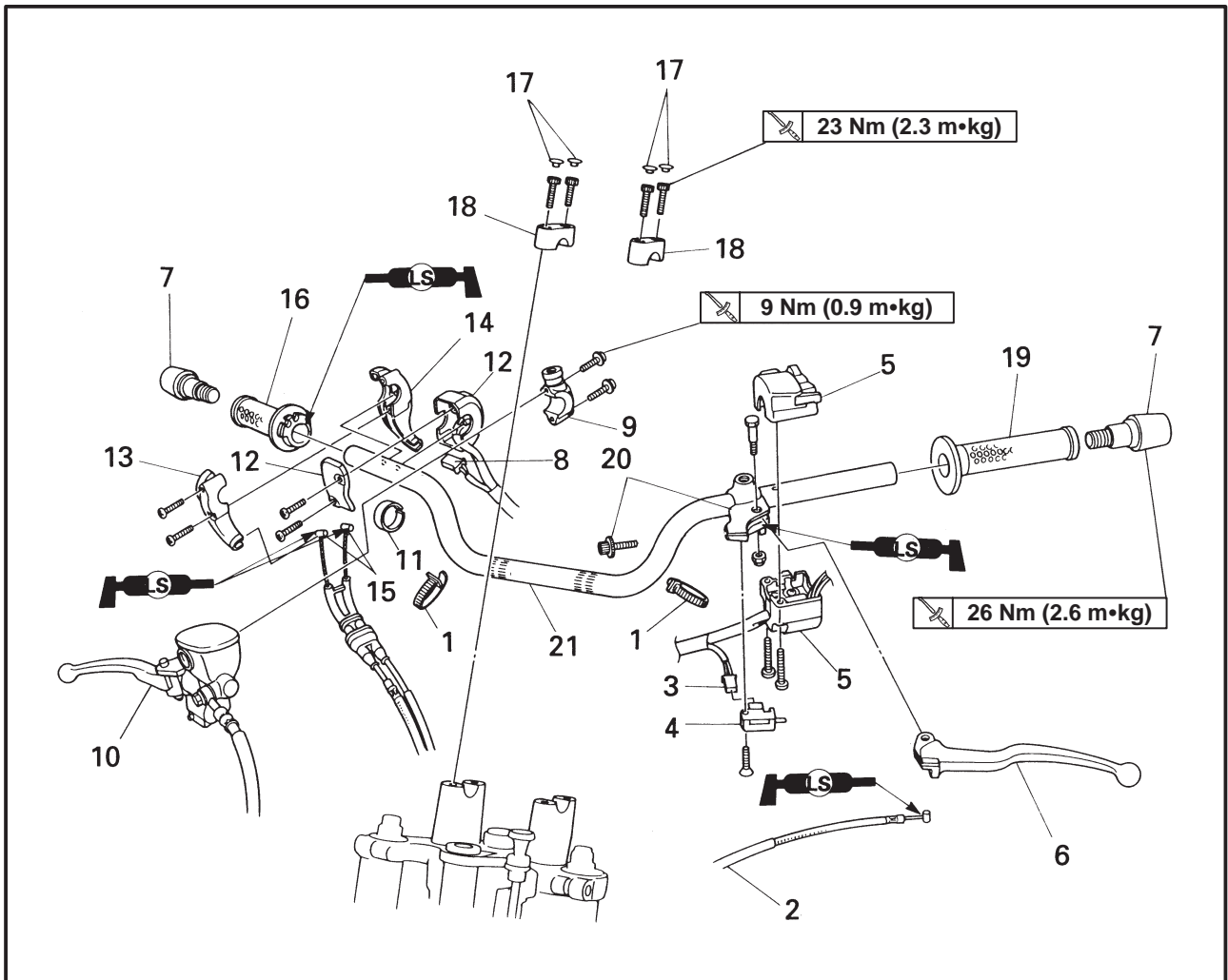
	23 Nm (2.3 m•kg)
--	-------------------------



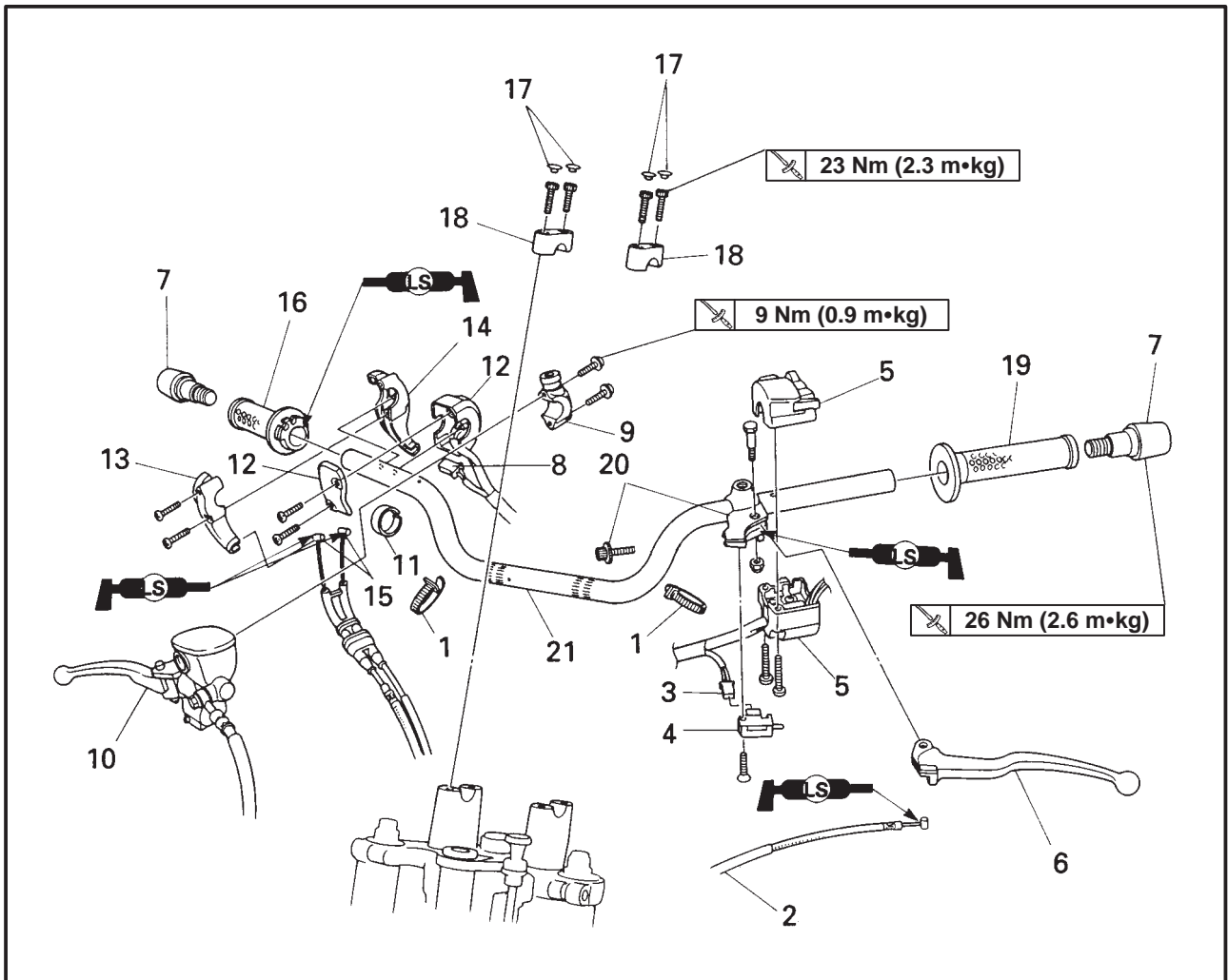
WARNING

Make sure that the brake hoses are routed properly.

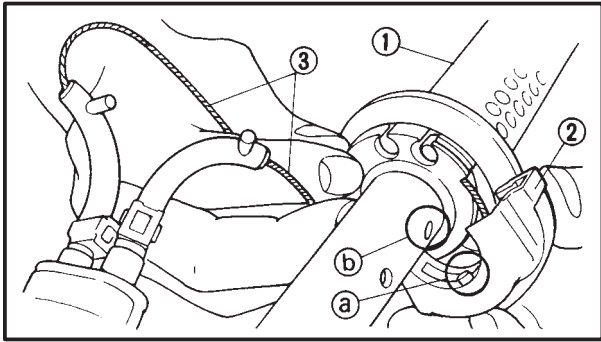
HANDLEBAR



Order	Job name/Part name	Q'ty	Remarks
	Handlebar removal		Remove the parts in the order below.
1	Band	2	
2	Clutch cable	1	
3	Clutch switch lead coupler	1	Disconnect
4	Clutch switch	1	
5	Left handlebar switch	1	
6	Clutch lever	1	
7	Grip end	2	Refer to "INSTALLATION".
8	Front brake switch lead coupler	1	
9	Master cylinder bracket	1	Disconnect
10	Master cylinder assembly	1	
11	Collar	1	



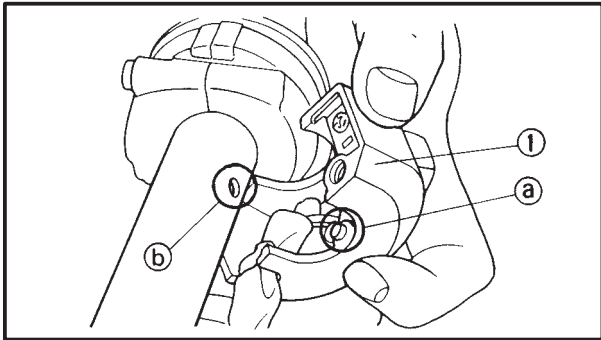
Order	Job name/Part name	Q'ty	Remarks
12	Right handlebar switch	1	Refer to "INSTALLATION". Refer to "INSTALLATION". For installation, reverse the removal procedure.
13	Throttle cable housing cover	1	
14	Throttle cable housing	1	
15	Throttle cable	2	
16	Throttle grip	1	
17	Plug	4	
18	Handlebar holder (upper)	2	
19	Handlebar grip (left)	1	
20	Clutch lever holder	1	
21	Handlebar	1	



2. Install:
- Throttle grip ①
 - Throttle cable housing ②
 - Throttle cables ③
 - Throttle cable housing cover

⚠ WARNING

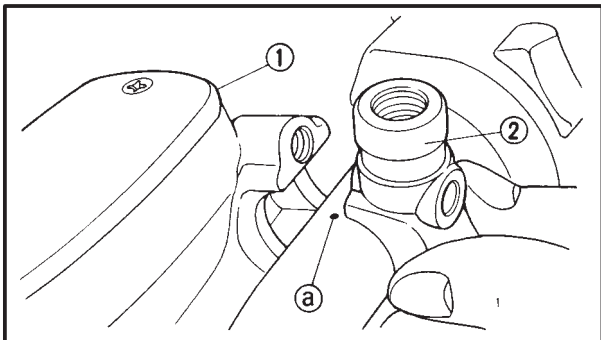
Align the projection (a) on the throttle cable housing with the hole (b) on the handlebar.



3. Install:
- Right handlebar switch ①

NOTE:

Align the projection (a) on the handlebar switch with the hole (b) on the handlebar.

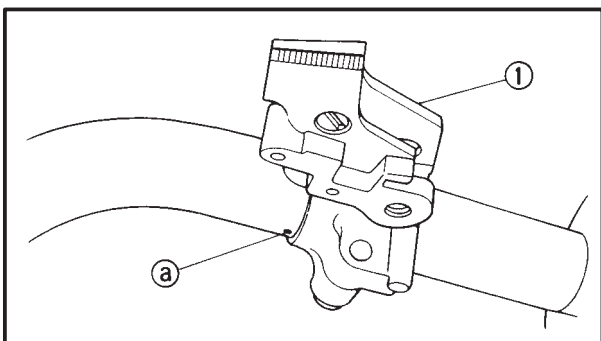


4. Install:
- Collar
 - Master cylinder assembly ①
 - Master cylinder bracket ②

9 Nm (0.9 m•kg)

CAUTION:

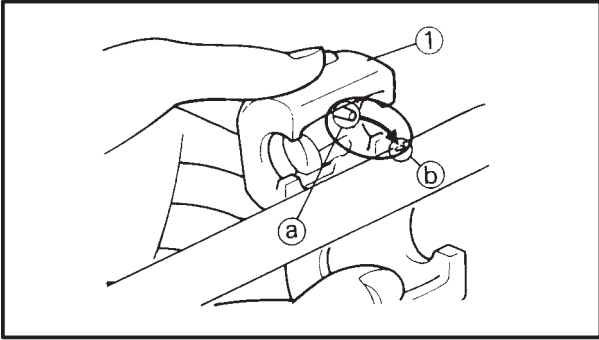
- Align the slit in the master cylinder bracket with the punched mark (a) on the handlebar.
- Tighten first the upper bolt, then the lower bolt.



5. Install:
- Clutch lever holder ①

NOTE:

Align the slit in clutch lever holder with the punched mark (a) on the handlebar.



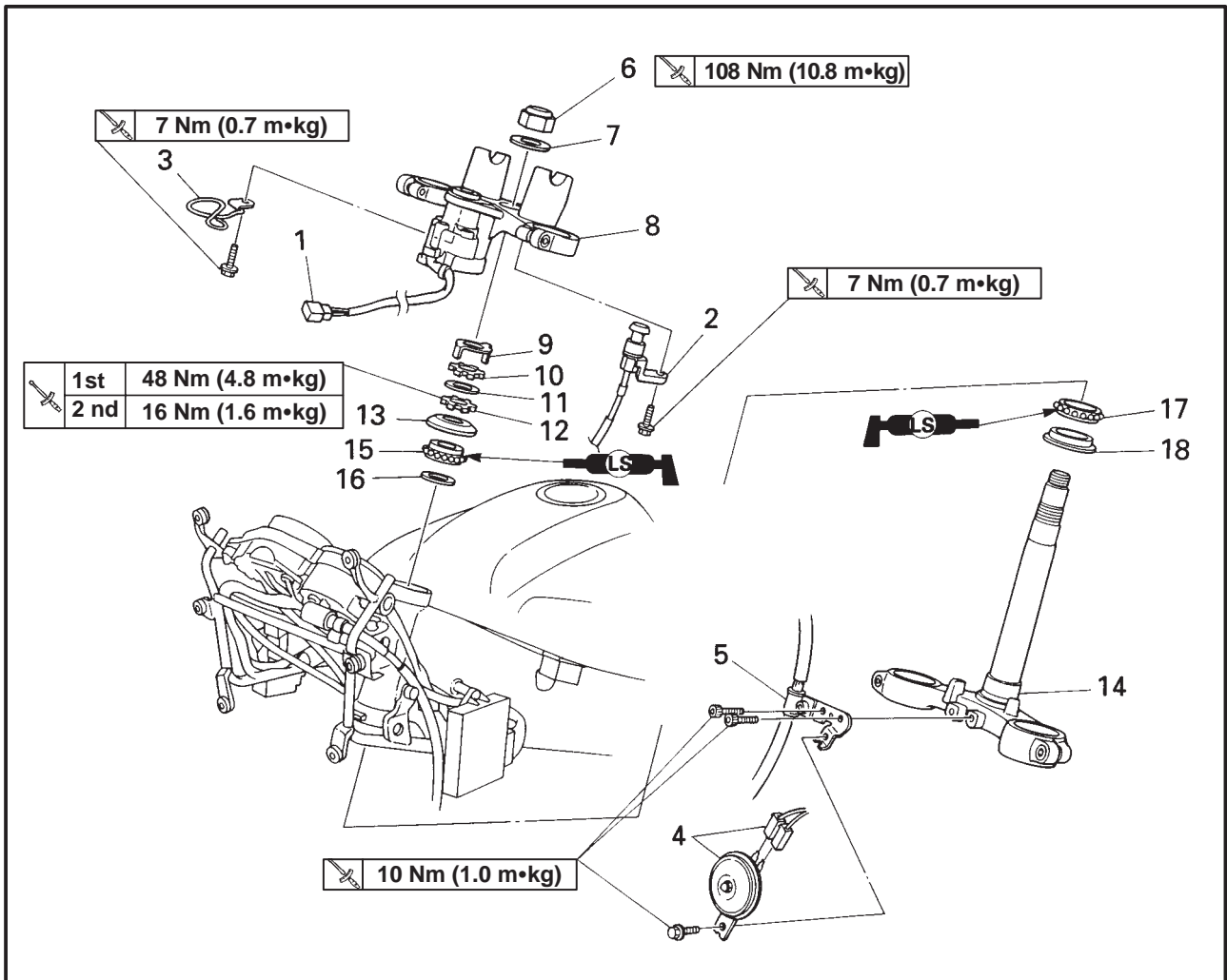
6. Install:
- Left handlebar switch (1)

NOTE:

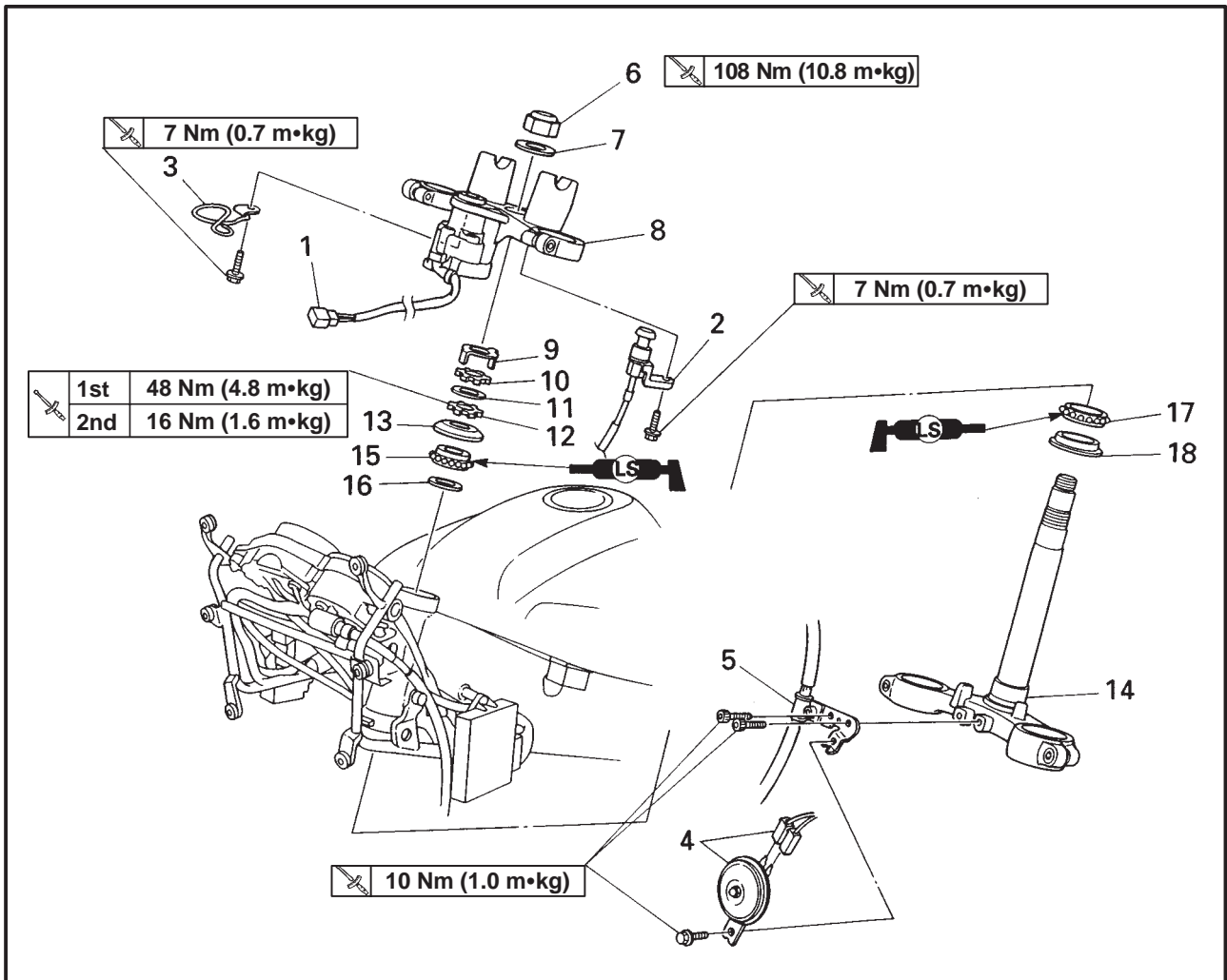
Align the projection (a) on the handlebar switch with the hole (b) on the handlebar.

7. Adjust:
- Clutch cable free play
Refer to "CLUTCH ADJUSTMENT" in CHAPTER 3.
8. Adjust:
- Throttle cable free play
Refer to "THROTTLE CABLE ADJUSTMENT" in CHAPTER 3.

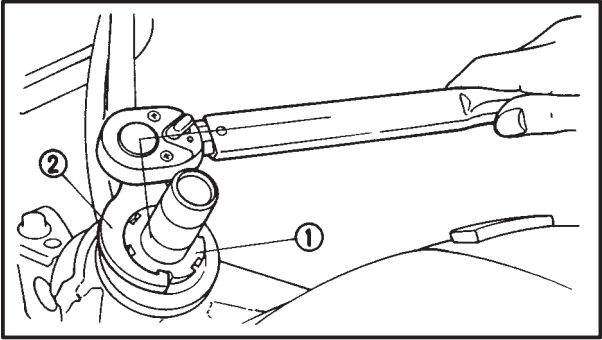
**STEERING HEAD
LOWER BRACKET**



Order	Job name/Part name	Q'ty	Remarks
	Lower bracket removal		Remove the parts in the order below.
	Front wheel		Refer to "FRONT WHEEL AND BRAKE DISC".
	Front fork		Refer to "FRONT FORK".
	Handlebar		Refer to "HANDLEBAR".
1	Main switch lead coupler	1	Disconnect
2	Starter cable holder	1	
3	Cable guide	1	
4	Horn/Horn lead coupler	1/1	Disconnect
5	Brake hose holder	1	
6	Steering stem nut	1	
7	Plate washer	1	
8	Upper bracket	1	
9	Special washer	1	
10	Ring nut (upper)	1	Refer to "REMOVAL".



Order	Job name/Part name	Q'ty	Remarks
11	Plate seal	1	Refer to "REMOVAL" and "INSTALLATION".
12	Ring nut (lower)	1	
13	Plate washer	1	
14	Lower bracket	1	
15	Bearing (upper)	1	
16	Rubber seal	1	
17	Bearing (lower)	1	
18	Dust seal	1	
			For installation, reverse the removal procedure.




INSTALLATION

- 1. Tighten:
 - Ring nuts (lower and upper)



Tightening steps:

- Tighten the ring nut (lower) ① using the ring nut wrench ②.


	Ring nut: 48 Nm (4.8 m•kg)
---	---

NOTE: _____

Set the torque wrench to the ring nut wrench so that they form a right angle.

	Ring nut wrench: 90890-01403
---	---

- Turn the steering stem left and right for several times.
- Loosen the ring nut completely and retighten it to specification.

	Ring nut: 16 Nm (1.6 m•kg)
---	---

! WARNING _____

Do not overtighten.

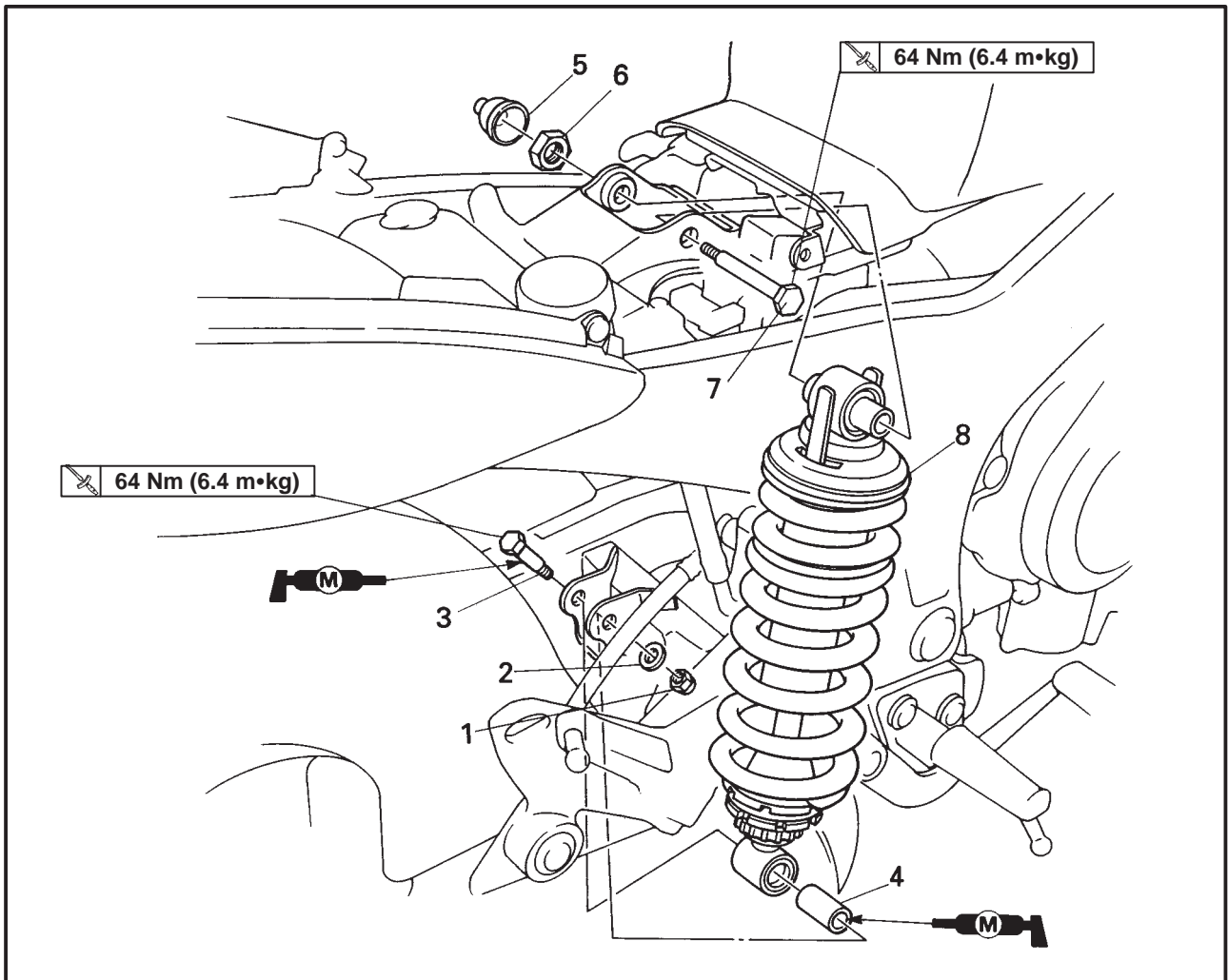
- Check the steering stem by turning lock to lock. If there is any binding, remove the steering stem assembly and inspect the steering bearings.
- Install the plate washer.
- Install the ring nut (upper).
- Finger tighten the ring nut, then align the slots of both ring nuts. If not aligned, hold the lower ring nut and tighten the other until they are aligned.
- Install the special washer.

NOTE: _____

Make sure that the special washer tab is placed in the slots.

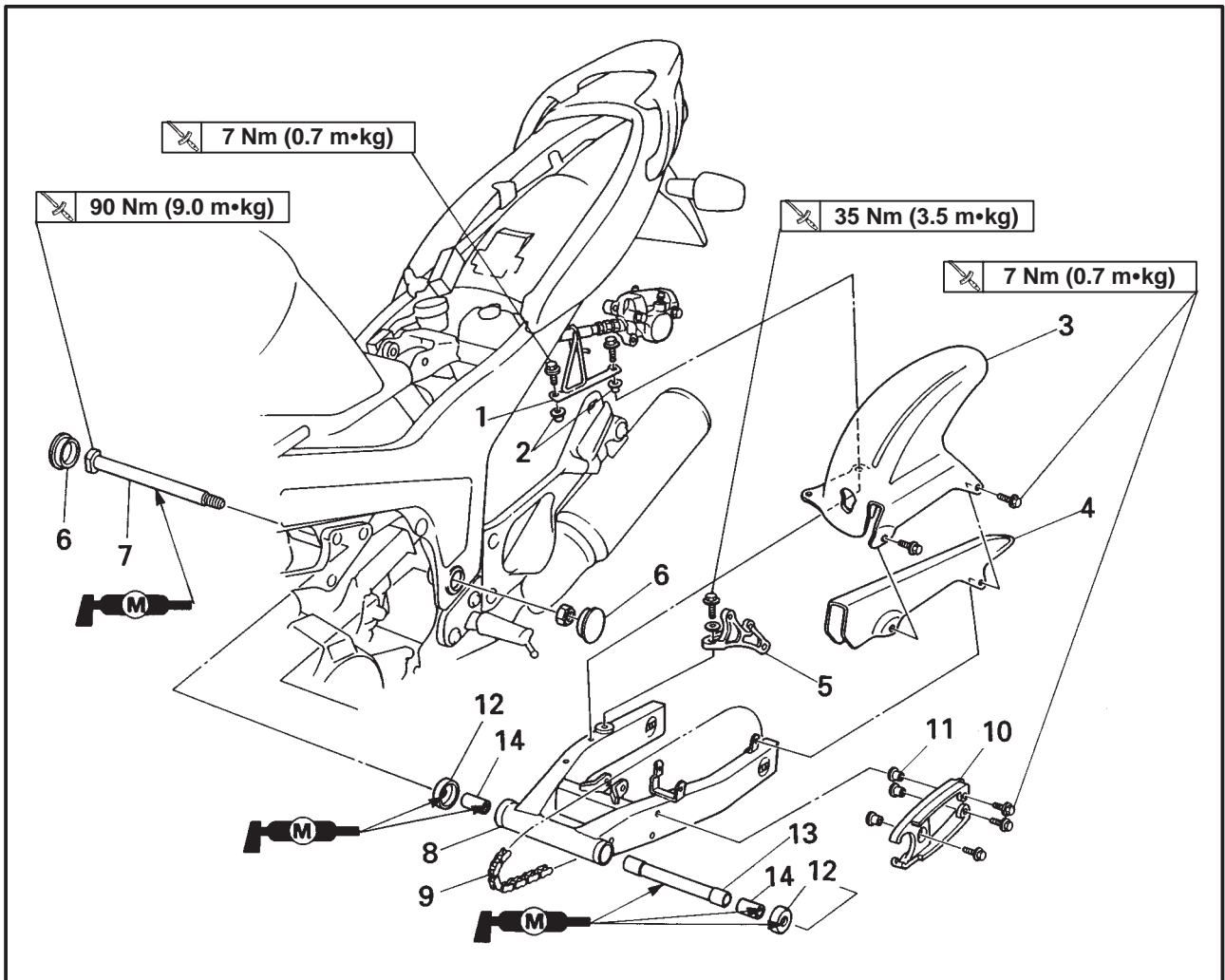


REAR SHOCK ABSORBER



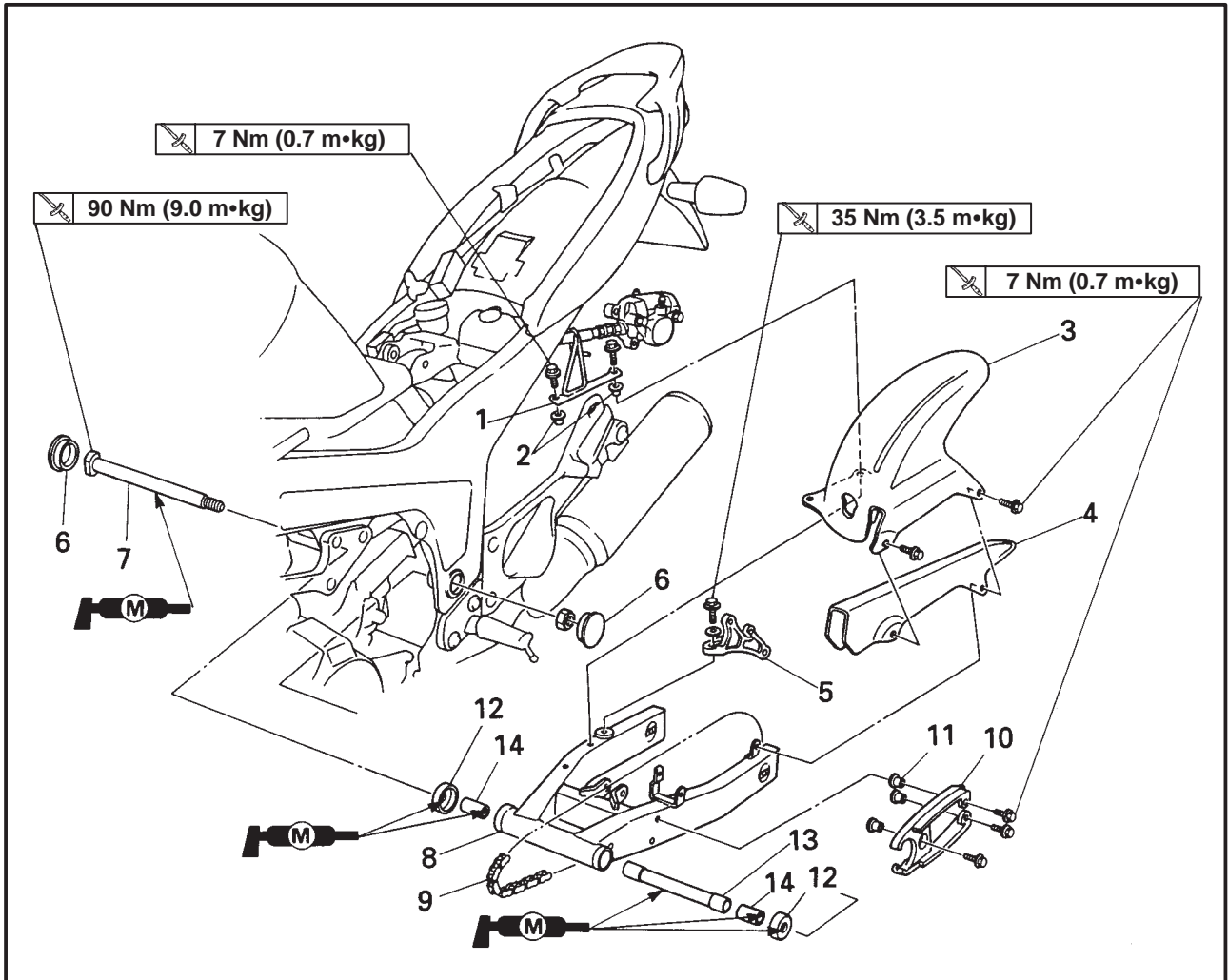
Order	Job name/Part name	Q'ty	Remarks
	Rear shock absorber removal		Remove the parts in the order below. Refer to "COWLINGS, SEAT, TAIL COVER AND FUEL TANK" in CHAPTER 3. For installation, reverse the removal procedure.
	Seat		
1	Self locknut	1	
2	Plain washer	1	
3	Bolt	1	
4	Collar	1	
5	Cap	1	
6	Self locknut	1	
7	Bolt	1	
8	Rear shock absorber	1	

SWINGARM AND DRIVE CHAIN

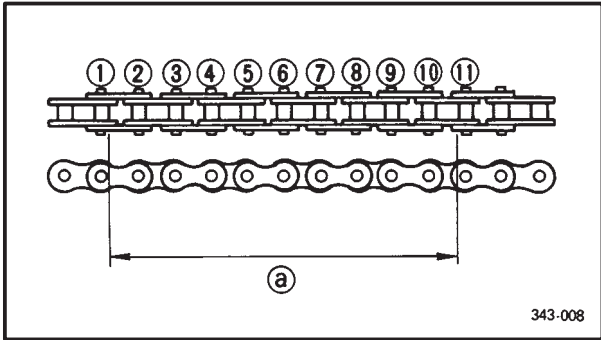


Order	Job name/Part name	Q'ty	Remarks
	Swingarm and drive chain removal		Remove the parts in the order below.
	Rear wheel		Refer to "REAR WHEEL, BRAKE DISC AND DRIVE SPROCKET".
	Rear shock absorber		Refer to "REAR SHOCK ABSORBER".
	Drive sprocket		Refer to "ENGINE ASSEMBLY" in CHAPTER 4.
1	Brake hose holder	1	
2	Collar	2	
3	Rear fender	1	
4	Drive chain case	1	
5	Caliper bracket	1	
6	Cap	2	
7	Pivot shaft	1	

SWINGARM AND DRIVE CHAIN



Order	Job name/Part name	Q'ty	Remarks
8	Swingarm	1	For installation, reverse the removal procedure.
9	Drive chain	1	
10	Chain protector	1	
11	Collar	3	
12	Thrust cover	2	
13	Bush	1	
14	Bearing	2	



INSPECTION

1. Measure:

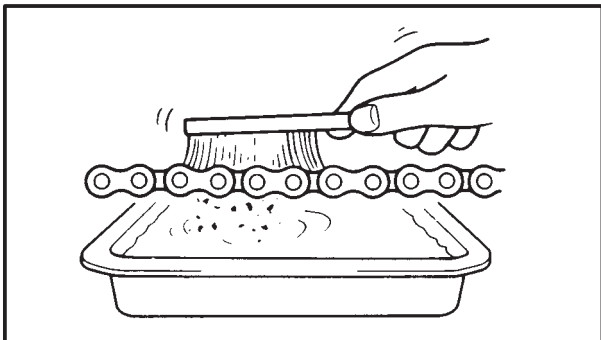
- 10 link length (drive chain) ②
- Out of specification → Replace drive chain.



10 link length limit:
159 mm

NOTE:

- For measurement make the chain tense by finger.
- 10 link length is a measurement between the insides of the ① and ⑪ rollers as shown.
- Two or three different 10 link length should be measured.

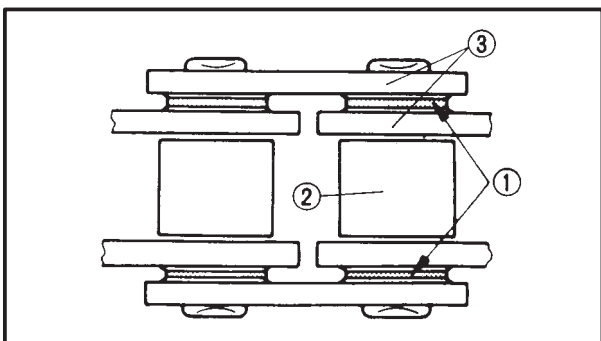
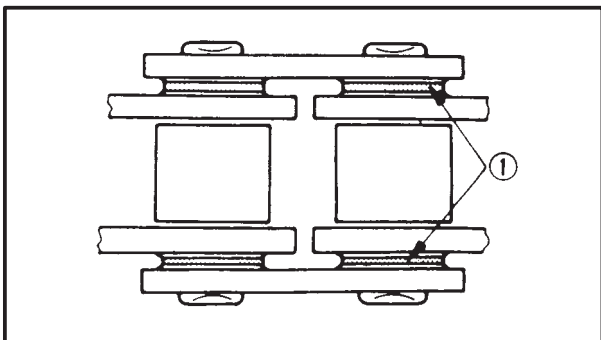


2. Clean:

- Drive chain
- Place it in kerosene, and brush off as much dirt as possible. Then remove the chain from the kerosene and dry the chain.

CAUTION:


This motorcycle has a drive chain with small rubber O-rings ① between the chain plates. Steam cleaning ①, high pressure washes, and certain solvent can damage these O-rings. Use only kerosene to clean the drive chain.

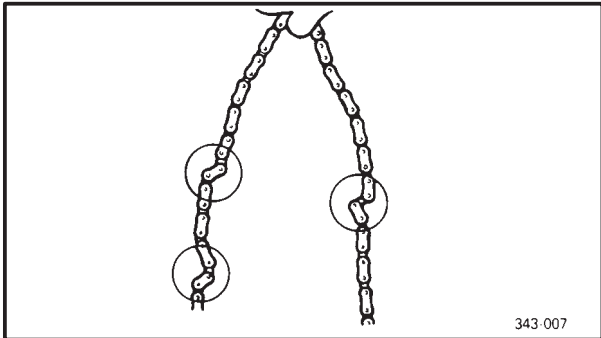


3. Inspect:

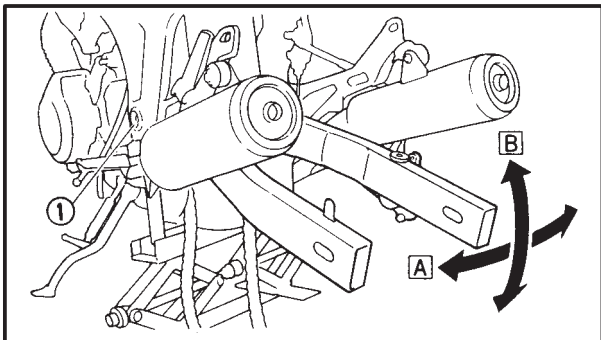
- O-rings (drive chain) ①
- Damage → Replace drive chain.
- Rollers ②
- Side plates ③
- Damage/Wear → Replace drive chain.

4. Lubricate:
- Drive chain

	<p>Drive chain lubricant: SAE 30 ~ 50W motor oil or chain lubricants suitable for "O-ring" chains</p>
---	--



5. Inspect:
- Drive chain stiffness
Stiff → Clean and lubricate or replace.




6. Check:
- Swingarm free play



Inspection steps:

- Check the tightening torque of the pivot shaft (swingarm) ① securing nut.

	<p>90 Nm (9.0 m•kg)</p>
---	--------------------------------

- Check the swingarm side play [A] by moving it from side to side.
If side play is noticeable, check the inner collar, bearing, washer and thrust cover.

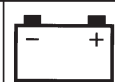
	<p>Side play (at end of swigarm): 0.3 mm</p>
---	--

- Check the swingarm vertical movement [B] by moving it up and down.
If vertical movement is tight, binding or rough, check the inner collar, bearing, washer and thrust cover.



CHAS





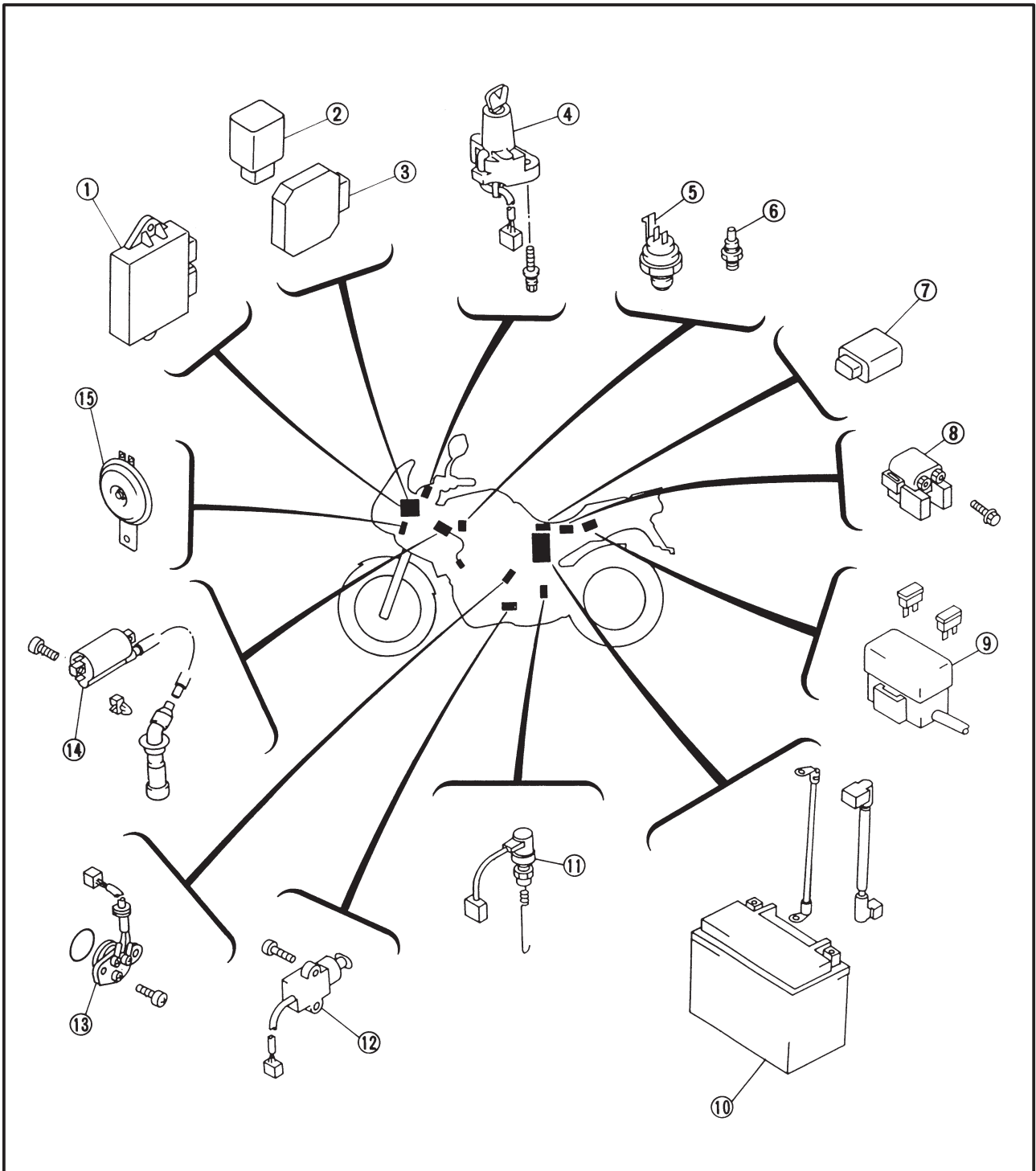
CHAPTER 8. ELECTRICAL

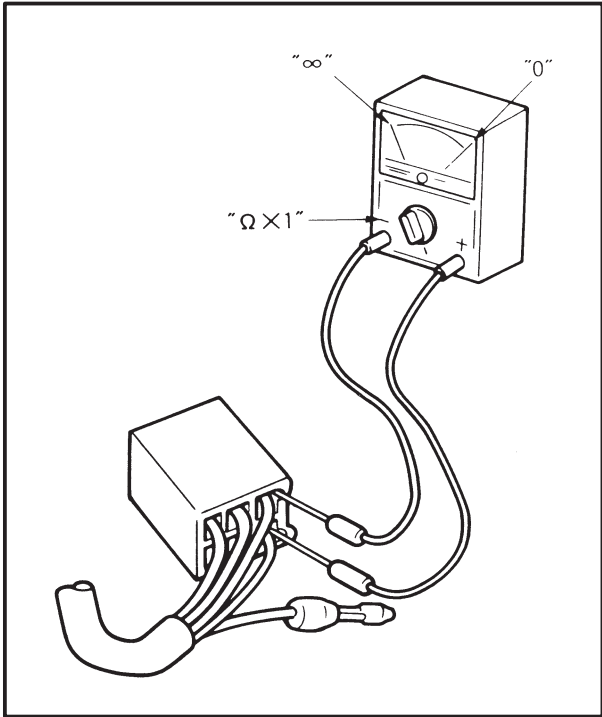
ELECTRICAL COMPONENTS	8-1
SWITCH INSPECTION	8-2
SWITCH INSPECTION	8-2
INSPECTING A SWITCH SHOWN IN THE MANUAL	8-2
SWITCH CONTINUITY INSPECTION	8-3
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CIRCUIT DIAGRAM	8-4
TROUBLESHOOTING	8-5
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CIRCUIT DIAGRAM	8-10
STARTING CIRCUIT OPERATION	8-11
TROUBLESHOOTING	8-12
STARTER MOTOR	8-16
CHARGING SYSTEM	8-20
CIRCUIT DIAGRAM	8-20
TROUBLESHOOTING	8-21
LIGHTING SYSTEM	8-24
CIRCUIT DIAGRAM	8-24
TROUBLESHOOTING	8-25
LIGHTING SYSTEM CHECK	8-27
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CIRCUIT DIAGRAM	8-44
TROUBLESHOOTING	8-45

ELECTRICAL

ELECTRICAL COMPONENTS

- | | |
|----------------------------------|---------------------|
| ① Ignitor unit | ⑨ Fuse box |
| ② Starting circuit cut-off relay | ⑩ Battery |
| ③ Rectifier/regulator | ⑪ Rear brake switch |
| ④ Main switch | ⑫ Sidestand switch |
| ⑤ Thermo switch | ⑬ Neutral switch |
| ⑥ Thermo unit | ⑭ Ignition coil |
| ⑦ Flasher relay | ⑮ Horn |
| ⑧ Starter relay | |





SWITCH INSPECTION

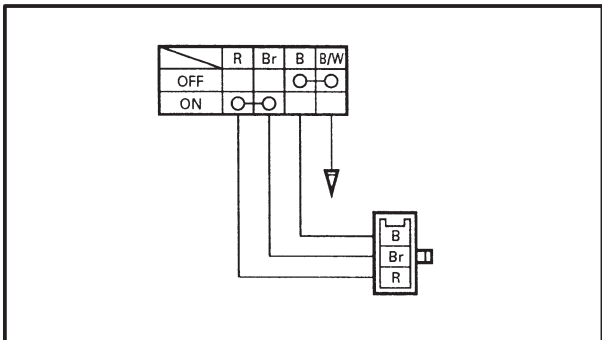
Use a pocket tester to check the terminals for continuity. If the continuity is faulty at any point, replace the switch.



Pocket tester:
90890-03112

NOTE: _____

- Set the pocket tester to “0” before starting the test.
- The pocket tester should be set to the “× 1” Ω range when testing the switch for continuity.
- Turn the switch on and off a few times when checking it.



INSPECTING A SWITCH SHOWN IN THE MANUAL

The terminal connections for switches (main switch, handlebar switch, engine stop switch, light switch, etc.) are shown in a chart similar to the one on the left.

This chart shows the switch positions in the column and the switch lead colors in the top row. For each switch position, “○—○” indicates the terminals with continuity.

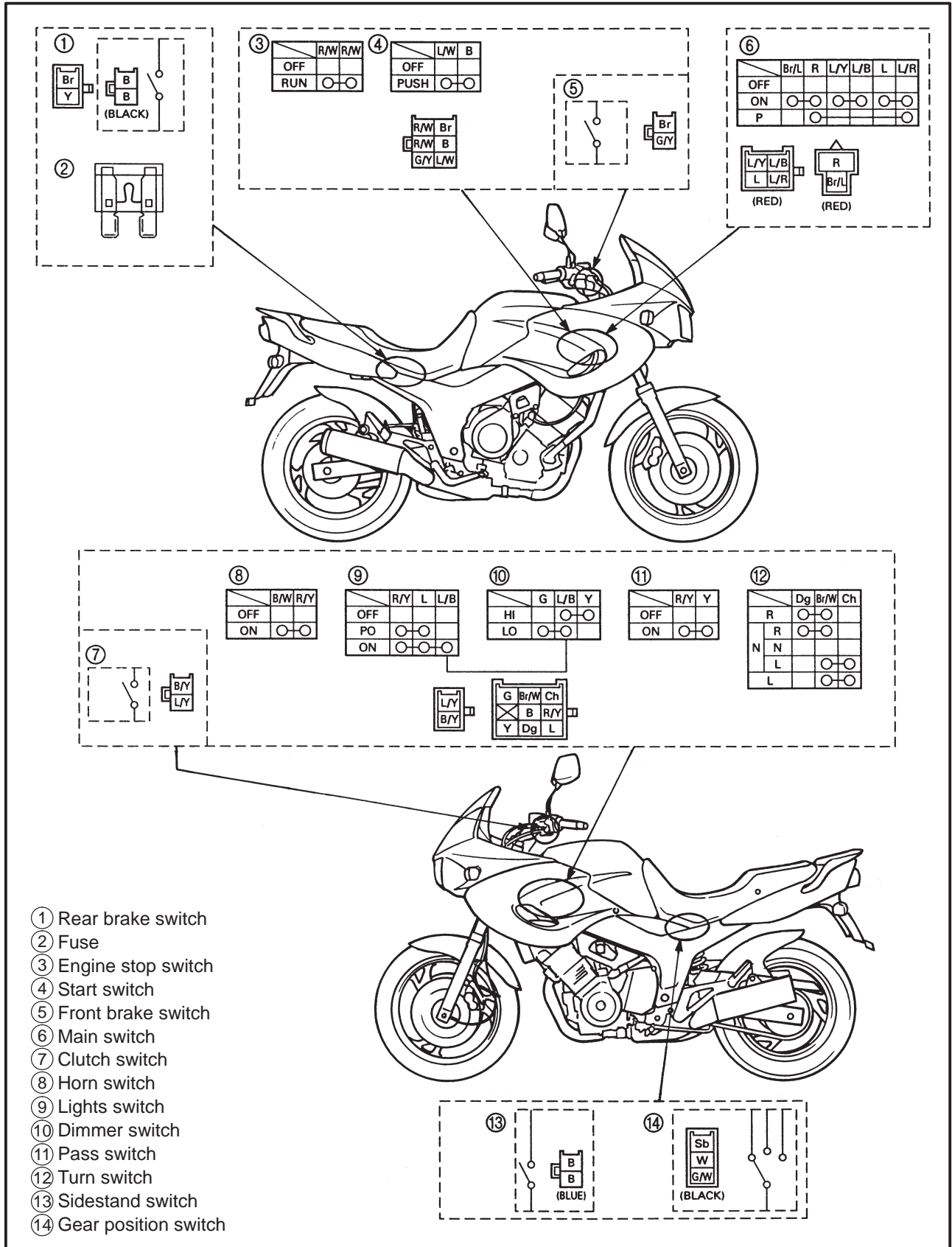
The example chart shows that:

- ① There is continuity between the “Black and Black/White” leads when the switch is set to “OFF”.
- ② There is continuity between the “Red and Brown” leads when the switch is set to “ON”.

SWITCH CONTINUITY INSPECTION

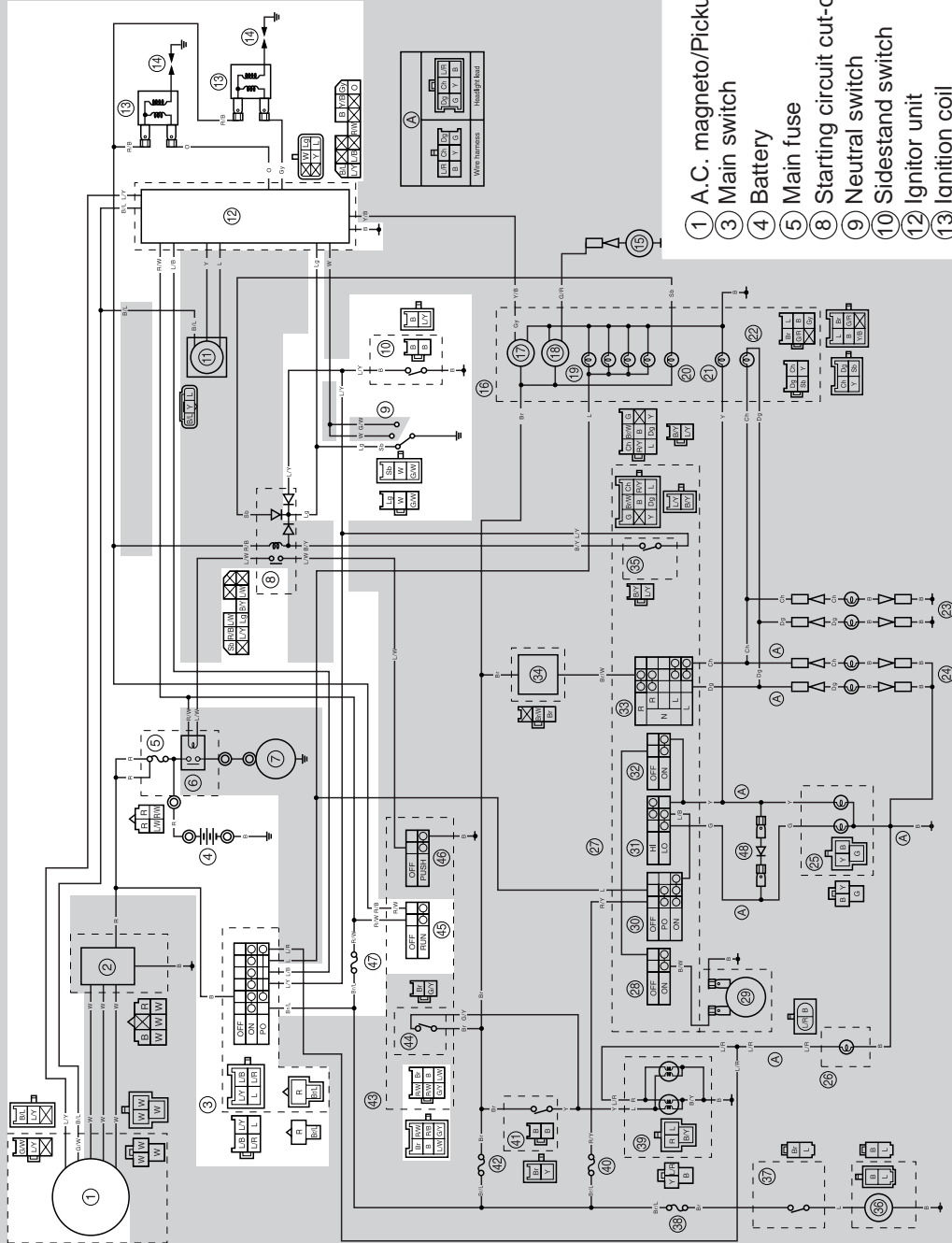
Refer to "SWITCH INSPECTION" and check for continuity between lead terminals.
 Poor connection, no continuity → Correct or replace.

* The coupler locations are circled.





IGNITION SYSTEM CIRCUIT DIAGRAM



- ① A.C. magneto/Pickup coil
- ③ Main switch
- ④ Battery
- ⑤ Main fuse
- ⑧ Starting circuit cut-off relay
- ⑨ Neutral switch
- ⑩ Sidestand switch
- ⑫ Ignitor unit
- ⑬ Ignition coil
- ⑭ Spark plug
- ④⑤ Engine stop switch
- ④⑦ Ignition fuse



TROUBLESHOOTING

IF IGNITION SYSTEM SHOULD BECOME INOPERATIVE (NO SPARK OR INTERMITTENT SPARK)


Procedure

Check:

- | | |
|------------------------------|---|
| 1. Fuse (main and ignition) | 8. Main switch |
| 2. Battery | 9. Engine stop switch |
| 3. Spark plug | 10. Neutral switch |
| 4. Ignition spark gap | 11. Sidestand switch |
| 5. Spark plug cap resistance | 12. Wiring connection
(entire ignition system) |
| 6. Ignition coil resistance | |
| 7. Pickup coil resistance | |

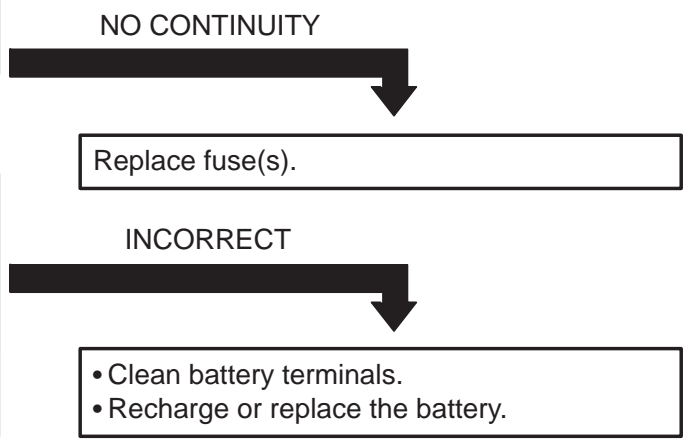
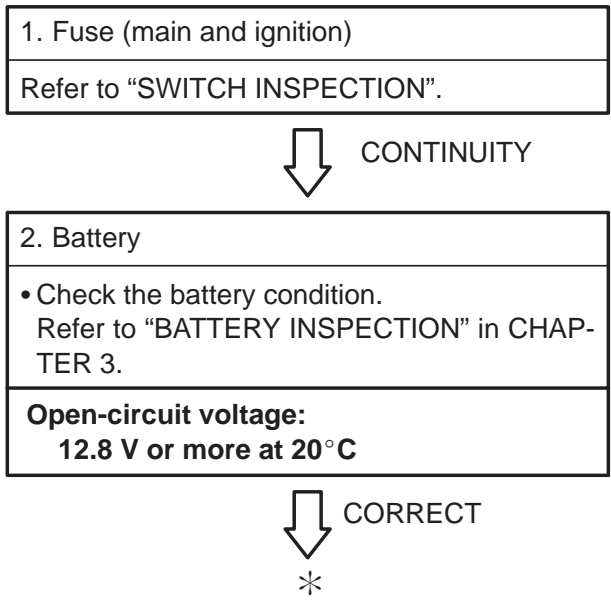
NOTE:

- Remove the following parts before troubleshooting.
 - 1) Seat
 - 2) Side cowlings
 - 3) Side covers
 - 4) Fuel tank
 - 5) Air filter case
- Use the following special tool(s) in this troubleshooting.



Ignition checker:
90890-06754

Pocket tester:
90890-03112





3. Spark plug

- Check the spark plug condition.
- Check the spark plug type.
- Check the spark plug gap.
Refer to “SPARK PLUG INSPECTION” in CHAPTER 3.

Standard spark plug:
DPR8EA-9/X24EPR-U9
NGK/NIPPONDENSO

 **Spark plug gap:**
0.8 ~ 0.9 mm

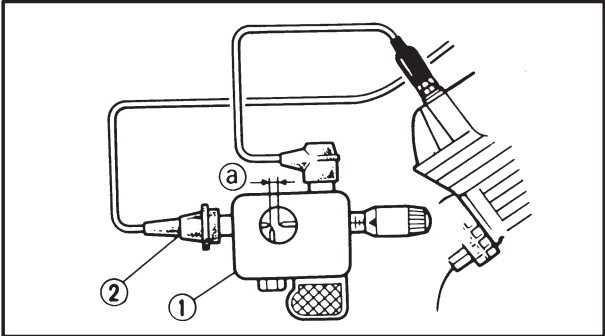
INCORRECT



Repair or replace spark plug.

4. Ignition spark gap

- Disconnect the spark plug cap from spark plug.
- Connect the ignition checker ① as shown.
- ② Spark plug cap
- Turn the main switch to “ON”.

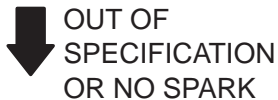


- Check the ignition spark gap ③.
- Crank the engine by pushing the starter switch, and increase the spark gap until a mis-fire occurs.

MEETS SPECIFICATION

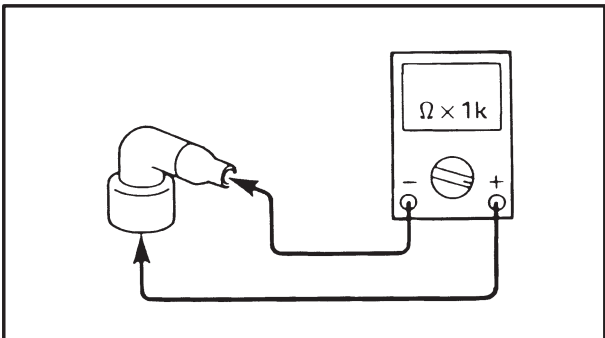
 **Minimum spark gap:**
6.0 mm

Ignition system is good.



5. Spark plug cap resistance

- Remove the spark plug cap.
- Connect the pocket tester ($\Omega \times 1k$) to the spark plug cap.



IGNITION SYSTEM



• Check the spark plug cap for specified resistance.



Spark plug cap resistance:
10 kΩ at 20°C

↓ MEETS SPECIFICATION

OUT OF SPECIFICATION



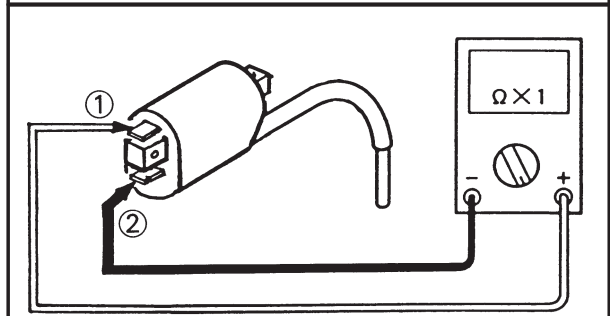
Replace spark plug cap.

6. Ignition coil resistance

• Disconnect the ignition coil connector from the wire harness.

• Connect the pocket tester ($\Omega \times 1$) to the ignition coil.

Tester (+) lead → Red/Black terminal ①
Tester (-) lead → Orange (Gray) terminal ②

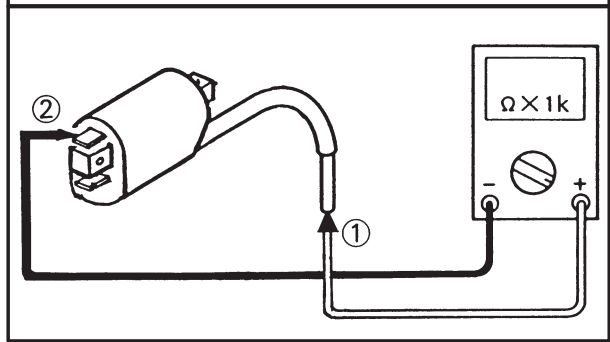


• Check the primary coil for specified resistance.

Primary coil resistance:
3.4 ~ 4.6 Ω at 20°C

• Connect the pocket tester ($\Omega \times 1k$) to the ignition coil.

Tester (+) lead → Spark plug lead ①
Tester (-) lead → Red/Black terminal ②



• Check the secondary coil for specified resistance.



Secondary coil resistance:
10.4 ~ 15.6 kΩ at 20°C

↓ BOTH MEET SPECIFICATION
*

OUT OF SPECIFICATION



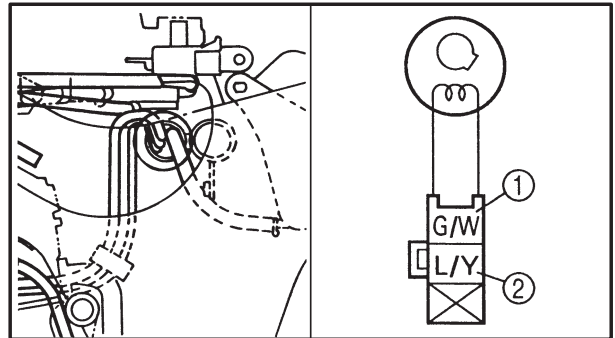
Replace ignition coil.




7. Pickup coil resistance

- Disconnect the pickup coil coupler from the wire harness.
- Connect the pocket tester ($\Omega \times 100$) to the pickup coil terminal.

Tester (+) lead → Green/White terminal ①
 Tester (-) lead → Blue/Yellow terminal ②



- Check the pickup coil for specified resistance.

 Pickup coil resistance:
 192 ~ 288 Ω at 20°C
 (Green/White – Blue/Yellow)

OUT OF SPECIFICATION

MEET SPECIFICATION

Replace pickup coil.

8. Main switch
 Refer to "SWITCH INSPECTION".

INCORRECT

CORRECT

Replace main switch.

9. Engine stop switch
 Refer to "SWITCH INSPECTION".

INCORRECT

CORRECT

Replace handlebar switch (right).

10. Neutral switch
 Refer to "SWITCH INSPECTION".

INCORRECT

CORRECT

Replace neutral switch.

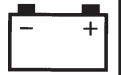
11. Sidestand switch
 Refer to "SWITCH INSPECTION".

INCORRECT

CORRECT

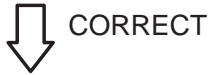
*

Replace sidestand switch.



12. Wiring connection

- Check the entire ignition system for connections.
Refer to "CIRCUIT DIAGRAM".



Replace ignitor unit.

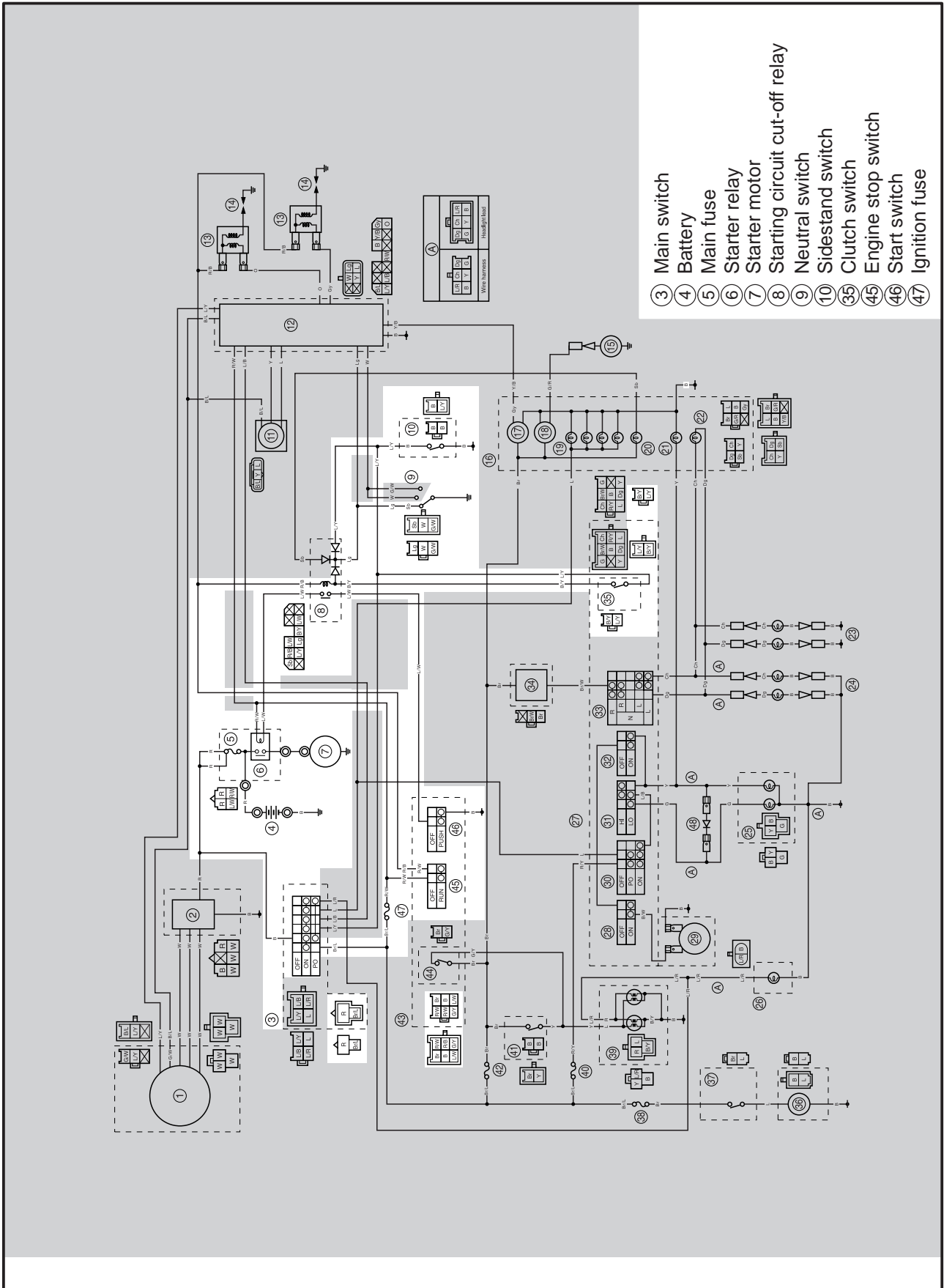
POOR CONNECTION

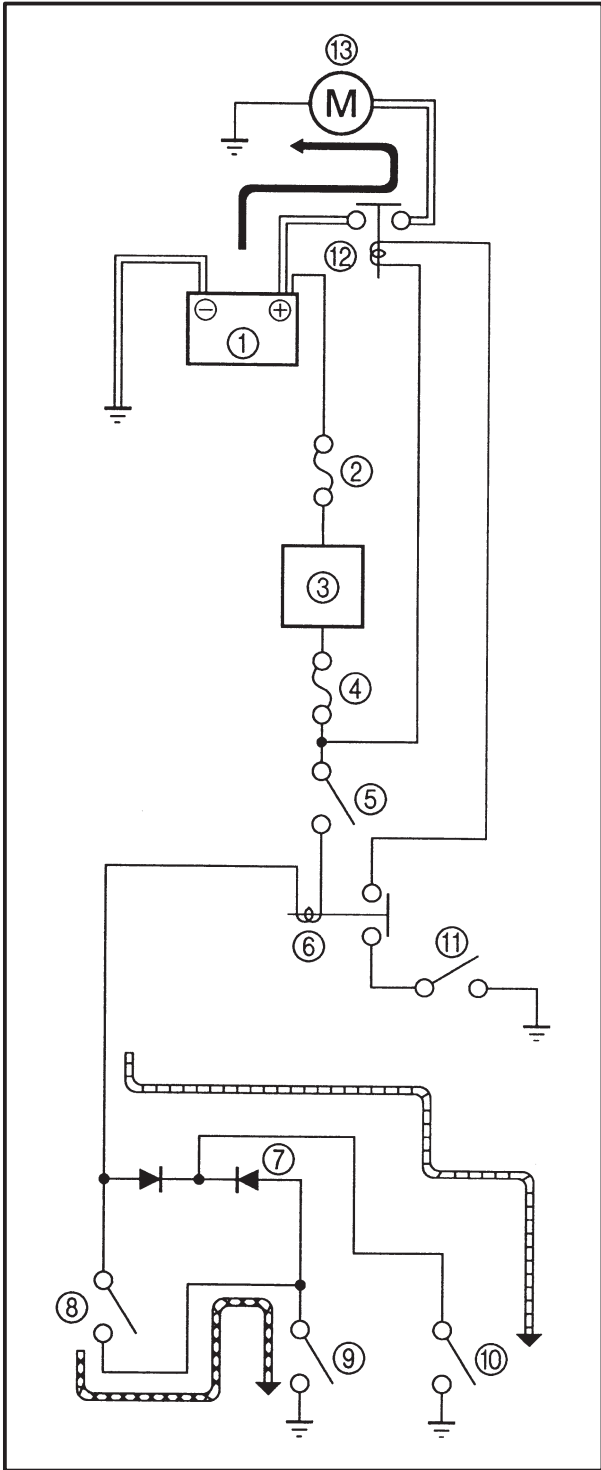


Correct.



ELECTRIC STARTING SYSTEM CIRCUIT DIAGRAM







STARTING CIRCUIT OPERATION

The starting circuit on this model consists of the starter motor, starter relay, and the starting circuit cut-off relay. If the “ENGINE STOP” switch and the main switch are both closed, the starter motor can operate only if:

- The transmission is in neutral (the neutral switch is closed).
- or if**
- The clutch lever is pulled to the handlebar (the clutch switch is closed) and the sidestand is up (the sidestand switch is closed).

The starting circuit cut-off relay prevents the starter from operating when neither of these conditions has been met. In this instance, the starting circuit cut-off relay is open so current cannot reach the starter motor.

When at least one of the above conditions has been met however, the starting circuit cut-off relay is closed, and the engine can be started by pressing the starter switch.

-  WHEN THE TRANSMISSION IS IN NEUTRAL
-  WHEN THE SIDESTAND IS UP AND THE CLUTCH LEVER IS PULLED IN

- ① Battery
- ② Main fuse
- ③ Main switch
- ④ Ignition fuse
- ⑤ Engine stop switch
- ⑥ Starting circuit cut-off relay
- ⑦ Diode
- ⑧ Clutch switch
- ⑨ Sidestand switch
- ⑩ Neutral switch
- ⑪ Start switch
- ⑫ Starter relay
- ⑬ Starter motor

TROUBLESHOOTING

STARTER MOTOR DOES NOT OPERATE.


Procedure

Check:

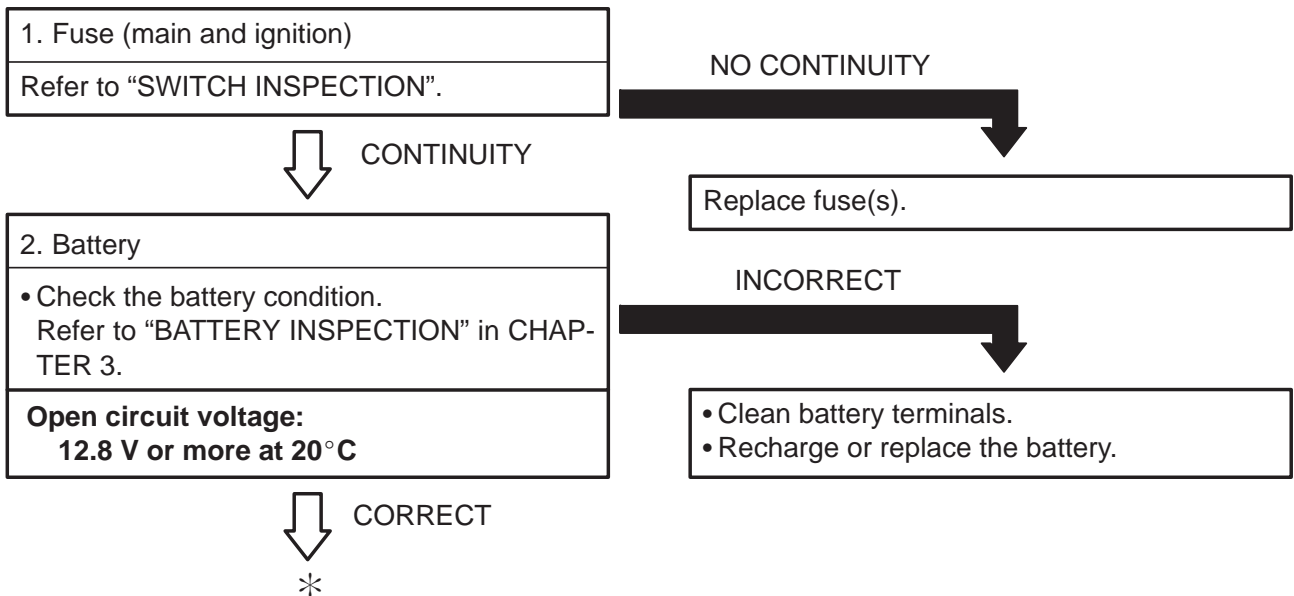
- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Fuse (main and ignition) 2. Battery 3. Starter motor 4. Starting circuit cut-off relay 5. Starter relay 6. Main switch 7. Engine stop switch | <ol style="list-style-type: none"> 8. Neutral switch 9. Sidestand switch 10. Clutch switch 11. Start switch 12. Wiring connection
(entire starting system) |
|---|---|

NOTE:

- Remove the following parts before troubleshooting.
 - 1) Seat
 - 2) Side cowlings
 - 3) Side covers
 - 4) Fuel tank
 - 5) Air filter case
- Use the following special tool(s) in this troubleshooting.



Pocket tester:
90890-03112





3. Starter motor

- Remove the starter motor from the engine.
- Check the starter motor.

Refer to "INSPECTION AND REPAIR".



4. Starting circuit cut-off relay

- Disconnect the starting circuit cut-off relay coupler from the wire harness.
- Connect the pocket tester ($\Omega \times 1$) and battery (12 V) to the starting circuit cut-off relay coupler terminals.

Battery (+) terminal → **Red/Black terminal ①**

Battery (-) terminal → **Black/Yellow terminal ②**

Tester (+) terminal → **Blue/White terminal ③**

Tester (-) terminal → **Blue/White terminal ④**

Check the starting circuit cut-off relay for continuity.



*

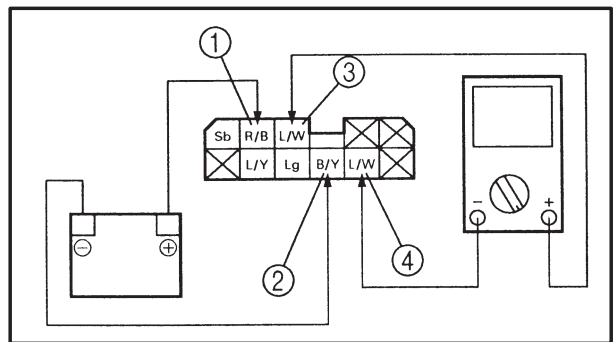
! WARNING

This check is likely to produce sparks, so be sure that no flammable gas or fluid is in the vicinity.

DOES NOT MOVE



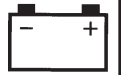
Repair or replace starter motor.
Refer to "INSPECTION AND REPAIR".



NO CONTINUITY



Replace starting circuit cut-off relay.



5. Starter relay

- Disconnect the relay unit coupler from the wire harness.
- Connect the pocket tester ($\Omega \times 1$) and battery (12 V) to the relay unit coupler terminals.

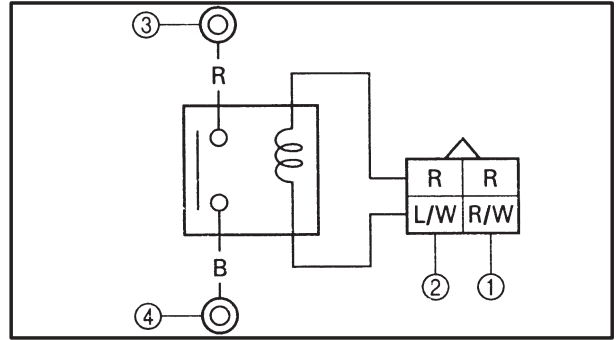
Battery (+) terminal → **Red/White terminal** ①

Battery (-) terminal → **Blue/White terminal** ②

Tester (+) lead → **Red terminal** ③

Tester (-) lead → **Black terminal** ④

- Check the starter relay for continuity.



NO CONTINUITY

Replace starter relay.

CONTINUITY

6. Main switch

Refer to "SWITCH INSPECTION".

INCORRECT

Replace main switch.

CORRECT

7. Engine stop switch

Refer to "SWITCH INSPECTION".

INCORRECT

Replace handlebar switch (right).

CORRECT

8. Neutral switch

Refer to "SWITCH INSPECTION".

INCORRECT

Replace gear position switch

CORRECT

9. Sidestand switch

Refer to "SWITCH INSPECTION".

INCORRECT

Replace sidestand switch.

CORRECT



ELECTRIC STARTING SYSTEM

ELEC



10. Clutch switch
Refer to "SWITCH INSPECTION".

INCORRECT



Replace clutch switch.



CORRECT

11. Start switch
Refer to "SWITCH INSPECTION".

INCORRECT



Replace handlebar switch (right).



CORRECT

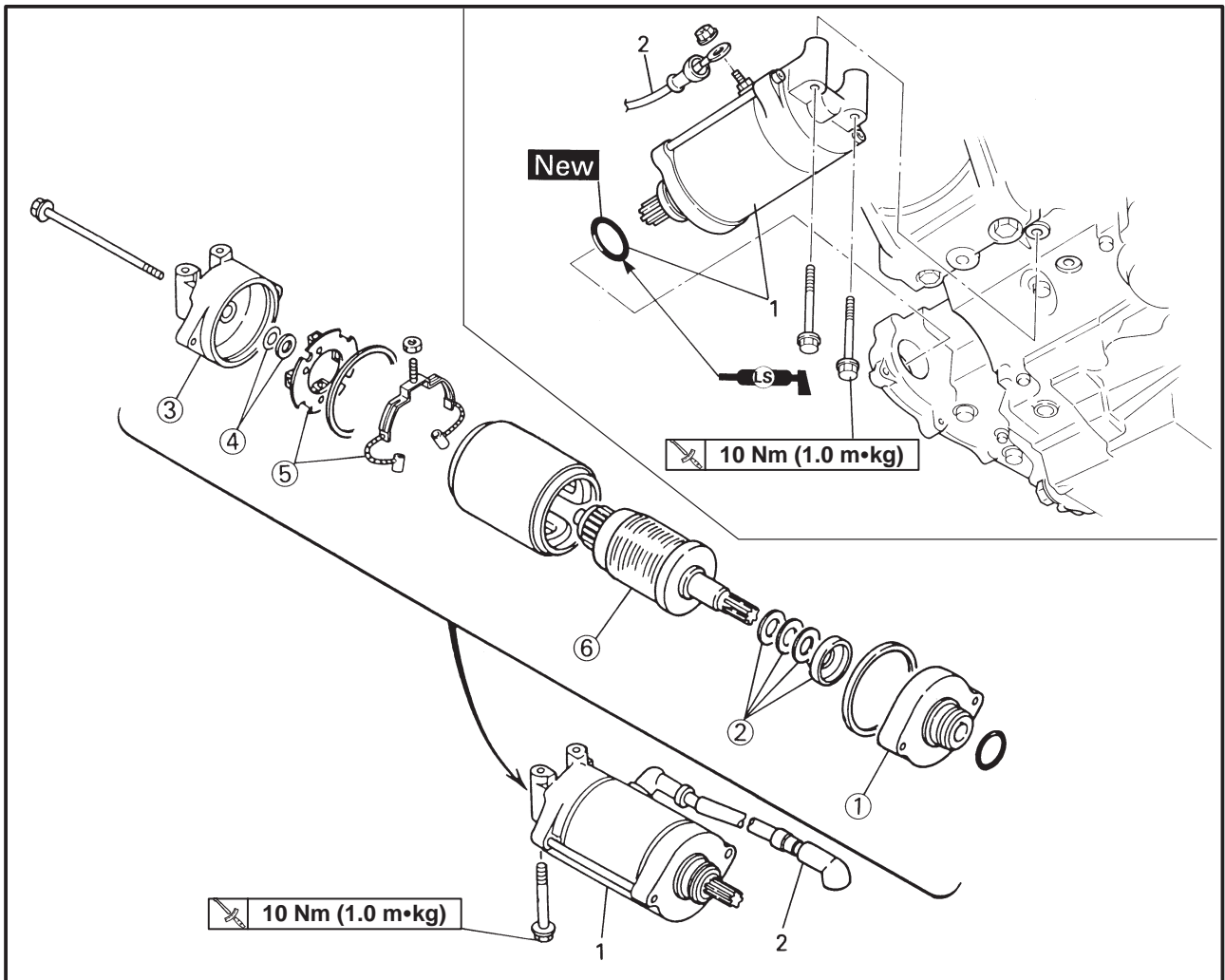
12. Wiring connection.
• Check the entire starting system for connections.
Refer to "CIRCUIT DIAGRAM".

POOR CONNECTION

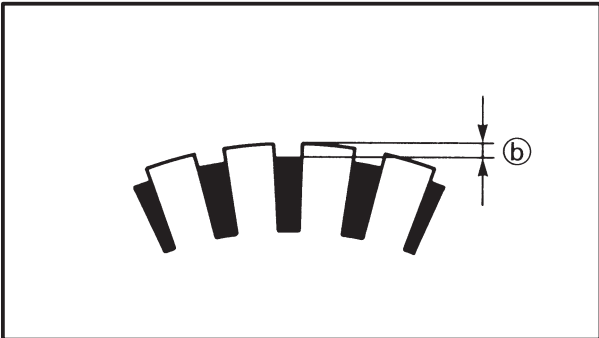
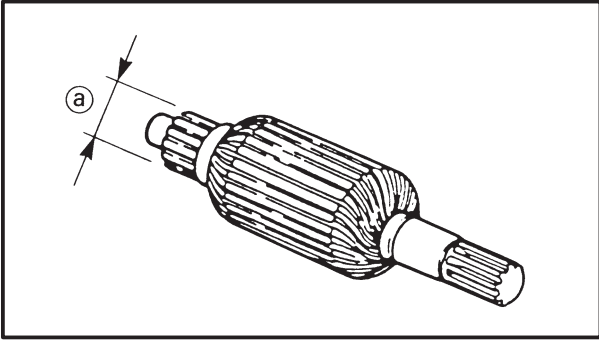


Correct.

STARTER MOTOR



Order	Job name/Part name	Q'ty	Remarks
	Starter motor removal Exhaust pipe and muffler assembly		Remove the parts in the order below. Refer to "ENGINE ASSEMBLY" in CHAPTER 4.
1	Starter motor/O-ring	1/1	
2	Starter motor lead	1	
	Starter motor disassembly		Disassemble the parts in the order below.
①	Front bracket	1	Refer to "ASSEMBLY".
②	Washer kit	1	
③	Rear bracket	2	
④	Washer kit	1	
⑤	Brush seat/Brush 1	1/1	
⑥	Armature coil	1	NOTE: _____ Be sure to remove the installation nut on brush #1 first. _____ For assembly, reverse the disassembly procedure.



Inspection and repair

1. Inspect:

- Commutator
Dirty → Clean it with #600 grit sandpaper.

2. Measure:

- Commutator diameter (a)
Out of specification → Replace starter motor.



Commutator wear limit:
27 mm

3. Measure:

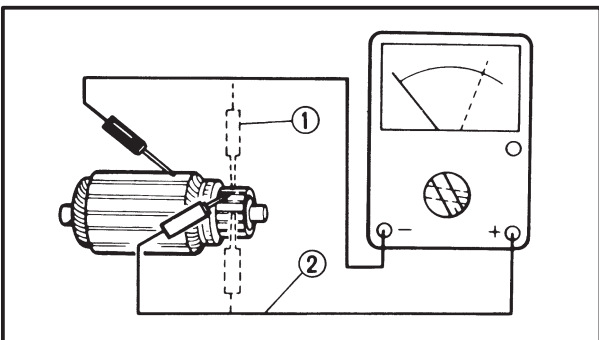
- Mica undercut (b)
Out of specification → Scrape the mica to proper value using a hacksaw blade can be ground to fit.



Mica undercut:
0.7 mm

NOTE:

The mica insulation of the commutator must be undercut to ensure proper operation of commutator.



4. Inspect:

- Armature coil (insulation/continuity)
Defects → Replace starter motor.

Inspecting steps:

- Connect the pocket tester for continuity check (1) and insulation check (2).
- Measure the armature resistances.

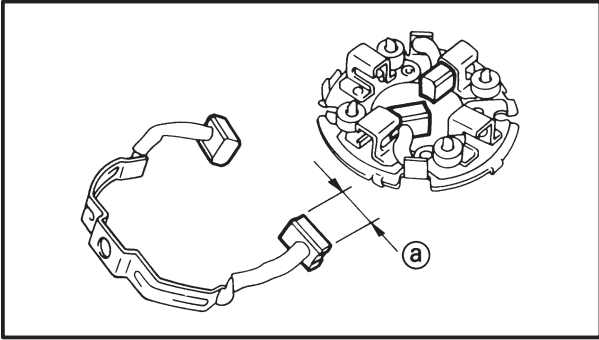


Armature coil resistance:
Continuity check (1):
0.01 Ω at 20°C
Insulation check (2):
More than 1 MΩ at 20°C

- If the resistance is incorrect, replace the starter motor.

ELECTRIC STARTING SYSTEM

ELEC

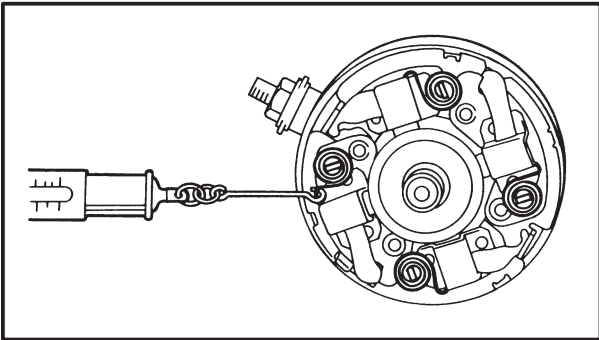


5. Measure:

- Brush length (a)
Out of specification → Replace.



Brush length limit:
5 mm



6. Measure:

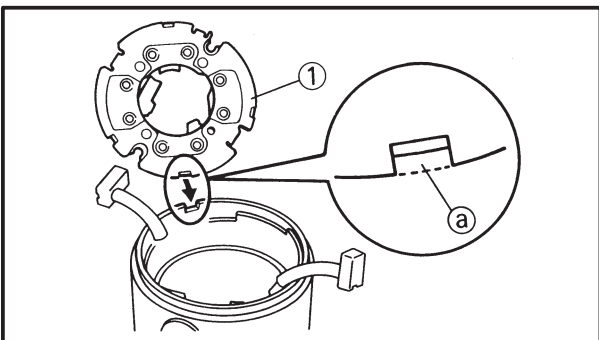
- Brush spring force
Fatigue/Out of specification → Replace as a set.



Brush spring force:
570 ~ 920 g

7. Inspect:

- Bearing
Roughness → Replace.
- Oil seal
- O-rings
- Bushing
Wear/Damage → Replace.



Assembly

Reverse the "Removal" procedure.

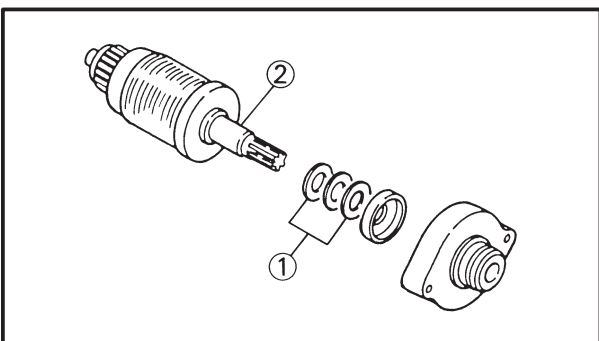
Note the following points.

1. Install:

- Brush seat (1)

NOTE: _____

Align the projection (a) on the brush seat with the slot on the housing.

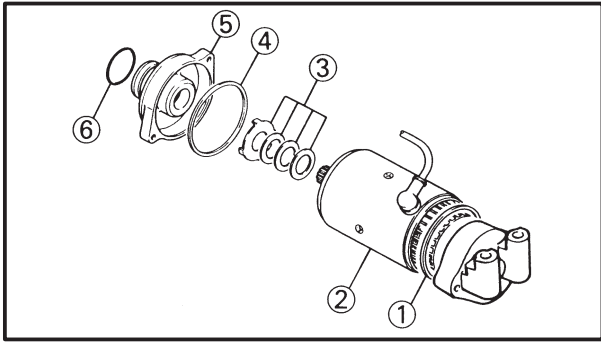
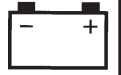


2. Install:

- Shim (1)
- Armature coil (2)

ELECTRIC STARTING SYSTEM

ELEC

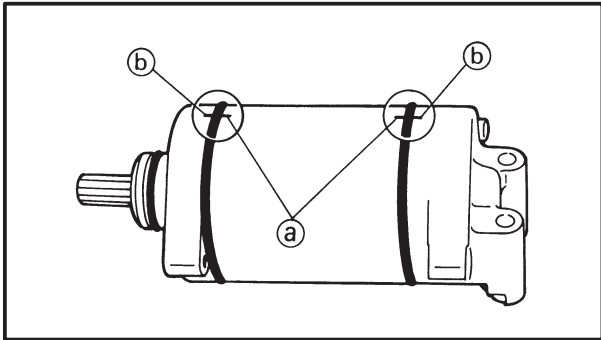


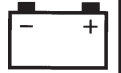
3. Install:

- Gasket ① **New**
- Yoke ②
- Washer kit ③
- Gasket ④ **New**
- Front bracket ⑤
- O-ring ⑥ **New**

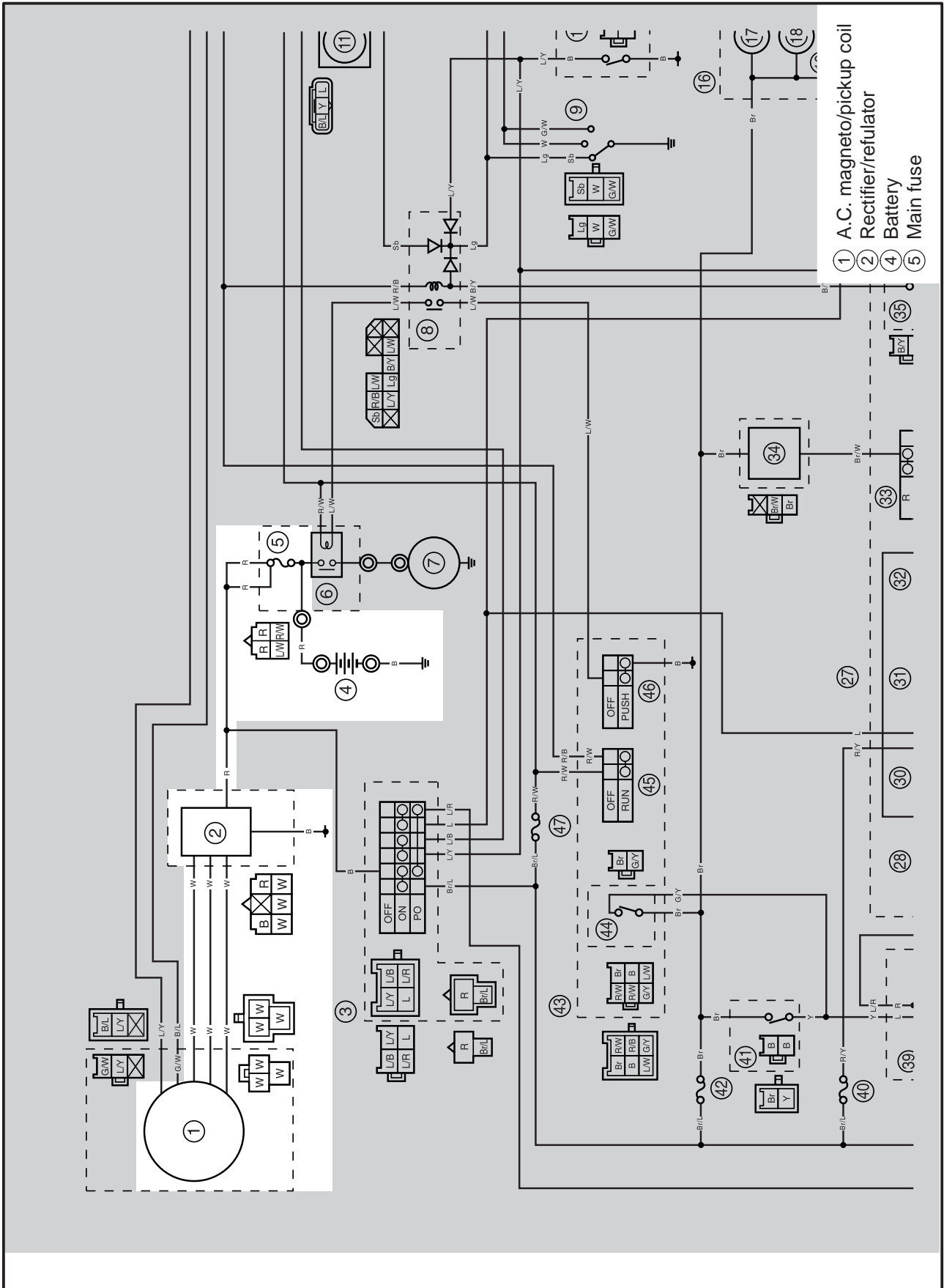
NOTE:

Align the match marks (a) on the yoke with the match marks (b) on the brackets.





CHARGING SYSTEM CIRCUIT DIAGRAM



TROUBLESHOOTING

THE BATTERY IS NOT CHARGED.


Procedure

Check:

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Fuse (main) 2. Battery 3. Charging voltage | <ol style="list-style-type: none"> 4. Stator coil resistance 5. Wiring connection
(entire charging system) |
|---|--|

NOTE:

- Remove the following parts before troubleshooting.
 - 1) Seat
 - 2) Side cowlings
 - 3) Side covers
 - 4) Fuel tank
- Use the following special tool(s) in this troubleshooting.



Engine tachometer:
90890-03113

Pocket tester:
90890-03112

1. Fuse (main)

Refer to "SWITCH INSPECTION".

↓ CONTINUITY

NO CONTINUITY

↓

Replace fuse(s).

INCORRECT

↓

2. Battery

- Check the battery condition.
Refer to "BATTERY INSPECTION" in CHAPTER 3.

Open circuit voltage:
12.8 V or more at 20°C

↓ CORRECT

*

- Clean battery terminals.
- Recharge or replace the battery.




3. Charging voltage

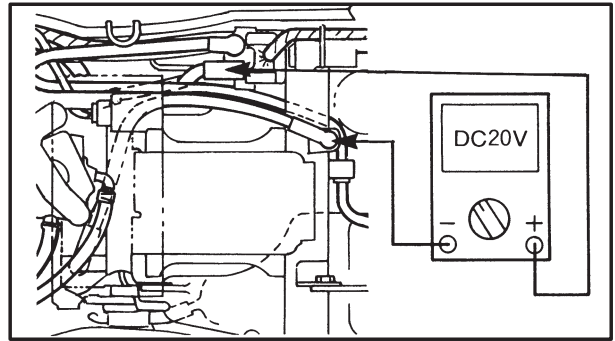
- Connect the engine tachometer to spark plug lead #1.
- Connect the pocket tester (DC 20 V) to the battery.

Tester (+) lead → Battery (+) lead
Tester (-) lead → Battery (-) lead

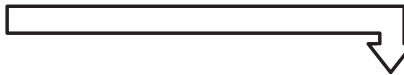
- Start the engine, accelerate to about, 5,000 r/min then check the measured voltage.
- Check battery voltage.

 **Charging voltage = measured voltage – terminal voltage:**
Difference of 0.5 ~ 2.5 V

NOTE: _____
 Use a fully charged battery.



MEETS SPECIFICATION




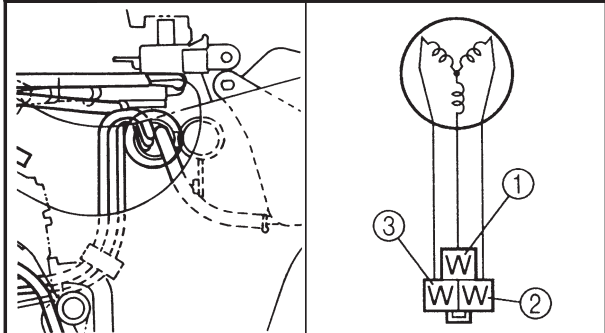
Replace battery.

↓
OUT OF SPECIFICATION

4. Stator coil resistance

- Disconnect A.C. magneto coupler from the wire harness.
- Connect the pocket tester “Ω × 1” to the stator coils.
- Measure the stator coil resistance.

 **Stator coil resistance:**
0.23 ~ 0.35 Ω at 20°C



Tester (+) lead → White lead ①
Tester (-) lead → White lead ②

Tester (+) lead → White lead ①
Tester (-) lead → White lead ③

OUT OF SPECIFICATION



Replace stator assembly.

↓
BOTH MEET SPECIFICATION
 *



5. Wiring connection

- Check the entire starting system for connections.
Refer to "CIRCUIT DIAGRAM".



CORRECT

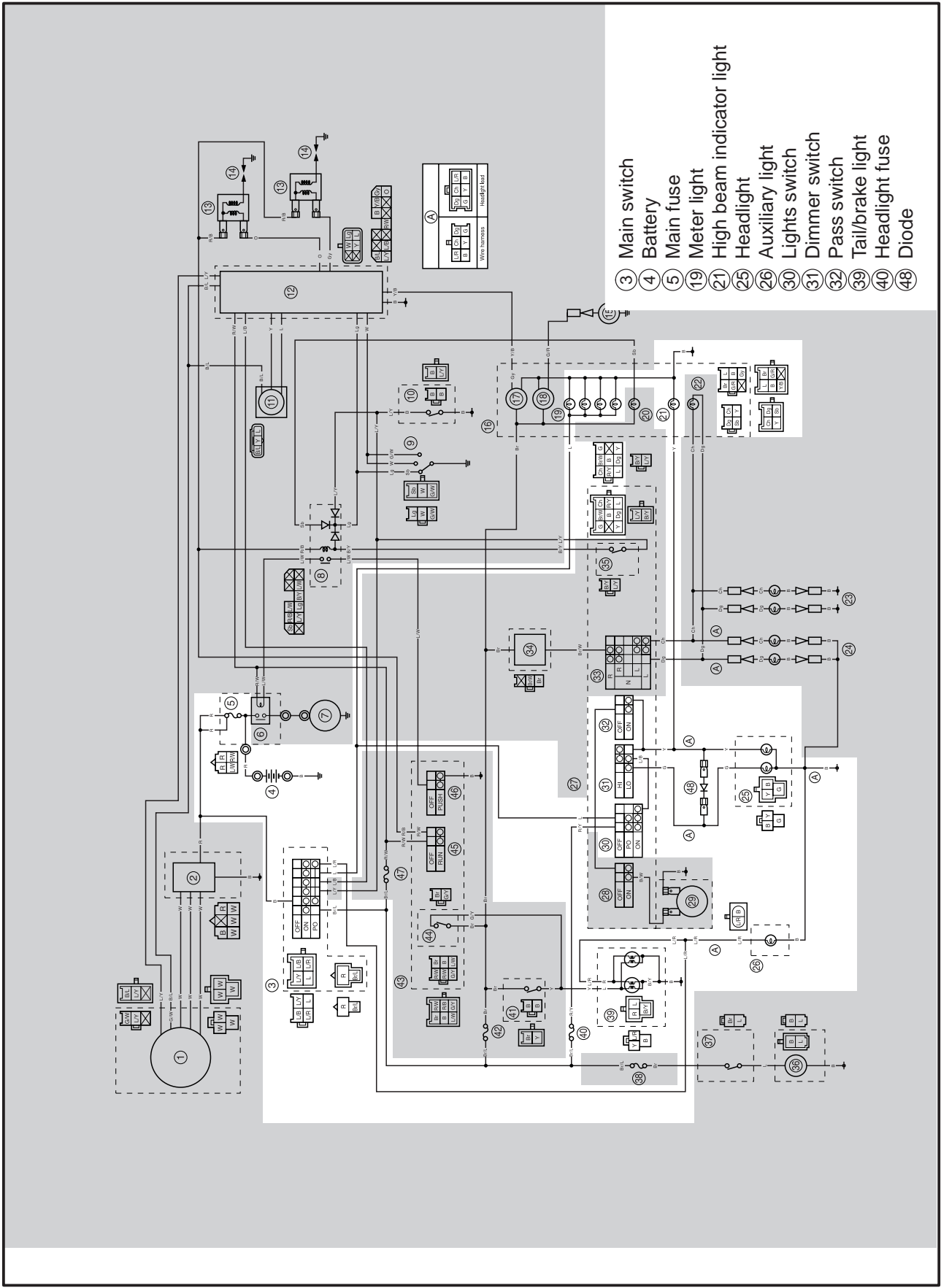
Replace rectifier/regulator.

POOR CONNECTION



Correct.

LIGHTING SYSTEM CIRCUIT DIAGRAM



- ③ Main switch
- ④ Battery
- ⑤ Main fuse
- ①⑨ Meter light
- ②① High beam indicator light
- ②⑤ Headlight
- ②⑥ Auxiliary light
- ③⑩ Lights switch
- ③① Dimmer switch
- ③② Pass switch
- ③⑨ Tail/brake light
- ④⑩ Headlight fuse
- ④⑧ Diode

TROUBLESHOOTING

HEADLIGHT, HIGH BEAM INDICATOR LIGHT, TAILLIGHT, AUXILIARY LIGHT AND/OR METER LIGHT DO NOT COME ON.

Procedure

Check:

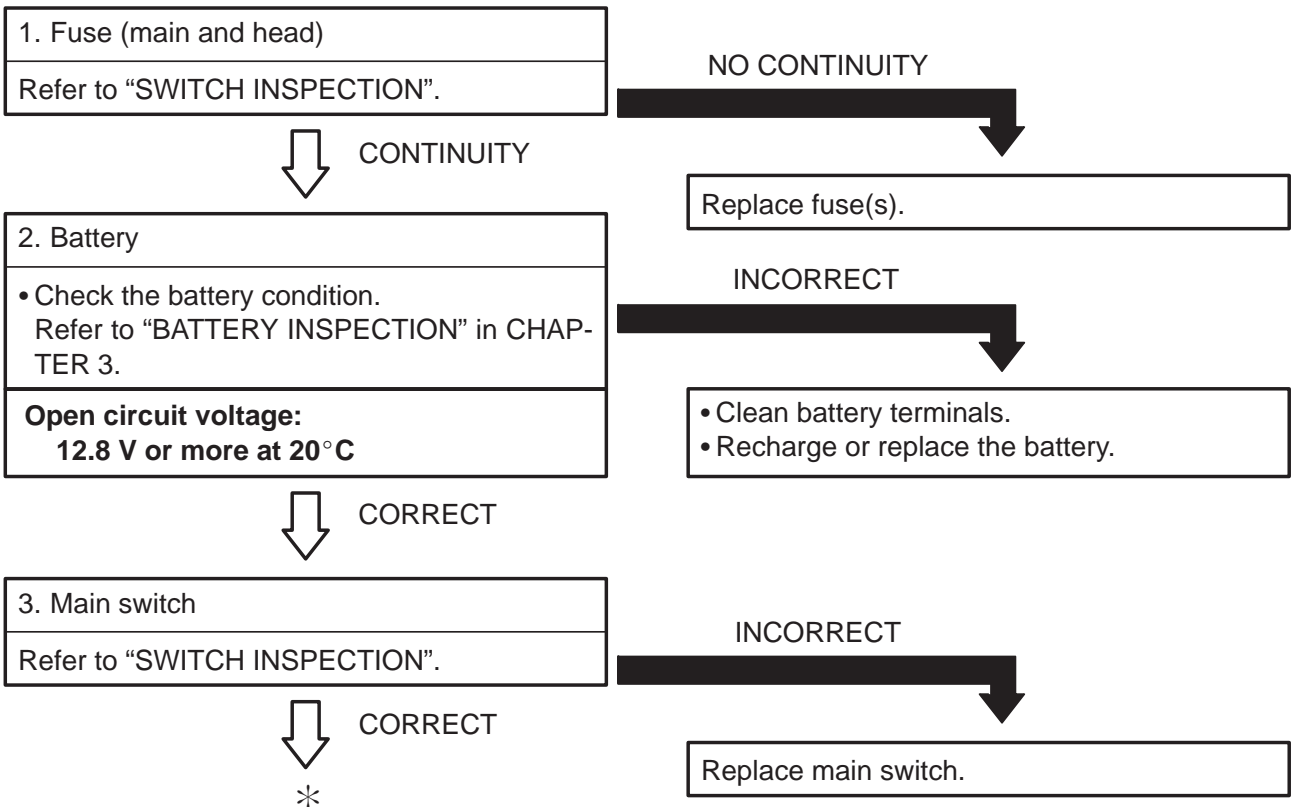
- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Fuse (main and head) 2. Battery 3. Main switch 4. Lights switch/Dimmer switch | <ol style="list-style-type: none"> 5. Pass switch 6. Wiring connection
(entire lighting system) |
|---|---|

NOTE:

- Remove the following parts before troubleshooting.
 - 1) Seat
 - 2) Side cowlings
 - 3) Side covers
 - 4) Fuel tank
 - 5) Air filter case
- Use the following special tool(s) in this troubleshooting.



**Pocket tester:
90890-03112**





4. Lights switch/Dimmer switch
Refer to "SWITCH INSPECTION".



INCORRECT



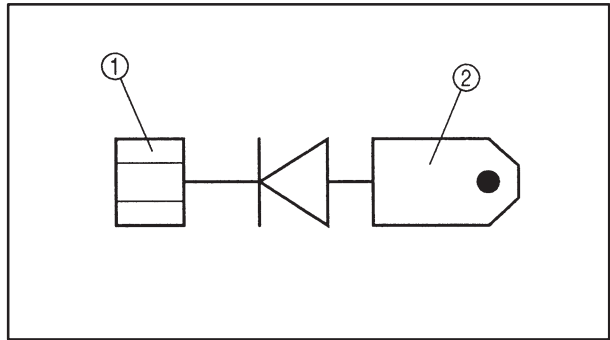
Lights switch/Dimmer switch are faulty, replace handlebar switch (left).

5. Diode

- Remove the diode from the wire harness.
- Check for continuity as follows:
Terminal ① – terminal ②

Tester (+) lead → Terminal ①	Continuity
Tester (-) lead → Terminal ②	
Tester (+) lead → Terminal ②	No Continuity
Tester (-) lead → Terminal ①	

NOTE: _____
When you switch the "-" and "+" leads of the digital pocket tester the readings in the above chart will be reversed.



INCORRECT



Replace the diode.

6. Pass switch
Refer to "SWITCH INSPECTION".



INCORRECT



Pass switch is faulty, replace handlebar switch (left).

7. Wiring connection

- Check the entire lighting system for connections.
Refer to "WIRING DIAGRAM".



POOR CONNECTION



Correct.

Check condition of each circuit for lighting system.
Refer to "LIGHTING SYSTEM CHECK".

LIGHTING SYSTEM CHECK

1. Headlight and high beam indicator light does not come on.

1. Voltage

- Connect the pocket tester (DC 20 V) to the headlight and high beam indicator light couplers.

A When dimmer switch is "LO" position.
B When dimmer switch is "HI" position.

Headlight connector.

Headlight:
Tester (+) lead → Yellow ① or Green ② lead.
Tester (-) lead → Black ③ lead.
High beam indicator light:
Tester (+) lead → Yellow ④ lead.
Tester (-) lead → Black ⑤ lead.

B Meter connector

- Turn the main switch to "ON".
- Turn the lights switch to "ON" position.
- Turn the dimmer switch to "LO" or "HI" position.
- Check for voltage (12 V) on the "Green" and "Yellow" lead at bulb socket connectors.

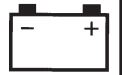
Dimmer switch	Headlight
Hi	
Lo	

↓ MEETS SPECIFICATION

OUT OF SPECIFICATION

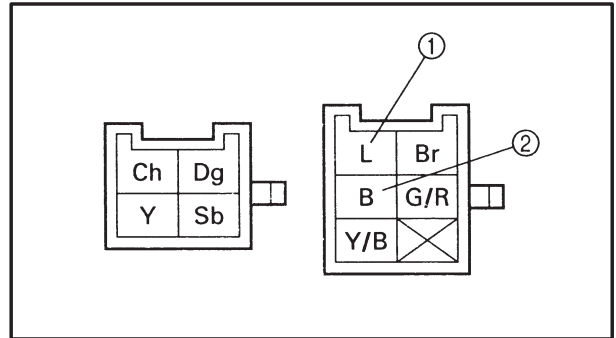
This circuit is good.

Wiring circuit from main switch to bulb socket connector is faulty, repair.



2. Meter light does not come on.

1. Voltage
• Connect the pocket tester (20 V) to the bulb socket coupler.
Tester (+) lead → Blue terminal ①
Tester (-) lead → Black terminal ②



<ul style="list-style-type: none"> • Turn the main switch to "ON". • Turn the lights switch to "ON" or "PO" position. • Check for voltage (12 V) on the "Blue" lead at the bulb socket connector.
--

OUT OF SPECIFICATION

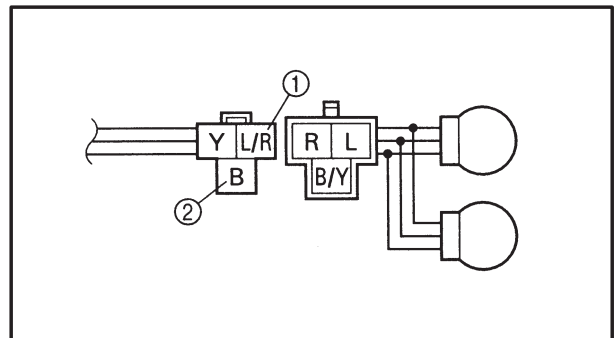
↓ MEETS SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

This circuit is good.

3. Taillight does not come on.

1. Voltage
• Connect the pocket tester (DC 20 V) to the bulb socket connector.
Tester (+) lead → Blue/Red terminal ①
Tester (-) lead → Black terminal ②



<ul style="list-style-type: none"> • Turn the main switch to "ON". • Turn the lights switch to "ON" or "PO" position. • Check for voltage (12 V) on the "Blue/Red" lead at the bulb socket connector.
--

OUT OF SPECIFICATION

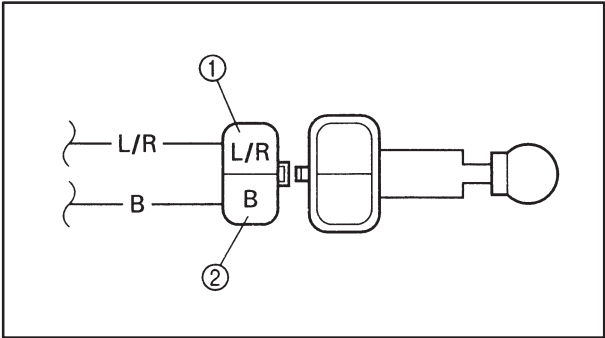
↓ MEETS SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

This circuit is good.

4. Auxiliary light does not come on.

1. Voltage
• Connect the pocket tester (DC 20 V) to the bulb socket connector.
Tester (+) lead → Blue/Red lead ①
Tester (-) lead → Black lead ②



- Turn the main switch to "ON".
- Turn the light switch to "ON" or "PO" position.
- Check for voltage (12 V) on the "Blue/Red" lead at the bulb socket connector.

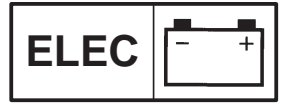
↓ MEETS SPECIFICATION

This circuit is good.

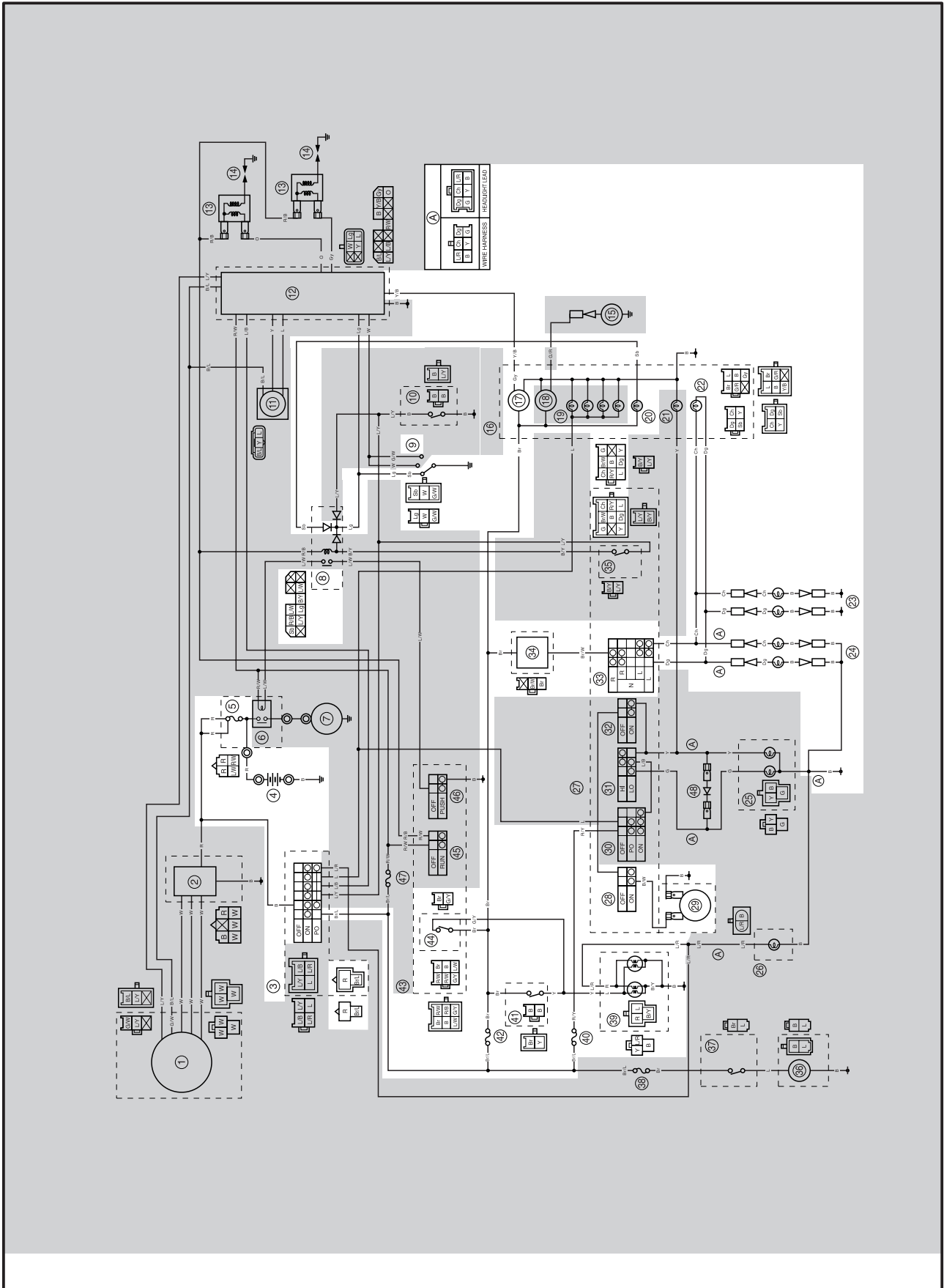
OUT OF SPECIFICATION
↓

Wiring circuit from main switch to bulb socket connector is faulty, repair.

LIGHTING SYSTEM

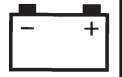


SIGNAL SYSTEM
CIRCUIT DIAGRAM



SIGNAL SYSTEM

ELEC



- ③ Main switch
- ④ Battery
- ⑤ Fuse (main)
- ⑧ Starting circuit cut-off relay
- ⑨ Neutral switch
- ⑰ Tachometer
- ⑳ Neutral indicator light
- ㉒ Turn indicator light
- ㉓ Rear flasher light
- ㉔ Front flasher light
- ㉘ Horn switch
- ㉙ Horn
- ㉛ Turn switch
- ㉜ Flasher relay
- ㉞ Tail/brake light
- ㉟ Headlight fuse
- ㊱ Rear brake switch
- ㊲ Signal system fuse
- ㊴ Front brake switch

TROUBLESHOOTING

- **FLASHER LIGHTS, BRAKE LIGHT AND/OR INDICATOR LIGHTS DO NOT COME ON.**
- **HORN DOES NOT SOUND.**

Procedure

Check:

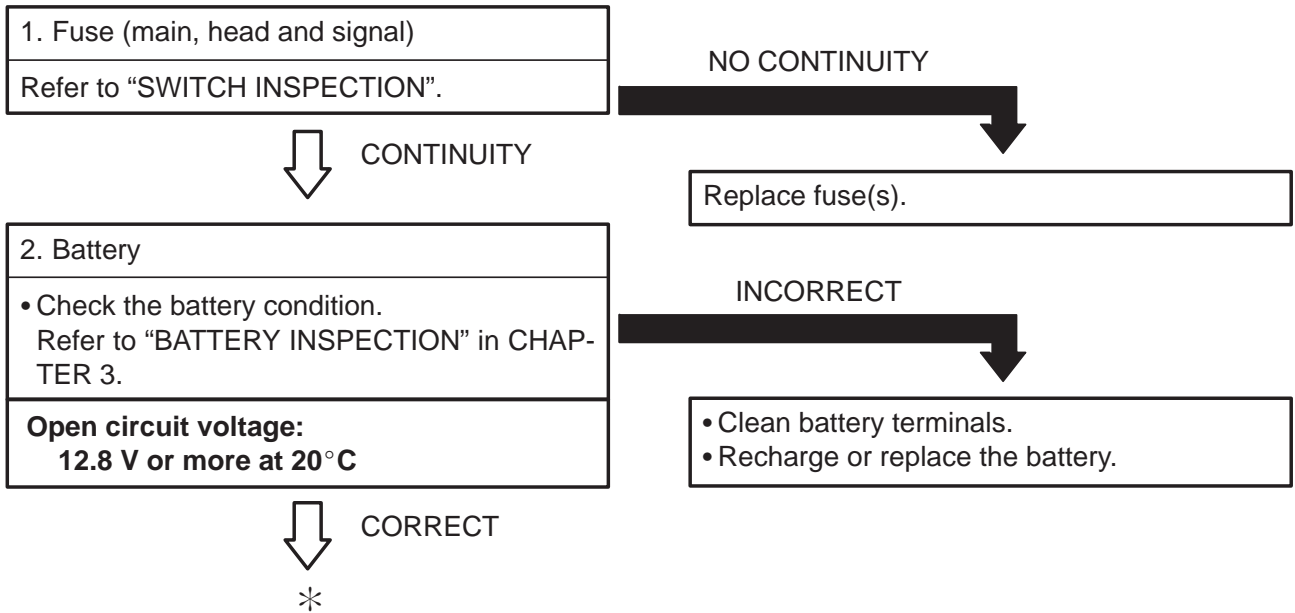
1. Fuse (main, head and signal)
2. Battery
3. Main switch
4. Wiring connection
(entire signal system)

NOTE:

- Remove the following parts before troubleshooting.
 - 1) Seat
 - 2) Side cowlings
 - 3) Side covers
 - 4) Fuel tank
 - 5) Air filter case
- Use the following special tool in this troubleshooting.



Pocket tester:
90890-03112





3. Main switch
Refer to "SWITCH INSPECTION".

INCORRECT



CORRECT

Replace main switch.

4. Wiring connection
• Check the entire signal system for connections.
Refer to "WIRING DIAGRAM".

POOR CONNECTION



CORRECT

Correct.

Check condition of each circuit for signal system. Refer to "SIGNAL SYSTEM CHECK".

SIGNAL SYSTEM CHECK

1. Horn does not sound.

1. Horn switch
Refer to "SWITCH INSPECTION".

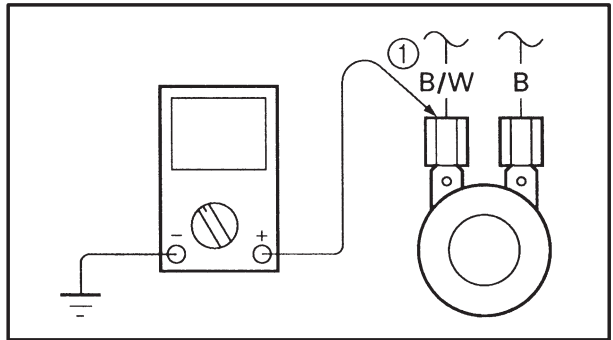
INCORRECT



CORRECT

Replace handlebar switch (left).

2. Voltage
• Connect the pocket tester (DC 20 V) to the horn lead.
Tester (+) lead → Black/White lead ①
Tester (-) lead → Frame ground



• Turn the main switch to "ON".
• Push the horn switch.
• Check for voltage (12 V) on the "Black/White" lead at the horn terminal.

OUT OF SPECIFICATION



MEETS SPECIFICATION

*

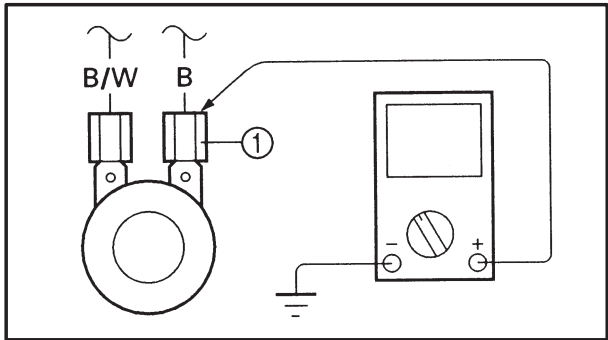
Wiring circuit from main switch to horn terminal is faulty, repair.



3. Voltage

- Connect the pocket tester (DC 20 V) to the horn at the “Black” terminal.

Tester (+) lead → Black lead ①
Tester (-) lead → Frame ground



- Turn the main switch to “ON”.
- Push the horn switch.
- Check for voltage (0 V) on the “Black” lead at the horn terminal.

OUT OF SPECIFICATION

MEETS SPECIFICATION

Adjust or replace horn.

Replace horn.

2. Brake light does not come on.

1. Brake switch (front, rear)
 Refer to “SWITCH INSPECTION”.

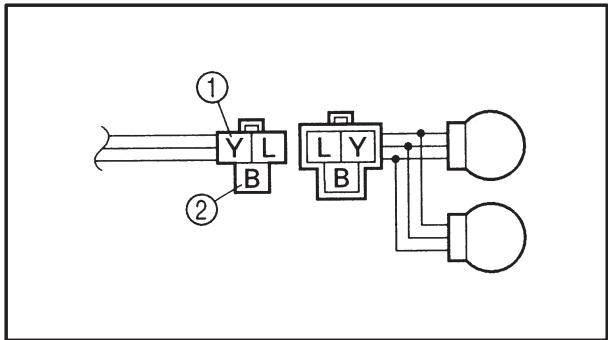
INCORRECT

CORRECT

2. Voltage

- Connect the pocket tester (DC 20 V) to the bulb socket connector.

Tester (+) lead → Yellow lead ①
Tester (-) lead → Black lead ②



Replace brake switch.

SIGNAL SYSTEM



- Turn the main switch to “ON”.
- Turn brake lever is pulled in or brake pedal is stepped down.
- Check for voltage (12 V) on the “Yellow” lead at the bulb socket connector.

↓ MEETS SPECIFICATION

This circuit is good.

3. Flasher light and/or turn indicator light does not blink.

1. Turn switch
Refer to “SWITCH INSPECTION”.

↓ CORRECT

2. Voltage
 - Connect the pocket tester (DC 20 V) to the flasher relay coupler.

Tester (+) lead → Brown terminal ①
Tester (-) lead → Frame ground

- Turn the main switch to “ON”.
- Check for voltage (12 V) on the “Brown” lead at the flasher relay terminal.

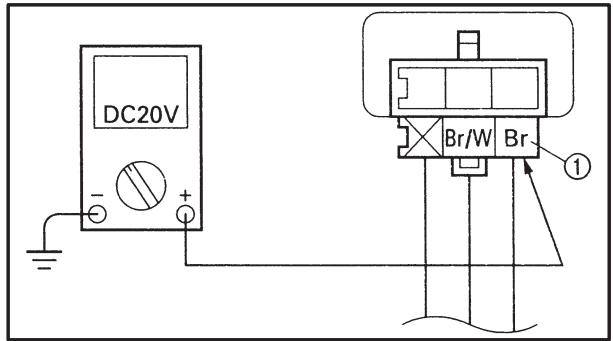
↓ MEETS SPECIFICATION
*

OUT OF SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

INCORRECT

Replace handlebar switch (left).



OUT OF SPECIFICATION

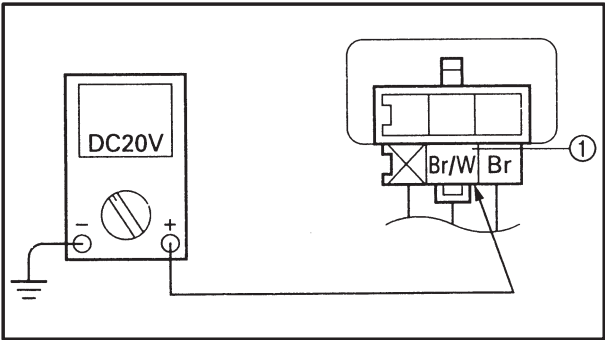
Wiring circuit from main switch to flasher relay connector is faulty, repair.



3. Voltage

- Connect the pocket tester (DC 20 V) to the flasher relay lead.

Tester (+) lead → Brown/White terminal ①
Tester (-) lead → Frame ground



- Turn the main switch to "ON".
- Check for voltage (12 V) on the "Brown/White" lead at the flasher relay terminal.

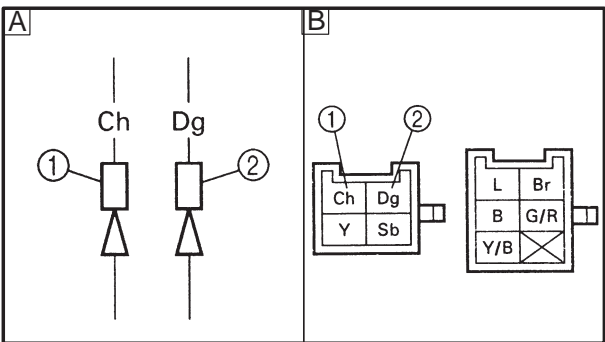
OUT OF SPECIFICATION

MEETS SPECIFICATION

Replace flasher relay.

4. Voltage

- Connect the pocket tester (DC 20 V) to the bulb socket connector.



A Flasher lights
B Turn indicator light

At flasher light (left):
Tester (+) lead → Chocolate lead ①
Tester (-) lead → Frame ground

At flasher light (right):
Tester (+) lead → Dark green lead ②
Tester (-) lead → Frame ground

- Turn the main switch to "ON".
- Turn the turn switch to "L" or "R".
- Check for voltage (12 V) on the "Chocolate" lead or "Dark green" lead at the bulb socket connector.

OUT OF SPECIFICATION

MEETS SPECIFICATION

Wiring circuit from turn switch to bulb socket connector is faulty, repair.

This circuit is good.

4. Neutral indicator light does not come on.

1. Neutral switch
Refer to "SWITCH INSPECTION".

CONTINUITY

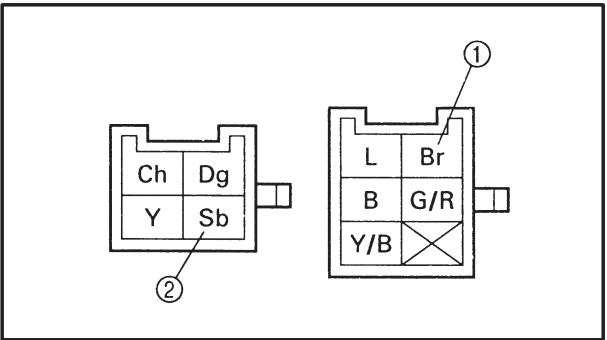
NO CONTINUITY

Replace neutral switch.

2. Voltage

- Connect the pocket tester (DC 20 V) to the bulb socket coupler.

Tester (+) lead → Brown terminal ①
Tester (-) lead → Sky blue terminal ②



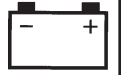
- Turn the main switch to "ON".
- Check for voltage (12 V).

MEETS SPECIFICATION

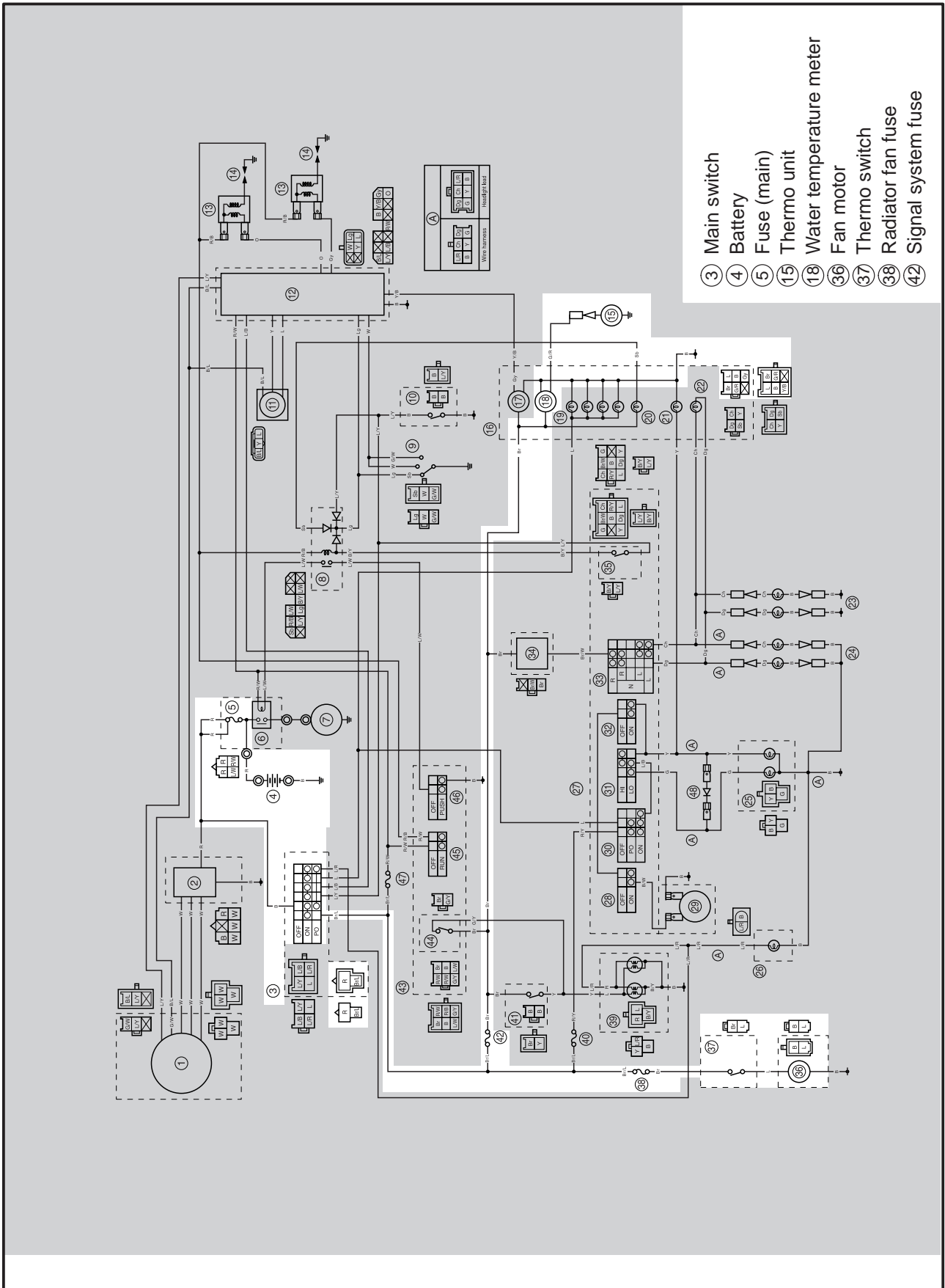
OUT OF SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

This circuit is good.



COOLING SYSTEM CIRCUIT DIAGRAM



- ③ Main switch
- ④ Battery
- ⑤ Fuse (main)
- ⑮ Thermo unit
- ⑱ Water temperature meter
- ⑳ Fan motor
- ㉑ Thermo switch
- ㉒ Radiator fan fuse
- ㉓ Signal system fuse

TROUBLESHOOTING

- **FAN MOTOR DOES NOT MOVE.**
- **WATER TEMPERATURE METER DOES NOT MOVE, WHEN ENGINE IS WARM.**

Procedure

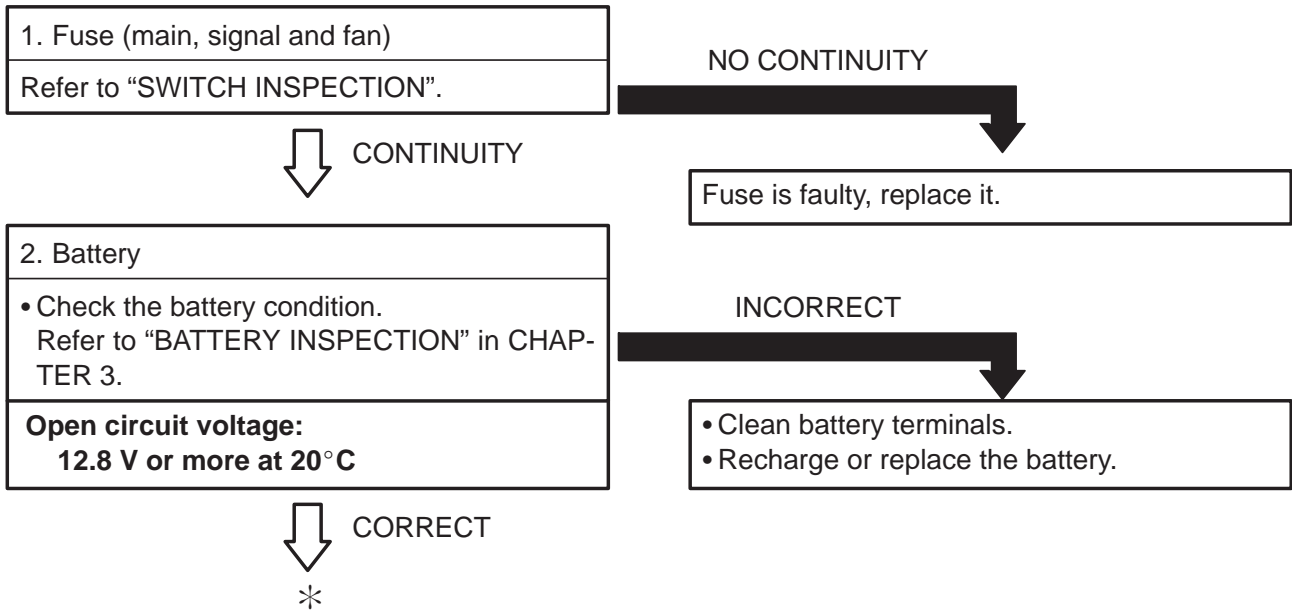
Check:

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Fuse (main, signal and fan) 2. Battery 3. Main switch 4. Fan motor 5. Thermo switch | <ol style="list-style-type: none"> 6. Thermo unit 7. Water temperature 8. Wiring connection
(entire cooling system) |
|--|--|

NOTE:

- Remove the following parts before troubleshooting.
 - 1) Seat
 - 2) Side cowlings
 - 3) Side covers
 - 4) Fuel tank
 - 5) Air filter case
- Use the following special tool in this troubleshooting.

Pocket tester:
90890-03112





3. Main switch
Refer to "SWITCH INSPECTION".

INCORRECT

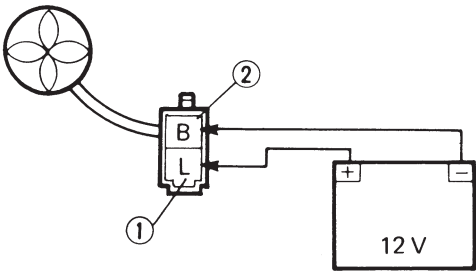


Main switch is faulty, replace it.



4. Fan motors
• Disconnect the fan motor couplers.
• Connect the battery (12 V) as shown.

Battery (+) lead → Blue lead ①
Battery (-) lead → Black lead ②

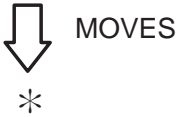


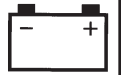
DOES NOT MOVES



Fan motor(s) is faulty, replace it(them).

• Check the fan motors for operation.

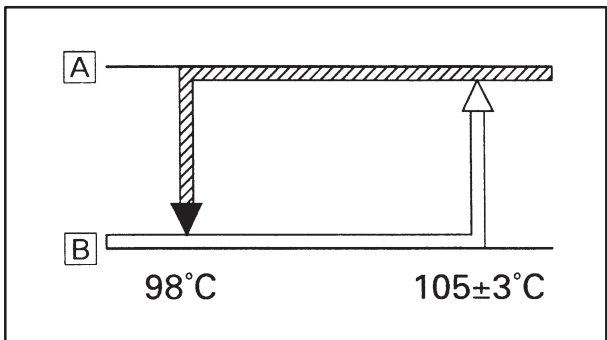
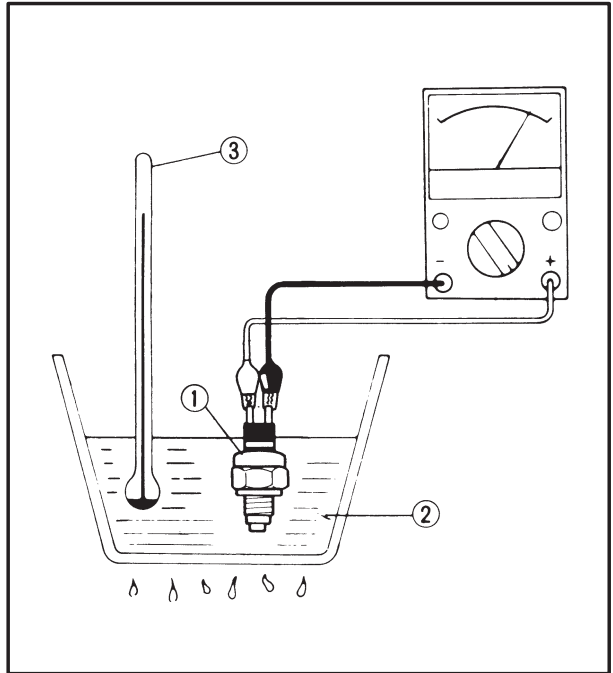




5. Thermo switch
- Remove the thermo switch from the radiator.
 - Connect the pocket tester ($\Omega \times 1$) to the thermo switch ①.
 - Immerse the thermo switch in the water ②.
 - Check the thermo switch for continuity. Note temperatures while heating the water with the temperature gauge ③.

! WARNING

- Handle the thermo switch with special care.
- Never subject it to strong shock or allow it to be dropped. Should it be dropped, it must be replaced.



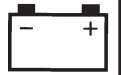
BAD CONDITION



Replace thermo switch.


- A** THERMO SWITCH "ON"
- B** THERMO SWITCH "OFF"





6. Thermo unit

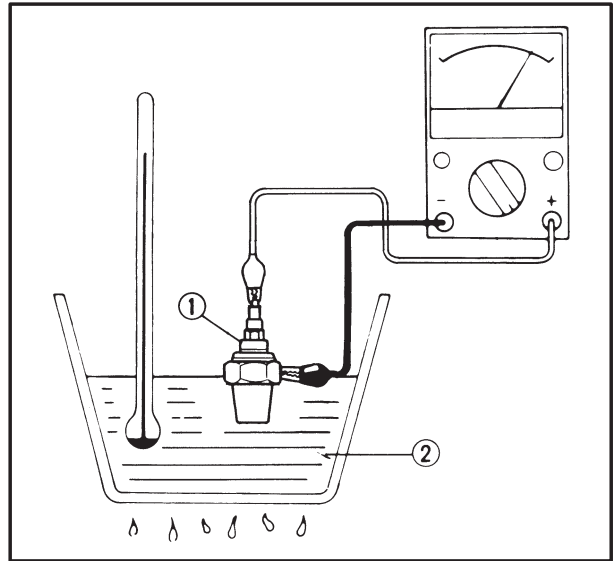
- Remove the thermo unit from the radiator.
- Connect the pocket tester ($\Omega \times 10$) to the thermo unit ①.
- Immerse the thermo unit in the water ②.
- Measure the resistance.



Thermo unit resistance:
 80°C: 47 ~ 53 Ω
 100°C: 26 ~ 30 Ω

⚠ WARNING

- Handle the thermo unit with special care.
- Never subject it to strong shock or allow it to be dropped. Should it be dropped, it must be replaced.



BAD CONDITION

Replace thermo unit.

GOOD CONDITION

7. Wiring connection

Check the entire cooling system for connections. Refer to "CIRCUIT DIAGRAM".

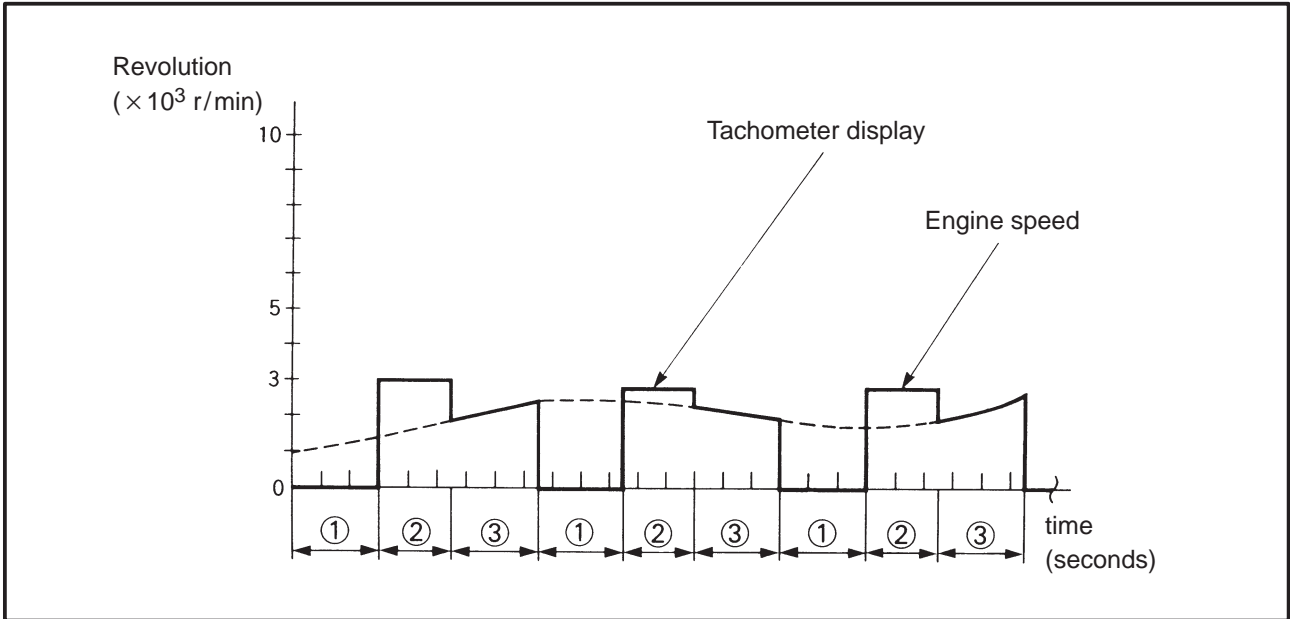
POOR CONNECTION

Correct.

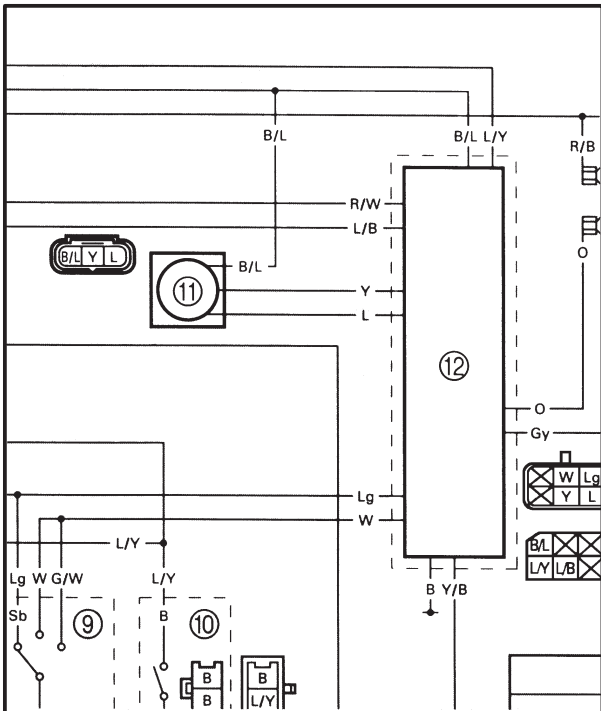
CORRECT

Replace the temperature meter.

TPS (THROTTLE POSITION SENSOR) SELF DIAGNOSIS



CIRCUIT DIAGRAM



If the needle of the tachometer shows the following pattern while the engine is running, the throttle position sensor circuit is broken, shorted, or the TPS (throttle position sensor) is locked. In that case, it would be best to inspect it.

- ① 0 rpm – 3 seconds
 - ② 3,000 rpm – 2.5 seconds
 - ③ present engine revolutions – 3 seconds
- The above pattern is repeated.

NOTE:

- The needle of the tachometer keeps pointing to “0” rpm for 6 seconds when the engine is not running.
- If any trouble occurs in the TPS, the ignition timing signal transmitted from the TPS to the ignitor unit is limited to the full-open state signal.

- ① TPS (throttle position sensor)
- ② Ignitor unit

TPS (THROTTLE POSITION SENSOR) SELF DIAGNOSIS



TROUBLESHOOTING

IF THE TACHOMETER'S TPS (THROTTLE POSITION SENSOR) SELF-DIAGNOSIS OPERATES.

Procedure

Check:

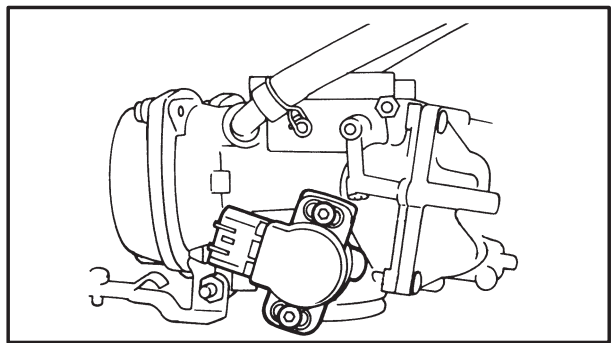
1. TPS (throttle position sensor)
2. Wire harness

NOTE:

Use the following special tool(s) in this troubleshooting.

	Pocket tester: 90890-03112
---	---------------------------------------

1. TPS (throttle position sensor)
<ul style="list-style-type: none">• Disconnect the throttle position sensor coupler from the wire harness.• Connect the pocket tester ($\Omega \times 1$) to the throttle position sensor. Refer to "TPS (THROTTLE POSITION SENSOR) ADJUSTMENT AND INSPECTION" in CHAPTER 6.



<ul style="list-style-type: none">• Check the TPS (throttle position sensor) for continuity.
--

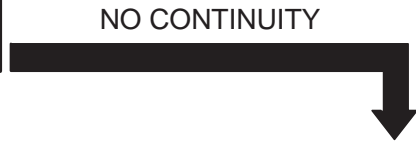
↓ GOOD
CONDITION



Replace TPS (throttle position sensor).

2. Wire harness
<ul style="list-style-type: none">• Check the wire harness for continuity. Refer to "CIRCUIT DIAGRAM".

↓ CONTINUITY



Repair or replace wire harness.

Replace the ignitor unit.

CHAPTER 9. TROUBLESHOOTING

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POOR IDLE SPEED PERFORMANCE	9-2
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TROUBLESHOOTING

NOTE:

The following troubleshooting does not cover all the possible causes of trouble. It should be helpful, however, as a guide to troubleshooting. Refer to the relative procedure in this manual for inspection, adjustment and replacement of parts.

STARTING FAILURE/HARD STARTING

FUEL SYSTEM

Fuel tank

- Empty
- Clogged fuel strainer
- Clogged fuel tank drain hose
- Deteriorated fuel or fuel containing water or foreign material

Fuel cock

- Clogged fuel hose/vacuum hose

Carburetor

- Deteriorated fuel, fuel containing water or foreign material
- Clogged pilot jet
- Clogged pilot air passage
- Sucked-in air
- Deformed float
- Groove-worn needle valve
- Improperly sealed valve seat
- Improperly adjusted fuel level
- Improperly set pilot jet
- Clogged starter jet
- Starter plunger malfunction
- Improperly adjusted starter cable

Air cleaner

- Clogged air filter

Fuel pump

- Faulty fuel pump

ELECTRICAL SYSTEM

Spark plug

- Improper plug gap
- Worn electrodes
- Wire between terminals broken
- Improper heat range
- Faulty spark plug cap

Ignition coil

- Broken or shorted primary/secondary
- Faulty spark plug lead
- Broken body

Full-transistor system

- Faulty ignitor unit
- Faulty pickup coil

Switches and wiring

- Faulty main switch
- Faulty engine stop switch
- Broken or shorted wiring
- Faulty neutral switch
- Faulty start switch
- Faulty sidestand switch
- Faulty clutch switch

Starter motor

- Faulty starter motor
- Faulty starter relay
- Faulty circuit cut-off relay
- Faulty starter clutch

STARTING FAILURE/HARD STARTING/POOR IDLE SPEED PERFORMANCE/POOR MEDIUM AND HIGH SPEED PERFORMANCE



COMPRESSION SYSTEM

Cylinder and cylinder head

- Loose spark plug
- Loose cylinder head or cylinder
- Broken cylinder head gasket
- Worn, damaged or seized cylinder
- Improperly sealed valve
- Improperly contacted valve and valve seat
- Improper valve timing
- Broken valve spring

Piston and piston rings

- Improperly installed piston ring
- Worn, fatigued or broken piston ring
- Seized piston ring
- Seized or damaged piston

Crankcase and crankshaft

- Improperly seated crankcase
- Seized crankshaft

POOR IDLE SPEED PERFORMANCE

POOR IDLE SPEED PERFORMANCE

Carburetor

- Improperly returned starter plunger
- Loose pilot jet
- Clogged pilot air jet
- Improperly synchronized carburetors
- Improperly adjusted idle speed (throttle stop screw)
- Improper throttle cable free play
- Flooded carburetor

Electrical system

- Faulty battery
- Faulty spark plug
- Faulty ignitor unit
- Faulty pickup coil
- Faulty ignition coil

Valve train

- Improperly adjusted valve clearance

Air Cleaner

- Clogged air filter

POOR MEDIUM AND HIGH SPEED PERFORMANCE

POOR MEDIUM AND HIGH SPEED PERFORMANCE

Refer to "Starting failure/Hard starting". (Fuel system, electrical system, compression system and valve train.)

Carburetor

- Diaphragm malfunction
- Improperly adjusted fuel level
- Clogged or loose main jet

Air cleaner

- Clogged air filter element

Fuel pump

- Faulty fuel pump

FAULTY GEAR SHIFTING

HARD SHIFTING

Refer to "Clutch dragging."

SHIFT PEDAL DOES NOT MOVE

Shift shaft

- Improperly adjusted shift rod
- Bent shift shaft

Shift cam, shift fork

- Groove jammed with impurities
- Seized shift fork
- Bent shift fork guide bar

Transmission

- Seized transmission gear
- Jammed impurities
- Incorrectly assembled transmission

JUMP-OUT GEAR

Shift shaft

- Improperly adjusted shift lever position
- Improperly returned stopper level

Shift fork

- Worn shift fork

Shift cam

- Improper thrust play
- Worn shift cam groove

Transmission

- Worn gear dog

CLUTCH SLIPPING/Dragging

CLUTCH SLIPPING

Clutch

- Improperly adjusted clutch cable
- Loose clutch spring
- Fatigued clutch spring
- Worn friction plate/clutch plate
- Incorrectly assembled clutch

Engine oil

- Low oil level
- Improper quality/(low viscosity)
- Deterioration

CLUTCH Dragging

Clutch

- Warped pressure plate
- Unevenly tensioned clutch springs
- Bent push rod
- Broken clutch boss
- Burnt primary driven gear bushing.
- Bent clutch plate
- Swollen friction plate

Engine oil

- Improper oil level
- Improper quality (high viscosity)
- Deterioration

OVERHEATING

OVERHEATING

Ignition system

- Improper spark plug gap
- Improper spark plug heat range
- Faulty ignitor unit

Fuel system

- Improper carburetor main jet (improper setting)
- Improperly adjusted fuel level
- Clogged air filter element

Compression system

- Heavy carbon build-up

Engine oil

- Incorrect oil level
- Improper oil viscosity
- Inferior oil quality.

Brake

- Dragging brake

Cooling system

- Faulty water temperature gauge
- Faulty thermo unit
- Incorrect coolant level
- Faulty thermostatic valve
- Faulty thermo switch
- Clogged or damaged radiator
- Faulty radiator cap
- Seized impeller shaft
- Inoperative fan motor

FAULTY BRAKE

POOR BRAKING EFFECT

Disc brake

- Worn brake pads
- Worn disc
- Air in brake fluid
- Leaking brake fluid
- Faulty cylinder cup kit
- Faulty caliper seal kit
- Loose union bolt
- Broken brake hose
- Oily or greasy disc/brake pads
- Improper brake fluid level

FRONT FORK OIL LEAKAGE AND FRONT FORK MALFUNCTION

OIL LEAKAGE

- Bent, damaged or rusty inner tube
- Damaged or cracked outer tube
- Damaged oil seal lip
- Improperly installed oil seal
- Improper oil level (too much)
- Loose damper rod holding bolt
- Broken cap bolt O-ring

MALFUNCTION

- Bent, deformed or damaged inner tube
- Bent or deformed outer tube
- Damaged fork spring
- Worn or damaged slide metal
- Bent or damaged damper rod
- Improper oil viscosity
- Improper oil level

INSTABLE HANDLING

INSTABLE HANDLING

Handlebar

- Improperly installed or bent

Steering

- Improperly installed handlebar crown
- Bent steering stem
- Improperly installed steering shaft (Improperly tightened ring nut)
- Damaged ball bearing or bearing race

Swingarm

- Worn bearing or bush
- Bent or damaged

Rear shock absorber

- Fatigued spring
- Oil and gas leakage

Tires

- Uneven tire pressures on both sides
- Incorrect tire pressure
- Unevenly worn tires

Front forks

- Uneven oil levels on both sides
- Uneven spring tension (uneven damping force adjuster position)
- Broken spring
- Twisted front forks

Wheels

- Incorrect wheel balance
- Deformed wheel
- Damaged bearing
- Bent or loose wheel axle
- Excessive wheel run-out

Frame

- Twisted
- Damaged head pipe
- Improperly installed bearing race

FAULTY LIGHTING AND SIGNAL SYSTEM

HEADLIGHT DARK

- Improper bulb
- Too many electric accessories
- Hard charging (broken stator coil wire, faulty rectifier/regulator)
- Incorrect connection
- Improperly grounded
- Poor contacts (main or light switch)
- Bulb life expires

FLASHER DOES NOT LIGHT

- Improperly grounded
- Discharged battery
- Faulty turn switch
- Faulty flasher relay
- Broken wire harness
- Loosely connected coupler
- Bulb burnt out
- Faulty fuse

BULB BURNT OUT

- Improper bulb
- Faulty battery
- Faulty rectifier/regulator
- Improperly grounded
- Faulty main and/or light switch
- Bulb life expired

FLASHER WINKS SLOWER

- Faulty flasher relay
- Faulty main and/or turn switch
- Improper bulb

FAULTY LIGHTING AND SIGNAL SYSTEM

TRBL
SHTG



FLASHER KEEPS ON

- Faulty flasher relay
- Bulb burnt out

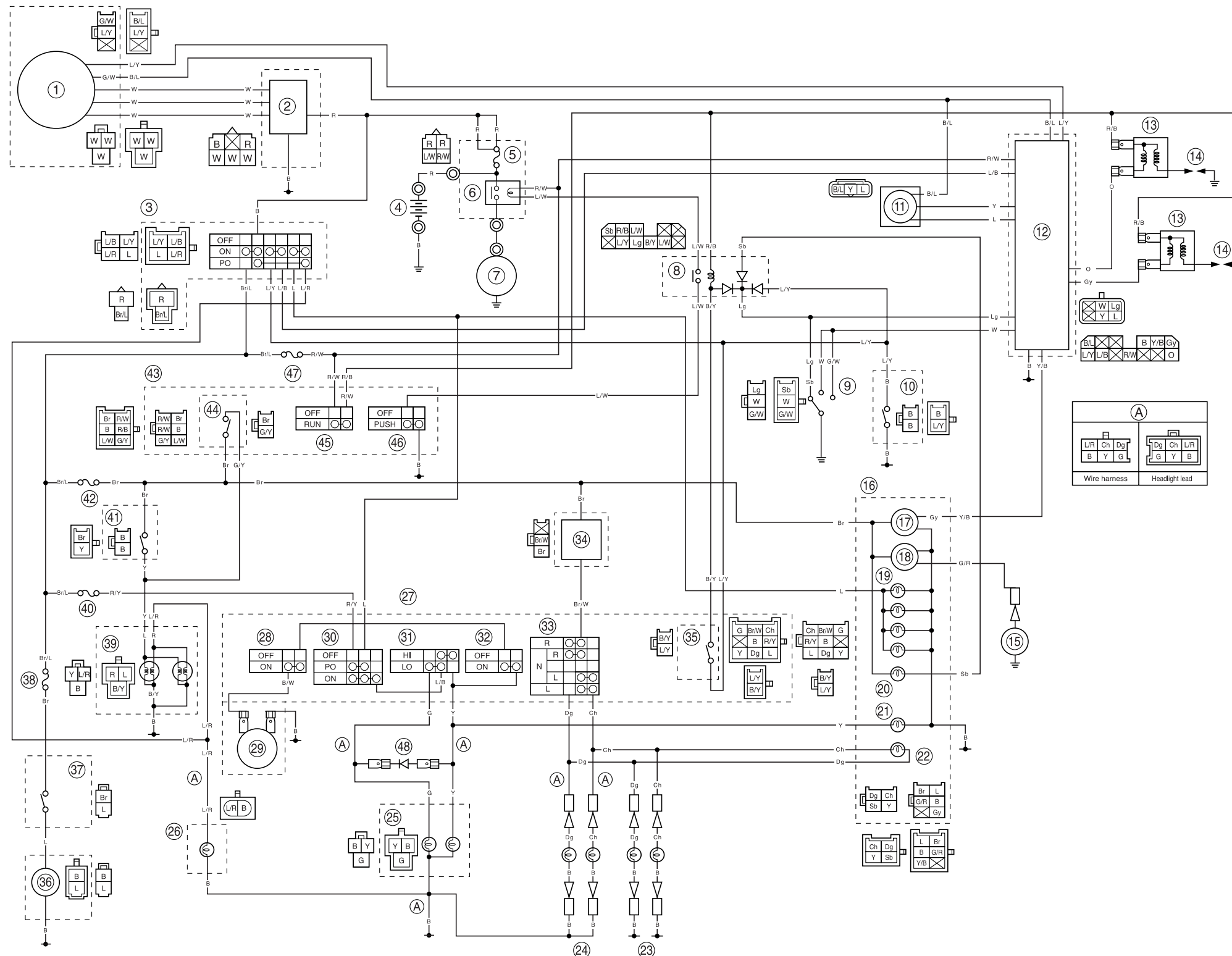
FLASHER WINKS QUICKER

- Improper bulb
- Faulty flasher relay
- Bulb burnt out

HORN IS INOPERATIVE

- Faulty battery
- Faulty fuse
- Faulty main and/or horn switch
- Improperly adjusted horn
- Faulty horn
- Broken wire harness

TDM850 '96 WIRING DIAGRAM



- ① A.C. magneto/pickup coil
- ② Rectifier/regulator
- ③ Main switch
- ④ Battery
- ⑤ Main fuse
- ⑥ Starter relay
- ⑦ Starter motor
- ⑧ Starting circuit cut-off relay
- ⑨ Gear position switch
- ⑩ Sidestand switch
- ⑪ T.P.S. (throttle position sensor)
- ⑫ Ignitor unit
- ⑬ Ignition coil
- ⑭ Spark plug
- ⑮ Thermo unit
- ⑯ Meter assembly
- ⑰ Tachometer
- ⑱ Water temperature meter
- ⑲ Meter light
- ⑳ Neutral indicator light
- ㉑ High beam indicator light
- ㉒ Turn indicator light
- ㉓ Rear flasher light
- ㉔ Front flasher light
- ㉕ Headlight
- ㉖ Auxiliary light
- ㉗ Left handlebar switch
- ㉘ Horn switch
- ㉙ Horn
- ㉚ Lights switch
- ㉛ Dimmer switch
- ㉜ Pass switch
- ㉝ Turn switch
- ㉞ Flasher relay
- ㉟ Clutch switch
- ㊱ Fan motor
- ㊲ Thermo switch
- ㊳ Radiator fan fuse
- ㊴ Tail/brake light
- ㊵ Headlight fuse
- ㊶ Rear brake switch
- ㊷ Signal system fuse
- ㊸ Right handlebar switch
- ㊹ Front brake switch
- ㊺ Engine stop switch
- ㊻ Start switch
- ㊼ Ignition fuse
- ㊽ Diode

COLOR CODE

B Black	L Blue	Y Yellow	Br/W .. Brown/White	L/W ... Blue/White
Br Brown	Lg Light green	B/L Black/Blue	G/R ... Green/Red	L/Y ... Blue/Yellow
Ch Chocolate	O Orange	B/R.... Black/Red	G/W ... Green/White	R/B... Red/Black
Dg Dark green	R Red	B/W ... Black/White	G/Y ... Green/Yellow	R/W ... Red/White
G Green	Sb Sky blue	B/Y Black/Yellow	L/B Blue/Black	R/Y.... Red/Yellow
Gy Gray	W White	Br/L ... Brown/Blue	L/R Blue/Red	