PREFACE

This Service Manual describes the technical features and servicing procedures for the KYMCO ***Apex*** *plus 150* 150/125.

Section 1 contains the precautions for all operations stated in this manual. Read them carefully before any operation is started.

Section 2 is the removal/installation procedures for the frame covers which are subject to higher removal/installation frequency during maintenance and servicing operations.

Section 3 describes the inspection/ adjustment procedures, safety rules and service information for each part, starting from periodic maintenance.

Sections 5 through 13 give instructions for disassembly, assembly and adjustment of engine parts. Section 14 is the removal/ installation of chassis. Section 17 states the testing and measuring methods of electrical equipment. Section 22 provides the maintenance instructions of the emission control system.

Most sections start with an assembly or system illustration and troubleshooting for the section. The subsequent pages give detailed procedures for the section.

The information and contents included in this manual may be different from the motorcycle in case specifications are changed.

KWANG YANG MOTOR CO., LTD.
OVERSEAS SALES DEPARTMENT
OVERSEAS SERVICE SECTION

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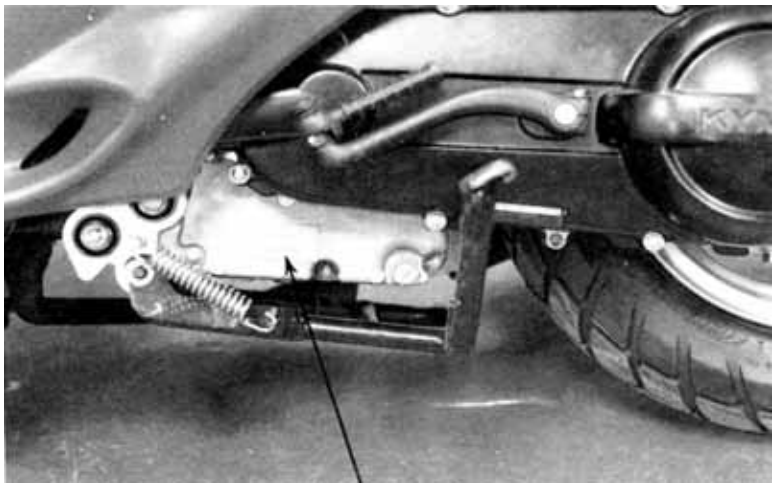
1. GENERAL INFORMATION

1

ENGINE SERIAL NUMBER



Location of Engine Serial Number

1. GENERAL INFORMATION

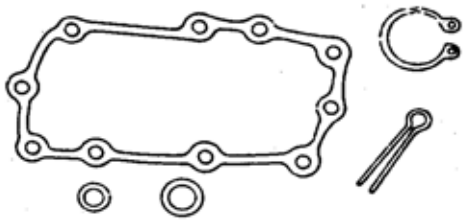
SPECIFICATIONS

Name & Model No.			SF30AA
Motorcycle Name & Type			
Overall length			1940mm
Overall width			745mm
Overall height			1140mm
Wheel base			1350mm
Engine type			Water cooled 4-stroke, OHC engine
Displacement			124cc
Fuel Used			92# nonleaded gasoline
Net weight (kg)		Front wheel	45
		Rear wheel	68
		Total	113
Gross weight(kg)		Front wheel	49
		Rear wheel	75
		Total	124
Tires		Front wheel	100/90-10
		Rear wheel	120/70-10
Ground clearance			130mm
Perform-ance	Braking distance (m)		7.9m /40km/HV
	Min. turning radius		2030mm
Engine	Starting system		Starting motor & kick starter
	Type		Gasoline, 4-stroke
	Cylinder arrangement		Single cylinder
	Combustion chamber type		Semi-sphere
	Valve arrangement		O.H.C.
	Bore x stroke (mm)		52.4 x 57.8
	Compression ratio		10.6:1
	Compression pressure (kg/cm²-rpm)		16—400
	Max. output (ps/rpm)		12.0/7500
	Max. torque (kg m/rpm)		1.2/6000
	Port timing	Intake (1mm) Open	BTDC 12°
		Intake (1mm) Close	ATDC 35°
		Exhaust (1mm) Open	BDDC 28°
		Exhaust (1mm) Close	0°
	Valve clearance (cold)	Intake	0.1
		Exhaust	0.1
	Idle speed (rpm)		1500rpm
	Lubrication System	Lubrication type	Forced pressure & wet sump
		Oil pump type	Inner/outer rotor type
		Oil filter type	Full-flow filtration
		Oil capacity	1.1 liters
	Cooling Type		Water cooling

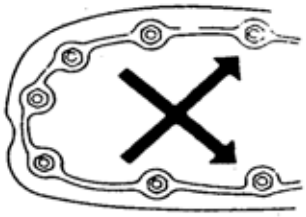
Fuel System	Air cleaner type & No			Paper element, wet
	Fuel capacity			10.5 liters
	Carburetor	Type		cv
		Piston dia.		26
		Venturi dia.		26 equivalent
		Throttle type		Butterfly type
Electrical Equipment	Ignition System	Type		CDI
		Ignition timing		BTDC 10°±3°
		Contact breaker		Non-contact point type
		Spark plug		NGK DP7EA-9
		Spark plug gap		0.8～1.0mm
	Battery	Capacity		12V9AH
Power Drive System	Clutch	Type		Dry multi-disc clutch
	Transmis-sion Gear	Type		Non-stage transmission
		Operation		Automatic centrifugal type
	Reduction Gear	Type		Two-stage reduction
		Reduction ratio	1st	
			2nd	
Moving Device	Front Axle	Caster angle		
		Connecting rod		
	Tire pressure (kg/cm²)		Front	1.75
			Rear	2.25
	Turning angle		Left	43°
			Right	43°
Brake system type			Front	Disk brake
			Rear	Disk brake
Damping Device	Suspension type		Front	Telescope
			Rear	Double swing
	Shock absorber type		Front	Telescope
			Rear	Double swing
Frame type				Under bone

SERVICE PRECAUTIONS

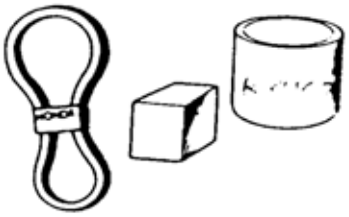
■ Make sure to install new gaskets, O-rings, circlips, cotter pins, etc. when reassembling.



■ When tightening bolts or nuts, begin with larger-diameter to smaller ones at several times, and tighten to the specified torque diagonally.

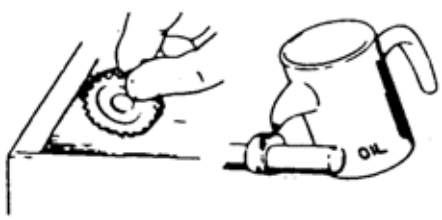


■ Use genuine parts and lubricants.

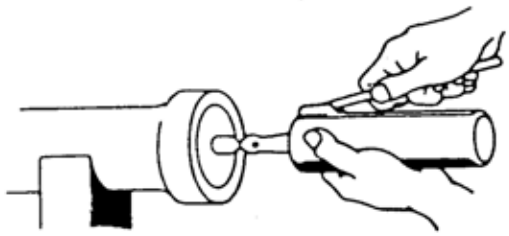


■ When servicing the motorcycle, be sure to use special tools for removal and installation.

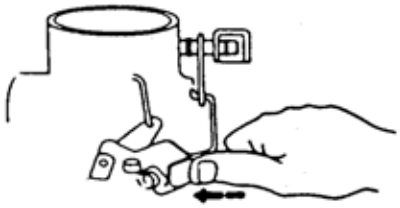
■ After disassembly, clean removed parts. Lubricate sliding surfaces with engine oil before reassembly.



■ Apply or add designated greases and lubricants to the specified lubrication points.

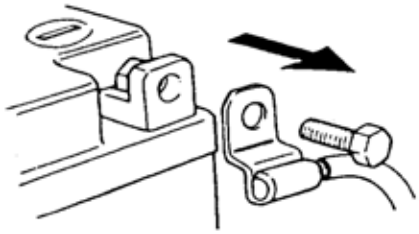


■ After reassembly, check all parts for proper tightening and operation.

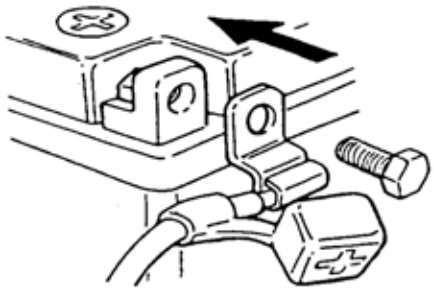


■ When two persons work together, pay attention to the mutual working safety.

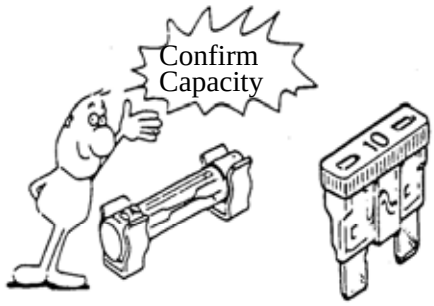
■ Disconnect the battery negative (-) terminal before operation.
■ When using a spanner or other tools, make sure not to damage the motorcycle surface.



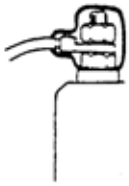
■ After operation, check all connecting points, fasteners, and lines for proper connection and installation.
■ When connecting the battery, the positive (+) terminal must be connected first.
■ After connection, apply grease to the battery terminals.
■ Terminal caps shall be installed securely.



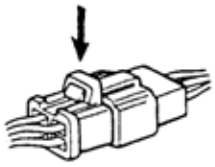
■ If the fuse is burned out, find the cause and repair it. Replace it with a new one according to the specified capacity.



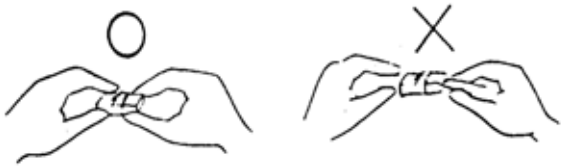
■ After operation, terminal caps shall be installed securely.



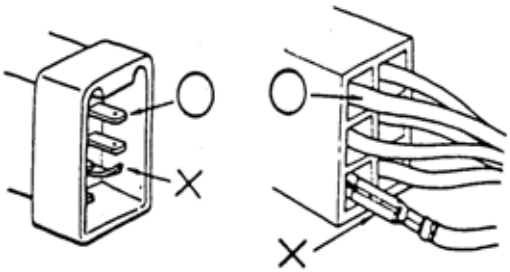
■ When taking out the connector, the lock on the connector shall be released before operation.



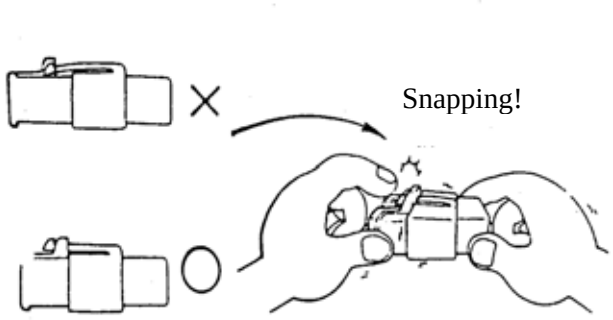
■ Hold the connector body when connecting or disconnecting it.
■ Do not pull the connector wire.



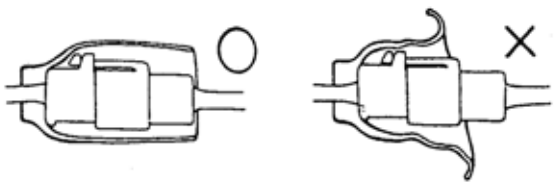
■ Check if any connector terminal is bending, protruding or loose.



- The connector shall be inserted completely.
- If the double connector has a lock, lock it at the correct position.
- Check if there is any loose wire.



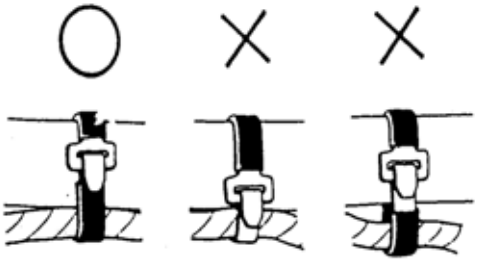
- Before connecting a terminal, check for damaged terminal cover or loose negative terminal.



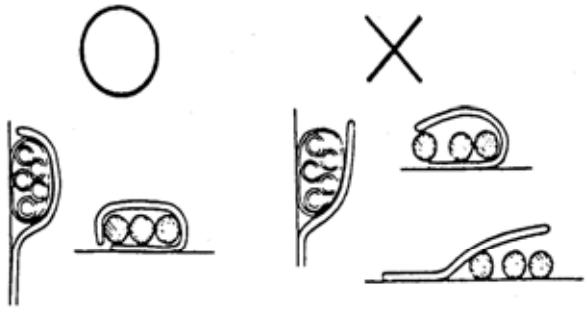
- Check the double connector cover for proper coverage and installation.

- Insert the terminal completely.
- Check the terminal cover for proper coverage.
- Do not make the terminal cover opening face up.

- Secure wire harnesses to the frame with their respective wire bands at the designated locations.
  Tighten the bands so that only the insulated surfaces contact the wire harnesses.

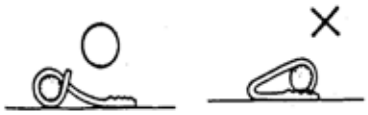


■ After clamping, check each wire to make sure it is secure.

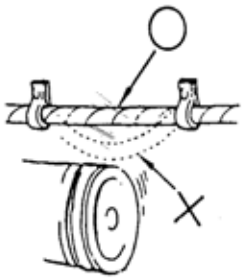


■ Do not squeeze wires against the weld or its clamp.

■ After clamping, check each harness to make sure that it is not interfering with any moving or sliding parts.

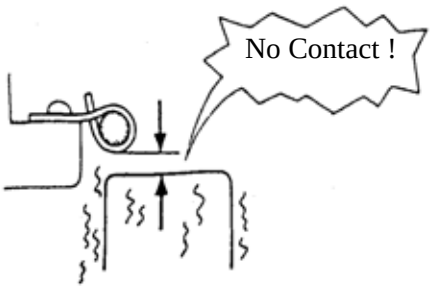


■ When fixing the wire harnesses, do not make it contact the parts which will generate high heat.

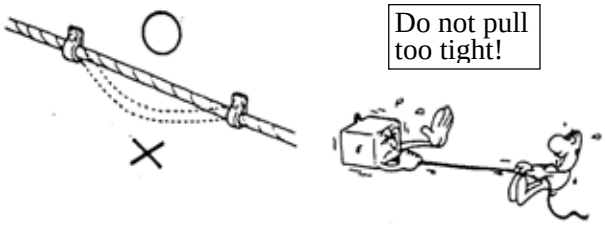


■ Route wire harnesses to avoid sharp edges or corners. Avoid the projected ends of bolts and screws.

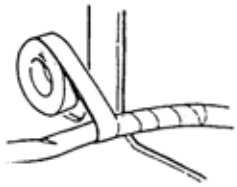
■ Route wire harnesses passing through the side of bolts and screws. Avoid the projected ends of bolts and screws.



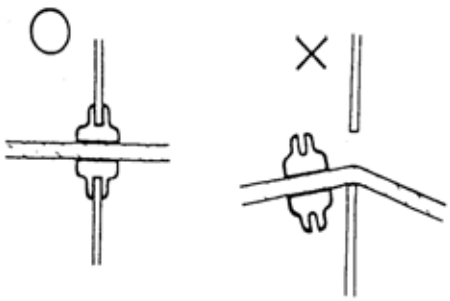
■ Route harnesses so they are neither pulled tight nor have excessive slack.



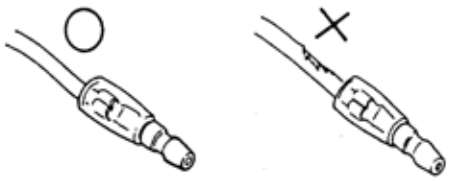
■ Protect wires and harnesses with electrical tape or tube if they contact a sharp edge or corner.



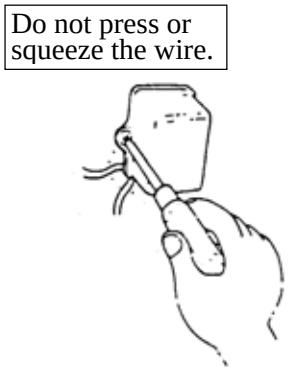
■ When rubber protecting cover is used to protect the wire harnesses, it shall be installed securely.



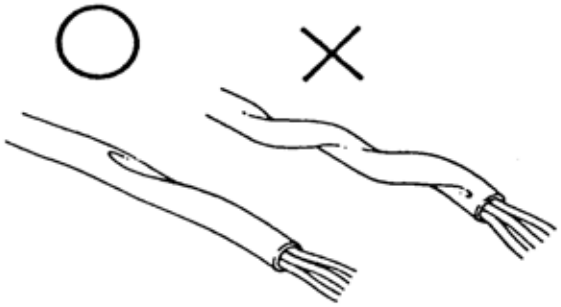
■ Do not break the sheath of wire.
■ If a wire or harness is with a broken sheath, repair by wrapping it with protective tape or replace it.



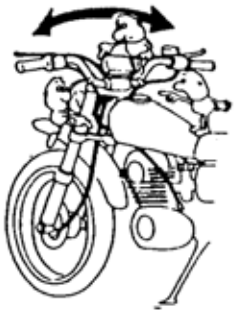
■ When installing other parts, do not press or squeeze the wires.



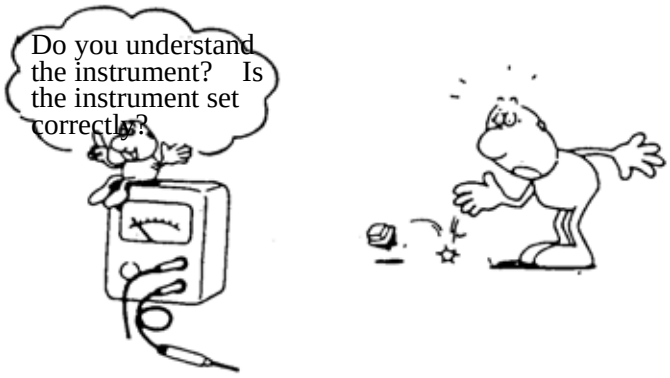
■ After routing, check that the wire harnesses are not twisted or kinked.



■ Wire harnesses routed along with handlebar should not be pulled tight, have excessive slack or interfere with adjacent or surrounding parts in all steering positions.

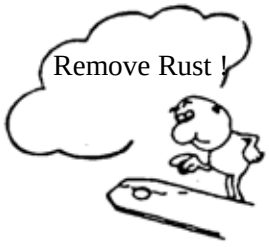


■ When a testing device is used, make sure to understand the operating methods thoroughly and operate according to the operating instructions.



■ Be careful not to drop any parts.

■ When rust is found on a terminal, remove the rust with sand paper or equivalent before connecting.



■ Do not bend or twist control cables. Damaged control cables will not operate smoothly and may stick or bind.

■ Symbols:

The following symbols represent the servicing methods and cautions included in this service manual.


Engine Oil

: Apply engine oil to the specified points. (Use designated engine oil for lubrication.)


Grease

: Apply grease for lubrication.


Gear Oil

: Transmission Gear Oil (90#)


Special

: Use special tool.

* : Caution

: Warning

TORQUE VALUES

STANDARD TORQUE VALUES

Item	Torque (kg-m)	Item	Torque (kg-m)
5mm bolt, nut	0.5	5mm screw	0.4
6mm bolt, nut	1.0	6mm screw, SH bolt	0.9
8mm bolt, nut	2.2	6mm flange bolt, nut	1.2
10mm bolt, nut	3.5	8mm flange bolt, nut	2.7
12mm bolt, nut	5.5	10mm flange bolt, nut	4.0

Torque specifications listed below are for important fasteners.

ENGINE

Item	Q'ty	Thread dia.(mm)	Torque (kg-m)	Remarks
Cylinder head bolt A	2	8	2.2	Double end bolt
Cylinder head bolt B	2	8	2.2	Double end bolt
Oil filter screen cap	1	30	1.5	Apply oil to threads
Exhaust muffler joint lock nut	2	8	0.9	
Cylinder head cap nut	4	8	2.2	
Valve adjusting lock nut	2	5	0.9	
Cam chain tensioner slipper bolt	1	6	0.9	
Oil bolt	1	12	1.3	
Clutch outer nut	1	12	5.5	
Clutch drive plate nut	1	12	5.5	
Flywheel nut	1	14	5.5	
Oil pump bolt	2	5	0.4	
Cylinder head cover bolt	4	6	1.2	
Spark plug	1	10	1.2	
Cam chain tensioner bolt	1	6	0.9	
Water pump impeller	1	8	1.4	Left hand threads

FRAME

Item	Q'ty	Thread dia.(mm)	Torque (kg-m)	Remarks
Steering stem lock nut	1	10	4.5	U-nut
Front axle nut	1	12	6.0	U-nut
Rear axle nut	1	14	9.0	U-nut
Rear shock absorber upper bolt	2	10	3.0	
Rear shock absorber lower bolt	2	8	3.0	
Front shock absorber lock bolt	4	10	2.5	
Engine hanger bolt	1	12	5.5	

SPECIAL TOOLS

Tool Name	Tool No.	Remarks	Ref. Page
Valve guide driver		Valve guide removal/installation	
Valve guide reamer		Valve guide grinding	
Valve spring compressor		Valve removal	
Lock nut wrench, 39mm		Clutch disassembly	
Bearing driver		Bearing removal	
Bearing remover, 12mm		Bearing removal	
Remover shaft		Bearing removal	
Remover weight		Bearing removal	
Bearing remover, 15mm		Bearing removal	
Bearing driver		Bearing removal	
Clutch spring compressor		Clutch disassembly	
Ball race remover extension		Ball race removal	
Ball race remover		Ball race removal	
Spring compressor		Spring removal	
Mechanical seal driver		Water pump mechanical seal removal/installation	
Kick starter spring remover		Kick starter spring removal	
Gear remover		Starter gear removal	
Valve adjuster		Tapper adjustment	
Float level gauge		Carburetor fuel level check	
Valve seat cutter 45°		Valve seat refacing	
Valve seat cutter 32°		Valve seat refacing	
Valve seat cutter 60°		Valve seat refacing	
Cutter clip, 5mm			
Universal holder		Holding clutch for removal	
Bearing driver (32x35mm)		Bearing installation	
Pilot, 12mm		Bearing installation	
Pilot, 15mm		Bearing installation	
Pilot, 17mm		Bearing installation	
Flywheel puller		A.C. generator flywheel removal	
Rear shock absorber compressor		Rear shock absorber disassembly	
Steering head bearing remover		Steering head bearing removal	
Kick starter spring remover		Kick starter spring installation	
Flywheel holder		A.C. generator flywheel holding	
Reamer clip			
Fuel unit wrench		Fuel unit removal	

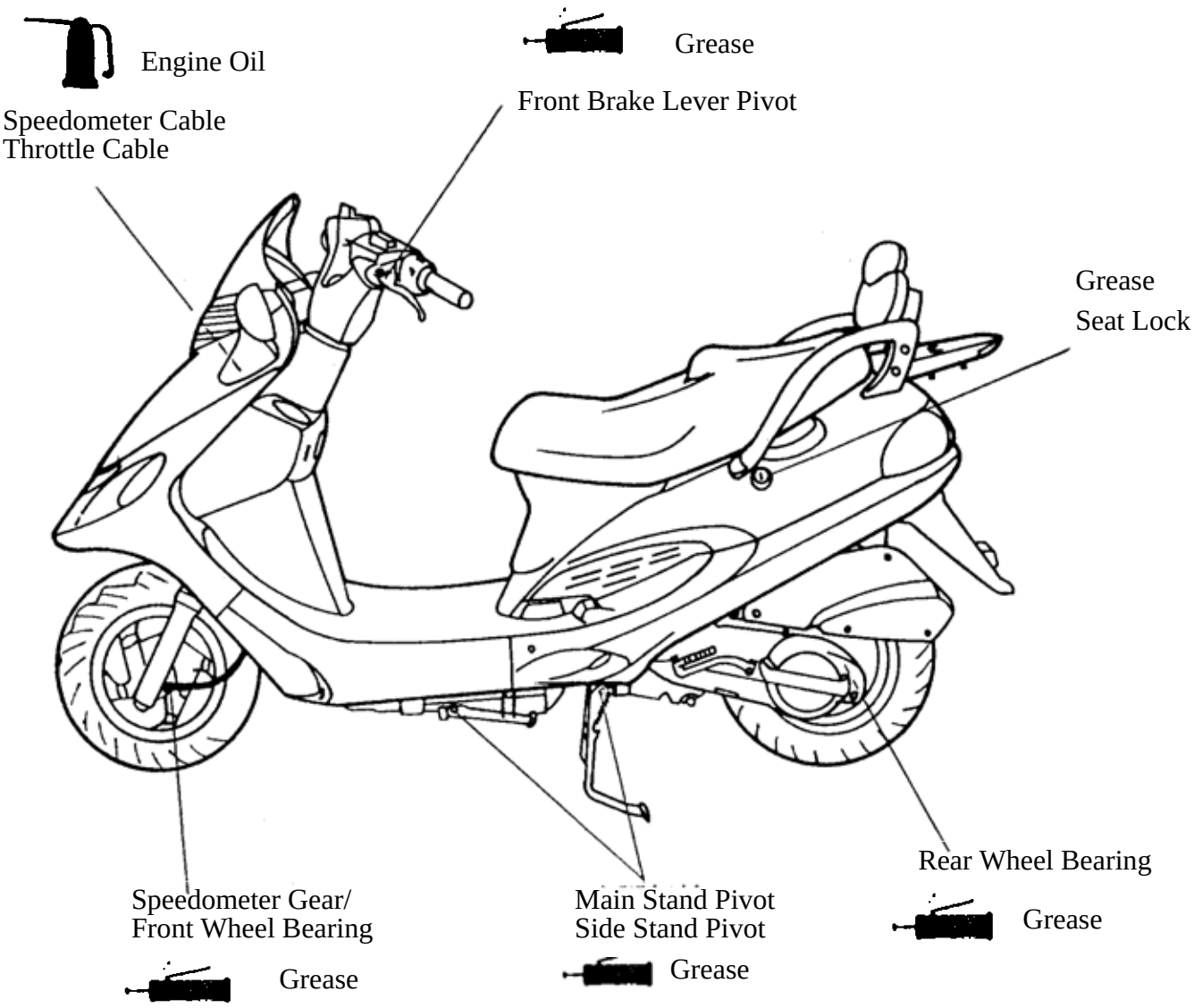
LUBRICATION POINTS

ENGINE

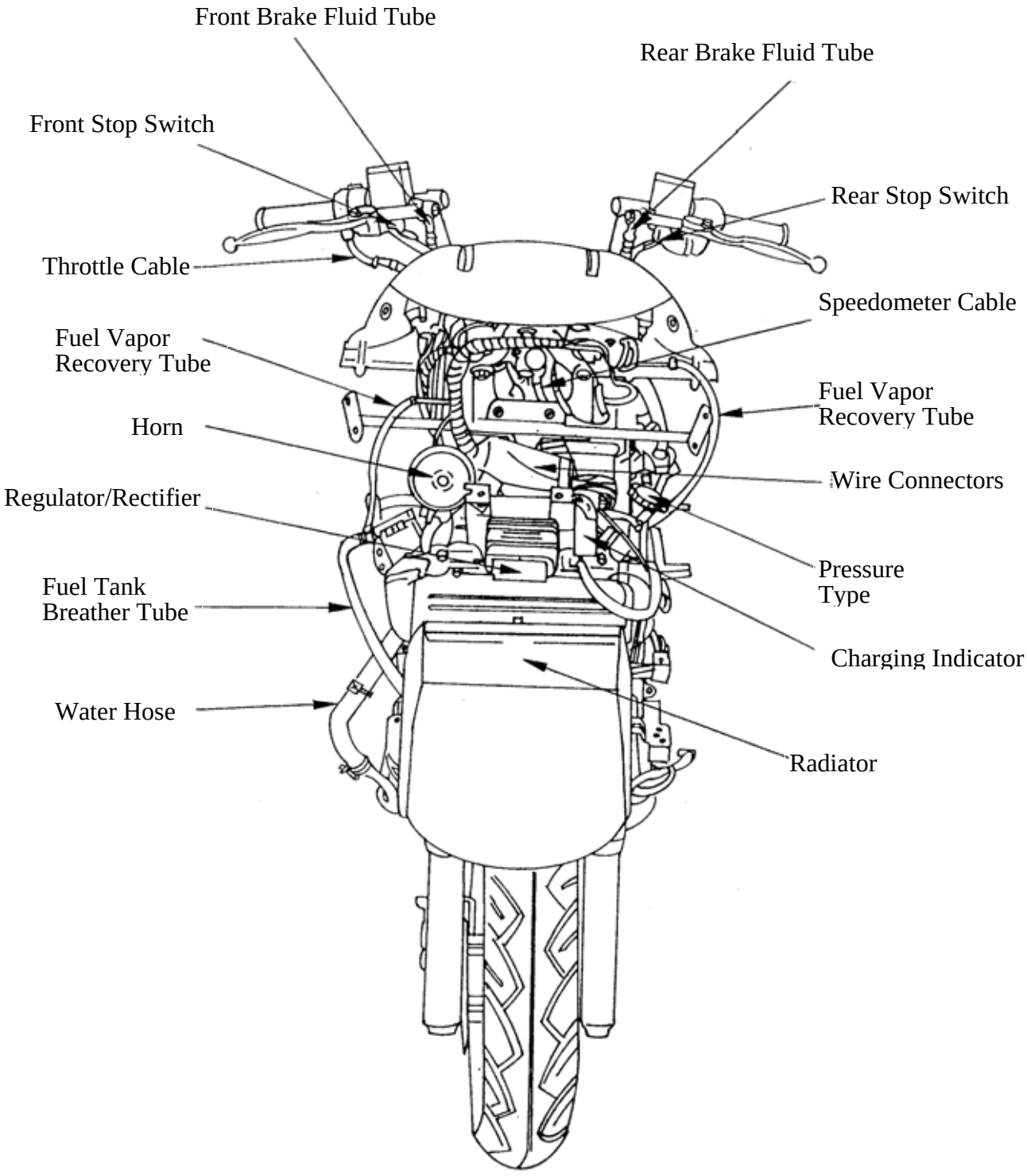
Lubrication Points	Lubricant
Valve guide/valve stem movable part Camshaft protruding surface Valve rocker arm friction surface Camshaft drive chain Cylinder lock bolt and nut Piston surroundings and piston ring grooves Piston pin surroundings Cylinder inside wall Connecting rod/piston pin hole Connecting rod big end Crankshaft Cranksahft one-way clutch movable part Oil pump drive chain Starter reduction gear engaging part Countershaft gear engaging part Final gear engaging part Bearing movable part O-ring face Oil seal lip	•Genuine KYMCO Engine Oil (SAE10W-30) •API SE, SF or SG Egnine Oil
Starter idle gear Friction spring movable part/shaft movable part Shaft movable grooved part Starter spindle movable part	High-temperature resistant grease
Starter one-way clutch threads	Thread locking agent
A.C. generator connector Transmission case breather tubee	Adhesive

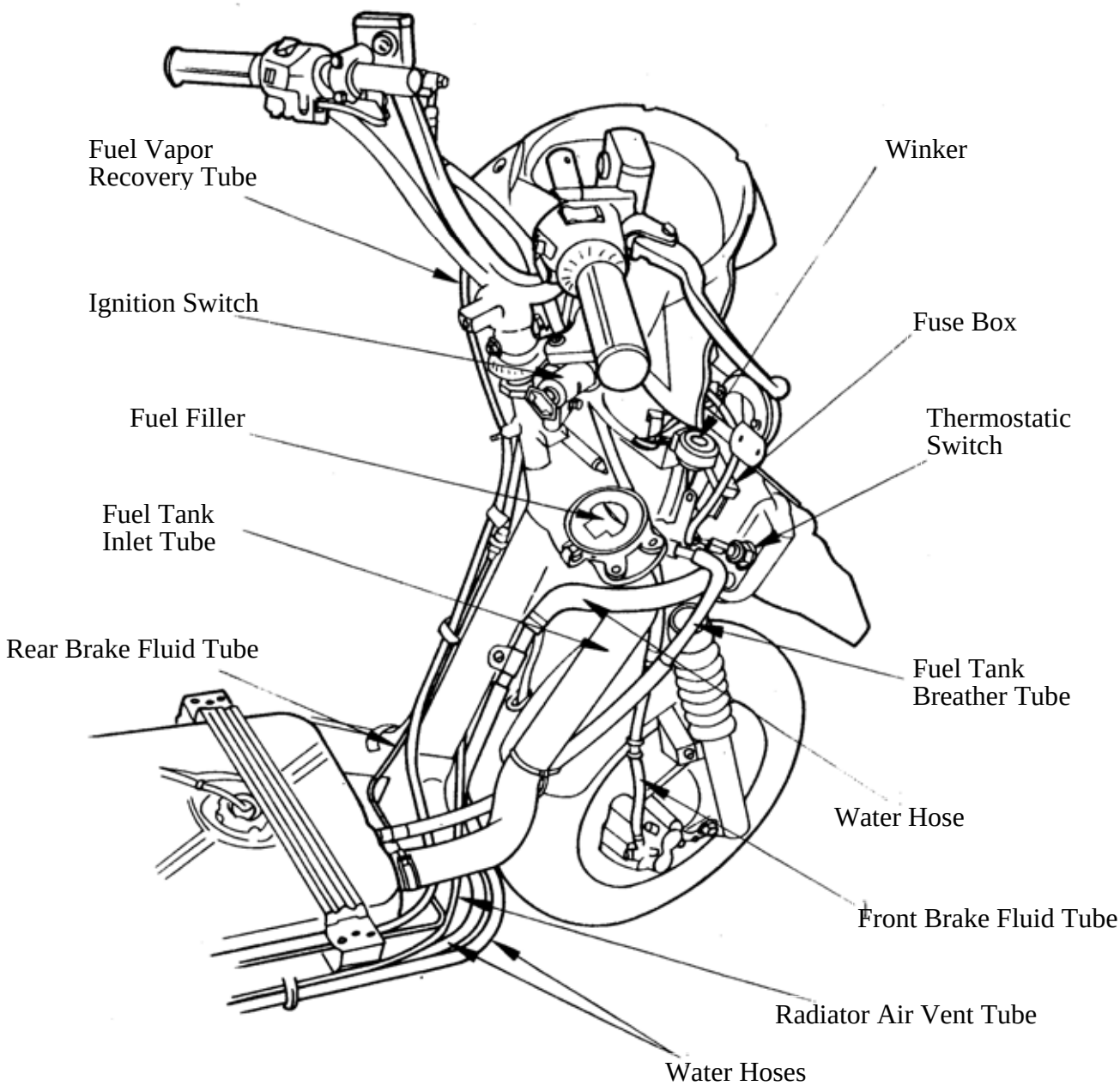
FRAME

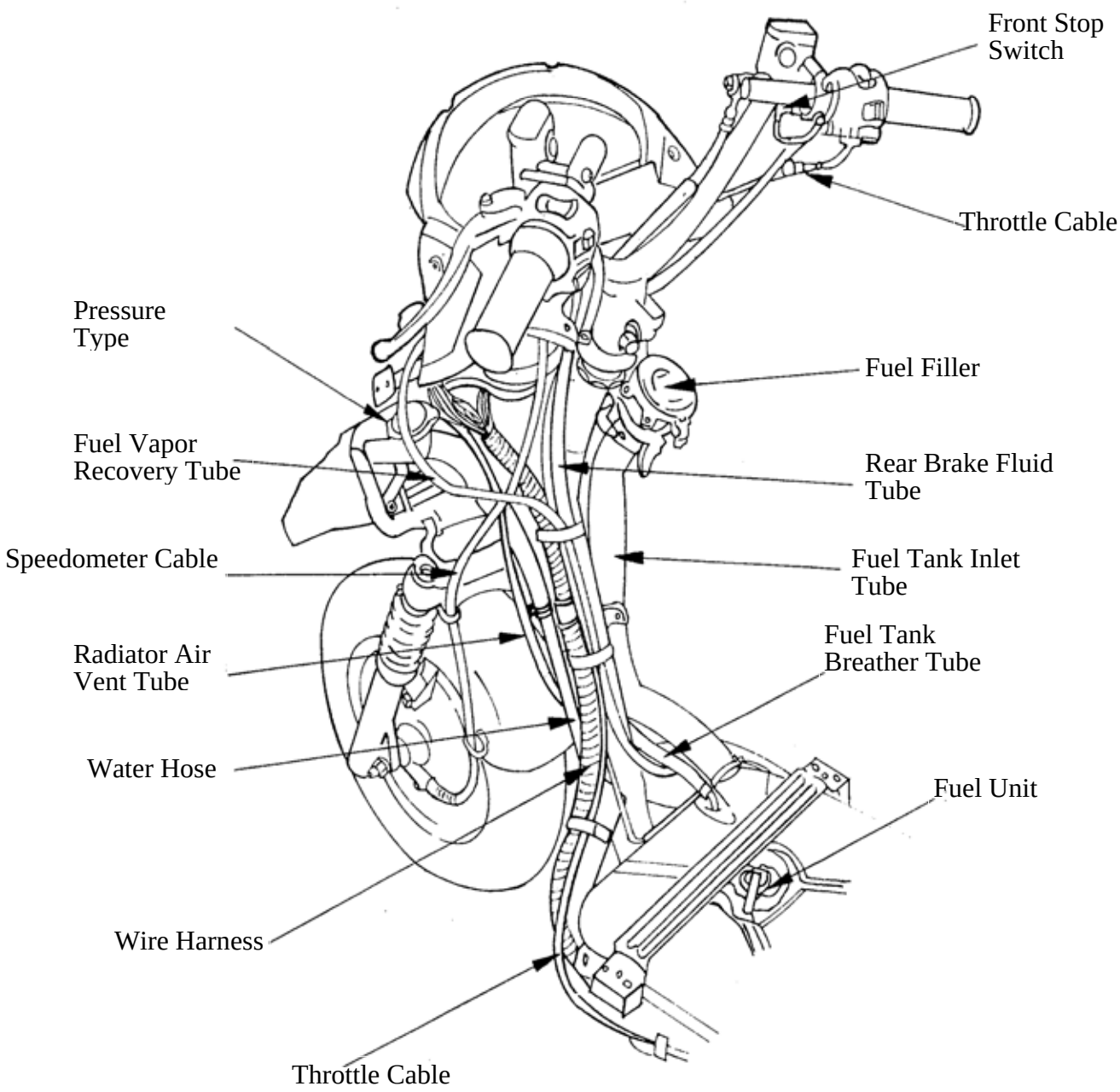
The following is the lubrication points for the frame.
Use general purpose grease for parts not listed.
Apply clean engine oil or grease to cables and movable parts not specified. This will avoid abnormal noise and rise the durability of the motorcycle.

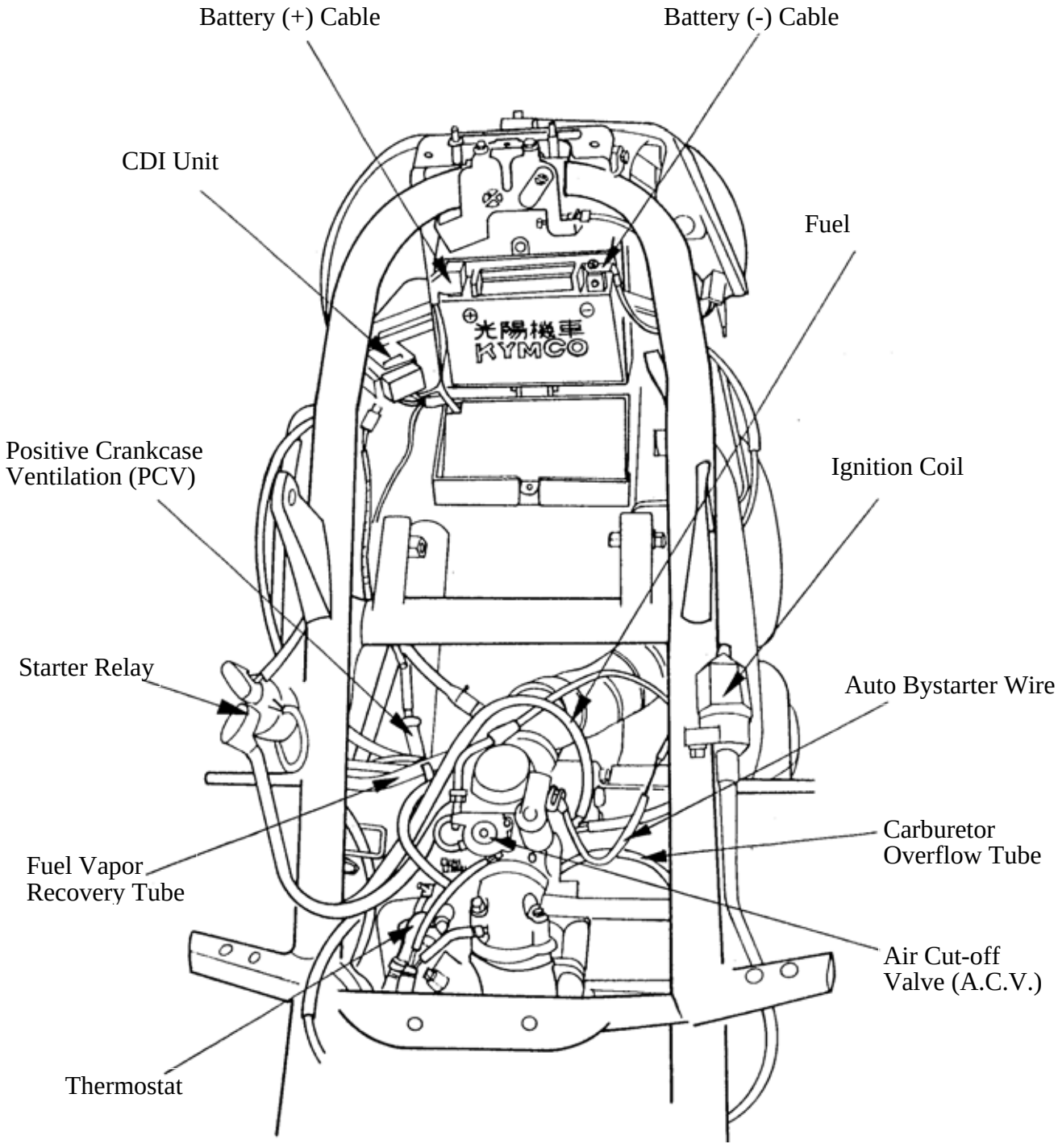


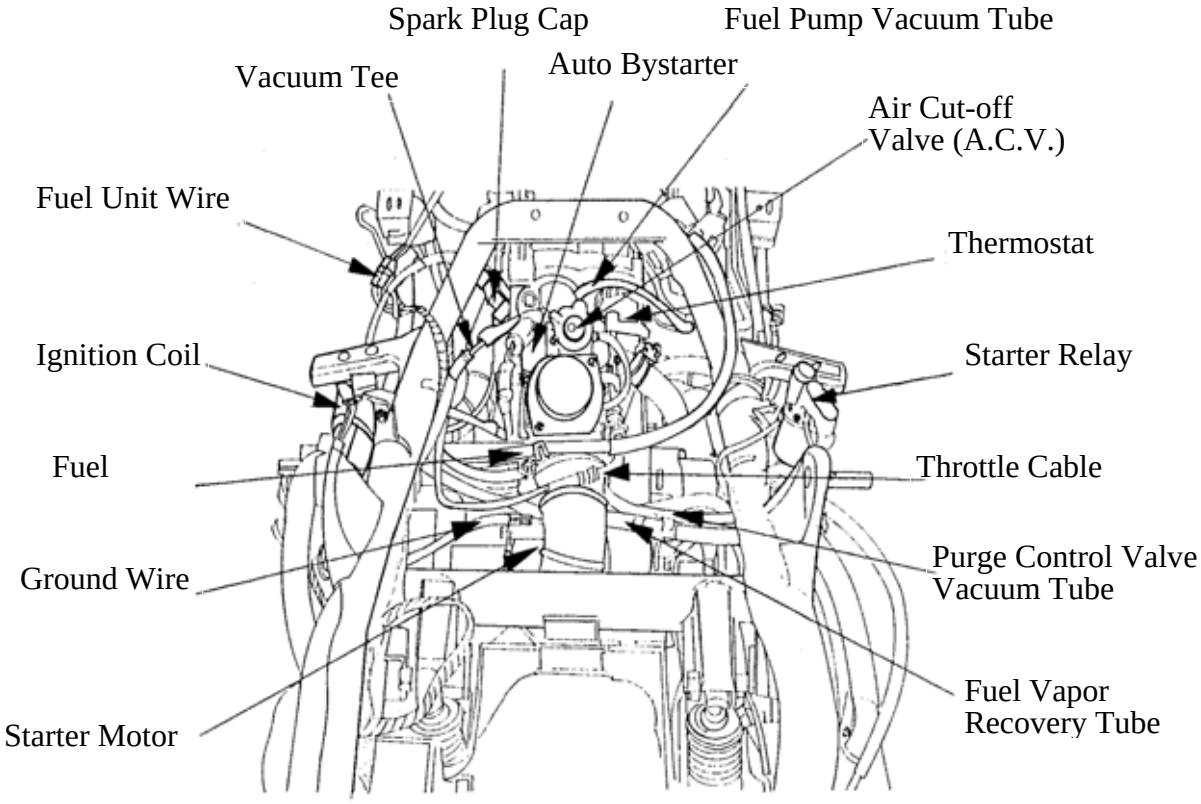
CABLE & HARNESS ROUTING

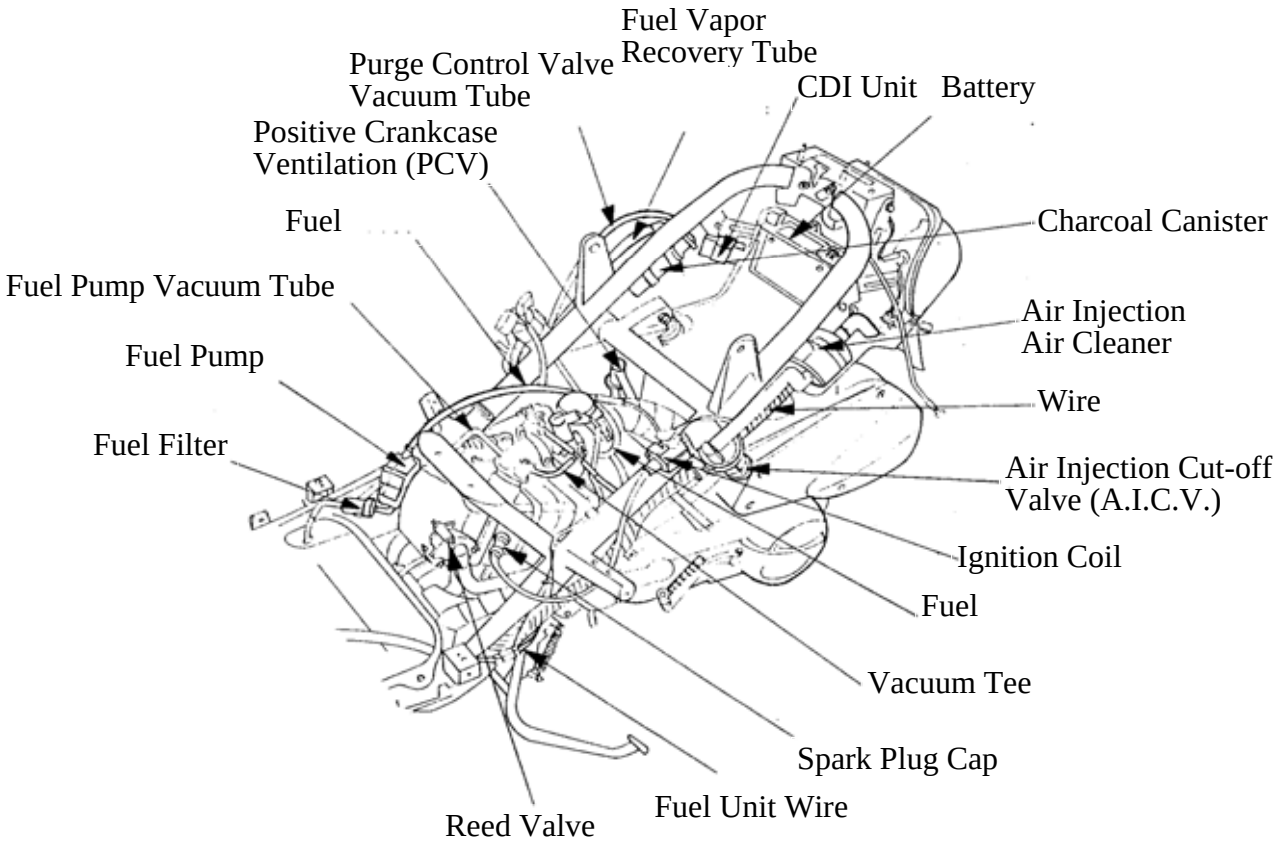



Fuel Vapor Recovery Tube
Winker
Ignition Switch
Fuse Box
Fuel Filler
Thermostatic Switch
Fuel Tank Inlet Tube
Rear Brake Fluid Tube
Fuel Tank Breather Tube
Water Hose
Front Brake Fluid Tube
Radiator Air Vent Tube
Water Hoses


Front Stop Switch
Throttle Cable
Pressure Type
Fuel Filler
Fuel Vapor Recovery Tube
Rear Brake Fluid Tube
Speedometer Cable
Fuel Tank Inlet Tube
Radiator Air Vent Tube
Fuel Tank Breather Tube
Water Hose
Fuel Unit
Wire Harness
Throttle Cable

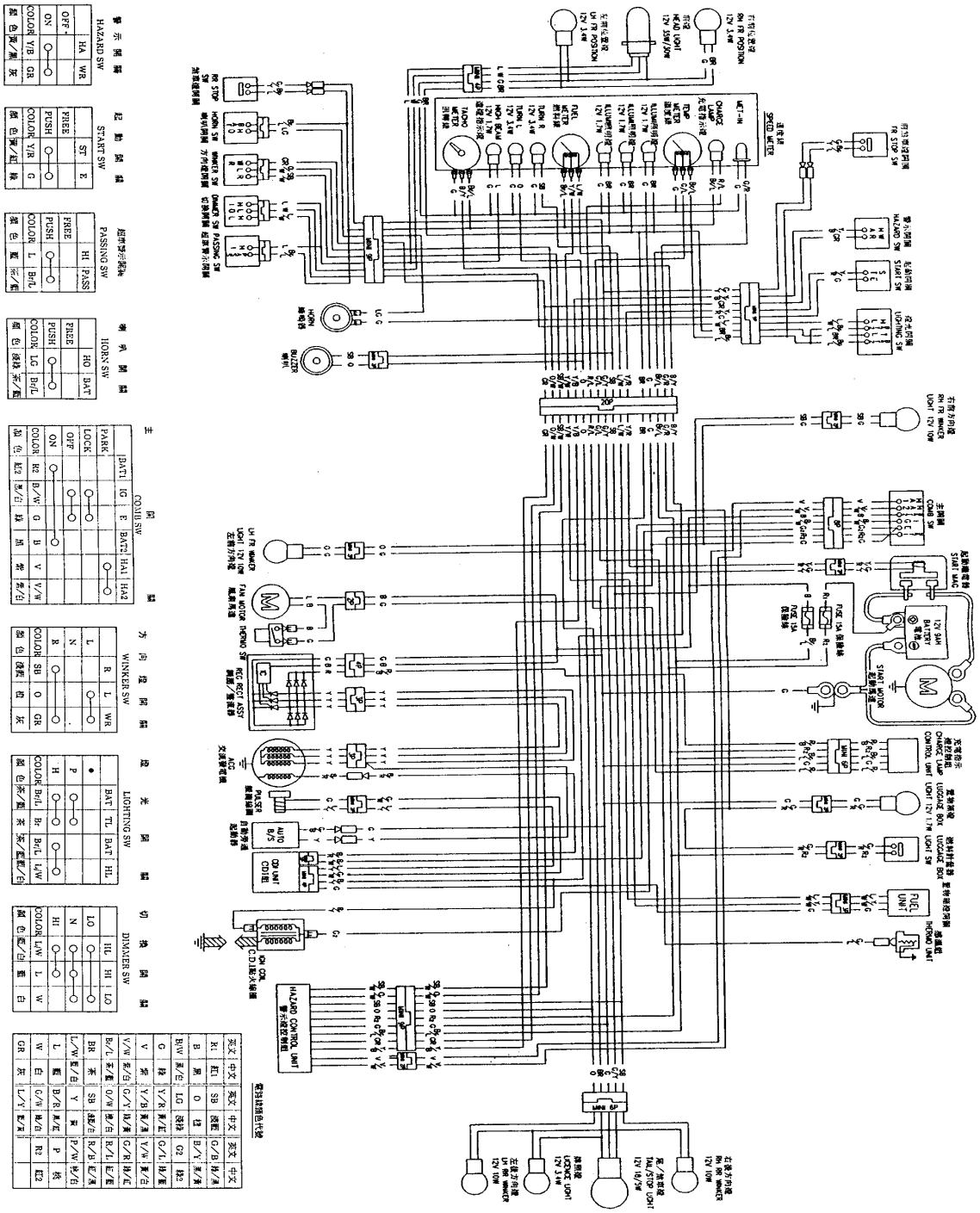

Battery (+) Cable
Battery (-) Cable
CDI Unit
Fuel
光陽機車
KYMCO
Positive Crankcase
Ventilation (PCV)
Ignition Coil
Starter Relay
Auto Bystarter Wire
Carburetor
Overflow Tube
Fuel Vapor
Recovery Tube
Air Cut-off
Valve (A.C.V.)
Thermostat


Spark Plug Cap
Fuel Pump Vacuum Tube
Auto Bystarter
Vacuum Tee
Air Cut-off Valve (A.C.V.)
Fuel Unit Wire
Thermostat
Ignition Coil
Starter Relay
Fuel
Throttle Cable
Ground Wire
Purge Control Valve Vacuum Tube
Fuel Vapor Recovery Tube
Starter Motor


Fuel Vapor Recovery Tube
Purge Control Valve Vacuum Tube
CDI Unit
Battery
Positive Crankcase Ventilation (PCV)
Fuel
Charcoal Canister
Fuel Pump Vacuum Tube
Air Injection Air Cleaner
Fuel Pump
Wire
Fuel Filter
Air Injection Cut-off Valve (A.I.C.V.)
Ignition Coil
Fuel
Vacuum Tee
Spark Plug Cap
Fuel Unit Wire
Reed Valve

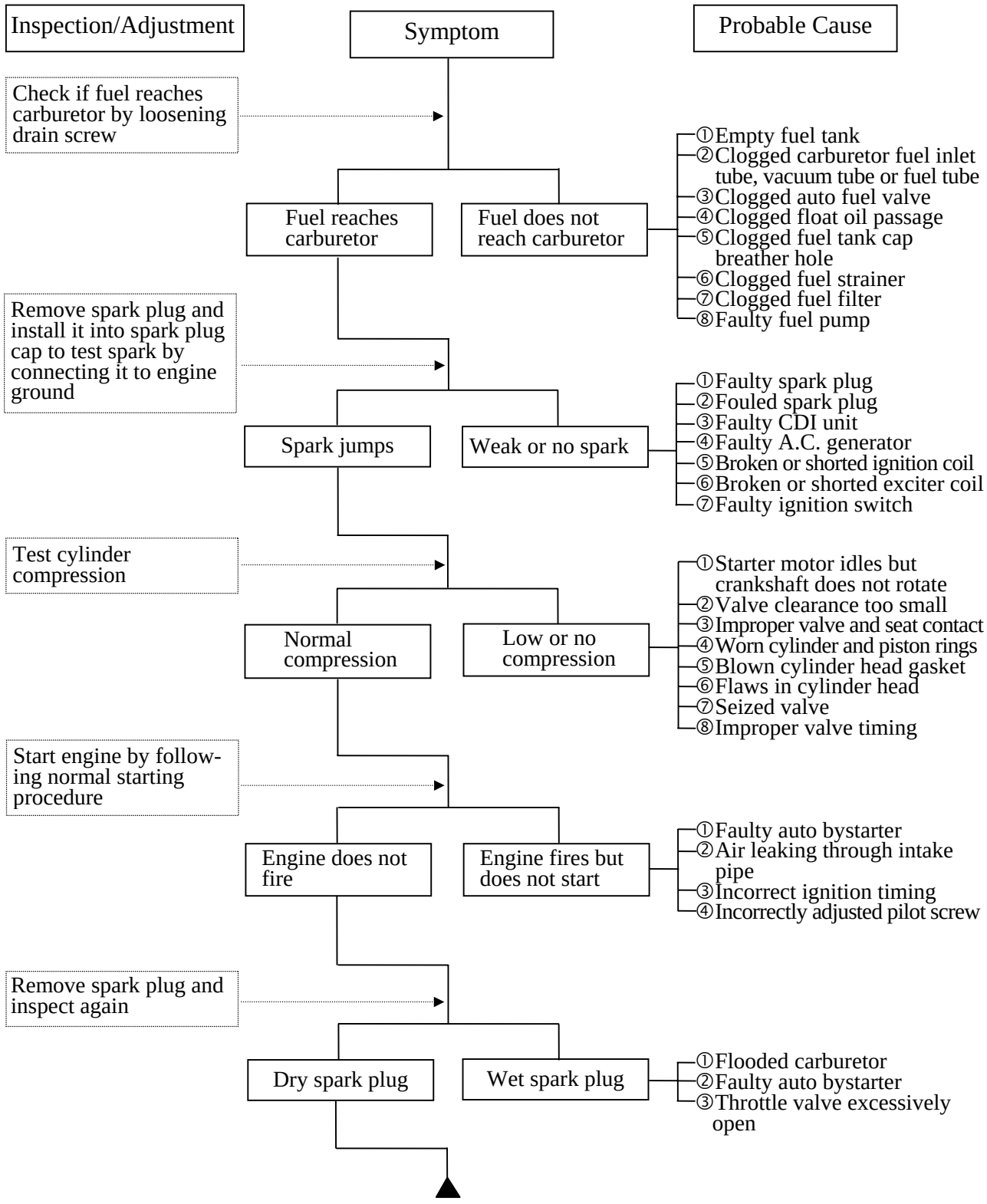
WIRING DIAGRAM

R	Red	O	Orange
B	Black	P	Pink
W	White	Br	Brown
G	Green	LG	Light green
V	Violet	SB	Light blue
L	Blue	GR	Gray
Y	Yellow		

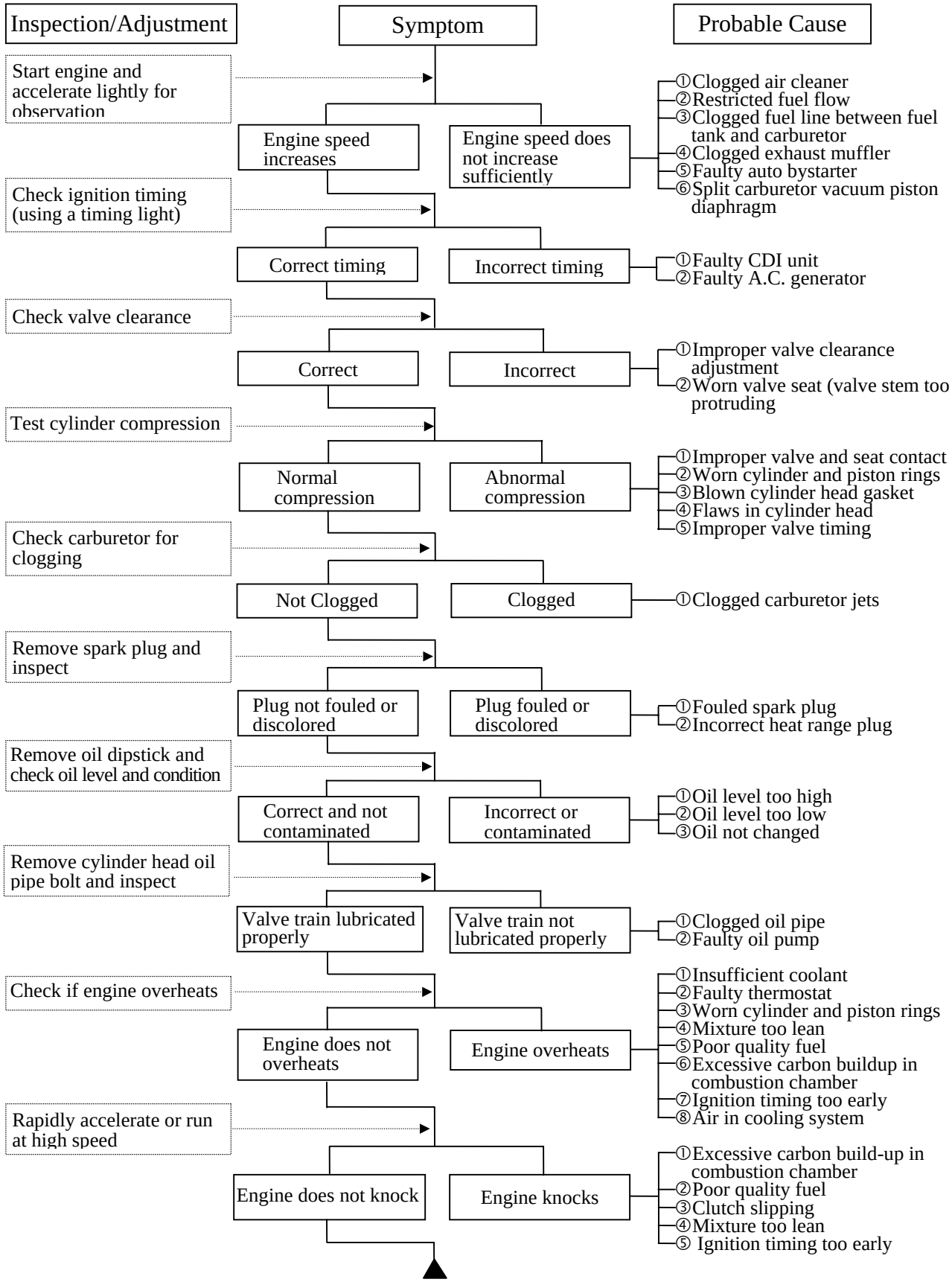


TROUBLESHOOTING

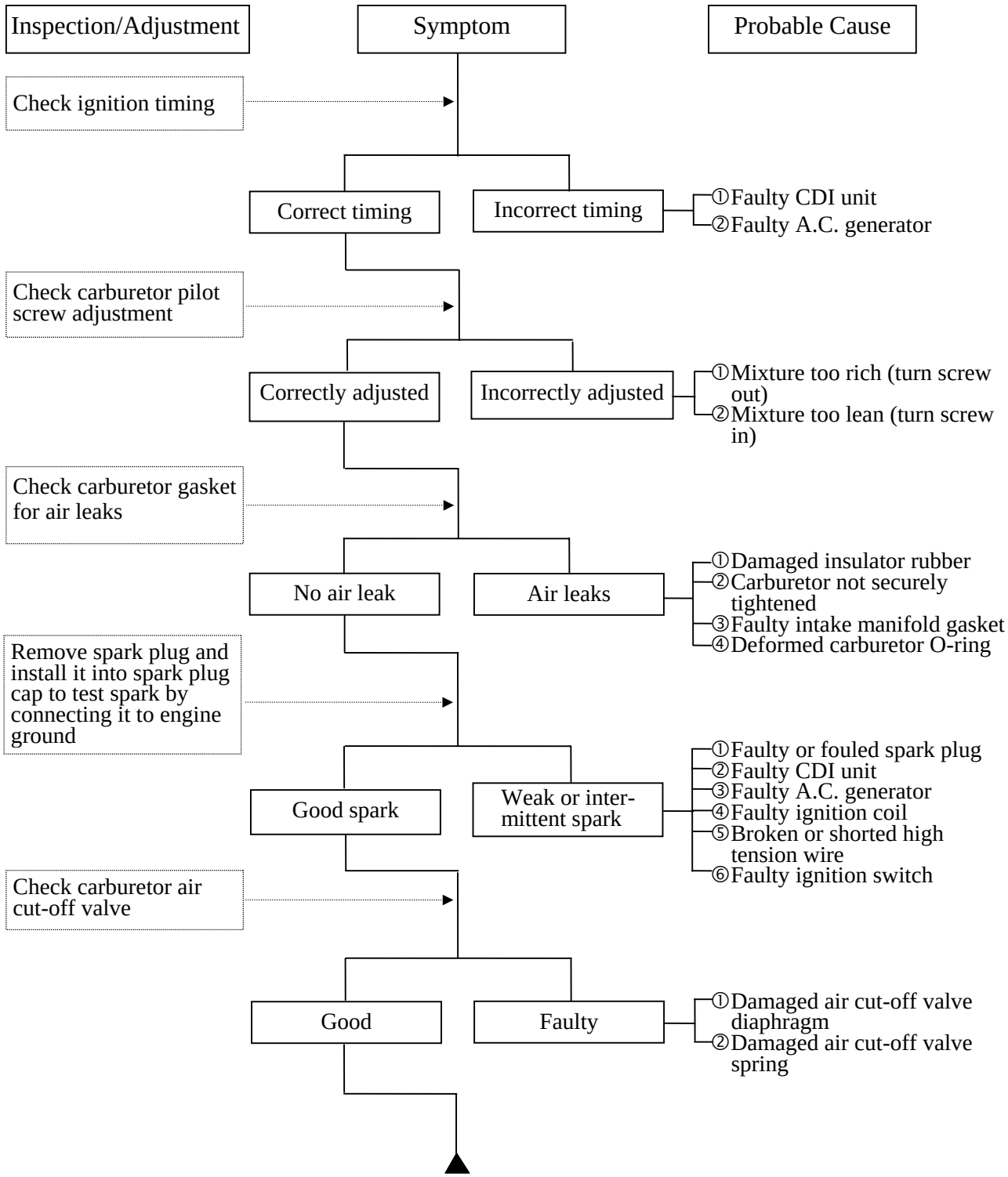
ENGINE WILL NOT START OR IS HARD TO START



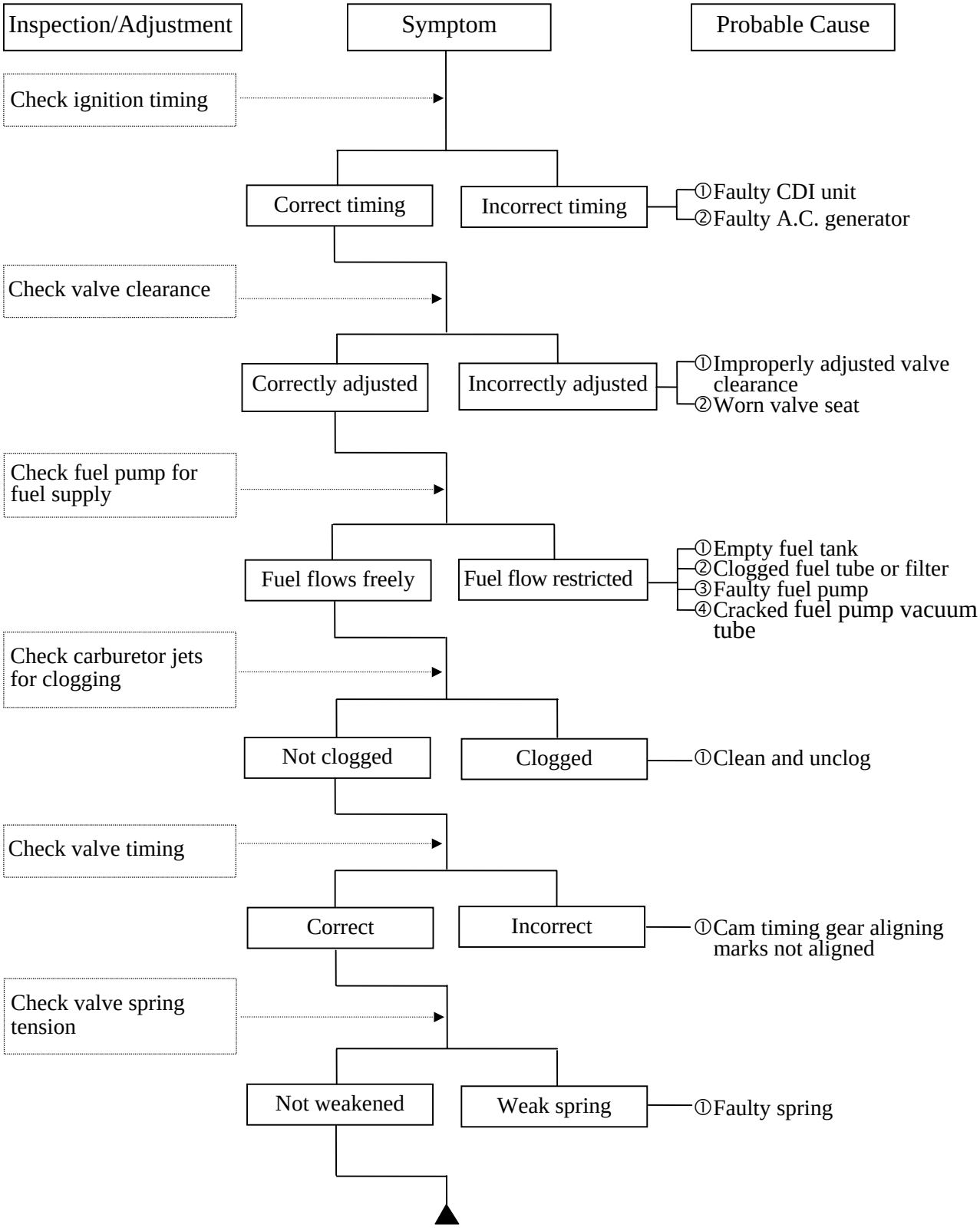
ENGINE LACKS POWER



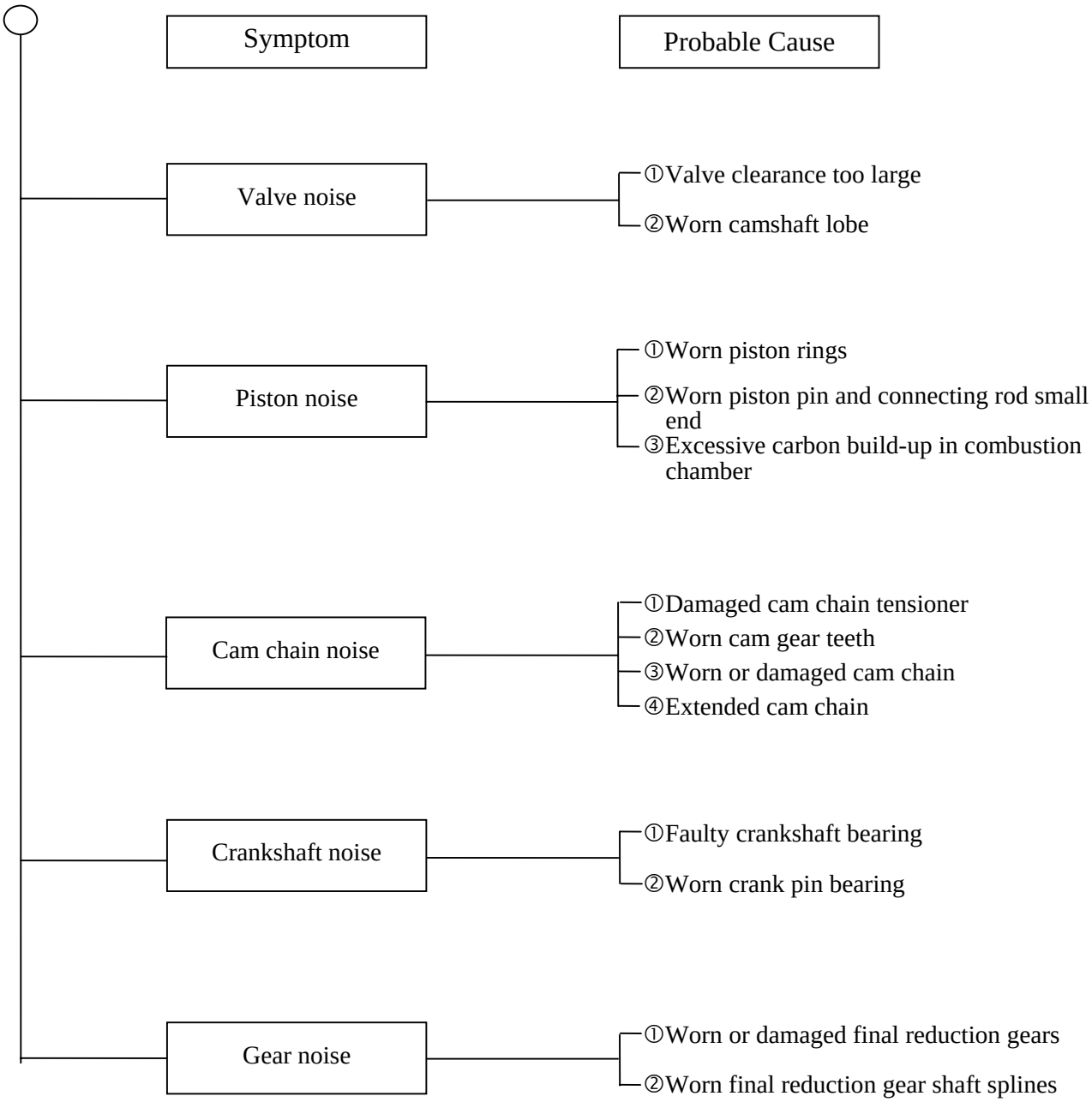
POOR PERFORMANCE (ESPECIALLY AT IDLE AND LOW SPEEDS)



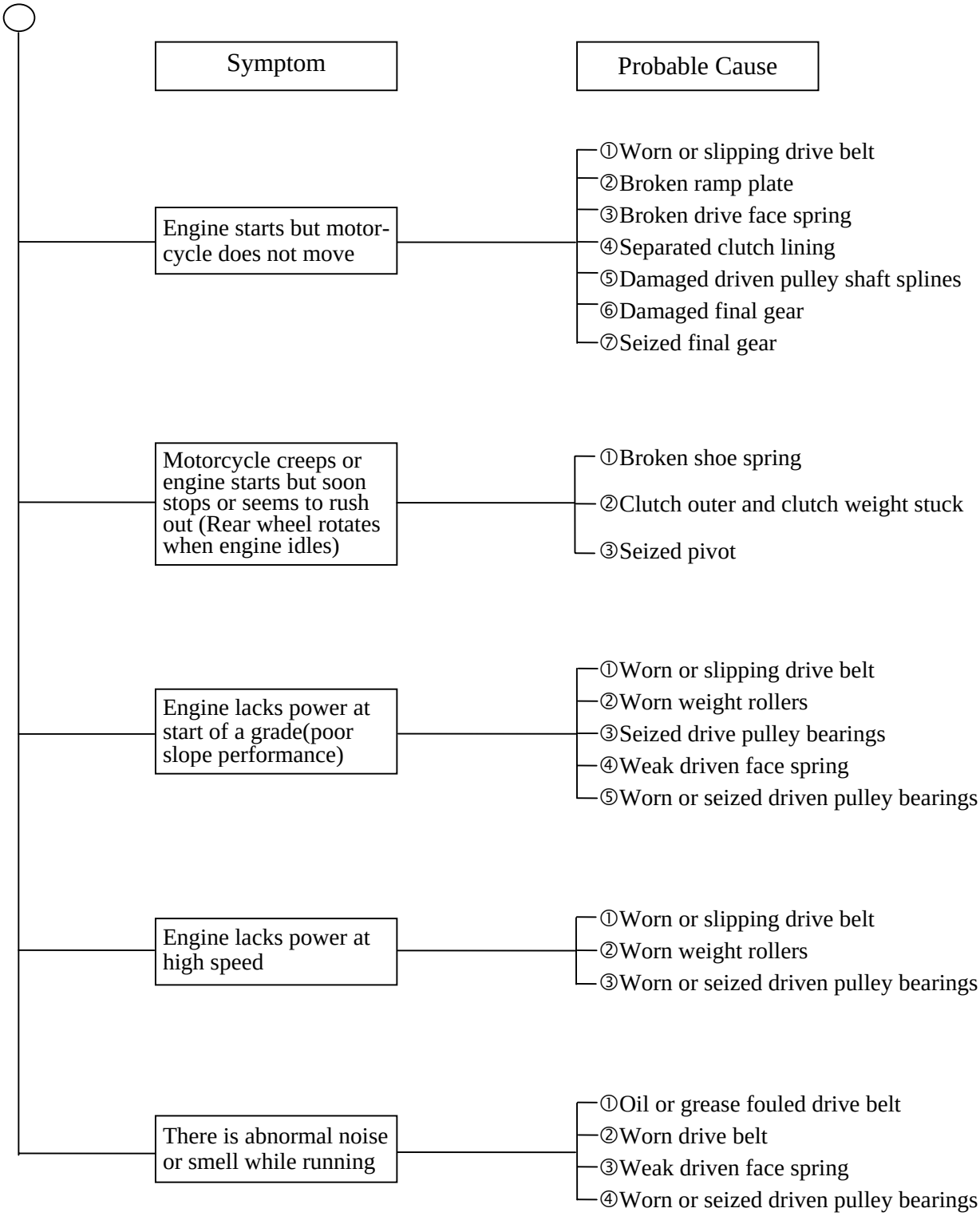
POOR PERFORMANCE (AT HIGH SPEED)



ENGINE NOISE

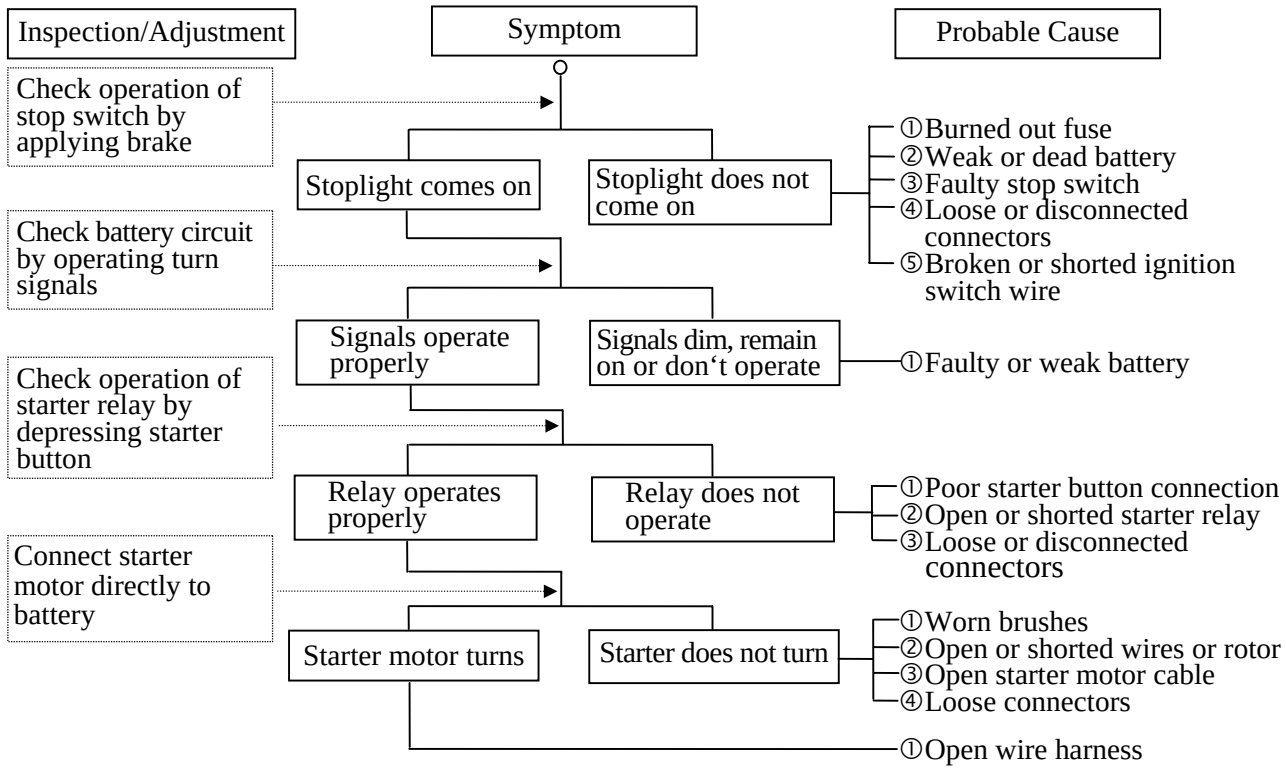


CLUTCH, DRIVE AND DRIVEN PULLEYS

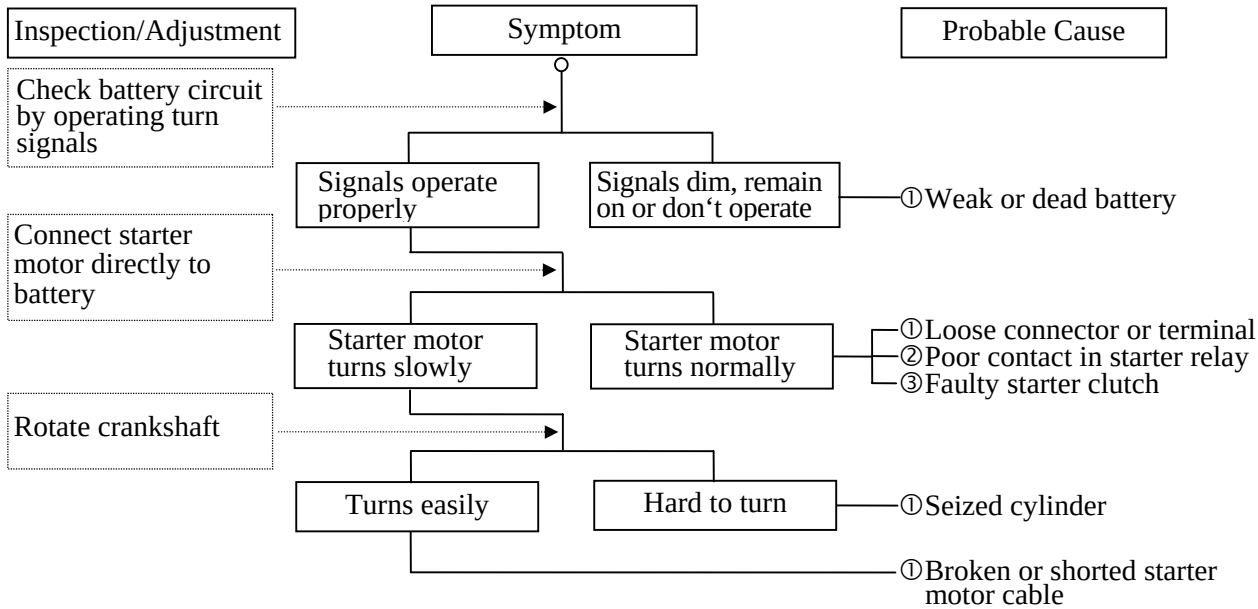


STARTER MOTOR

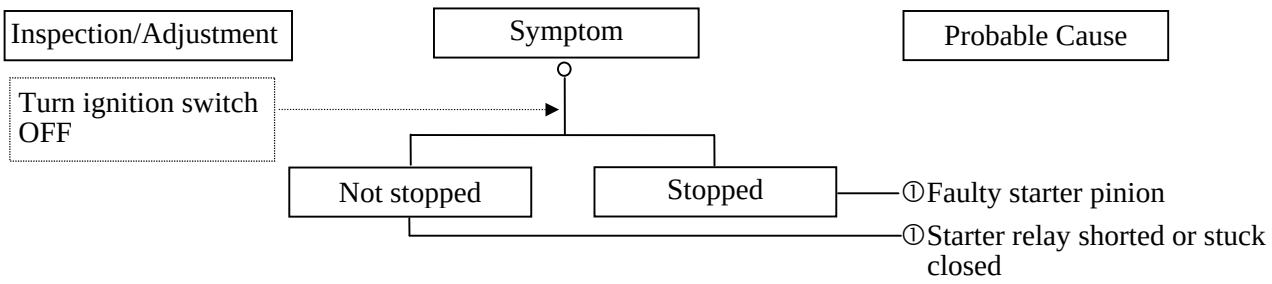
1. Starter motor won‘t turn



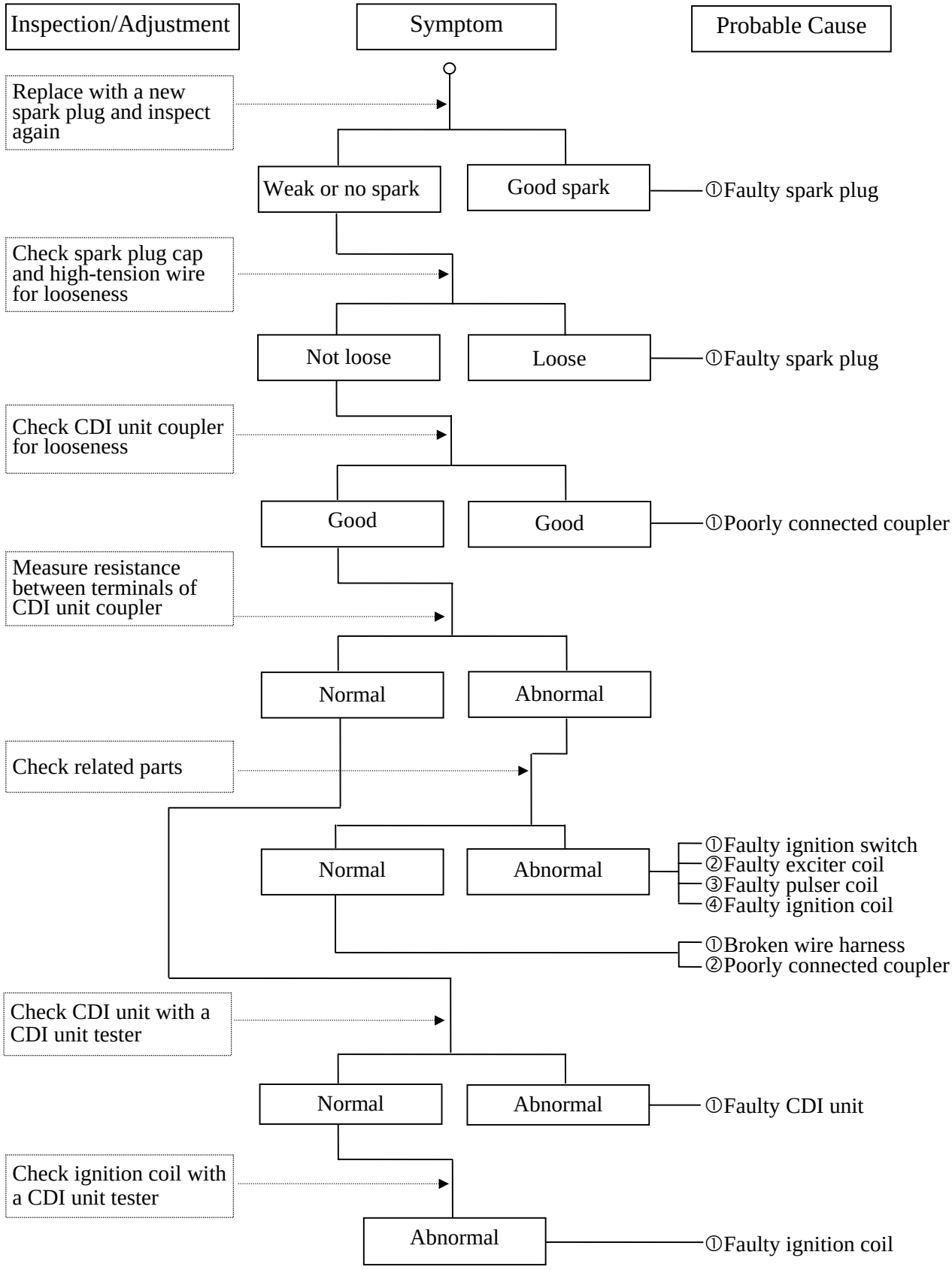
2. Starter motor turns slowly or idles



3. Starter motor does not stop turning

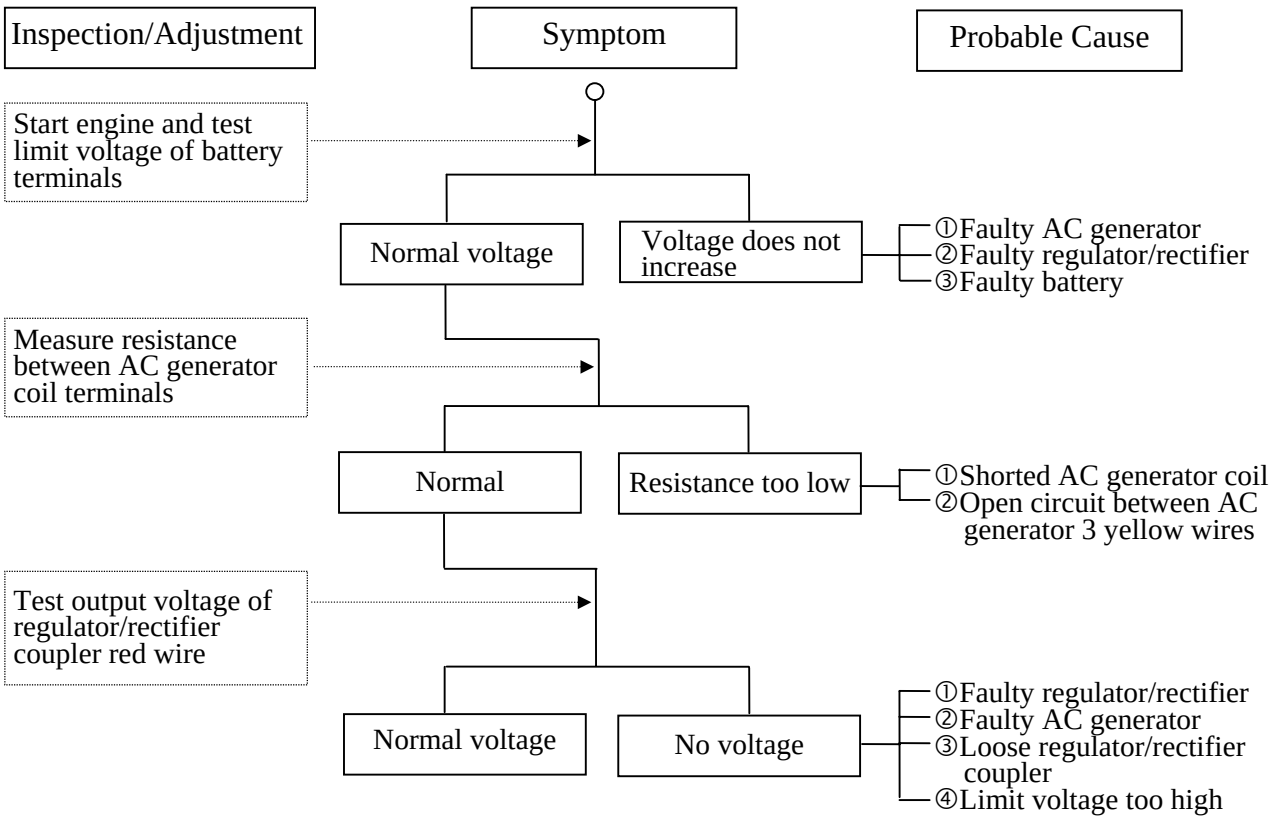


NO SPARK AT SPARK PLUG

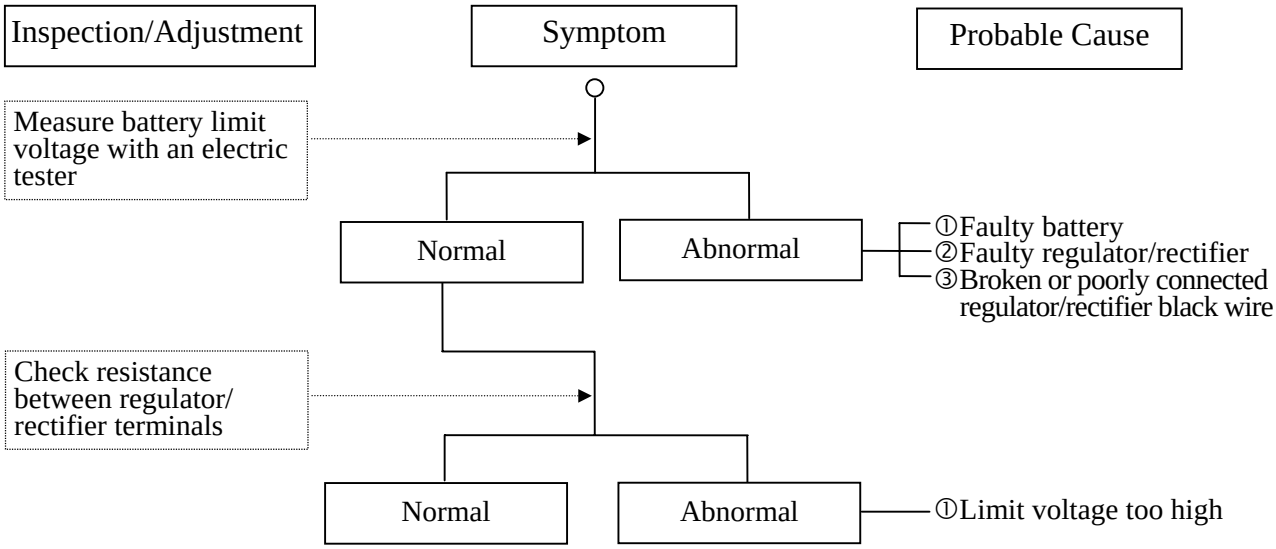


POOR CHARGING (BATTERY OVER DISCHARGING OR OVERCHARGING)

Undercharging

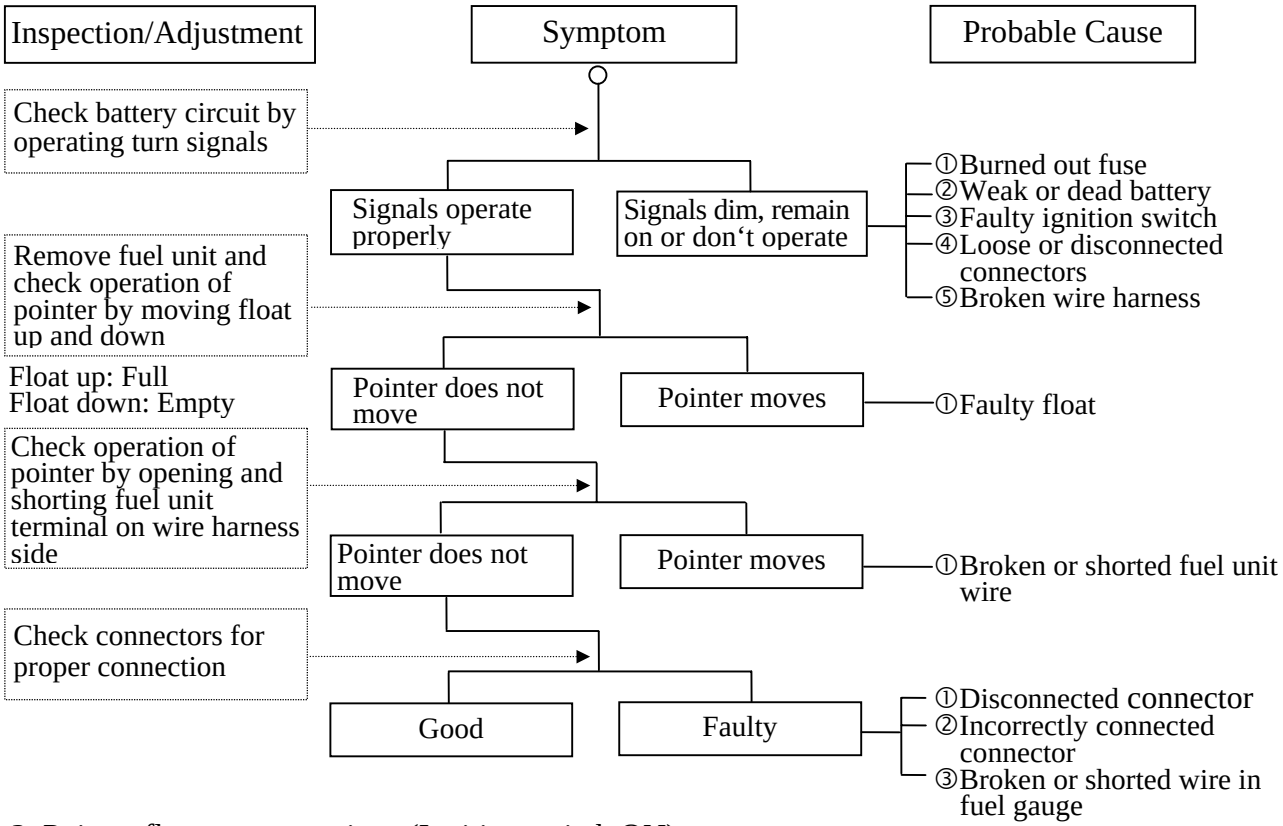


Overcharging

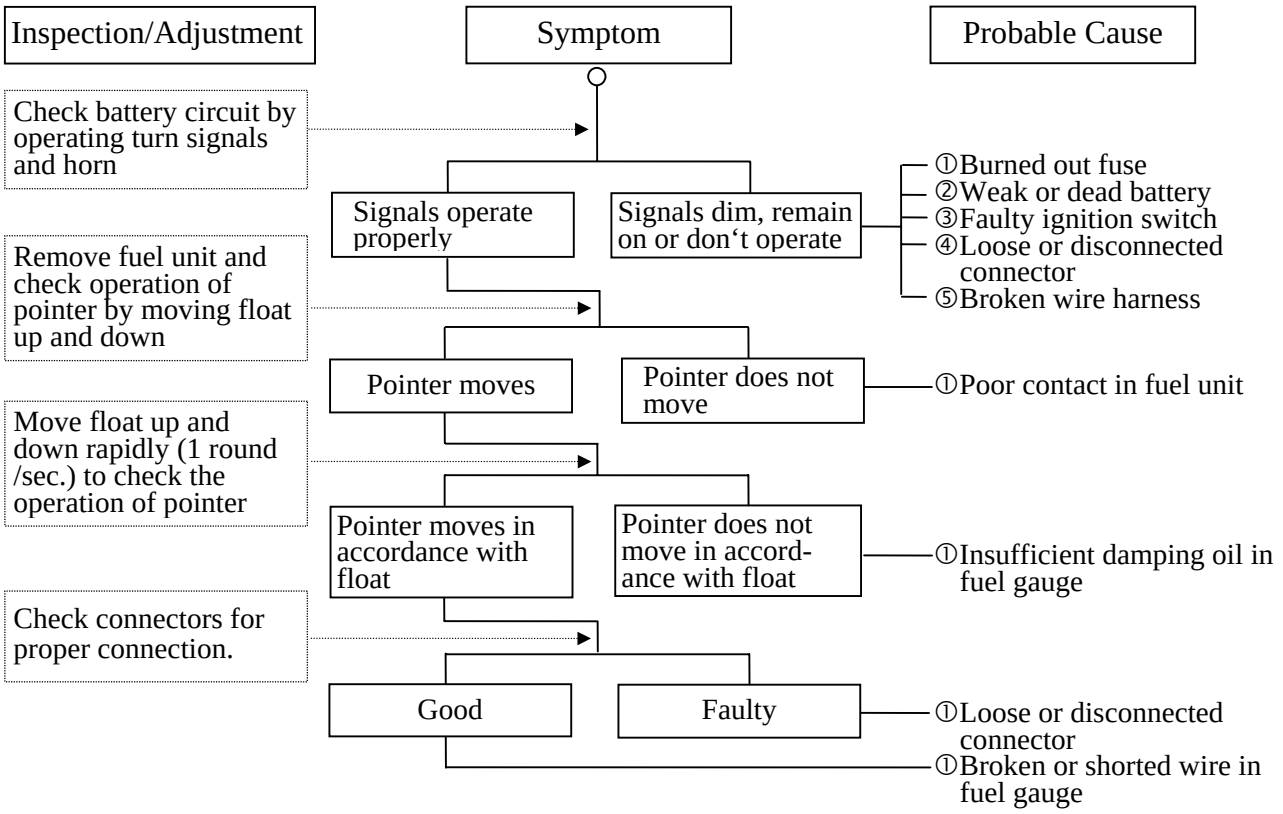


FUEL GAUGE

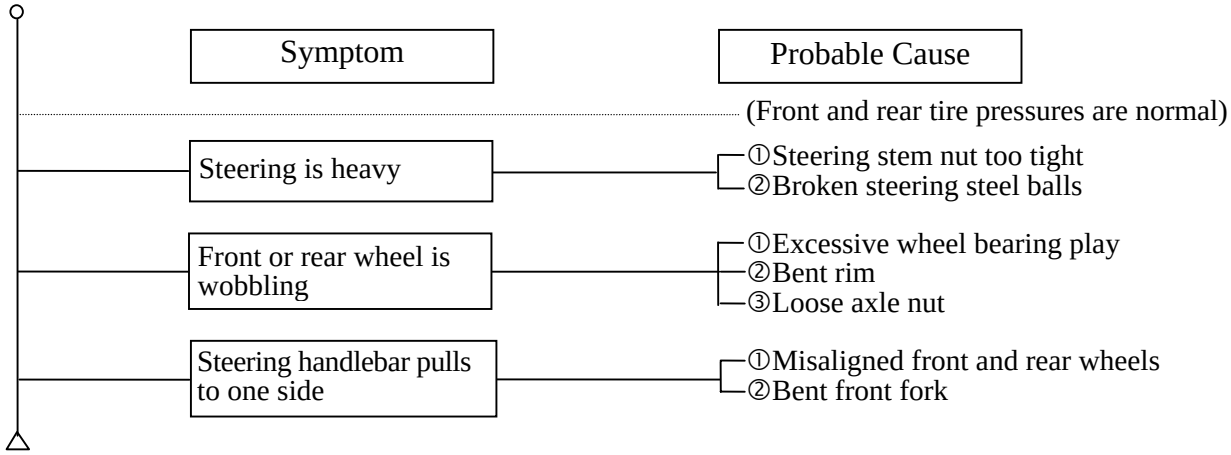
1. Pointer does not register correctly (Ignition switch ON)



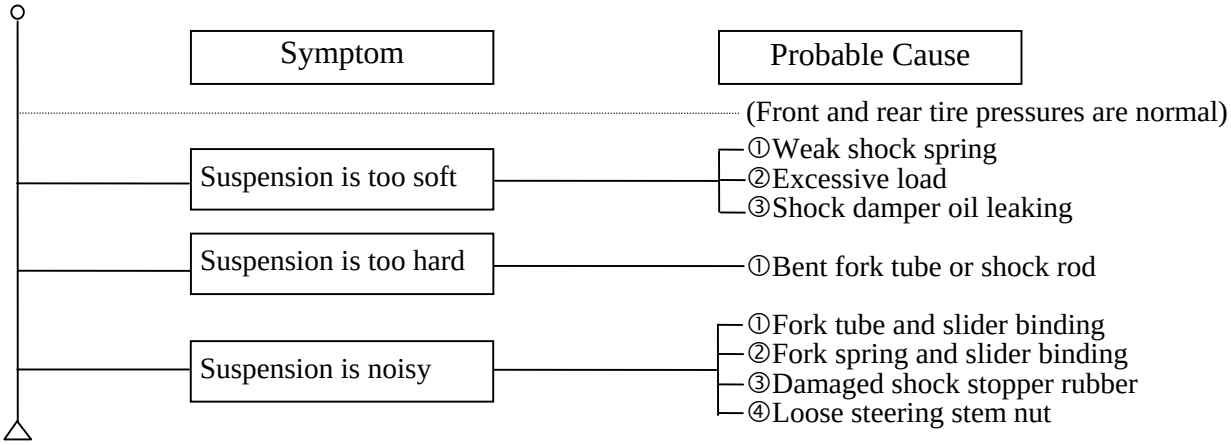
2. Pointer fluctuates or swings (Ignition switch ON)



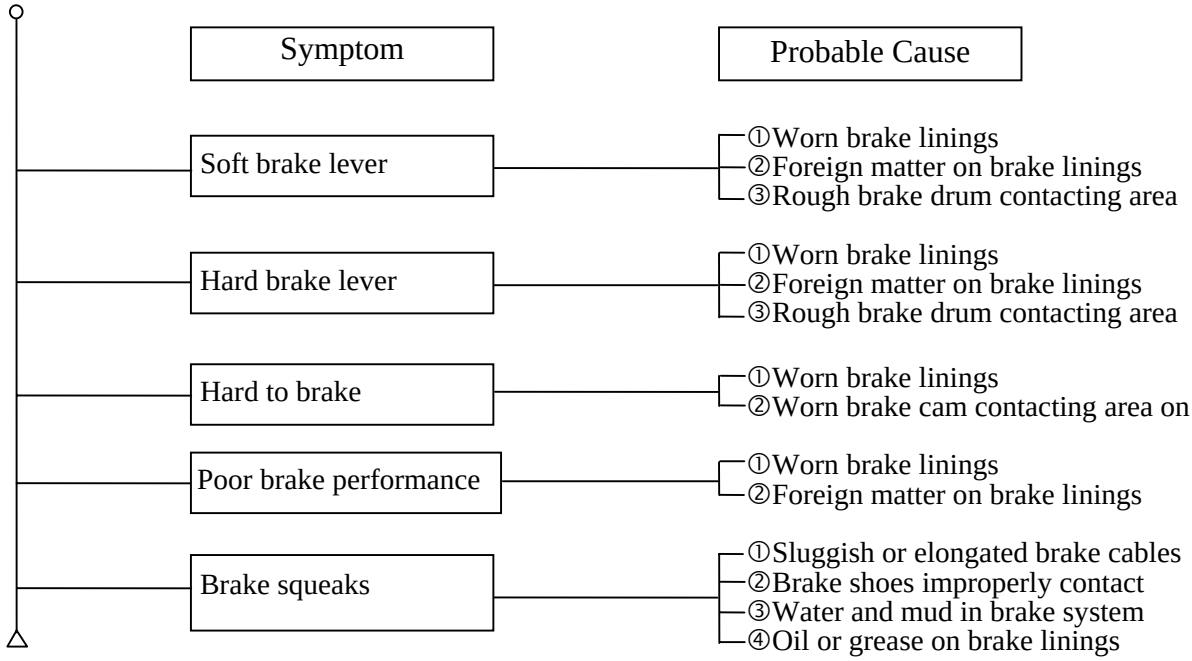
STEERING HANDLEBAR DOES NOT TRACK STRAIGHT



POOR SUSPENSION PERFORMANCE



POOR BRAKE PERFORMANCE

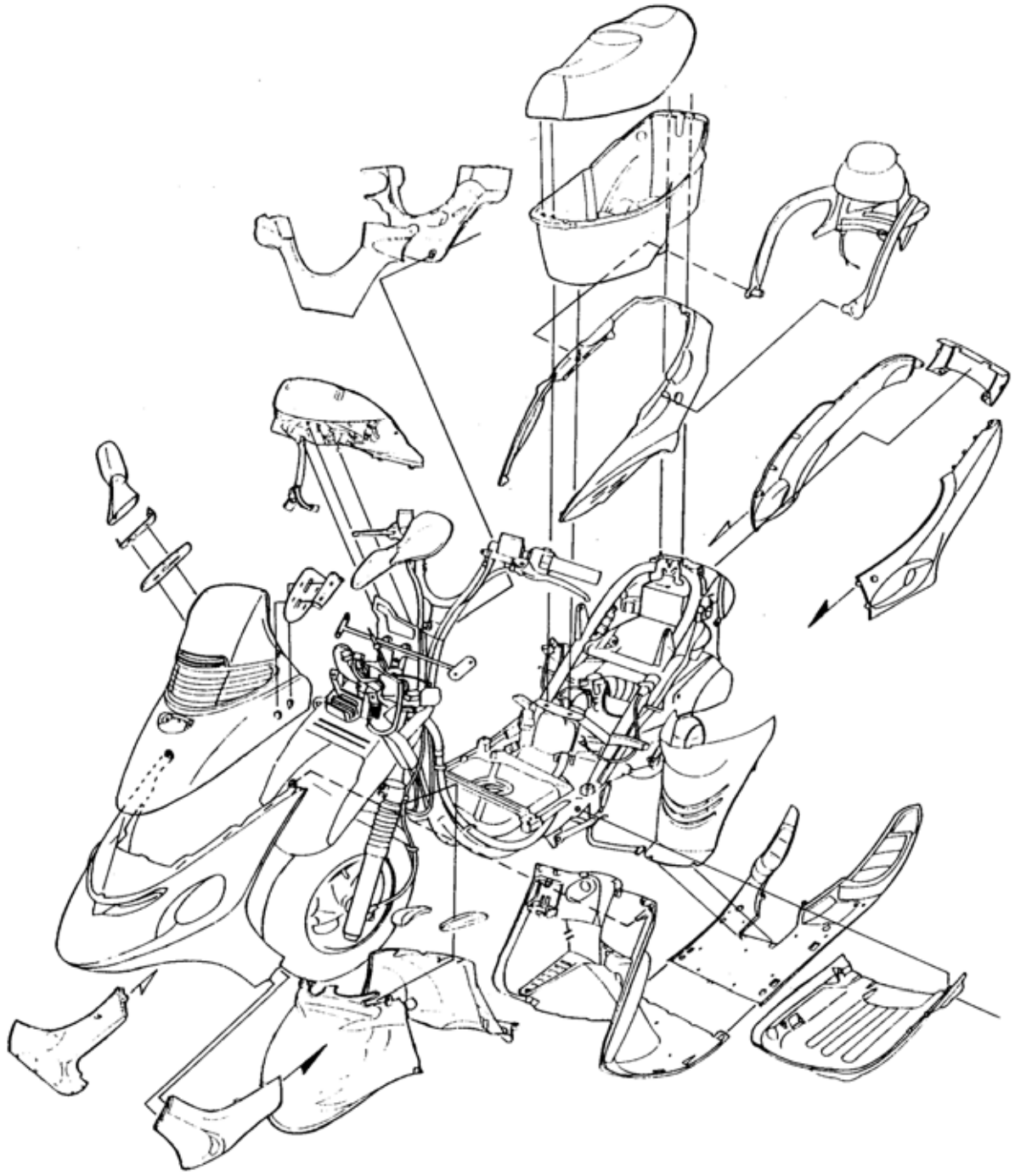


2

EXHAUST MUFFLER/FRAME COVERS

2. EXHAUST MUFFLER/FRAME COVERS

SCHEMATIC DRAWING



2. EXHAUST MUFFLER/FRAME COVERS

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- When removing frame covers, use care not to pull them by force because the cover joint claws may be damaged.
- Make sure to route cables and harnesses according to the Cable & Harness Routing.

TORQUE VALUES

Exhaust muffler lock bolt	3.5kg-m
Exhaust muffler joint lock nut	1.2kg-m

TROUBLESHOOTING

Noisy exhaust muffler

- Damaged exhaust muffler
- Exhaust muffler joint air leaks

Lack of power

- Caved exhaust muffler
- Clogged exhaust muffler
- Exhaust muffler air leaks

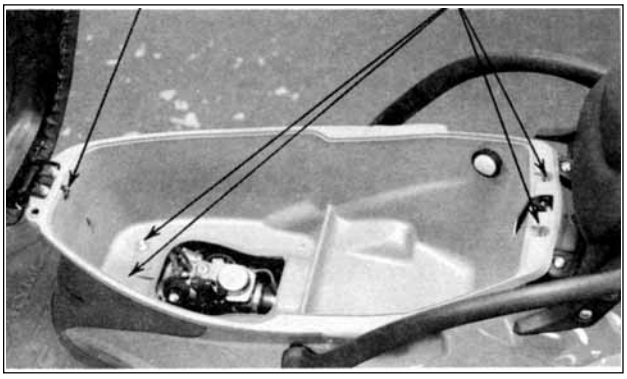
2. EXHAUST MUFFLER/FRAME COVERS

FRAME COVERS REMOVAL

REAR CARRIER & HAND RAIL REMOVAL

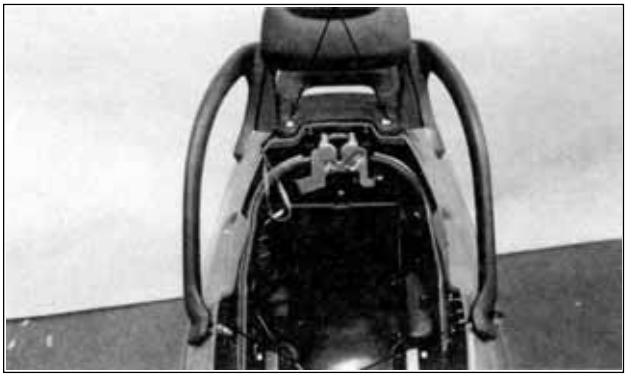
Remove the met-in box:
First remove the two bolts and two nuts attaching the met-in box.
Remove the bolt attaching the center cover.
Remove the met-in box.

Center Cover Bolt Bolts/Nuts



Remove the hand rail right and left lock bolts.
Remove the two hex bolts and one stay bolt attaching the rear carrier.
Disconnect the third stoplight wire connector on the rear carrier.
Remove the rear carrier and hand rail.

Hex Bolts



Lock Bolts

FRAME BODY COVER REMOVAL

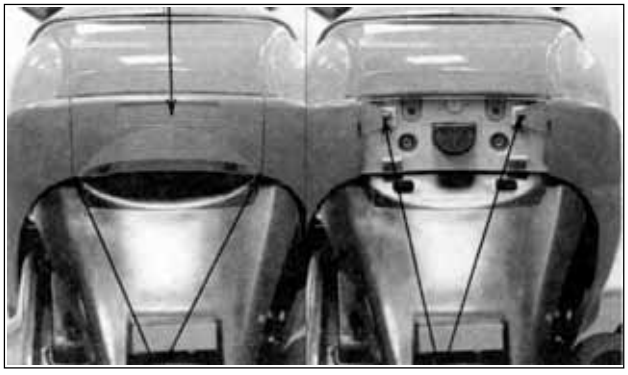
Remove the two screws on the bottom of the center cover.
Remove the center cover.
Remove the two screws attaching the front part of the frame body cover.

Center Cover Frame Body Cover

Screws Screws

Remove the two screws attaching the rear protective cover.
Remove the rear protective cover.
Remove the two screws attaching the rear ends of the right and left side rails.

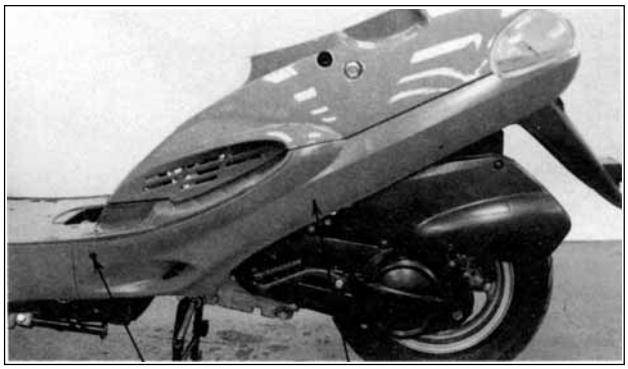
Rear Protective Cover



Screws Screws

2. EXHAUST MUFFLER/FRAME COVERS

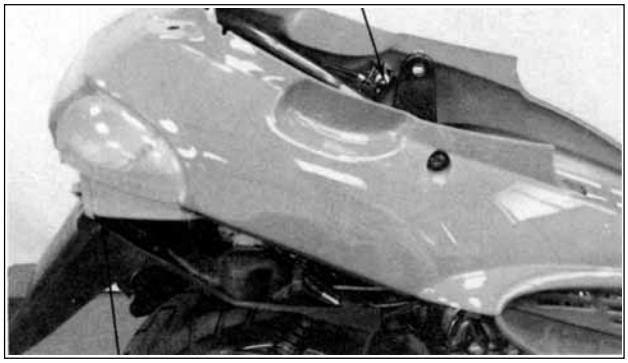
Remove the screws attaching the right and left side covers.
Remove the right and left side covers by pulling them backward.



Screws Side Cover

Seat Lock Wire

Remove the right and left screws on the rear part of the frame body cover.
Disconnect the seat lock wire.
Remove the frame body cover.

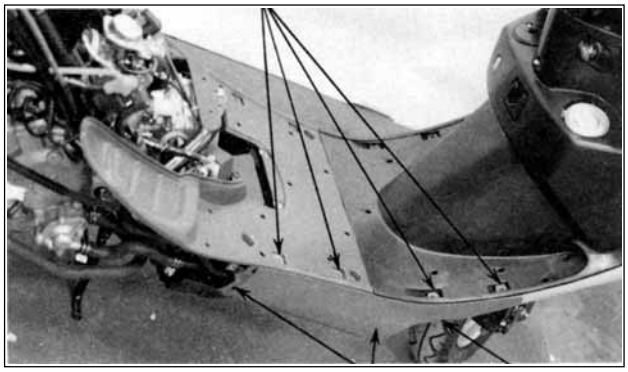


Screw

Screws

FLOOR BOARD REMOVAL

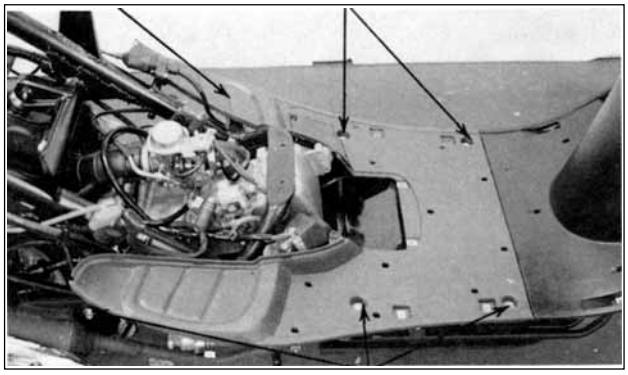
Remove the floor mat.
Remove the center cover. (⇨2-3)
Remove the ten screws and two bolts attaching the front right and left side covers.
Remove the two bottom cover adjusting screws.
Remove the front right and left side covers.



Adjusting Screws Screw

Floor Board Bolts

Remove the six bolts attaching the floor board.
Remove the floor board .
The installation sequence is the reverse of removal.



Bolts

2. EXHAUST MUFFLER/FRAME COVERS

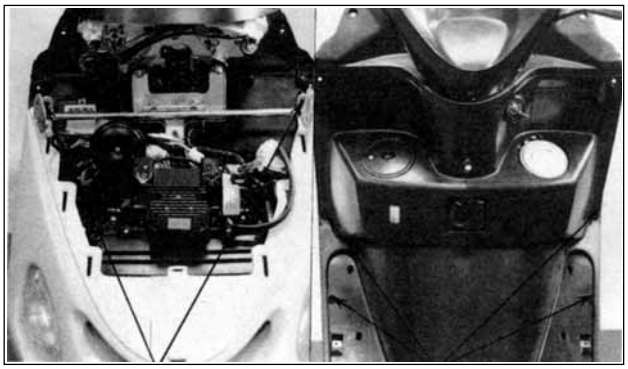
FRONT UPPER COVER REMOVAL

Remove the right and left rearview mirrors.
Remove the two screws on the back of the front upper cover.
Remove the two bolts on the front of the front upper cover.
Disconnect the headlight wire connector.
Remove the front upper cover.
The installation sequence is the reverse of removal.

Bolts Screws

FRONT LOWER COVER REMOVAL

First remove the front upper cover.
Remove the two screws attaching the front lower cover.
Remove the four screws on the back of the front lower cover.
Disconnect the right/left turn signal light wire connectors.
Remove the front lower cover
The installation sequence is the reverse of removal.

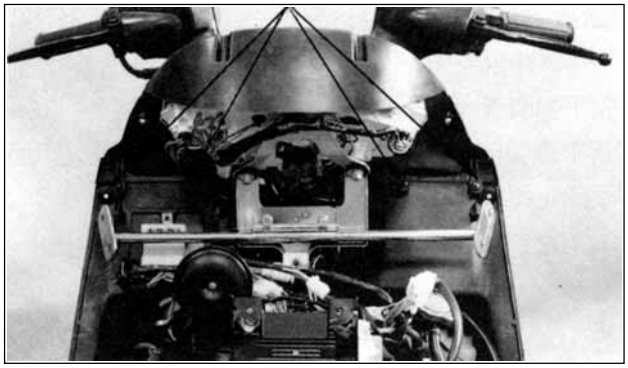


Screws Screws

Screws

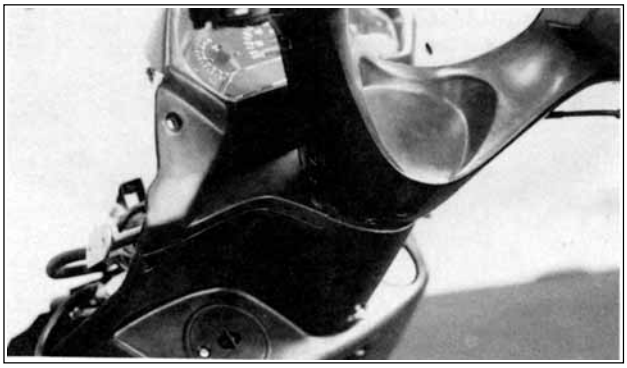
LEG SHIELD REMOVAL

Remove the front upper cover.
Remove the front lower cover.
Remove the four screws attaching the leg shield and instruments and remove the fuse box.
Remove the nut attaching the leg shield.
Remove the adjusting screw which combines the leg shield with instruments.



Adjusting Screw

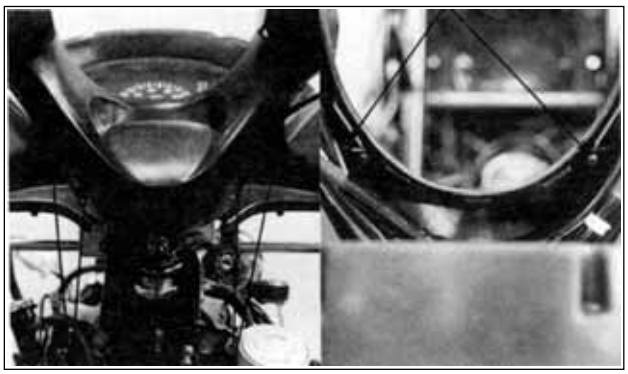
Remove the leg shield.
The installation sequence is the reverse of removal.



2. EXHAUST MUFFLER/FRAME COVERS

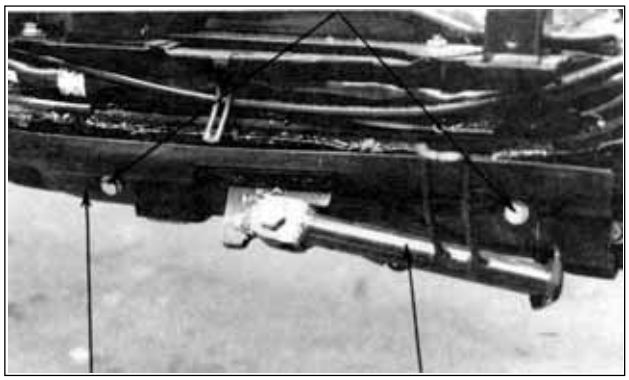
HANDLEBAR COVER REMOVAL

First remove the four screws attaching the handlebar front cover.
Remove the handlebar front cover.
Remove the two screws and one bolt attaching the handlebar rear cover.
Remove the handlebar rear cover.
The installation sequence is the reverse of removal.



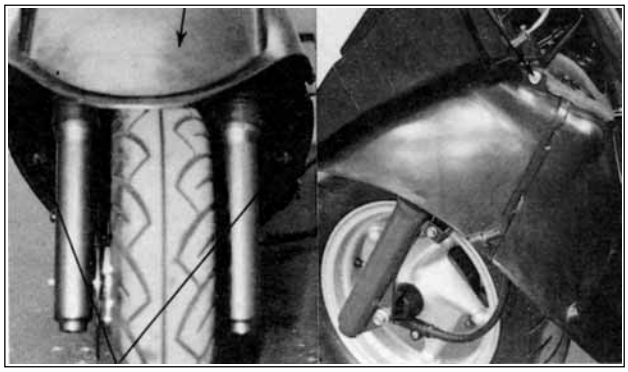
BOTTOM COVER REMOVAL

Remove the side stand.
Remove the four bolts attaching the bottom cover.
Remove the bottom cover.



FRONT INNER FENDER A/B REMOVAL

Remove the front upper cover. (⇨2-5)
Remove the front lower cover. (⇨2-5)
Remove the screws which combines inner fender A with inner fender B.
Remove the two bolts attaching the inner fender A.
Separate inner fenders A and B.
The installation sequence is the reverse of removal.

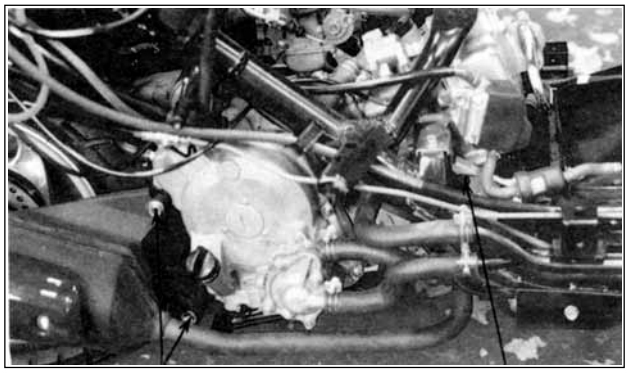


EXHAUST MUFFLER REMOVAL

Remove the two exhaust muffler joint lock nuts.
Remove the two exhaust muffler lock bolts to remove the exhaust muffler.
Remove the exhaust muffler joint packing collar.
The installation sequence is the reverse of removal.

Torque:

Exhaust muffler joint lock nut: 1.2kg-m
Exhaust muffler lock bolt: 3.5kg-m



INSPECTION/ADJUSTMENT

3. INSPECTION/ADJUSTMENT

SERVICE INFORMATION

GENERAL

⚠ WARNING

- Before running the engine, make sure that the working area is well-ventilated. Never run the engine in a closed area. The exhaust contains poisonous carbon monoxide gas which may cause death to people.
- Gasoline is extremely flammable and is explosive under some conditions. The working area must be well-ventilated and do not smoke or allow flames or sparks near the working area or fuel storage area.

SPECIFICATIONS

ENGINE

Throttle grip free play : 2～6mm
Spark plug : NGK: DP7EA9
Spark plug gap : 0.8～1.0mm
Valve clearance : IN: 0.1mm EX: 0.1mm
Idle speed : 1500±100rpm
(SH25AA: 1700±100rpm)

Engine oil capacity:
At disassembly : 1.1 liter
At change : 0.8 liter
Gear oil capacity :
At disassembly : 0.2 liter
At change : 0.195 liter

Cylinder compression : 15±2kg/cm²
Ignition timing : BTDC 10°±3°/1500rpm
Coolant capacity : 1165cc
Radiator capacity : 825cc
Reserve tank capacity : 340cc

CHASSIS

Front/rear brake free play: 20～30mm

TIRE

	1 Rider	2 Riders
Front	1.75kg/cm²	1.75kg/cm²
Rear	2.00kg/cm²	2.25kg/cm²

TIRE SPECIFICATION:
Front : 100/90−10
Rear : 120/70−10

TORQUE VALUES

Front axle nut : 5.0～7.0kg-m
Rear axle nut : 11.0～13.0kg-m

MAINTENANCE SCHEDULE

Perform the periodic maintenance at each scheduled maintenance period.
I: Inspect, and Clean, Adjust, Lubricate or Replace if necessary.
A: Adjust C: Clean R: Replace T : Tighten

Item \ Frequency	Whichever comes first ⇨ ⇩	Regular Service Mileage (km)											
		1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
Engine oil		R New motorcycle 300km		R		R		R		R		R	
Engine oil filter screen					C				C				
Fuel filter screen											R		
Gear oil	Note 3	R New motorcycle 300km				R					R		
Valve clearance			A		A				A				A
Carburetor					I				I				
Air Cleaner	Note 2,3	I				R					R		
Spark plug		Clean at every 3000km and replace if necessary											
Brake system		I	I	I	I	I	I	I	I	I	I	I	I
Drive belt									I				
Suspension					I				I				I
Nut, bolt, fastener									I				
Tire					I				I				I
Steering head bearing		I					I		I				I
Brake fluid		Perform pre-ride inspection daily											
Radiator coolant		Replace every year or at every 10000km (R)											
Radiator core							I						I
Radiator cap							I						I
Brake lever						I					I		
Brake shoe wear						I					I		
Shock absorber						I					I		

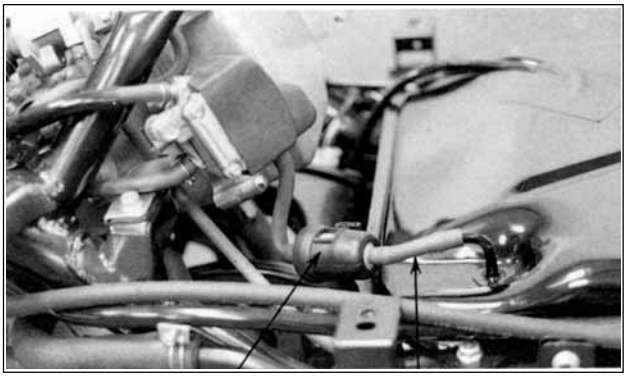
- In the interest of safety, we recommend these items be serviced only by an authorized KYMCO motorcycle dealer.

Note: 1. For higher odometer readings, repeat at the frequency interval established here.
2. Service more frequently when riding in dusty or rainy areas.
3. Service more frequently when riding in rain or at full throttle.

FUEL LINE/FUEL FILTER

Remove the center cover.
Check the fuel lines and replace any parts which show signs of deterioration, damage or leakage.
Check for dirty or clogged fuel filter and replace with a new one if it is clogged.

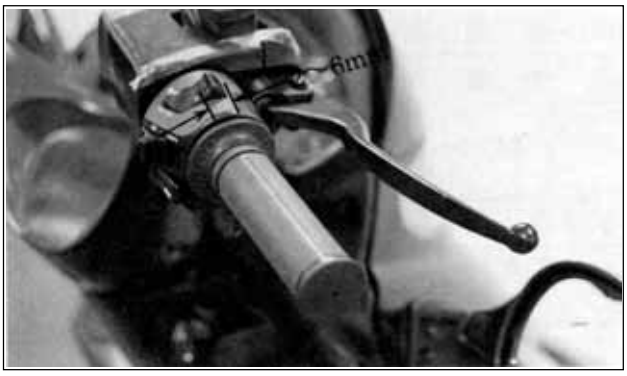
* • Do not smoke or allow flames or sparks in your working area.



Fuel Filter Fuel Line

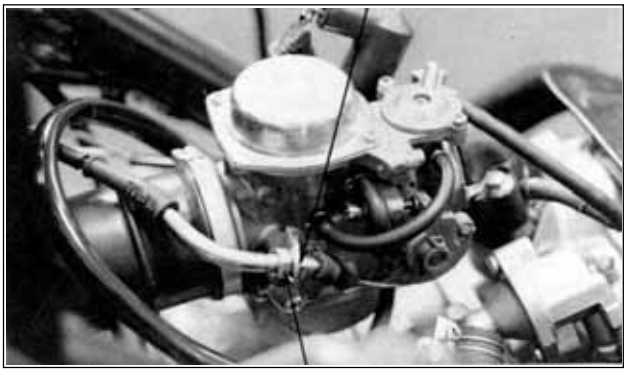
THROTTLE OPERATION

Check the throttle grip for smooth movement.
Measure the throttle grip free play.
Free Play: 2～6mm



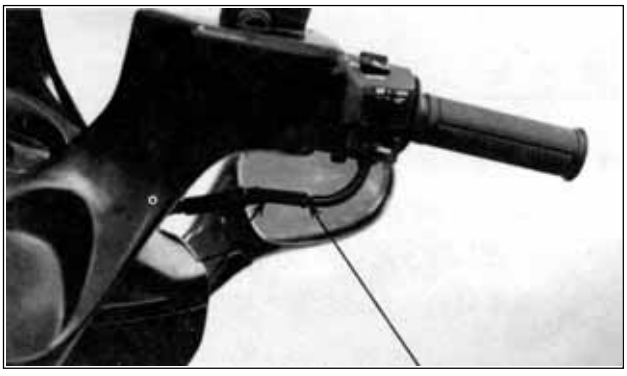
Lock Nut

Major adjustment of the throttle grip free play is made with the adjusting nut at the carburetor side. Adjust by loosening the lock nut and turning the adjusting nut.



Adjusting Nut

Minor adjustment is made with the adjusting nut at the throttle grip side.
Slide the rubber cover out and adjust by loosening the lock nut and turning the adjusting nut.



Adjusting Nut Lock Nut

ENGINE OIL

OIL LEVEL INSPECTION

Stop the engine and support the motorcycle upright on level ground.
Wait for 2～3 minutes and check the oil level with the dipstick. Do not screw in the dipstick when making this check.

Oil Dipstick

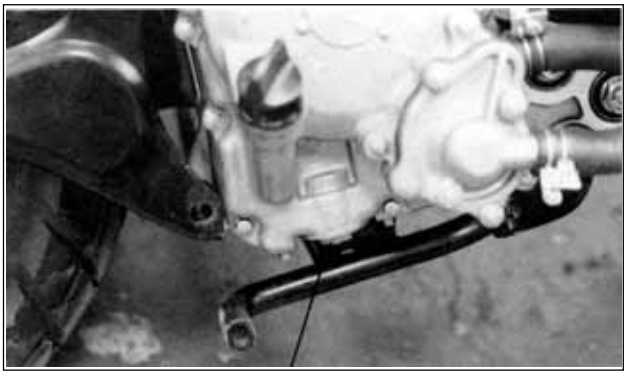
OIL CHANGE

* • Drain the oil while the engine is warm.

Remove the oil drain bolt to drain the engine oil.
Install the aluminum washer and tighten the oil drain bolt.
Torque: 1.5kg-m

* • Replace the aluminum washer with a new one if it is deformed or damaged.

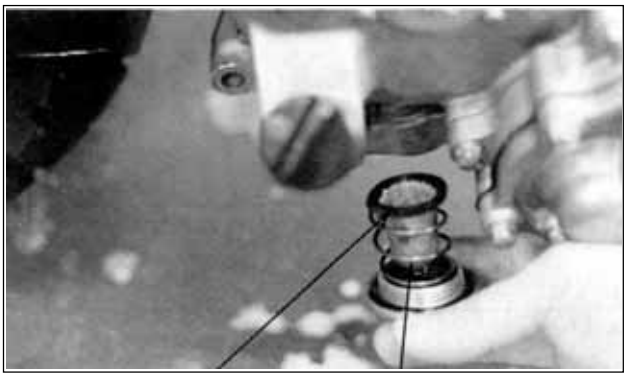
Pour the recommended oil through the oil filler hole.
Oil Capacity:
At disassembly: 1.1 liter
At change: 0.8 liter
Recommended Oil:
SAE: 15W40#
API: SG/CD
Start the engine and check for oil leaks.
Stop the engine and recheck the oil level.



Oil Filter Screen Cap

OIL FILTER SCREEN INSPECTION

Drain the engine oil.
Remove the oil filter screen and spring.
Clean the oil filter screen.
Install the oil filter screen, spring, and filter screen cap.
Fill the engine with recommended engine oil.

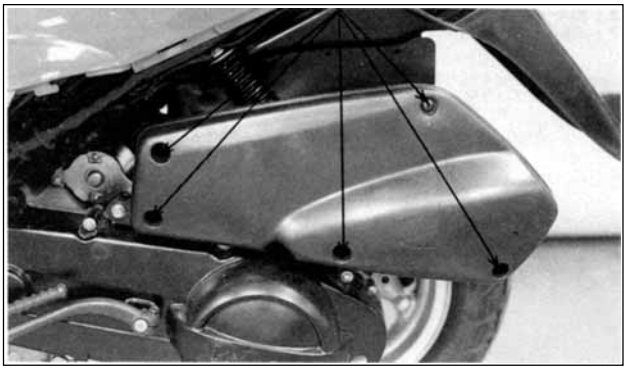


Oil Filter Screen Spring

AIR CLEANER

Remove the five air cleaner case cover screws and the cover.

Screws



Air Cleaner Case Cover

Remove the air cleaner element.
Check the element and replace it if it is excessively dirty or damaged.

Air Cleaner Element

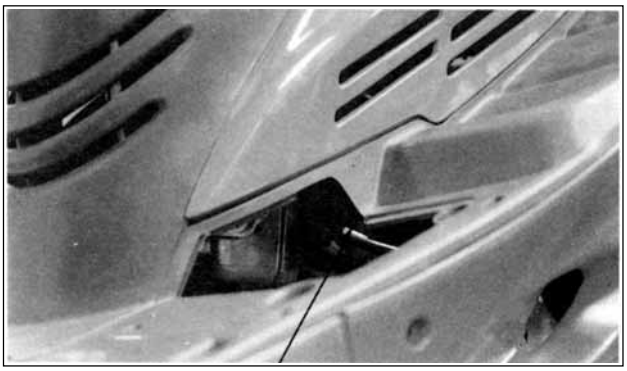
CHANGE INTERVAL

More frequent replacement is required when riding in unusually dusty or rainy areas.

* • The air cleaner element has a viscous type paper element. Do not clean it with compressed air.
  • Be sure to install the air cleaner element and cover securely.

SPARK PLUG

Remove the frame center cover.
Remove the spark plug cap and spark plug.
Check the spark plug for wear and fouling deposits.
Clean any fouling deposits with a spark plug cleaner or a wire brush.

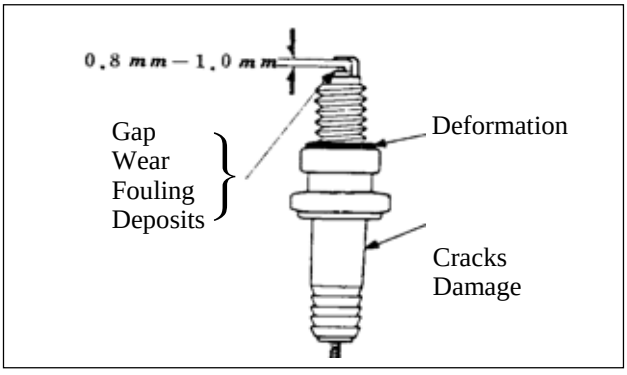


Spark Plug

Specified Spark Plug: NGK: DP7EA9

Measure the spark plug gap.

Spark Plug Gap: 0.8～1.0mm



* • When installing, first screw in the spark plug by hand and then tighten it with a spark plug wrench.

Torque: 0.8～1.0kg-m

VALVE CLEARANCE

* • Inspect and adjust valve clearance while the engine is cold (below 35℃).

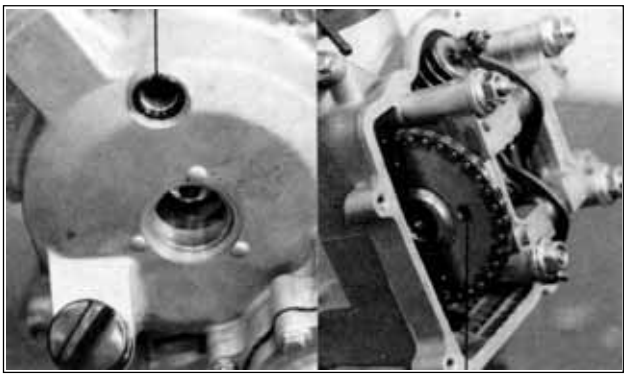
Remove the center cover and the secondary air inlet tube bolt.
Remove the cylinder head cover.

Bolts

Cylinder Head Cover

Turn the A.C. generator flywheel to the top dead center (TDC) on the compression stroke so that the “T” mark on the flywheel aligns with the index mark on the left crankcase cover.

“T” Mark

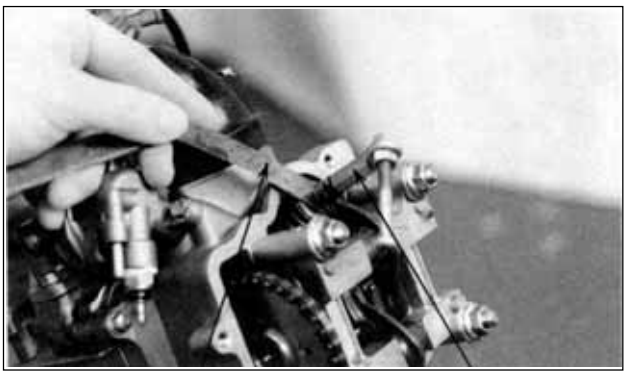


Top Dead Center

Inspect and adjust valve clearance.
Valve Clearance: IN: 0.1mm
EX: 0.1mm
Loosen the lock nut and adjust by turning the adjusting nut

Special
Valve Wrench

* • Check the valve clearance again after the lock nut is tightened.

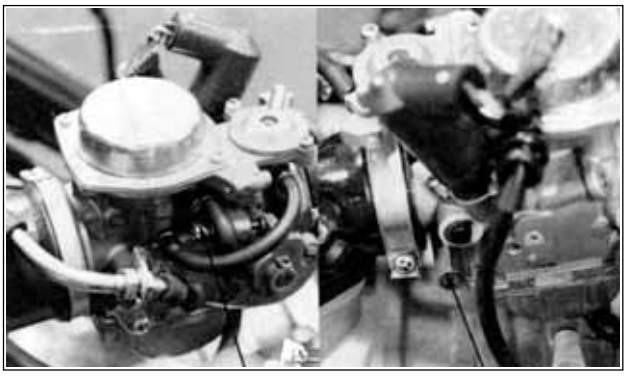


Feeler Gauge Valve Wrench

CARBURETOR IDLE SPEED

* • The engine must be warm for accurate idle speed inspection and adjustment.

Lift up the seat and remove the inspection cover.
Warm up the engine before this operation.
Start the engine and connect a tachometer.
Turn the throttle stop screw to obtain the specified idle speed.
Idle Speed: 1500±100rpm
(SH25AA: 1700±100rpm)
When the engine misses or run erratic, adjust the pilot screw.



Throttle Stop Screw Pilot Screw

IGNITION TIMING

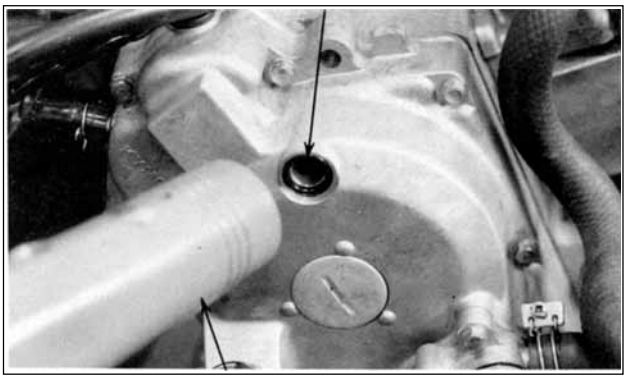
* • The CDI unit is not adjustable.
  • If the ignition timing is incorrect, check the ignition system,

Remove the timing hole cap.

Timing Hole Cap

Check the ignition timing with a timing light. When the engine is running at the specified idle speed, the ignition timing is correct if the "F" mark on the flywheel aligns with the index mark on the crankcase cover.
Also use a timing light to check the advance. Raise the engine speed to 4,000rpm.
The index mark should be between the advance marks.

"F" Mark



Timing Light

CYLINDER COMPRESSION

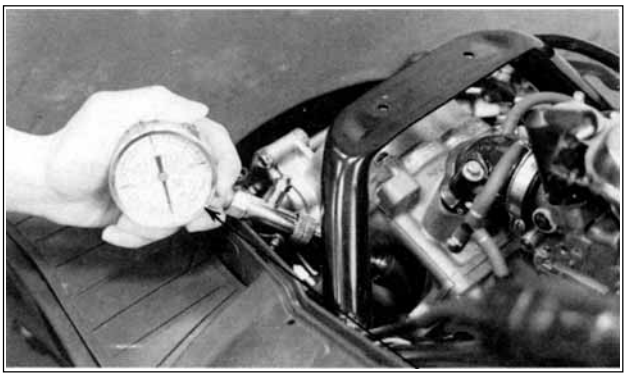
Warm up the engine before compression test.
Remove the center cover and spark plug cap.
Remove the spark plug .
Insert a compression gauge.
Open the throttle valve fully and push the starter button to test the compression.

Compression: 15±2kg/cm²

If the compression is low, check for the following:

- Leaky valves
- Valve clearance to small
- Leaking cylinder head gasket
- Worn pistons
- Worn piston/cylinder

If the compression is high, it indicates that carbon deposits have accumulated on the combustion chamber and the piston head.



Compression Gauge

FINAL REDUCTION GEAR OIL

* • Place the motorcycle on its main stand on level ground.

Stop the engine and remove the oil check bolt.
The oil level shall be at the oil check bolt hole.
If the oil level is low, add the recommended oil SAE90# to the proper level.

Install the oil check bolt.

* • Make sure that the sealing washer is in good condition.

Oil Check Bolt Hole/Oil Filler

OIL CHANGE

Remove the oil check bolt.
Remove the oil drain bolt and drain the oil thoroughly.
Install the oil drain bolt.
Torque: 1.0kg-m

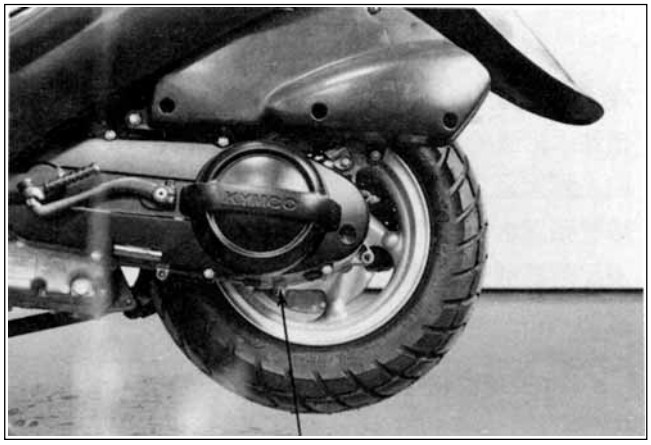
* • Make sure that the sealing washer is in good condition.

Fill the final reduction with the recommended oil SAE90#.

Gear Oil Capacity:

At disassembly : 200cc
At change : 195cc

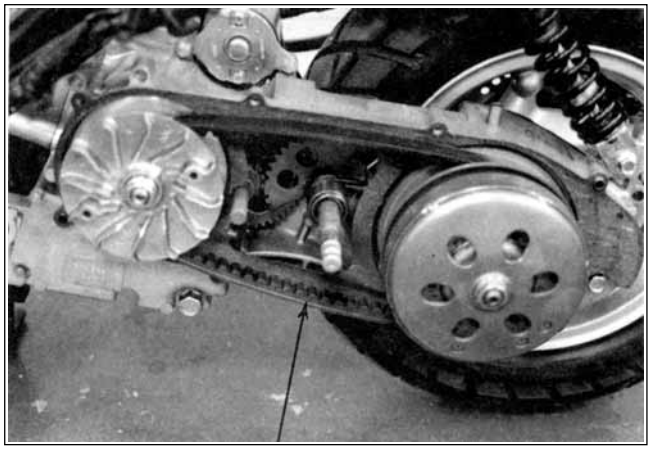
Reinstall the oil check bolt and check for oil leaks.



Oil Drain Bolt/Sealing Washer

DRIVE BELT

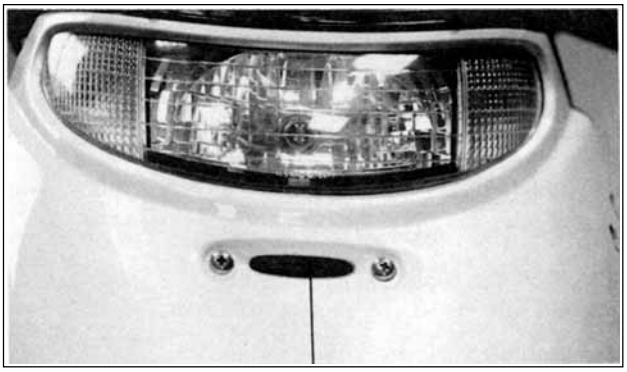
Remove the left crankcase cover.
Inspect the drive belt for cracks or excessive wear.
Replace the drive belt with a new one if necessary and in accordance with the Maintenance Schedule.



Drive Belt

HEADLIGHT AIM

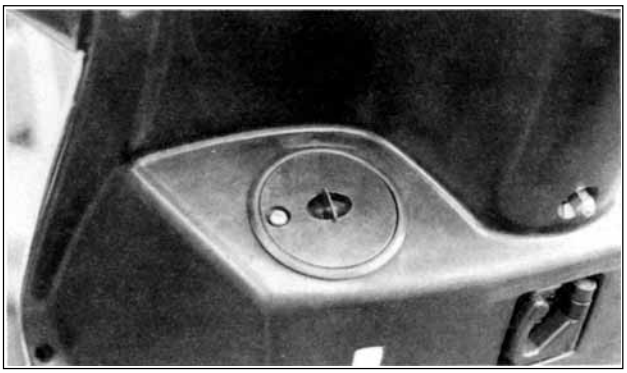
Turn the ignition switch ON.
Turn on the headlight switch.
Adjust the headlight aim by turning the headlight aim adjusting bolt.



Headlight Aim Adjusting Bolt

CLUTCH SHOE WEAR

Start the engine and check the clutch operation by increasing the engine speed gradually.
If the motorcycle tends to creep, or the engine stalls, check the clutch shoes for wear and replace if necessary.



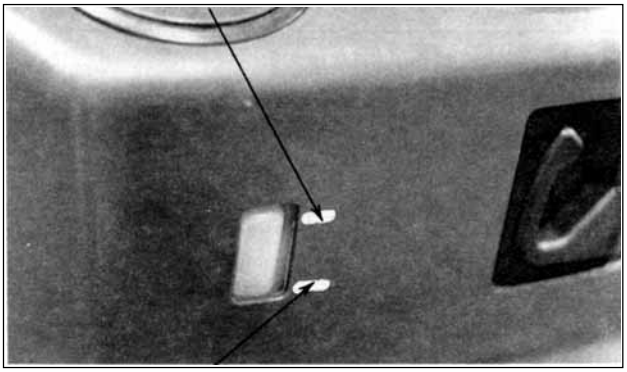
COOLING SYSTEM

COOLANT LEVEL INSPECTION

Place the motorcycle on its main stand on level ground.
Check the coolant level of the reserve tank and the level should be between the upper and lower level lines.
If necessary, fill the reserve tank with recommended coolant to the “F” level line.
Recommended Coolant: SIGMA Coolant
(Standard Concentration 30%)

* • The coolant level does not change no matter the engine is warm or cold. Fill to the “F” (upper) line.

Upper Line



Lower Line

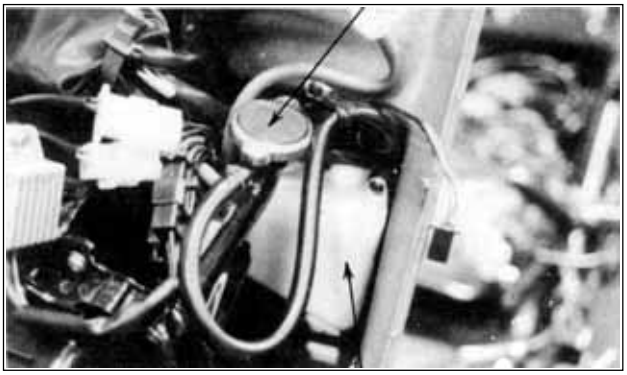
COOLANT REPLACEMENT

* • Perform this operation when the engine is cold.

Remove the front cover.
Remove the radiator cap.
Remove the drain bolt to drain the coolant and tilt the motorcycle to the right and the coolant will drain more easily.
Drain the coolant in the reserve tank.
Reinstall the drain bolt.
Fill the radiator with the specified coolant.

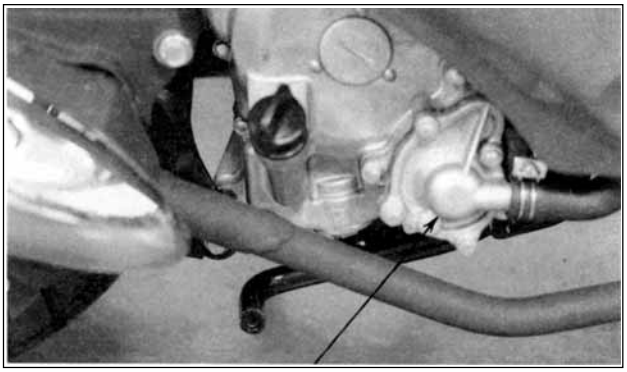
* • The coolant freezing point should be 5 ℃ lower than the temperature of the riding area.

Radiator Cap



Reserve Tank

Coolant capacity : 1165cc
Radiator capacity : 825cc
Reserve tank capacity :340cc
Start the engine and check if there is no bubbles in the coolant and the coolant level is stable. Reinstall the radiator cap.
If there are bubbles in the coolant, bleed air from the system.
Fill the reserve tank with the recommended coolant up to the upper line.



Drain Bolt

BRAKE SYSTEM

BRAKE LEVER

Measure the front and rear brake lever free plays.

Free Play: Front: 20～30mm

Rear Brake Reservoir Front Brake Reservoir

BRAKE FLUID

Turn the steering handlebar upright and check if the front/rear brake fluid level is at the upper limit. If the brake fluid is insufficient, fill to the upper limit.

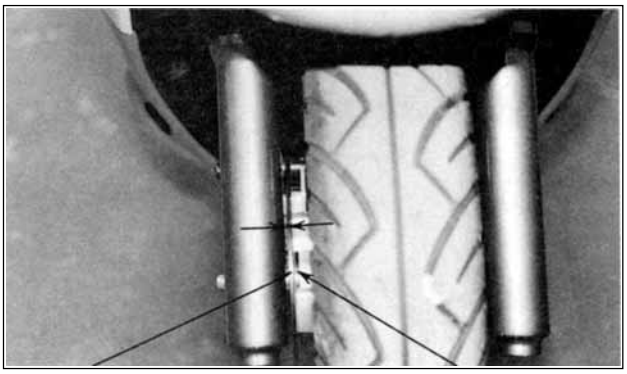
Specified Brake Fluid: DOT-3

* • The brake fluid level will decrease if the brake pads are worn.

BRAKE DISK/BRAKE PAD

Check the brake disk surface for scratches, unevenness or abnormal wear.
Check if the brake disk runout is within the specified service limit.
Check if the brake pad wear exceeds the wear indicator line.

* • Keep grease or oil off the brake disk to avoid brake failure.



Brake Disk Wear Indicator Line

NUTS/BOLTS/FASTENERS

Check all important chassis nuts and bolts for looseness.
Tighten them to their specified torque values if any looseness is found.

WHEELS/TIRES

Check the tires for cuts, imbedded nails or other damages.
Check the tire pressure.

* • Tire pressure should be checked when tires are cold.

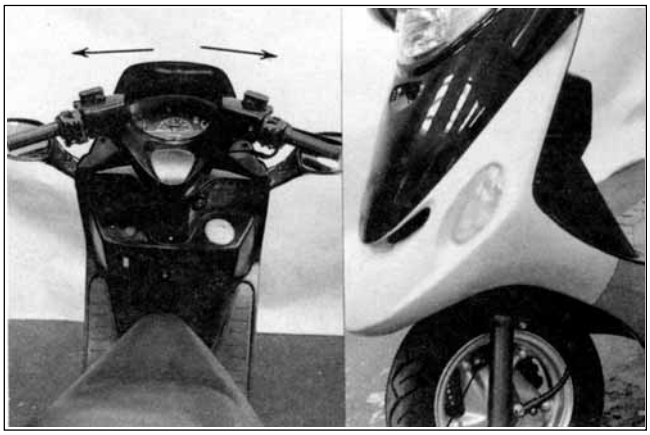
Tire Pressure

	1 Rider	2 Riders
Front	1.75kg/cm²	1.75kg/cm²
Rear	2.00kg/cm²	2.25kg/cm²

Pressure Gauge

STEERING HANDLEBAR

Raise the front wheel off the ground and check that the steering handlebar rotates freely.
If the handlebar moves unevenly, binds, or has vertical movement, adjust the steering head bearing.



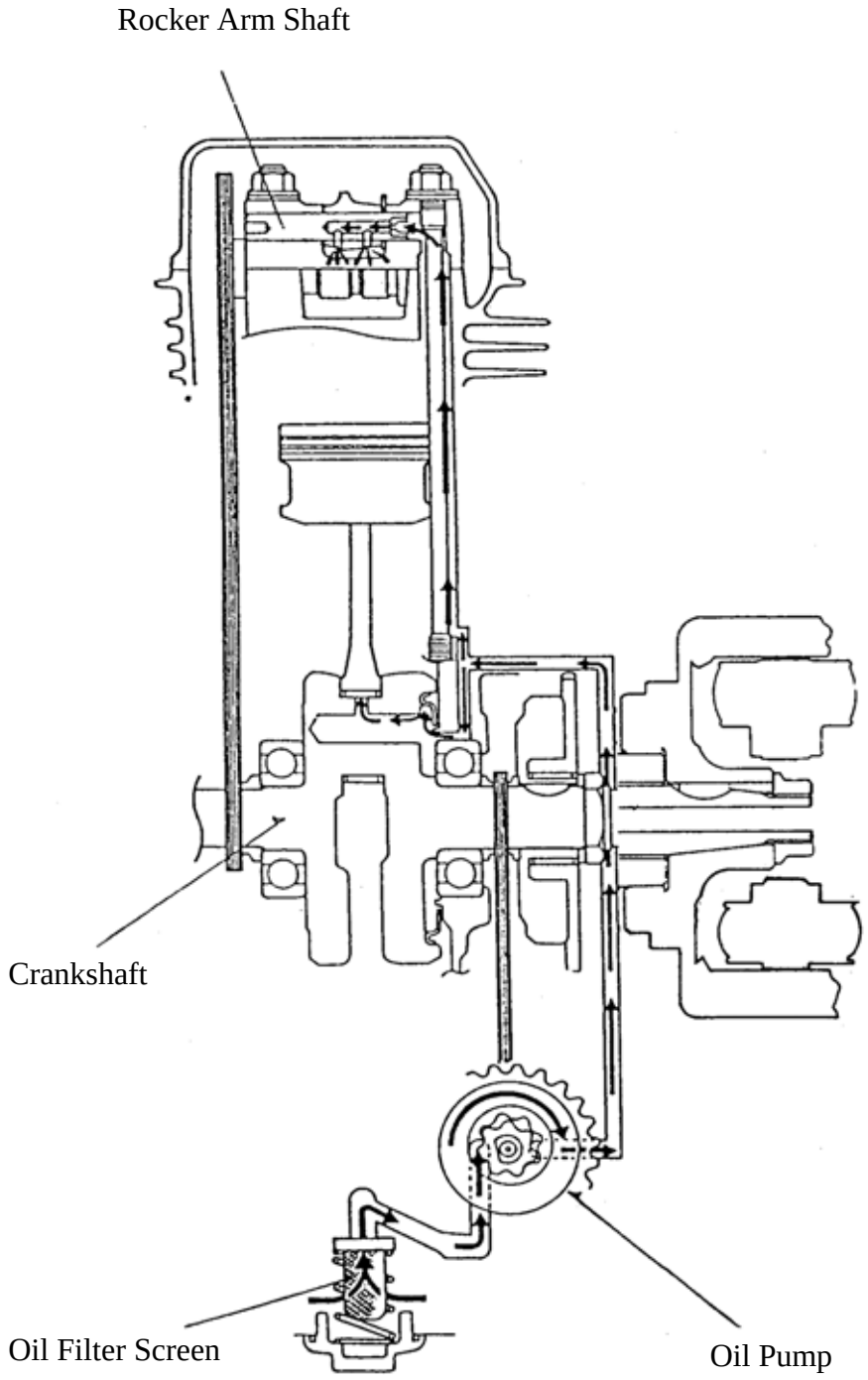
Front Shock Absorber

SUSPENSION

Check the action of the front/rear shock absorbers by compressing them several times.
Check the entire shock absorber assembly for oil leaks, looseness or damage.
Jack the rear wheel off the ground and move the rear wheel sideways with force to see if the engine hanger bushings are worn.
Replace the engine hanger bushings if there is any looseness.

LUBRICATION SYSTEM

LUBRICATION SYSTEM



4. LUBRICATION SYSTEM

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- The maintenance of lubrication system can be performed with the engine installed in the frame.
- Drain the coolant before starting any operations.
- Use care when removing and installing the oil pump not to allow dust and foreign matters to enter the engine and oil line.
- Do not attempt to disassemble the oil pump. The oil pump must be replaced as a set when it reaches its service limit.
- After the oil pump is installed, check each part for oil leaks.

SPECIFICATIONS

OIL PUMP

	Standard (mm)	Service Limit (mm)
Inner rotor-to-outer rotor clearance	0.15	0.20
Outer rotor-to-pump body clearance	0.15～0.20	0.25
Rotor end-to-pump body clearance	0.04～0.09	0.12

ENGINE OIL

Engine Oil Capacity	At disassembly: 1.1 liter At change: 0.8 liter
Recommended Oil	SAE15W40# API: SG/CD

TROUBLESHOOTING

Oil level too low

- Natural oil consumption
- Oil leaks
- Worn piston rings
- Worn valve guide
- Worn valve guide seal

Oil contamination

- Oil not changed often enough
- Faulty cylinder head gasket
- Loose cylinder head bolts

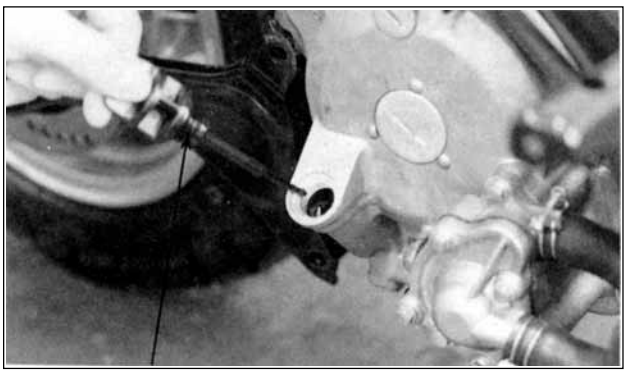
Poor lubrication pressure

- Oil level too low
- Clogged oil filter or oil passage
- Faulty oil pump

ENGINE OIL/OIL FILTER

* • Place the motorcycle upright on level ground for engine oil level check.
  • Run the engine for 2～3 minutes and check the oil level after the engine is stopped for 2～3 minutes.

Remove the oil dipstick and check the oil level with the oil dipstick.
If the level is near the lower level, fill to the upper level with the recommended engine oil.

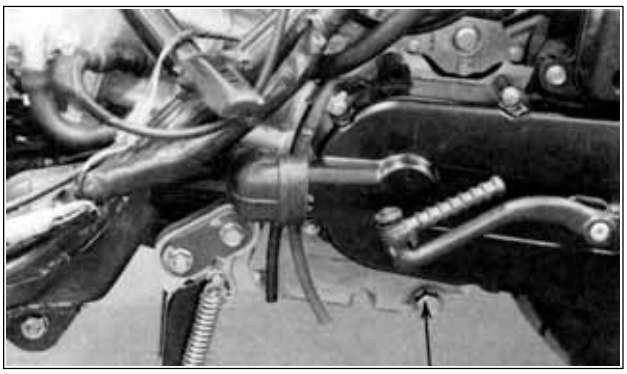


Oil Dipstick

OIL CHANGE

* • The engine oil will drain more easily while the engine is warm.

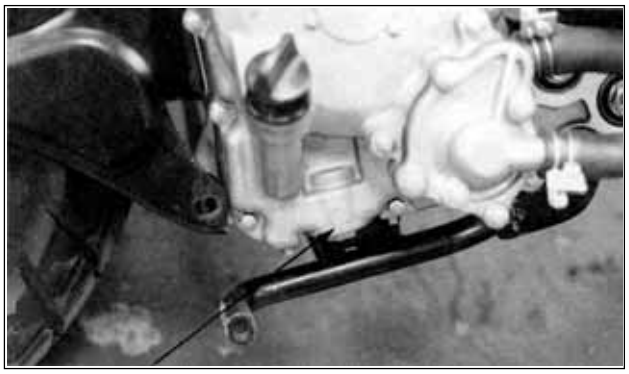
Remove the oil drain bolt located at the left side of the engine to drain the engine oil.
After the oil has been completely drained, install the aluminum washer and tighten the oil drain bolt.
Torque: 1.5kg-m
Pour the recommended oil through the oil filler hole.



Oil Drain Bolt

OIL FILTER SCREEN

Drain the engine oil.
Remove the oil filter screen cap.
Remove the oil filter screen and spring.
Check the oil filter screen for clogging or damage and replace if necessary. Check the filter screen O-ring for damage and replace if necessary.
Install the oil filter screen, spring, O-ring and filter screen cap.
Torque: 1.5kg-m



Oil Filter Screen Cap

Recommended Oil: SAE15W40# API: SG/CD
Oil Capacity:
At disassembly: 1.1 liter
At change: 0.8 liter

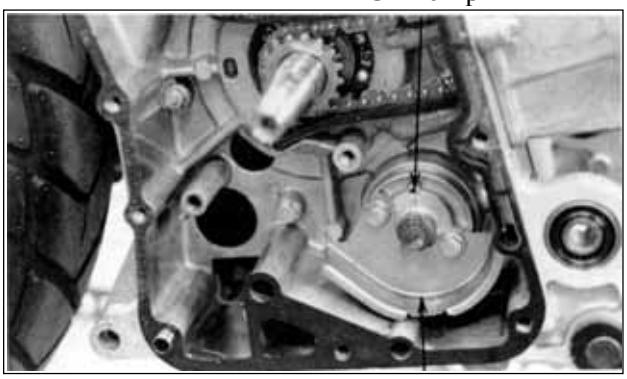
Start the engine and check for oil leaks.
Start the engine and let it idle for few minutes, then recheck the oil level.

OIL PUMP REMOVAL

First drain the coolant.
Remove the right crankcase cover. (⇨10-3)
Remove the A.C. generator starter driven gear. (⇨10-4)
Remove the attaching bolt and oil separator cover.

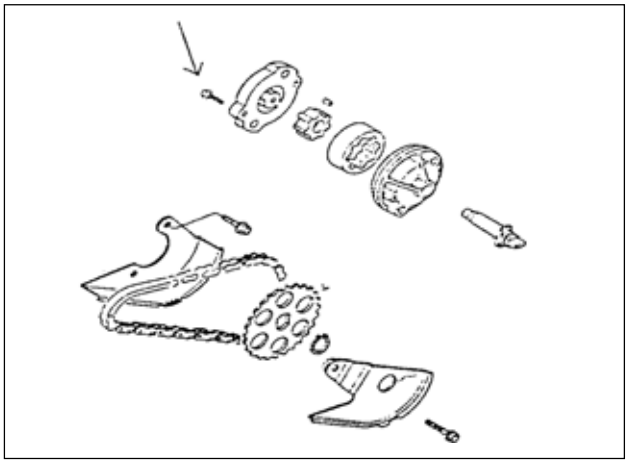
Pry the circlip off and remove the oil pump driven gear, then remove the oil pump drive chain.

Remove the two oil separator bolts to remove the oil pump.



OIL PUMP DISASSEMBLY

Remove the screw and disassemble the oil pump as shown.

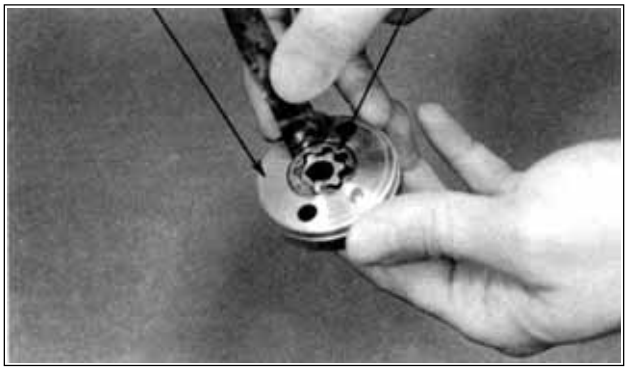


OIL PUMP INSPECTION

Measure the pump body-to-outer rotor clearance.

Service Limit: 0.25mm replace if over

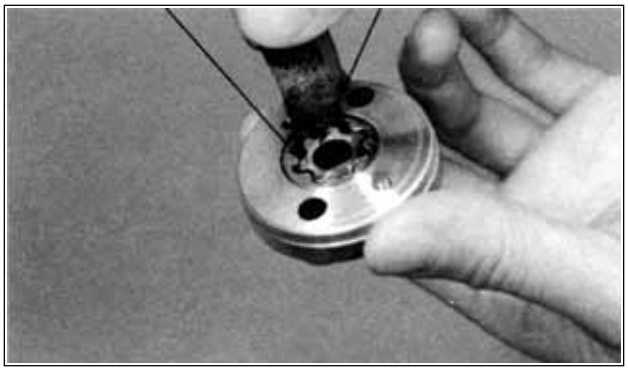
Pump Body Outer Rotor



Measure the inner rotor-to-outer rotor clearance.

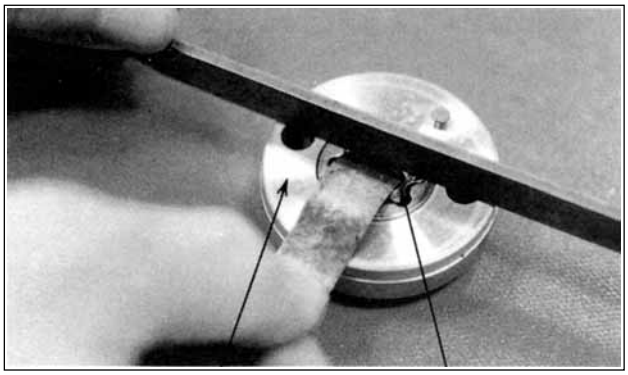
Service Limit: 0.20mm replace if over

Outer Rotor Inner Rotor



Measure the rotor end-to-pump body clearance.

Service Limit: 0.12mm replace if over



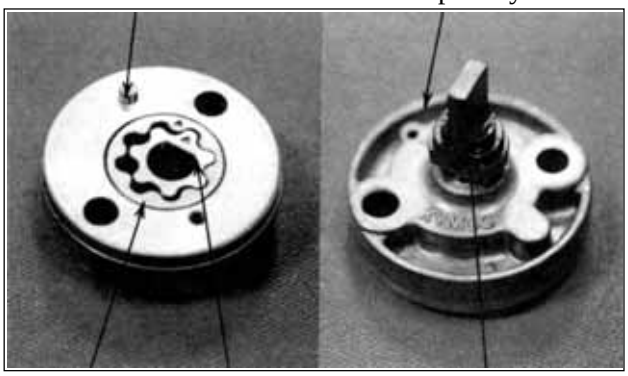
Pump Body Rotor End

OIL PUMP ASSEMBLY

Install the outer rotor, inner rotor and pump shaft into the pump body.

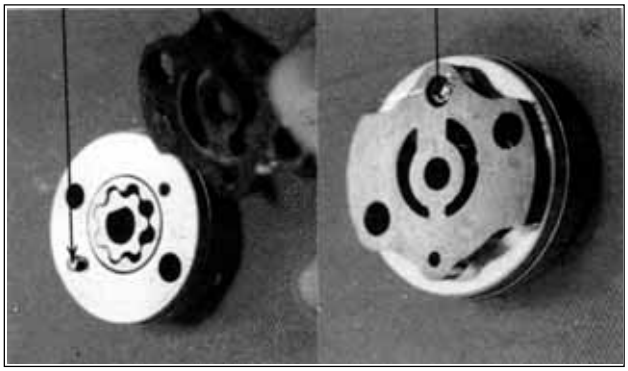
* Insert the pump shaft by aligning the flat on the shaft with the flat in the inner rotor. Install the dowel pin.

Dowel Pin Pump Body



Outer Rotor Inner Rotor Pump Shaft

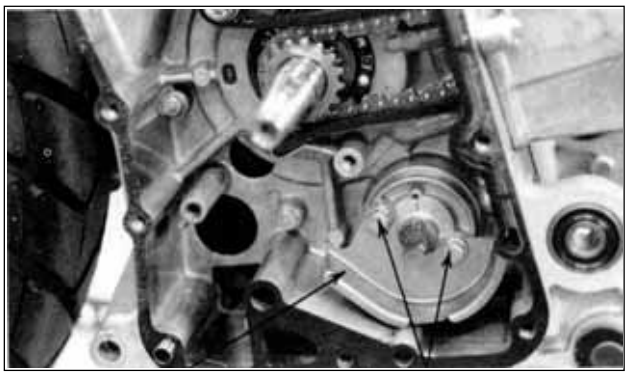
Install the pump cover by aligning the hole in the cover with the dowel pin.
Tighten the screw to secure the pump cover.
Make sure that the pump shaft rotates freely without binding.



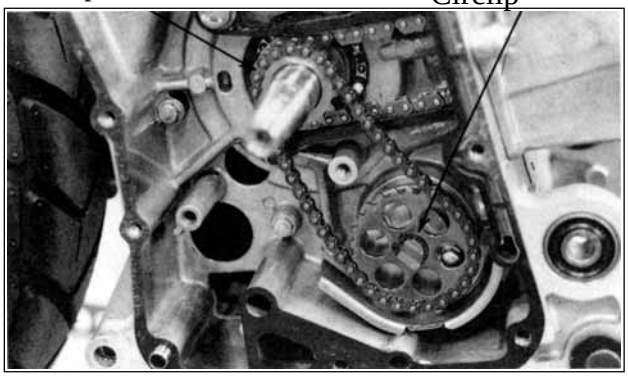
Pump Cover

OIL PUMP INSTALLATION

Install the oil pump and oil separator and tighten the two bolts.
Make sure that the pump shaft rotates freely.

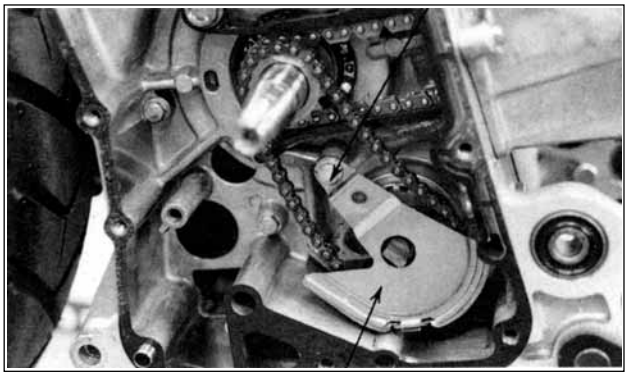


Install the pump drive chain and driven gear, then set the circlip securely on the pump shaft.



Pump Driven Gear

Install the oil separator cover properly.



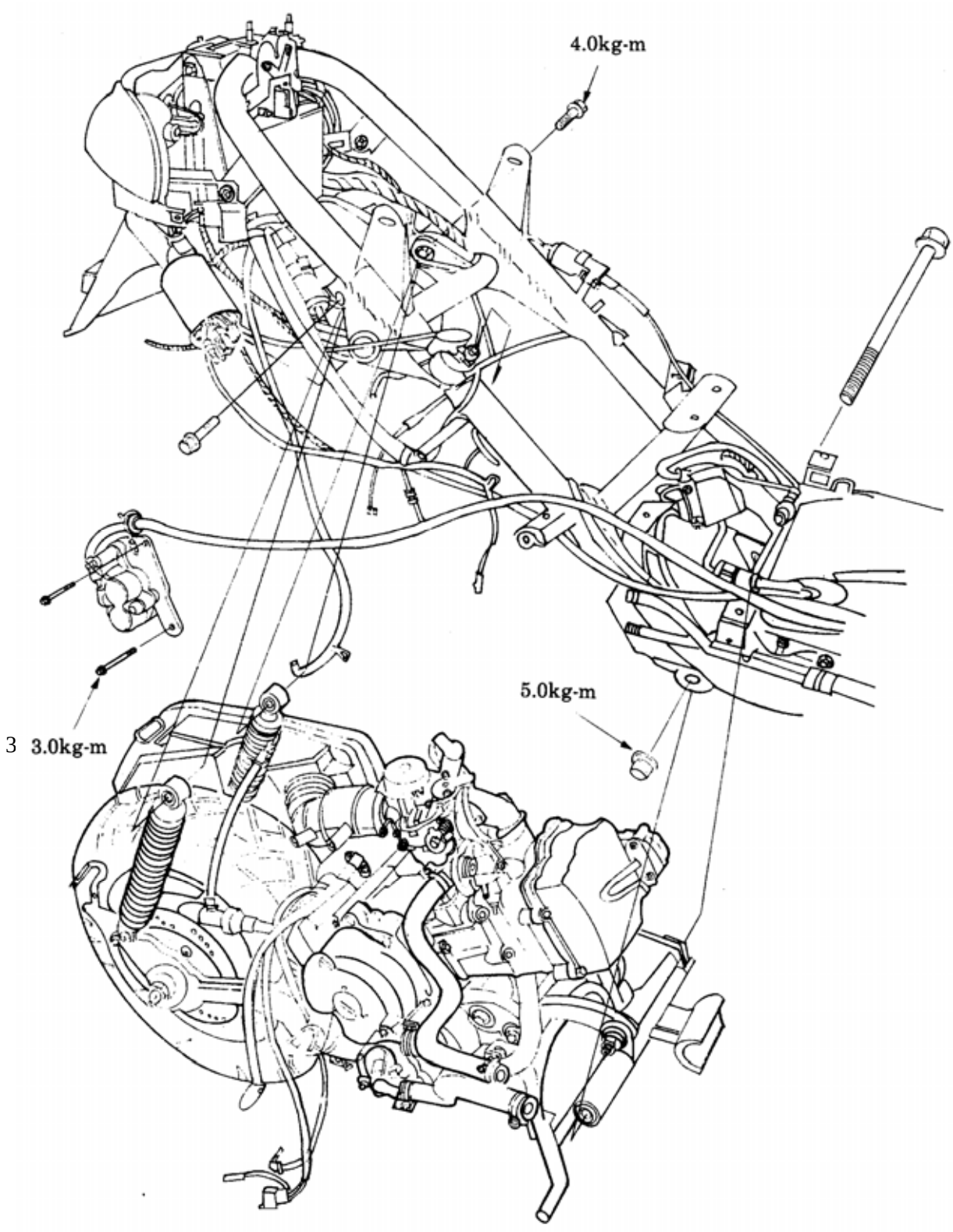
* Fit the tab of the separator cover into the slit in the separator.

Install the A.C. generator starter driven gear. (⇨10-5)

ENGINE REMOVAL/INSTALLATION

5. ENGINE REMOVAL/INSTALLATION

SCHEMATIC DRAWING



5. ENGINE REMOVAL/INSTALLATION

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- A floor jack or other adjustable support is required to support and maneuver the engine. Be careful not to damage the motorcycle body, cables and wires during engine removal.
- Use shop towels to protect the motorcycle body during engine removal.
- Drain the coolant before removing the engine.
- After the engine is installed, fill the cooling system with coolant and be sure to bleed air from the water jacket. Start the engine to check for coolant leaks.
- Before removing the engine, the rear brake caliper must be removed first. Be careful not to bend or twist the brake fluid tube.

SPECIFICATIONS

Engine dry weight: 30kg

Engine oil capacity: at disassembly: 1.1 liter

Coolant capacity:

Total capacity	: 1165cc
Radiator capacity	: 825cc
Reserve tank capacity	: 340cc

TORQUE VALUES

Engine mounting bolt	5.0kg-m
Rear shock absorber upper mount bolt	4.0kg-m

ENGINE REMOVAL

Disconnect the battery negative cable.
Remove the frame body cover. (⇨2-3)
Disconnect the engine negative cable.
Disconnect all of the A.C. generator, auto bystarter, spark plug, thermosensor wire couplers and connectors.
Disconnect the engine fuel tube.
Drain the coolant. (⇨3-9)
Disconnect the water hose.

Wire Connectors

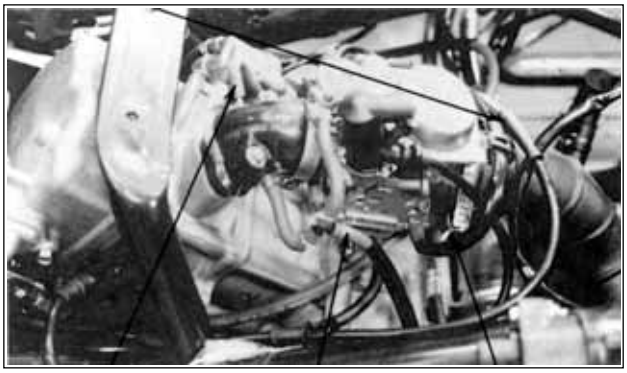
Rear Brake Caliper

Disconnect the starter motor wire that goes to the starter relay.

Starter Relay

Disconnect the fuel tube and vacuum tube that go to the carburetor from the fuel pump.
Disconnect the vacuum tube from the air injection cut-off valve (AICV).
Disconnect the throttle cable from the carburetor.

Throttle Cable



Fuel Pump Vacuum Tube AICV Vacuum Tube Fuel Tube

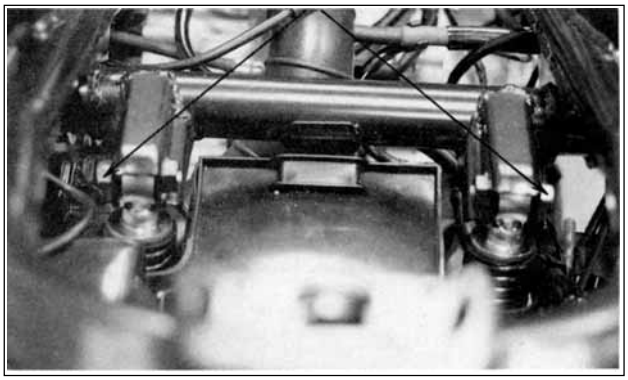
Remove the brake fluid tube bolt of the rear brake caliper.
Remove the rear brake caliper bolt and the rear brake caliper.

Brake Fluid Tube

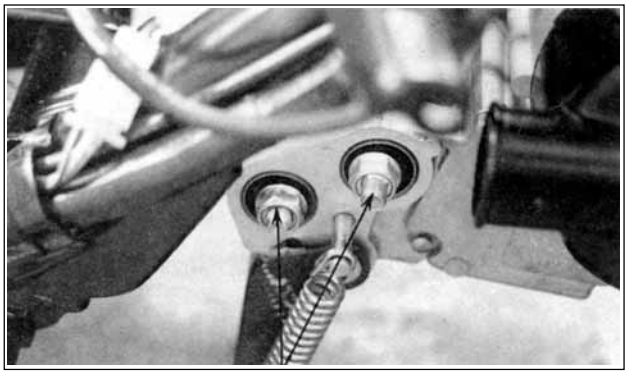
Rear Brake Caliper

Remove the right/left rear shock absorber upper mount bolts.

Rear Shock Absorber Upper Mount Bolts



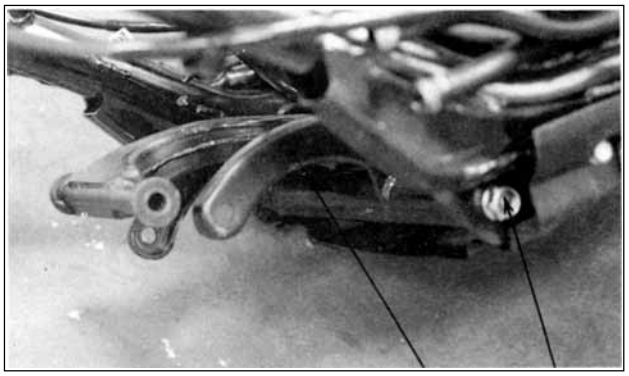
Remove the two engine mounting bolts and pull out the engine with the engine hanger backward.



Engine Hanger Bolt Engine Mounting Bolt

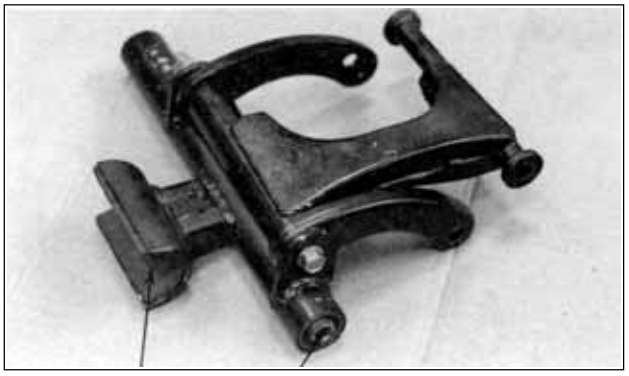
ENGINE HANGER REMOVAL

Remove the engine hanger bolts to remove the engine hanger.



Engine Hanger Bolt

Inspect the engine hanger bushings and stopper rubber for wear or damage.

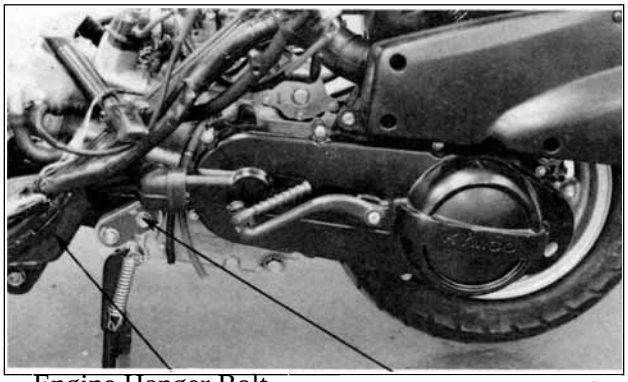


Stopper Rubber Bushings

ENGINE INSTALLATION

Install the engine in the reverse order of removal.
Tighten the engine mounting bolts.

Torque: 5.0kg-m



Engine Hanger Bolt

Engine Mounting Bolt

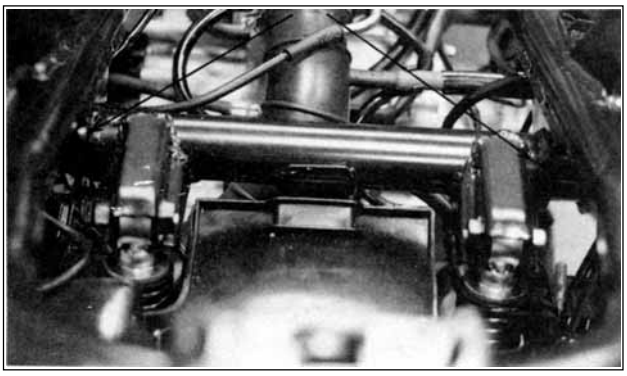
Rear Shock Absorber Upper Mount Bolts

Tighten the rear shock absorber upper mount bolts.

Torque: 4.0kg-m

After installation, inspect and adjust the following:

- Throttle grip free play (⇨3-3)
- Fill the rear brake reservoir with brake fluid and bleed air from the rear brake.
- Fill the cooling system with coolant and start the engine to bleed air from the system.

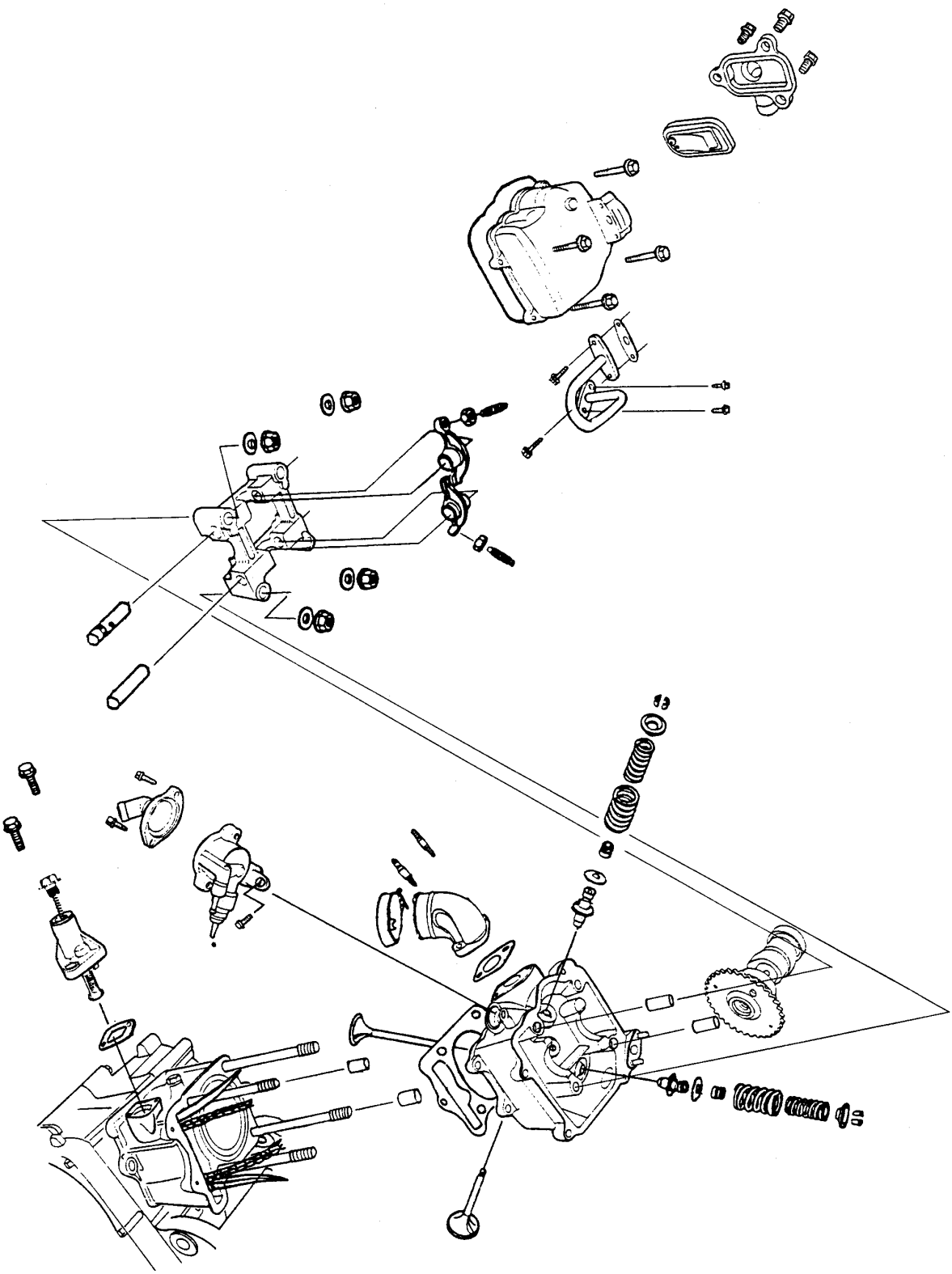


6

CYLINDER HEAD/VALVES

6. CYLINDER HEAD/VALVES

SCHEMATIC DRAWING



6. CYLINDER HEAD/VALVES

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- The cylinder head can be serviced with the engine installed in the frame. Coolant in the radiator and water jacket must be drained first.
- When assembling, apply molybdenum disulfide grease or engine oil to the valve guide movable parts and valve arm sliding surfaces for initial lubrication.
- The valve rocker arms are lubricated by engine oil through the cylinder head engine oil passages. Clean and unclog the oil passages before assembling the cylinder head.
- After disassembly, clean the removed parts and dry them with compressed air before inspection.
- After removal, mark and arrange the removed parts in order. When assembling, install them in the reverse order of removal.

SPECIFICATIONS

Item		Standard (mm)		Service Limit (mm)	
		SF30AA	SH25AA	SF30AA	SH25AA
Valve clearance (cold)	IN	0.10	0.10	—	—
	EX	0.10	0.10	—	—
Cylinder head compression pressure		16kg/cm² –		—	
Cylinder head warpage		—	—	0.05	0.05
Camshaft cam height	IN	30.800～30.920	30.800～30.920	30.75	30.75
	EX	30.411～30.531	30.411～30.531	30.26	30.26
Valve rocker arm I.D.	IN	12.00～12.015	12.00～12.015	12.10	12.10
	EX	12.00～12.015	12.00～12.015	12.10	12.10
Valve rocker arm shaft O.D.	IN	12.00～11.980	12.00～11.980	12.10	12.10
	EX	12.00～11.980	12.00～11.980	12.10	12.10
Valve seat width	IN	1.0	1.0	1.8	1.8
	EX	1.0	1.0	1.8	1.8
Valve stem O.D.	IN	5.00～5.012	5.00～5.012	4.925	4.925
	EX	5.00	5.00	4.925	4.925
Valve guide I.D.	IN	5.00～5.012	5.00～5.012	5.03	5.03
	EX	5.00～5.012	5.00～5.012	5.03	5.03
Valve stem-to-guide clearance	IN	0.010～0.037	0.010～0.037	0.08	0.08
	EX	0.030～0.057	0.030～0.057	0.10	0.10

TORQUE VALUES

Cylinder head cap nut	2.0kg-m	Apply engine oil to threads
Valve clearance adjusting nut	0.9kg-m	Apply engine oil to threads
Cylinder head cover bolt	0.8～1.2kg-m	

SPECIAL TOOLS

Valve spring compressor	
Valve seat cutter, 24.5mm	45° IN-EX
Valve seat cutter, 25mm	Plane cutter 37.5° EX
Valve seat cutter, 22mm	Plane cutter 37.5° EX
Valve seat cutter, 26mm	Plane cutter 63.5° IN/EX
Cutter clip	
Valve guide driver	
Valve guide reamer	

TROUBLESHOOTING

- The poor cylinder head operation can be diagnosed by a compression test or by tracing engine top-end noises.

Poor performance at idle speed
- Compression too low

Compression too low
- Incorrect valve clearance adjustment
- Burned or bend valves
- Incorrect valve timing
- Broken valve spring
- Poor valve and seat contact
- Leaking cylinder head gasket
- Warped or cracked cylinder head
- Poorly installed spark plug

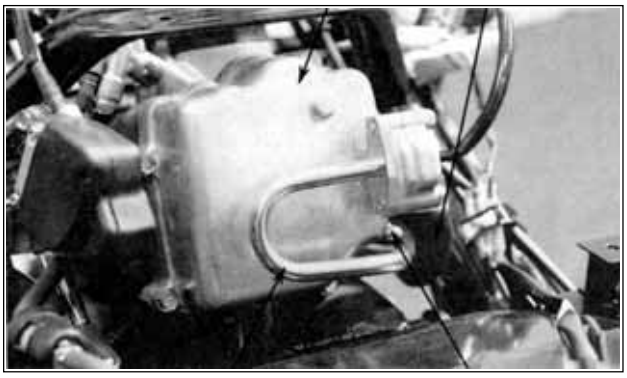
Compression too high
- Excessive carbon build-up in combustion chamber

White smoke from exhaust muffler
- Worn valve stem or valve guide
- Damaged valve stem oil seal

Abnormal noise
- Incorrect valve clearance adjustment
- Sticking valve or broken valve spring
- Damaged or worn camshaft
- Worn cam chain tensioner
- Worn camshaft and rocker arm

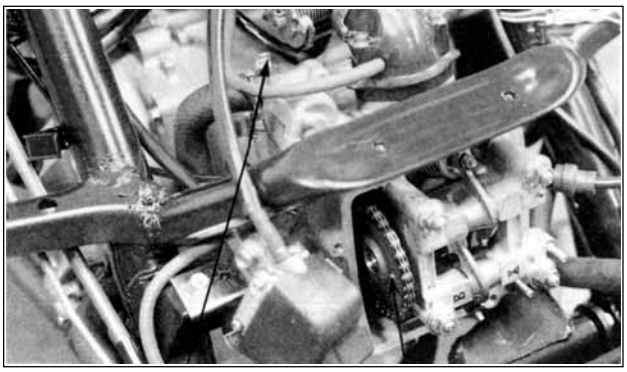
CYLINDER HEAD COVER REMOVAL

Remove the center cover. (⇨2-3)
Remove the met-in box. (⇨2-3)
Remove the secondary air inlet hose connector.
Remove the secondary air inlet tube bolt.
Remove the cylinder head cover bolts and then remove the cylinder head cover.



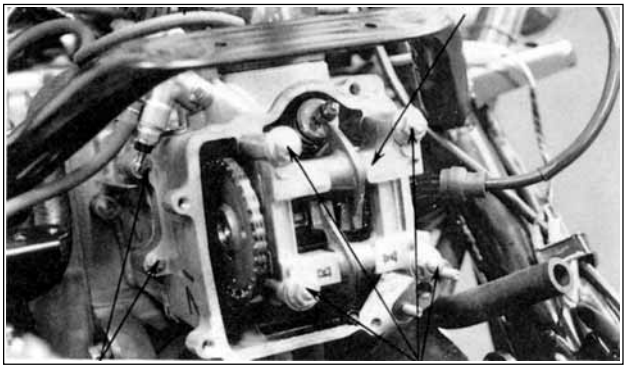
CAMSHAFT REMOVAL

Turn the A.C. generator flywheel so that the "T" mark on the flywheel aligns with the index mark on the crankcase.
Hold the round hole on the camshaft gear facing up and the location is the top dead center on the compression stroke.
Remove the two bolts attaching cam chain tensioner and the tensioner.

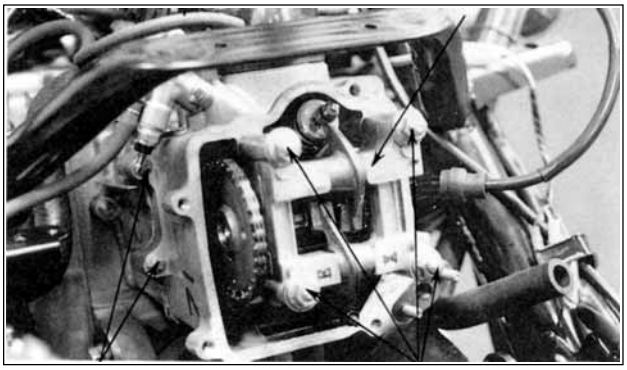


First remove the two bolts between the cylinder head and cylinder.
Then, remove the four cap nuts attaching the cylinder head.

* • Diagonally loosen the cylinder head cap nuts in 2 or 3 times.

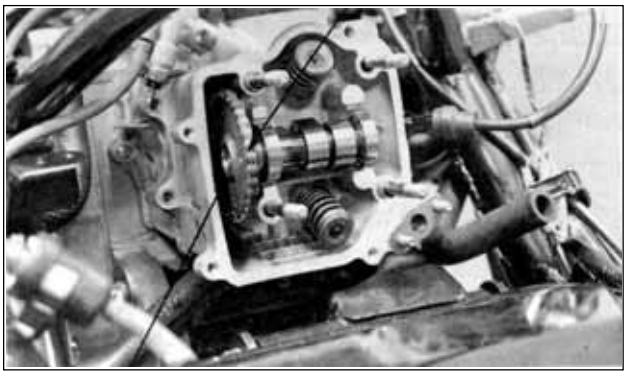


Remove the camshaft holder and dowel pins.



Remove the camshaft gear from the cam chain to remove the camshaft.

Cam Chain



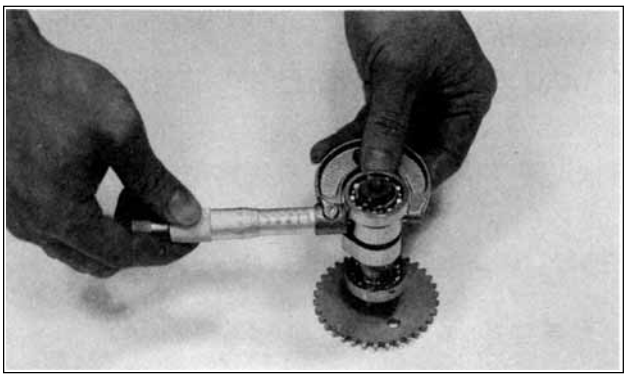
Camshaft Gear

CAMSHAFT INSPECTION

Check each cam lobe for wear or damage.
Measure the cam lobe height.

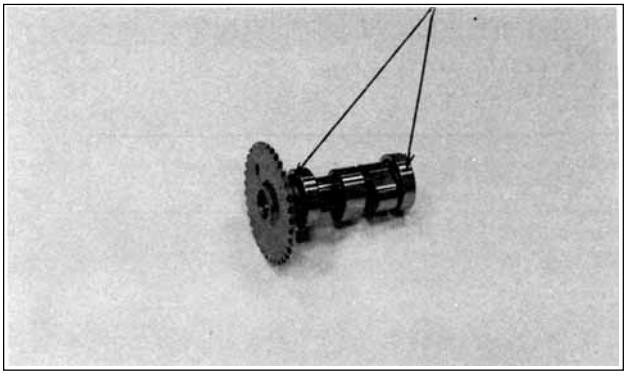
Service Limits:

SF30AA	IN: 30.75mm replace if below
SH25AA	EX:30.26mm replace if below



Camshaft Bearings

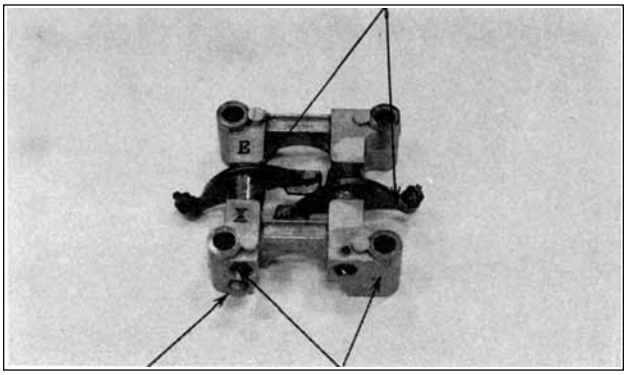
Check each camshaft bearing for play or damage. Replace the camshaft assembly with a new one if the bearings are noisy or have excessive play.



CAMSHAFT HOLDER DISASSEMBLY

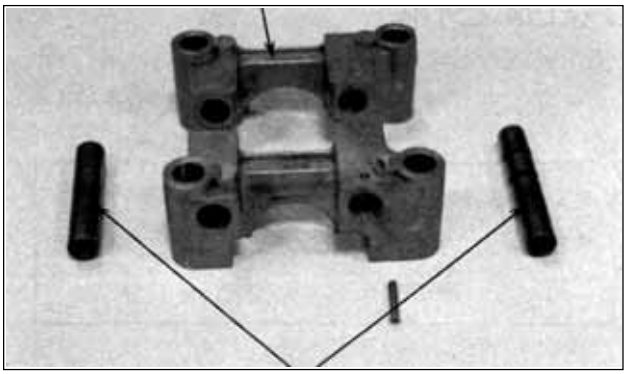
Take out the valve rocker arm shafts using a 5mm bolt.
Remove the valve rocker arms.

Valve Rocker Arms



5mm Bolt Rocker Arm Shafts

Camshaft Holder



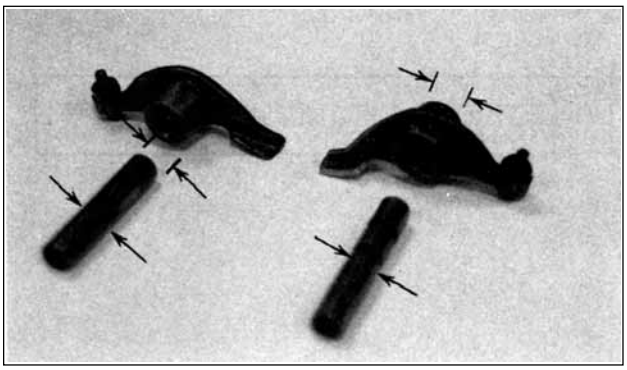
Rocker Arm Shafts

CAMSHAFT HOLDER INSPECTION

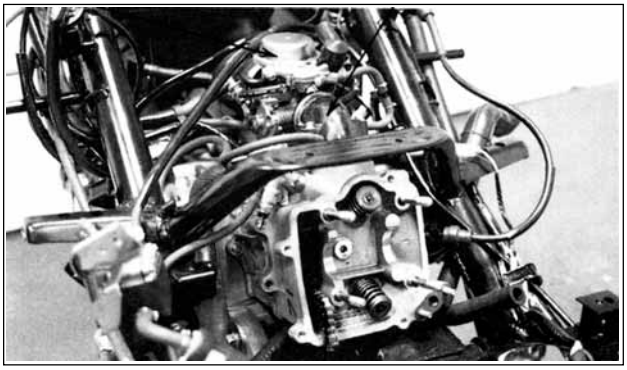
Inspect the camshaft holder, valve rocker arms and rocker arm shafts for wear or damage.

* If the valve rocker arm contact surface is worn, check each cam lobe for wear or damage.

Measure the I.D. of each valve rocker arm.
Service Limits: IN: 12.10mm replace if over
EX: 12.10mm replace if over
Measure each rocker arm shaft O.D.
Service Limits: IN: 12.10mm replace if over
EX: 12.10mm replace if over



Carburetor Intake Manifold



Cam Chain

Cam Chain Tensioner Slipper

Cylinder Cam Chain Guide Cylinder Head Gasket

CYLINDER HEAD REMOVAL

First drain the coolant from the radiator and water jacket, then remove the thermostat water hose.
Remove the camshaft. (⇨6-4)
Remove the carburetor and intake manifold.
Remove the bolt attaching the thermostat housing and the thermostat housing.
Remove the cylinder head.

Remove the dowel pins and cylinder head gasket.
Remove the cam chain guide.
Remove all gasket material from the cylinder head mating surface.

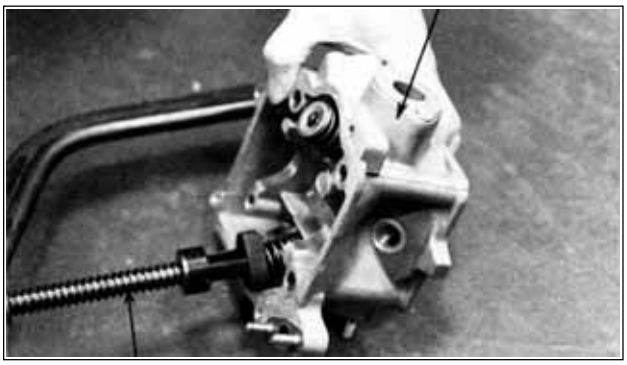
* Be careful not to drop any gasket material into the engine.

CYLINDER HEAD DISASSEMBLY

Remove the valve spring cotters, retainers, springs, spring seats and valve stem seals using a valve spring compressor.

* • Be sure to compress the valve springs with a valve spring compressor.
  • Mark all disassembled parts to ensure correct reassembly.

Cylinder Head

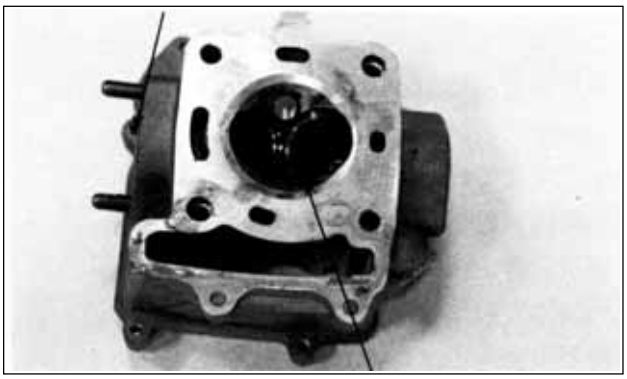


Valve Spring Compressor

Remove carbon deposits from the exhaust port and combustion chamber.

* Be careful not to damage the cylinder head mating surface.

Exhaust Port



Combustion Chamber

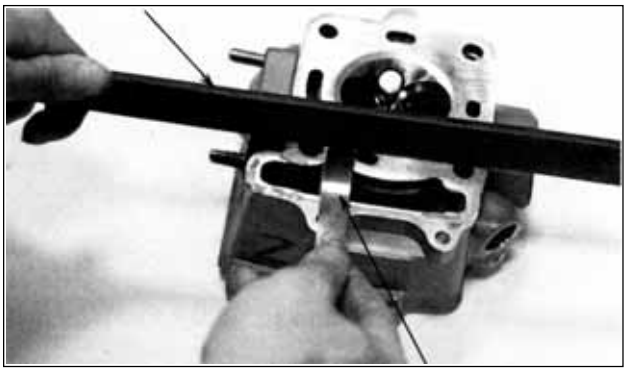
INSPECTION

CYLINDER HEAD

Check the spark plug hole and valve areas for cracks.
Check the cylinder head for warpage with a straight edge and feeler gauge.

Service Limit: 0.05mm repair or replace if over

Straight Edge

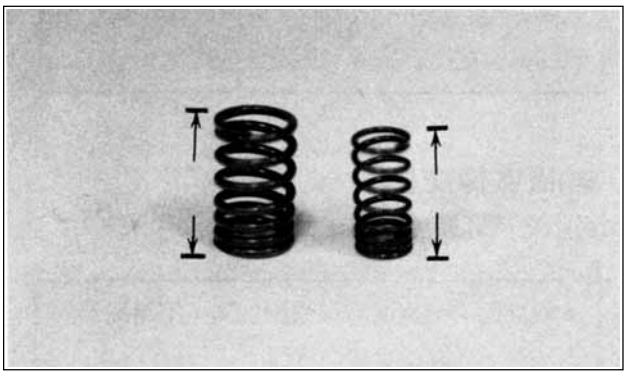


Feeler Gauge

VALVE SPRING FREE LENGTH

Measure the free length of the inner and outer valve springs.

Service Limits:
Inner (IN, EX) : 29.1mm replace if below
Outer (IN, EX): 31.5mm replace if below

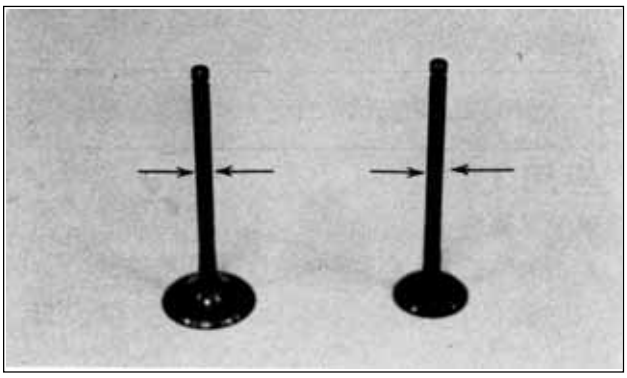


VALVE /VALVE GUIDE

Inspect each valve for bending, burning, scratches or abnormal stem wear.
Check valve movement in the guide.

Measure each valve stem O.D.

Service Limits: IN: 5.03mm replace if below
EX: 5.03mm replace if below

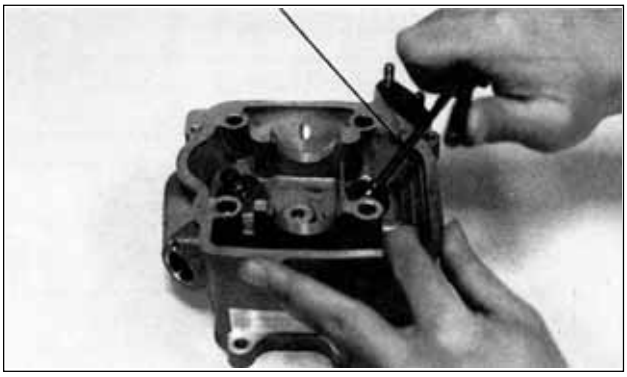


Valve Guide Reamer

Ream the guides to remove any carbon build-up using a valve guide reamer.

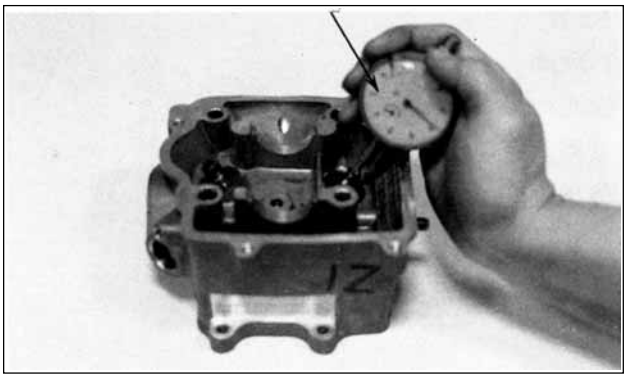
Special Tool

Valve Guide Reamer



* During this operation, rotate the reamer clockwise and do not insert or remove it straight when it is stopped.

Micrometer



Measure each valve guide I.D.

Service Limits: IN: 5.03mm replace if over
EX: 5.03mm replace if over

Subtract each valve stem O.D. from the corresponding guide I.D. to obtain the stem-to-guide clearance.

Service Limits: IN: 0.08mm replace if over
EX: 0.10mm replace if over

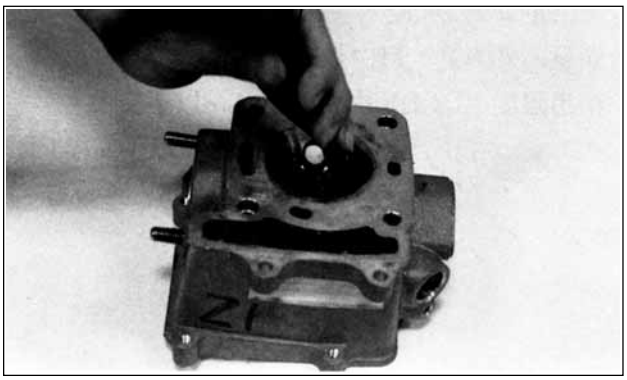
* If the stem-to-guide clearance exceeds the service limits, replace the guides as necessary. Reface the valve seats whenever the valve guides are replaced.

VALVE GUIDE REPLACEMENT

Heat the cylinder head to 100～150℃ for this operation.

* • The cylinder head must be heated evenly and rapidly to avoid warpage.
  • Wear heavy gloves when handling the heated cylinder head to avoid burns.

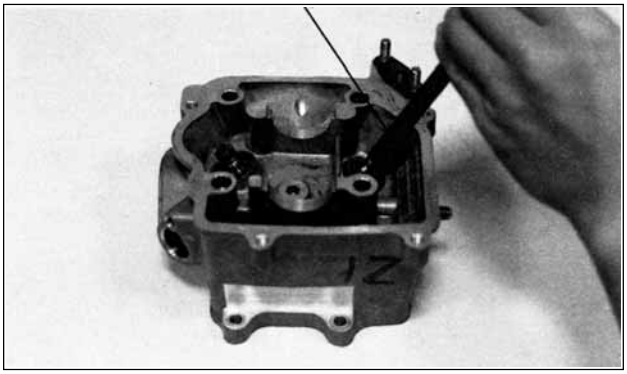
Valve Guide Driver



Drive out the old valve guides.

* Be careful not to damage the cylinder head mating surface.

Valve Guide Driver



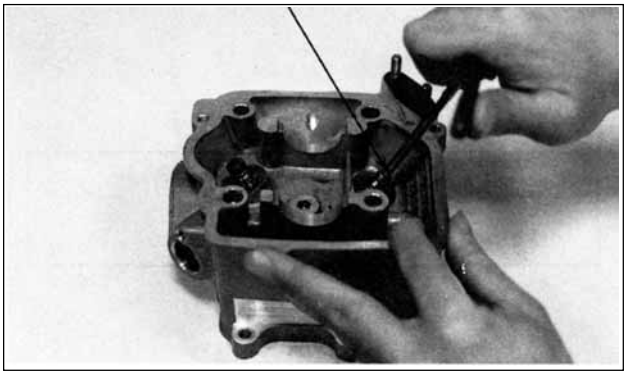
Special Tool

Valve Guide Driver

Apply engine oil to a new O-ring and drive a new valve guide into the cylinder head from the camshaft side.
The cylinder head should still be hot for installation a new guide.

* • Be careful not to damage the cylinder head mating surface.
  • After drive in the new guide, check it for damage.

Valve Guide Reamer



Ream the new valve guides with a valve guide reamer.

* • Use cutting oil on the reamer during this operation.
  • Rotate the reamer clockwise and do not insert or remove it straight when it is stopped.

Clean the cylinder head and remove any metal particles.

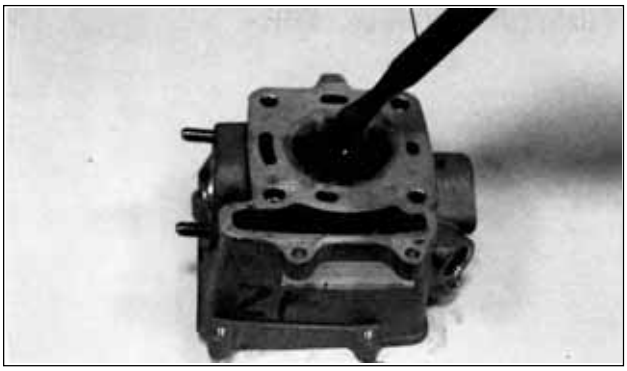
Valve Guide Reamer

VALVE SEAT INSPECTION AND REFACING

VALVE SEAT INSPECTION

Remove carbon deposits from the combustion chamber and valves.
Apply emery to each valve and valve seat contact face.
Lap each valve using a hand lapper.
If the valve face is rough, worn unevenly, or contacts the seat improperly, the valve must be replaced.

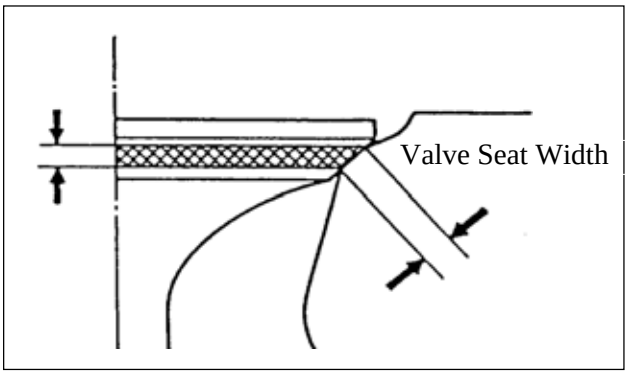
Hand Lapper



Inspect the valve seat width.

Service Limit: 1.8mm replace if over

If the seat is too wide or too narrow, the seat must be ground using a valve seat cutter.

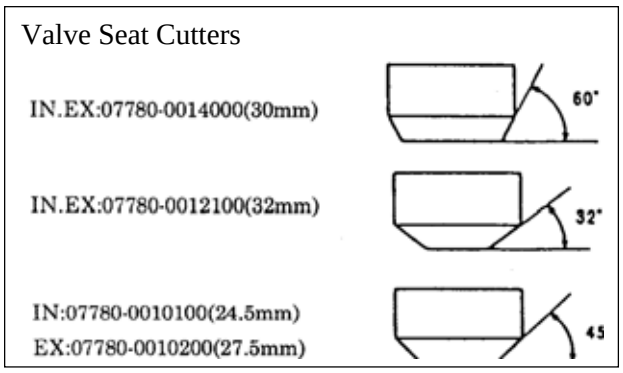


VALVE SEAT CUTTERS

Refer to the Instructions supplied with the Valve Seat Refacing Equipment for details.
When refacing the seat, apply a force of 4～5kg to press the valve seat cutter for grinding operation.

* Apply engine oil to the cutter and reuse it after the grinding scraps are removed.

Valve Seat Cutters

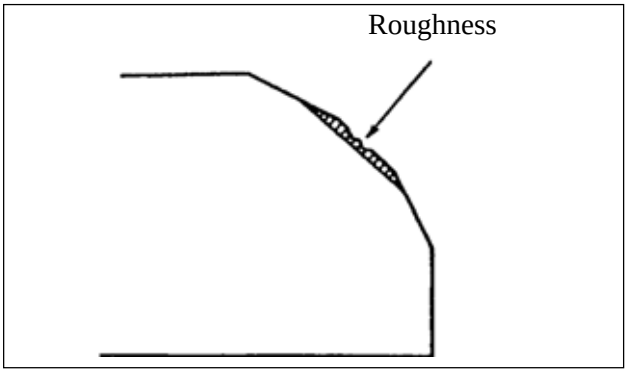


VALVE SEAT GRINDING

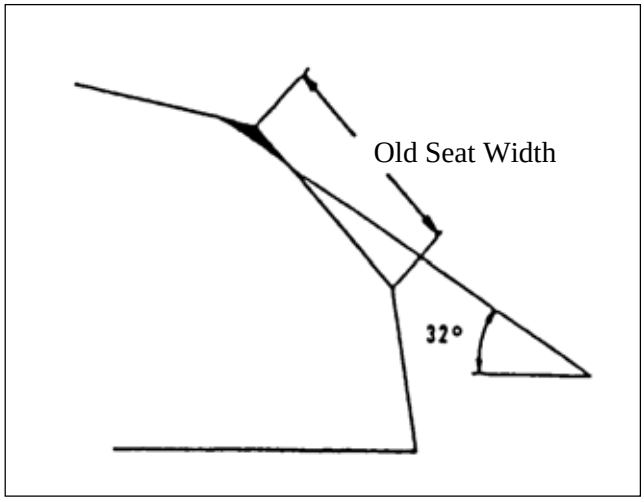
Remove any roughness or irregularities from the seat using a 45° cutter.

* Be careful not to grind too much.

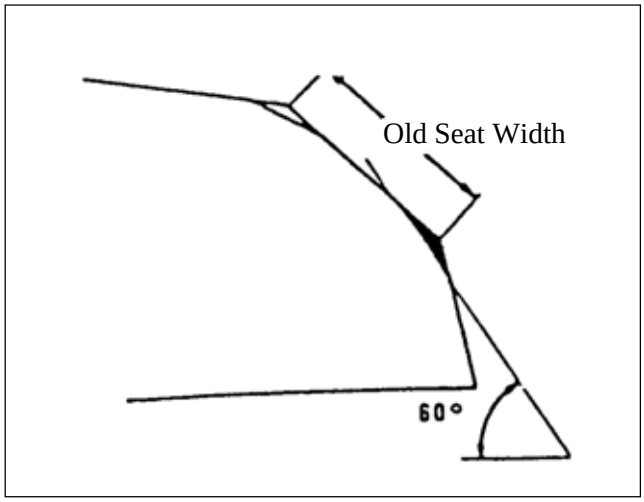
Roughness



Use a 32° cutter to remove the upper existing valve seat material.

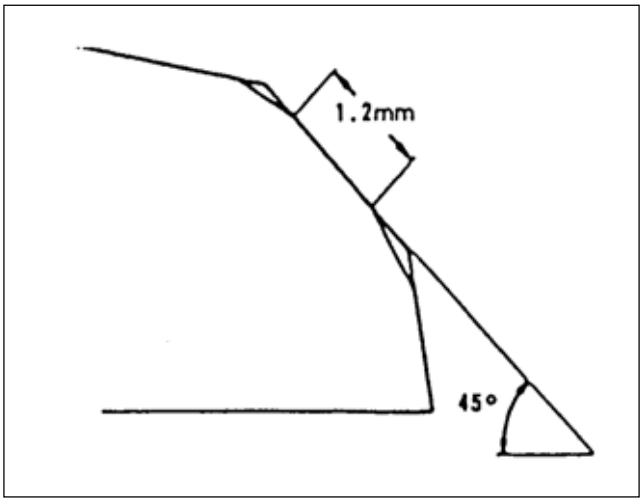


Use a 60° cutter to remove the lower existing valve seat material.



Install a 45° finish cutter and cut the seat to the proper width.

Standard Seat Width: 1.0mm

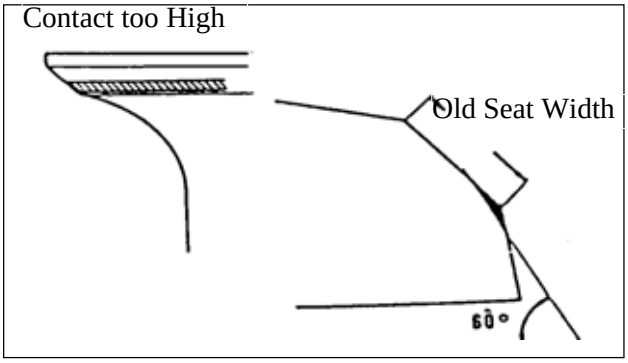


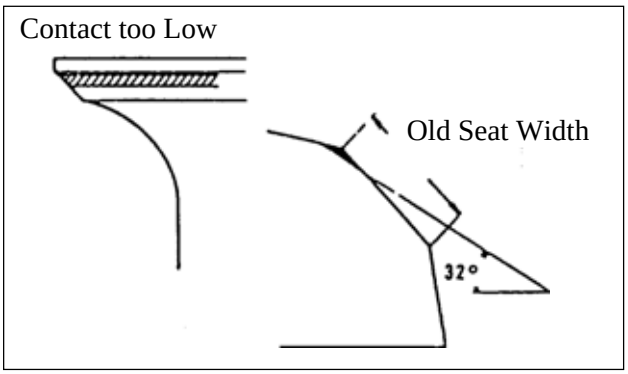
Inspect the valve seat contact area.
If the contact area is too high on the valve, the seat must be lowered using a 32° cutter.
If the contact area is too low on the valve, the seat must be raised using a 60° cutter.
Refinish the seat to specifications using a 45° seat cutter.

After cutting the seat, apply emery to each valve contact face and lap the valve.
After lapping, wash all residuals off the cylinder head and valves.

* • When lapping, use a light pressure and avoid damaging the valve seat due to forcedly lapping.
  • Use care not to allow emery to enter the valve stem and guide.

After refacing and lapping, apply red lead to the 45° valve seat to make sure that the center of the valve contact face is even.





CYLINDER HEAD ASSEMBLY

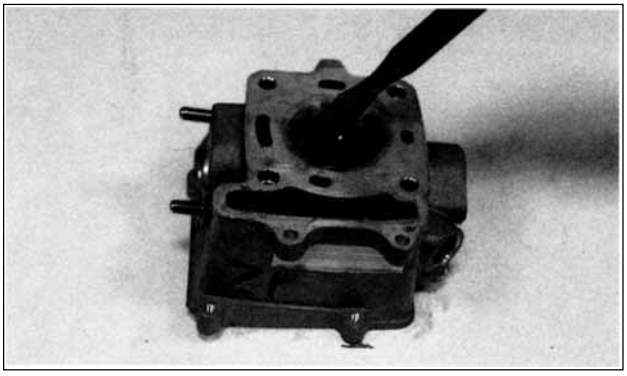
Install the valve spring seats and valve stem seals.

* Be sure to install new valve stem seals.

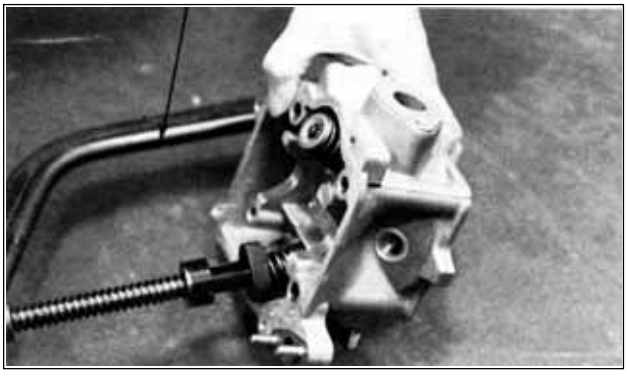
Apply engine oil to the inside of the valve stem seals and insert the valves into the valve guides.
Install the valve springs and retainers.
Compress the valve springs using the valve spring compressor, then install the valve cotters.

* • When assembling, a valve spring compressor must be used.
  • Install the cotters with the pointed ends facing down from the upper side of the cylinder head.

Special Tool
Valve Spring Compressor



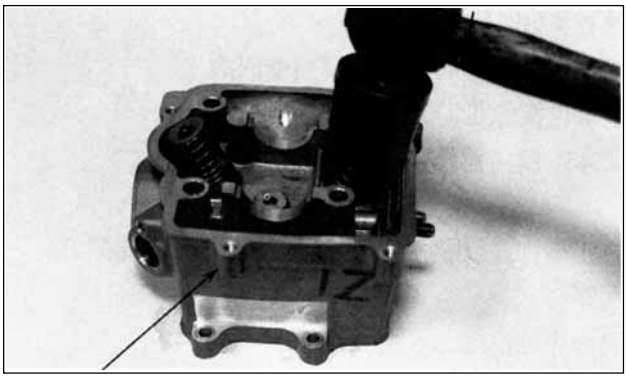
Valve Spring Compressor



Plastic Hammer

Tap the valve stems gently with a plastic hammer to firmly seat the cotters.

* Be careful not to damage the valves.

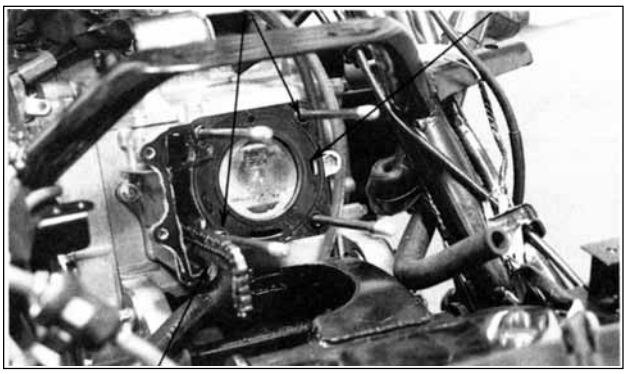


Cylinder Head

Dowel Pins Gasket

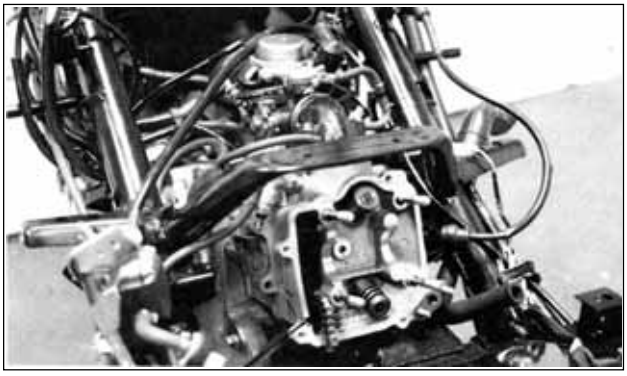
CYLINDER HEAD INSTALLATION

Install the cam chain guide.
Install the dowel pins and a new cylinder head gasket.



Cam Chain Guide

Install the cylinder head and take out the cam chain

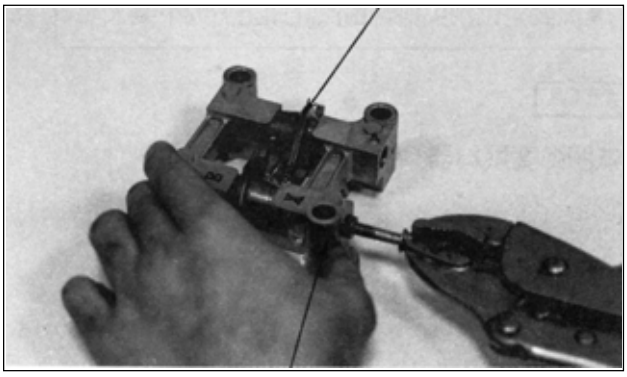


Cam Chain

Valve Rocker Arms

Assemble the camshaft holder.
First install the intake and exhaust valve rocker arms; then install the rocker arm shafts.

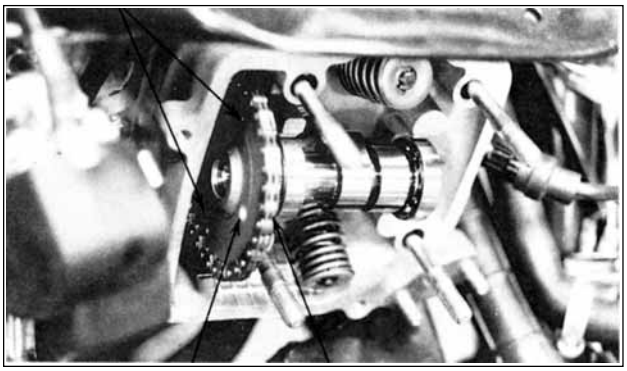
* • Install the exhaust valve rocker arm shaft on the “EX” side of the camshaft holder and the exhaust rocker arm shaft is shorter.
  • Clean the intake valve rocker arm shaft off any grease before installation.
  • Align the cutout on the exhaust valve rocker arm shaft with the bolt of the camshaft holder.



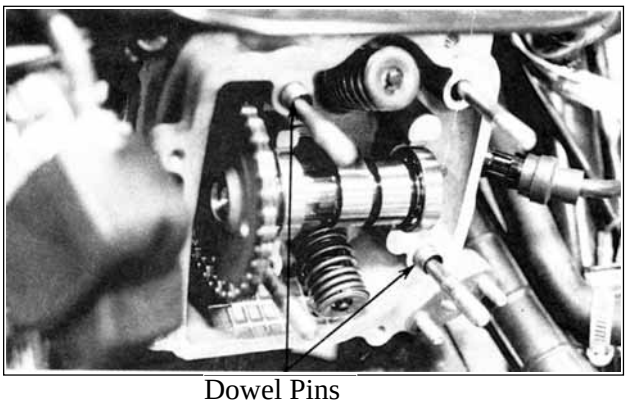
Camshaft Holder

CAMSHAFT INSTALLATION

Turn the A.C. generator flywheel so that the "T" mark on the flywheel aligns with the index mark on the crankcase.
Keep the round hole on the camshaft gear facing up and align the punch marks on the camshaft gear with the cylinder head surface (Position the intake and exhaust cam lobes down.) and install the cam chain over the camshaft gear.

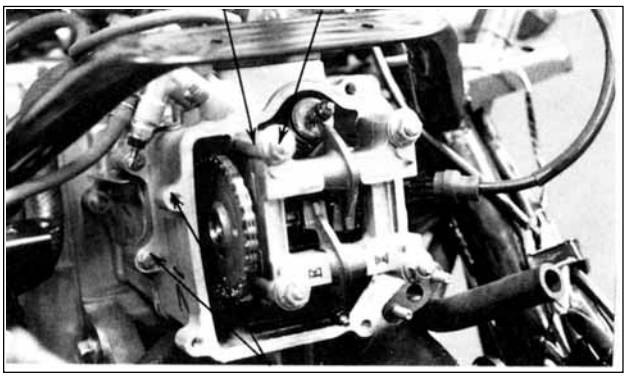


Install the dowel pins.



Install the camshaft holder, washers and nuts on the cylinder head.
Tighten the four cylinder head nuts and the two bolts between the cylinder head and cylinder.

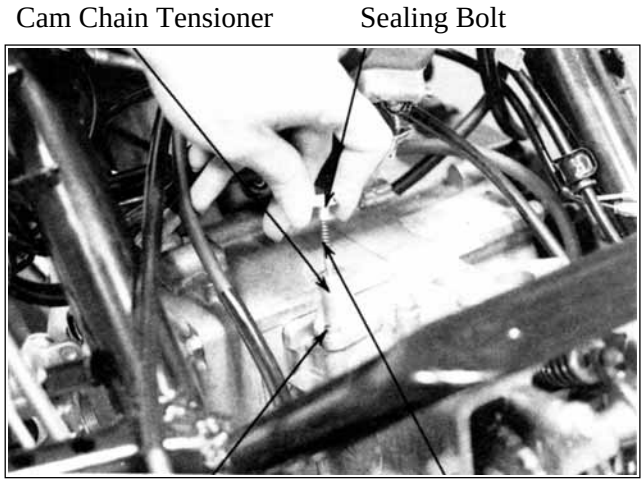
Torque: Cylinder head cap nut: 2.0kg-m
Cylinder & cylinder head bolt: 0.8 ～1.2kg-m



* • Apply engine oil to the threads of the cylinder head cap nuts.
  • Diagonally tighten the cylinder head cap nuts in 2～3 times.
  • First tighten the cylinder head cap nuts and then tighten the bolts between the cylinder and cylinder head to avoid cracks.

Install a new cam chain tensioner gasket.
Release the lock pawl and push the push rod all the way in.

Install the cam chain tensioner and tighten the two bolts.
Install the tensioner spring and tighten the sealing bolt.
Torque: 0.3～0.59kg-m

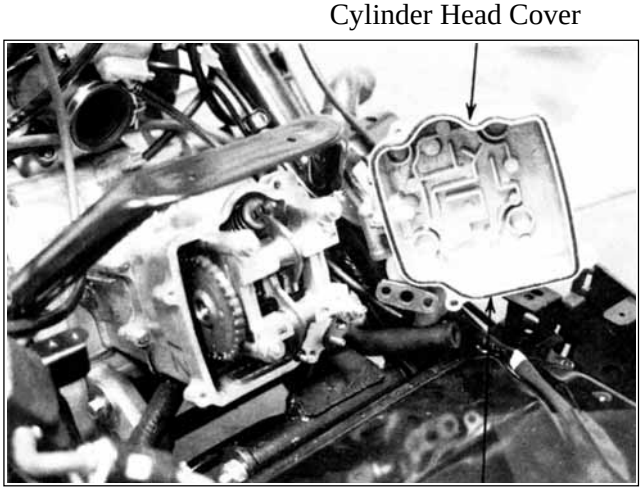


CYLINDER HEAD COVER INSTALLATION

Adjust the valve clearance. (⇨3-6)
Install a new cylinder head cover O-ring and install the cylinder head cover.

* Be sure to install the O-ring into the groove properly.

Install and tighten the cylinder head cover bolts.
Torque: 0.8～1.2kg-m
Install the secondary air system hose connector and tube.

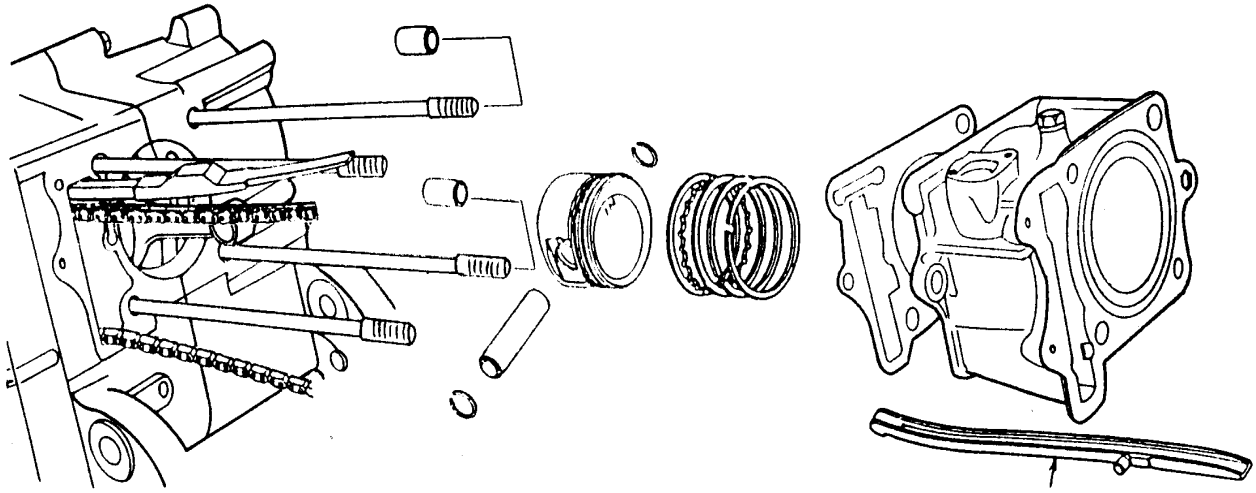


CYLINDER/PISTON

7

7. CYLINDER/PISTON

SCHEMATIC DRAWING



Do not bend

7. CYLINDER/PISTON

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- The cylinder and piston can be serviced with the engine installed in the frame.
- When installing the cylinder, use a new cylinder gasket and make sure that the dowel pins are correctly installed.
- After disassembly, clean the removed parts and dry them with compressed air before inspection.

SPECIFICATIONS

Item			Standard (mm)		Service Limit (mm)	
			SF30AA	SH25AA	SF30AA	SH25AA
Cylinder	I.D.		58.000～58.010	52.400～52.410	58.10	52.50
	Warpage		—	—	0.05	0.05
	Cylindricity		—	—	0.05	0.05
	True roundness		—	—	0.05	0.05
Piston, piston ring	Ring-to-groove clearance	top	0.015～0.050	0.015～0.050	0.09	0.09
		Second	0.015～0.050	0.015～0.050	0.09	0.09
	Ring end gap	top	0.15～0.30	0.15～0.30	0.50	0.50
		Second	0.15～0.30	0.15～0.30	0.50	0.50
		Oil side rail	0.2～0.9	0.2～0.9	—	—
	Piston O.D.		57.975～57.995	52.370～52.390	57.90	52.30
	Piston O.D. measuring position		9mm from bottom of skirt	9mm from bottom of skirt	9mm from bottom of skirt	9mm from bottom of skirt
.	Piston-to-cylinder clearance		0.010～0.040	0.010～0.040	0.01	0.01
	Piston pin hole I.D.		15.000～15.800	15.000～15.800	15.04	15.04
Piston pin O.D			14.994～15.000	14.994～15.000	14.96	14.96
Piston-to-piston pin clearance			0.002～0.014	0.002～0.014	0.02	0.02
Connecting rod small end I.D. bore			15.016～15.034	15.016～15.034	15.06	15.06

TROUBLESHOOTING

- When hard starting or poor performance at low speed occurs, check the crankcase breather for white smoke. If white smoke is found, it means that the piston rings are worn, stuck or broken.

Compression too low or uneven compression

- Worn or damaged cylinder and piston rings
- Worn, stuck or broken piston rings

Compression too high

- Excessive carbon build-up in combustion chamber or on piston head

Excessive smoke from exhaust muffler

- Worn or damaged piston rings
- Worn or damaged cylinder and piston

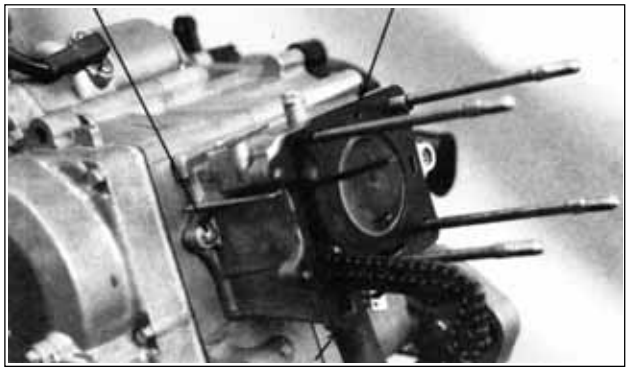
Abnormal noisy piston

- Worn cylinder, piston and piston rings
- Worn piston pin hole and piston pin
- Incorrectly installed piston

CYLINDER REMOVAL

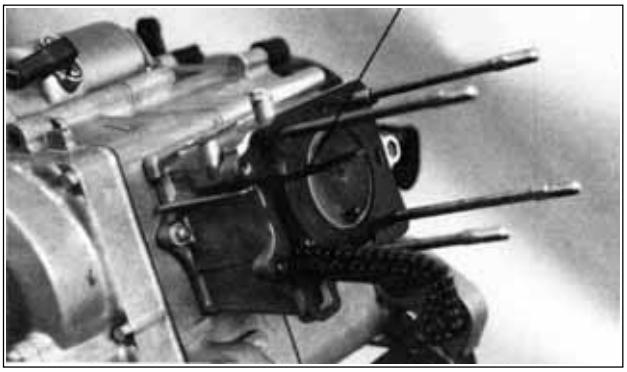
Remove the cylinder head. (⇨6-7)
Remove the water hose from the cylinder.
Remove the cylinder base bolt.

Cylinder Base Bolt Cylinder



Water Hose

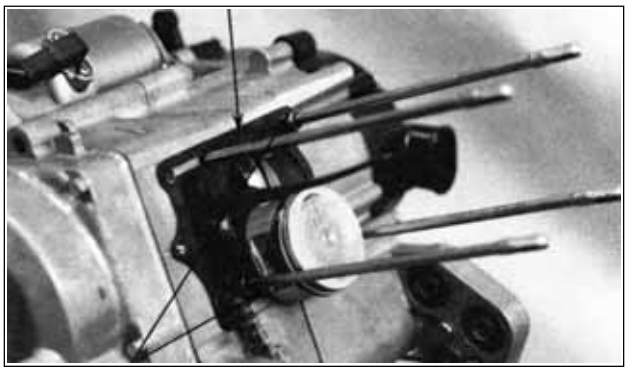
Remove the cam chain guide.
Remove the cylinder.



Cam Chain Guide

Gasket

Remove the cylinder gasket and dowel pins.
Clean any gasket material from the cylinder surface.



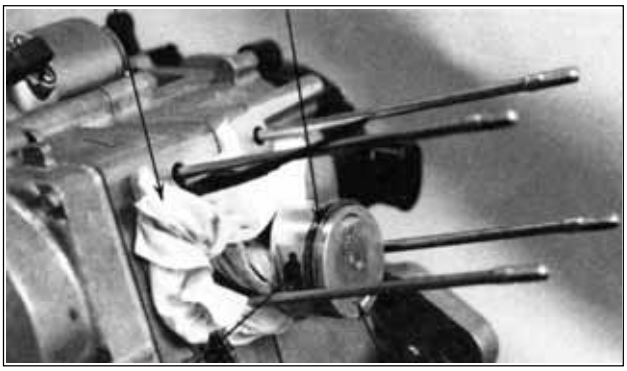
Dowel Pins

Shop Towel Piston Rings

PISTON REMOVAL

Remove the piston pin clip.
Press the piston pin out of the piston.

* Place a clean shop towel in the crankcase to keep the piston pin clip from falling into the crankcase.



Piston Pin Piston

Inspect the piston, piston pin and piston rings. Remove the piston rings.

* • Take care not to damage or break the piston rings during removal.

Clean carbon deposits from the piston ring grooves.

Install the piston rings onto the piston and measure the piston ring-to-groove clearance.

Service Limits:

Top: 0.09mm replace if over
2nd: 0.09mm replace if below

Remove the piston rings and insert each piston ring into the cylinder bottom.

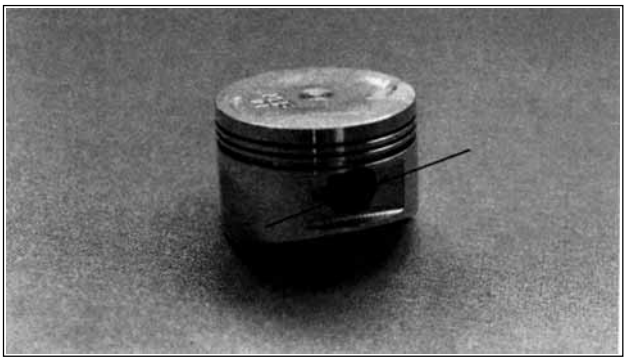
* • Use the piston head to push each piston ring into the cylinder.

Measure the piston ring end gap.

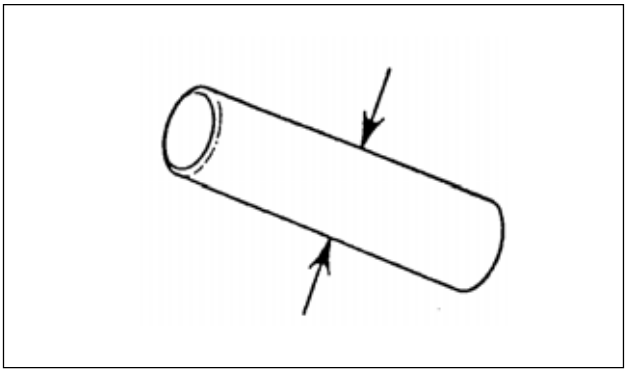
Service Limit: 0.5mm replace if over

Measure the piston pin hole I.D.

Service Limit: 15.04mm replace if below



Measure the piston pin O.D.
Service Limit: 14.96mm replace if below

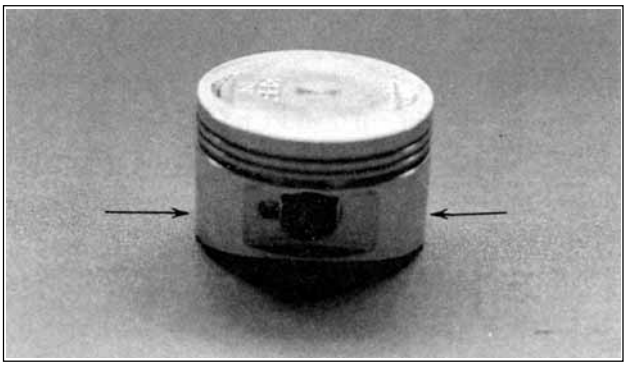


Measure the piston O.D.

* • Take measurement at 9mm from the bottom and 90° to the piston pin hole.

Service Limit: 57.90mm replace if below

SF30AA	57.90mm replace if below
SH25AA	52.3mm replace if below



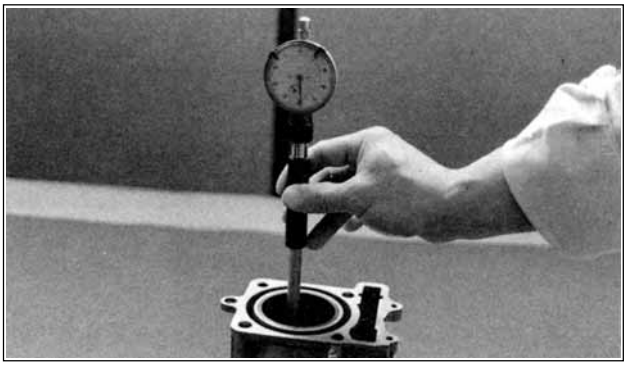
Measure the piston-to-piston pin clearance.
Service Limit: 0.02mm replace if below

CYLINDER INSPECTION

Inspect the cylinder bore for wear or damage. Measure the cylinder I.D. at three levels of top, middle and bottom at 90° to the piston pin (in both X and Y directions).

Service Limit: 58.10mm repair or replace if below

SF30AA	58.10mm repair or replace if below
SH25AA	52.50mm repair or replace if below



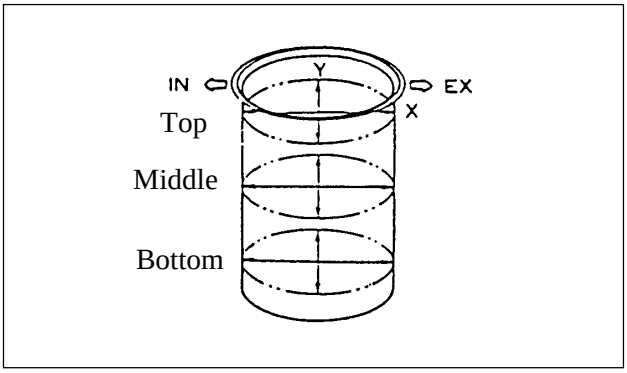
Measure the cylinder-to-piston clearance.
Service Limit: 0.1mm repair or replace if below

The true roundness is the difference between the values measured in X and Y directions. The cylindricity (difference between the values measured at the three levels) is subject to the maximum value calculated.

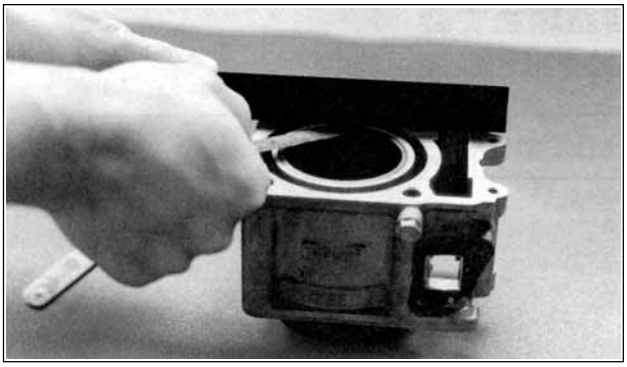
Service Limits:

True Roundness: 0.05mm repair or replace if over

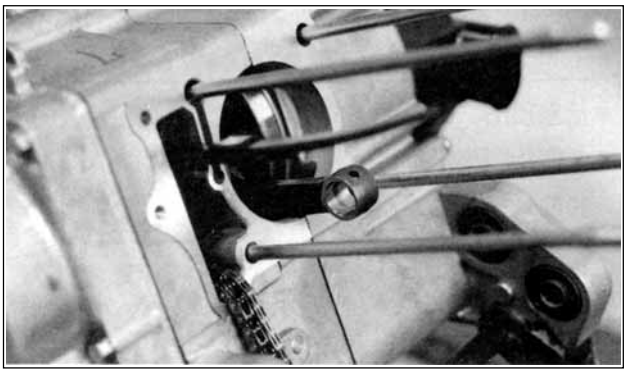
Cylindricity: 0.05mm repair or replace if over



Inspect the top of the cylinder for warpage.
Service Limit: 0.05mm repair or replace if below

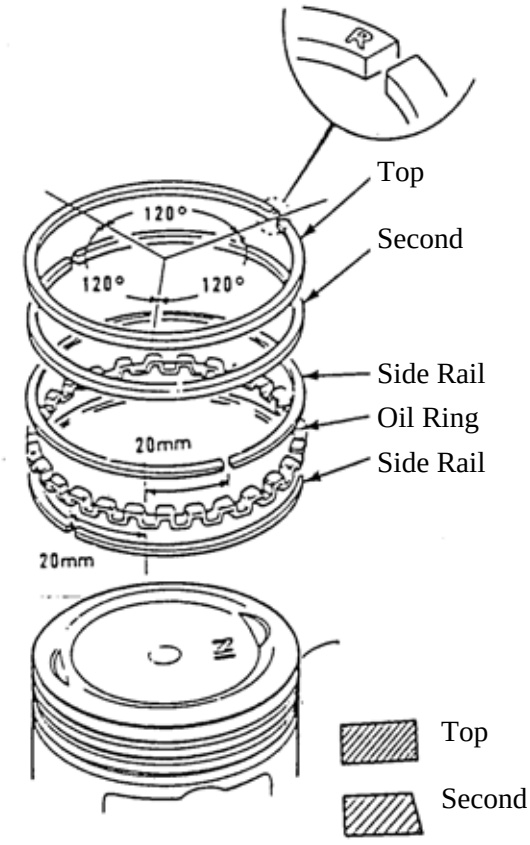


Measure the connecting rod small end I.D.
Service Limit: 15.06mm replace if below



PISTON RING INSTALLATION
Install the piston rings onto the piston.
Apply engine oil to each piston ring.

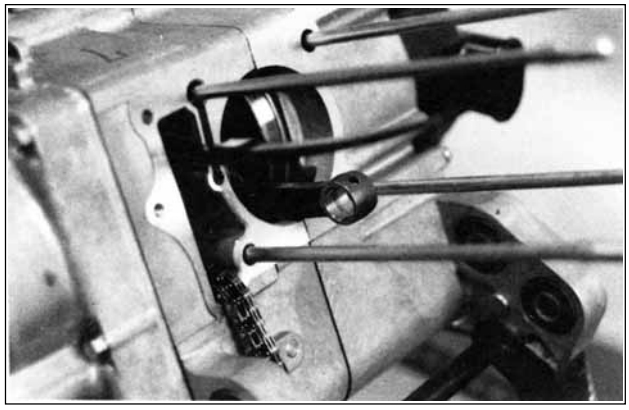
*
- Be careful not to damage the piston and piston rings during assembly.
- All rings should be installed with the markings facing up.
- After installing the rings, they should rotate freely without sticking.
- Stagger the ring end gaps as the figure shown.



PISTON INSTALLATION

Remove any gasket material from the crankcase surface.

* • Be careful not to drop foreign matters into the crankcase.



Piston Pin

Install the piston, piston pin and a new piston pin clip.

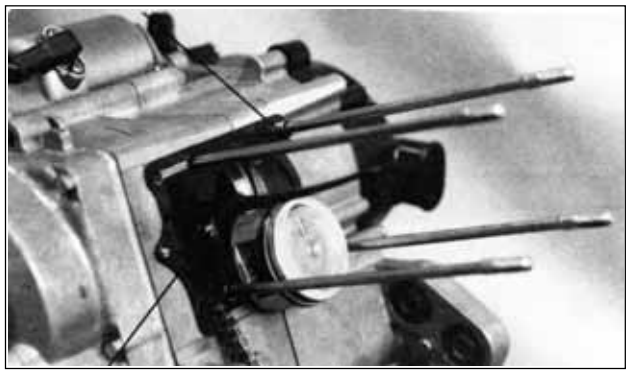
* • Position the piston “IN” mark on the intake valve side.
• Place a clean shop towel in the crankcase to keep the piston pin clip from falling into the crankcase.

Piston Pin Clip Piston

Dowel Pin

CYLINDER INSTALLATION

Install the dowel pins and a new cylinder gasket on the crankcase.

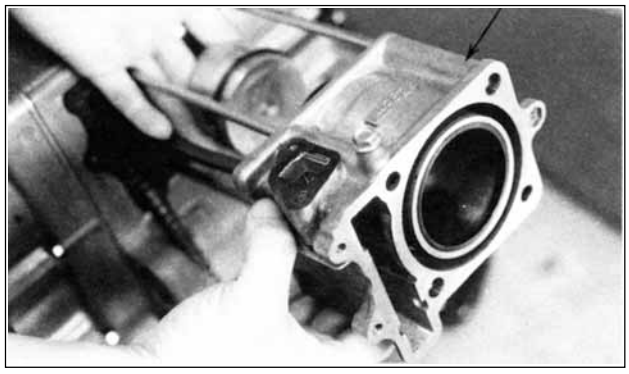


Gasket

Cylinder

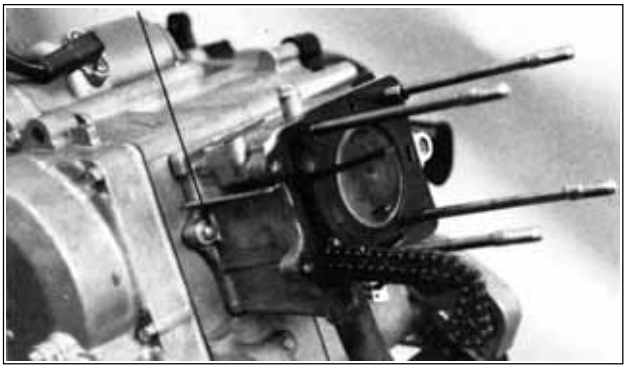
Coat the cylinder bore, piston and piston rings with clean engine oil.
Carefully lower the cylinder over the piston by compressing the piston rings.

* • Be careful not to damage or break the piston rings.
• The piston ring end gaps should not be parallel with or at 90° to the piston pin.



Loosely install the cylinder base bolt.

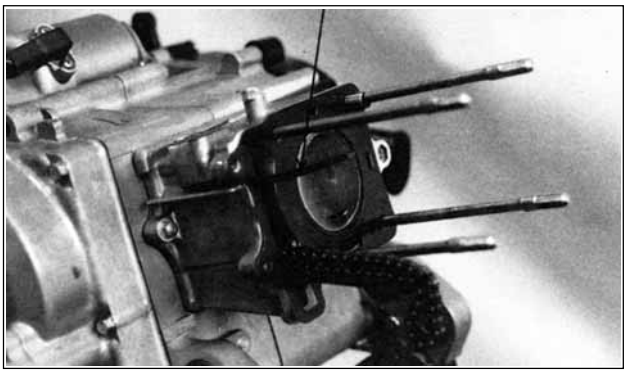
Cylinder Base Bolt



Install the cam chain guide.

* • Insert the tab on the cam chain guide into the cylinder groove.

Connect the water hose to the cylinder.
Install the cylinder head. (⇨6-13)
Tighten the cylinder base bolt.



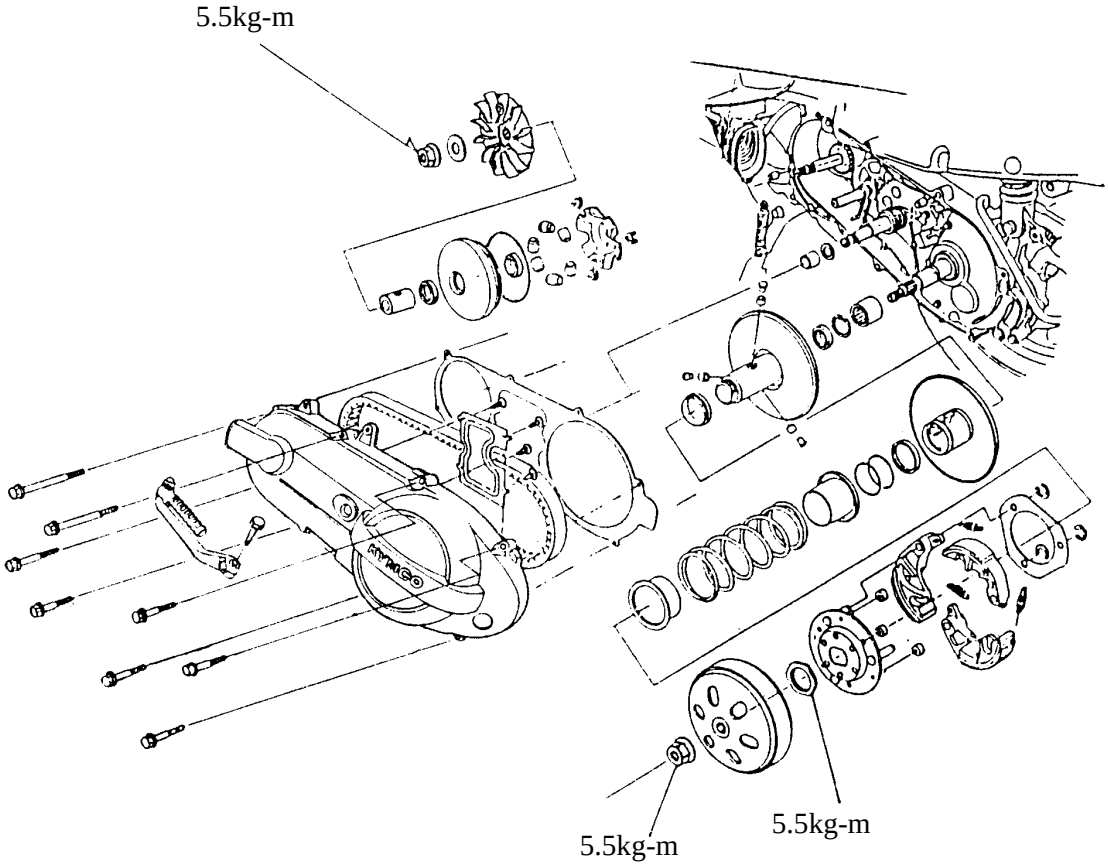
Cam Chain Guide

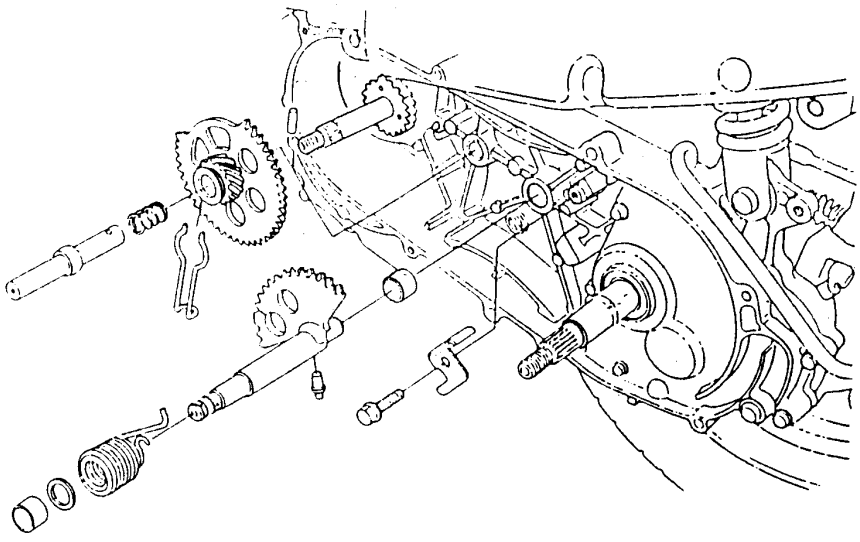
DRIVE AND DRIVEN PULLEYS/ KICK STARTER

8

8. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

SCHEMATIC DRAWING





8. DRIVE AND DRIVEN PULLEYS/ KICK STARTER

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- The drive pulley, clutch and driven pulley can be serviced with the engine installed.
- Avoid getting grease and oil on the drive belt and pulley faces. Remove any oil or grease from them to minimize the slipping of drive belt and drive pulley.

SPECIFICATIONS

Item	Standard (mm)	Service Limit (mm)
Movable drive face bushing I.D.	27.000～27.021	27.06
Drive face collar O.D.	26.970～26.990	26.94
Drive belt width	19.0	17.5
Clutch lining thickness	—	2.0
Clutch outer I.D.	130.0～130.2	130.5
Driven face spring free length	—	83.2
Driven face O.D.	33.965～33.985	33.94
Movable driven face I.D.	34.00～34.025	34.06
Weight roller O.D.	20.95～21.1	20.42

TORQUE VALUES

Drive face nut	5.0～6.0kg-m
Clutch outer nut	5.0～6.0kg-m
Clutch drive plate nut	5.0～6.0kg-m

SPECIAL TOOLS

Universal holder
Bearing driver
Clutch spring compressor
Lock nut wrench, 39mm
Kick starter spring remover

TROUBLESHOOTING

Engine starts but motorcycle won‘t move

- Worn drive belt
- Broken ramp plate
- Worn or damaged clutch lining
- Broken driven face spring

Engine stalls or motorcycle creeps

- Broken clutch weight spring

Lack of power

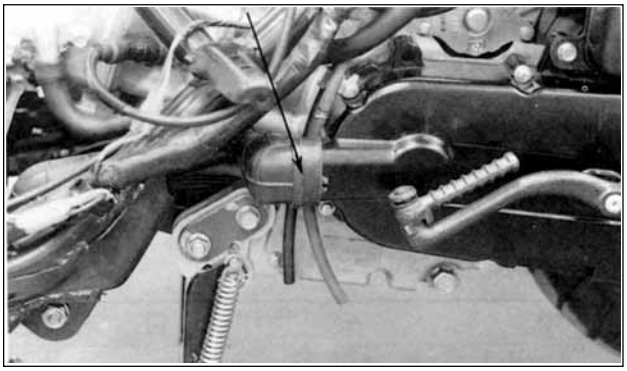
- Worn drive belt
- Weak driven face spring
- Worn weight roller
- Faulty driven face

LEFT CRANKCASE COVER

REMOVAL

Loosen the drive belt air tube band screw.

Air Tube Band



Remove the kick lever.
Remove the left crankcase cover bolts and left crankcase cover.
Remove the seal rubber and dowel pins.

Bolts

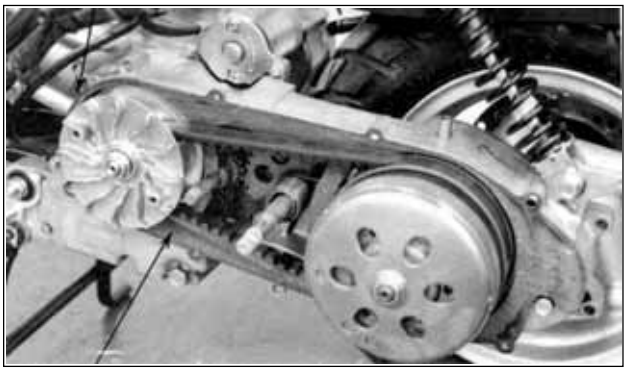
Kick Lever

Left Crankcase Cover

Dowel Pins

INSTALLATION

Install the dowel pins and the seal rubber.



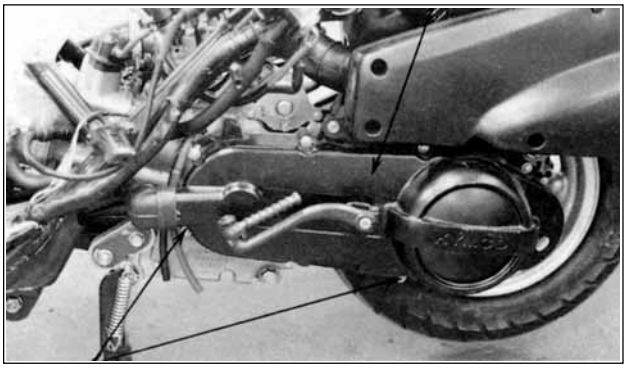
Seal Rubber

Left Crankcase Cover

Install the left crankcase cover.

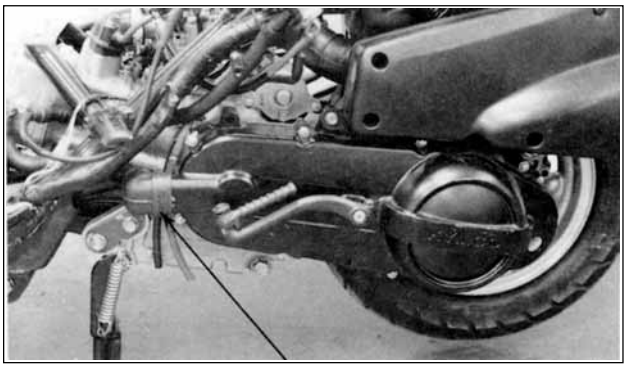
* • Do not pull out the kick starter spindle. Press in the kick starter spindle when installing the left crankcase cover.

Install the cable clamp to the specified location. Install and tighten the left crankcase cover bolts.



Bolts

Install the drive belt air tube and tighten the tube band screw.



Tube Band Screw

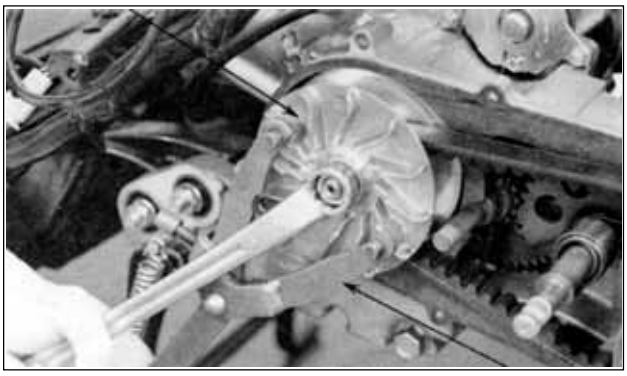
DRIVE PULLEY

REMOVAL

Remove the left crankcase cover.
Hold the drive pulley using an universal holder and remove the drive face nut and washer.
Remove the drive pulley face.

Special
Universal Holder

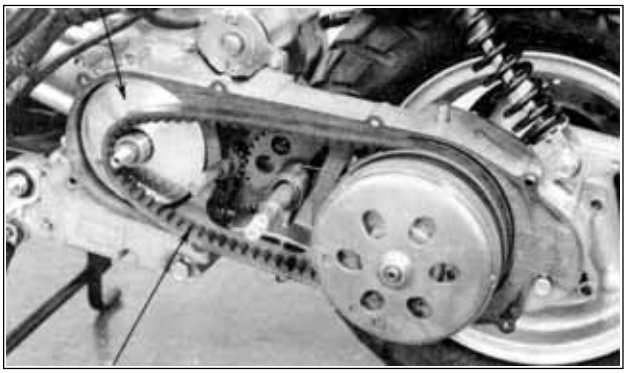
Drive Pulley Face



Universal Holder

Remove the drive belt from the movable drive face.

Movable Drive Face



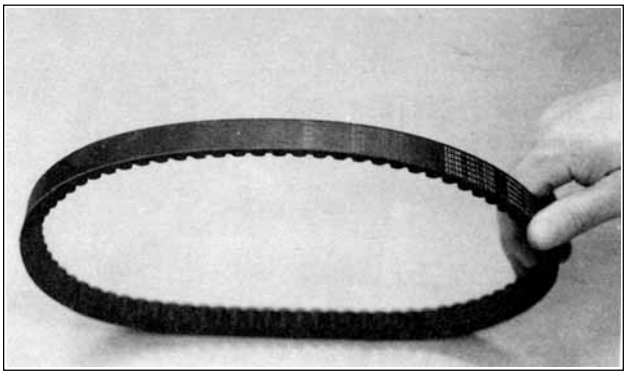
Drive Belt

INSPECTION

Check the drive belt for cracks, separation or abnormal or excessive wear.
Measure the drive belt width.

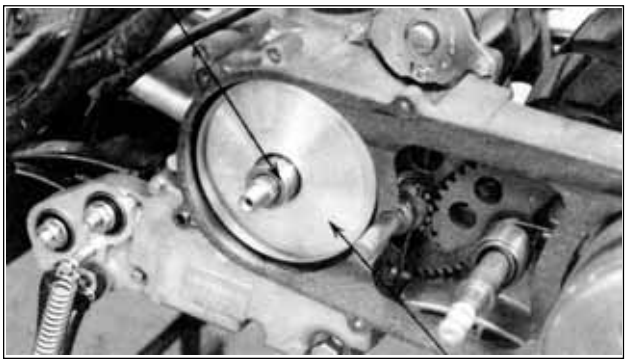
Service Limit: 17.5mm

* • Use specified genuine parts for replacement.



Drive Pulley Collar

Remove the movable drive face assembly.
Remove the drive pulley collar.

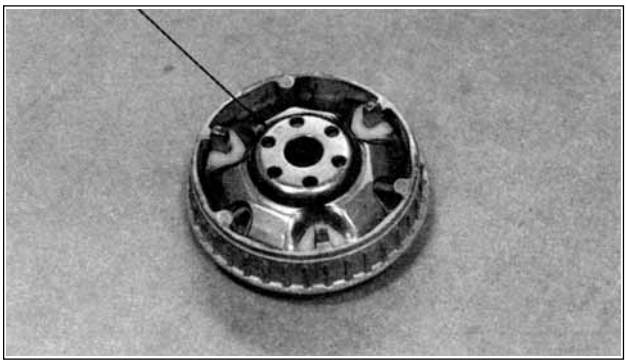


Movable Drive Face Assembly

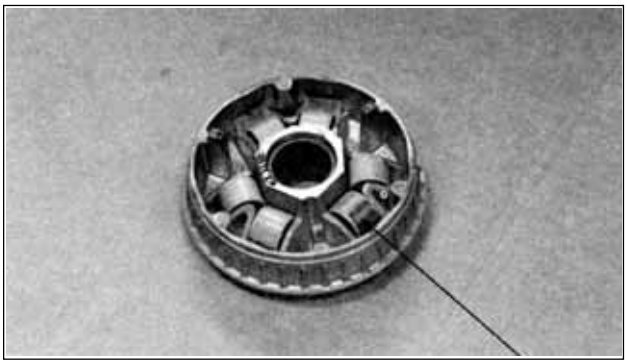
Ramp Plate

DISASSEMBLY

Remove the ramp plate.



Remove the weight rollers.

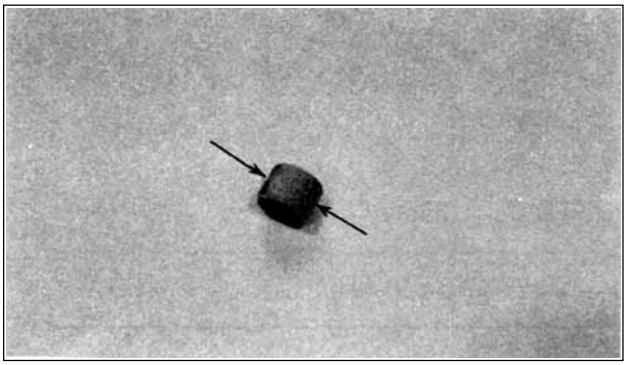


Weight Roller

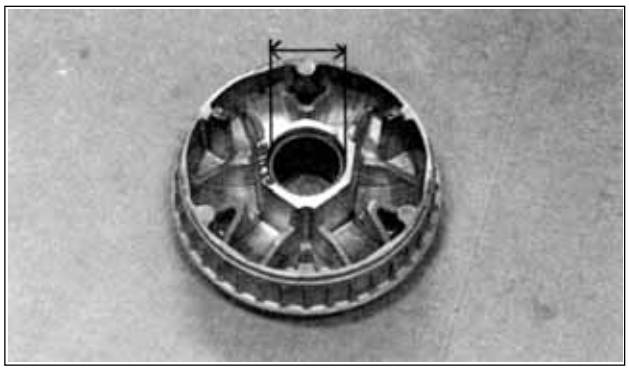
INSPECTION

Check each weight roller for wear or damage.
Measure each weight roller O.D.

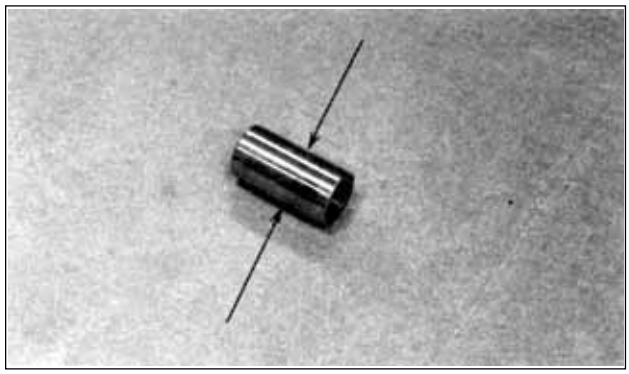
Service Limit: 20.42mm replace if below



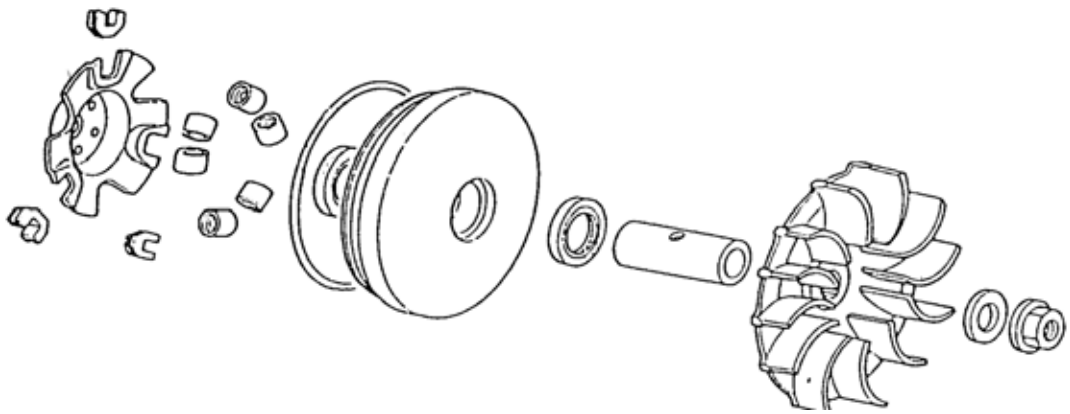
Measure the movable drive face bushing I.D.
Service Limit: 27.06mm replace if over



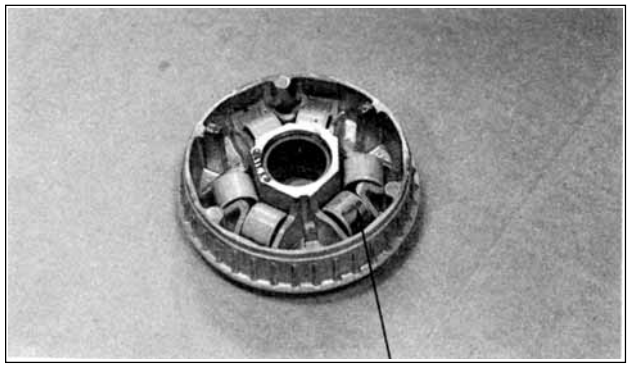
Check the drive pulley collar for wear or damage.
Measure the O.D. of the drive pulley collar sliding surface.
Service Limit: 26.94mm replace if below



ASSEMBLY



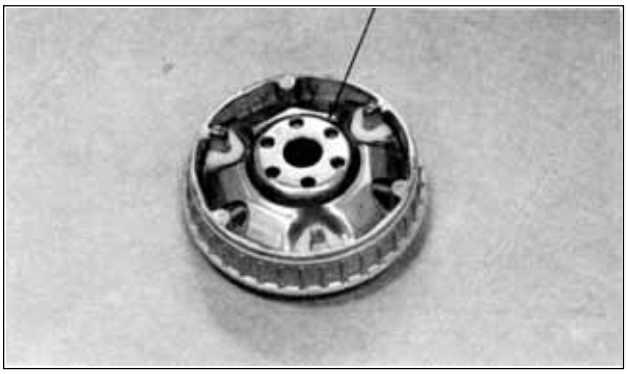
Install the weight rollers into the movable drive face.



Weight Roller

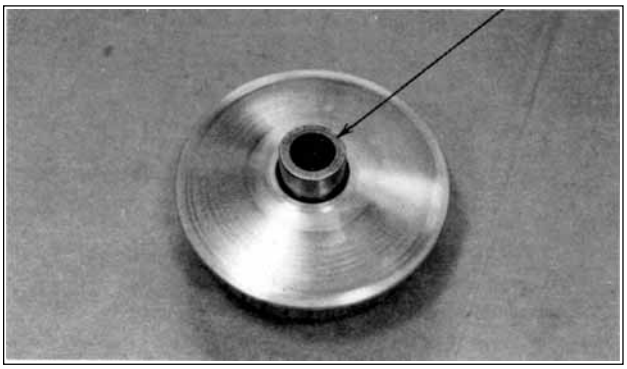
Ramp Plate

Install the ramp plate.



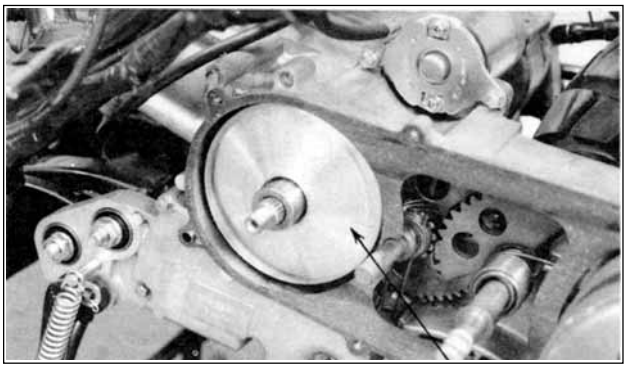
Drive Pulley Collar

Insert the drive pulley collar into the movable drive face.



INSTALLATION

Install the movable drive face onto the crankshaft.

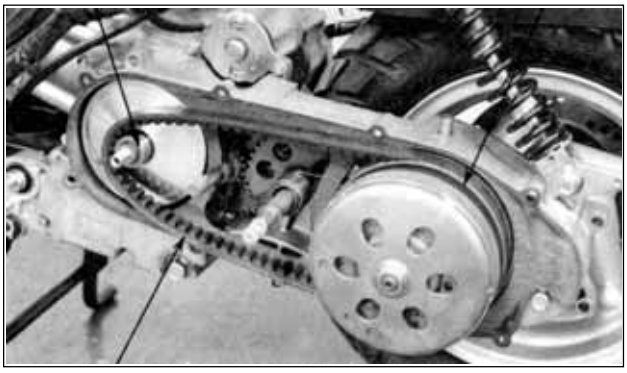


Movable Drive Face Assembly

Drive Pulley Collar

Driven Pulley

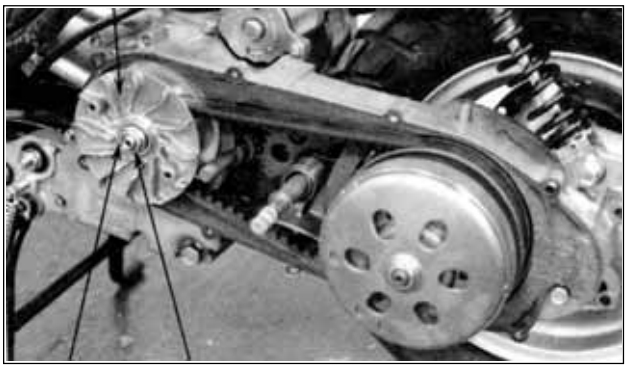
Lay the drive belt on the driven pulley.
Set the drive belt on the drive pulley collar.



Drive Belt

Install the drive pulley face, washer and drive face nut.

Drive Pulley Face



Washer Drive Face Nut

Drive Pulley

Hold the drive pulley with the universal holder and tighten the drive face nut.

Torque: 5.0～6.0kg-m

Special

Universal Holder

Universal Holder

✻ • Do not get oil or grease on the drive belt or drive pulley faces.

Clutch Outer

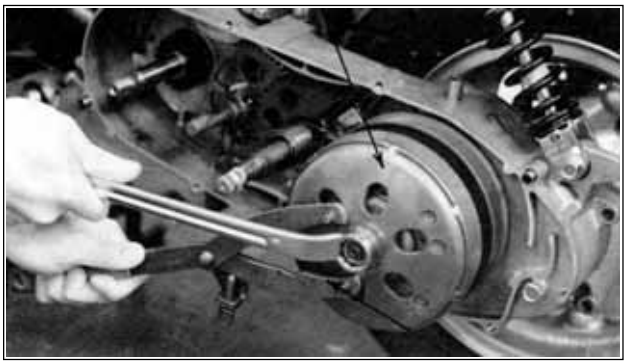
CLUTCH/DRIVEN PULLEY

Remove the left crankcase cover. (⇨8-3)
Remove the drive pulley and drive belt. (⇨8-4)
Hold the clutch outer with the universal holder and remove the clutch outer nut.

Special

Universal Holder

Remove the clutch outer.

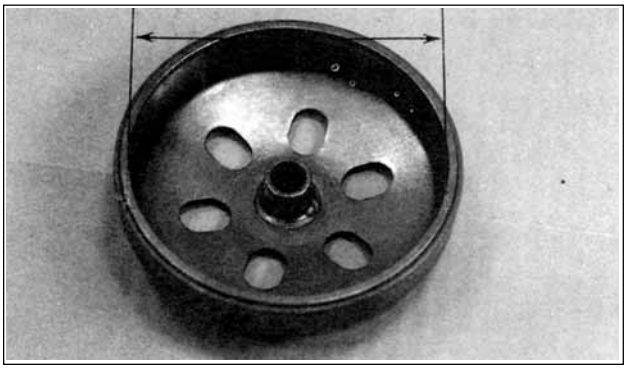


Universal Holder

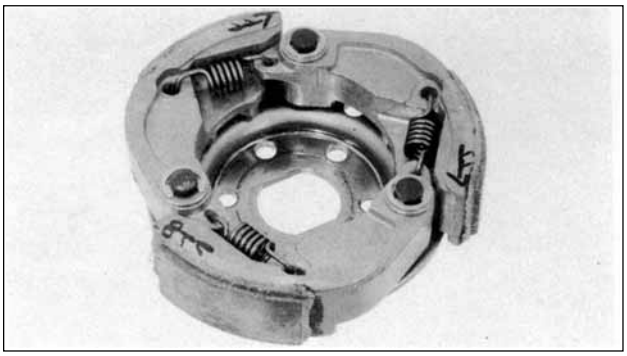
INSPECTION

Inspect the clutch outer for wear or damage.
Measure the clutch outer I.D.

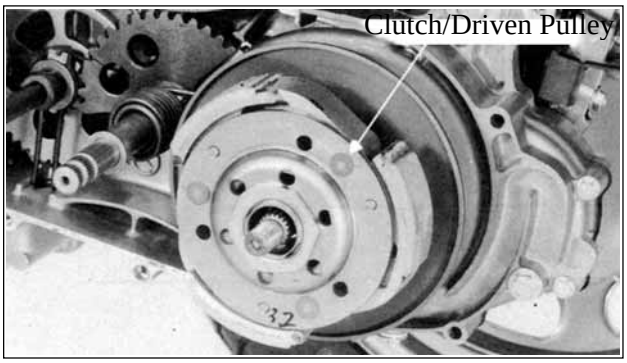
Service Limit: 130.5mm replace if over



Check the clutch shoes for wear or damage.
Measure the clutch lining thickness.
Service Limit: 2.0mm replace if below



CLUTCH/DRIVEN PULLEY DISASSEMBLY



Hold the clutch/driven pulley assembly with the clutch spring compressor.

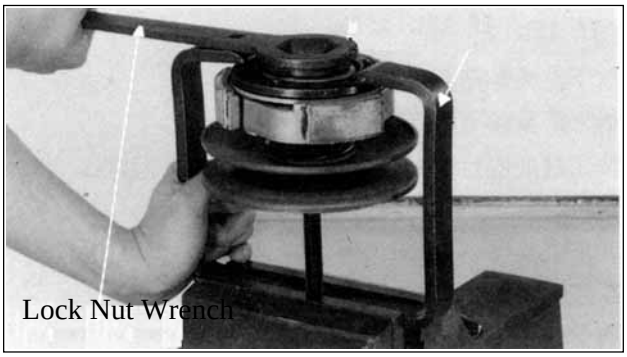
* • Be sure to use a clutch spring compressor to avoid spring damage.

Special

Clutch Spring Compressor

Set the tool in a vise and remove the clutch drive plate nut.

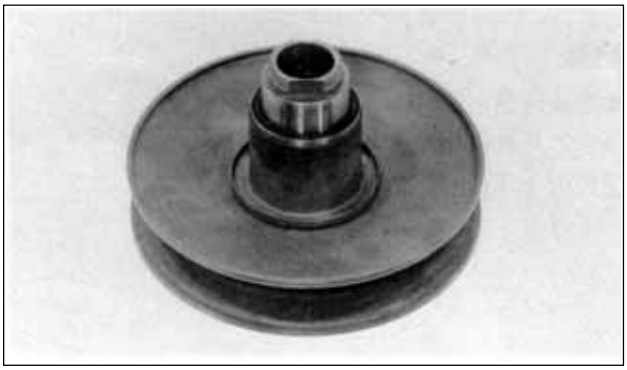
Clutch Spring Compressor



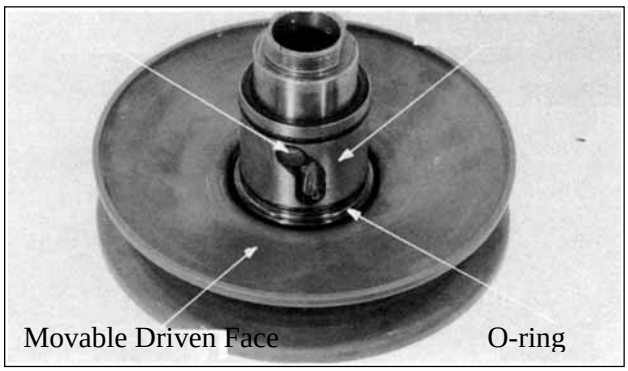
Special

Lock Nut Wrench, 39mm

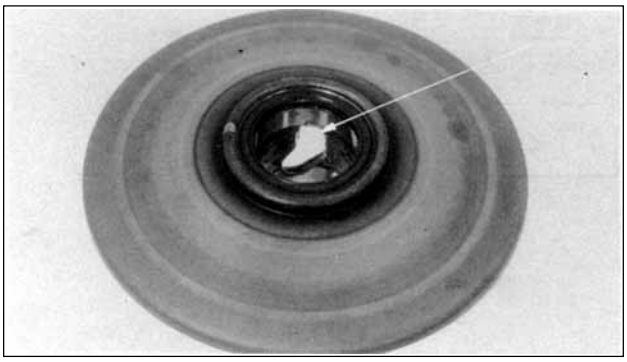
Loosen the clutch spring compressor and disassemble the clutch/driven pulley assembly.
Remove the seal collar.



Pull out the guide roller pins and guide rollers. Remove the movable driven face from the driven face.



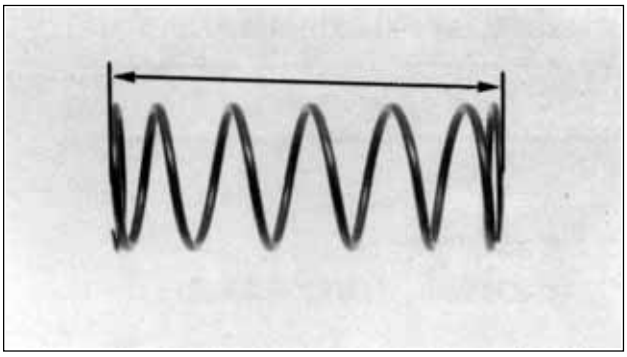
Remove the oil seal from the movable driven face.



INSPECTION

Measure the driven face spring free length.

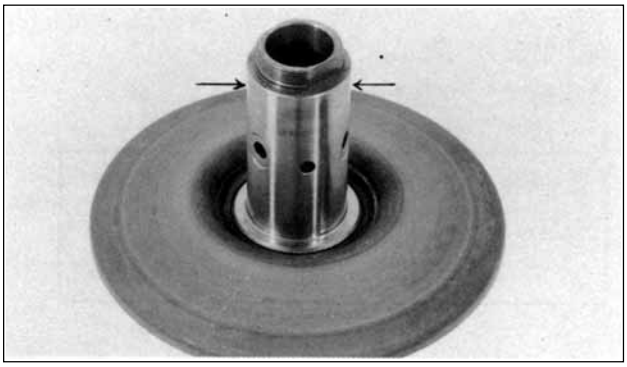
Service Limit: 83.2mm replace if below



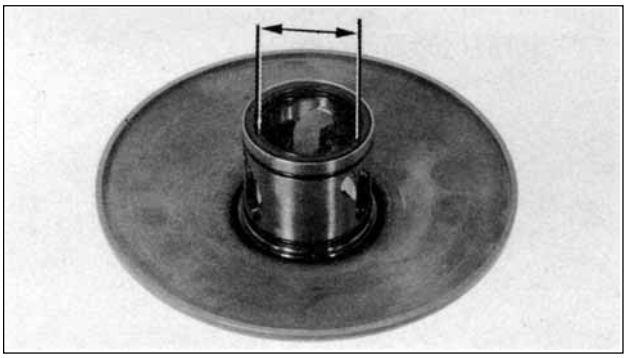
Check the driven face assembly for wear or damage.

Measure the driven face O.D.

Service Limit: 33.94mm replace if below



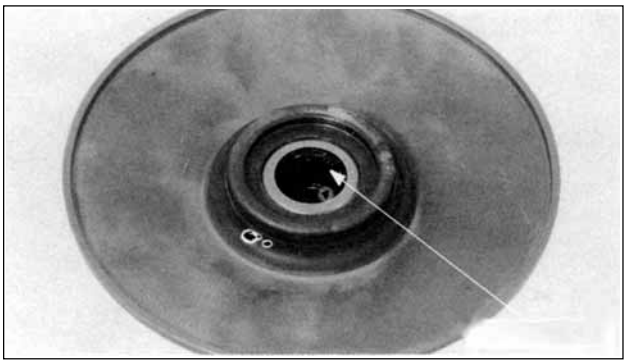
Check the movable driven face for wear or damage.
Measure the movable driven face I.D.
Service Limit: 34.06mm replace if below



DRIVEN PULLEY FACE BEARING REPLACEMENT

Check the bearings for play and replace them if they have excessive play.
Drive the inner needle bearing out of the driven pulley face.

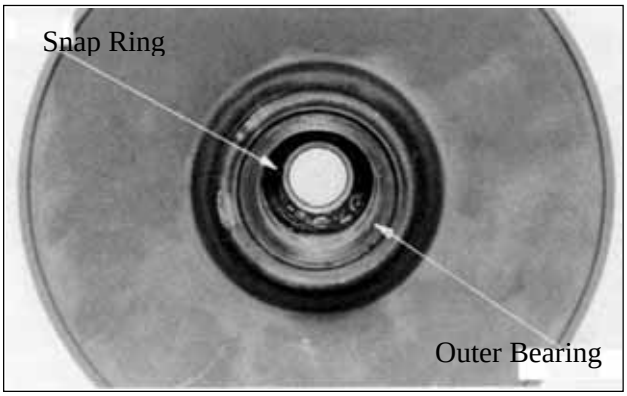
* • Discard the removed bearing and replace with a new one.



Inner Bearing

Remove the snap ring and drive the outer bearing out of the driven face.

* • Discard the removed bearing and replace with a new one.



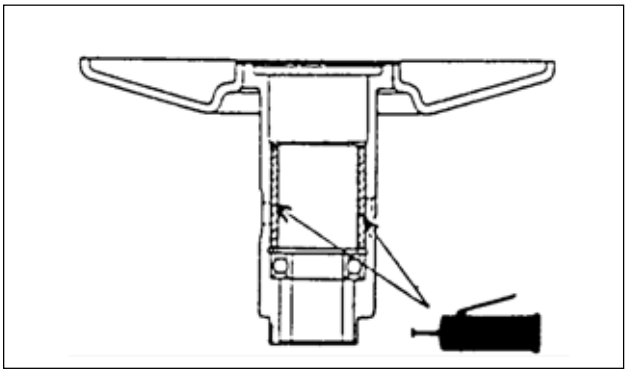
Apply grease to the outer bearing.
Drive a new outer bearing into the driven face with the sealed end facing up.

Special

Bearing Driver

Seat the snap ring in its groove.
Apply grease to the driven face bore areas.

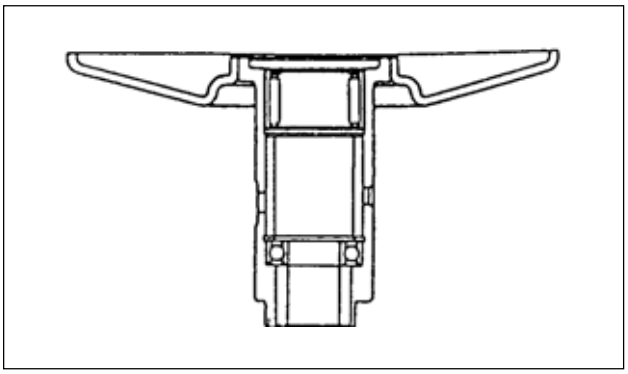
* Pack all bearing cavities with 9～9.5g grease.
Specified grease: IDEMITSU KOSAN Grease



Press a new needle bearing into the driven face.

Special

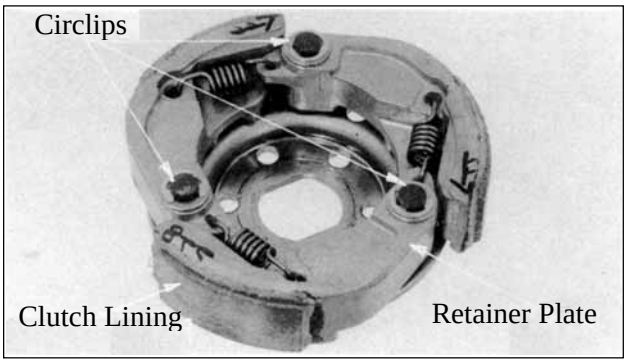
Bearing Driver



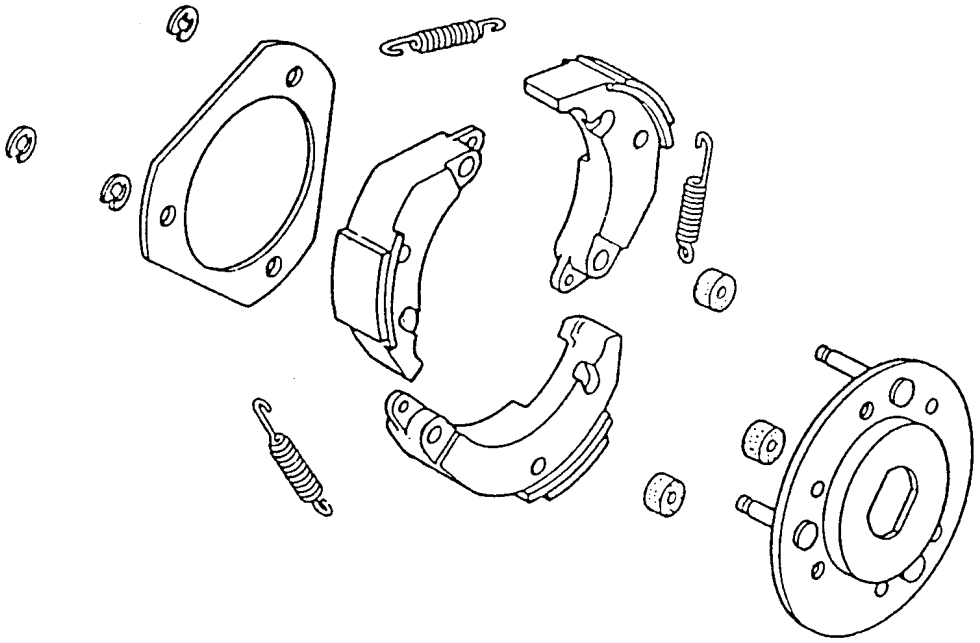
CLUTCH DISASSEMBLY

Remove the circlips and retainer plate to disassemble the clutch.

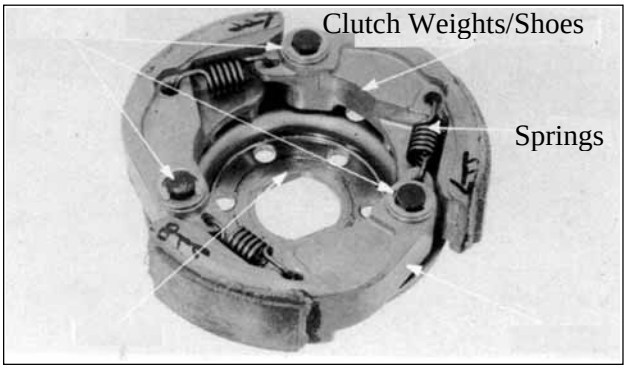
* • Keep grease off the clutch linings.



CLUTCH ASSEMBLY

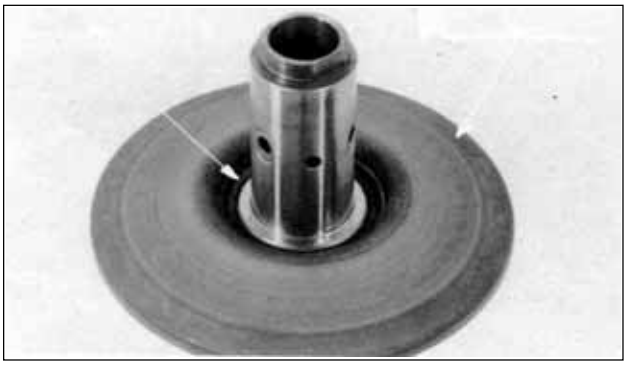


Install the damper rubbers on the drive plate pins.
Install the clutch weights/shoes and clutch springs onto the drive plate.
Install the retainer plate and secure with the circlips.

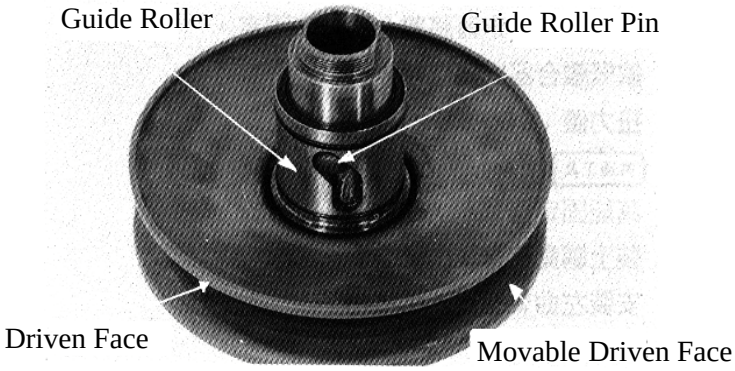


CLUTCH/DRIVEN PULLEY ASSEMBLY

Clean the pulley faces and remove any grease from them.
Install the oil seal onto the moveable driven face.
Apply grease to the O-rings and install them onto the moveable driven face.



Install the movable driven face onto the driven face.
Apply grease to the guide rollers and guide roller pins and then install them into the holes of the driven face.



Install the seal collar.
Remove any excessive grease.

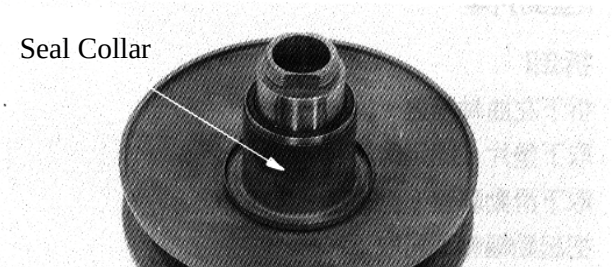
* • Be sure to clean the driven face off any grease.

Set the driven pulley assembly, driven face spring and clutch assembly onto the clutch spring compressor.

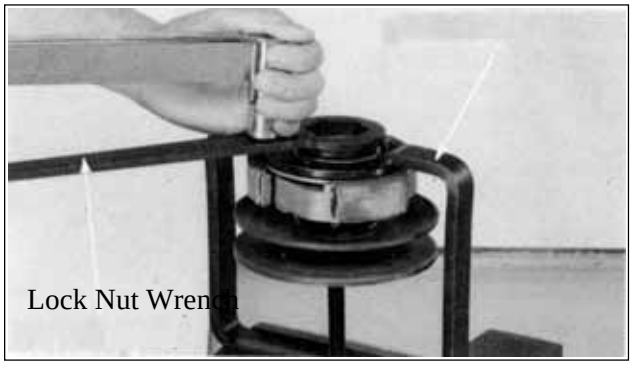
* • Align the flat surface of the driven face with the flat on the clutch drive plate.

Compress the tool and install the drive plate nut.
Set the tool in a vise and tighten the drive plate nut to the specified torque.
Torque: 5.0～6.0kg-m

* • Be sure to use a clutch spring compressor to avoid spring damage.



Clutch Spring Compressor



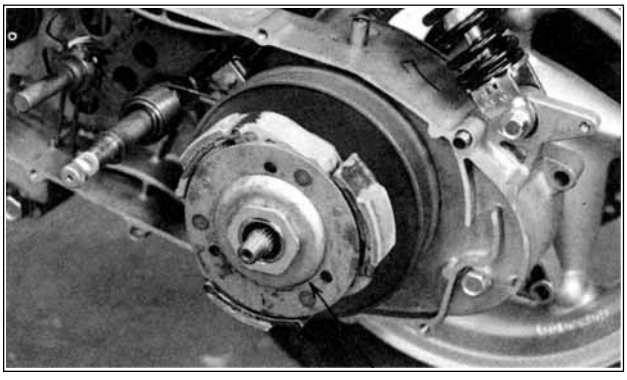
Special

Clutch Spring Compressor
Outer Driver, 32x35mm

INSTALLATION

Install the clutch/driven pulley onto the drive shaft.

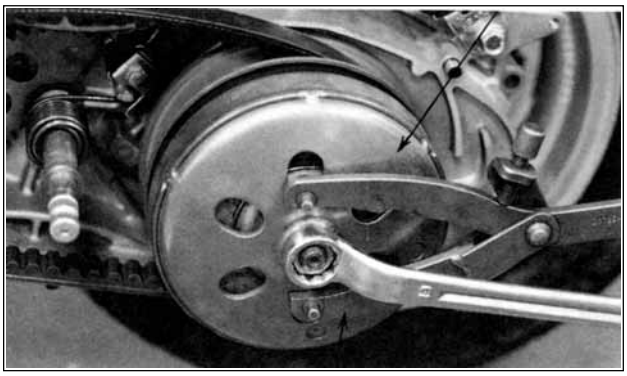
* • Keep grease off the drive shaft.



Clutch/Driven Pulley

Clutch Outer

Install the clutch outer.
Hold the clutch outer with the universal holder.
Install and tighten the clutch outer nut.
Torque: 5.0～6.0kg-m



Special
Universal Holder

Universal Holder

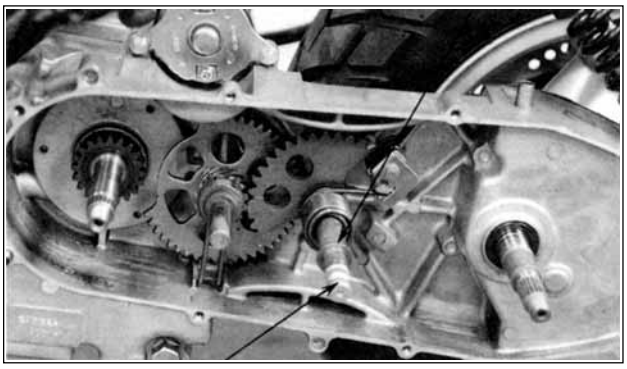
Install the drive belt. (⇨8-7)
Install the left crankcase cover. (⇨8-3)

Washer

KICK STARTER

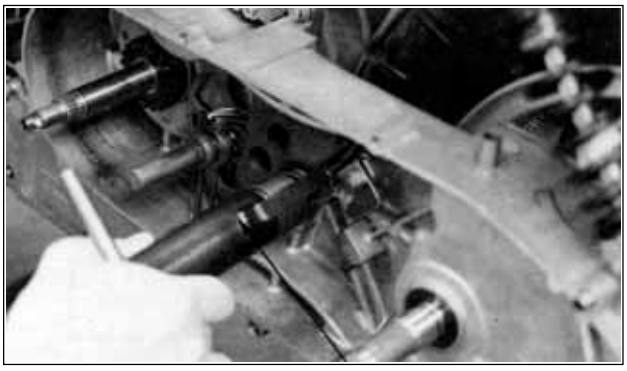
REMOVAL

Remove the left crankcase cover. (⇨8-3)
Remove the seal rubber and dowel pins.
Remove the drive belt, drive and driven pulleys. (⇨8-8)
Remove the kick starter spindle washer.



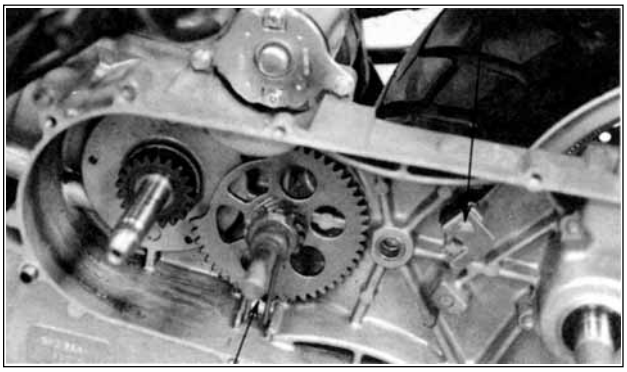
Kick Starter Spindle

Remove the return spring set plate and return spring.
Remove the kick starter spindle assembly.



Kick Starter Spring Remover
Return Spring Set Plate

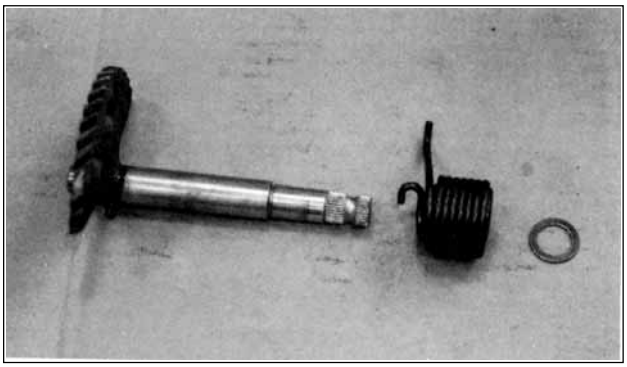
Remove the kick starter idle shaft.



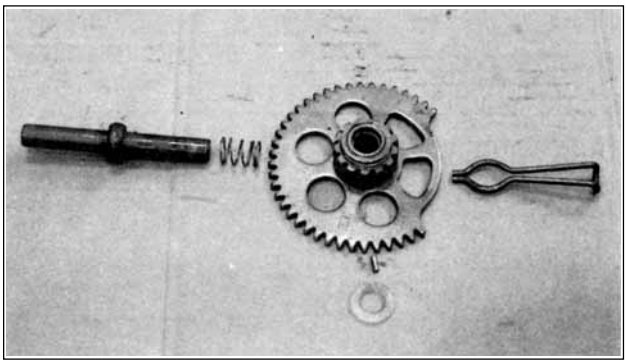
Kick Starter Idle Shaft

DISASSEMBLY

Disassemble the kick starter spindle.

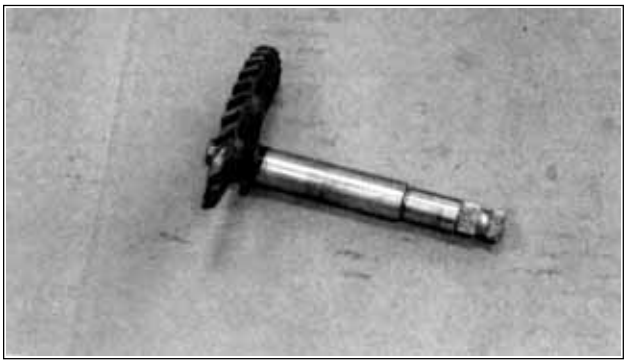


Disassemble the kick starter idle shaft.

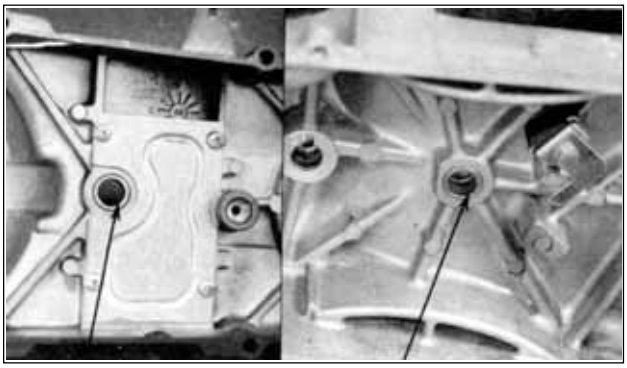


INSPECTION

Inspect the kick starter spindle and gear for wear or damage.

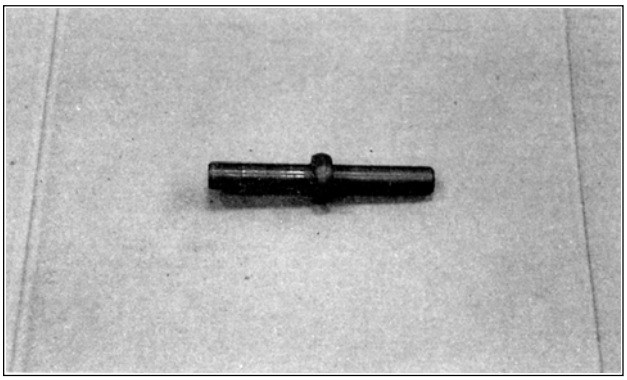


Inspect the kick starter spindle bushing and idle shaft forcing part for wear or damage.



Bushing Idle Shaft Forcing Part

Check the idle gear for wear or damage.
Check the idle shaft for wear or damage.



ASSEMBLY

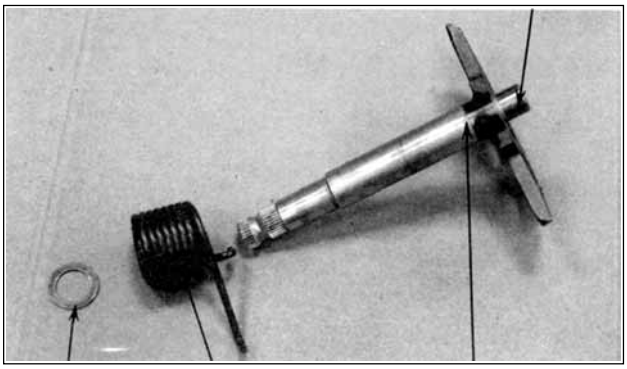
Assemble the kick starter idle gear and idle shaft.

* • Apply grease to the idle gear bore.

Grease

Assemble the kick starter spindle, return spring and spring lock pin.

* • Apply grease to the kick starter spindle forcing part.

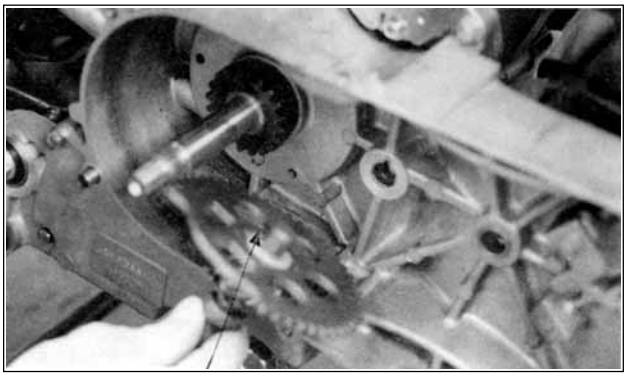


Washer Return Spring Lock Pin

INSTALLATION

Install the kick starter idle shaft with the lock pin aligned with the groove in the left crankcase.

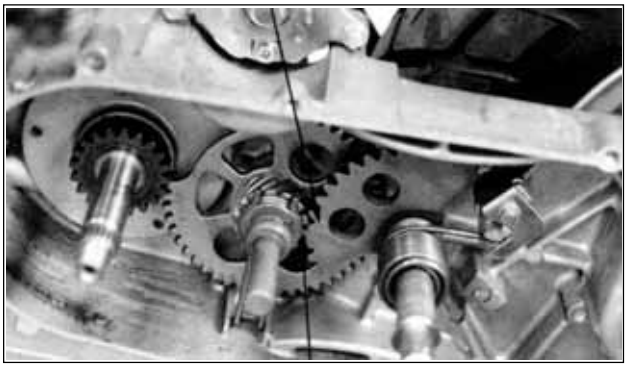
* • Apply grease to the idle gear friction spring groove.
  • Align the idle gear friction spring with the left crankcase groove and install it.



Lock Pin

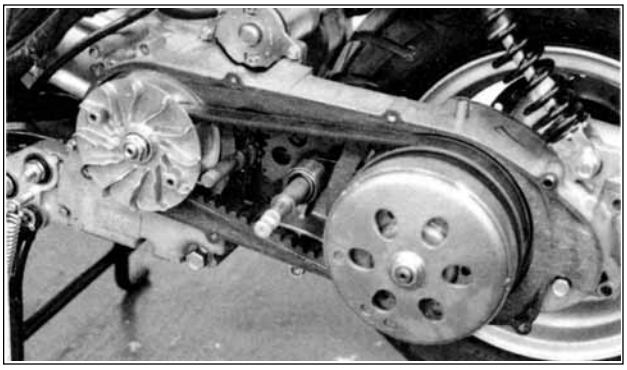
Install the kick starter spindle with the scribed line on the kick starter spindle aligned with the punch mark on the idle shaft.

Scribed Line



Punch Mark

Install the return spring to the set point and then install the set plate.
Install the kick starter spindle washer.

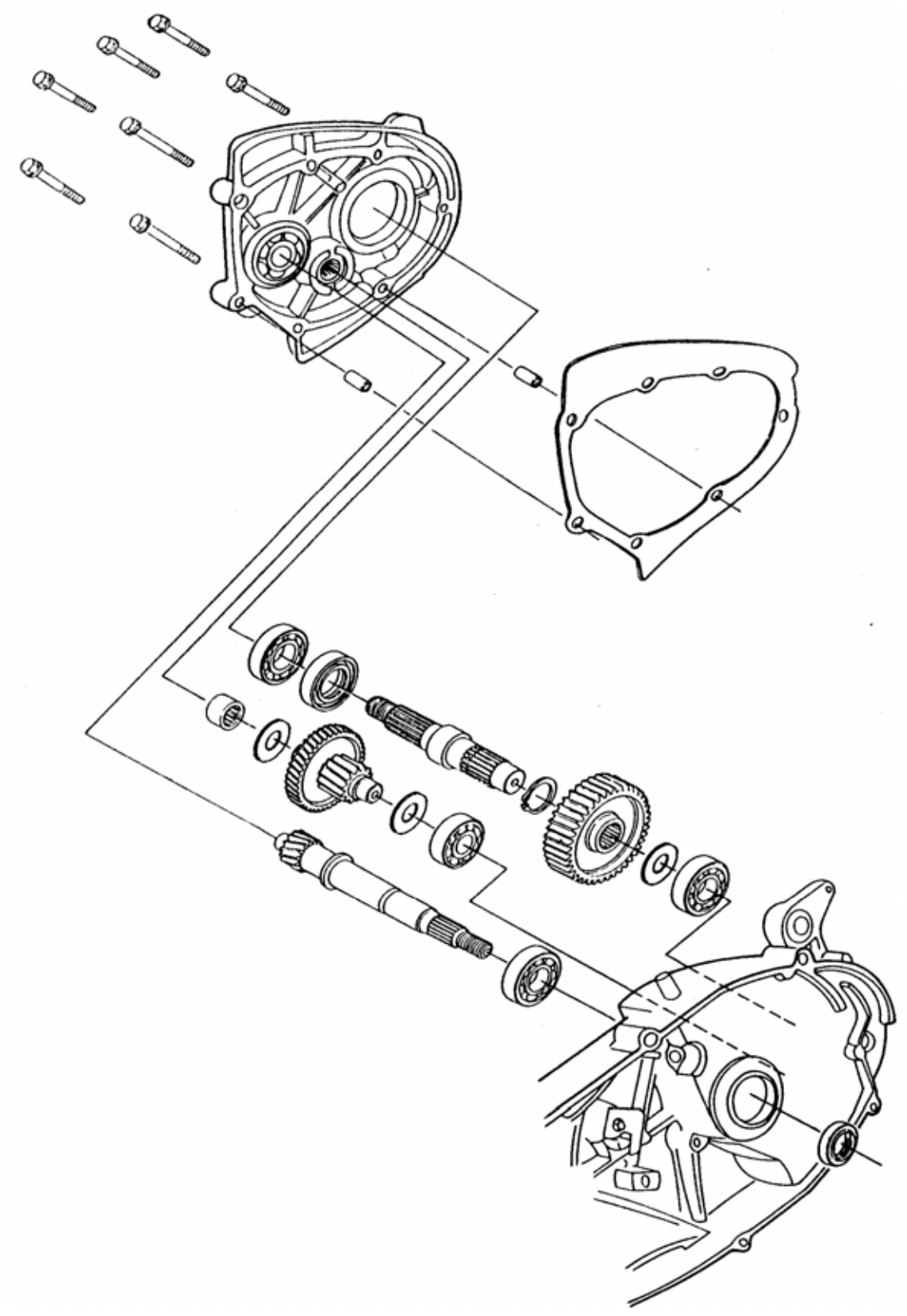


Install the dowel pins and seal rubber.
Install the drive belt, drive and driven pulleys. (⇨8-7)
Install the left crankcase cover. (⇨8-3)
Install the kick lever.

FINAL REDUCTION

9. FINAL REDUCTION

SCHEMATIC DRAWING



9. FINAL REDUCTION

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- The servicing operations of this section can be made with the engine installed.
- When replacing the drive shaft, use a special tool to hold the bearing inner race for this operation.

SPECIFICATIONS

Specified Oil: SAE 90#
Oil Capacity:
At disassembly : 0.2 liter
At change : 0.195 liter

TORQUE VALUES

Transmission case cover bolt	2.6～3.2kg-m
Oil check bolt	1.0～1.5kg-m

SPECIAL TOOLS

Bearing remover, 12mm
Bearing remover, 15mm
Pilot, 12mm
Pilot, 15mm

TROUBLESHOOTING

Engine starts but motorcycle won‘t move

- Damaged transmission
- Seized or burnt transmission

Abnormal noise

- Worn, seized or chipped gears
- Worn bearing

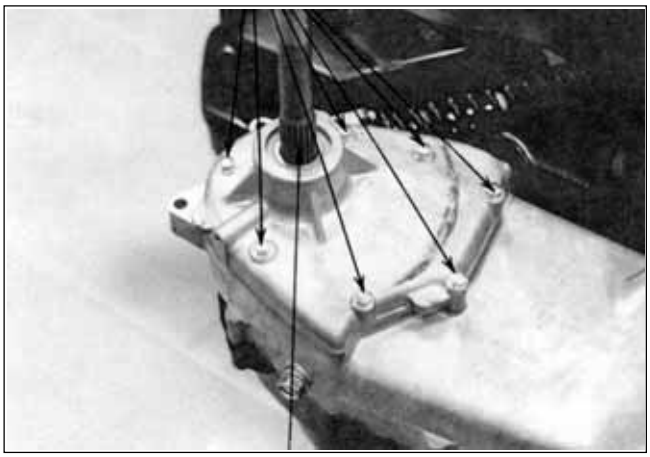
Oil leaks

- Oil level too high
- Worn or damaged oil seal

FINAL REDUCTION DISASSEMBLY

Remove the exhaust muffler. (⇨2-6)
Remove the rear brake caliper. (⇨15-3)
Remove the right rear shock absorber. (⇨15-5)
Remove the rear fork. (⇨15-4)
Remove the rear wheel. (⇨15-4)
Remove the left crankcase cover. (⇨8-3)
Remove the clutch/driven pulleys. (⇨8-4)
Drain the transmission gear oil into a clean container.
Remove the transmission case cover attaching bolts.

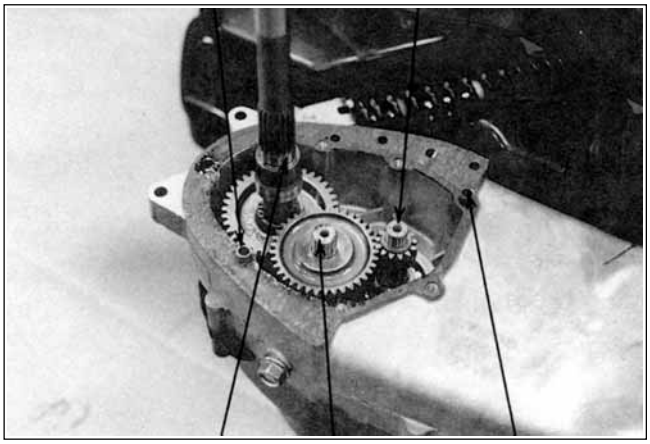
Bolts



Final Shaft

Remove the transmission case cover.
Remove the gasket and dowel pins.
Remove the final gear and countershaft.

Dowel Pin Drive Shaft

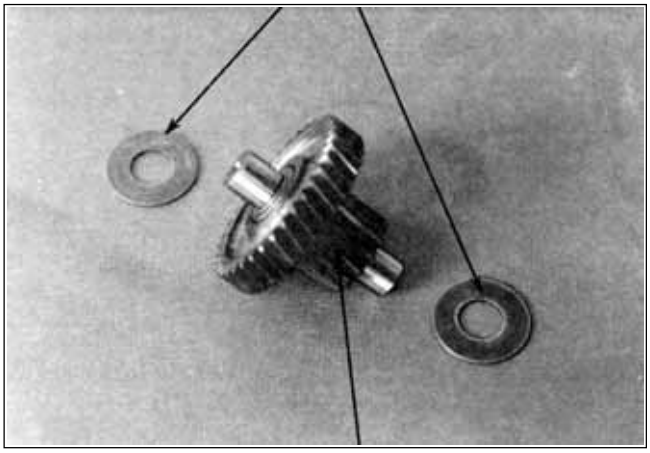


Final Gear Countershaft Dowel Pin

FINAL REDUCTION INSPECTION

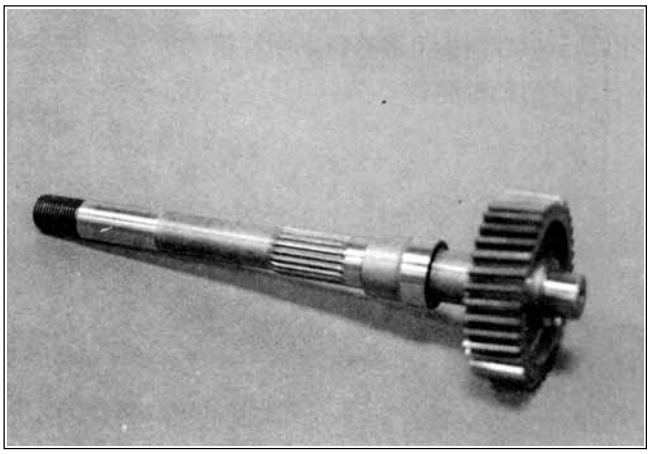
Inspect the countershaft and gear for wear or damage.

Washers



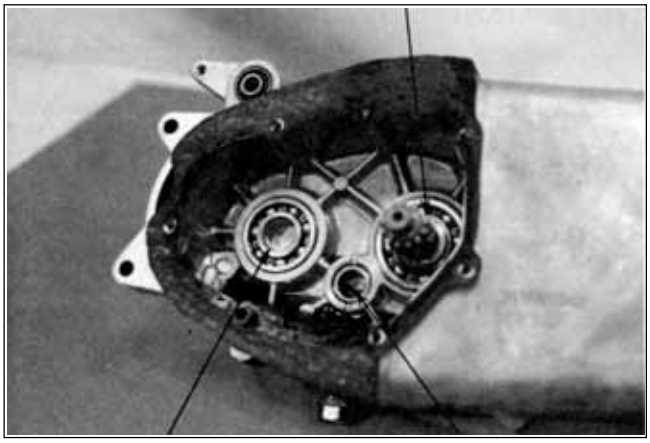
Countershaft

Inspect the final gear and final shaft for wear, damage or seizure.



Drive Shaft Bearing

Check the left crankcase bearings for excessive play and inspect the oil seal for wear or damage.

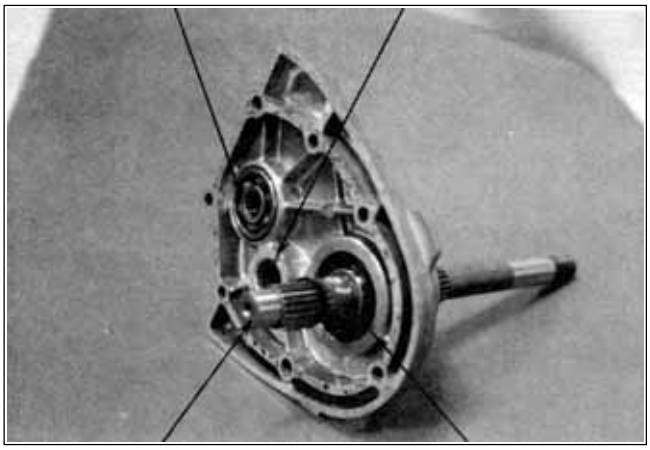


Final Shaft Bearing Countershaft Bearing

Final Shaft Bearing Countershaft Bearing

Inspect the drive shaft and gear for wear or damage.
Check the transmission case cover bearings for excessive play and inspect the final shaft bearing oil seal for wear or damage.

* Do not remove the transmission case cover except for necessary part replacement. When replacing the drive shaft, also replace the bearing and oil seal.

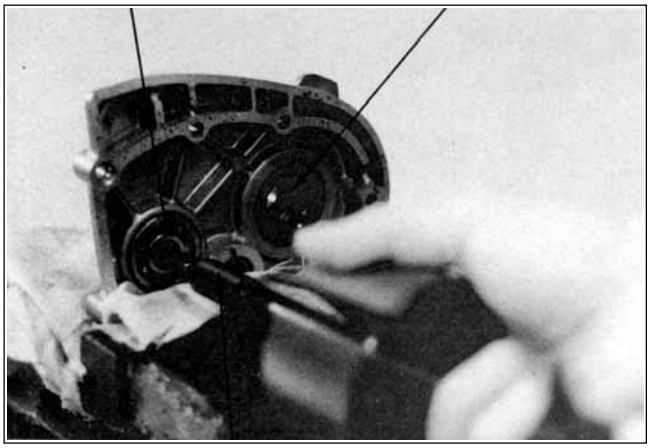


Drive Shaft Oil Seal

BEARING REPLACEMENT (TRANSMISSION CASE COVER)

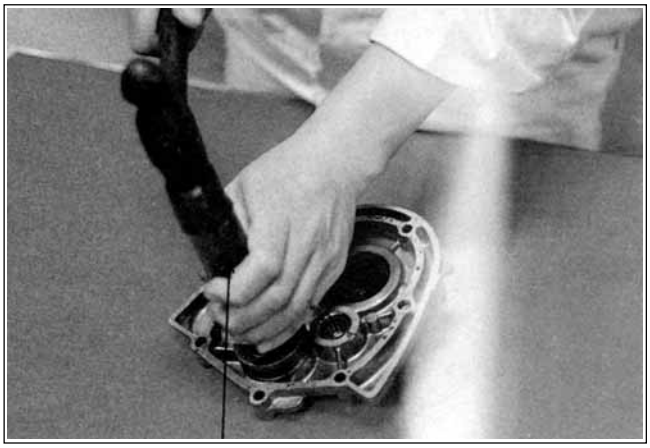
Remove the transmission case cover bearings using the bearing remover.
Remove the final shaft oil seal.

Drive Shaft Bearing Final Shaft Bearing



Bearing Remover, 15mm

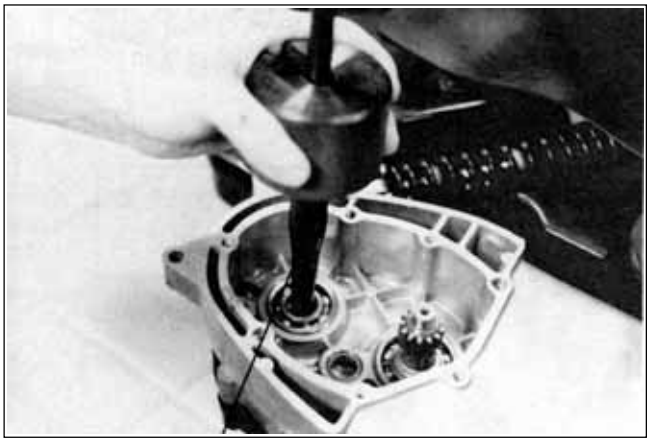
Drive new bearings into the transmission case cover.



Pilot, 15mm

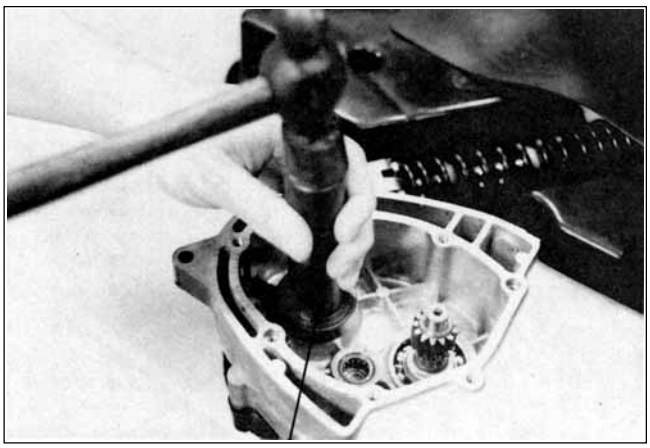
BEARING REPLACEMENT (LEFT CRANKCASE COVER)

Remove the drive shaft.
Remove the drive shaft oil seal.
Remove the left crankcase bearings using the bearing remover.



Bearing Remover, 12mm

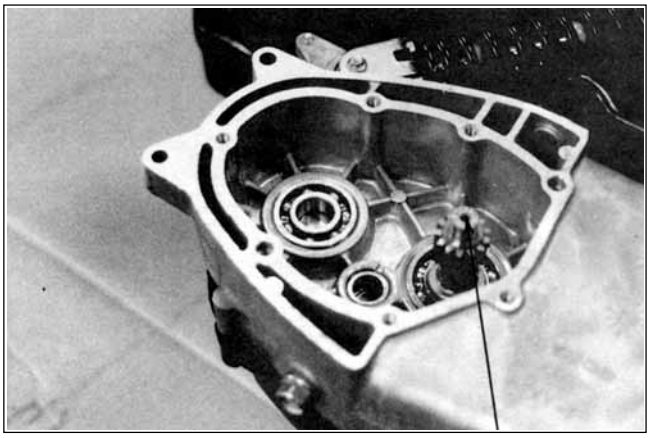
Drive new bearings into the left crankcase. Install a new drive shaft oil seal.



Pilot, 15mm

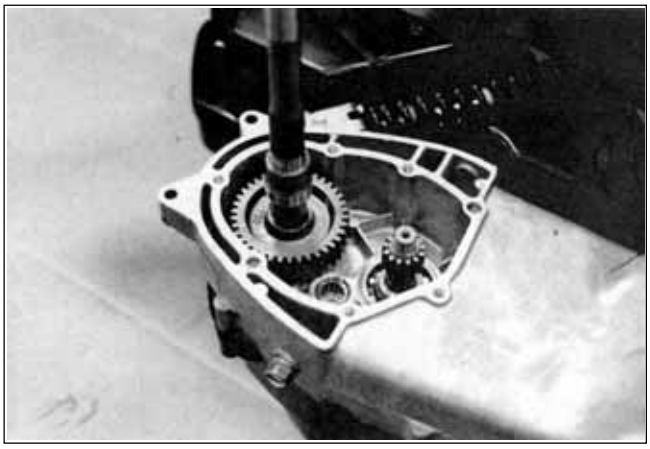
FINAL REDUCTION ASSEMBLY

Install the drive shaft into the left crankcase.

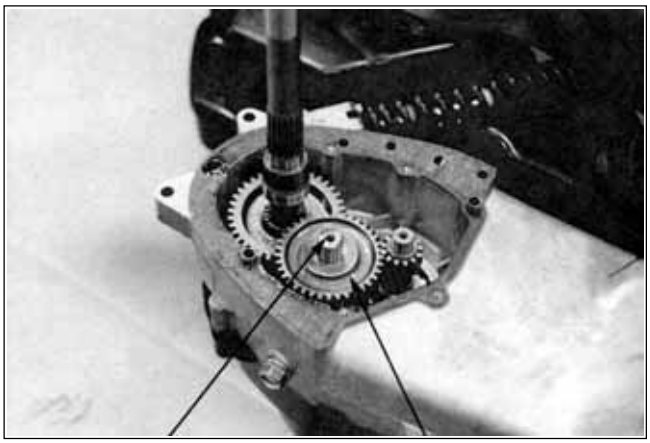


Drive Shaft

Install the final gear and final shaft into the left crankcase.

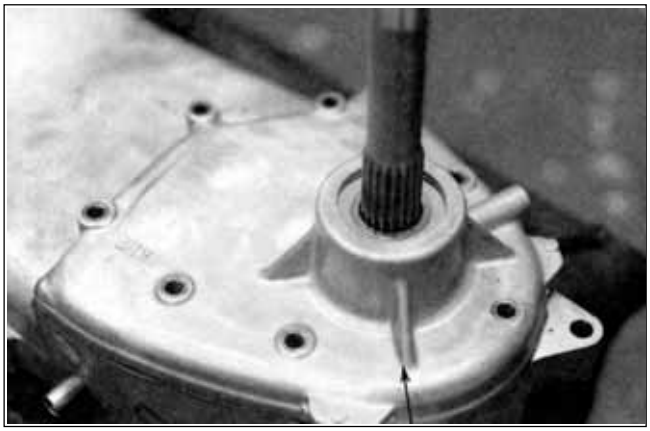


Install the countershaft and gear into the left crankcase.
Install the resin washer onto the countershaft.
Install the dowel pins and a new gasket.



Countershaft Washer

Install the transmission case cover.



Transmission Case Cover

Install and tighten the transmission case cover bolts.
Install the clutch/driven pulley.
Install other removed parts in the reverse order of removal.

Bolts

After installation, fill the transmission case with the specified oil.

*
- Place the motorcycle on its main stand on level ground.
- Check the oil sealing washer for wear or damage.

Specified Gear Oil: SAE90#

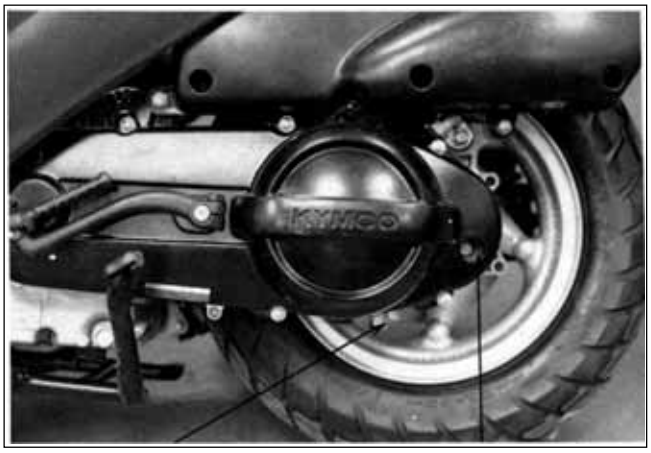
Oil Capacity:

At disassembly : 0.2 liter
At change : 0.195 liter

Install and tighten the oil check bolt.

Torque: 1.0～1.5kg-m

Start the engine and check for oil leaks. Check the oil level from the oil check bolt hole and add the specified oil to the proper level if the oil level is low.

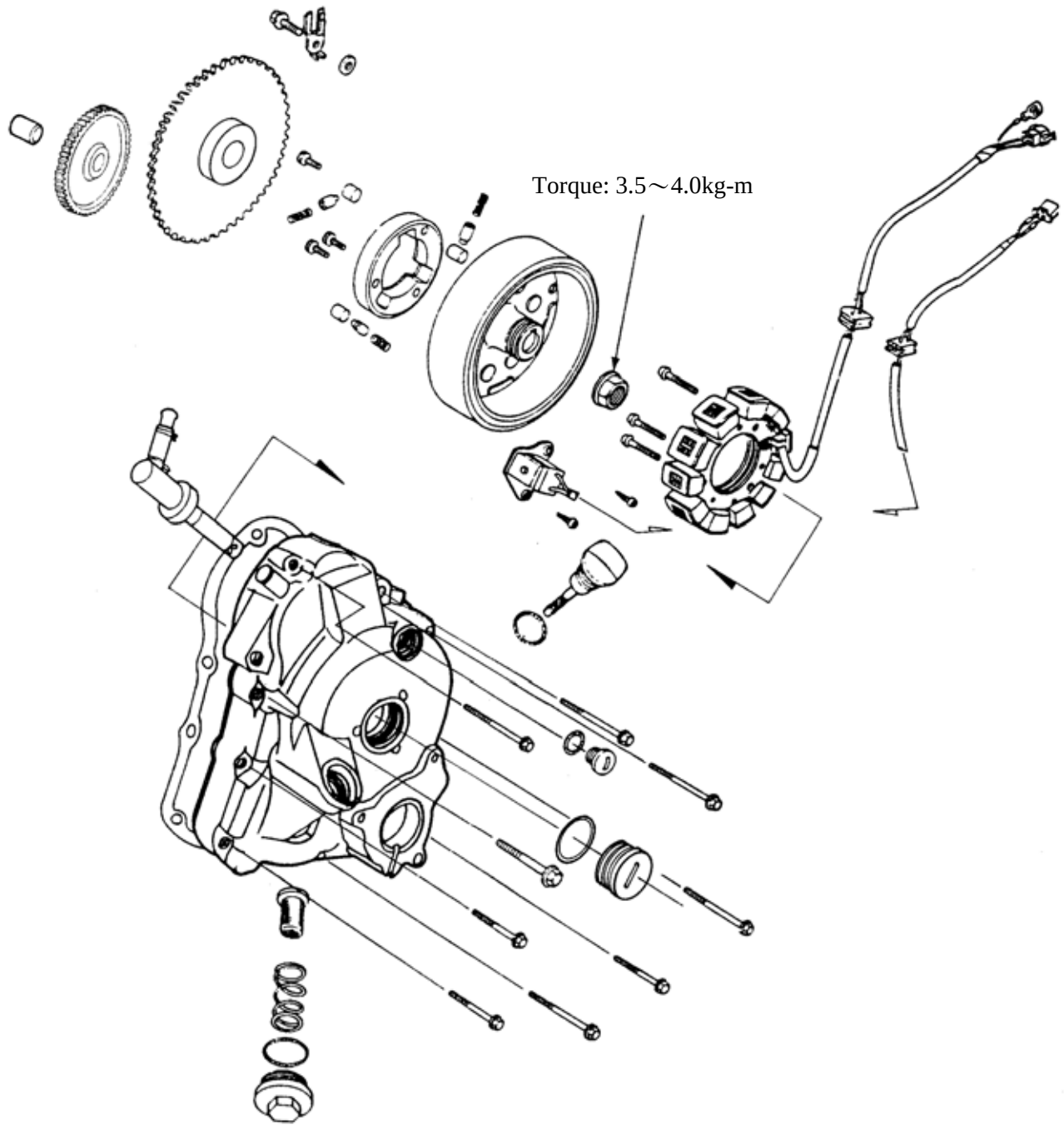


Drain Bolt Oil Check Bolt Hole/Oil Filler

A.C. GENERATOR/STARTER CLUTCH

10. A.C. GENERATOR/STARTER CLUTCH

SCHEMATIC DRAWING



10. A.C. GENERATOR/STARTER CLUTCH

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- All servicing operations and inspections in this section can be made with the engine installed.
- Drain the coolant before removing the right crankcase cover.
- Be careful not to drain the coolant when the engine temperature is high. (Perform this operation when the engine is cold.)
- Drain the coolant into a clean container.
- Drain the engine oil into a clean container before removing the right crankcase cover.
- When the right crankcase cover is installed, fill with the recommended engine oil and coolant. Then, bleed air from the water jacket.
- Refer to page 18-4 for A.C. generator inspection.

SPECIFICATIONS

Engine oil: SAE15W/40#
API-SG/CD
Oil capacity at change: 0.8 liter
Coolant: distilled water + coolant concentrate
Coolant capacity: 1165cc

SPECIAL TOOLS

Flywheel puller
Flywheel holder

SPECIFICATIONS

Item	Standard (mm)	Service Limit (mm)
Starter driven gear I.D.	19.8～19.99	20.1mm
Starter driven gear O.D.	42.2～42.31	41.0mm

TORQUE VALUES

Flywheel nut : 3.5～4.5kg-m

TROUBLESHOOTING

Refer to page 1-27 for A.C. generator troubleshooting.

Starter motor rotates but engine does not start

- Faulty starter clutch
- Starter motor rotates reversely
- Weak battery

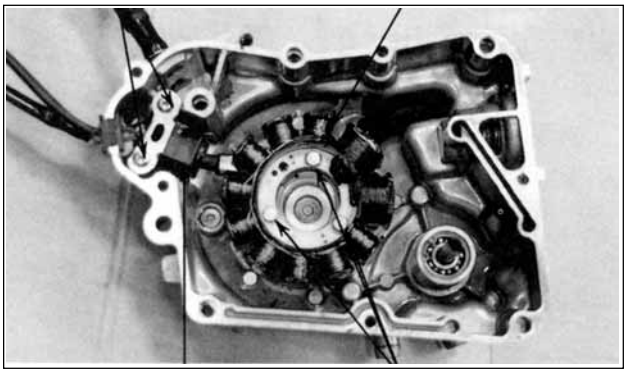
RIGHT CRANKCASE COVER REMOVAL

Disconnect the water hoses from the right crankcase cover.
Remove the nine bolts attaching the right crankcase cover and the cover.

STATOR REMOVAL

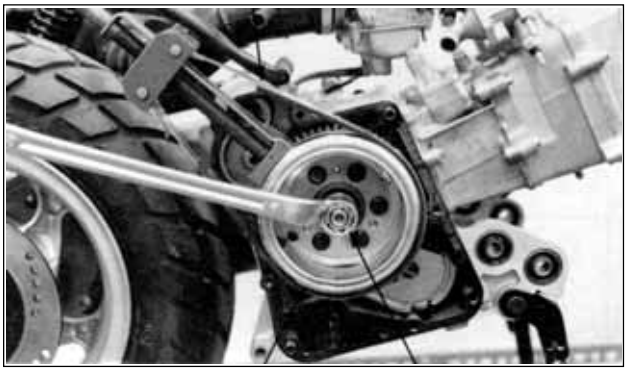
Remove the two pulser coil attaching screws and the pulser coil.
Remove the three A.C. generator stator bolts and the stator.

* When removing the pulser coil and stator, be careful not to damage them to avoid shorted or broken wire.

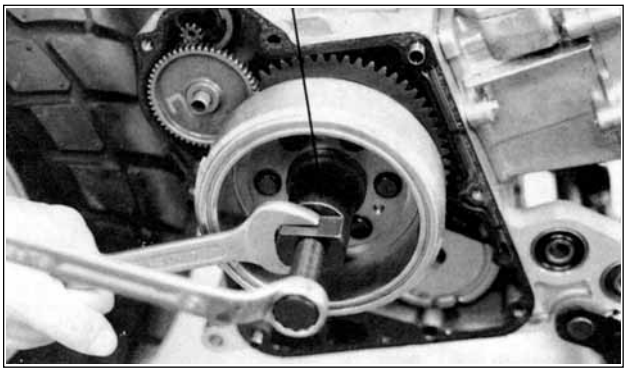


FLYWHEEL REMOVAL

Hold the flywheel with a flywheel holder and remove the flywheel nut.



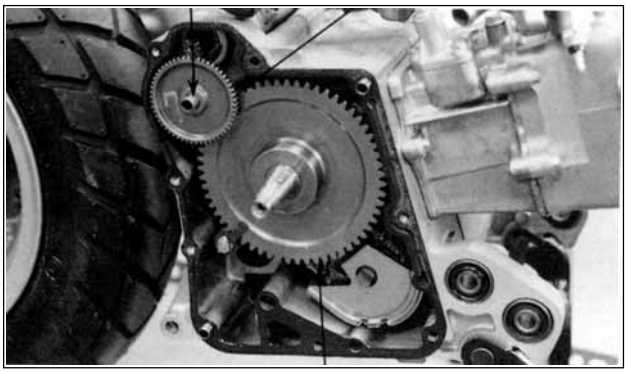
Remove the flywheel with a flywheel puller.



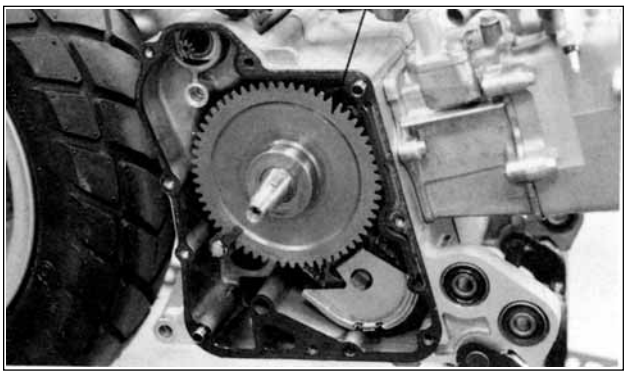
STARTER CLUTCH

REMOVAL

Remove the starter idle gear and shaft.



Remove the starter driven gear.

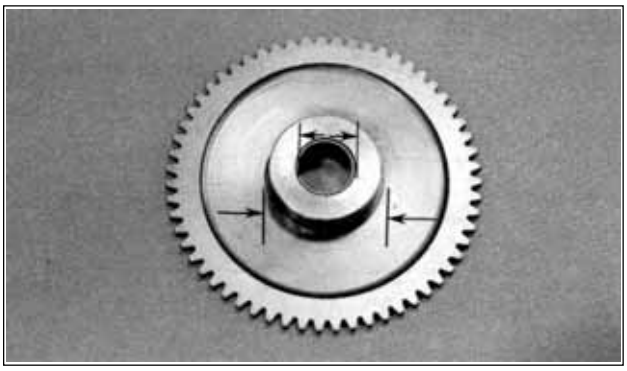


INSPECTION

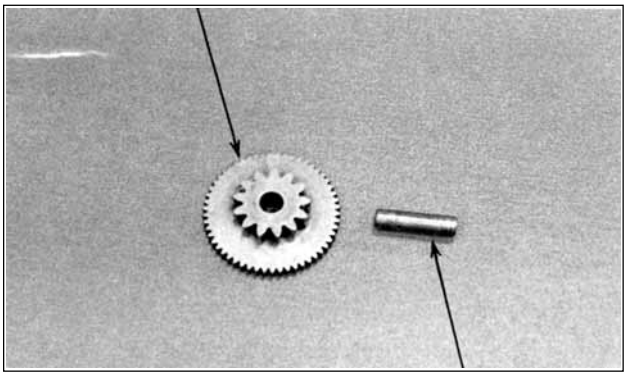
Inspect the starter driven gear for wear or damage.
Measure the starter driven gear I.D. and O.D.

Service Limits:

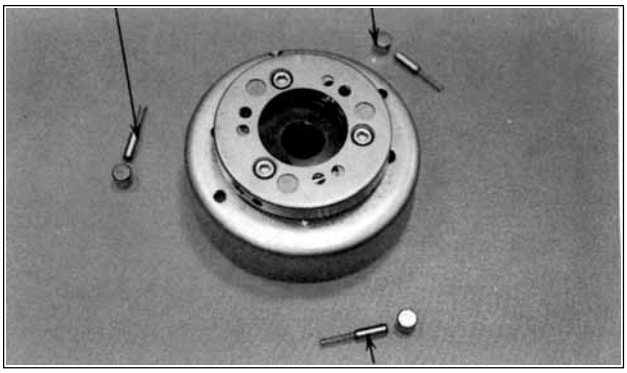
I.D. : 20.1mm replace if over
O.D. : 41.0mm replace if below



Inspect the starter idle gear and shaft for wear or damage.

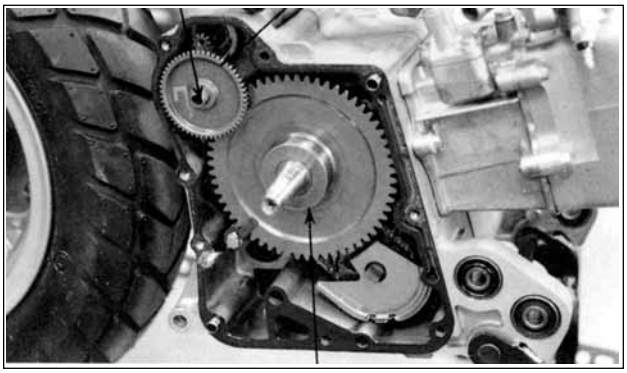


Remove the starter one-way clutch rollers, plungers and springs.
Inspect each roller and plunger for wear or damage and check for broken or weak spring.



INSTALLATION

Install the starter driven gear onto the crankshaft.
Install the starter idle gear and shaft.



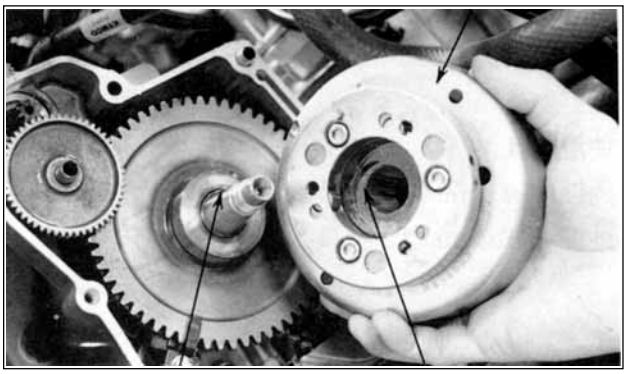
FLYWHEEL INSTALLATION

Install the flywheel onto the crankshaft by aligning the key on the crankshaft with the groove in the flywheel.

* • Before installation, check and make sure that the inside of the flywheel is not contaminated.

Hold the flywheel with the flywheel holder and tighten the flywheel nut.

Torque: 3.4～4.5kg-m

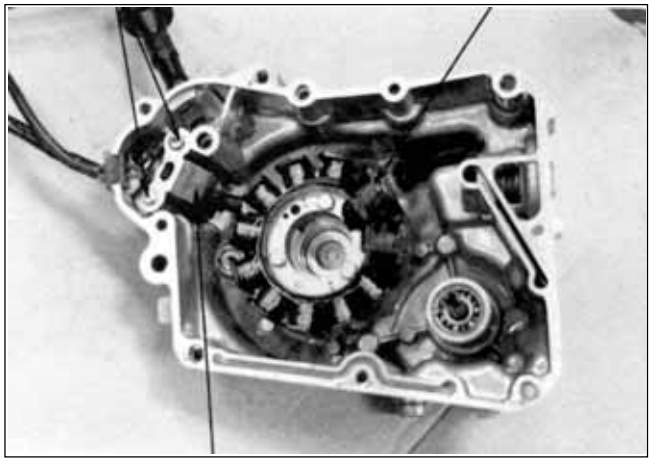


STATOR INSTALLATION

Install the A.C. generator stator on the right crankcase cover and secure it with the three bolts.
Install the pulser coil on the right crankcase cover and secure it with the two screws.
Install the wire grommet in the groove in the right crankcase cover securely.

* Be sure to route the stator wire under the pulser coil.

Screws A.C. Generator Stator

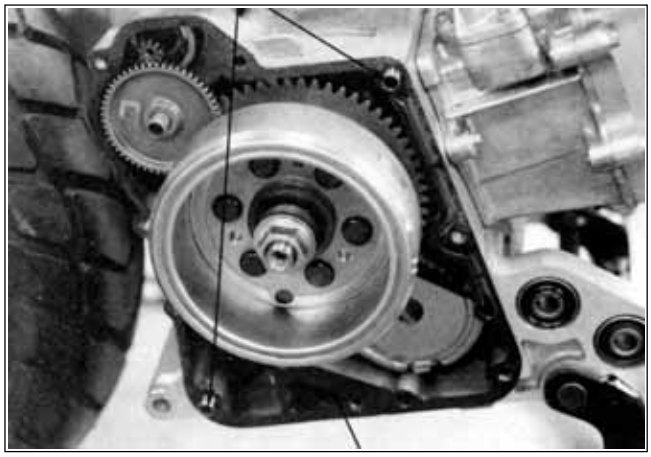


Pulser Coil

RIGHT CRANKCASE COVER INSTALLATION

Install the two dowel pins and a new gasket.

Dowel Pins



Gasket

Install the right crankcase cover over the crankcase, aligning the water pump shaft groove with the oil pump shaft.
Tighten the nine right crankcase cover bolts.
Connect the water hoses to the right crankcase cover.
Add the recommended engine oil. (⇨4-3)
Fill the cooling system with the specified coolant. (⇨3-9)

* • Be sure to bleed air from the water jacket after filling the coolant.

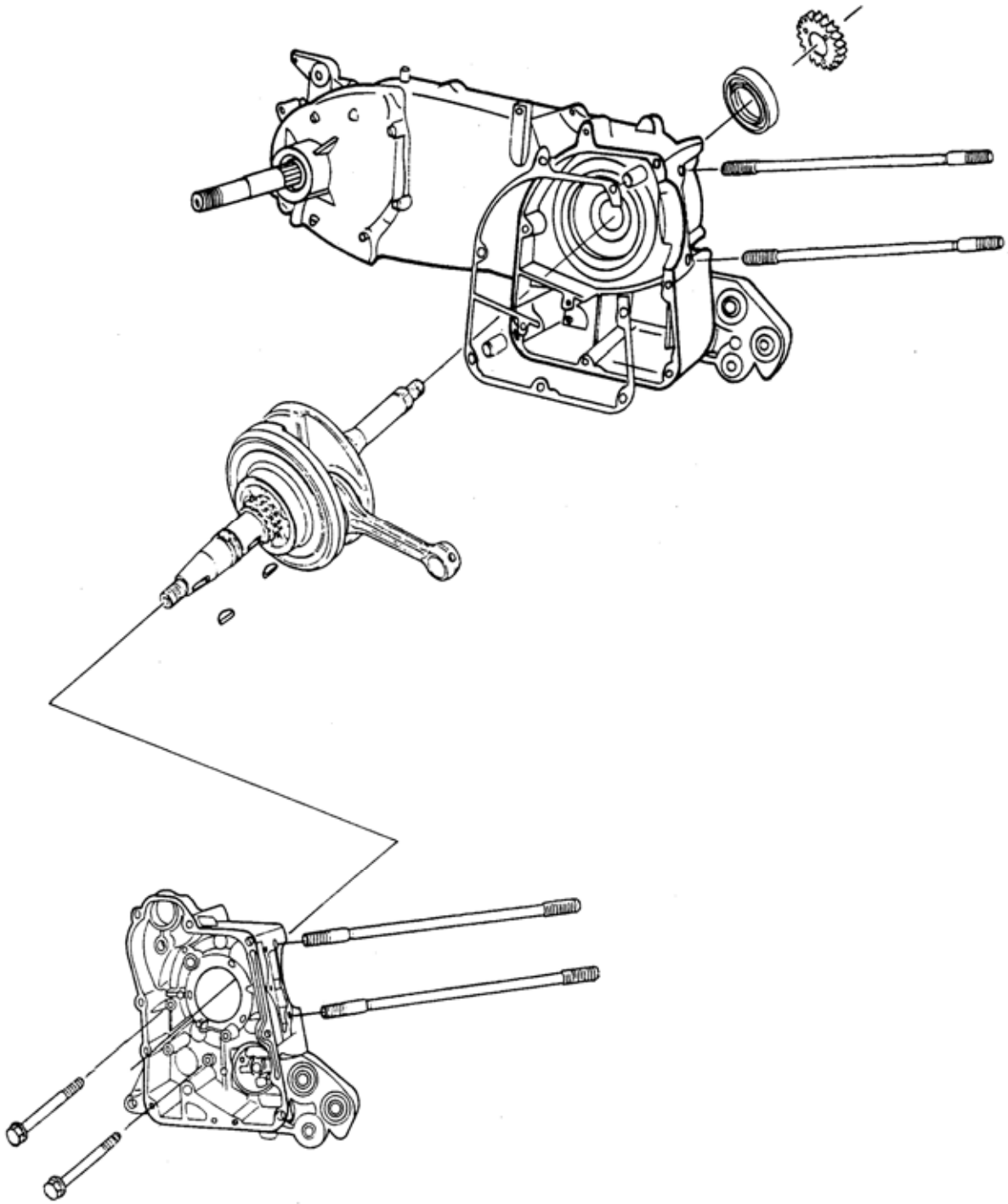
Right Crankcase Cover

Oil Pump Shaft Water Pump Shaft

CRANKCASE/CRANKSHAFT

11. CRANKCASE/CRANKSHAFT

SCHEMATIC DRAWING



11. CRANKCASE/CRANKSHAFT

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- This section covers crankcase separation to service the crankshaft. The engine must be removed for this operation.
- When separating the crankcase, never use a driver to pry the crankcase mating surfaces apart forcedly to prevent damaging the mating surfaces.
- When installing the crankcase, do not use an iron hammer to tap it.
- The following parts must be removed before separating the crankcase.

  Cylinder head (⇨6-4)
  Cylinder/piston (⇨7-3)
  Right crankcase cover/drive and driven pulley (⇨8-3)
  A.C. generator/starter clutch (⇨10-3)
  Rear wheel/rear shock absorber (⇨15-4)
  Starter motor (⇨19-3)
  Oil pump (⇨4-4)

SPECIFICATIONS

	Item	Standard (mm)	Service Limit (mm)
Crankshaft	Connecting rod big end side clearance	0.15～0.35	0.6
	Connecting rod big end radial clearance	0.～0.008	0.05
	Runout	—	0.10

TORQUE VALUES

Crankcase bolt	0.8～1.1kg-m
Cam chain tensioner slipper bolt	0.8～1.2kg-m

SPECIAL TOOL

Gear remover

TROUBLESHOOTING

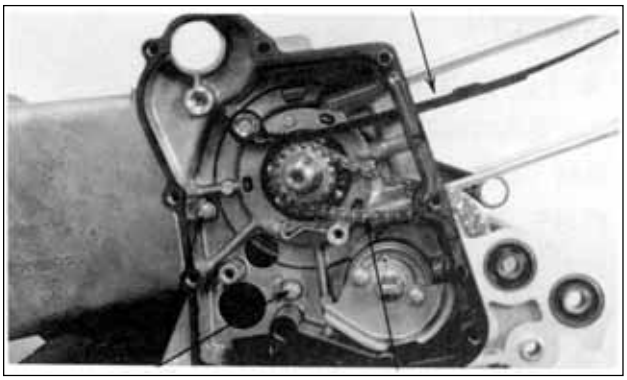
Excessive engine noise

- Excessive bearing play
- Excessive crankpin bearing play
- Worn piston pin and piston pin hole

CRANKCASE SEPARATION

Remove the cam chain tensioner slipper bolt.
Remove the cam chain tensioner slipper and cam chain.
Remove the two right crankcase attaching bolts.

Cam Chain Tensioner Slipper

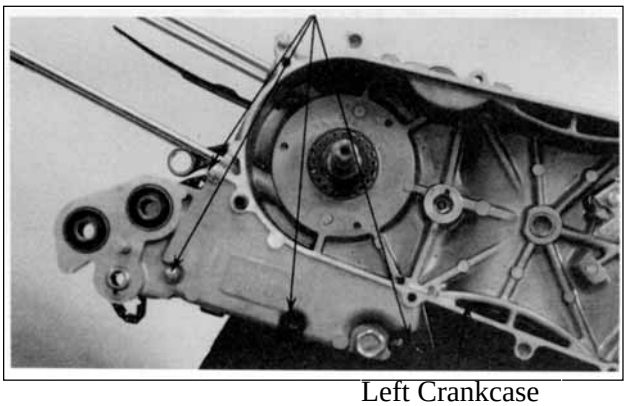


Bolt

Cam Chain

Bolts

Remove the five left crankcase bolts.



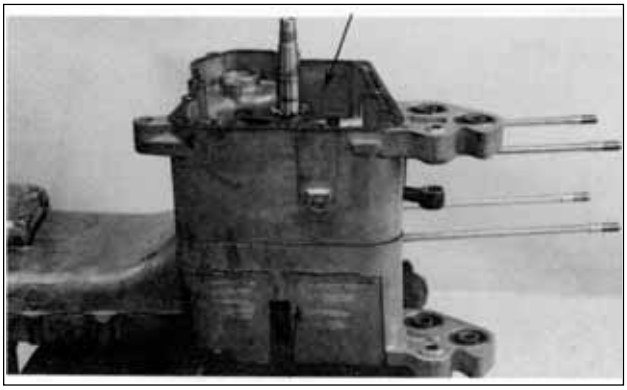
Left Crankcase

Right Crankcase

Place the crankcase with the left crankcase down and remove the right crankcase from the left crankcase.

* • Never use a driver to pry the crankcase mating surfaces apart.

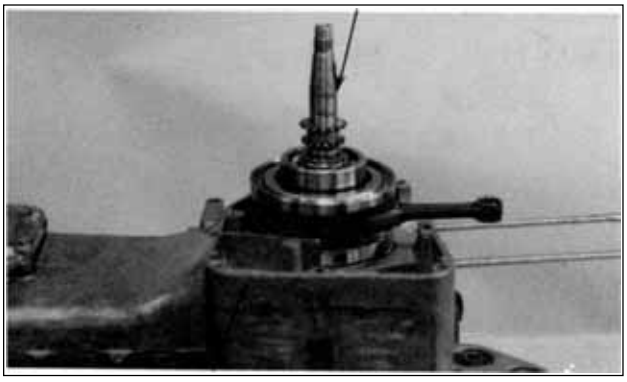
Remove the gasket and dowel pins.



Left Crankcase

Crankshaft

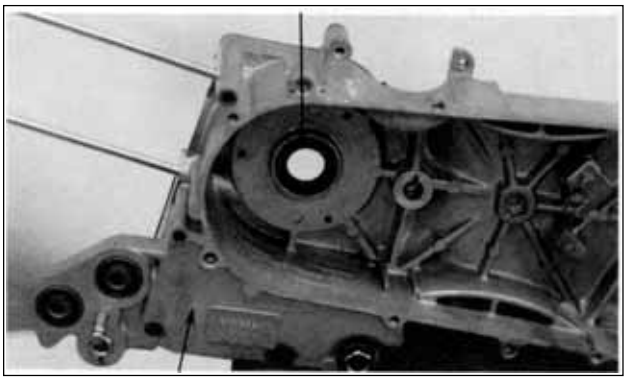
Remove the crankshaft from the left crankcase.



Left Crankcase

Oil Seal

Remove the oil seal from the left crankcase.

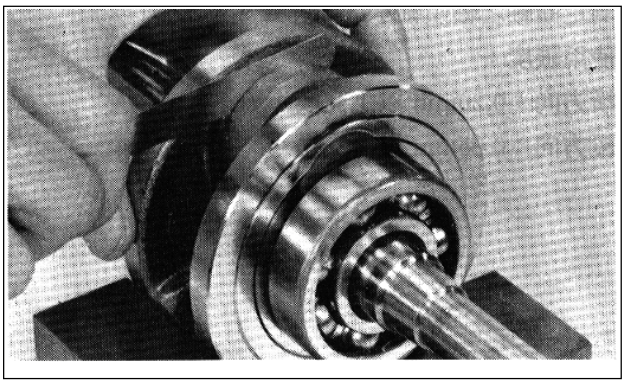


Left Crankcase

CRANKSHAFT INSPECTION

Measure the connecting rod big end side clearance.

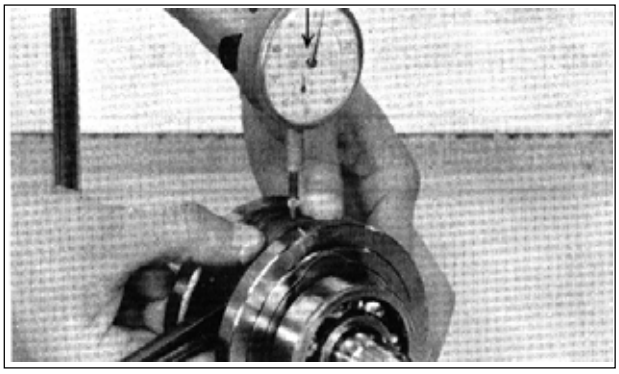
Service Limit: 0.6mm replace if over



Dial Gauge

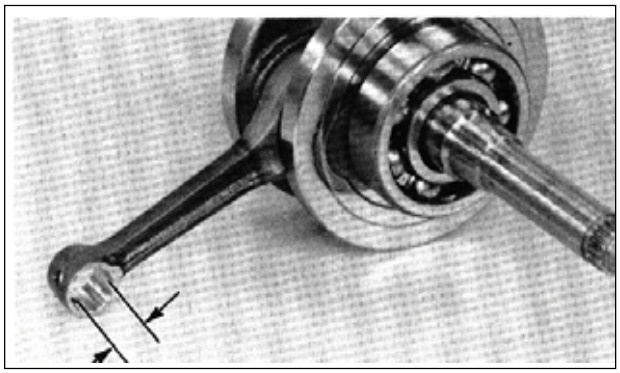
Measure the connecting rod big end radial clearance at two points at right angels to the shaft.

Service Limit: 0.05mm replace if over

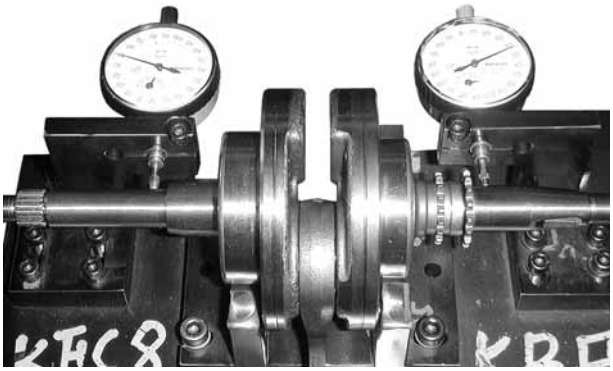


Measure the connecting rod small end I.D.

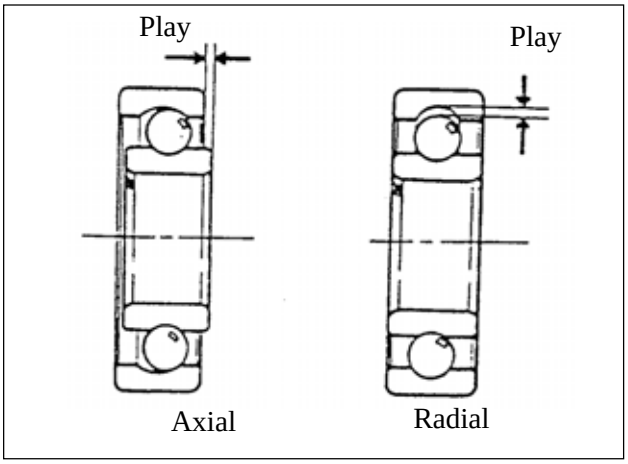
Service Limit: 15.06mm replace if over



Measure the crankshaft runout.
Service Limit: 0.10mm replace if over



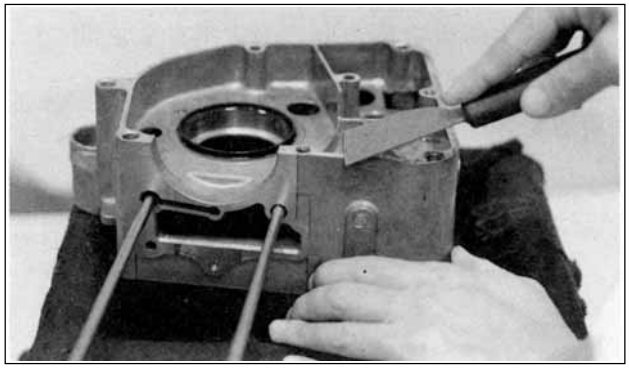
Measure the crankshaft bearing play.
Service Limits:
Axial : 0.20mm replace if over
Radial: 0.05mm replace if over



CRANKCASE ASSEMBLY

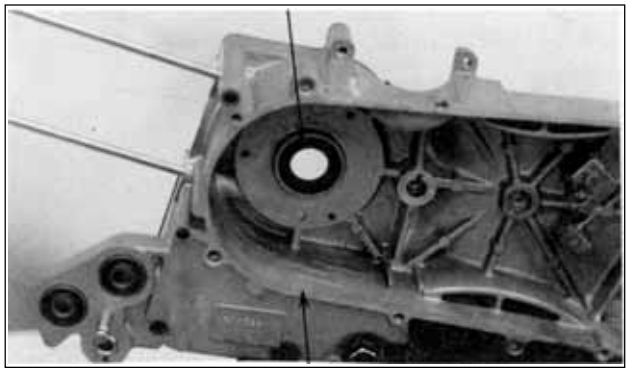
Clean off all gasket material from the crankcase mating surfaces.

* • Avoid damaging the crankcase mating surfaces.



Oil Seal

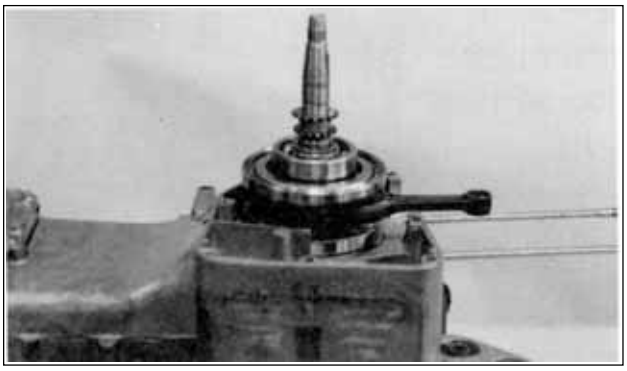
Install a new oil seal into the left crankcase.



Left Crankcase

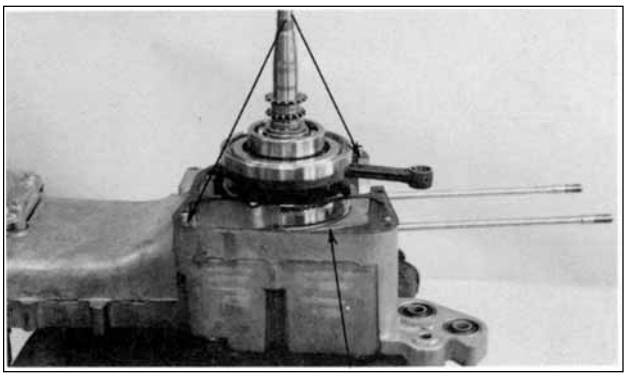
Place the left crankcase down and install the crankshaft into the left crankcase.

* • Avoid damaging the oil seal.
  • Apply grease to the lip of the oil seal.



Dowel Pins

Install the two dowel pins and a new gasket.

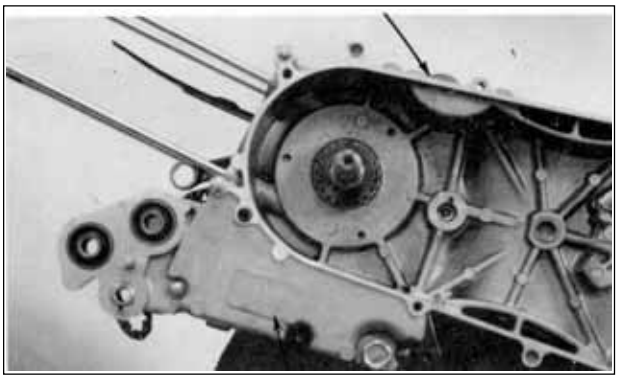


Gasket

Right Crankcase

Place the right crankcase over the crankshaft and onto the left crankcase.

* • Install the right crankcase squarely and do not tap it with an iron or plastic hammer.

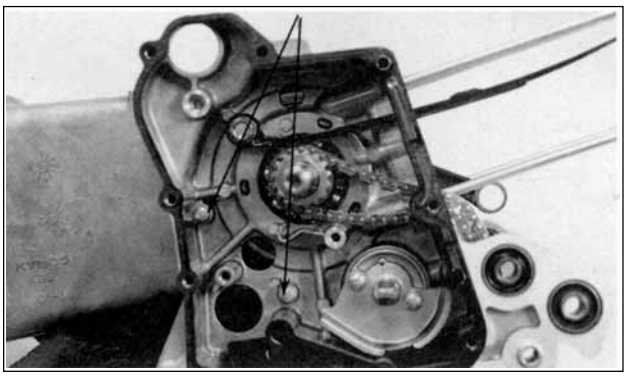


Left Crankcase

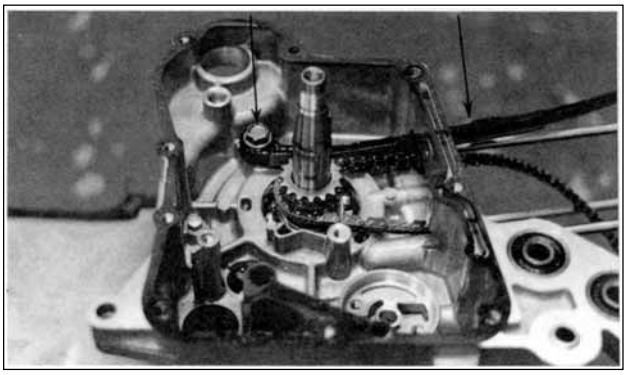
Bolts

Install and tighten the right and left crankcase attaching bolts.

Torque: 0.8～1.1kg-m



Bolt Cam Chain Tensioner Slipper



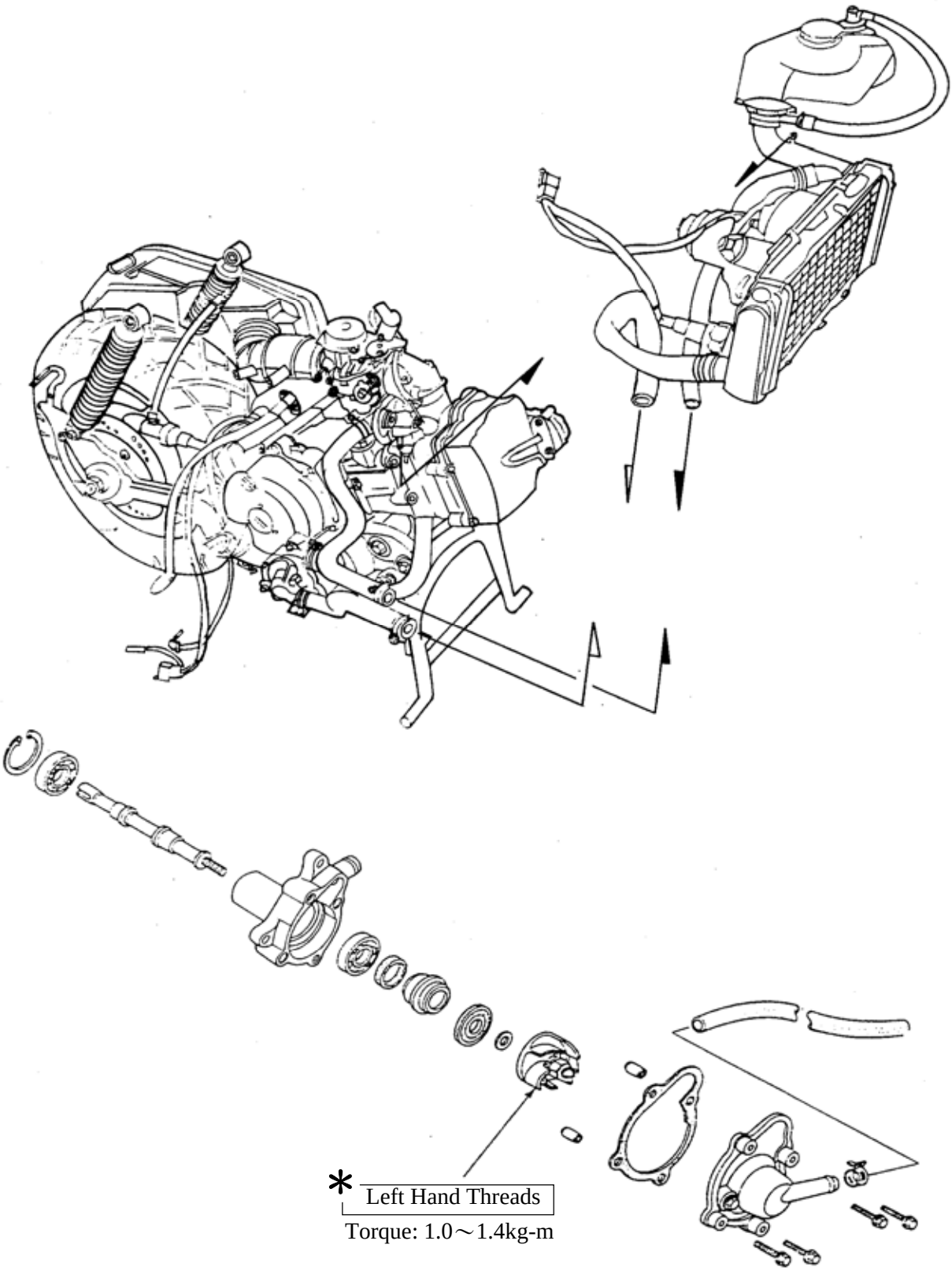
Install the cam chain.
Install the cam chain tensioner slipper.
Install and tighten the cam chain tensioner slipper bolt.

Torque: 0.8～1.2kg-m

COOLING SYSTEM

12. COOLING SYSTEM

SCHEMATIC DRAWING



12. COOLING SYSTEM

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- The water pump must be serviced after removing the engine. Other cooling system service can be done with the engine installed in the frame.
- The engine must be cool before servicing the cooling system.
  When the coolant temperature is over 100℃, never remove the radiator cap to release the pressure because the boiling coolant may cause danger.
- Avoid spilling coolant on painted surfaces because the coolant will corrode the painted surfaces. Wash off any spilled coolant with fresh water as soon as possible.
- After servicing the system, check for leaks with a cooling system tester.

SPECIAL TOOL

Mechanical seal driver

TORQUE VALUES

Water pump impeller	1.0～1.4kg-m
Water pump cover bolt	0.8～1.2kg-m

TROUBLESHOOTING

Engine temperature too high

- Faulty temperature gauge or thermosensor
- Faulty radiator cap
- Faulty thermostat
- Insufficient coolant
- Passages blocked in hoses or water jacket
- Clogged radiator fins
- Passages blocked in radiator
- Faulty water pump

Temperature gauge pointer does not register the correct coolant temperature

- Faulty temperature gauge or thermosensor
- Faulty thermostat

Coolant leaks

- Faulty pump mechanical (water) seal
- Deteriorated O-rings
- Damaged or deteriorated water hoses

12. COOLING SYSTEM

SPECIFICATIONS

Radiator cap relief pressure		0.9±0.15kg/cm²	
Thermostat temperature	Begins to open	80±2℃	
	Full-open	90℃	
	Valve lift	3.5～4.5mm	
Coolant capacity		Total system 1165cc	Radiator: 825cc Reserve tank: 340cc

COOLANT GRAVITY

Temp. ℃ / Coolant concentration	0	5	10	15	20	25	30	35	40	45	50
5%	1.009	1.009	1.008	1.008	1.007	1.006	1.005	1.003	1.001	0.009	0.997
10%	1.018	1.107	1.017	1.016	1.015	1.014	0.013	1.011	1.009	1.007	1.005
15%	1.028	1.027	1.026	1.025	1.024	1.022	1.020	1.018	1.016	1.014	1.012
20%	1.036	1.035	1.034	1.033	1.031	1.029	1.027	1.025	1.023	1.021	1.019
25%	1.045	1.044	1.043	1.042	1.040	1.038	1.036	1.034	1.031	1.028	1.025
30%	1.053	1.051	1.051	1.049	1.047	1.045	1.043	1.041	1.038	1.035	1.032
35%	1.063	1.062	1.060	1.058	1.056	1.054	1.052	1.049	1.046	1.043	1.040
40%	1.072	1.070	1.068	1.066	1.064	1.062	1.059	1.056	1.053	1.050	1.047
45%	1.080	1.078	1.076	1.074	1.072	1.069	1.056	1.063	1.062	1.057	1.054
50%	1.086	1.084	1.082	1.080	1.077	1.074	1.071	1.068	1.065	1.062	1.059
55%	1.095	1.093	1.091	1.088	1.085	1.082	1.079	1.076	1.073	1.070	1.067
60%	1.100	1.098	1.095	1.092	1.089	1.086	1.083	1.080	1.077	1.074	1.071

COOLANT MIXTURE (WITH ANTI-RUST AND ANTI-FREEZING EFFECTS)

Freezing Point	Mixing Rate	KYMCO SIGMA Coolant Concentrate	Distilled Water
-9℃	20%		
-15℃	30%	360cc	825cc
-25℃	40%		
-37℃	50%		
-44.5℃	55%		

Cautions for Using Coolant:
- Use coolant of specified mixing rate. (The mixing rate of 360cc KYMCO SIGMA coolant concentrate + 825cc distilled water is 30%.)
- Do not mix coolant concentrate of different brands.
- Do not drink the coolant which is poisonous.
- The freezing point of coolant mixture shall be 5℃ lower than the freezing point of the riding area.

COOLING SYSTEM TESTING

RADIATOR CAP INSPECTION

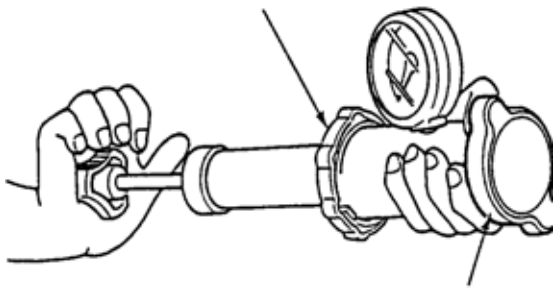
Install the radiator cap onto the radiator tester and apply specified pressure to it. It must hold specified pressure for at least six seconds.

* Apply water to the cap sealing surface before testing.

Radiator Cap Relief Pressure:

0.9±0.15kg/cm²

Radiator Tester

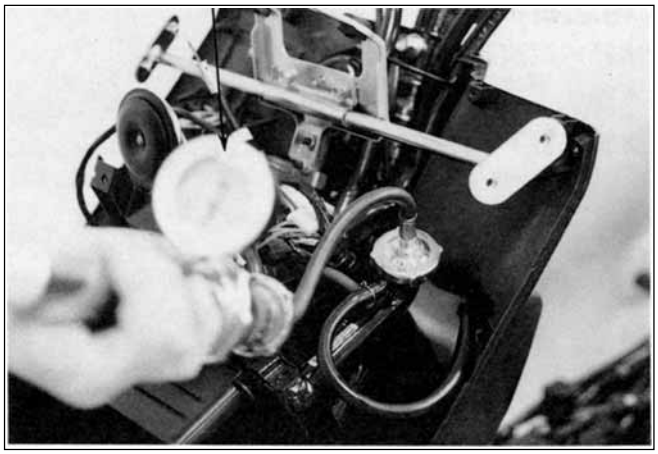


Radiator Cap

Radiator Tester

Install the radiator tester onto the radiator and apply specified pressure to it. It must hold specified pressure for at least six seconds.
Check the water hoses and connectors for leaks.

* The test pressure should not exceed 1.05 kg/cm². Excessive pressure can damage the radiator and its hose

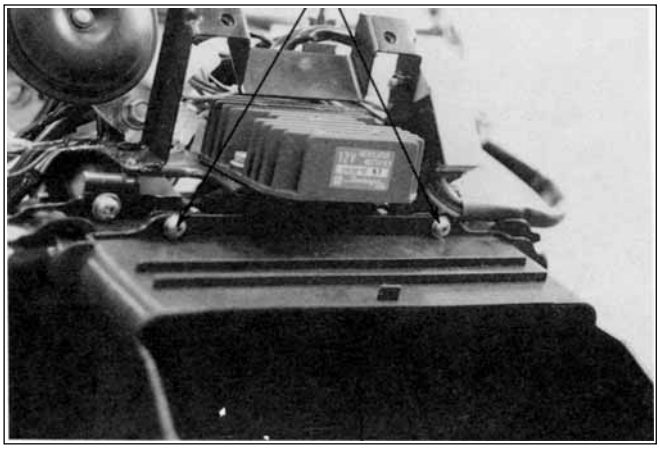


RADIATOR

RADIATOR INSPECTION

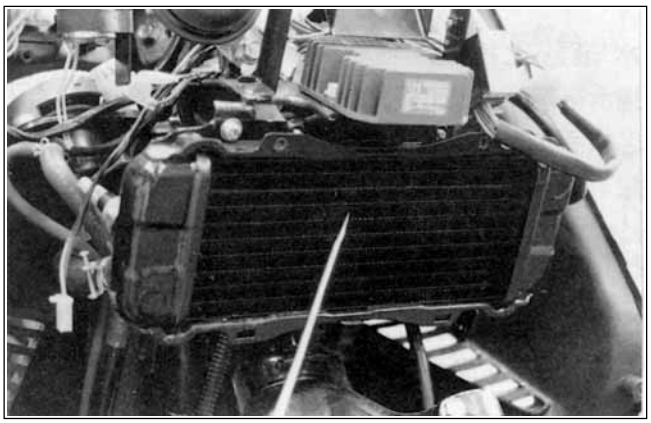
Remove the front upper cover. (⇨2-5)
Remove the front lower cover. (⇨2-5)
Remove the two screws and the air duct.

Screws



Air Duct

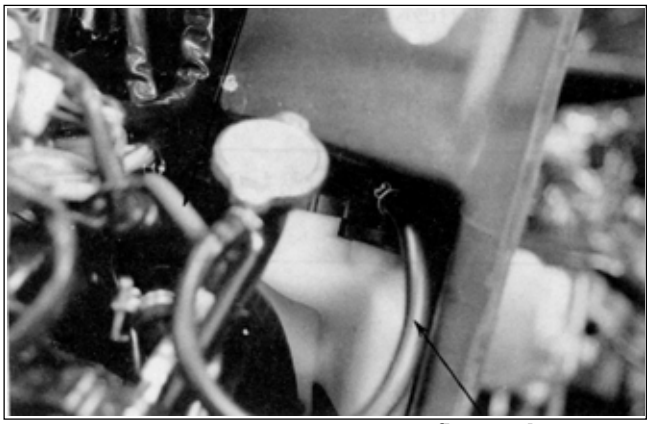
Inspect the radiator soldered joints and seams for leaks.
Blow dirt out from between core fins with compressed air. If insects, etc., are clogging the radiator, wash them off.
Carefully straighten any bent fins.



Air Vent Tube

RADIATOR REMOVAL

Drain the coolant. (⇨3-9)
Disconnect the air vent tube from the radiator filler.
Remove the overflow tube clamp and disconnect the overflow tube.



Overflow Tube

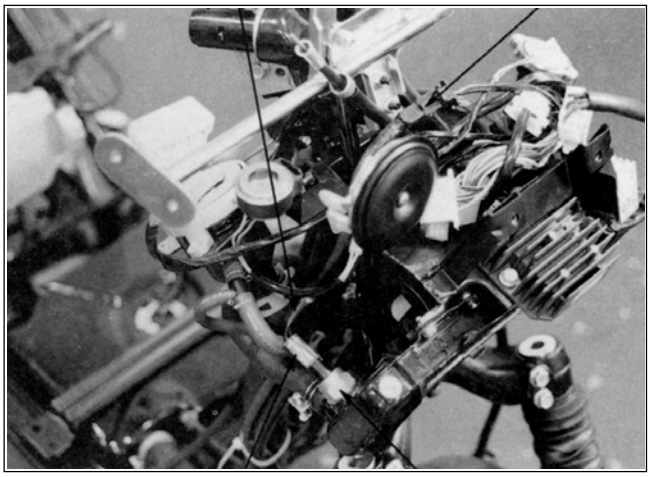
Upper Hose

Loosen the hose band and disconnect the upper hose from the radiator.

Radiator

Loosen the hose band and disconnect the lower hose from the radiator.
Disconnect the thermostatic switch wire coupler.
Disconnect the fan motor wire coupler.

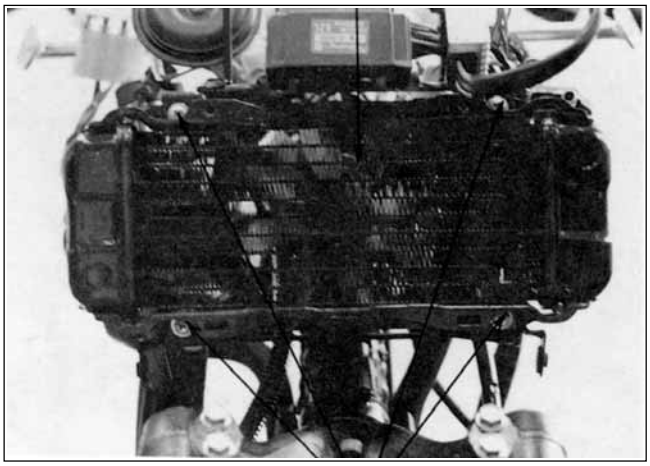
Thermostatic Switch Wire Fan Motor Wire Coupler



Lower Hose Thermostatic Switch

Remove the four screws and the radiator.

Radiator

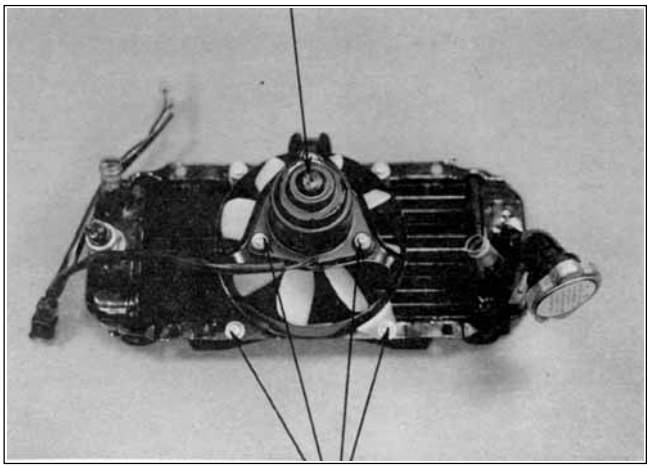


Screws

RADIATOR DISASSEMBLY

Remove the four bolts and then remove the fan/shroud from the radiator.

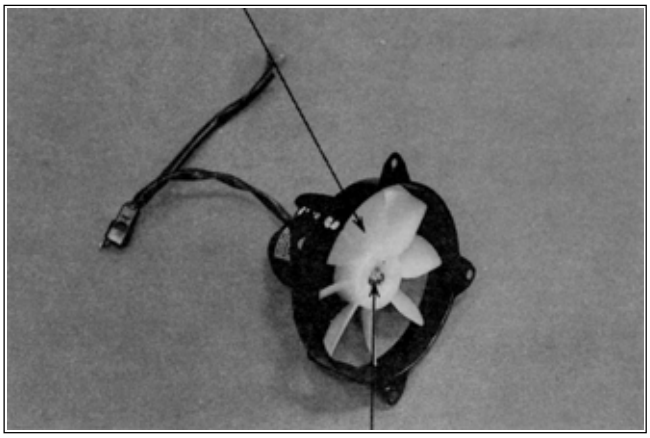
Fan/Shroud



Bolts

Remove the cooling fan from the motor by removing the nut.

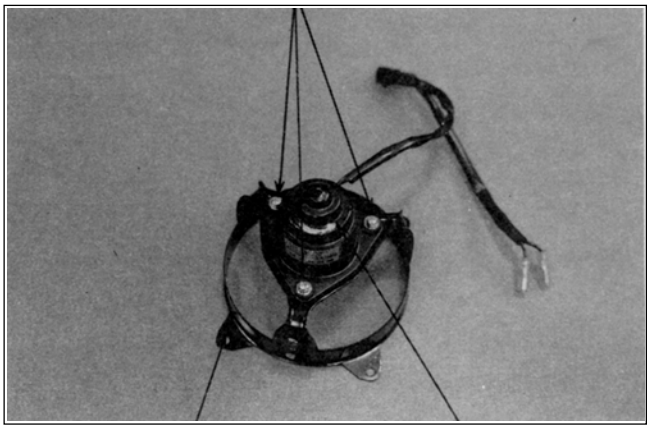
Cooling Fan



Nut

Remove the fan motor from the shroud by removing the three screws.

Screws



Shroud Fan Motor

RADIATOR BRACKET REMOVAL/ INSTALLATION

Remove the two bolts to remove the radiator bracket.
The installation sequence is the reverse of removal.

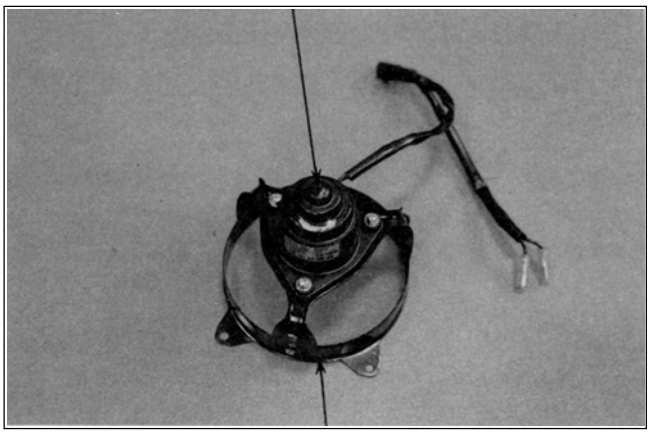
Bolts

Radiator Bracket

RADIATOR ASSEMBLY

Install the fan motor on the fan shroud.

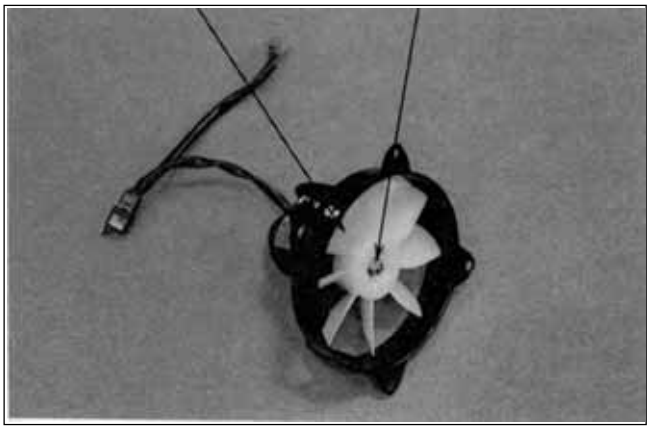
Fan Motor



Fan Shroud

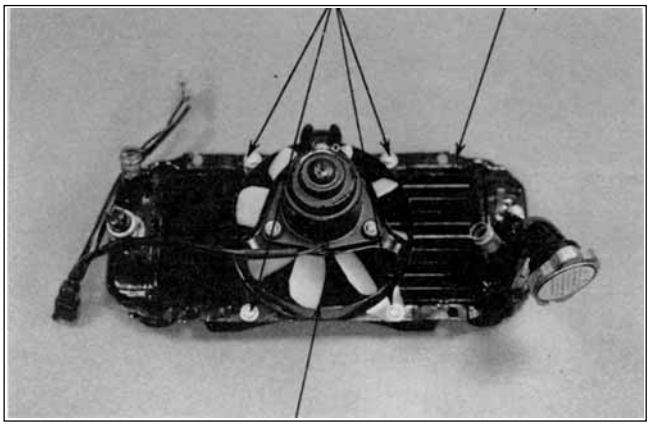
Install the fan onto the fan shaft.
Apply locking agent to the threaded portion of the motor shaft.
Install the plain washer and lock washer and tighten with the nut.

Cooling Fan Nut



Install the fan shroud on the radiator with the four bolts.

Bolts Radiator

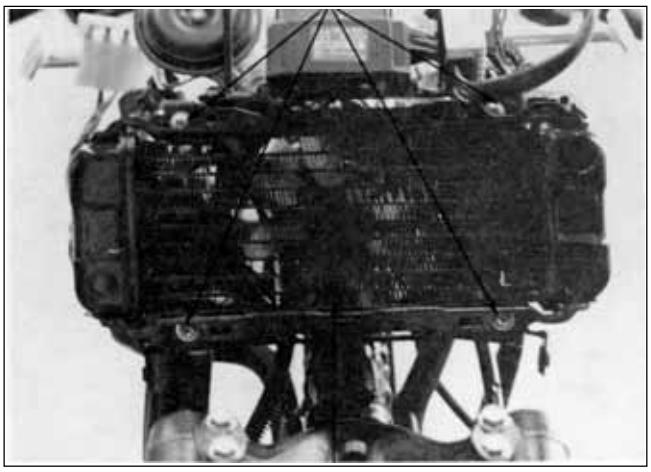


Fan Shroud

RADIATOR INSTALLATION

Install the radiator on the radiator bracket with the four screws.

Screws

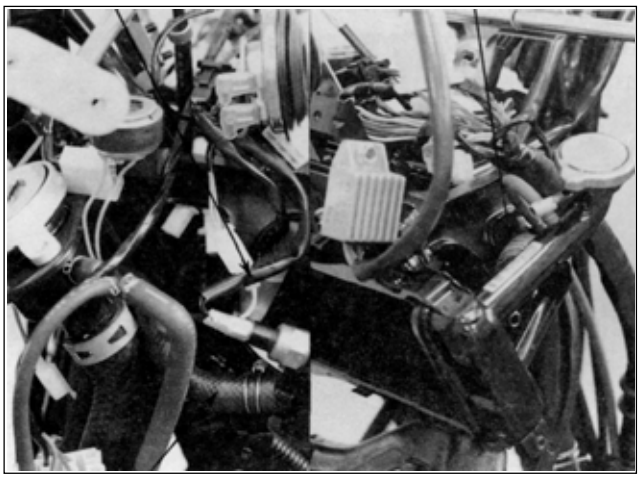


Radiator

.

Connect the upper and lower hoses and secure them with hose bands.
Connect the thermostatic switch wire and fan motor wire couplers.

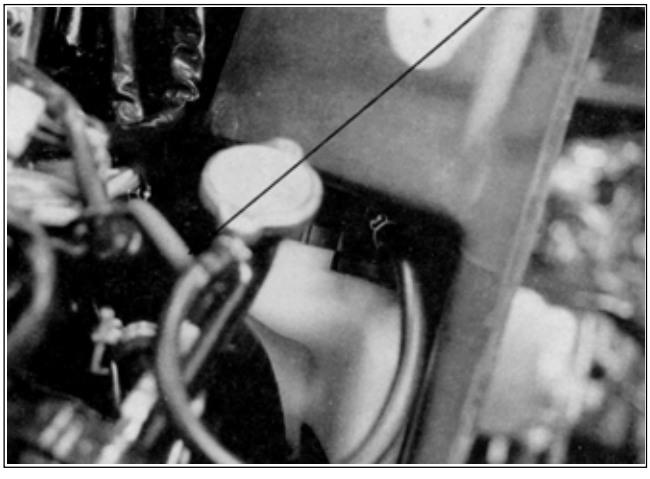
Thermostatic Switch Wire Upper Hose



Lower Hose

Install the heat screen.
Connect the overflow tube and secure with the tube clamp.
Connect the vent tube to the radiator filler.

Air Vent Tube

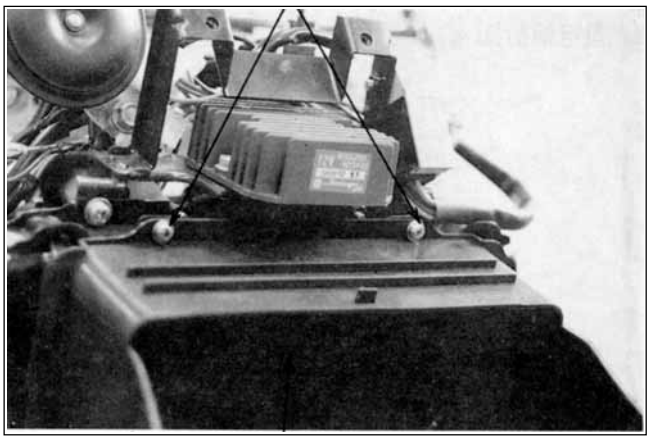


Overflow Tube

Set the two tabs under the air duct into the grooves on the radiator lower part and then secure the radiator with the two screws.

Fill the radiator with coolant. (⇨3-9)
After installation, check for coolant leaks.

Screws



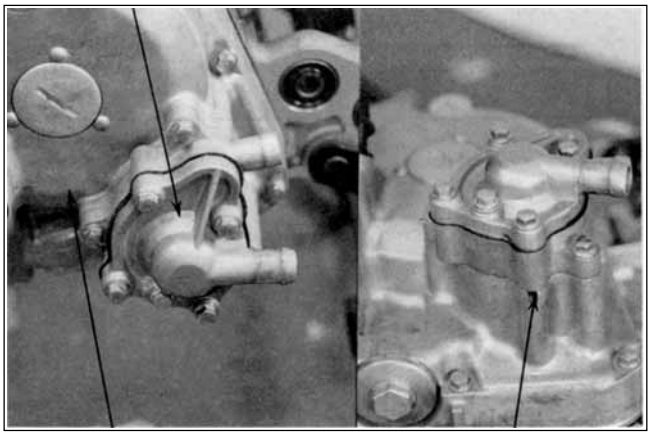
Air Duct

WATER PUMP

MECHANICAL SEAL (WATER SEAL) INSPECTION

Inspect the telltale hole for signs of mechanical seal coolant leakage.
If the mechanical seal is leaking, remove the right crankcase cover and replace the mechanical seal.

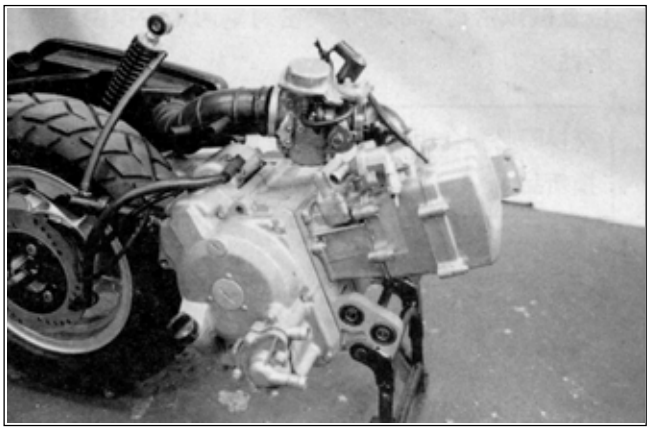
Water Pump



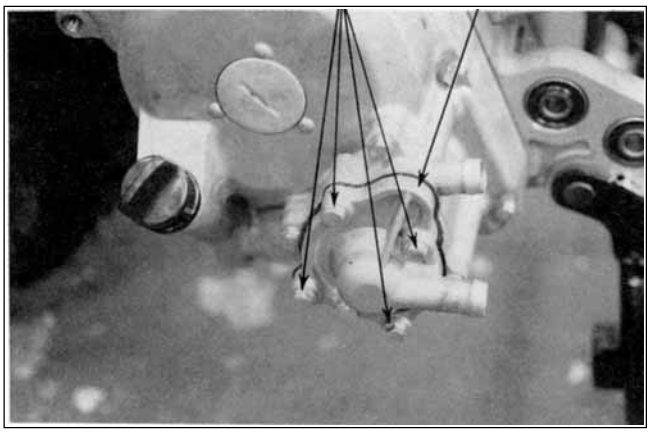
Right Crankcase Cover Telltale Hole

WATER PUMP/IMPELLER REMOVAL

Remove the engine from the frame. (⇨5-3)

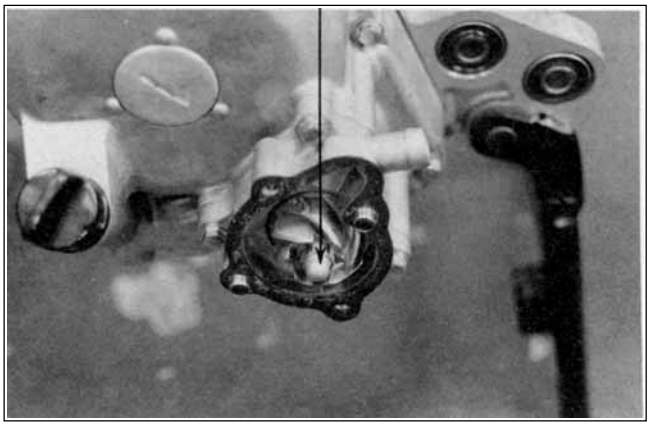


Remove the four bolts and the water pump cover, gasket and 2 dowel pins.



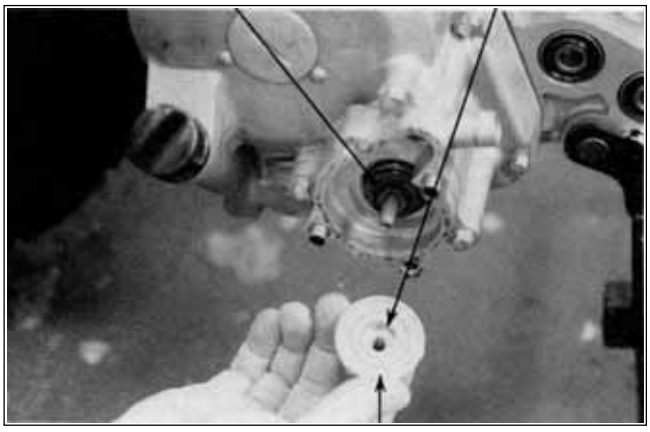
Remove the water pump impeller.

* The impeller has left hand threads.



Inspect the mechanical (water) seal and seal washer for wear or damage.

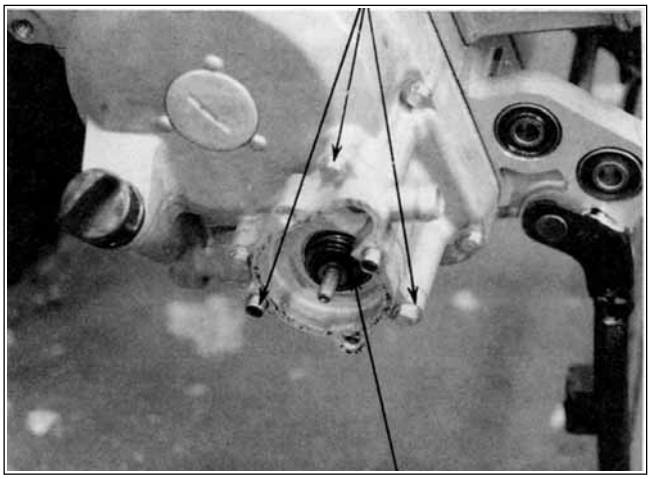
* The mechanical seal and seal washer must be replace as a set.



WATER PUMP SHAFT REMOVAL

Disconnect the water hose from the right crankcase cover.
Remove the 3 bolts attaching the water pump assembly.
Remove the water pump assembly, gasket and dowel pins.

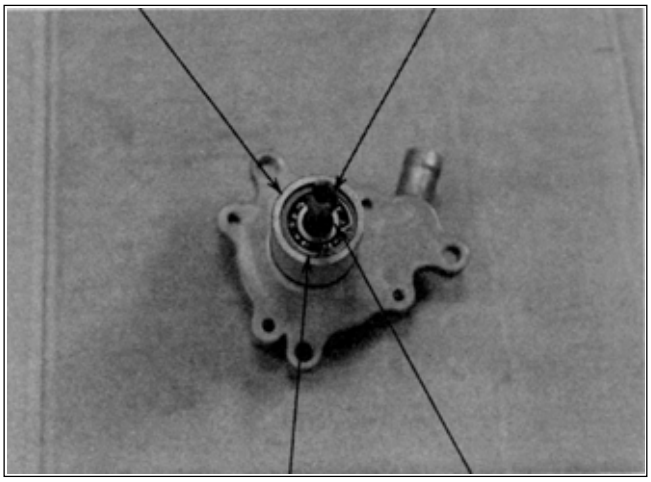
Bolts



Water Pump Assembly

Remove the water pump bearing snap ring from the water pump assembly.
Remove the water pump shaft and shaft inner bearing.

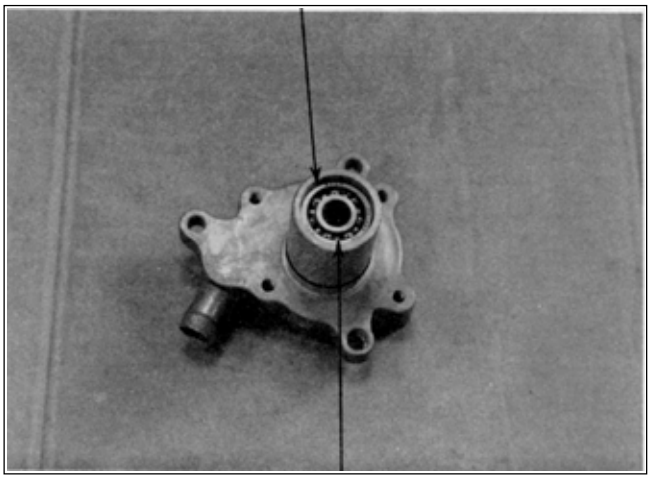
Water Pump Assembly Inner Bearing



Snap Ring Water Pump Shaft

Remove the water pump shaft outer bearing.

Water Pump Assembly

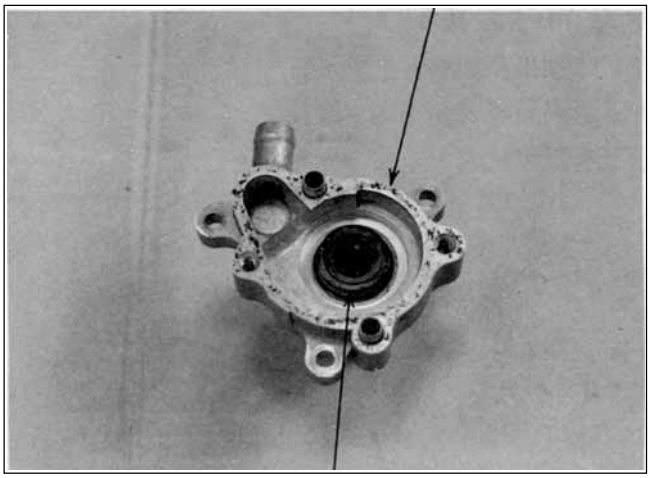


Outer Bearing

MECHANICAL SEAL REPLACEMENT

Drive the mechanical seal out of the water pump assembly from the inside.

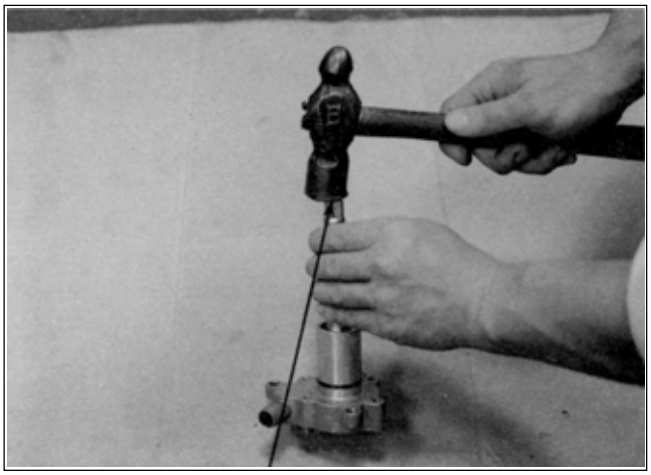
Water Pump Assembly



Mechanical Seal (Water Seal)

Drive in a new mechanical seal using a mechanical seal driver.

* Apply sealant to the right crankcase cover fitting surface of a new mechanical seal and then drive in the mechanical seal.

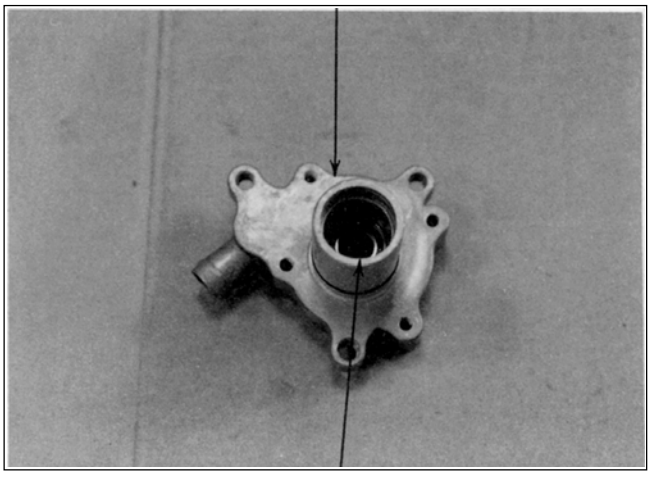


Mechanical Seal Driver

WATER PUMP SHAFT INSTALLATION

Drive a new water pump shaft outer bearing into the water pump assembly from the inside.

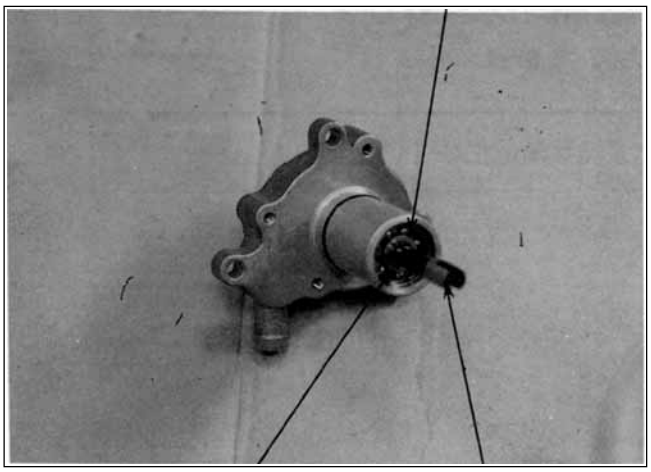
Water Pump Assembly



Outer Bearing

Install the water pump shaft and shaft inner bearing into the waster pump assembly.
Install the snap ring to secure the inner bearing properly.

Snap Ring

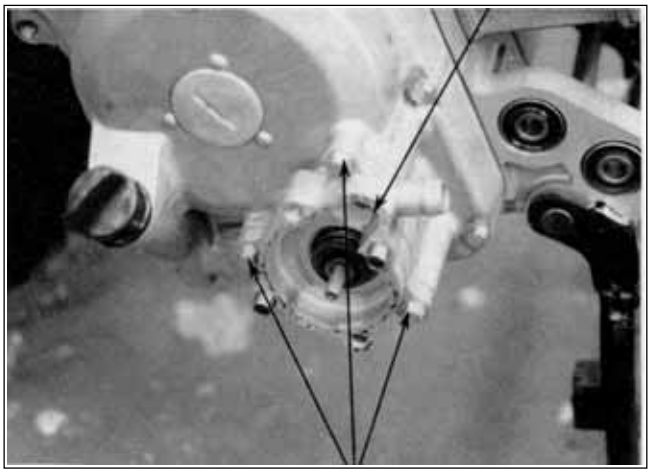


Inner Bearing Water Pump Shaft

Water Pump Assembly

Install the dowel pins and a new gasket and then install the water pump assembly to the right crankcase cover.
Tighten the 3 bolts to secure the water pump assembly.

* When installing the water pump assembly, aligning the groove on the water pump shaft with the tab on the oil pump shaft.

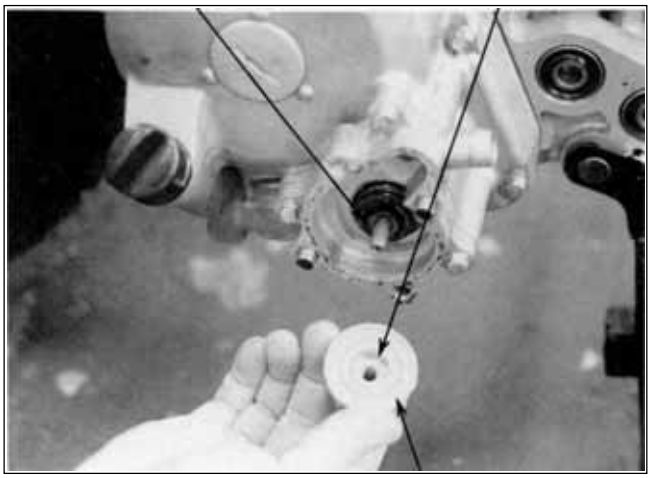


Bolts

Mechanical Seal Seal Washer (Porcelain)

WATER PUMP/IMPELLER INSTALLATION

When the mechanical seal is replaced, a new seal washer must be installed to the impeller.

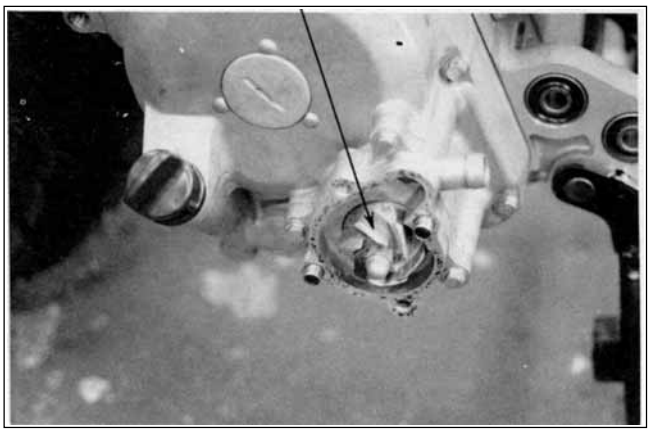


Impeller

Install the impeller onto the water pump shaft.
Torque: 1.0～1.4kg-m

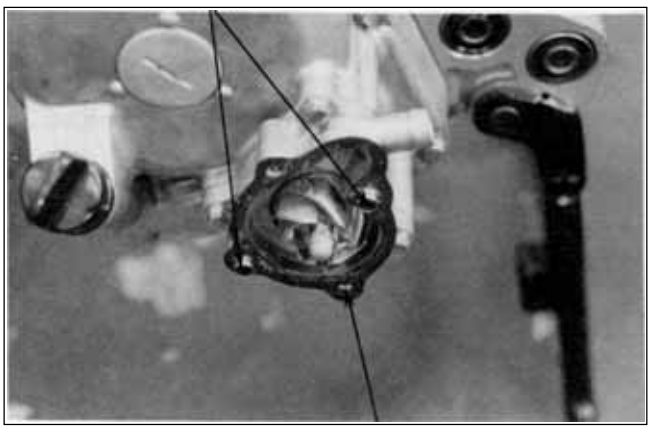
* The impeller has left hand threads.

Impeller (Left Hand Threads)



Install the two dowel pins and a new gasket.

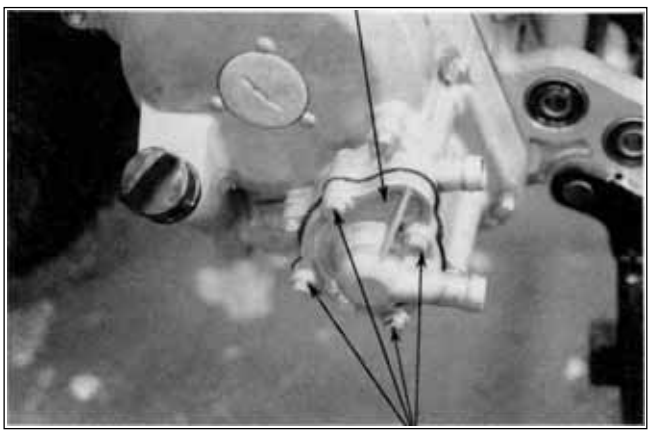
Dowel Pins



Gasket

Install the water pump cover and tighten the 4 bolts.
Torque: 0.8～1.2kg-m

Water Pump Cover



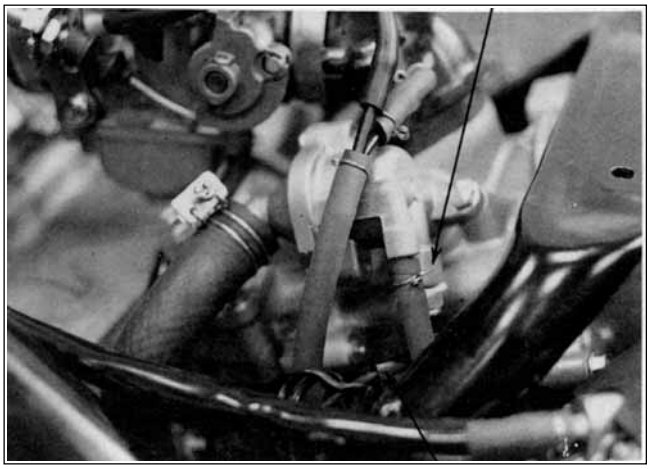
S

Bolt

THERMOSENSOR

THERMOSENSOR REMOVAL

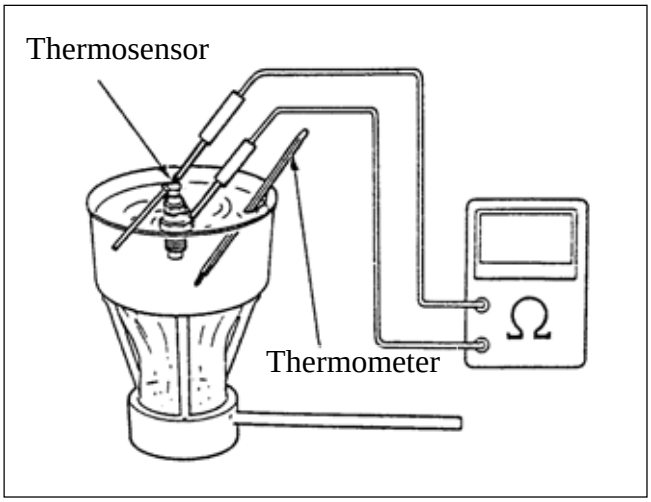
Remove the seat, met-in box and center cover.
Drain the coolant.
Disconnect the thermosensor wire.
Remove the thermosensor.



THERMOSENSOR INSPECTION

Suspend the thermosensor in a pan of water over a burner and measure the resistance through the sensor as the water heats up.

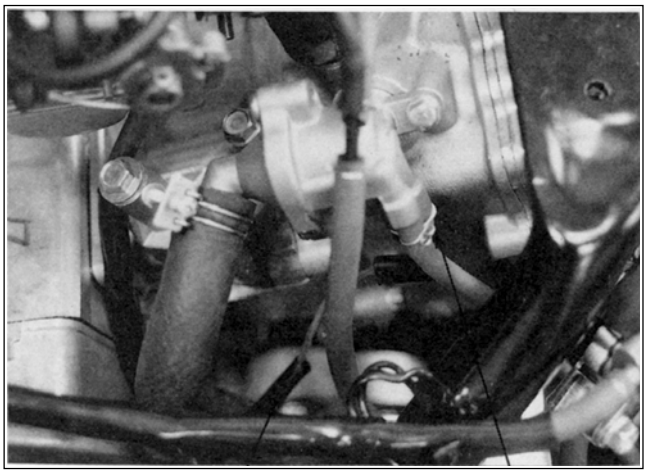
Temperature(℃)	50	80	100	120
Resistance(Ω)	154	52	27	16



THERMOSENSOR INSTALLATION

Apply 3-BOND No. 1212 sealant or equivalent to the thermosensor threads and install it into the thermostat housing.
Connect the thermosensor wire.
Fill the radiator with coolant. (⇨3-9)
Install the center cover, met-in box and seat. (⇨2-3)

* Be sure to bleed air from the cooling system.

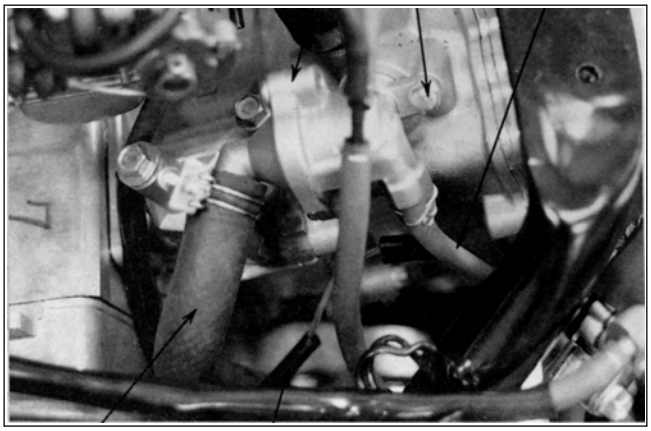


THERMOSTAT

THERMOSTAT REMOVAL

Remove the seat, met-in box and center cover.
Drain the coolant.
Disconnect the thermosensor wire from the thermosensor.
Disconnect the water hose from the thermostat housing.
Disconnect the air vent tube from the thermostat housing.
Remove the mounting bolt and the thermostat housing from the cylinder head.

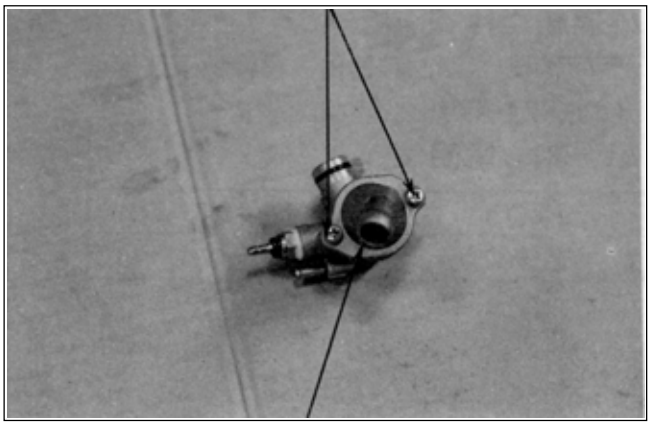
Thermostat Housing Bolt Air Vent Tube



Water Hose Thermosensor Wire

Remove the two bolts and separate the thermostat housing halves.

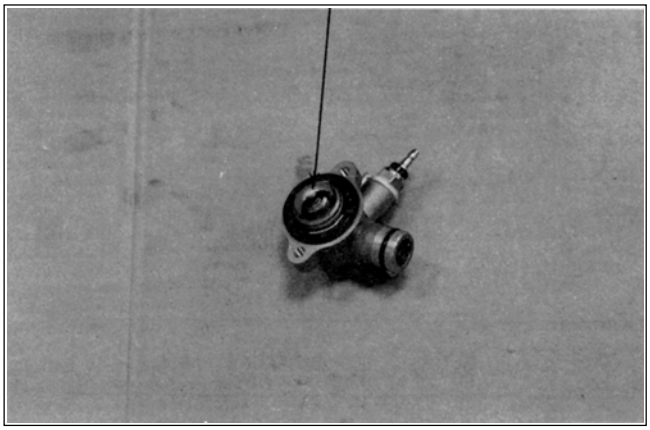
Bolts



Thermostat

Remove the thermostat from the thermostat housing.

Thermostat

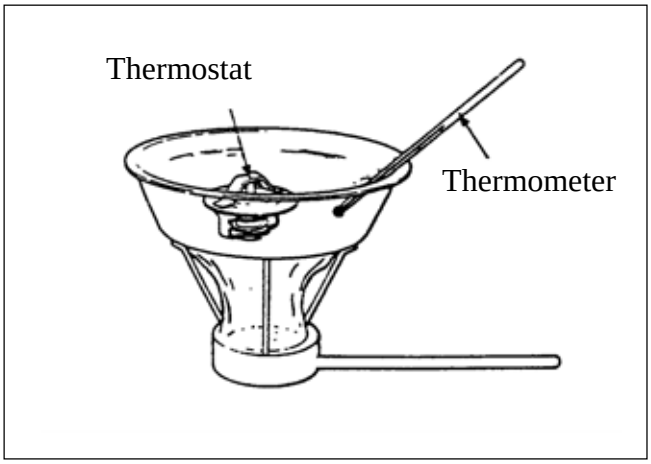


THERMOSTAT INSPECTION

Suspend the thermostat in a pan of water over a burner and gradually raise the water temperature to check its operation.

Technical Data

Begins to open	80±2℃
Full-open	90℃
Valve lift	3.5～4.5mm



* • Do not let the thermostat touch the pan as it will give a false reading.
  • Replace the thermostat if the valve stays open at room temperature.
  • Test the thermostat after it is opened for about 5 minutes and holds the temperature at 70℃.

THERMOSTAT INSTALLATION

The installation sequence is the reverse of removal.

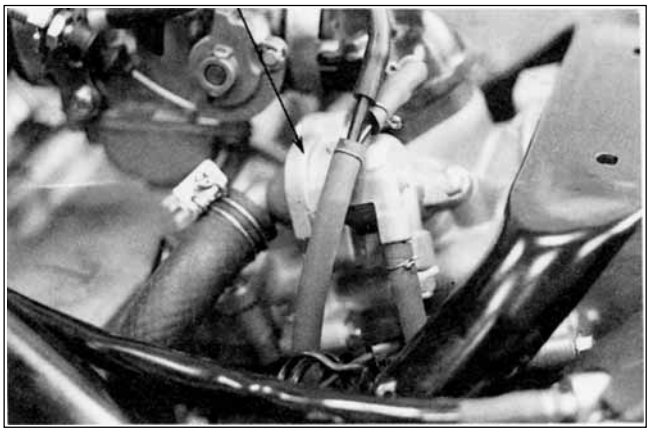
* Replace the O-ring with a new one and apply grease to it.

Fill the cooling system with the specified coolant. (⇨3-9)

O-ring

Thermostat Housing

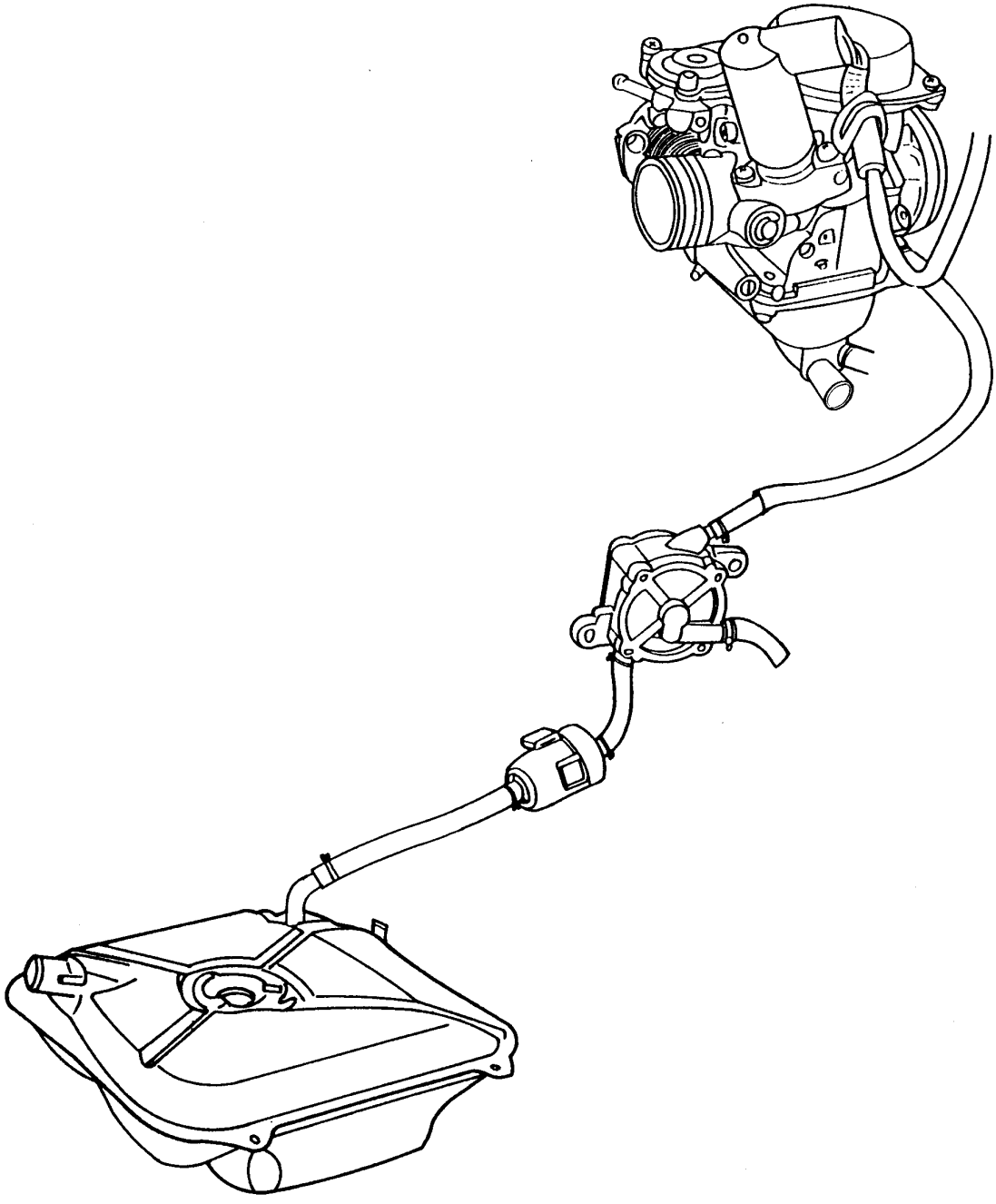
Thermostat Housing



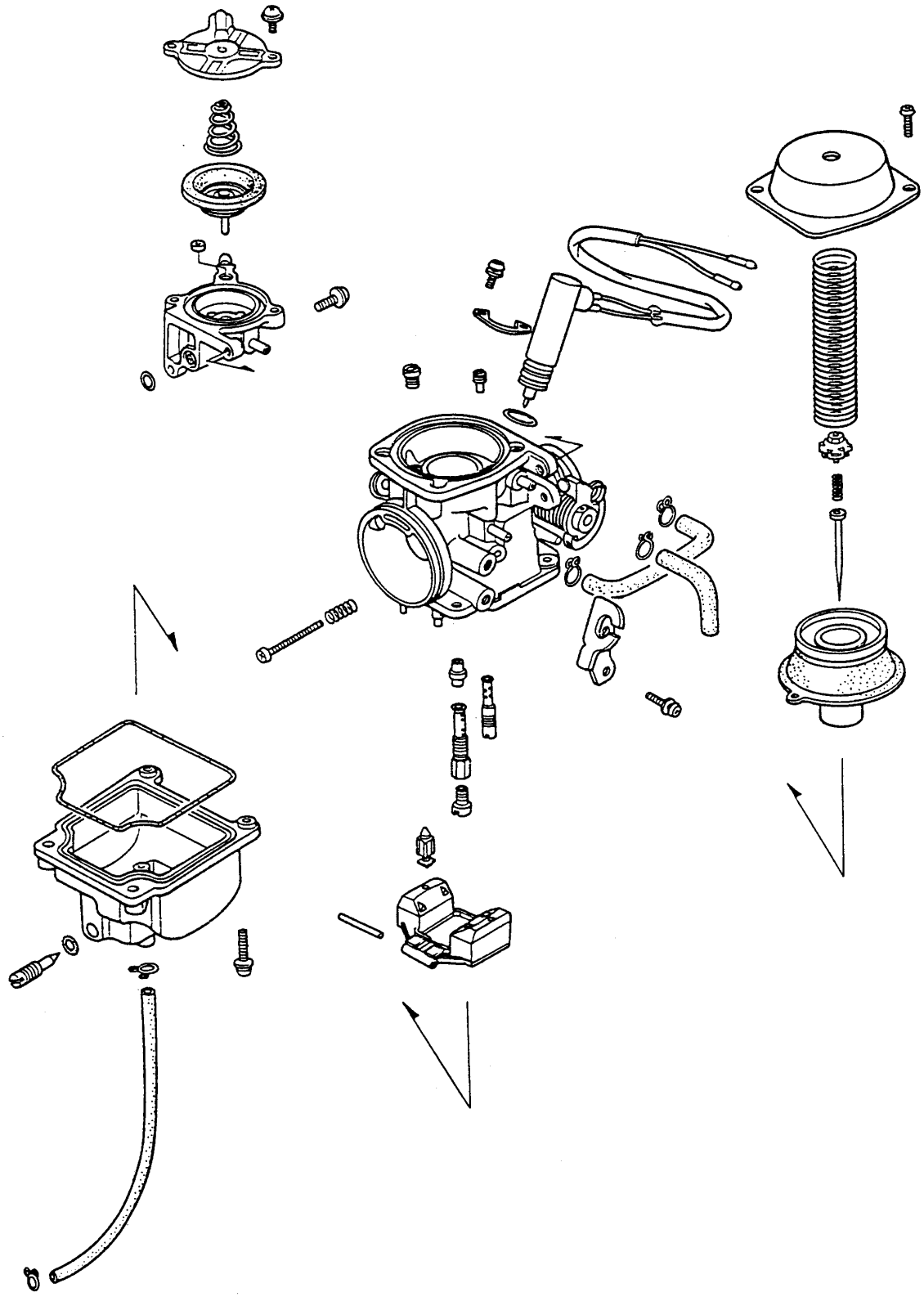
FUEL SYSTEM/CARBURETOR/FUEL PUMP

13. FUEL SYSTEM/CARBURETOR/FUEL PUMP

FUEL SYSTEM



SCHEMATIC DRAWING

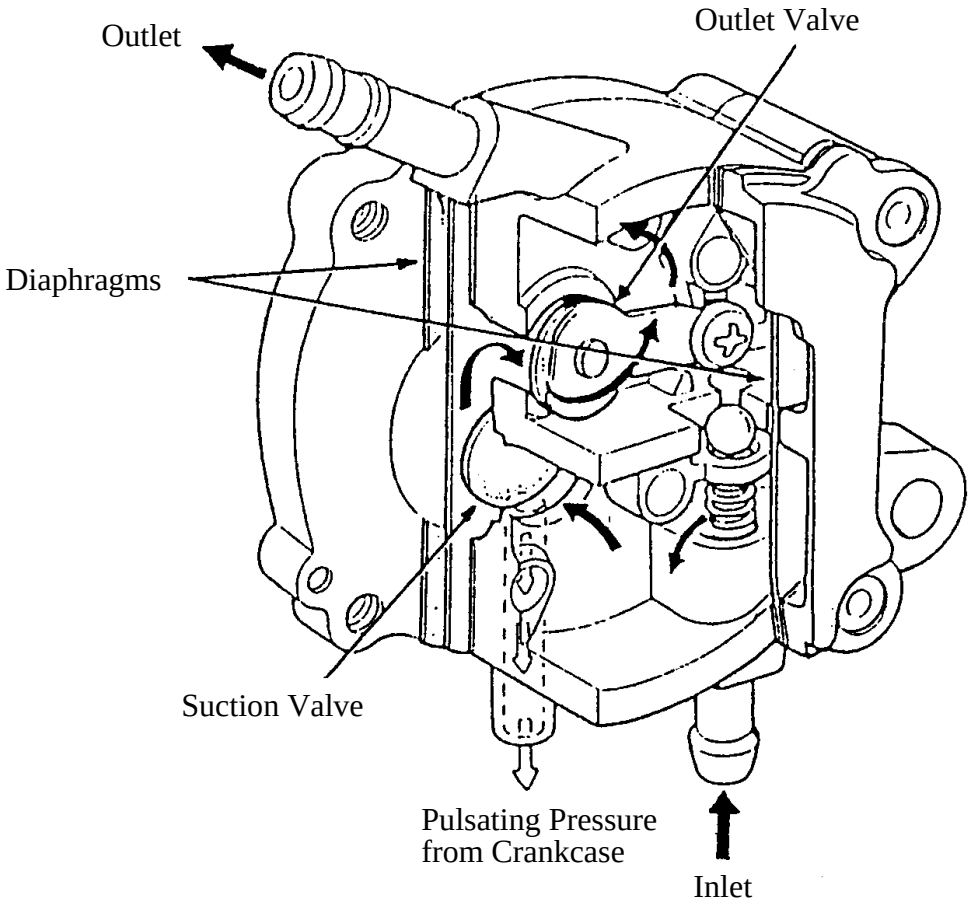


FUEL PUMP

CONSTRUCTION:

The fuel pump adopted for this model is a vacuum-type fuel pump which utilizes the positive and negative pulsating pressures produced by the engine crankcase to control the oil pump diaphragms and deliver fuel from the fuel tank to the carburetor through the suction valve and outlet valve.

FUEL PUMP CONSTRUCTION



SERVICE INFORMATION

GENERAL INSTRUCTIONS

- When working with gasoline, keep away from sparks and flames.
- Note the locations of O-rings when disassembling and replace them with new ones during assembly.
- Before float chamber disassembly, drain the residual gasoline from the float chamber.
- Do not try to disassemble the auto bystarter.
- When assembling the vacuum chamber and air cut-off valve, be careful not to damage the diaphragms.
- All cables, fuel lines and wires must be routed and secured at correct locations.

SPECIFICATIONS

Venturi dia. (mm)	22
Identification number	VE0222A B
Float level (mm)	18.5
Pilot screw opening	2¼ ±½
Main jet	105#
Slow jet	35#
Idle speed	1500±100rpm
Fuel pump output	40cc/1500rpm/10 seconds

SPECIAL TOOLS

Float level gauge
Fuel unit remover

TROUBLESHOOTING

Engine does not start

- No fuel in tank
- Restricted fuel line
- Too much fuel getting to cylinder
- Clogged air cleaner
- Contaminated fuel
- Faulty fuel pump

Engine idles roughly, stalls or runs poorly

- Incorrect idle speed
- Rich mixture
- Lean mixture
- Clogged air cleaner
- Intake air leak
- Contaminated fuel
- Faulty air-cut off valve
- Damaged vacuum tube and connectors
- Damaged carburetor insulator

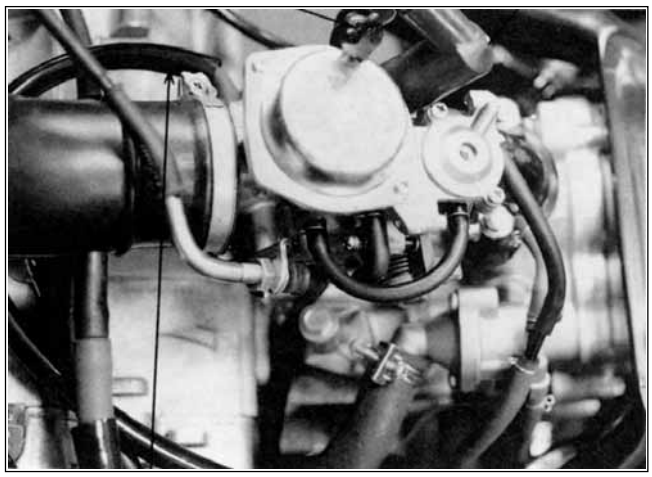
Throttle does not open fully, so engine stalls
- Damaged vacuum piston diaphragm
- Clogged diaphragm hole

Lean mixture
- Clogged fuel jets
- Clogged fuel tank cap breather hole
- Clogged fuel filter
- Bent, kinked or restricted fuel line
- Faulty float valve
- Float level too low
- Faulty fuel pump or insufficient output

Rich mixture
- Auto bystarter valve opens excessively
- Faulty float valve
- Float level too high
- Clogged air jets
- Auto bystarter valve set plate installed in the wrong groove
- Clogged air cleaner

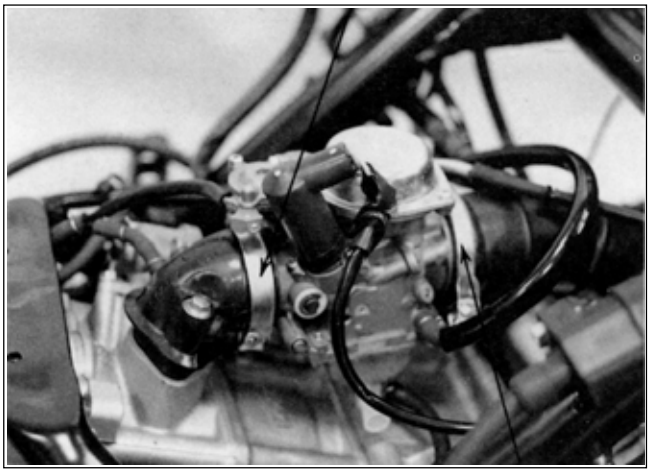
CARBURETOR REMOVAL

Remove the seat, met-in box and center cover.
Disconnect the fuel tube and vacuum tube at the carburetor.
Disconnect the auto bystarter wire.



Fuel Tube

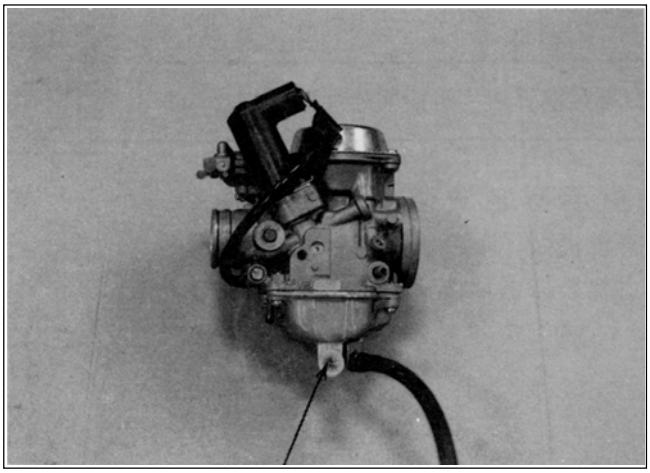
Loosen the throttle cable adjusting nut and lock nut, and disconnect the throttle cable from the carburetor.
Loosen the air cleaner connecting tube band and carburetor intake manifold band and then remove the carburetor.



Air Cleaner Connecting Tube Band

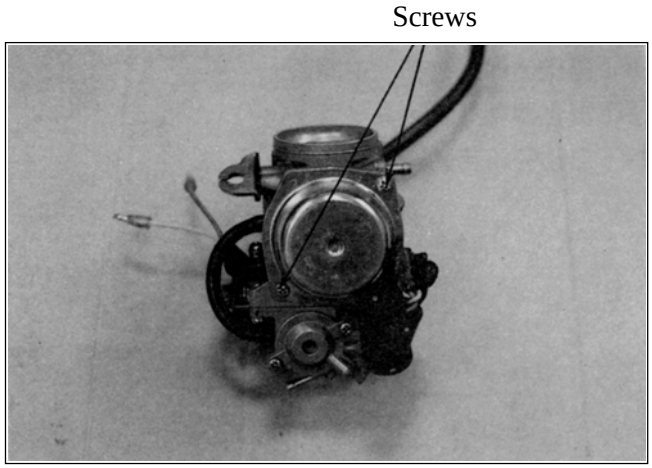
VACUUM CHAMBER DISASSEMBLY

Loosen the drain screw and drain the fuel from the float chamber.



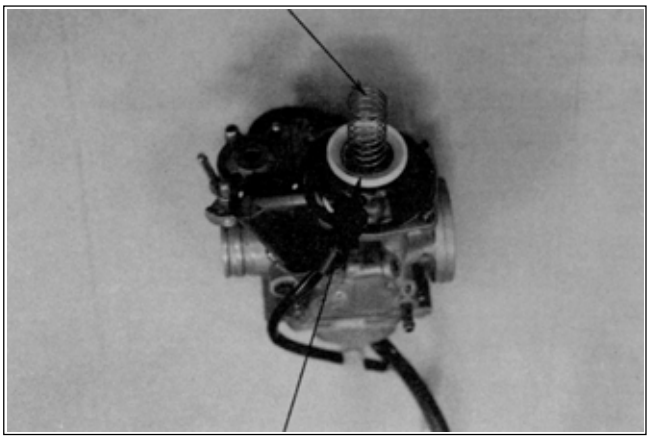
Drain Screw

Remove the two vacuum chamber cover screws and the cover.



Vacuum Chamber Cover

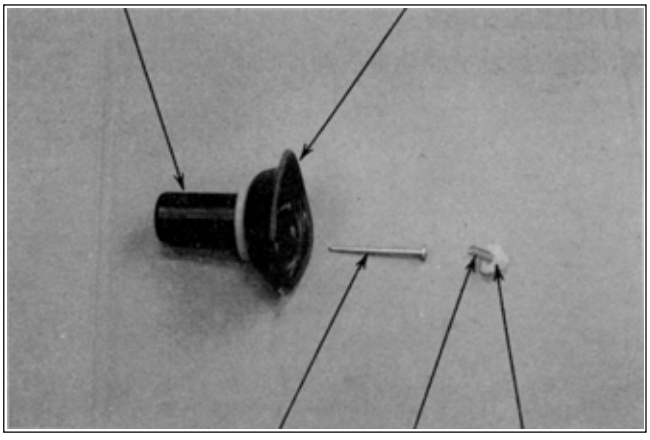
Remove the compression spring and vacuum piston.



Vacuum Piston

Remove the needle holder, spring and jet needle from the piston.

* • Be careful not to damage the vacuum piston diaphragm.



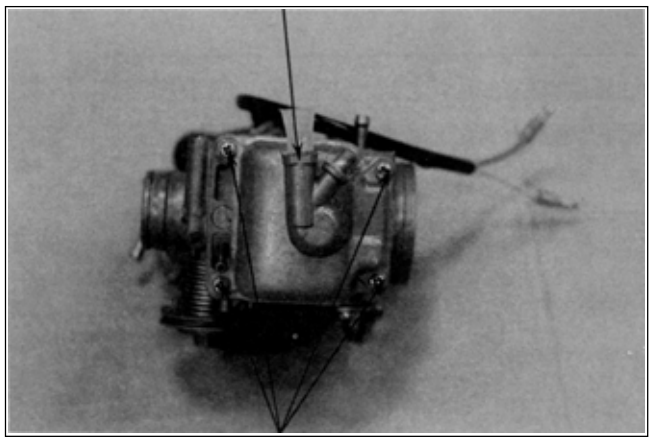
VACUUM PISTON INSPECTION

Inspect the vacuum piston and jet needle for wear or damage.
Inspect the diaphragm for deterioration and tears.

FLOAT CHAMBER DISASSEMBLY

Remove the four float chamber screws and the float chamber.

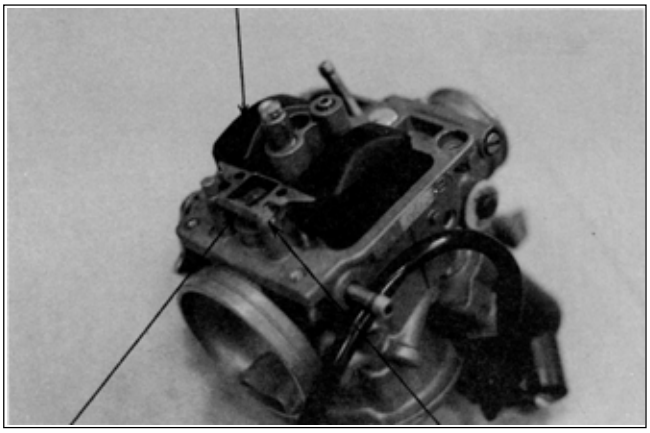
Float Chamber



Screws

Remove the float pin, float and float valve.

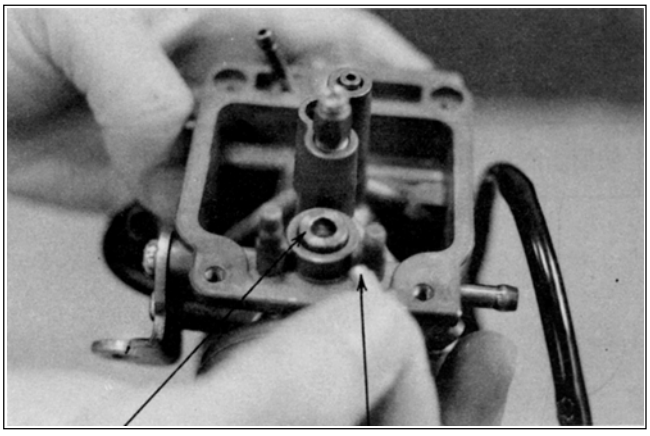
Float



Float Valve Float Pin

FLOAT VALVE INSPECTION

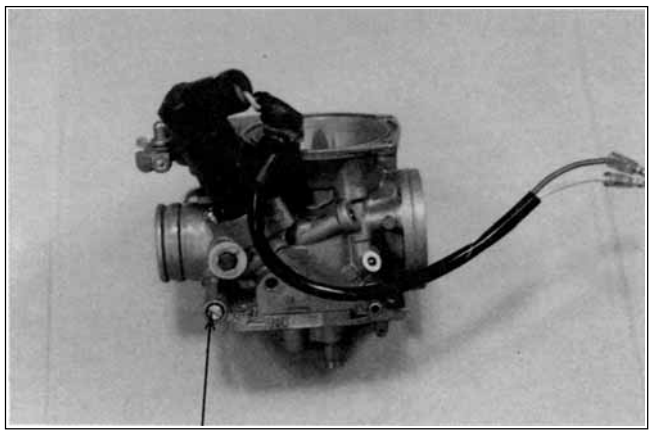
Inspect the float valve seat contact area for wear.



Float Valve Seat Float Valve

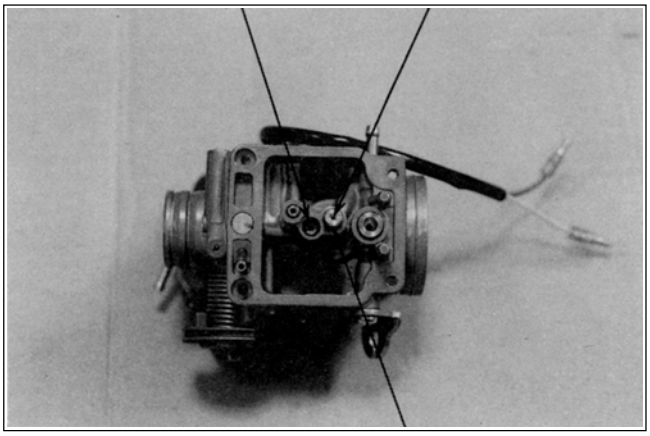
JETS/SCREWS REMOVAL

* • Before removing the pilot screw, turn the pilot screw clockwise until it seats lightly and record the rotating turns. Do not force the pilot screw against its seat to avoid seat damage.



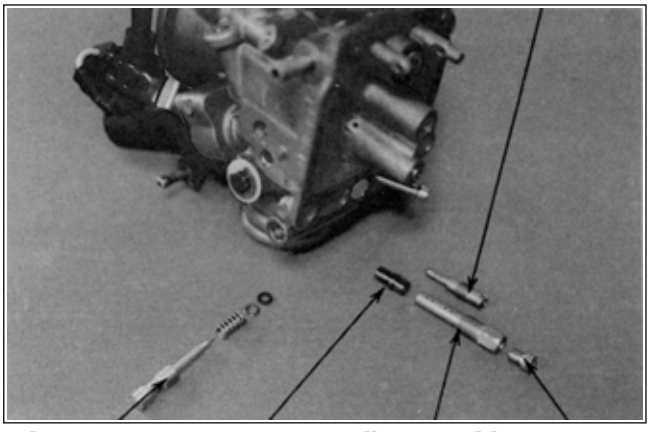
Pilot Screw (P.S.)

Remove the main jet, needle jet holder and needle jet.
Remove the slow jet.



Clean the removed the main jet, needle jet holder, needle jet and slow jet with detergent oil.

* • Be sure to use clean detergent oil.



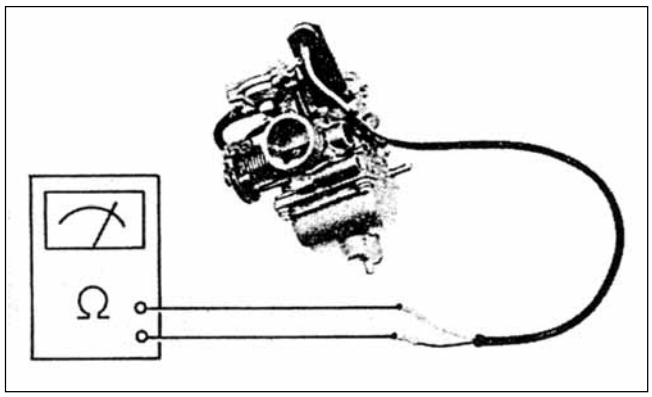
AUTO BYSTARTER INSPECTION /REMOVAL

AUTO BYSTARTER INSPECTION

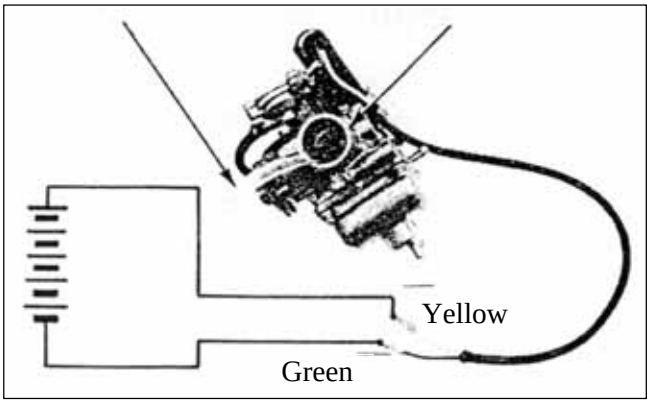
Measure the resistance between the auto bystarter wire terminals.

Resistance: 10Ω (10 minutes minimum after stopping the engine)

If the reading is not within the limit, replace the auto bystarter with a new one.

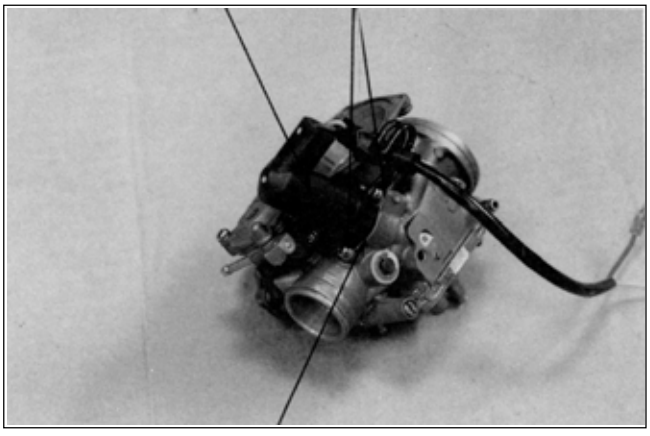


Connect a hose to the fuel enriching circuit of the carburetor. Connect the auto bystarter yellow wire to the positive (+) terminal of a battery and green wire to the negative (-) terminal. Wait 5 minutes and blow the hose with mouth. If the passage is blocked, the auto bystarter is normal. Disconnect the auto bystarter from the battery. Wait 30 minutes and blow the hose with mouth.. If air can be blown into the hose, the auto bystarter is normal.



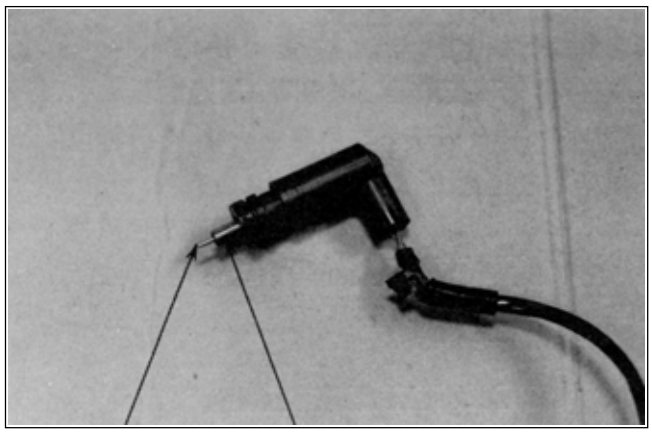
AUTO BYSTARTER REMOVAL

Remove the two set plate screws and set plate and then remove the auto bystarter from the carburetor body.



AUTO BYSTARTER INSPECTION

Check the auto bystarter valve and needle for nicks, wear or damage.
If any faulty part is found, replace the auto bystarter with a new one.



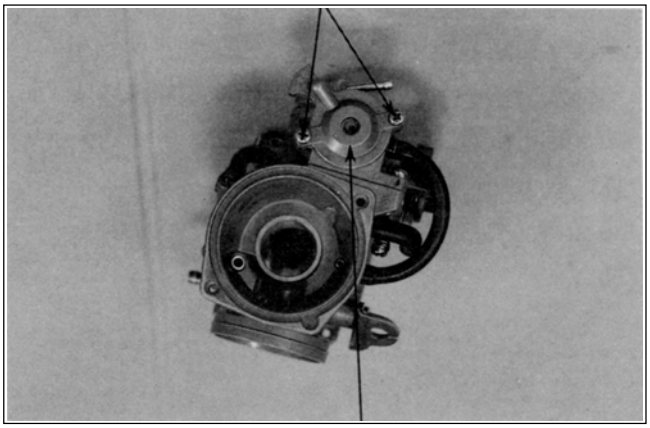
Bystarter Needle Bystarter Valve

AIR CUT-OFF VALVE (A.C.V.)

A.C.V. REMOVAL

Remove the two screws and the air cut-off valve cover.

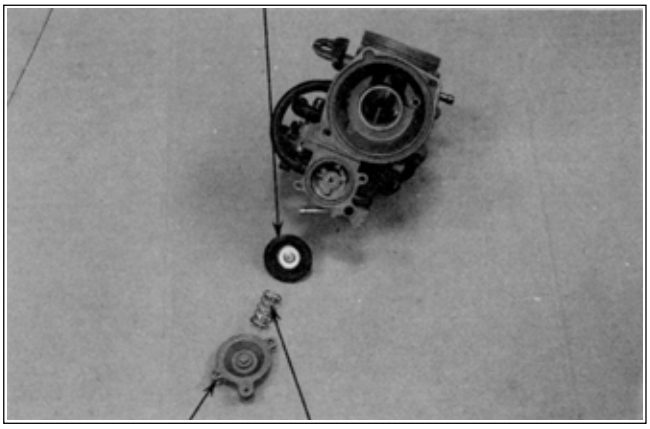
Screws



Air Cut-off Valve Cover

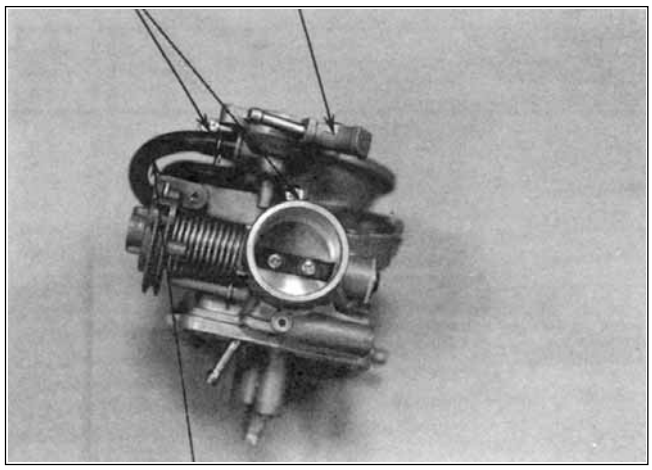
Remove the spring, diaphragm and O-rings. Inspect the diaphragm and spring for wear or damage.

Diaphragm



Cover Spring

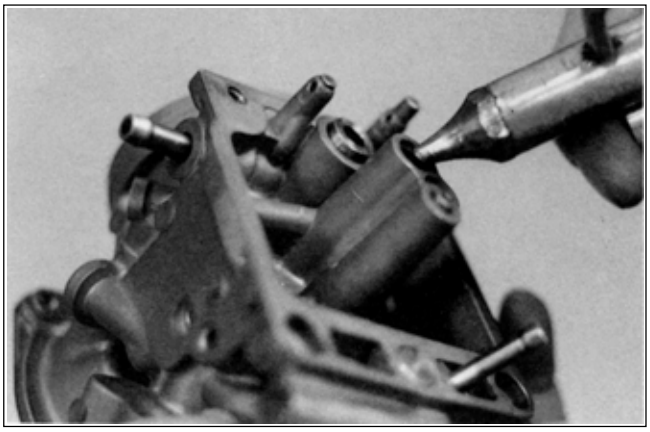
Disconnect the hose at the valve seat. Remove the two screws and the air cut-off valve body.



CARBURETOR BODY CLEANING

Blow compressed air through all passages of the carburetor body.

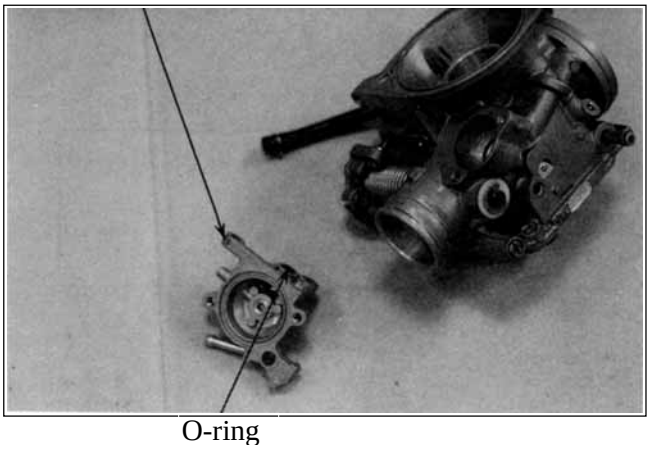
* • Make sure that no fuel jet is clogged.



A.C.V. ASSEMBLY

Install the O-ring onto the air-cut-off valve body and then install the valve body to the carburetor with the two screws.

* • Install the O-ring with the flat face toward the valve body side.

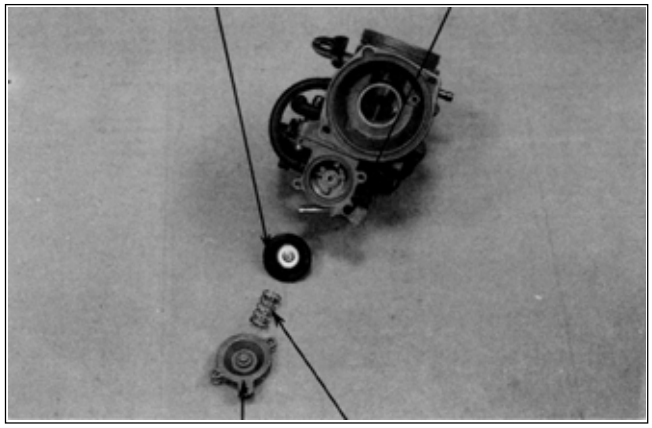


Install the O-ring onto the air-cut-off valve body securely.

* • Install the O-ring with the flat face toward the valve body side.

Install the diaphragm, spring, and cover.

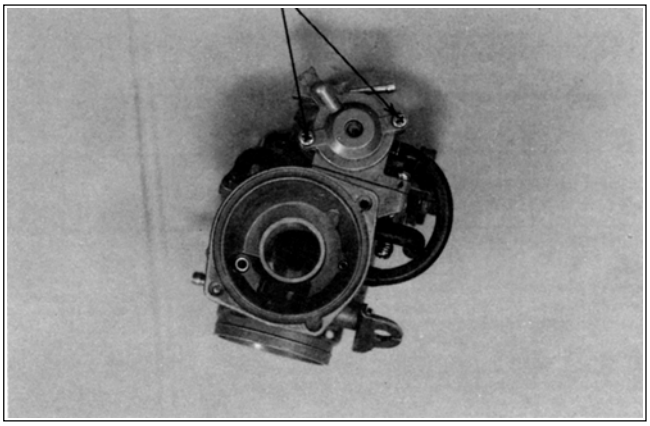
Diaphragm O-ring



Cover Spring

Install and tighten the two screws attaching the air cut-off valve cover.
Connect the hose.

Screws

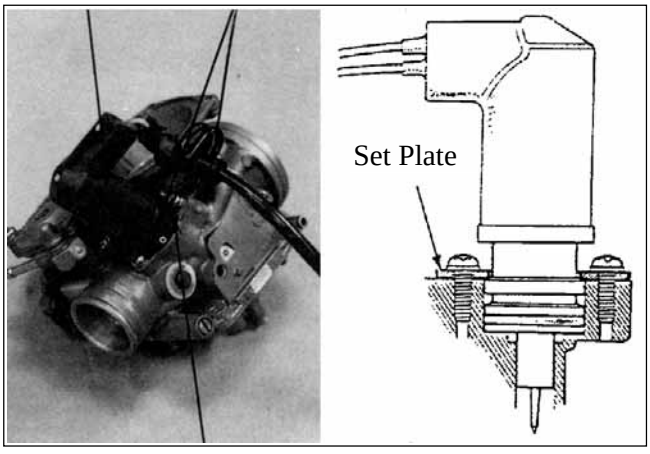


AUTO BYSTARTER INSTALLATION

Install the auto bystarter and set plate.
Install and tighten the two screws.

* • Insert the auto bystarter into the carburetor body until it bottoms and position the set plate into the upper groove in the bystarter.
• Install the set plate with its round face facing down.

Auto Bystarter Screws

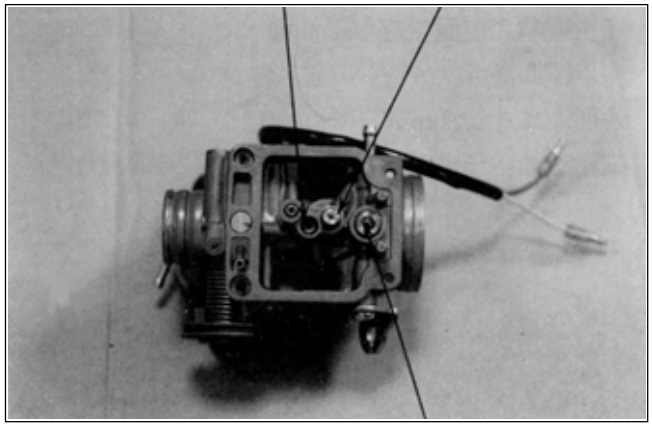


Set Plate

FLOAT CHAMBER ASSEMBLY

Install the needle jet and needle jet holder.
Install the main jet.
Install the slow jet.

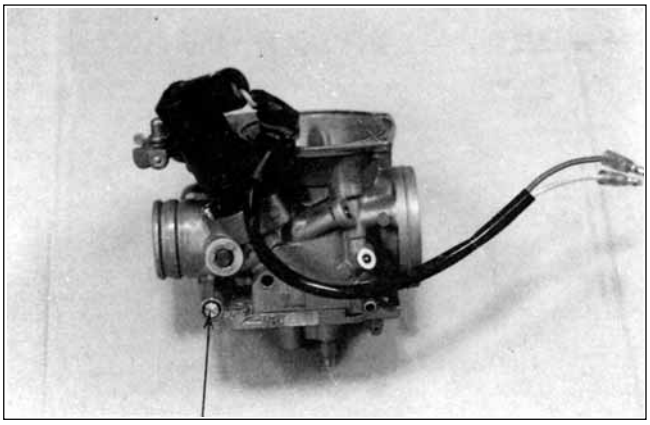
Slow Jet Main Jet



Needle Jet Holder

Install the pilot screw.

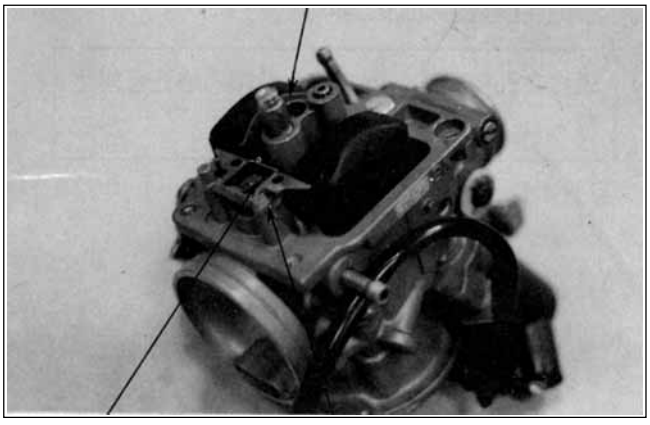
* • Be sure to record the rotating turns when it is removed.



Pilot Screw

Install the float valve, float and float pin.

Float



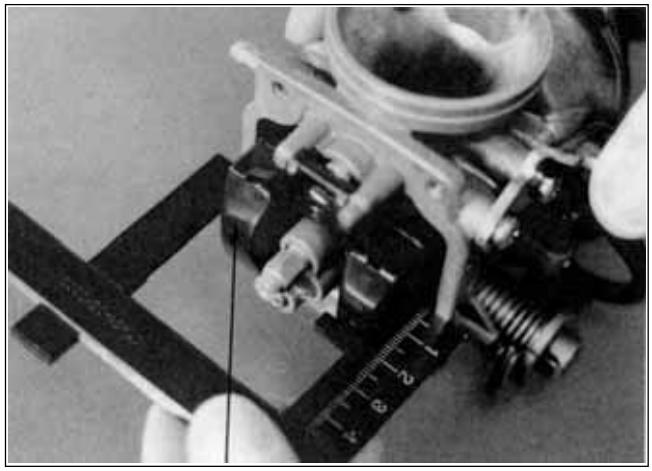
Float Valve Float Pin

FLOAT LEVEL INSPECTION

Measure the float level at the location of the main jet (just contacting the float valve).

Float Level: 18.5±1.0mm

Replace the float if the level is incorrect. Check the operation of the float and then reinstall the float chamber.

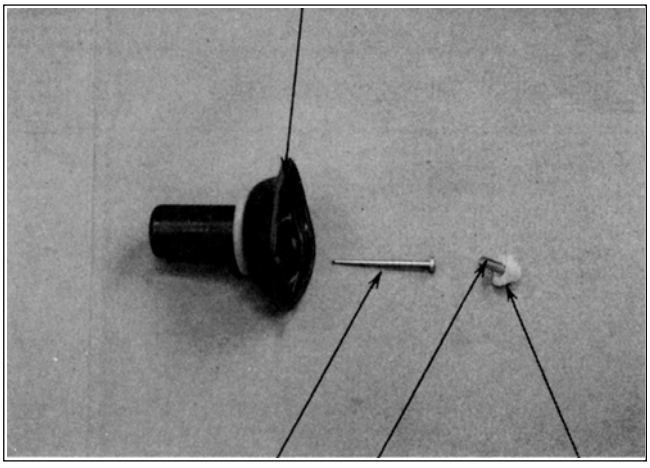


Float

VACUUM CHAMBER ASSEMBLY

First install the jet needle and spring into the vacuum chamber and then install the needle holder.

Vacuum Piston



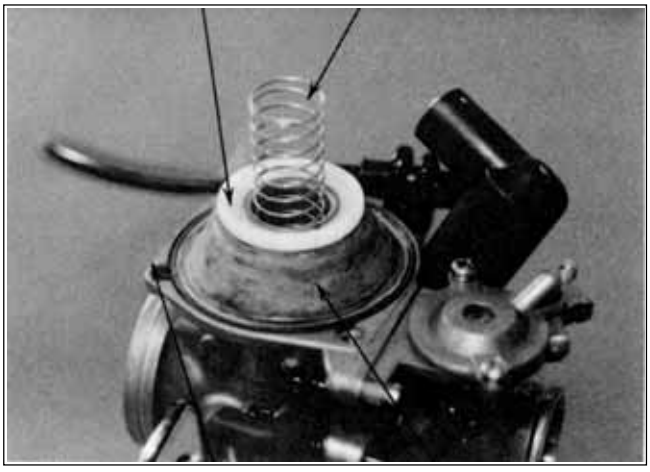
Jet Needle Spring Needle Holder

Install the vacuum piston into the carburetor body.

* • Align the hole in the diaphragm with the vacuum passage in the carburetor body.

Install the spring.

Vacuum Piston Spring

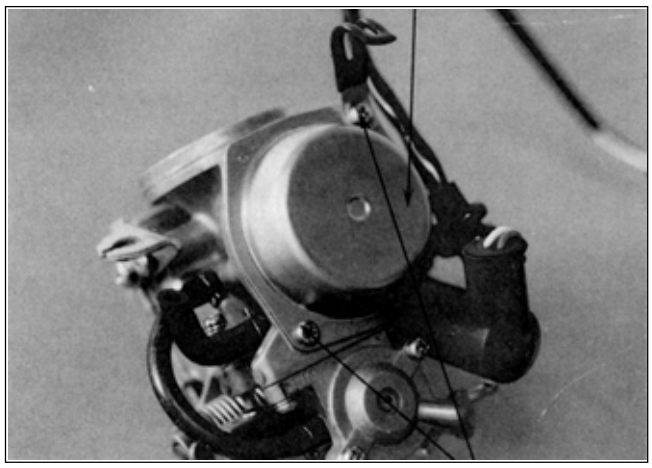


Vacuum Passage Diaphragm

Install the vacuum chamber cover and tighten it with the two screws.

* • Be careful not to let the diaphragm slip.
  • If the diaphragm cannot be positioned correctly because of expansion, dry the

Vacuum Chamber Cover



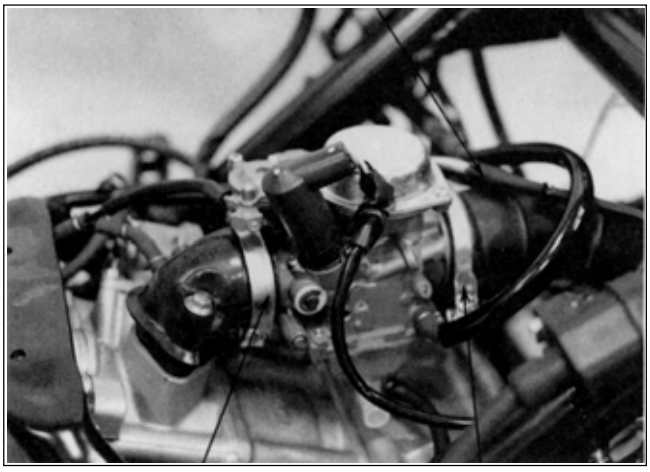
Screws

CARBURETOR INSTALLATION

Tighten the drain screw.
Install the carburetor onto the intake manifold and tighten the band.
Install the air cleaner connecting tube and tighten the band.
Connect the throttle cable to the carburetor.

* • After connecting the throttle cable, adjust the throttle grip free play to 2～6mm.

Throttle Cable



Intake Manifold Band

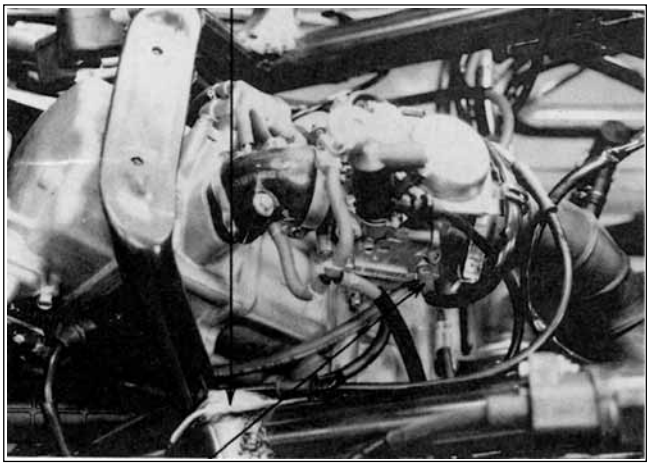
Air Cleaner Connecting Tube Band

Connect the auto bystarter wire.
Connect the fuel tube and vacuum tube to the carburetor.
Perform the following inspections and adjustments:

- Throttle grip free play (⇨3-3)
- Idle speed (⇨3-6)

Install the seat, met-in box and frame center cover.

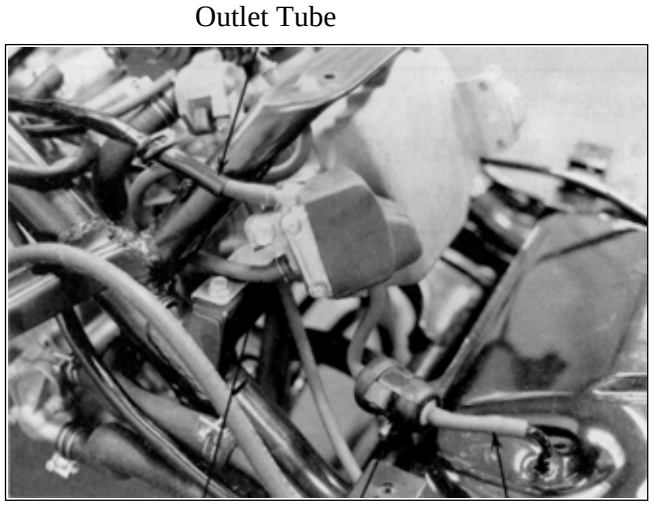
Auto Bystarter Wire



Fuel Tube

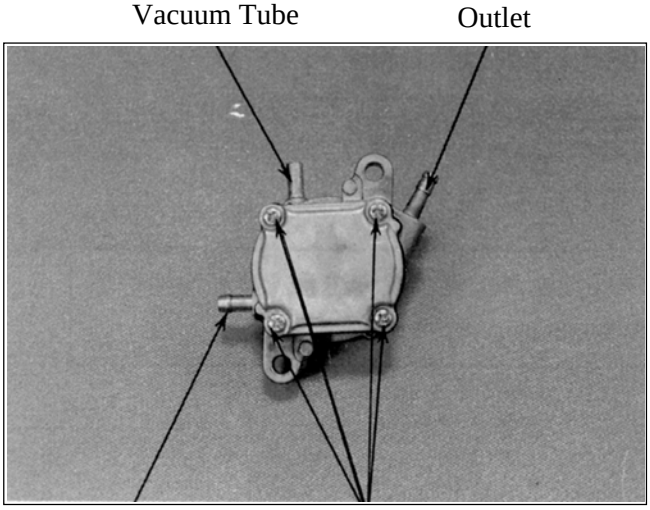
FUEL PUMP REMOVAL

Remove the frame center cover.
Disconnect the fuel pump inlet, outlet and vacuum tubes.
Remove the two fuel pump attaching bolts and the fuel pump.

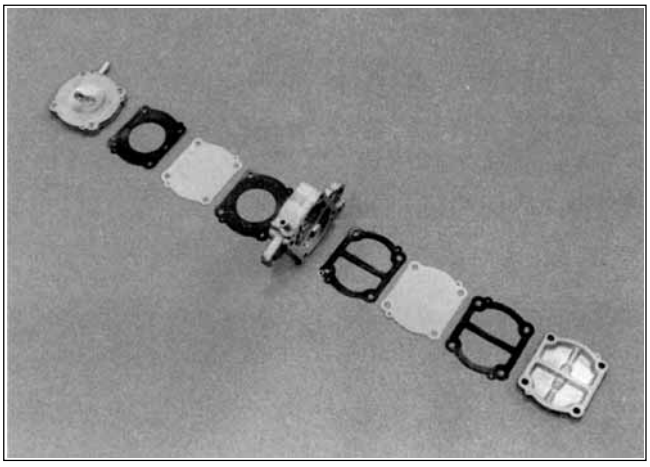


FUEL PUMP DISASSEMBLY

Remove the four fuel pump body screws.

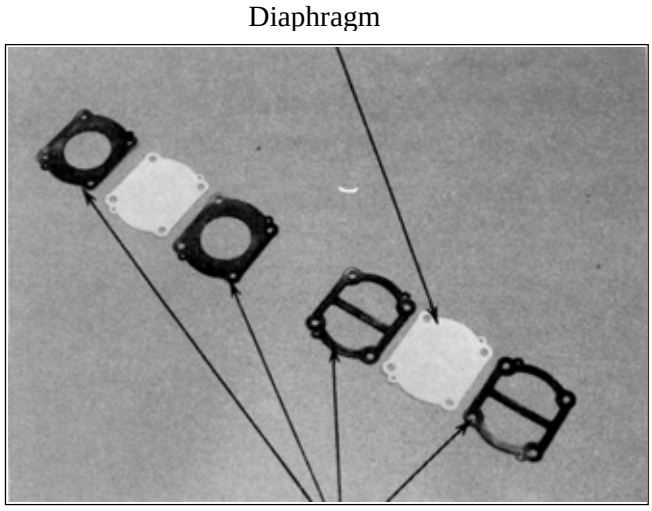


Disassemble the fuel pump.

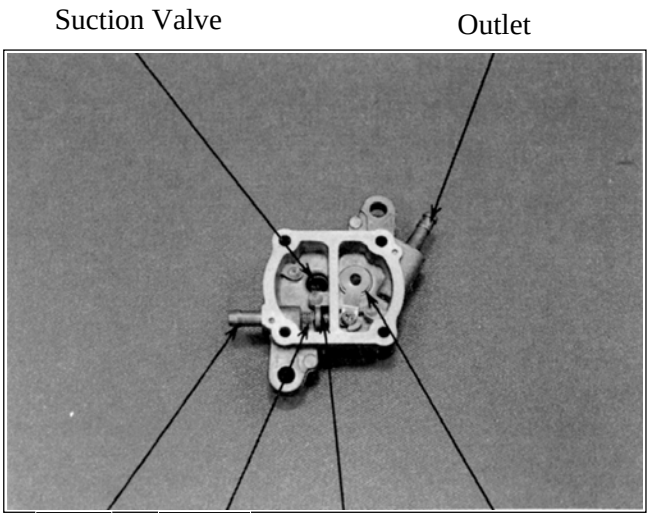


FUEL PUMP INSPECTION

Inspect the fuel pump diaphragms A and B for damage.
Inspect each gasket for damage.



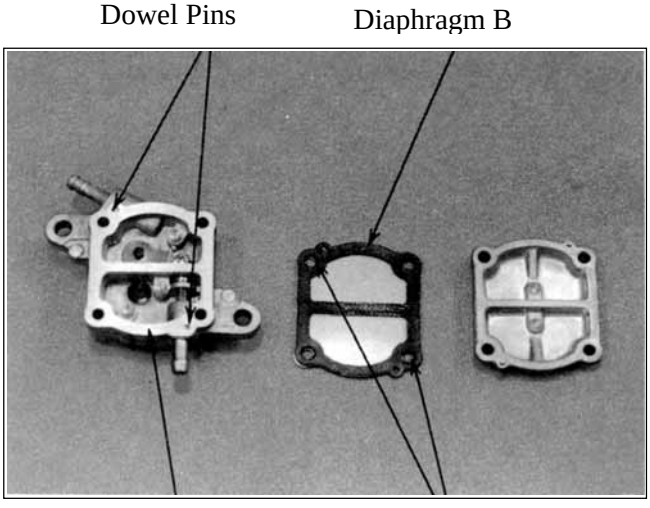
Inspect the suction valve, outlet valve and relief valve in the fuel pump body for damage, cracks or foreign matters.



FUEL PUMP ASSEMBLY

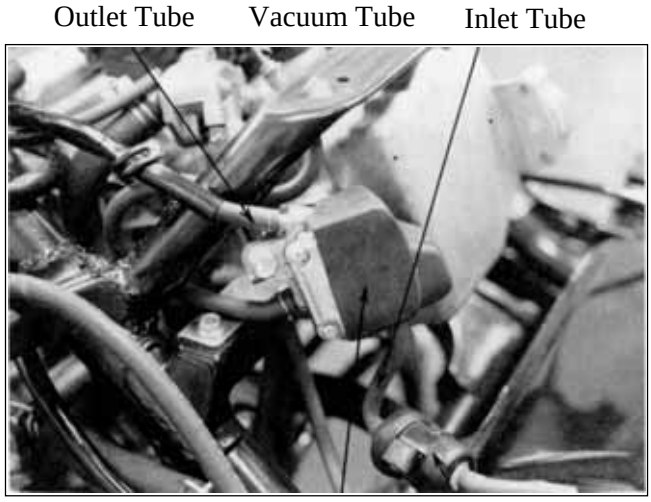
Assemble the fuel pump in the reverse order of disassembly.

*
- During assembly, be sure to install the gaskets and diaphragms properly to avoid damage.
- Do not allow any foreign matter to enter the fuel pump during assembly.



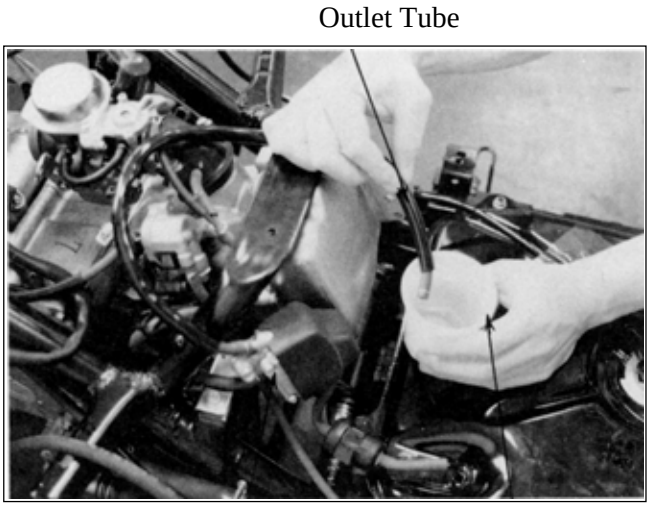
FUEL PUMP INSTALLATION

Install the fuel pump and secure it with the two bolts.
Connect the fuel pump inlet, outlet and vacuum tubes.
Install the seat, met-in box and frame center cover.



Measure the fuel pump output.
Start the engine and disconnect the fuel outlet tube and place a clean container under the tube to check the fuel output.

Output: 40cc/1500rpm/10 seconds .

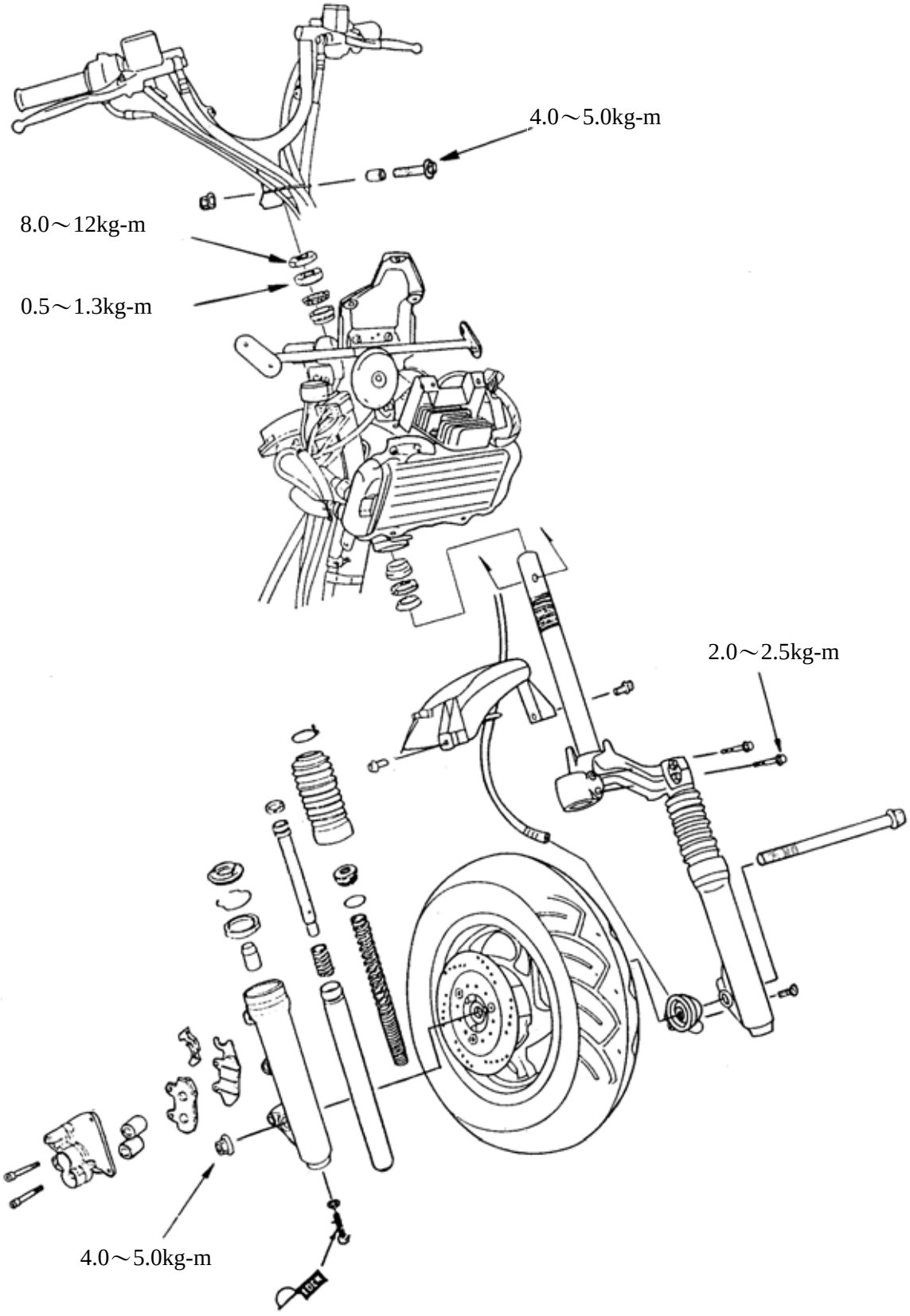


STEERING HANDLEBAR/FRONT WHEEL/FRONT BRAKE/FRONT SHOCK ABSORBER/FRONT FORK

14

14. STEERING HANDLEBAR/FRONT WHEEL/FRONT BRAKE/FRONT SHOCK ABSORBER/FRONT FORK

SCHEMATIC DRAWING



SERVICE INFORMATION

GENERAL INSTRUCTIONS

- Remove the motorcycle frame covers before removing the front wheel, steering handlebar, front shock absorber and front fork. Jack the motorcycle front wheel off the ground and be careful to prevent the motorcycle from falling down.
- During servicing, keep oil or grease off the brake pads and brake disk.

SPECIFICATIONS

Item		Standard (mm)	Service Limit (mm)
Axle shaft runout		—	0.2
Front wheel rim runout	Radial	—	2.0
	Axial	—	2.0
Front brake pad thickness		4.0	2.0
Front shock absorber spring free length		240.6	233
Brake disk thickness		3.8～4.2	3.0
Brake disk runout		—	0.30
Brake master cylinder I.D.		12.700～12.743	12.755
Brake master cylinder piston O.D.		12.657～12.684	12.645
Brake caliper piston O.D.		25.335～25.368	25.30
Brake caliper cylinder I.D.		25.400～25.45	25.45

TORQUE VALUES

Steering stem lock nut	8.0～12.0kg-m
Steering top cone race	0.5～1.3kg-m
Front shock absorber bolt	2.0～2.5kg-m
Front axle nut	4.5～5.0kg-m
Brake caliper bolt	2.5～3.5kg-m

SPECIAL TOOLS

Lock nut wrench
Front shock absorber compressor
Ball race remover
Driver handle
Outer driver, 37x40mm
Pilot, 12mm
Bearing remover
Bearing remover head, 12mm

TROUBLESHOOTING

Hard steering (heavy)
- Excessively tightened steering stem top cone race
- Broken steering balls
- Insufficient tire pressure

Steers to one side or does not track straight
- Uneven front shock absorbers
- Bent front fork
- Bent front axle or uneven tire

Poor brake performance
- Worn brake pads
- Contaminated brake pad surface
- Deformed brake disk
- Air in brake system
- Deteriorated brake fluid
- Worn brake master cylinder piston oil seal
- Clogged brake fluid line
- Unevenly worn brake caliper

Front wheel wobbling
- Bent rim
- Loose front axle
- Bent spoke plate
- Faulty tire
- Improperly tightened axle nut

Soft front shock absorber
- Weak shock springs
- Insufficient damper oil

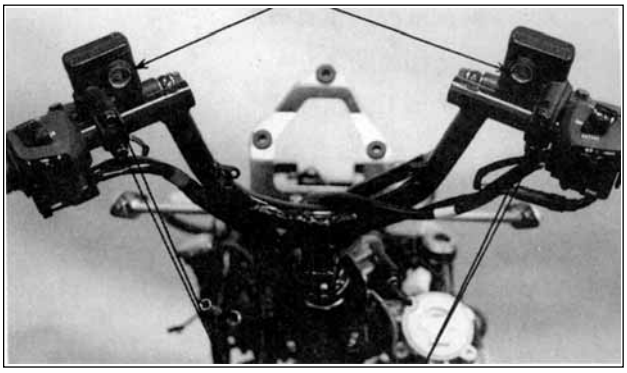
Front shock absorber noise
- Slider bending
- Loose fork fasteners
- Lack of lubrication

STEERING HANDLEBAR

REMOVAL

Remove the handlebar front and rear covers. (⇨2-6)
Remove the front and rear brake master cylinder attaching bolts.
Remove the front upper cover. (⇨2-5)
Remove the front lower cover. (⇨2-5)
Remove the floor board. (⇨2-4)
Remove the leg shield. (⇨2-5)

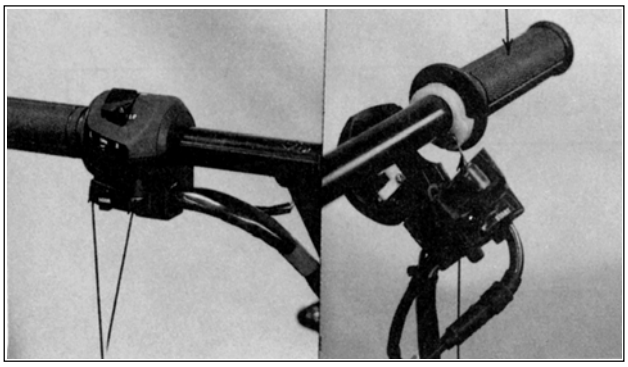
Brake Master Cylinders



Bolts Bolts

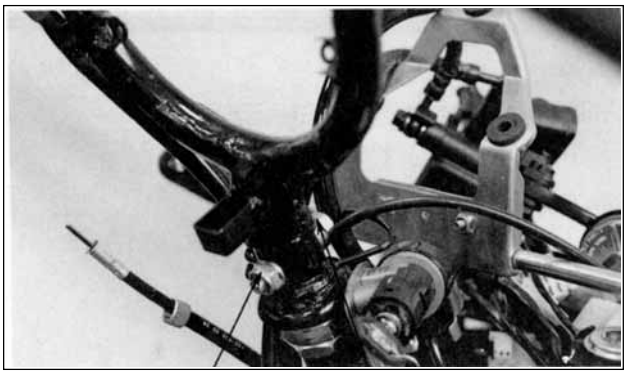
Throttle Grip

Remove the four screws attaching the right and left handlebar switches.
Disconnect the throttle cable from the throttle grip and remove the throttle grip from the handlebar.



Screws Throttle Cable

Remove the handlebar lock nut and take out the bolt.
Remove the handlebar.



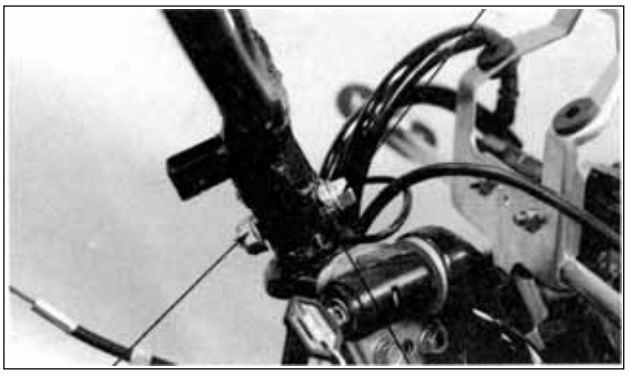
Lock Nut Bolt

Bolt

INSTALLATION

Install the handlebar onto the steering stem and install the handlebar collar, lock nut and bolt.
Tighten the bolt to the specified torque.

Torque: 4.0～5.0kg-m

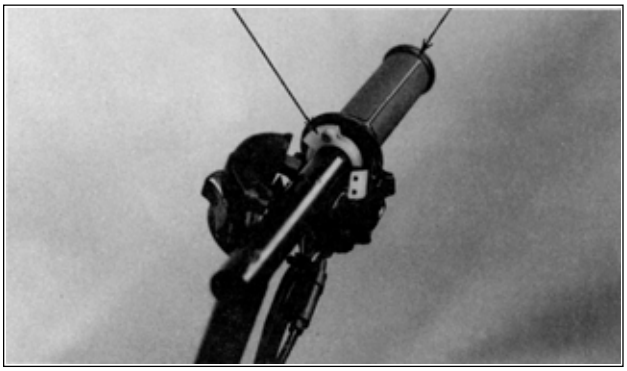


Lock Nut Collar

Lubricate the throttle grip front end with grease and then install the throttle grip.
Connect the throttle cable to the throttle grip.
Install the right and left handlebar switches and tighten the screws.

* • Adjust the throttle grip free play to the specified range of 2～6mm.

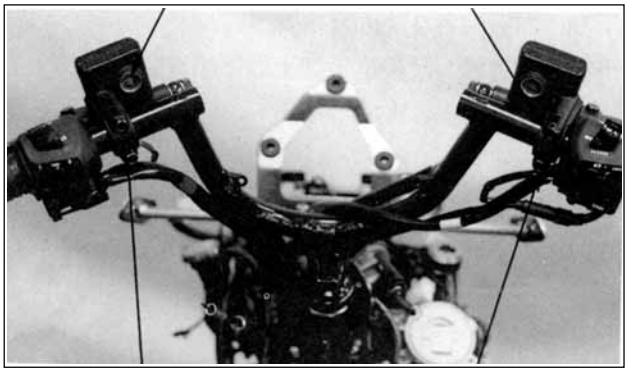
Throttle Cable Throttle Grip



Install the front and rear brake master cylinders.

* • Install the brake master cylinders by aligning the index marks.

Brake Master Cylinder Brake Master Cylinder



Bolt Bolt

FRONT WHEEL

REMOVAL

Jack the motorcycle front wheel off the ground.
Remove the front axle nut to pull out the axle.
Remove the front wheel and the speedometer gear unit.

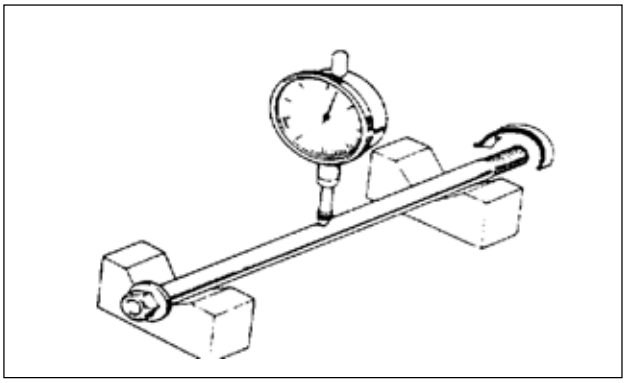
Axle Nut Speedometer Gear Unit

INSPECTION

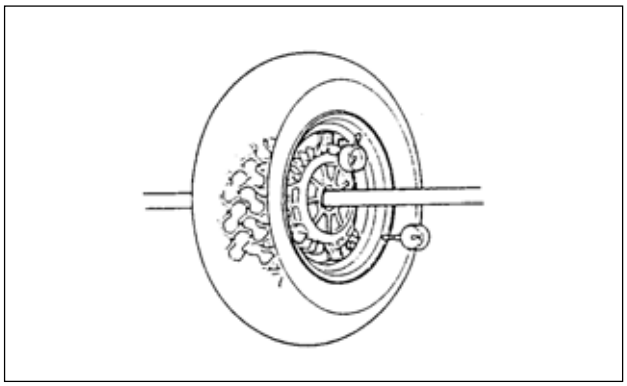
AXLE RUNOUT

Set the axle in V blocks and measure the runout using a dial gauge.
The actual runout is ½ of the total indicator reading.

Service Limit: 0.2mm replace if over

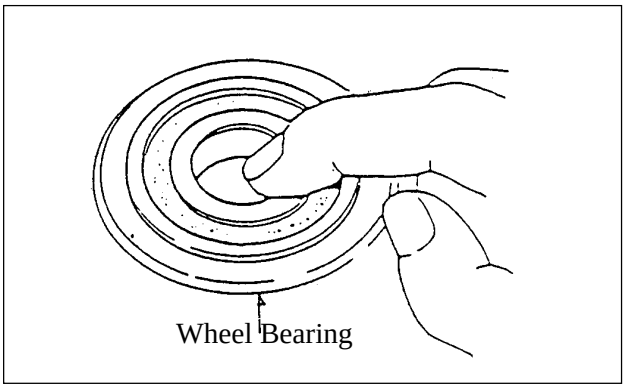


WHEEL RIM
Check the wheel rim runout.
Service Limits:
Radial: 2.0mm replace if over
Axial: 2.0mm replace if over



FRONT WHEEL BEARING
Remove the side collar and dust seal.

Turn the inner race of each bearing with your finger to see if they turn smoothly and quietly. Also check if the outer race fits tightly in the hub.
Replace the bearings if the races do not turn smoothly, quietly, or if they fit loosely in the hub.



BEARING REPLACEMENT
Remove the front wheel bearings and distance collar.

Special Tools
Bearing Remover
Bearing Remover Head, 12mm

Pack all bearing cavities with grease.
Drive in the left bearing.
Install the distance collar.
Drive in the right bearing.

* • Do not allow the bearings to tilt while driving them in.
  • Drive in the bearing squarely with the sealed end facing out.

Special Tools

Outer driver, 32x35mm
Driver handle A
Pilot, 12mm

INSTALLATION

Apply grease to the speedometer gear unit.
Install the speedometer gear unit by aligning its retaining pawl with the hub cutout.

* • If not aligned, the retaining pawl will be deformed when the axle nut is tightened.
  • After installing the axle, turn the wheel to make sure that the speedometer drive shaft rotates freely.

Install the front wheel by aligning the speedometer gear unit groove with the front shock absorber tab.
Insert the axle and tighten the axle nut.

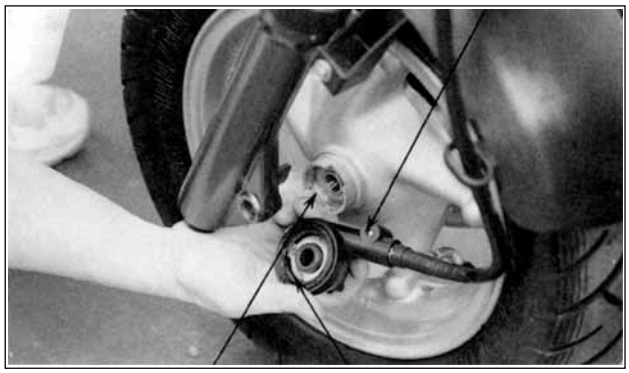
* When installing the front wheel, position the brake disk between the two brake pads.

Torque: 4.5～5.0kg-m

Driver Handle A

Outer Driver, 32x35mm Pilot, 12mm

Speedometer Gear Unit



Hub Cutout Pawl

Tab

Speedometer Gear Unit Groove

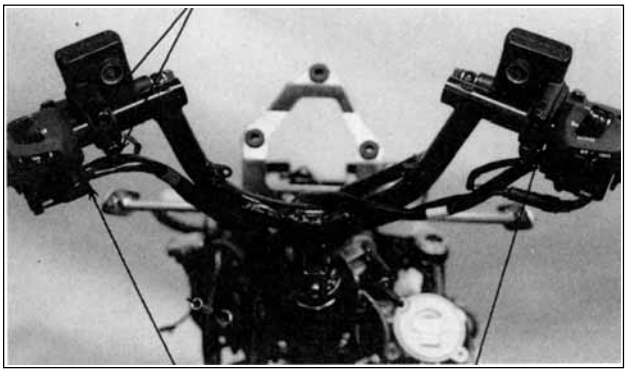
FRONT BRAKE

BRAKE MASTER CYLINDER

REMOVAL

Remove the handlebar covers. (⇨2-6)
First drain the brake fluid from the hydraulic brake system.
Disconnect the front stop switch wire connector.
Remove the brake fluid tube bolt.
Remove the two bolts attaching the brake master cylinder
Remove the brake master cylinder.

Bolts



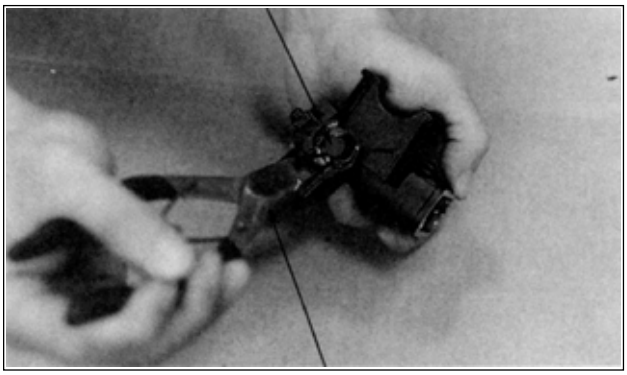
Stop Switch Wire Connector Holder

* • When servicing the brake system, use shop towels to cover rubber and plastic parts and coated surfaces to avoid being contaminated by brake fluid.
  • When removing the brake fluid tube bolt, be sure to plug the tube end to avoid brake fluid leakage.

DISASSEMBLY

Remove the brake lever bolt and the brake lever.
Remove the piston rubber cover and snap ring from the brake master cylinder.

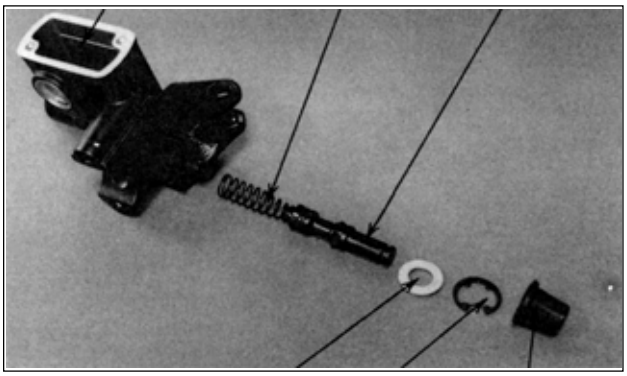
Snap Ring



Snap Ring Pliers (Close)

Remove the washer, main piston and spring from the brake master cylinder.
Clean the inside of the master cylinder and brake reservoir with brake fluid.

Master Cylinder Spring Main Piston

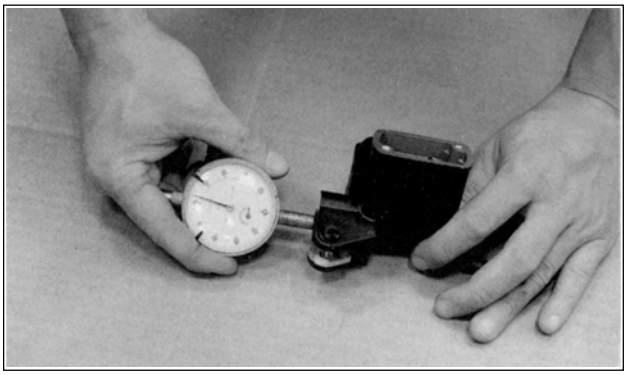


Washer Snap Ring Rubber Cover

INSPECTION

Measure the brake master cylinder I.D.
Inspect the master cylinder for scratches or cracks.

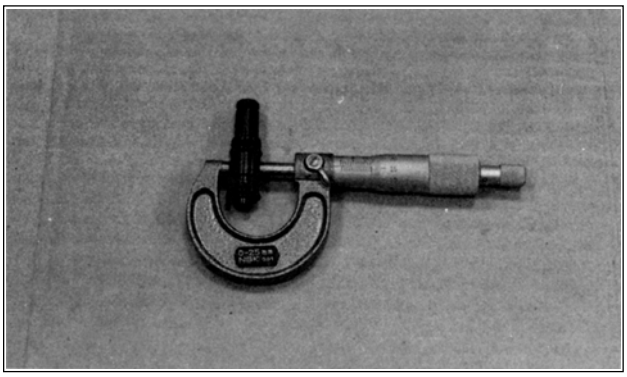
Service Limit: 12.75mm



Measure the brake master cylinder piston O.D.

Service Limit: 12.645mm

Before assembly, inspect the lst and 2nd rubber cups for wear.

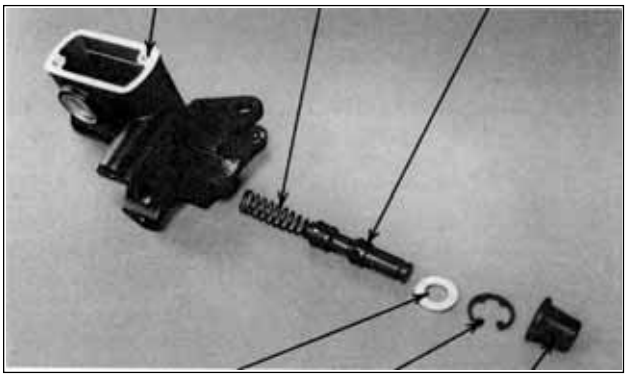


ASSEMBLY

Before assembly, apply brake fluid to all removed parts.
Install the spring together with the 1st rubber cup.

*
- During assembly, the main piston and spring must be installed as a unit without exchange.
- When assembling the piston, soak the cups in brake fluid for a while.
- Install the cups with the cup lips facing the correct direction.

Master Cylinder Spring Main Piston

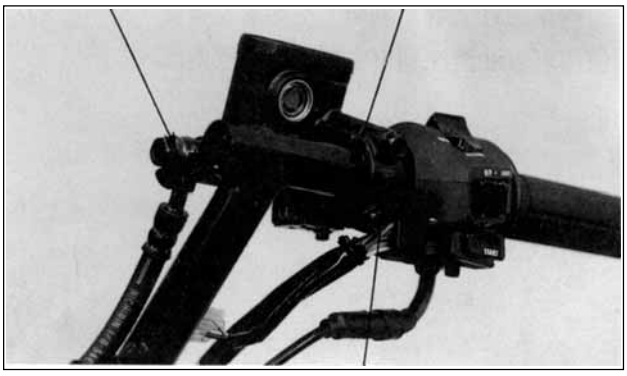


Washer Snap Ring Rubber Cover

Install the main piston, spring and snap ring.
Install the rubber cover.
Install the brake lever.
Place the brake master cylinder on the handlebar and install the holder with the “up” mark facing up. Also align the punch mark with the holder joint seam.
First tighten the upper bolt and then tighten the lower bolt.

Torque: 1.0～1.4kg-m

Fluid Tube Bolt Punch Mark



“Up” Mark

Install the brake fluid tube with the attaching bolt and two sealing washers.

Connect the front stop switch wire connector.
Install the handlebar covers. (⇨2-6)

Stop Switch Wire Connector

BRAKE FLUID REFILLING

Keep the handlebar upright and remove the brake reservoir cover and diaphragm.
Add DOT-3 brake fluid to the brake reservoir.

* • When bleeding, be careful not to allow air in the brake reservoir flowing into the brake system.
  • When using a brake bleeder, follow the manufacturer's instructions.
  • Never use dirty or unspecified brake fluid or mix different brake fluids because it will damage the brake system.

BRAKE FLUID BLEEDING

Keep the handlebar upright and remove the brake reservoir cover and diaphragm. Add the specified brake fluid to the upper limit.

* • Do not allow dust or water to enter the brake system during refilling.
  • When servicing the brake system, use shop towels to cover plastic parts and coated surfaces to avoid damage caused by splash of brake fluid.

In order to avoid spilling brake fluid, connect a transparent hose to the bleed valve.

Warning

Brake fluid spilled on brake pads or brake disk will reduce the braking effect. Clean the brake pads and brake disk with a high quality brake degreaser.

Fully apply the brake lever and then loosen the brake caliper bleed valve to drain the brake fluid until there is no air bubbles in the brake fluid. Then, tighten the bleed valve. Repeat these steps until the brake system is free of air.

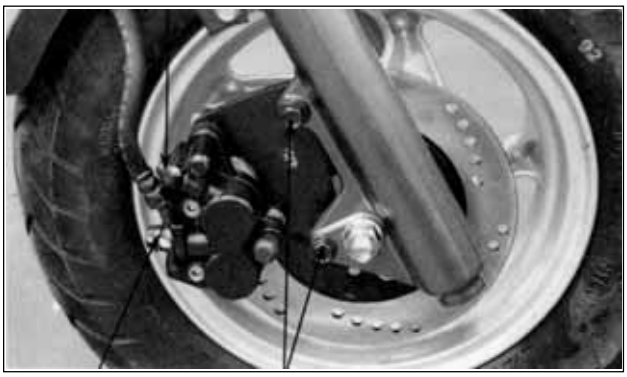
Bleed Valve

BRAKE CALIPER

REMOVAL

First drain the brake fluid from the hydraulic brake system.
Remove the brake fluid tube bolt.
Remove the two bolts attaching the brake caliper.
Remove the brake caliper.

Bleed Valve

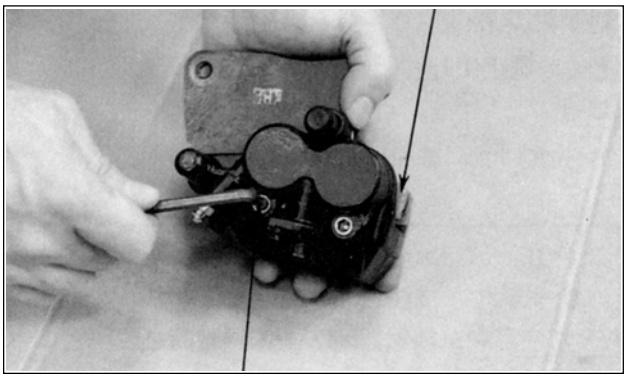


Fluid Tube Bolt Bolts

Brake Pad

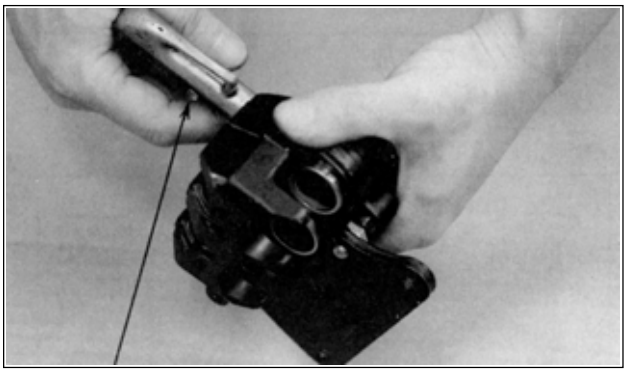
DISASSEMBLY

Remove the two brake pads dowel pins from the brake caliper.
Remove the brake pads.



Dowel Pin

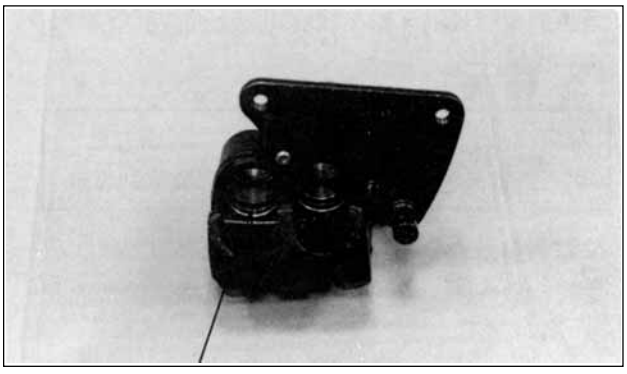
Remove the piston from the brake caliper.
If necessary, use compressed air to squeeze out the piston through the brake fluid inlet opening and place a shop towel under the caliper to avoid contamination caused by the removed piston.
Check the piston cylinder for scratches or wear and replace if necessary.



Compressed Air

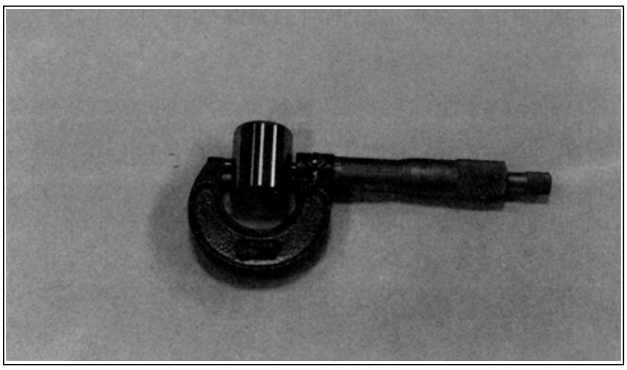
Push the piston oil seal outward to remove it.
Clean the oil seal groove with brake fluid.

* Be careful not to damage the piston surface.

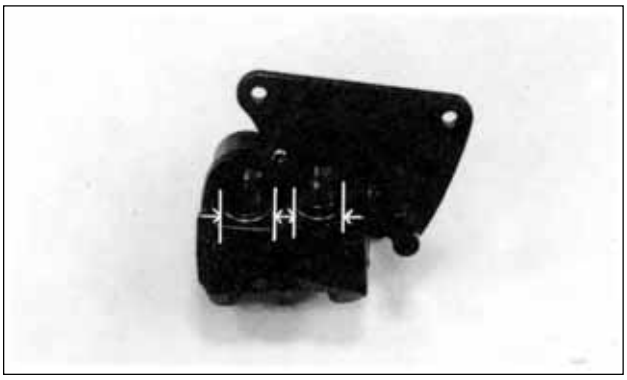


Piston Oil Seal

Check the piston for scratches or wear.
Measure the piston O.D. with a micrometer gauge.
Service Limit: 25.30mm

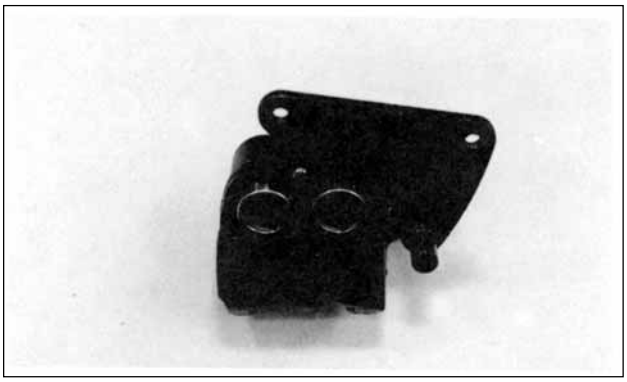


Check the caliper cylinder for scratches or wear and measure the cylinder bore.
Service Limit: 25.45mm



ASSEMBLY

Clean all removed parts.
Apply silicon grease to the piston and oil seal.
Lubricate the brake caliper cylinder inside wall with brake fluid.
Install the brake caliper piston with grooved side facing out.



* Install the piston with its outer end protruding 3～5mm beyond the brake caliper.

Wipe off excessive brake fluid with a clean shop towel. Apply silicon grease to the brake caliper seat pin and caliper inside.
Install the brake caliper seat.

INSTALLATION

Install the brake caliper to the shock absorber and tighten the two bolts.
Torque: 2.5～3.5kg-m

* When installing the brake caliper, be sure to position the brake disk between the two brake pads.

Fluid Tube Bolt Brake Caliper

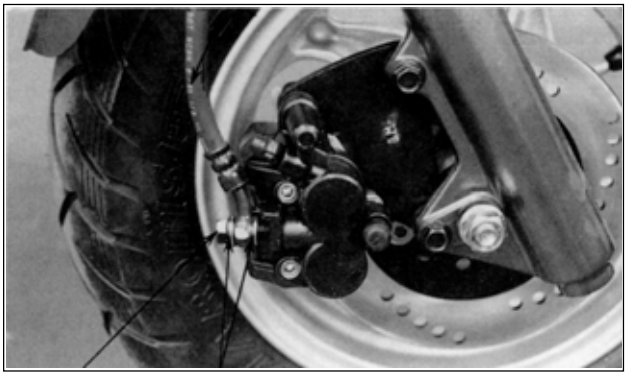
Connect the brake fluid tube to the brake caliper and tighten the fluid tube bolt.

Torque: 2.5～3.5kg-m

Fill the brake reservoir with the specified brake fluid and bleed air from the brake system. (⇨14-10)

* When installing the brake fluid tube, be sure to install the two copper sealing washers.

Brake Fluid Tube



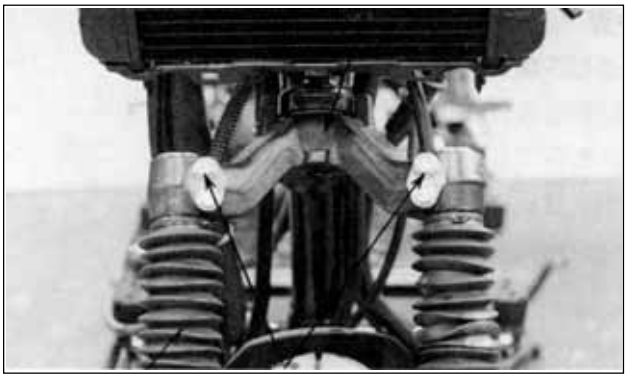
Fluid Tube Bolt Copper Washers

FRONT SHOCK ABSORBER

REMOVAL

Remove the front upper cover. (⇨2-5)
Remove the front lower cover. (⇨2-5)
Remove the front wheel. (⇨14-5)
Remove the front brake caliper. (⇨14-11)
Remove the front shock absorber upper mount bolts.
Loosen the lower mount bolts to remove the front shock absorbers.

Front Fork

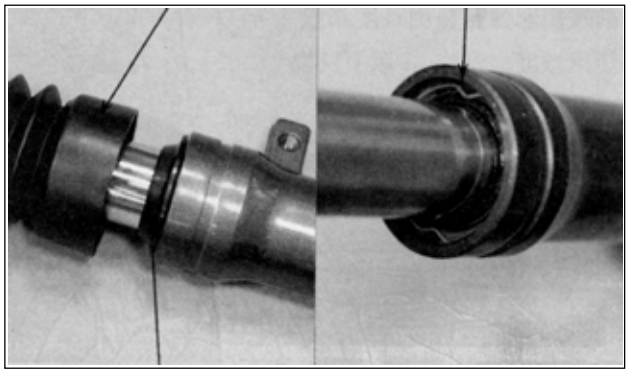


Shock Absorber Mount Bolts

DISASSEMBLY

Remove the dust boot.
Remove the dust seal.
Remove the circlip.

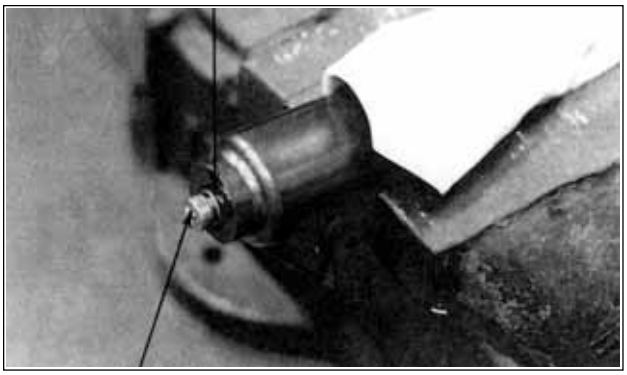
Dust Boot Circlip



Dust Seal

Set the front shock absorber in a vise.
Remove the damper rod hex bolt and copper washer.
Pull out the front shock absorber tube.

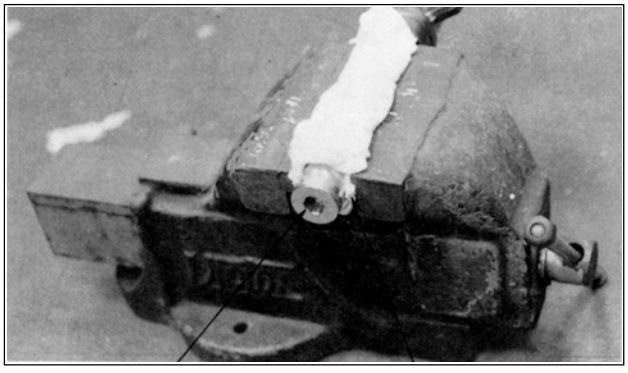
Copper Washer



Hex Bolt

* After the hex bolt is removed, place a container under the front shock absorber to drain the engine oil from it.

Set the front shock absorber tube in a vise.
Remove the lock nut on the front shock absorber tube.
Take out the shock absorber spring and damper rod.



Lock Nut Shock Absorber Tube

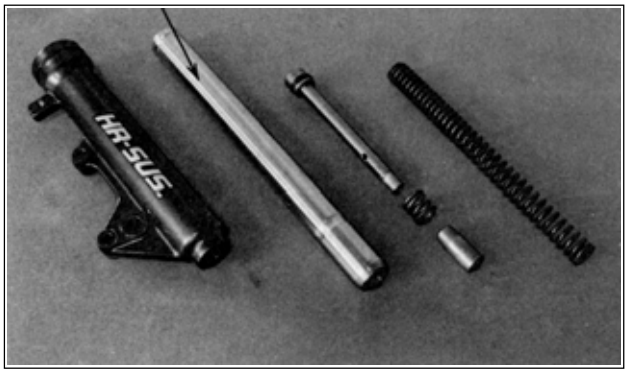
* When holding the shock absorber tube, place a shop towel to protect it and do apply too much force .

INSPECTION

Inspect the following items and replace if necessary.

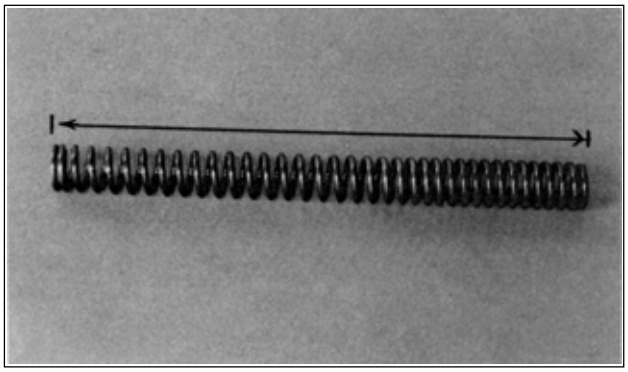
- Front shock absorber tube bending, damage or wear
- Weak front shock absorber spring
- Damper and damper rod bending
- Oil seal damage or wear

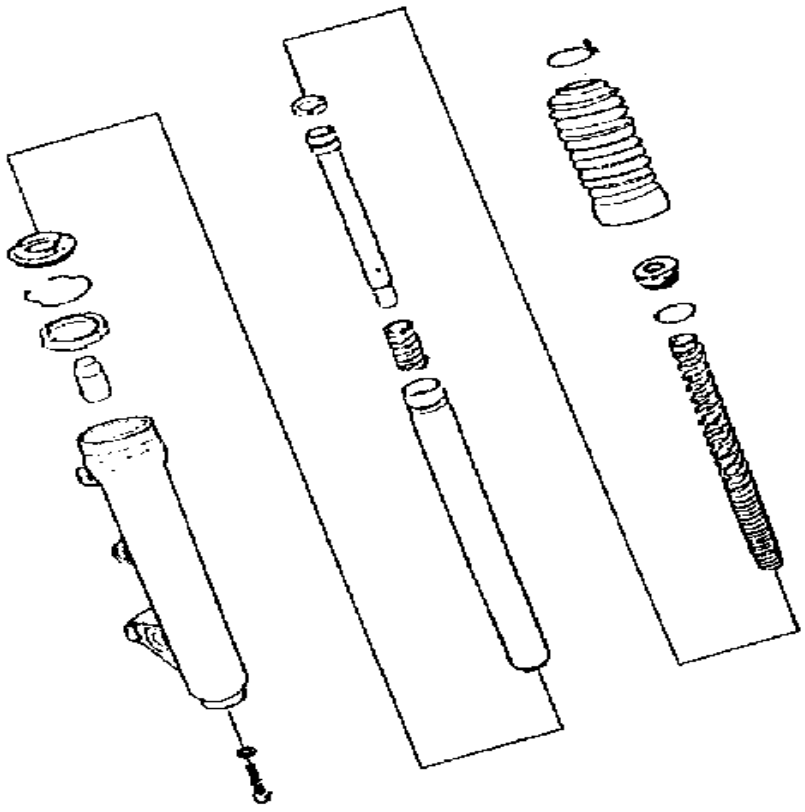
Shock Absorber Tube



Measure the front shock absorber spring free length.

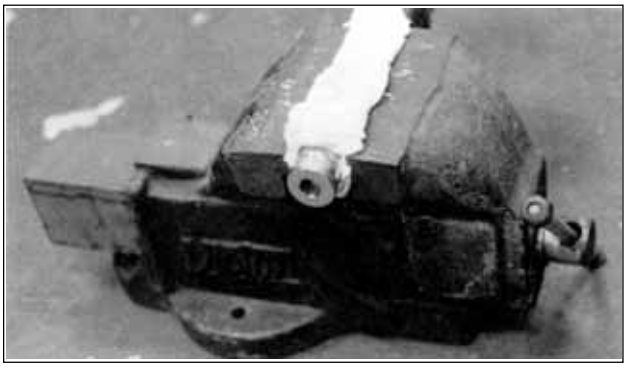
Service Limit: 233mm replace if below





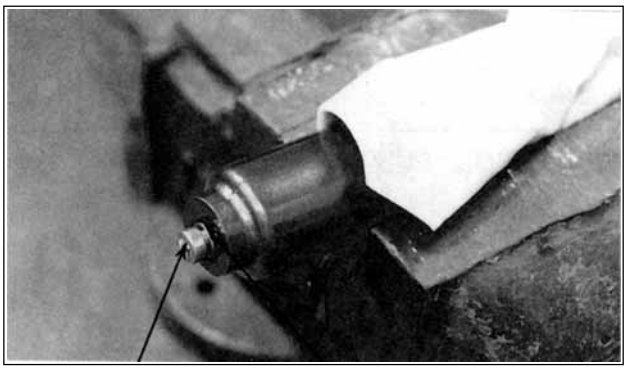
ASSEMBLY

Install the damper spring onto the damper rod and then install them into the front shock absorber tube.
Install the shock absorber spring onto the front shock absorber tube.
Set the front shock absorber tube in a vise and then tighten the lock nut.



* When holding the shock absorber tube, place a shop towel to protect it and do apply too much force .

Set the front shock absorber in a vise.
Insert the shock absorber tube into the shock absorber and then install the copper washer and tighten the damper rod hex bolt.



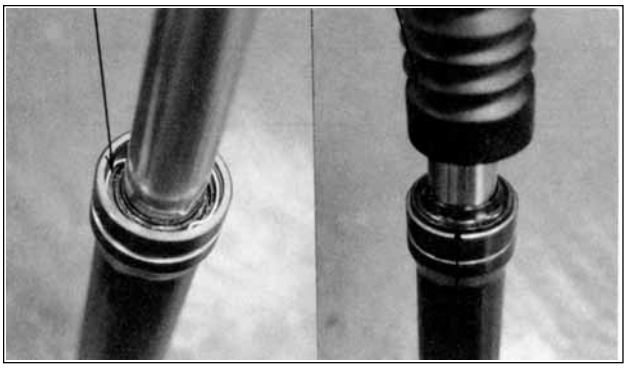
* Apply locking agent to the washer and hex bolt and install them together.

Add engine oil into the front shock absorber.
Torque: 1.5～3.0kg-m
Specified Oil: SS#8

Hex Bolt Copper Washer

Oil Capacity: 52cc
Install the oil seal
Install the circlip.
Install the dusts seal and dust boot.

Circlip Dust Boot



Dust Seal

INSTALLATION

Install the front shock absorbers onto the front fork.
Install and tighten the front shock absorber upper mount bolts.
Tighten the lower mount bolts.

* Align the upper mount bolt hole with the groove on the front fork.

Install the front wheel. (⇨14-7)

FRONT FORK

REMOVAL

Remove the handlebar covers. (⇨2-6)
Remove the steering handlebar. (⇨14-4)
Remove the front upper cover. (⇨2-5)
Remove the front lower cover. (⇨2-5)
Remove the front inner fender. (⇨2-6)
Remove the front wheel. (⇨14-5)
Remove the front brake caliper. (⇨14-11)
Hold the steering stem top cone race and remove the steering stem lock nut.
Remove the top cone race and remove the front fork.

* Be careful not to lose the steel balls (26 on top race and 19 on bottom race).

Inspect the ball races, cone races and steel balls for wear or damage. Replace if necessary.

BOTTOM CONE RACE REPLACEMENT

Remove the bottom cone race using a chisel.

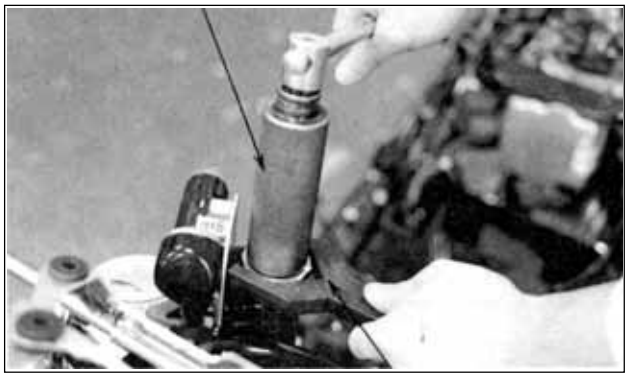
Drive a new bottom cone race into place with a proper driver.

* Be careful not to damage the steering stem and front fork.

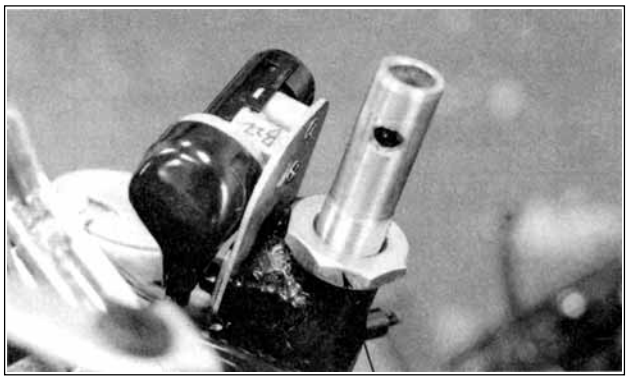
BALL RACE REPLACEMENT

Drive out the ball races.

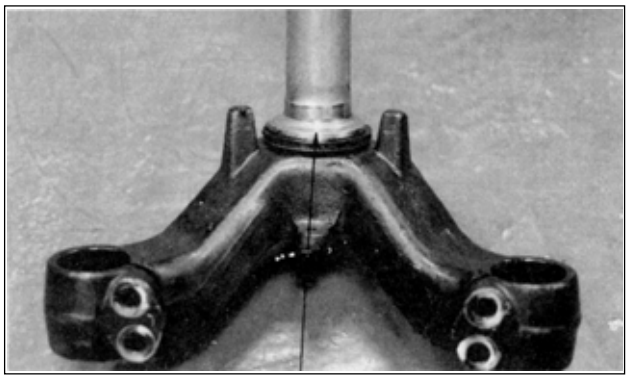
Lock Nut Socket



Lock Nut Wrench

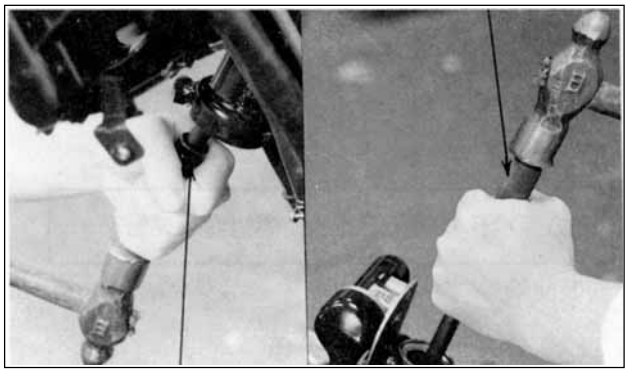


Top Cone Race



Bottom Cone Race

Ball Race Remover

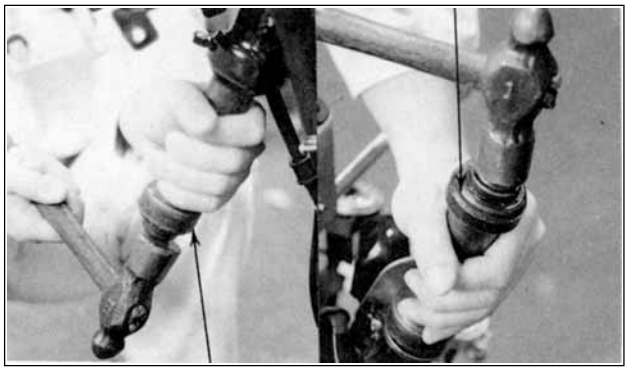


Ball Race Remover

Drive in new ball races.

* Be sure to drive the ball races into place completely.

Outer Driver, 37x40mm



Outer Driver, 37x40mm

INSTALLATION

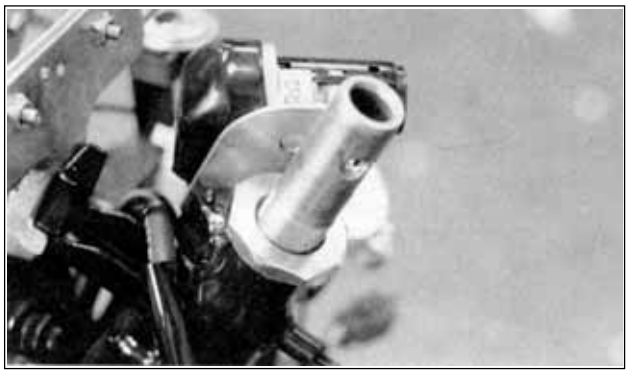
Apply grease to the top and bottom ball races and install 26 steel balls on the top ball race and 19 steel balls on the bottom ball race. Then, install the front fork.

Top Cone Race

Ball Race

Apply grease to the top cone race and install it.
Tighten the top cone race and then turn the steering stem right and left several times to make steel balls contact each other closely.

* Check that the steering stem rotates freely without vertical play.

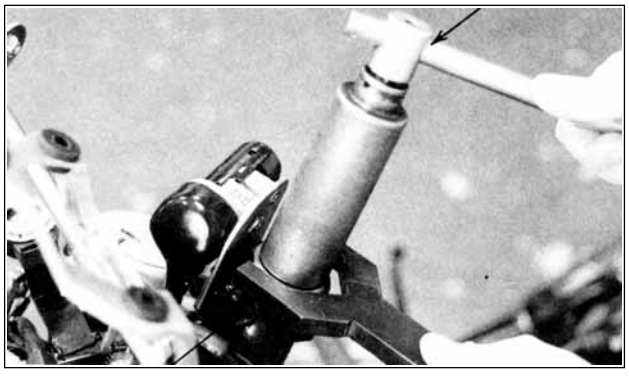


Lock Nut Wrench

Install the steering stem lock nut and tighten it while holding the top cone race.

Torque: 8.0～12.0kg-m

Install the front wheel. (⇨14-7)
Install the front brake caliper. (⇨14-12)
Install the front inner fender. (⇨2-6)
Install the throttle grip and the right and left handlebar switches.(⇨14-5)
Install the right and left brake master cylinders. (⇨14-5)

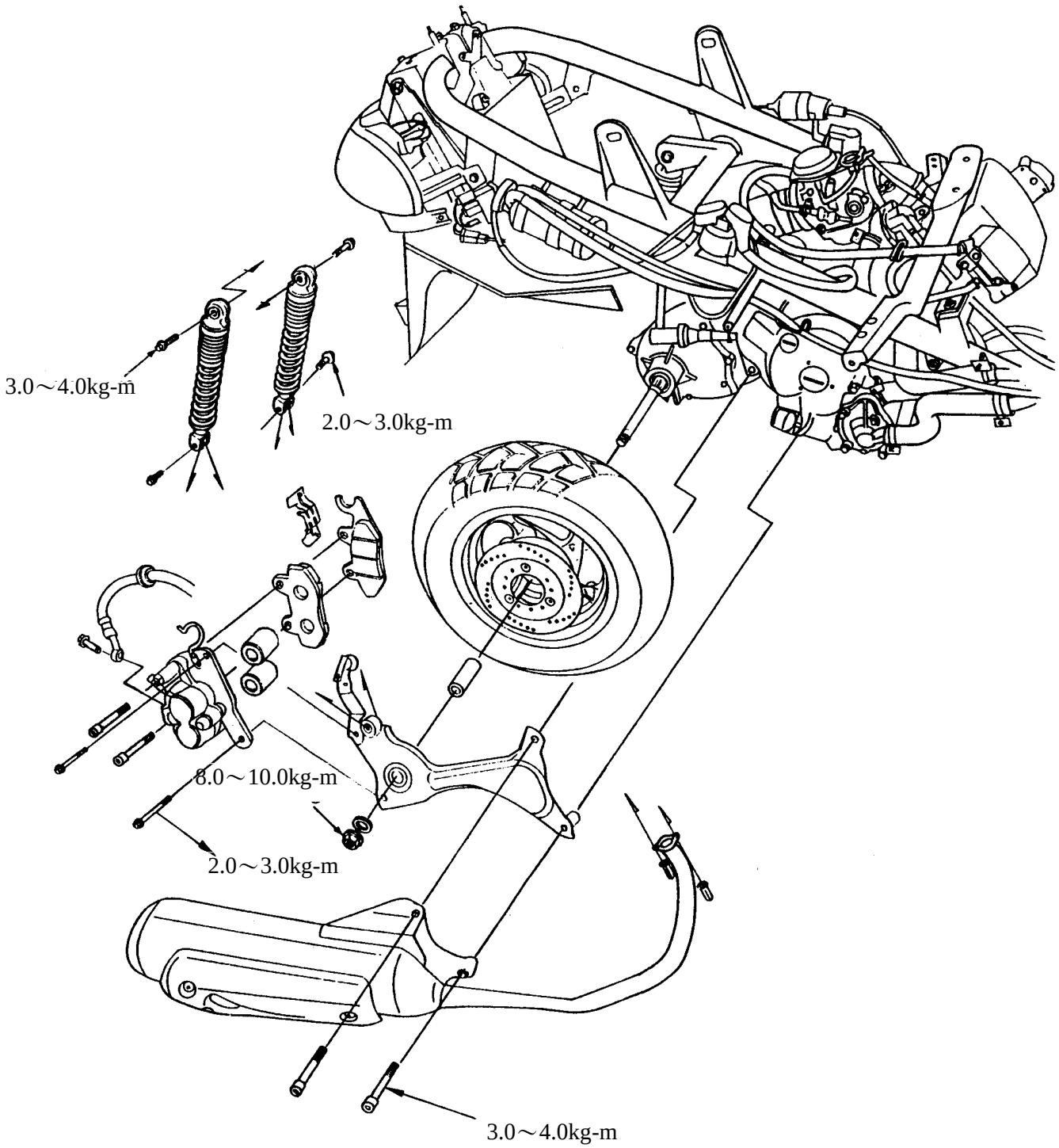


Lock Nut Wrench

REAR BRAKE/REAR FORK/REAR WHEEL/ REAR SHOCK ABSORBER

15. REAR BRAKE/REAR FORK/REAR WHEEL/REAR SHOCK ABSORBER

SCHEMATIC DRAWING



15. REAR BRAKE/REAR FORK/REAR WHEEL/REAR SHOCK ABSORBER

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- When performing the services stated in this section, the engine and exhaust muffler must be cold to avoid scalding.
- During servicing, keep oil or grease off the brake pads and brake disk.

SPECIFICATIONS

Item	Standard (mm)	Service Limit (mm)
Rear wheel rim runout	—	2.0
Rear shock absorber spring free length	232.9	226
Rear brake disk thickness	3.5～3.8	3.0
Rear brake disk runout	—	0.30
Rear brake master cylinder I.D.	12.700～12.743	12.755
Rear brake master cylinder piston O.D.	12.657～12.684	12.645
Rear brake caliper cylinder I.D.	25.400～25.45	25.45
Rear brake caliper piston O.D.	25.335～25.368	25.30

TORQUE VALUES

Exhaust muffler lock bolt	3.0～4.0kg-m
Rear axle nut	8.0～10.0kg-m
Rear shock absorber lower mount bolt	2.0～3.0kg-m
Rear shock absorber upper mount bolt	4.0kg-m
Rear damper lock nut	1.5～2.5kg-m (apply locking agent)
Rear brake caliper bolt	2.0～3.0kg-m

SPECIAL TOOLS

Rear shock absorber remover
Shock absorber spring compressor

TROUBLESHOOTING

Rear wheel wobbling
- Bent rim
- Faulty tire
- Axle not tightened properly

Soft rear shock absorber
- Weak shock absorber spring
- Damper oil leaks

Rear wheel noise
- Worn rear wheel axle bearings
- Worn rear fork bearings
- Deformed rear fork

Poor brake performance
- Air in brake system
- Deteriorated brake fluid
- Contaminated brake pad surface
- Worn brake pads
- Clogged brake fluid line
- Deformed brake disk
- Unevenly worn brake caliper

15. REAR BRAKE/REAR FORK/REAR WHEEL/REAR SHOCK ABSORBER

REAR BRAKE

REAR BRAKE CALIPER REMOVAL

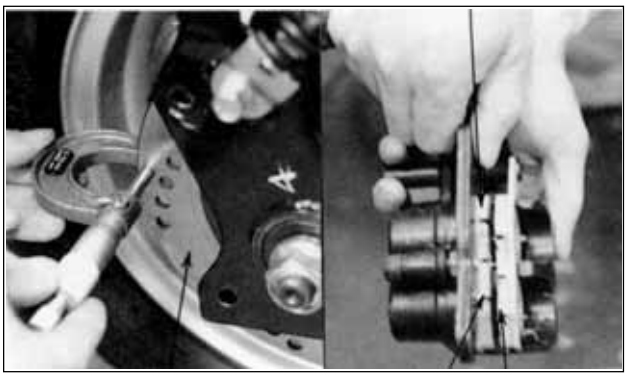
First remove the exhaust muffler. (⇨2-6)
Remove the rear brake fluid tube bolt and disconnect the brake fluid tube.
Remove the two bolts attaching the rear brake caliper.
Remove the rear brake caliper.

* When removing the brake fluid tube, use shop towels to cover plastic parts and coated surfaces to avoid damage.

Fluid Tube Bolt

Brake Caliper Bolts

Brake Pads



Brake Disk Wear Indicator Mark

INSPECTION

Inspect the brake pads and brake disk.
Visually check the brake pad thickness and it should not exceed the wear indicator mark.
Measure the brake disk thickness.

Service Limit: 3.0mm replace if below

DISASSEMBLY

Disassemble the rear brake caliper. (⇨14-11)
Inspect and assemble the rear brake caliper . (⇨14-12)

Note: The rear brake caliper and front brake caliper have the same specification.

INSTALLATION

Install the brake caliper to the rear fork and tighten the two bolts.

Torque: 2.5～3.5kg-m

Connect the brake fluid tube to the brake caliper and tighten the fluid tube bolt.
Fill the brake reservoir with the specified brake fluid and bleed air from the brake system. (⇨14-10)

* When installing the brake fluid tube, be sure to install the two copper sealing washers.

Copper Washers

Fluid Tube Bolt Bolts

15. REAR BRAKE/REAR FORK/REAR WHEEL/REAR SHOCK ABSORBER

REAR FORK

REMOVAL

Remove the exhaust muffler. (⇨2-6)
Remove the rear brake caliper. (⇨15-3)
Remove the right rear shock absorber lower mount bolt.
Remove the rear axle nut and remove the collar.
Remove the rear fork.

Shock Absorber Lower Mount Bolt

Axle Nut Collar Rear Fork Bolts

The installation sequence is the reverse of removal.

Torque:

Rear shock absorber lower mount bolt: 2.0 ～3.0kg-m
Rear fork bolt: 2.0～3.0kg-m
Rear axle nut: 8.0～10.0kg-m

REAR WHEEL

REMOVAL

Remove the exhaust muffler. (⇨2-6)
Remove the rear brake caliper. (⇨15-3)
Remove the rear fork.
Remove the rear axle collar.
Remove the rear wheel.

Rear Brake Disk

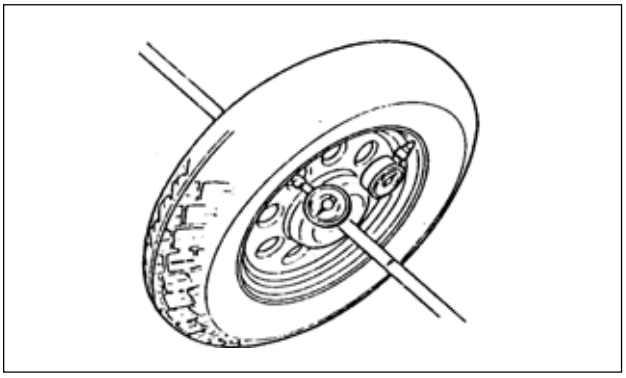
Rear Axle Collar

INSPECTION

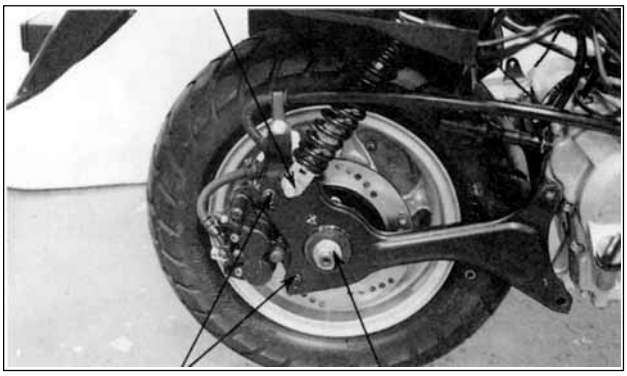
Measure the rear wheel rim runout.

Service Limits:

Radial: 2.0mm replace if over
Axial: 2.0mm replace if over



Shock Absorber Lower Mount Bolt



Brake Caliper Bolts

Axle Nut

INSTALLATION

The installation sequence is the reverse of removal.

Torque:

Rear shock absorber lower mount bolt: 2.0 ～3.0kg-m

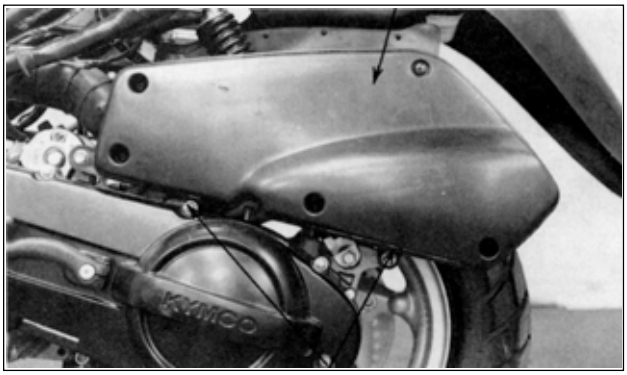
Rear axle nut: 8.0～10.0kg-m

REAR SHOCK ABSORBER

REMOVAL

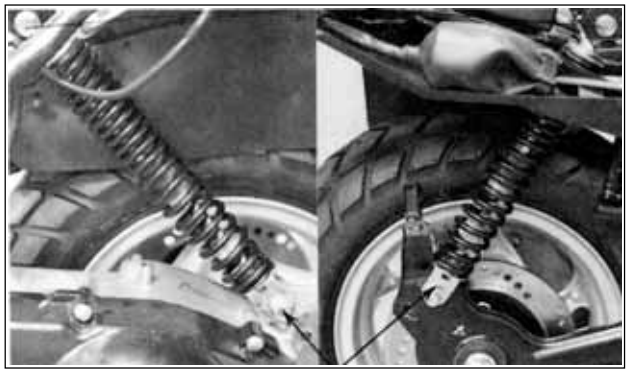
Remove the rear carrier and hand rail. (⇨2-3)
Remove the met-in box. (⇨2-3)
Remove the two air cleaner bolts.
Remove the rear shock absorber upper mount bolt.
Remove the right/left rear shock absorber upper and lower mount bolts.
Remove the right and left rear shock absorbers.

Air Cleaner



Bolts

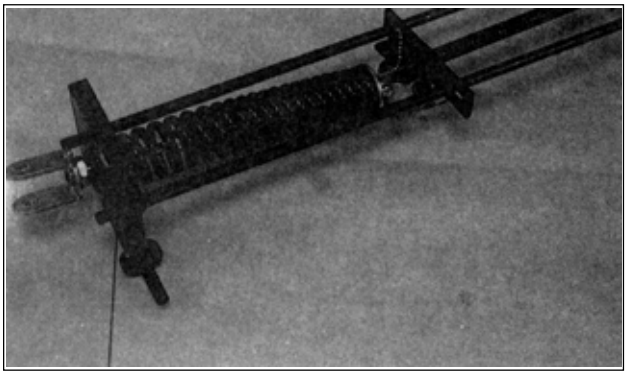
Upper Mount Bolts



Lower Mount Bolts

DISASSEMBLY

Disassemble the right and left rear shock absorbers using the rear shock absorber remover.

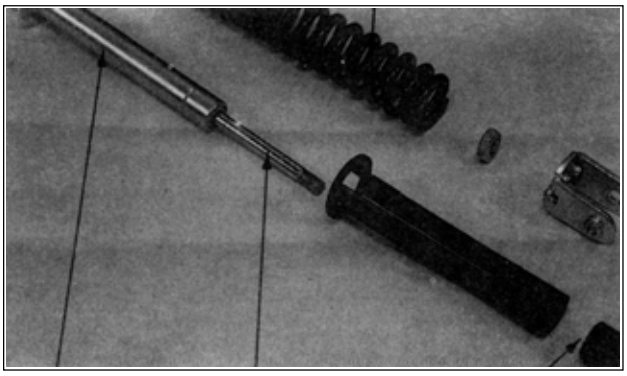


Rear Shock Absorber Remover

INSPECTION

Inspect the damper rod for bending or damage.
Inspect the damper for oil leaks.
Inspect the damper rubber for deterioration or damage.

Spring

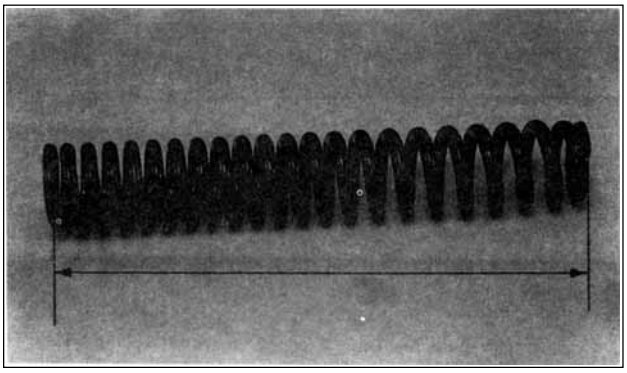


Damper Damper Rod Rubber

Measure the front shock absorber spring free length.

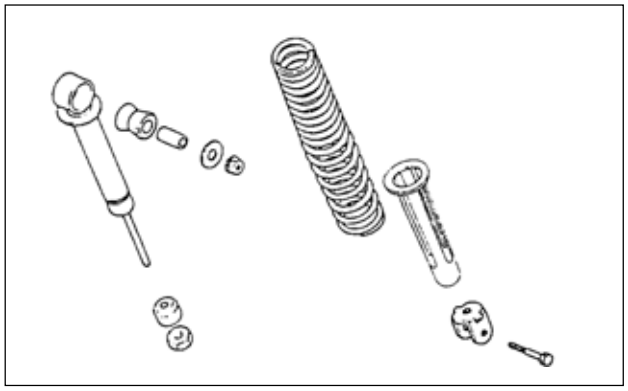
Service Limit:

Right: 226mm
Left : 226mm



ASSEMBLY

Assemble the rear shock absorbers in the reverse order of disassembly.



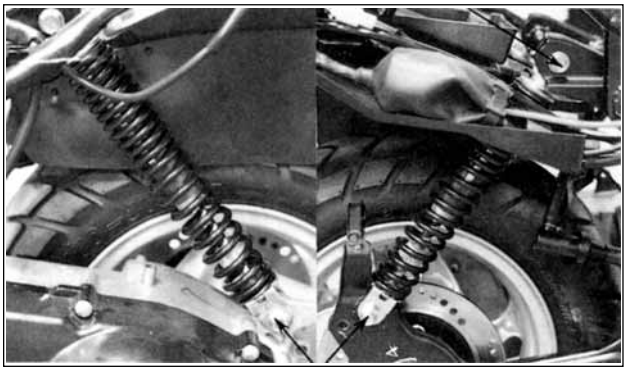
Upper Mount Bolts

INSTALLATION

Install the rear shock absorbers in the reverse order of removal.

Torque:

Upper Mount Bolt: 4.0kg-m
Lower Mount Bolt: 2.0～3.0kg-m



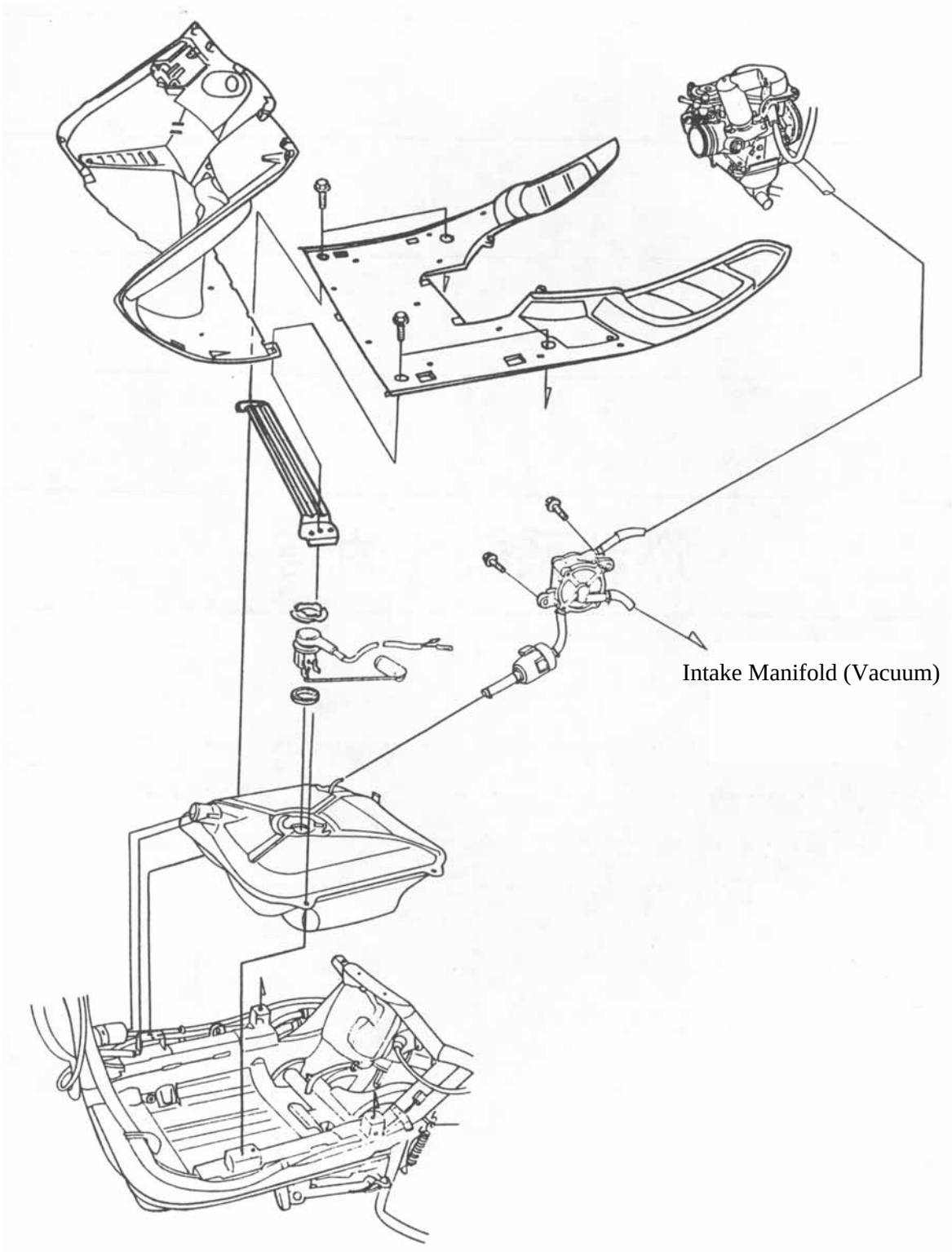
Lower Mount Bolts

16

FUEL TANK

16. FUEL TANK

SCHEMATIC DRAWING



16. FUEL TANK

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- When removing the fuel tank, keep sparks and flames away from the working area.
- When removing the fuel tank, the remaining fuel in the tank must be lower than ½ of the fuel tank capacity to avoid gasoline overflowing.
- Fuel tank capacity: 10.5 liters

TROUBLESHOOTING

Engine is hard to start

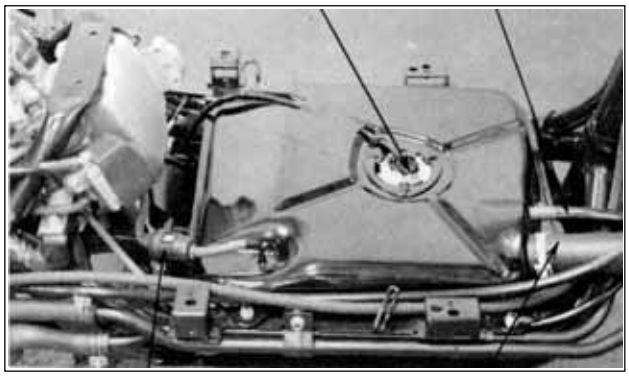
- No fuel in tank
- Restricted fuel line
- Clogged fuel strainer
- Faulty fuel pump
- Broken or clogged vacuum tube
- Faulty or clogged charcoal canister

Lean mixture

- Clogged charcoal canister
- Bent, kinked or restricted fuel line
- Clogged fuel strainer
- Float level too low

FUEL TANK REMOVAL

Remove the floor board. (⇨2-4)
Remove the leg shield . (⇨2-5)
Disconnect the fuel unit wire connector.
Remove the fuel tube between the fuel tank and the fuel filler.
Disconnect the fuel vapor tube.
Remove the fuel tank.



The installation sequence is the reverse of removal.

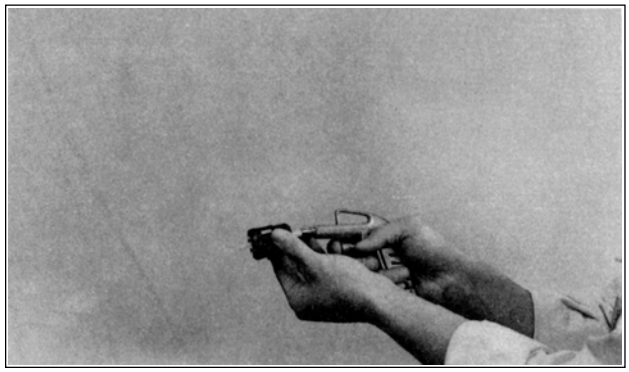
FUEL STRAINER REMOVAL

Remove the fuel strainer from the fuel tank.

INSPECTION

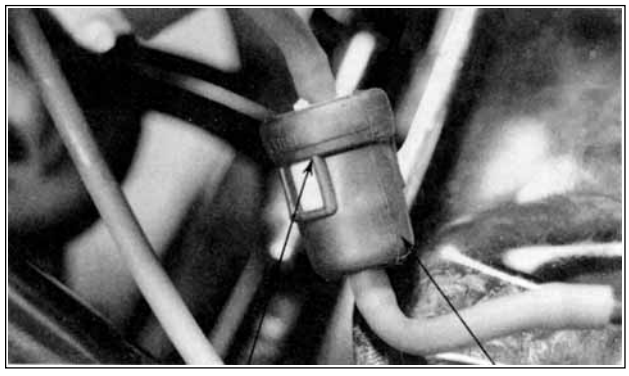
Inspect if the fuel strainer is clogged and clean it with compressed air.

✳
- When removing the fuel strainer, do not allow flames or sparks near the working area and drain the residual gasoline into a container.



INSTALLATION

Install the fuel strainer with its arrow mark toward the fuel pump.

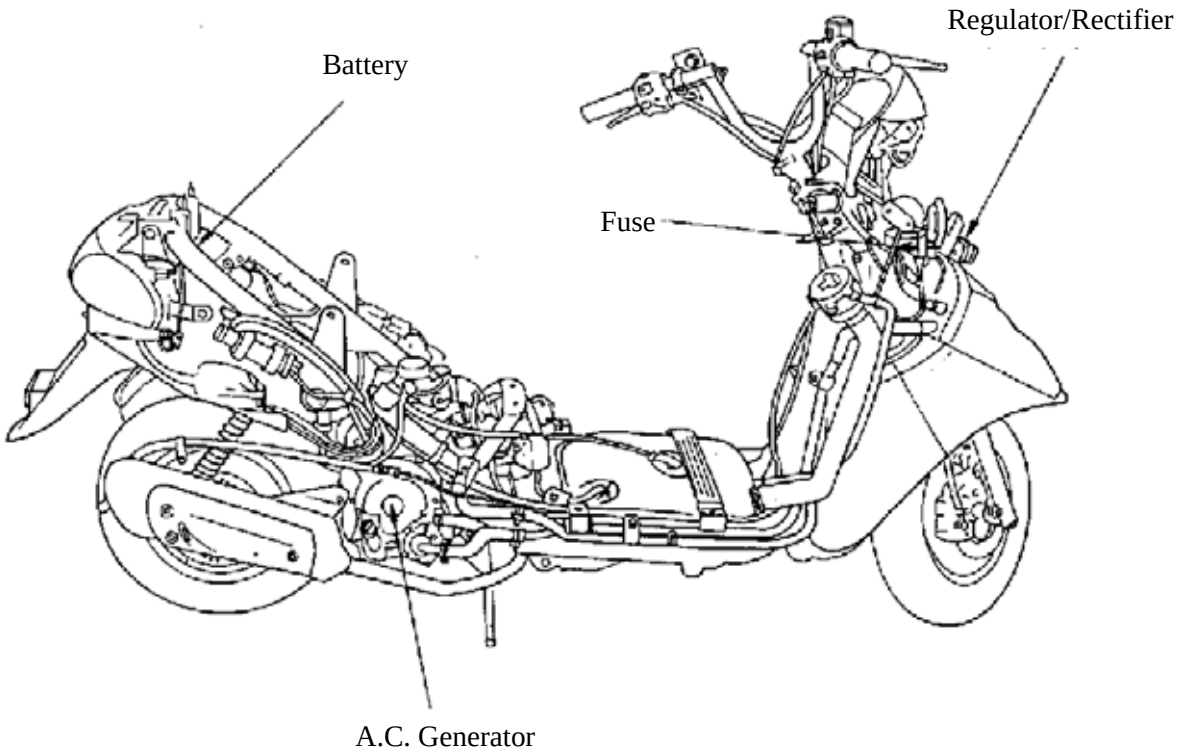


17

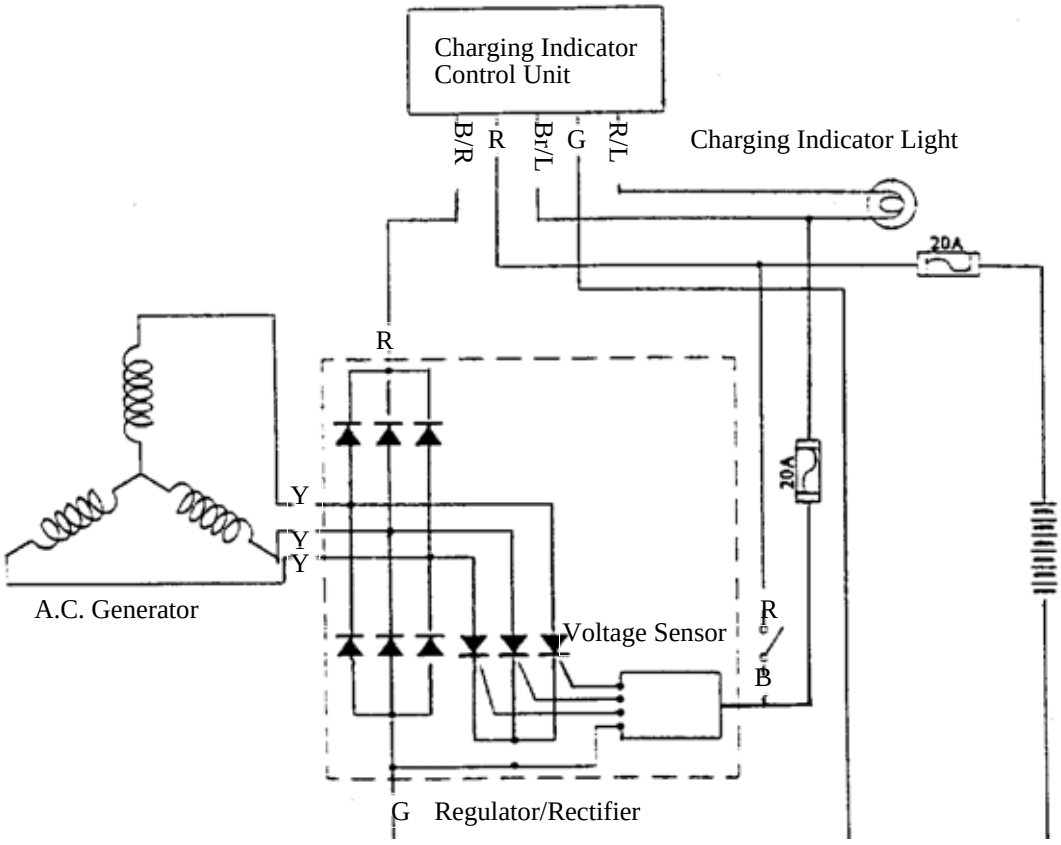
BATTERY/CHARGING SYSTEM

17. BATTERY/CHARGING SYSTEM

CHARGING SYSTEM LAYOUT



CHARGING CIRCUIT



17. BATTERY/CHARGING SYSTEM

SERVICE INFORMATION

GENERAL INSTRUCTIONS

The battery electrolyte (sulfuric acid) is poisonous and may seriously damage the skin and eyes. Avoid contact with skin, eyes, or clothing. In case of contact, flush with water and get prompt medical attention

- The battery can be charged and discharged repeatedly. If a discharged battery is not used for a long time, its service life will be shortened. Generally, the capacity of a battery will decrease after it is used for 2～3 years. A capacity-decreased battery will resume its voltage after it is recharged but its voltage decreases suddenly and then increases when a load is added.
- When a battery is overcharged, some symptoms can be found. If there is a short circuit inside the battery, no voltage is produced on the battery terminals. If the rectifier won't operate, the voltage will become too high and shorten the battery service life.
- If a battery is not used for a long time, it will discharge by itself and should be recharged every 3 months.
- A new battery filled with electrolyte will generate voltage within a certain time and it should be recharged when the capacity is insufficient. Recharging a new battery will prolong its service life.
- Inspect the charging system according to the sequence specified in the Troubleshooting.
- Do not disconnect and soon reconnect the power of any electrical equipment because the electronic parts in the regulator/rectifier will be damaged. Turn off the ignition switch before operation.
- It is not necessary to check the MF battery electrolyte or fill with distilled water.
- Check the load of the whole charging system.
- Do not quick charge the battery. Quick charging should only be done in an emergency.
- Remove the battery from the motorcycle for charging.
- When replacing the battery, do not use a traditional battery.
- When charging, check the voltage with an electric tester.

SPECIFICATIONS

Item			Standard
Battery	Capacity		12V9AH
	Voltage (20℃)	Fully charged	13.2V
		Undercharged	12.3V
	Charging current		STD: 0.9A Quick: 4.0A
	Charging time		STD: 5-10hr Quick: 30min
A.C. Generator	Capacity		160W/500rpm
	Charging coil resistance (20℃)		Yellow～Yellow 0.6～1.6Ω
	Charging rpm		1300rpm max (14V)
	Charging performance		6A min/2500rpm 8A min/5000rpm
Regulator/Rectifier	Limit voltage		14.5±0.5V

TESTING INSTRUMENTS

Ammeter
Electric tester
Tachometer

TORQUE VALUES

Pulser coil bolt	0.5kg-m
Coil lock bolt	0.9kg-m
Flywheel nut	3.5～4.5kg-m

17. BATTERY/CHARGING SYSTEM

SPECIAL TOOLS
Universal holder
Flywheel puller

TROUBLESHOOTING

No power
- Dead battery
- Disconnected battery cable
- Fuse burned out
- Faulty ignition switch

Low power
- Weak battery
- Loose battery connection
- Charging system failure
- Faulty regulator/rectifier

Intermittent power
- Loose battery cable connection
- Loose charging system connection
- Loose connection or short circuit in ignition system

Charging system failure
- Loose, broken or shorted wire or connector
- Faulty regulator/rectifier
- Faulty A.C. generator

17. BATTERY/CHARGING SYSTEM

BATTERY

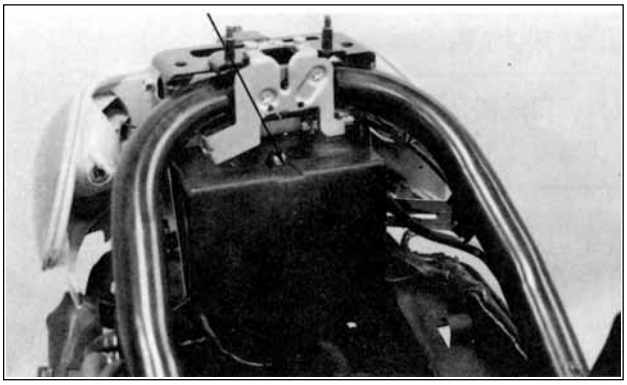
Remove the seat and met-in box. (⇨2-3)
Remove the battery cover screw and the battery cover.
Remove the battery.
First disconnect the battery negative (-) cable and then the positive (+) cable.

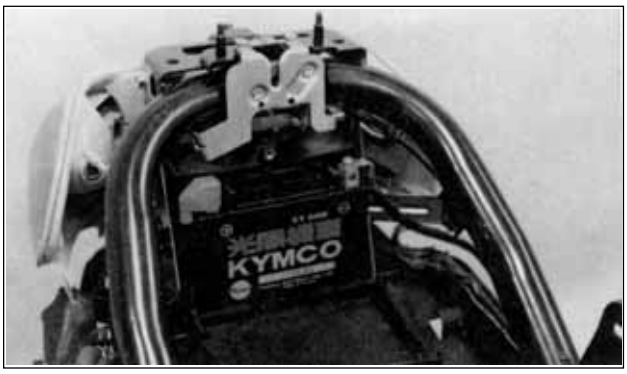
> When disconnecting the battery positive (+) cable, do not touch the frame with tool; otherwise it will cause short circuit and sparks to fire the fuel.

The installation sequence is the reverse of removal.

> First connect the positive (+) cable and then negative (-) cable to avoid short circuit.

Battery Cover Screw

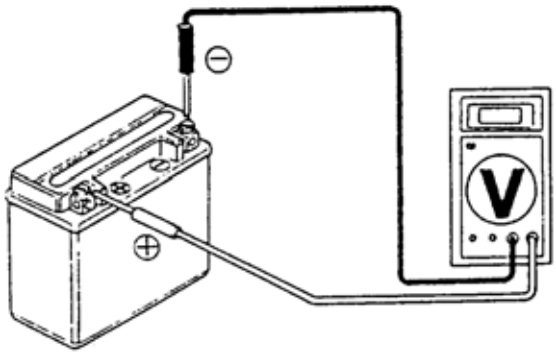




BATTERY VOLTAGE INSPECTION (OPEN CIRCUIT VOLTAGE)

Disconnect the battery cables.
Measure the voltage between the battery terminals.
Fully charged : 13.2V
Undercharged : 12.3V max.

* Battery charging inspection must be performed with a voltmeter.

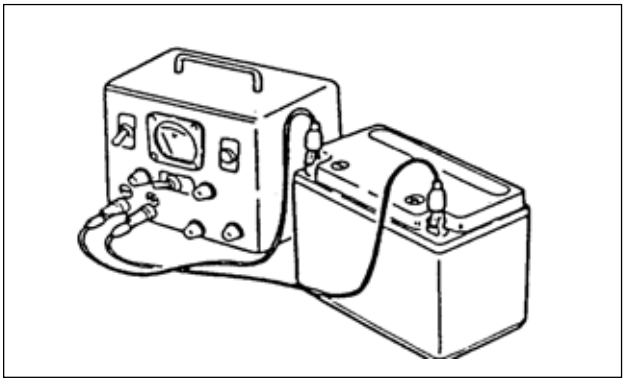


CHARGING

Connect the charger positive (+) cable to the battery positive (+) terminal.
Connect the charger negative (-) cable to the battery negative (-) terminal.

- Keep flames and sparks away from a charging battery.
- Turn power ON/OFF at the charger, not at the battery terminals to prevent sparks near the battery.
- Charge the battery according to the current specified on the battery.
- During quick charging, the battery temperature should not exceed 45℃.

*
- Quick charging should only be done in an emergency.
- Measure the voltage 30 minutes after the battery is charged.



Charging current: Standard : 0.9A
Quick : 4A
Charging time : Standard : 5～10 hours
Quick : 30 minutes
After charging: Open circuit voltage: 12.8V min.

CHARGING SYSTEM

CURRENT TEST

* Use a fully charged battery (12.8V min.) to check the charging system.

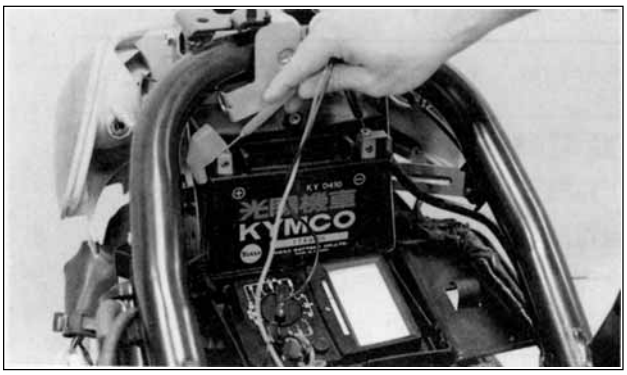
Warm up the engine before taking readings.
Connect an electric tester across the battery terminals.
Disconnect the red wire from the fuse terminal and connect an ammeter between the red wire lead and the fuse terminal.
Attach a tachometer to the engine.

Start the engine and gradually increase the engine speed to measure the limit voltage and current.

Limit Voltage/Current: 14～15V/0.5A max.
(5000rpm max.)

If the limit voltage is not within the specified range, check the regulator/rectifier.

Red Wire



PERFORMANCE TEST

Engine Speed	2500rpm	5000rpm
Charging Current	6A min.	8A min.

* When measuring the charging current, disconnect the black wire from the regulator/rectifier wire coupler.

If the readings do not meet the specified values, check the regulator/rectifier.

A.C. GENERATOR INSPECTION

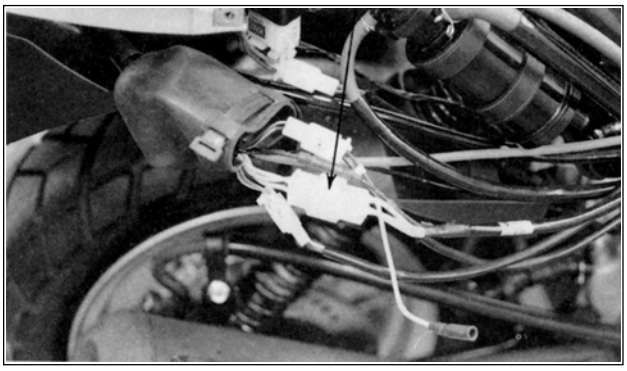
* This test can be made without removing the stator from the engine. Disconnect the yellow wire from the auto bystarter.

Remove the frame center cover.
Disconnect the A.C. generator connector.
Check the continuity between the yellow wires and ground.
There should be continuity between the yellow wires and no continuity between each yellow wire and ground.

Resistance:

Yellow～Yellow	0.6～1.6Ω

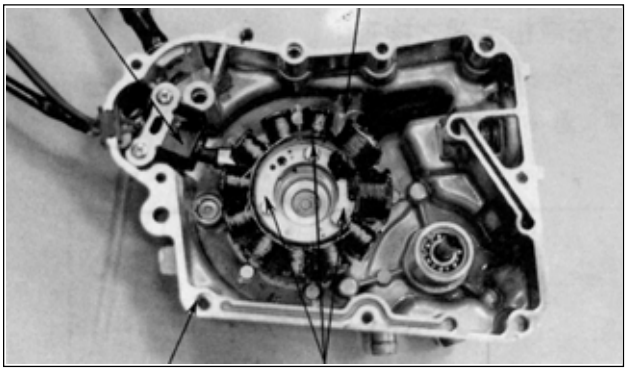
A.C. Generator Connector



A.C. GENERATOR REMOVAL

A.C. generator removal (⇨10-3)
A.C. generator installation (⇨10-6)

Pulser Coil A.C. Generator Stator



Right Crankcase Cover Bolts

Regulator/Rectifier

REGULATOR/RECTIFIER

INSPECTION

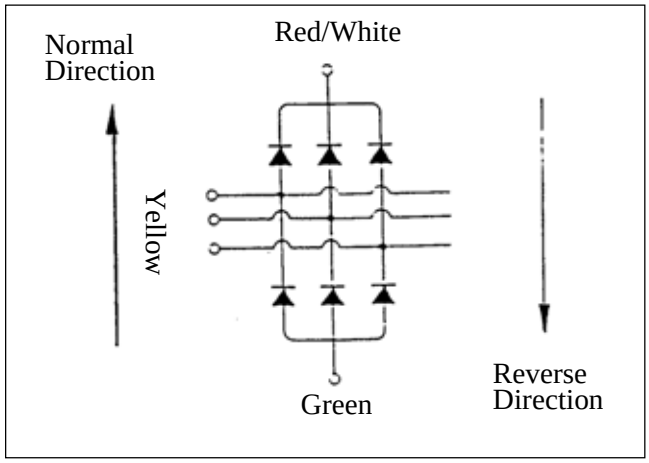
Remove the frame front cover. (⇨2-5)
Remove the regulator/rectifier wire coupler.
Check the continuity between the wire terminals.

Normal Direction: Continuity

	(+) Probe	(-) Probe
I	Yellow	Green
II	Red/White	Yellow

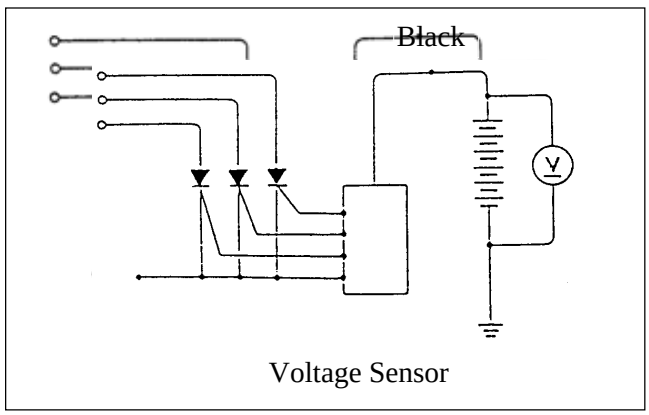
Reverse Direction: No Continuity

	(+) Probe	(-) Probe
I	Green	Yellow
II	Yellow	Red/White



VOLTAGE REGULATION TEST

Connect a voltmeter across the battery terminals.
Start the engine and gradually increase the engine speed.
The battery terminal voltage should be within 14.0～15.0V.



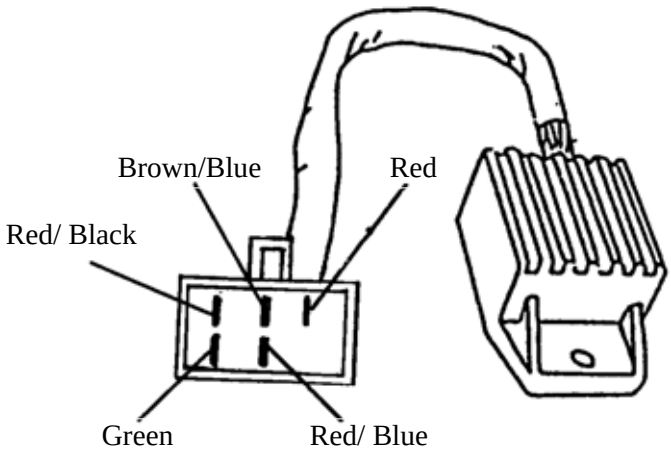
Voltage Sensor

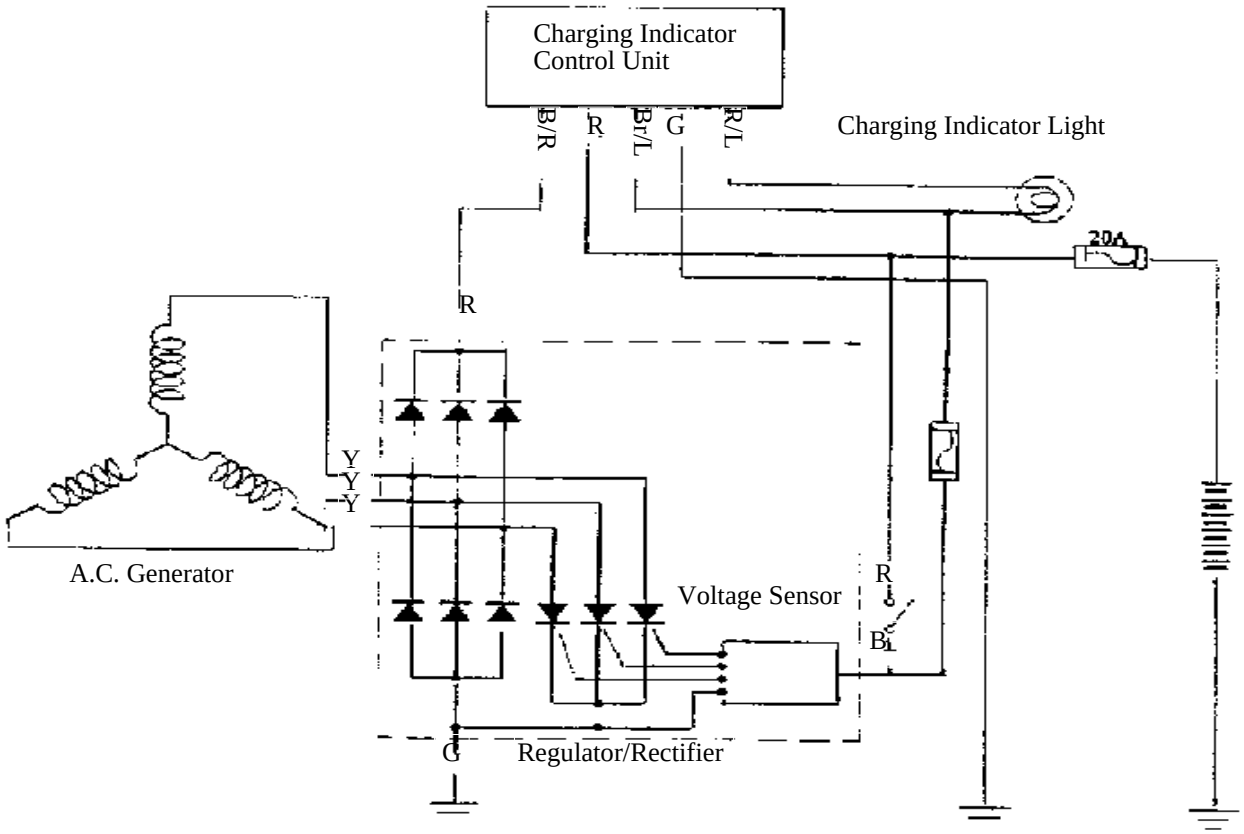
CHARGING INDICATOR INSPECTION

Use Sanwa electric tester for testing.
Take readings in XKΩ range.

Unit: KΩ

Probe (+) / Probe (-)	Red/ Black	Red	Brown /Blue	Red/ Blue	Green
Red/ Black	∞	4～5Ω	Needle moves from 24 to 50KΩ	Needle moves from 15 to 50KΩ	Needle moves from 9 to 30KΩ
Red			∞	∞	∞
Brown/ Blue	Needle moves from 24 to 50KΩ	Needle moves from 40 to 60KΩ		25～35	15～20
Red/ Blue	∞	∞	∞		∞
Green	Needle moves from 8 to 25KΩ	Needle moves from 15 to 40KΩ	15～20	4～8	



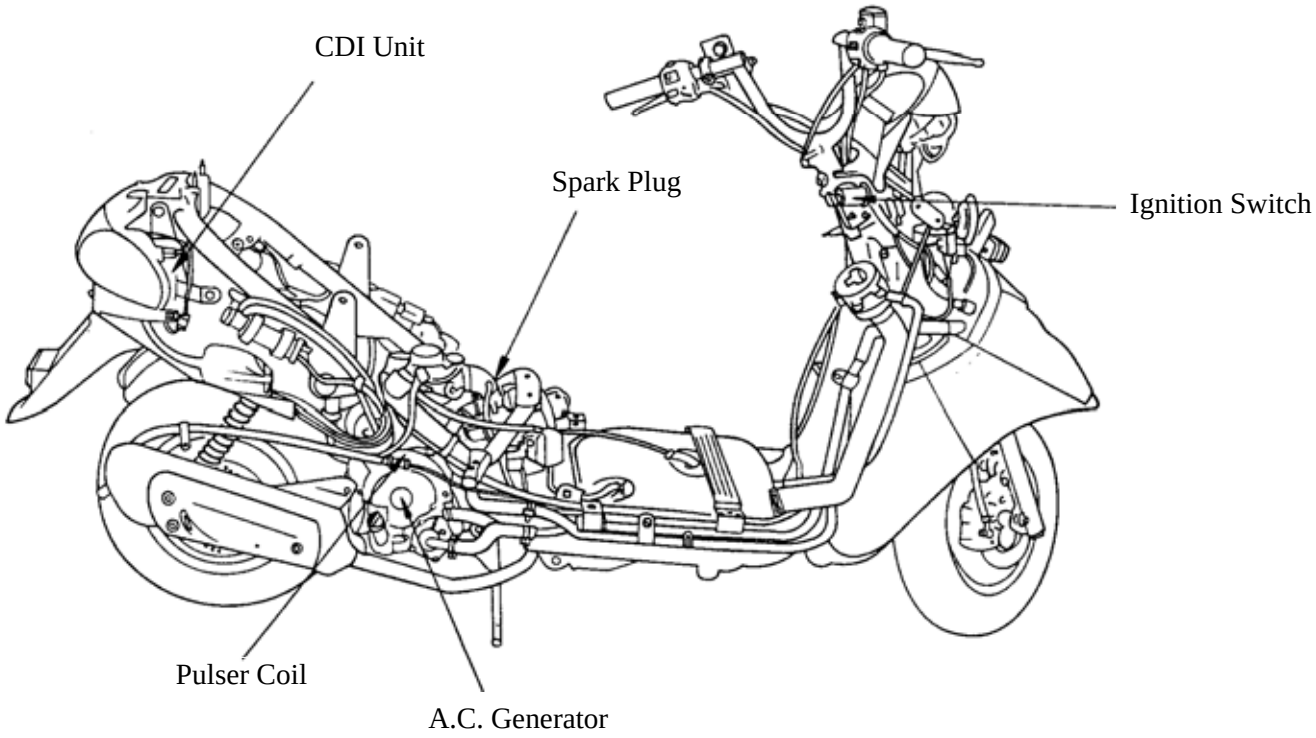


18

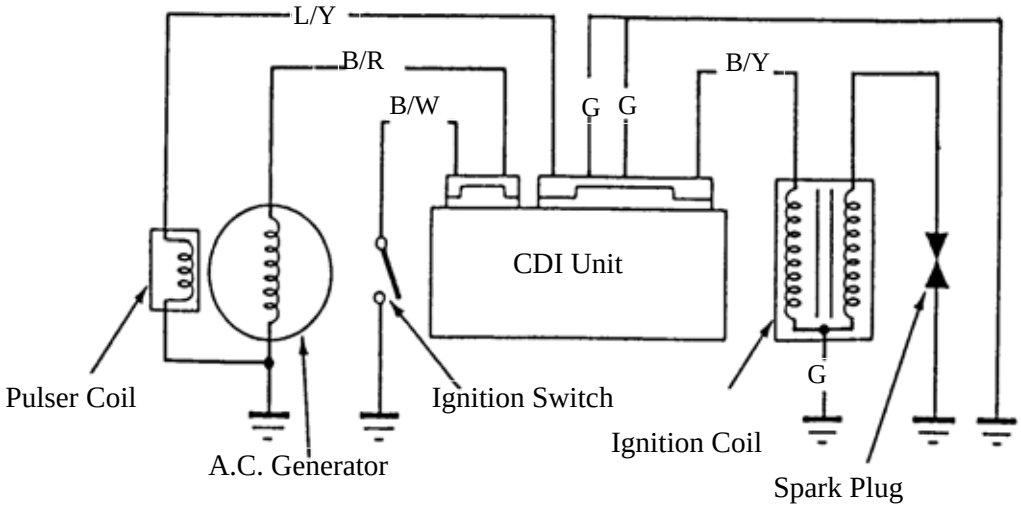
IGNITION SYSTEM

18. IGNITION SYSTEM

IGNITION SYSTEM LAYOUT



IGNITION CIRCUIT



18. IGNITION SYSTEM

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- Check the ignition system according to the sequence specified in the Troubleshooting. (⇨1-28)
- The ignition system adopts CDI unit and the ignition timing cannot be adjusted.
- If the timing is incorrect, inspect the CDI unit and A.C. generator and replace any faulty parts. Inspect the CDI unit with a CDI tester
- Loose connector and poor wire connection are the main causes of faulty ignition system. Check each connector before operation.
- Use of spark plug with improper heat range is the main cause of poor engine performance.
- The inspections in this section are focused on maximum voltage. The inspection of ignition coil resistance is also described in this section.
- Inspect the ignition switch according to the continuity table specified in page 20-3.
- Inspect the spark plug referring to Section 3.
- Remove the A.C. generator and pulser coil referring to Section 10.

SPECIFICATIONS

Item			Standard
Spark plug	Standard type		NGK DP7EA9
	Hot type		NGK DP6EA9
	Cold type		NGK DP8EA9
Spark plug gap			0.8～1.0mm
Ignition timing	"F" mark		BTDC 10°±3°
	Full advance		BTDC 27°
Ignition coil resistance (20℃)	Primary coil		0.16～0.20Ω
	Secondary coil	without plug cap	3.6～4.6KΩ
		with plug cap	7.6～8.6KΩ
Pulser coil resistance (20℃)			50～170Ω
Exciter coil resistance (20℃)			50～350Ω
Ignition coil primary side max. voltage			244V
Pulser coil max. voltage			10.5V
Exciter coil max. voltage			244V

TESTING INSTRUMENT

Electric tester

TROUBLESHOOTING

No spark at plug

- Faulty spark plug
- Poorly connected, broken or shorted wire
- Faulty ignition switch
- Faulty ignition coil
- Faulty CDI unit
- Faulty A.C. generator

Engine starts but turns poorly

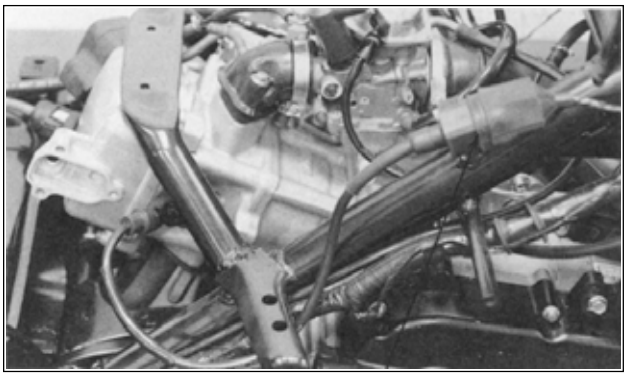
- Ignition primary circuit
  —Faulty ignition coil
  —Poorly connected wire or connector
  —Poorly contacted ignition switch
- Ignition secondary circuit
  —Faulty ignition coil
  —Faulty spark plug
  —Faulty high-tension wire
  —Poorly insulated plug cap
- Improper ignition timing
  —Faulty A.C. generator
  —Stator not installed properly
  —Faulty CDI unit

SPARK PLUG

For spark plug inspection and adjustment, refer to page 3-5.

IGNITION COIL INSPECTION

Remove the seat and met-in box. (⇨2-3)
Remove the ignition coil



Ignition Coil

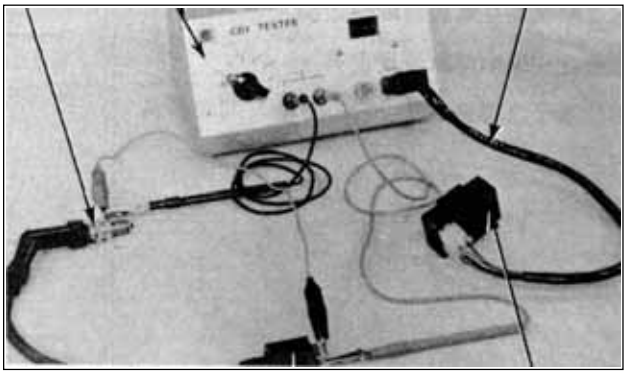
IGNITION COIL PERFORMANCE TEST

Test the ignition coil using a CDI tester.

* Correctly operate the CDI tester following the manufacturer's instructions.

When there is no spark at the spark plug, replace the ignition coil with a new one.

Spark Plug CDI Tester Special Coupler (KB7)



Ignition Coil CDI Unit

IGNITION COIL CONTINUITY TEST

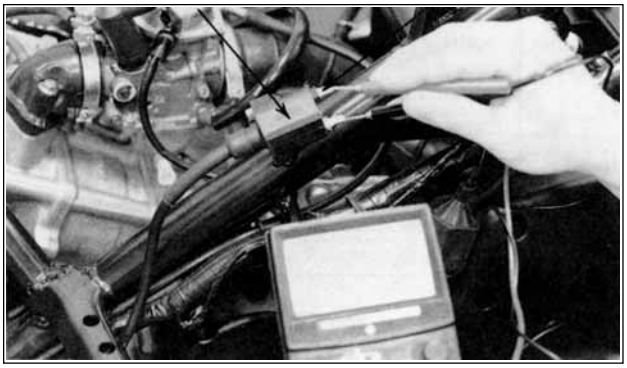
Inspect the continuity of the ignition coil, primary coil and secondary coil.

* This is a general test. Accurate ignition coil test must be performed with a CDI tester.

Measure the ignition coil resistances at 20℃.

Primary coil	0.16～0.20Ω
Secondary coil without plug cap	3.4～4.6KΩ
Secondary coil with plug cap	7.6～8.6KΩ

Ignition Coil Primary Coil



Ignition Coil Secondary Coil

A.C. GENERATOR INSPECTION

EXCITER COIL/PULSER COIL INSPECTION

* This test is performed with the stator installed in the engine.

Remove the frame right cover. (⇨2-4)
Disconnect the A.C. generator connector.
Measure the exciter coil resistance between the black/red wire terminal and ground.

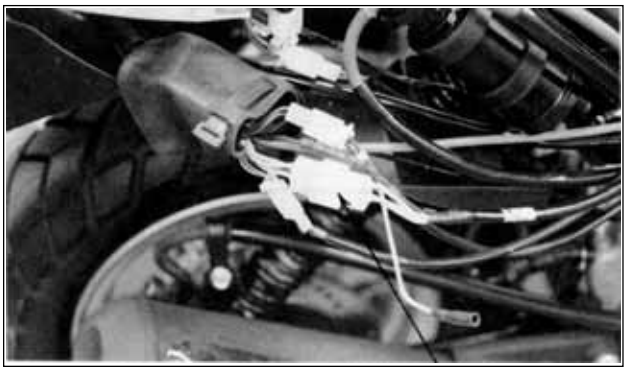
Black/red～Ground	50～350Ω

* Measure the resistance in the XΩ range.

For A.C. generator removal/installation, refer to pages 10-3 and 10-6.
Disconnect the pulser coil wire coupler.
Measure the pulser coil resistance between the blue/white and green/white wire terminals.

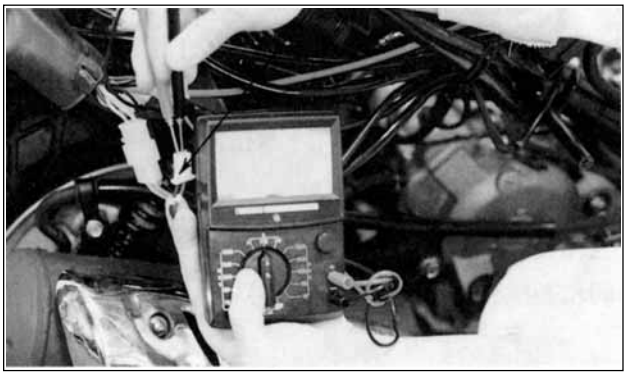
Blue/white～Green/white	50～170Ω

For pulser coil replacement, refer to pages 10-3 and 10-6.

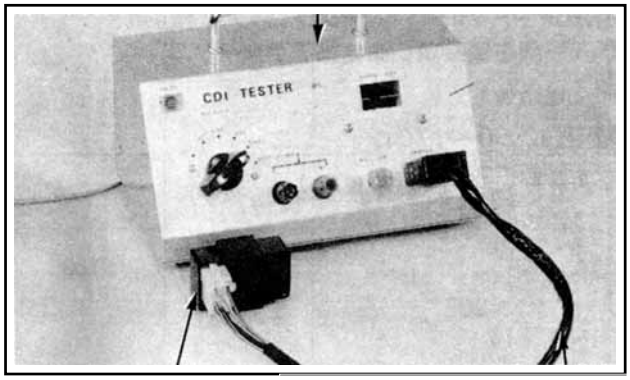


A.C. Generator Connector

Pulser Coil Wire Coupler



CDI Tester



CDI Unit

CDI Tester Special Coupler

CDI UNIT INSPECTION

Remove the met-in box. (⇨2-3)
Disconnect the CDI coupler and remove the CDI unit.
Inspect the CDI unit performance using the CDI tester.

* Correctly operate the CDI tester following the manufacturer‘s instructions.

Connect the CDI unit to the CDI tester special coupler (KB7). Adjust the CDI tester switch range.

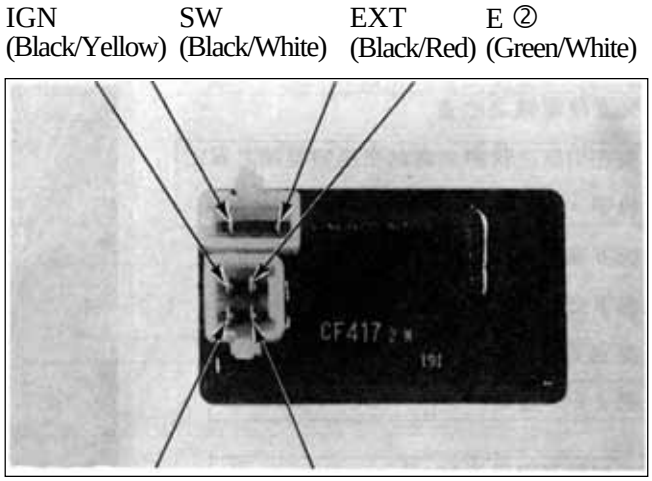
Switch	Good CDI	Faulty CDI
1. OFF	No spark	——
2. P	↑	——
3. EXT	↑	Good spark
4. ON1	Good spark	No spark
5. ON2	Good spark	No spark

RESISTANCE INSPECTION

Measure the resistance between the terminals. Replace the CDI unit if the readings are not within the specifications in the table below.

* • Due to the semiconductor in circuit, it is necessary to use a specified tester for accurate testing. Use of an improper tester in an improper range may give false readings.
  • Use a Sanwa Electric Tester (07308-0020000) or Kowa Electric Tester (TH-5H).
  • In this table, "Needle swings then returns" indicates that there is a charging current applied to a condenser. The needle will then remain at "∞" unless the condenser is discharged.

Use the x KΩ range for the Sanwa Tester.
Use the x 100Ω range for the Kowa Tester.



Unit: KΩ

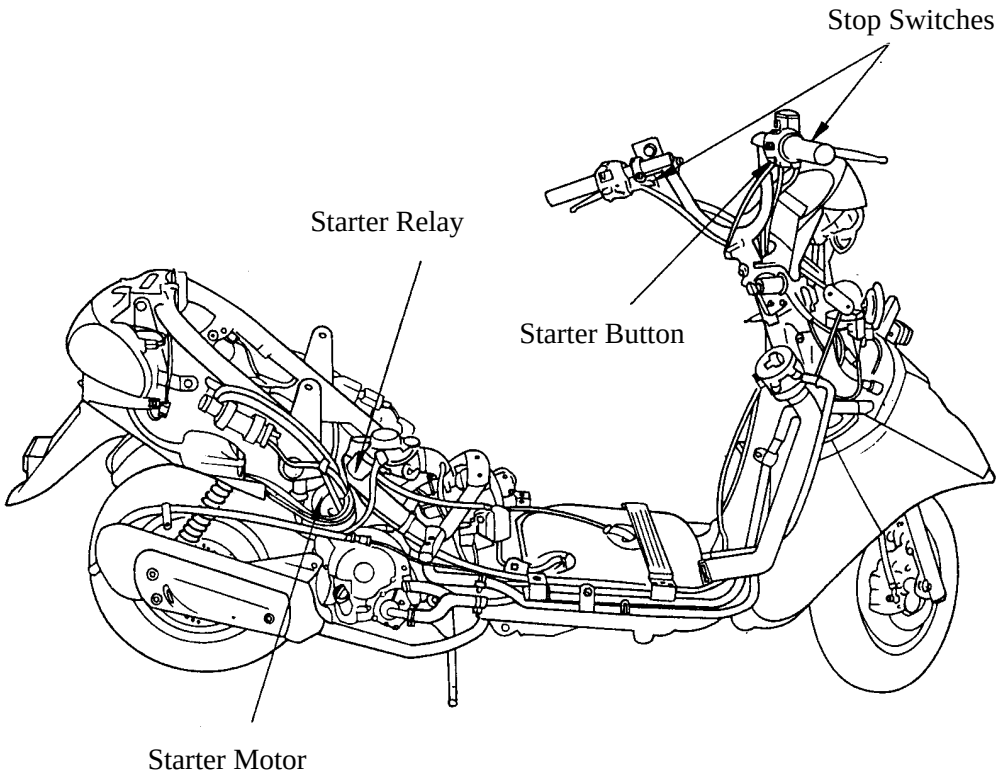
(+)Probe / (-)Probe	SW (Black/White)	EXT (Black/Red)	PC (Blue/Yellow)	E ① ② (Green • Green/White)	IGN (Black/Yellow)
SW (Black/White)		∞	∞	∞	∞
EXT (Black/Red)	0.1-20		Needle swings then returns	Needle swings then returns	∞
PC (Blue/Yellow)	30-300	10-200		1-100	∞
E ① ② (Green • Green/White)	1-15	0.1-20	1-100		∞
IGN (Black/Yellow)	∞	∞	∞	∞	

19

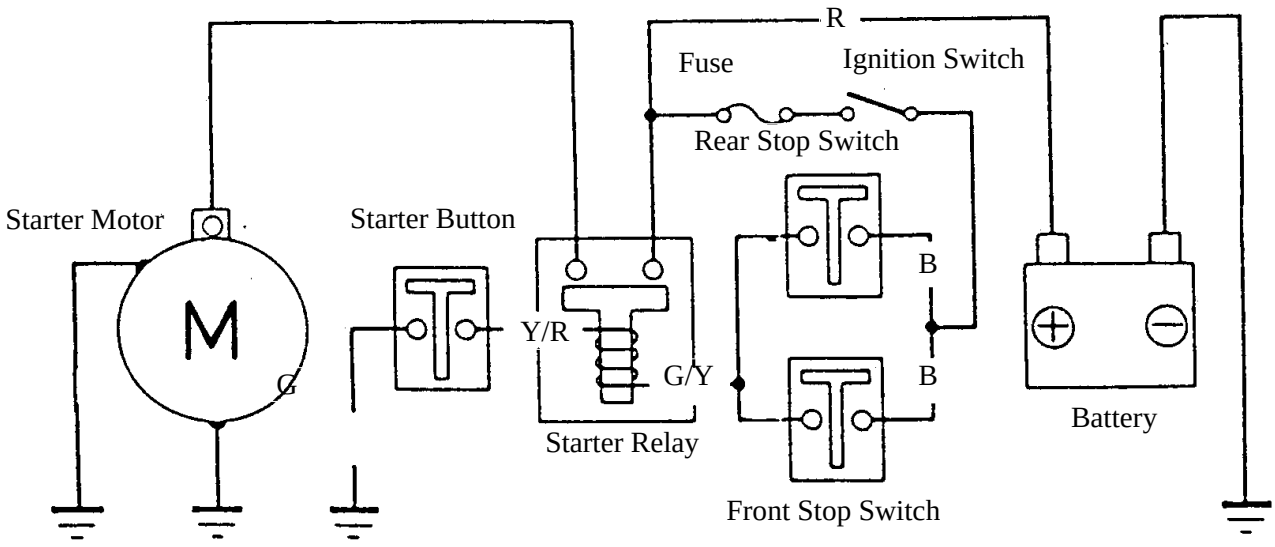
STARTING SYSTEM

19. STARTING SYSTEM

STARTING SYSTEM LAYOUT



STARTING CIRCUIT



19. STARTING SYSTEM

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- The removal of starter motor can be accomplished with the engine installed.
- For the starter clutch removal, refer to page 10-3.
- After the starter clutch is installed, be sure to add the engine oil and coolant and then bleed air from the cooling system.

SPECIFICATIONS

Item	Standard (mm)	Service Limit (mm)
Starter motor brush length	12.5mm	8.5mm

TORQUE VALUES

Starter motor mounting bolt	0.7～1.1kg-m
Starter motor case screw	0.3～0.5kg-m
Starter clutch bolt	1.0～1.4kg-m

SPECIAL TOOLS

Flywheel holder
Flywheel puller

TROUBLESHOOTING

Starter motor won‘t turn

- Fuse burned out
- Weak battery
- Faulty ignition switch
- Faulty starter clutch
- Faulty front or rear stop switch
- Faulty starter relay
- Poorly connected, broken or shorted wire
- Faulty starter motor

Lack of power

- Weak battery
- Loose wire or connection
- Foreign matter stuck in starter motor or gear

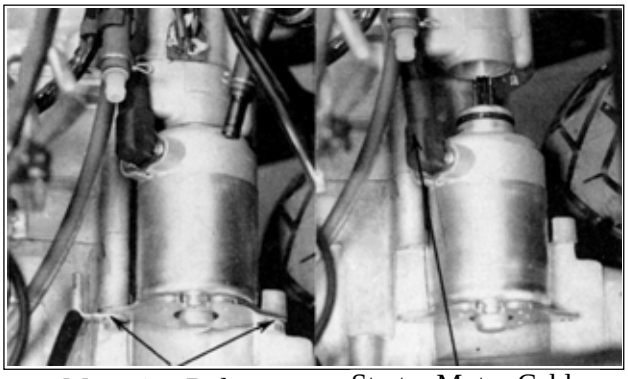
Starter motor rotates but engine does not start

- Faulty starter pinion
- Starter motor rotates reversely
- Weak battery

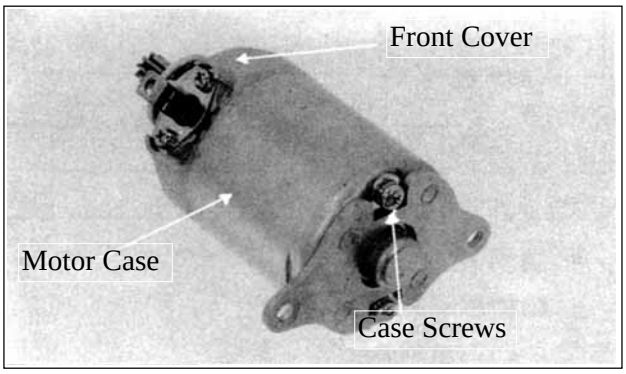
STARTER MOTOR

REMOVAL

* • Before removing the starter motor, turn the ignition switch OFF and remove the battery ground. Then, turn on the ignition switch and push the starter button to see if the starter motor operates properly.



Remove the seat, met-in box and frame center cover. (⇨2-3)
Remove the waterproof rubber jacket and disconnect the starter motor cable.
Remove the two starter motor mounting bolts and the motor.

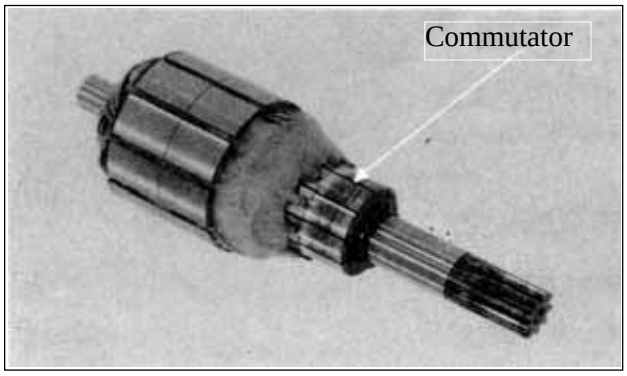


DISASSEMBLY

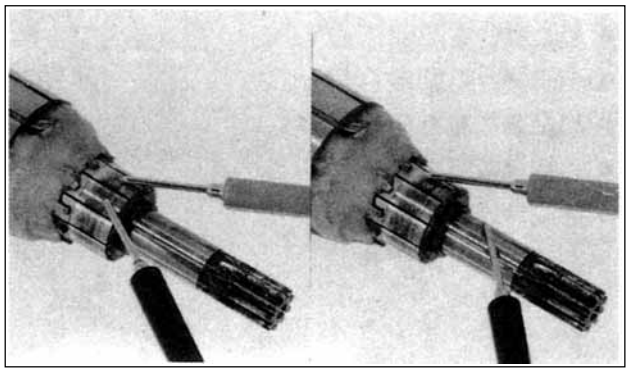
Remove the two starter motor case screws, front cover, rear cover, motor case and other parts.

INSPECTION

Inspect the removed parts for wear, damage or discoloration. Replace if necessary.
Clean the commutator if there is metal powder between the segments.

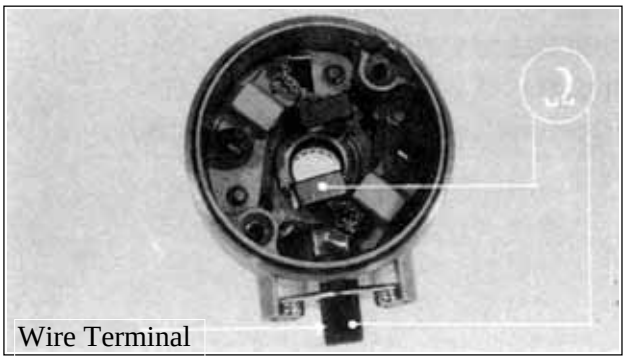


Check for continuity between pairs of the commutator segments and there should be continuity.
Also, make a continuity check between individual commutator segments and the armature shaft. There should be no continuity.

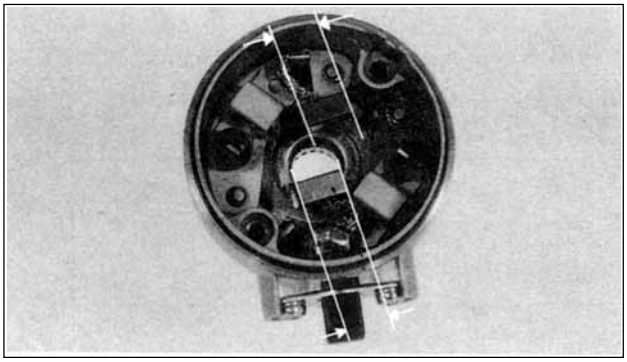


STARTER MOTOR CASE CONTINUITY CHECK

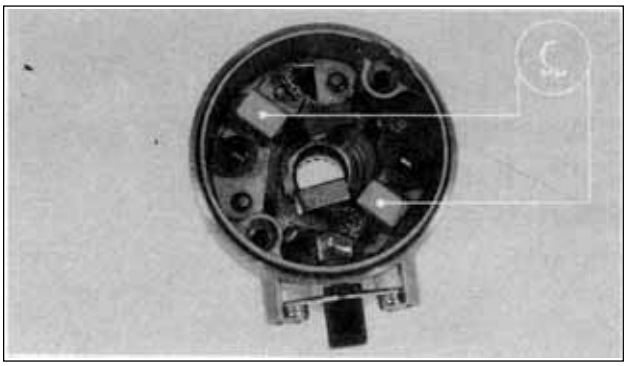
Check to confirm that there is no continuity between the starter motor wire terminal and the motor front cover.
Also check for the continuity between the wire terminal and each brush.
Replace if necessary.



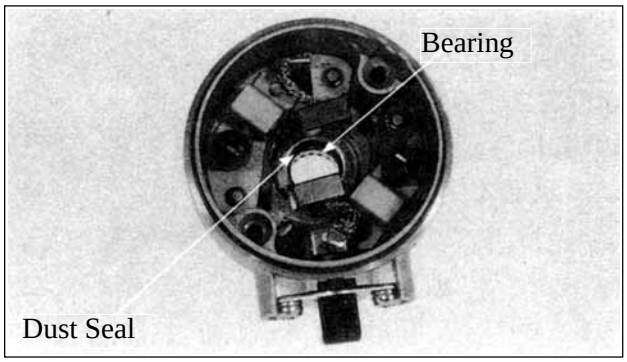
Measure the length of the brushes.
Service Limit: 8.5mm replace if below



Check for continuity between the brushes. If there is continuity, replace with new ones.

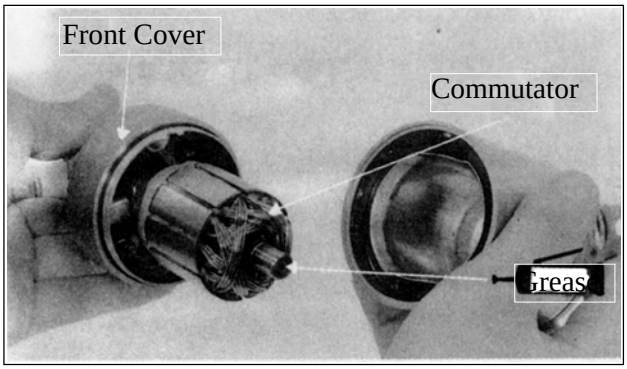


Check if the needle bearing in the front cover turns freely and has no excessive play.
Replace if necessary.
Check the dust seal for wear or damage.

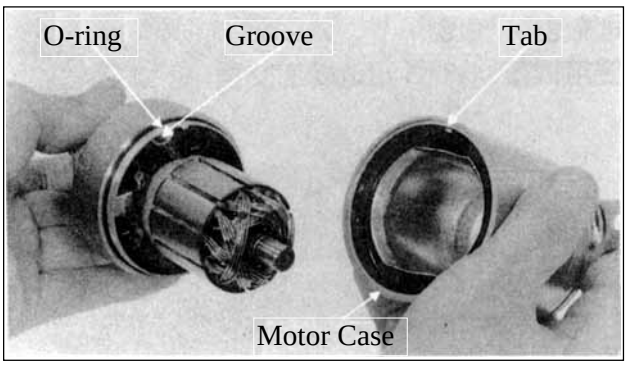


ASSEMBLY

Apply grease to the dust seal in the front cover.
Install the brushes onto the brush holders.
Apply a thin coat of grease to the two ends of the armature shaft.
Insert the commutator into the front cover.

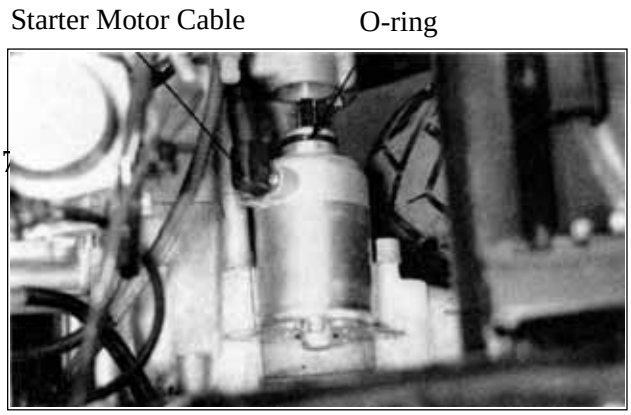


Install a new O-ring to the front cover.
Install the starter motor case, aligning the tab on the motor case with the groove on the front cover.
Tighten the starter motor case screws.



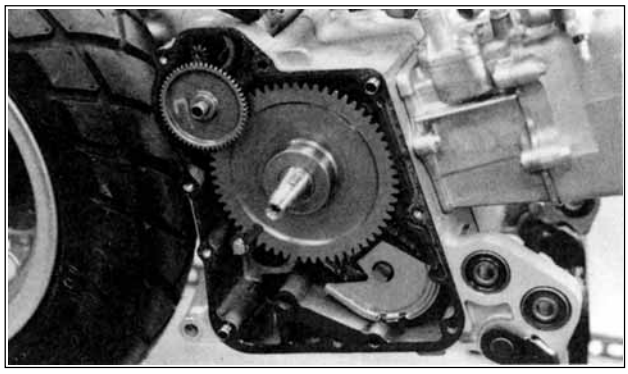
INSTALLATION

Connect the starter motor cable.
Check the O-ring for wear or damage and replace if necessary.
Apply grease to the O-ring and install it to the starter motor.
Tighten the two mounting bolts.



STARTER CLUTCH INSPECTION

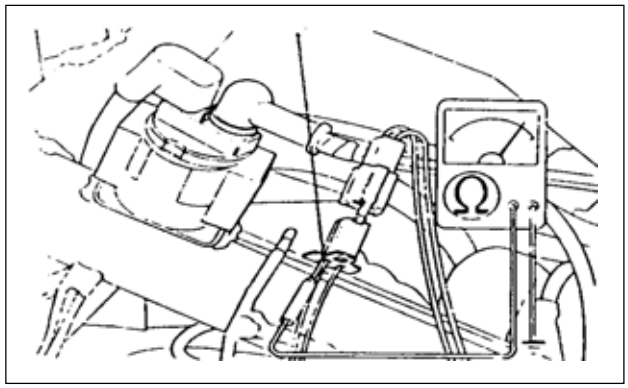
Refer to pages 10-4 and 10-5 for the starter clutch removal, inspection and installation.



STARTER RELAY INSPECTION

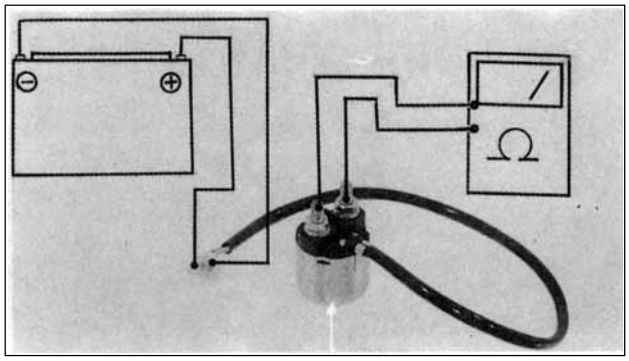
Disconnect the starter relay wire connector.
Check for continuity between the yellow/red wire terminal and ground.
There should be continuity when the starter button is depressed.
If there is no continuity, check the starter button for continuity and inspect the wire.

Yellow/Red Wire



OPERATION TEST

Connect the electric tester to the starter relay larger terminals that connect to the battery positive cable and the starter motor cable.
Connect a fully charged battery across the starter relay yellow/red and green/yellow wire terminals.
Check for continuity between the starter relay large terminals. The relay is normal if there is continuity.

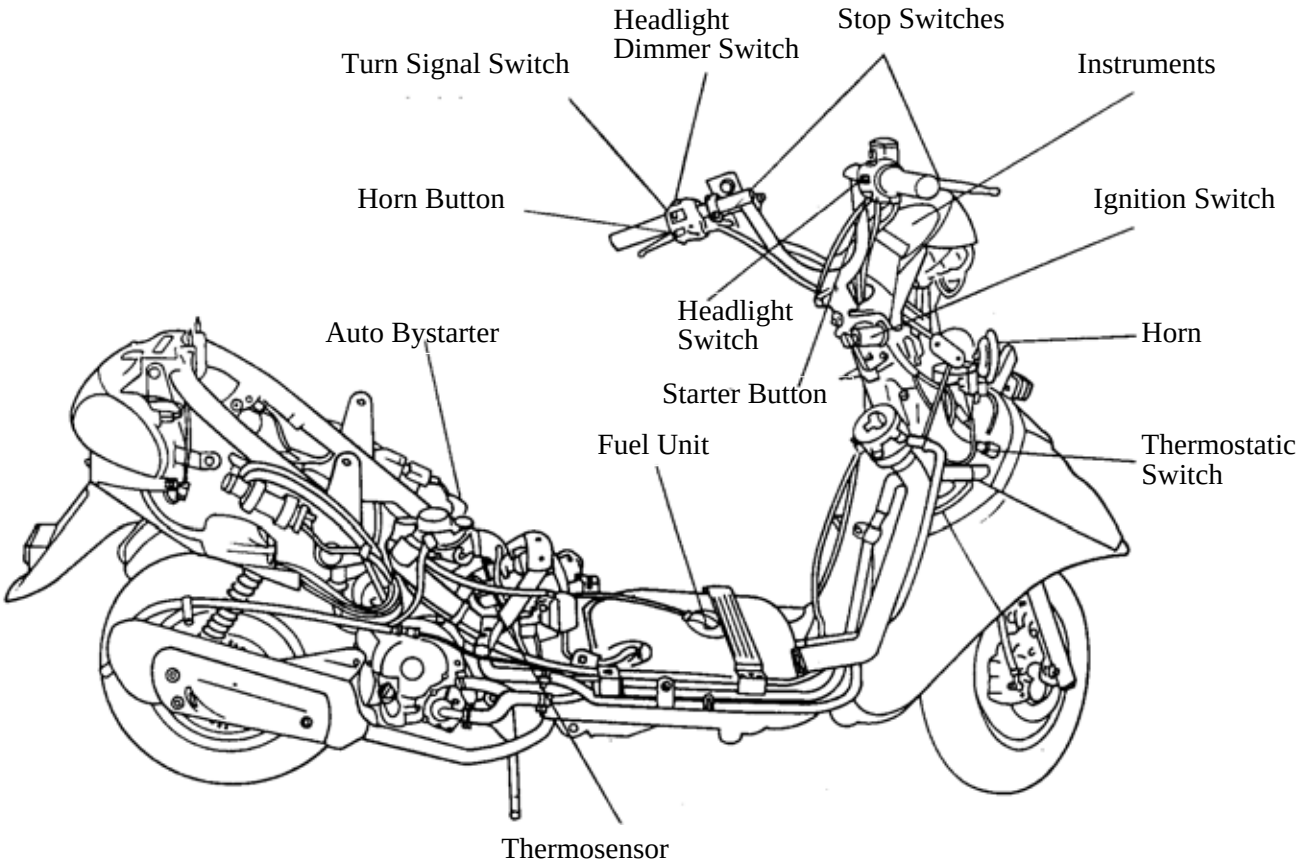


Starter Relay

20

SWITCHES/HORN/FUEL UNIT/THERMOSTATIC SWITCH/TEMPERATURE GAUGE/ INSTRUMENTS/LIGHTS

ELECTRICAL EQUIPMENT LAYOUT



SERVICE INFORMATION

GENERAL INSTRUCTIONS

- After installation of each switch, a continuity check must be performed. A continuity check can usually be made without removing the part from the motorcycle.

TESTING INSTRUMENT

Electric tester

SPECIAL TOOL

Fuel unit wrench

TROUBLESHOOTING

Lights do not come on when ignition switch is "ON"

- Burned bulb
- Faulty switch
- Poorly connected, broken or shorted wire

Fuel gauge pointer does not move or register correctly

- Faulty fuel gauge
- Faulty fuel unit
- Poorly connected wire between fuel gauge and fuel unit
- Fuse burned out

Temperature gauge does not register correctly

- Faulty temperature gauge
- Faulty thermosensor
- Broken or shorted wire between temperature gauge and thermosensor

SPECIFICATIONS

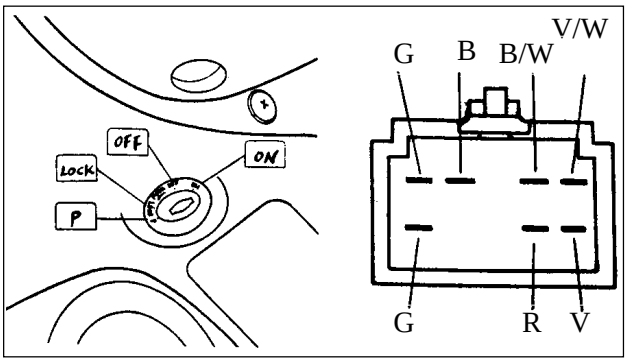
Fuse	20A
Headlight bulb	12V 35W/30W
Turn signal light bulb	12V 10W
Stoplight/taillight	12V18/5W
License plate light	12V 3.4W
Instrument light	12V 1.7W
Position light	12V 3.4W
Turn signal indicator light	12V 3.4W

SWITCHES

IGNITION SWITCH INSPECTION

Remove the frame front covers. (⇨2-5)
Disconnect the ignition switch wire couplers. Check for continuity between the wire terminals.

Color / Position	Red2	Black/ White	Green	Black	Violet	Violet/ White
PARK					○—○	
LOCK		○—○				
ON		○—○				
OFF	○—	——	——	—○		

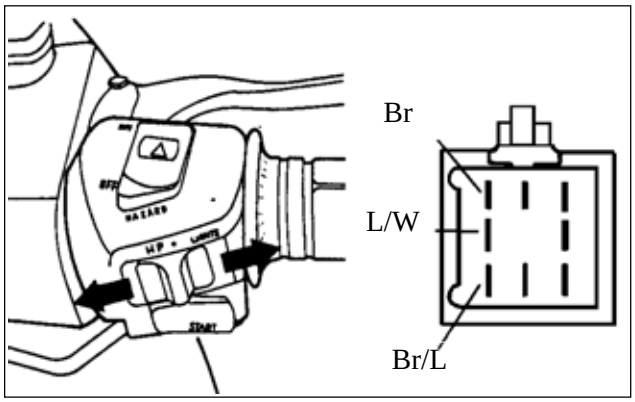


Ignition Switch

HEADLIGHT SWITCH INSPECTION

Remove the frame front covers. (⇨2-5)
Disconnect the headlight switch wire couplers. Check for continuity between the wire terminals.

Color / Position	Blue/ White	Brown/ Blue	Brown
■			
P		○——	—○
H	○—	—○—	—○

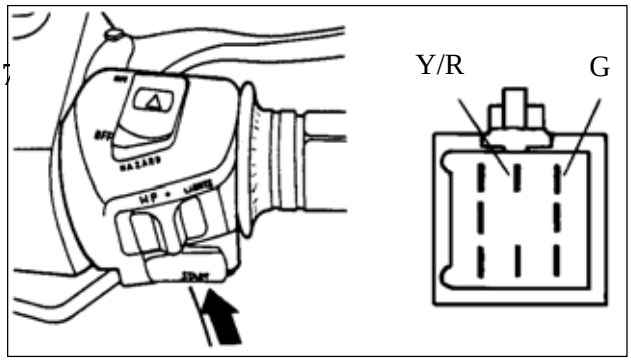


Headlight Switch

STARTER SWITCH INSPECTION

Remove the frame front covers. (⇨2-5)
Disconnect the starter switch wire couplers. Depress the starter button and check for continuity between the wire terminals.

Color / Position	Yellow/Red	Green
FREE		
PUSH	○——	—○

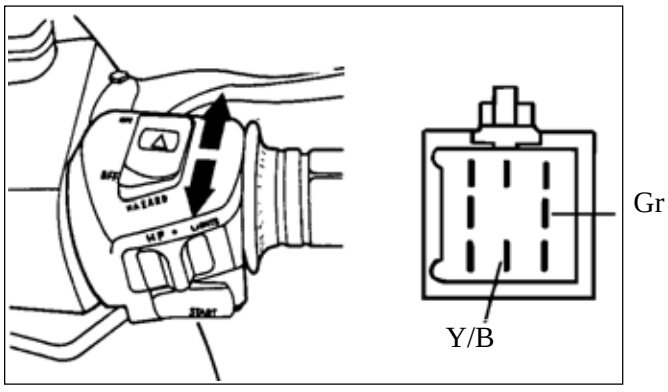


Starter Switch

HAZARD SWITCH

Remove the front upper cover. (⇨2-5)
Disconnect the headlight switch wire couplers. Check for continuity between the hazard switch wire terminals.

Color / Position	Yellow/Black	Gray
OFF		
ON	○——	—○

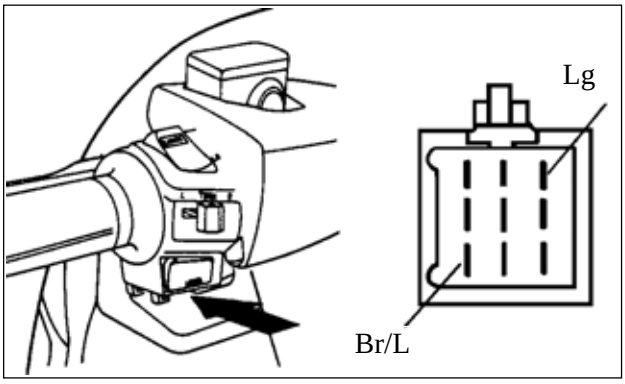


Hazard Switch

HORN BUTTON INSPECTION

Remove the frame front covers. (⇨2-5)
Disconnect the horn wire couplers.
Depress the horn button and check for continuity between the wire terminals.

Color / Position	Light Green	Brown/Blue
FREE		
PUSH	○———	———○

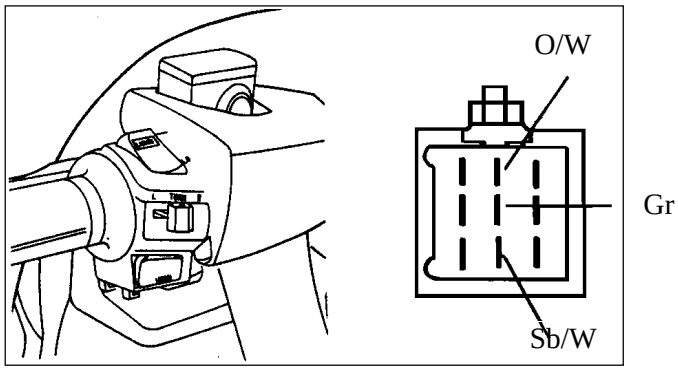


Horn Button

TURN SIGNAL SWITCH INSPECTION

Remove the frame front covers. (⇨2-5)
Disconnect the turn signal switch wire couplers and turn on the turn signal switch.
Check for continuity between the wire terminals.

Color / Position	Light Blue/ White	Gray	Orange/ White
L		○———	———○
N			
R	○———	———○	



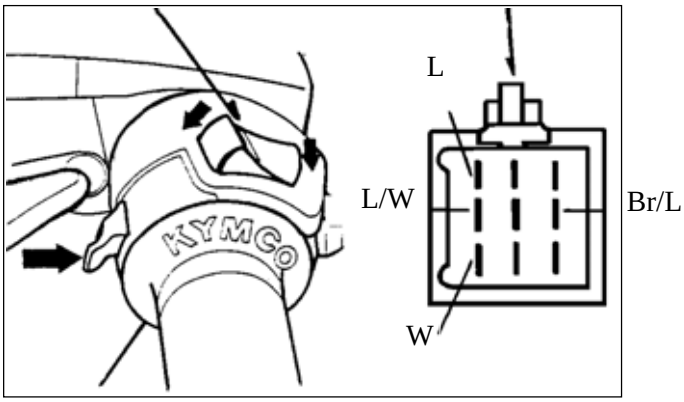
Turn Signal Switch

DIMMER SWITCH INSPECTION

Remove the frame front covers. (⇨2-5)
Disconnect the headlight dimmer switch wire couplers.
Turn on the dimmer switch and check for continuity between the wire terminals.

Color / Position	Blue/ White	Blue	White	Brown/ Blue
LO	○———	———	———○	
HI	○———	———○		
PASSING		○———	————	———○

Dimmer Switch Dimmer Switch Coupler

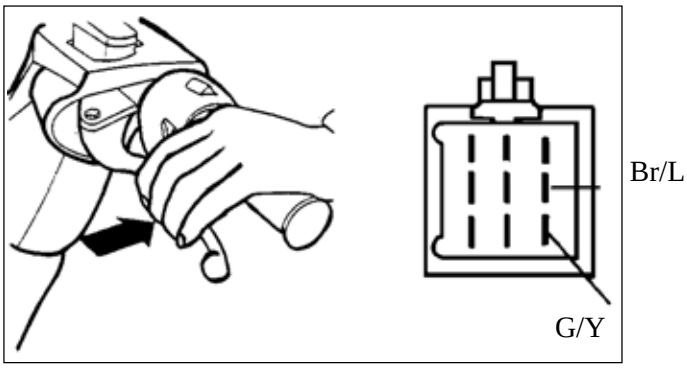


PASSING

STOP SWITCH INSPECTION

Remove the frame front covers. (⇨2-5)
Disconnect the front/rear stop switch wire couplers.
Check for continuity between the wire terminals when the front brake lever is applied.

Color / Position	Brown/Blue	Green/Yellow
FREE		
APPLY	○———	———○



Stop Switch

HORN INSPECTION

Remove the front upper cover. (⇨2-5)
Disconnect the horn wire couplers.
The horn is normal if it sounds when a 12V battery is connected across the horn wire terminals.

12V Battery

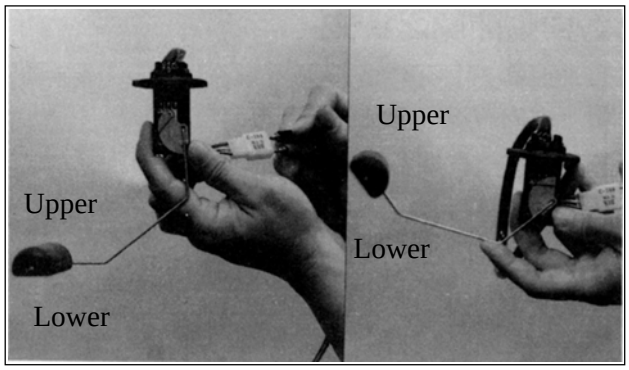
Horn

FUEL UNIT

FUEL UNIT INSPECTION

Remove the fuel unit.
Disconnect the fuel unit wire connectors.
Measure the resistance between the fuel unit wire terminals with the float at upper and lower positions.

Wire Terminals	Upper	Lower
Y/W～G	33～45Ω	500～850Ω
L/W～G	400～700Ω	100～200Ω
Y/W～L/W	450～750Ω	450～750Ω



Fuel Unit

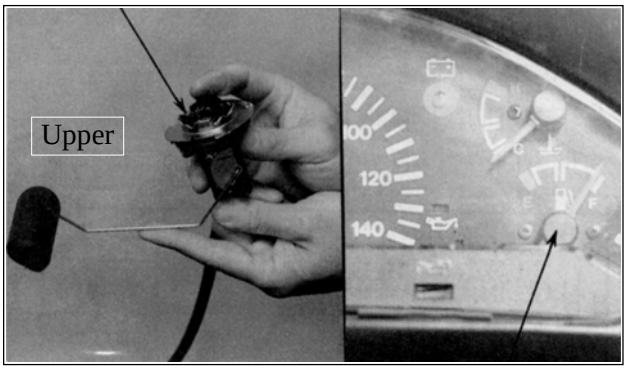
FUEL GAUGE INSPECTION

Connect the fuel unit wire connectors and turn the ignition switch “ON”.

* Before performing the following test, operate the turn signals to determine that the battery circuit is normal.

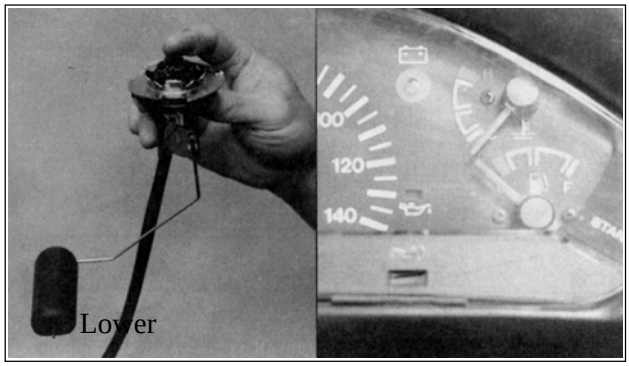
Check the fuel gauge needle for correct indication by moving the fuel unit float up and down.

Float Position	Needle Position
Upper	“F” (Full)
Lower	“E” (Empty)



Fuel Gauge

Wire Terminals	Needle Position
Y/W～G	From E to F
L/W～G	From F to E



Needle moves from F to E.

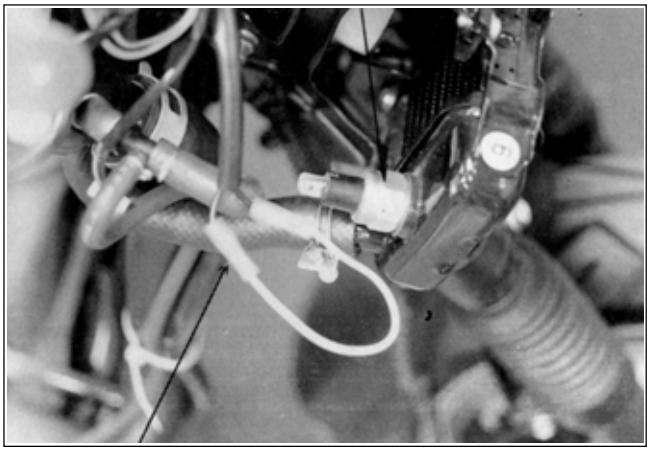
The fuel gauge is normal if it operates as above indicated. If not, check for loosely tightened nuts, poorly connected terminals or shorted wires.

THERMOSTATIC SWITCH

INSPECTION

Remove the front covers. (⇨2-5)
Start and run the engine to make the water temperature reaches 100℃±2℃ and check if the cooling fan motor operates.
Lower the water temperature to 95～97℃ and check if the fan motor stops.
If the fan motor does not start, disconnect the wires from the thermostatic switch and then connect a jumper wire between the wire harness and thermosensor wires (black and green wires).

Thermostatic Switch

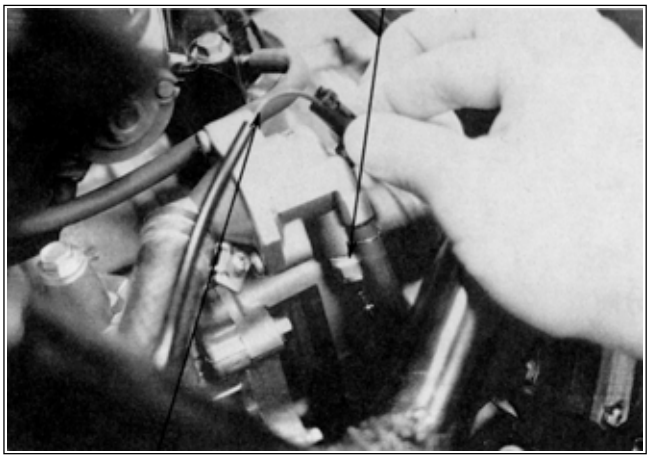


Wire

Turn the ignition switch ON. The thermostatic switch is faulty if the cooling fan motor runs properly.
If it does not start, check for voltage between the fan motor coupler wire terminals (black～green).
If there is no voltage, check for the following:

- Blown or faulty fuse
- Loose terminals or connectors
- Shorted wire in the wire harness

Thermosensor

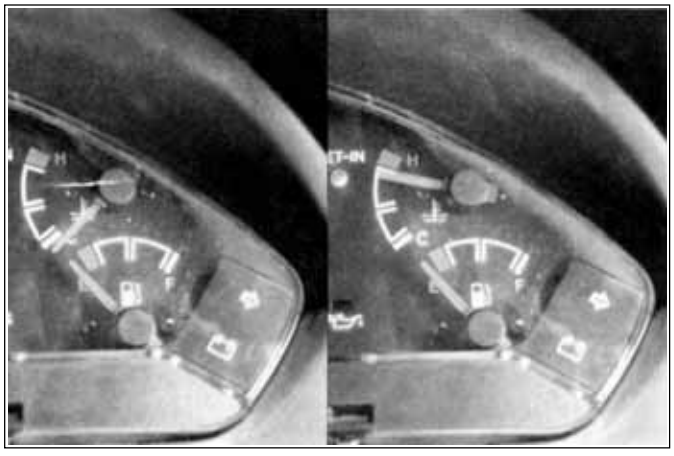


Thermosensor Wire

TEMPERATURE GAUGE

Disconnect the wire from the thermosensor and ground it to the engine.
Turn the ignition switch ON.
The temperature gauge needle should move all the way to “H”.

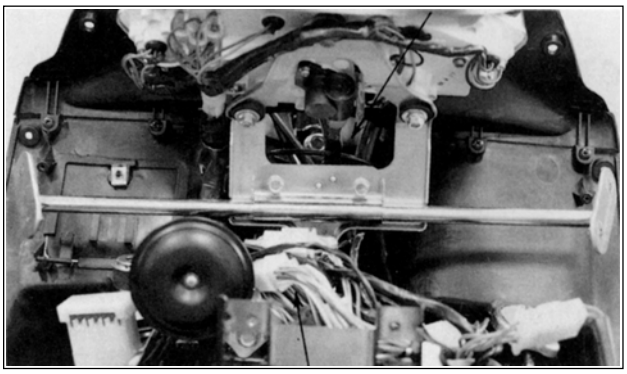
* Do not leave the thermosensor wire grounded for longer than 5 seconds or the temperature gauge will be damaged.



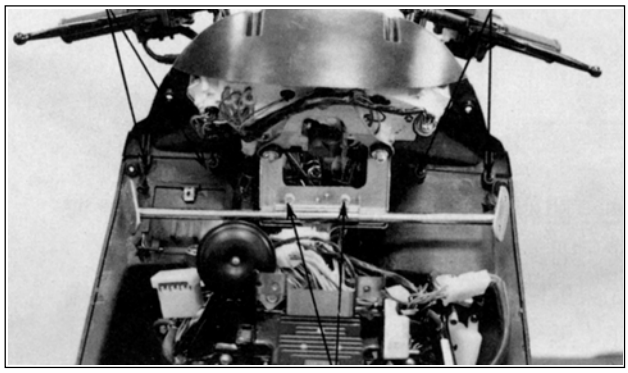
INSTRUMENTS

REMOVAL

Remove the front upper cover. (⇨2-5)
Disconnect the instrument wire couplers and connectors.
Disconnect the speedometer cable.

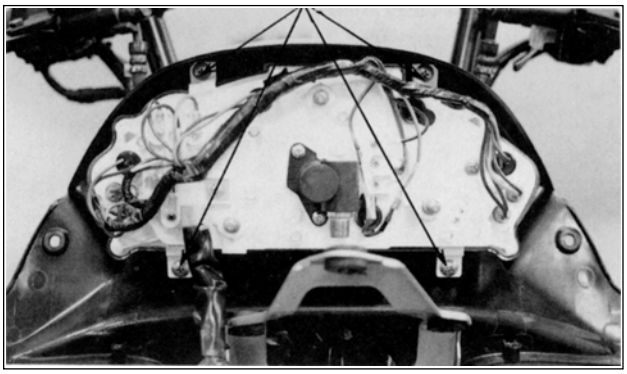


Remove the four instrument cover and leg shield screws.
Remove the two instrument holder bolts.
Remove the instruments.



DISASSEMBLY/ASSEMBLY

Remove the three instrument holder nuts.
Remove the holder.
Remove the four screws to disassemble the instruments and instrument cover .
Assemble the instruments in the reverse order of disassembly.



INSTALLATION

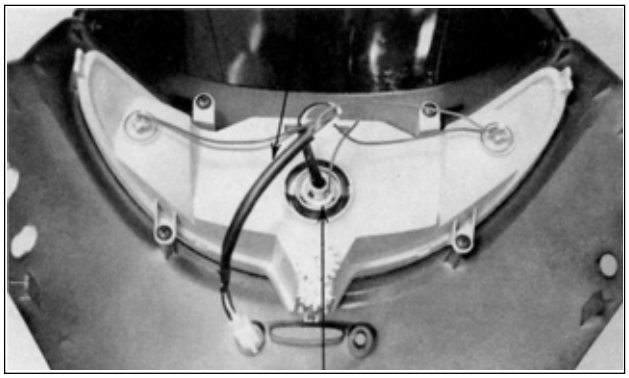
The installation sequence is the reverse of removal.

LIGHTS

HEADLIGHT BULB REPLACEMENT

Remove the front upper cover. (⇨2-5)
Disconnect the headlight and turn signal light wire couplers.
Remove the rubber boot from the bulb socket.
Remove the bulb socket and replace the bulb.
Install the bulb socket, aligning the bulb socket tab with the groove.
Install the rubber boot.
Install the front cover in the reverse order of removal.

Wire

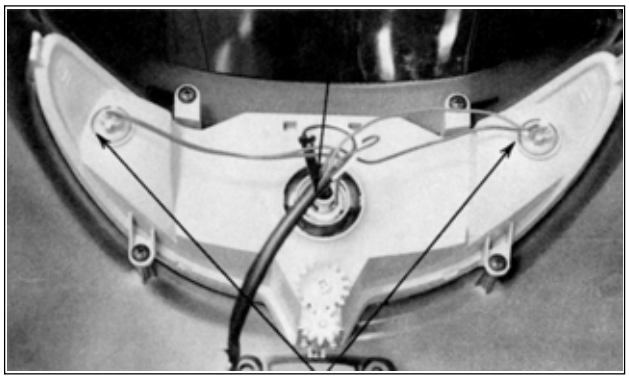


Bulb Socket

FRONT POSITION LIGHT BULB REPLACEMENT

Remove the front upper cover. (⇨2-5)
Disconnect the headlight and turn signal light wire couplers.
Remove the bulb sockets by turning them counterclockwise.
Remove the bulbs and replace them with new ones.

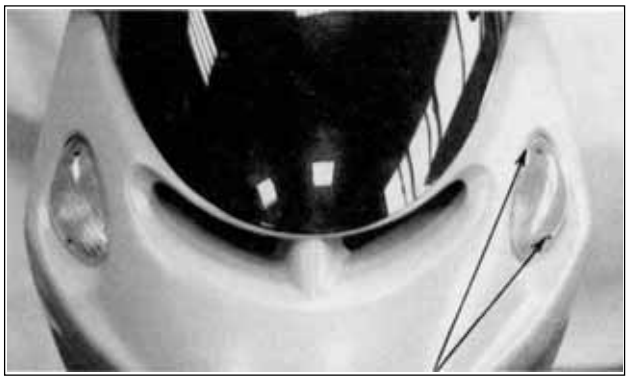
Wire



Front Position Light Bulb Sockets

FRONT TURN SIGNAL LIGHT BULB REPLACEMENT

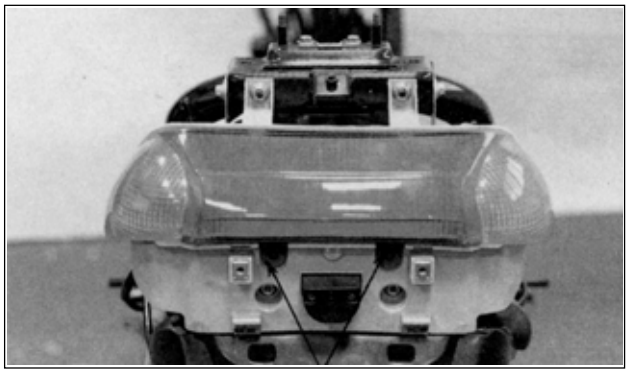
Remove the two screws attaching the turn signal light shell and remove the light shell.
Remove the bulb and replace with a new one.



Screws

TAILLIGHT/REAR TURN SIGNAL LIGHT BULB REPLACEMENT

Remove the rear protective cover. (⇨2-3)
Remove the two screws attaching the rear light shell and remove the light shell.
Remove the bulbs and replace with new ones.
The installation sequence is the reverse of removal.



Screws

21

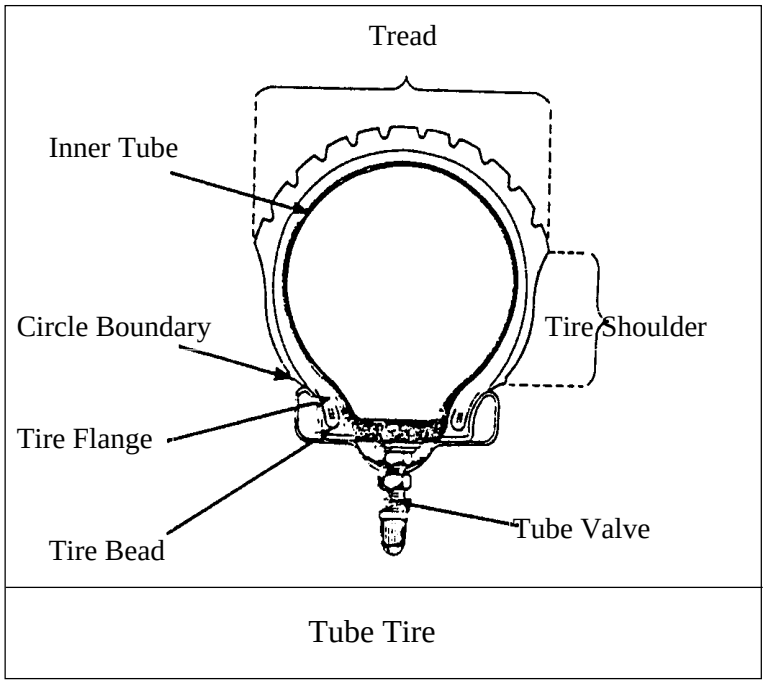
HIGH-SPEED TIRE (TUBELESS TIRE)

HIGH-SPEED TIRE CONSTRUCTION & FEATURES

CONSTRUCTION

INNER LINER

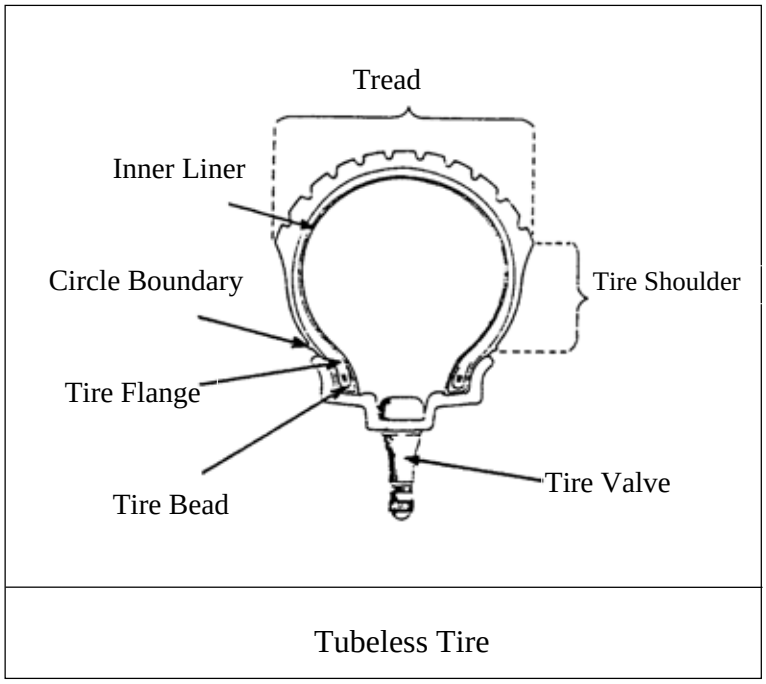
A layer of rubber (inner liner) which replaces the inner tube is stuck to the inside wall of the high-speed tire. The inner liner is made of thick rubber, a material that high-pressure air can not pass through. The liner can not be lengthened like other inner tubes, so when nails are inserted into the tire, breaks will not be enlarged because the nails are suppressed to avoid air leaks. When tire break occurs, the inserted nails will spring out to make the tire run under low pressure. It is very dangerous because the tire temperature will raise highly to make tire wobble during riding. Therefore, riders must be very careful to check tire pressure and inserted nails before riding at high-speed.



Tube Tire

- Tire pressure
- Tire deformation and damage
- Tire groove depth and abnormal wear

  Tire Depth: Front : 0.8mm
  Rear : 0.8mm
- Imbedded metals, stones, or other foreign matters



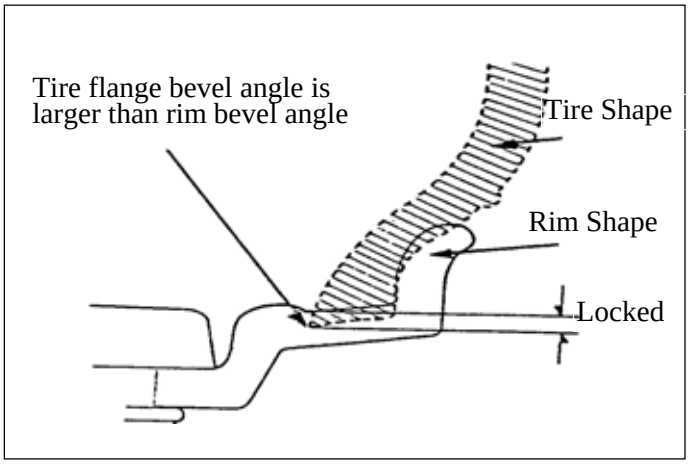
Tubeless Tire

The bead base where tire and rim contact is wrapped by rubber fabrics called tire bead in order to reinforce its function. The fabrics is specially adopted for the high-speed tire to keep its air density because air can not pass through this material. Also, the fabrics can keep the tire from damage when the tire falls off, and protect tire from damage due to friction of wheel rim while riding.

21. HIGH-SPEED TIRE

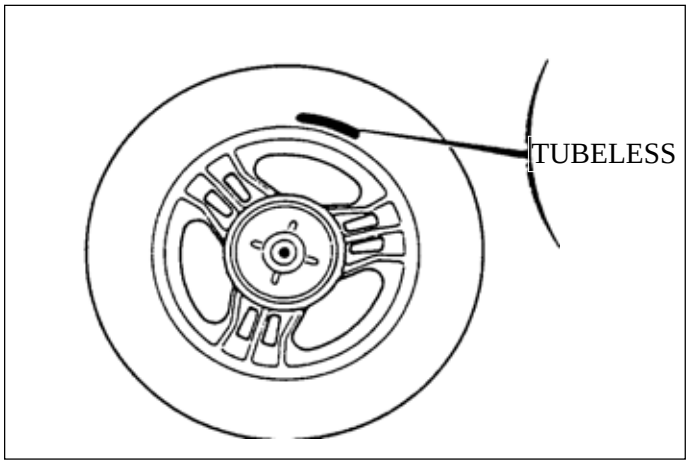
TIRE FLANGE BEVEL ANGEL

If the tire flange radius is smaller than the wheel rim radius, the tire and wheel can be locked tightly. Take the advantage of tire bead bevel angle to enlarge tire bead so that the tire and rim can combine with each other precisely. Consequently, it can prevent air leaks and tire will not fall off the rim when tire break or low pressure occurs.



METHOD TO IDENTIFY A HIGH-SPEED TIRE

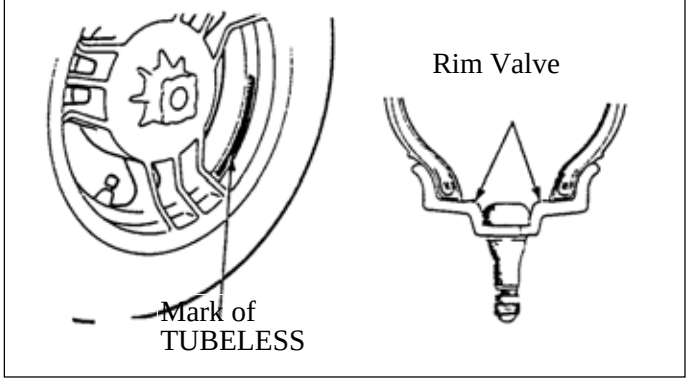
For distinguishing a high-speed tire from a tube-tire, the word "TUBELESS" is stamped on the side wall of the high-speed tire. A tire without this word cannot be used as a high-speed tire.



RIM USED FOR HIGH-SPEED TIRE

For the purpose of preventing tire from falling off the wheel rim while driving, there are special requirements on the size, shape and pressure density of rim used for high-speed tire. It is necessary to use special rims.
Refer to the Figure shown for distinction.
Air leaks occur easily when the wheel rim is deformed. Avoid driving on rugged road and crashing against stones.
When replacing the high-speed tire, also replace the valve as a set.

Rim Used for High-speed Tire



* • When replacing the high-speed tire, use a tire of the same specification.

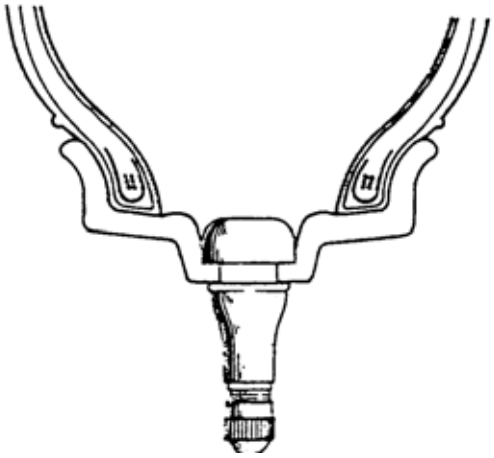
RIM VALVE USED FOR HIGH-SPEED TIRE

Air-tight valve is specially designed for rim valve of a high-speed tire.

AIR-TIGHT VALVE

A rubber of special shape is used to cover around the valve hole. The spring of rubber can prevent air leaks. Install the valve from the inner side of the rim and then pull it out through the rim valve hole with a special tool.

* • Use only the KYMCO recommended air-tight valve.

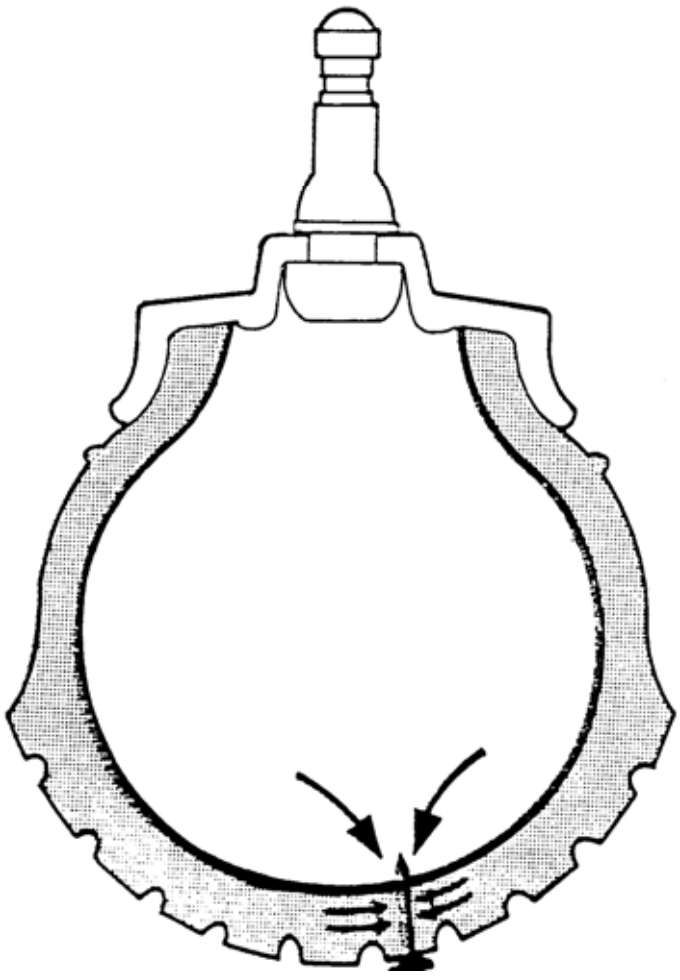


HIGH-SPEED TIRE FEATURES

- Air will not release quickly when a nail is inserted into the tire. It is the same as the tube-tire that tire break may occur to a high-speed tire when nails or other objects are inserted into it. However, when a nail is inserted into a high-speed tire, external rubber and internal anti-leak rubber will grip the nail tightly to prevent air leaks. If the nail is deeply inserted, air will not release quickly to avoid sudden slipping of steering handlebar.

- EXCELLENT COOLING PERFORMANCE

  Because the high-speed tire is tubeless, the air within the tire will contact the rim directly. Heat produced during driving can be dissipated through the rim. Heat affects the rubber greatly and if the tire temperature is not high, the tire service life can be prolonged .

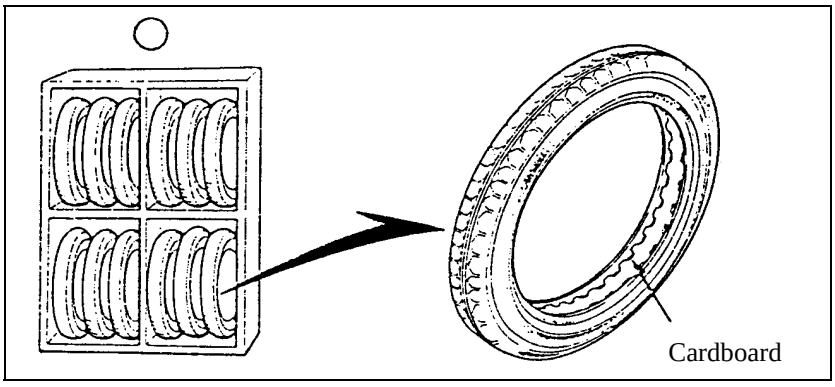


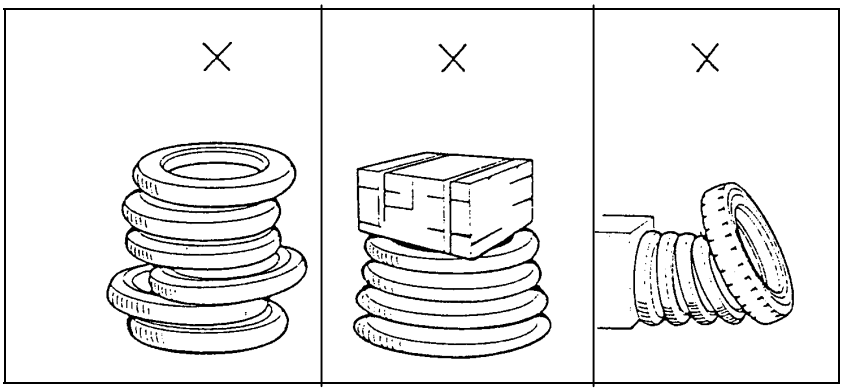
There is no air leak when a nail is inserted into the tire.

PRECAUTIONS FOR HIGH SPEED TIRE STORAGE

•STORAGE METHODS

If the space within the tire bead of a high-speed tire is narrower than the width of its rim, it is hard to install the tire to the rim and pump air into the tire. Therefore, it is better to put cardboard within the tire bead and put tires in order.
Tires deform easily if they are piled horizontally. Avoid doing so.
As to the reused tires, the structure of the rim remains the same. Install the valve cap when the tire pressure is lowered to 1/2 of the specified pressure.

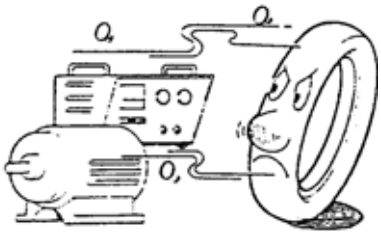




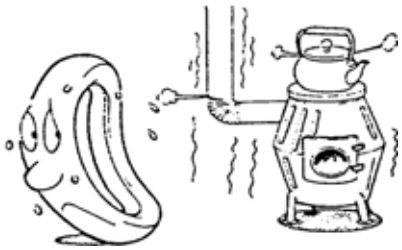
•PLACE FOR STORAGE

The place used for storage should avoid the following conditions:

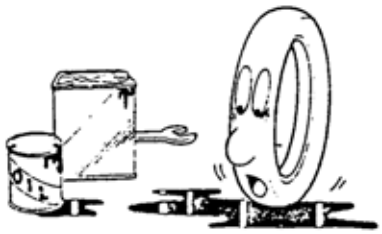
①A place where produces ozone (a place near motors or chargers)



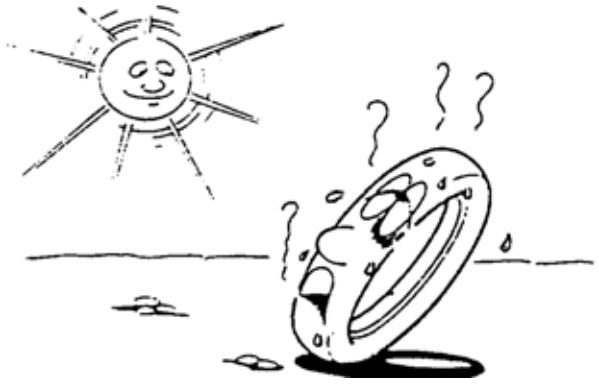
②A place where produces heat (a place near stoves or steam pipes)



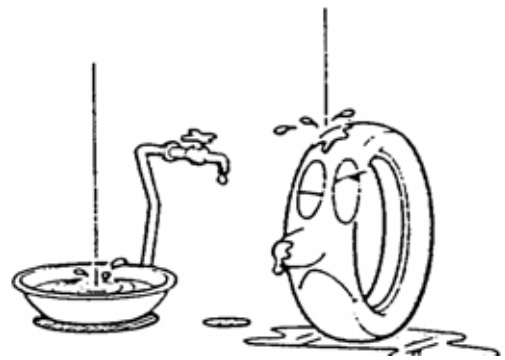
③A place with oils or lubricants (especially in service working area)



④A place with direct sunshine



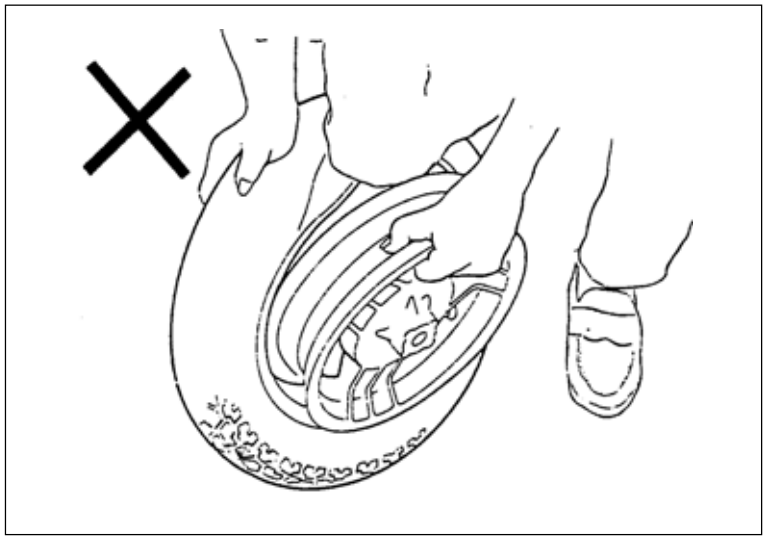
⑤A place with high moisture

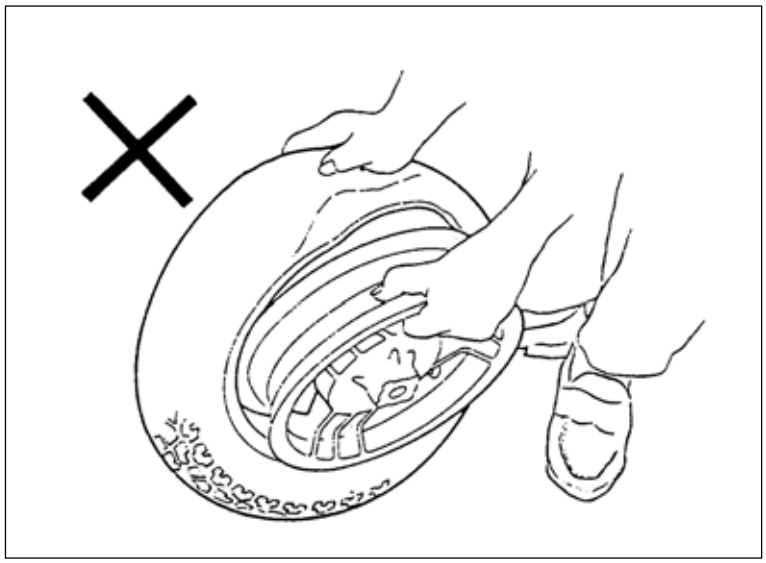


HIGH-SPEED TIRE REMOVAL/INSTALLATION

In comparison with the tube-tire, the following points must be noticed when removing and installing a high-speed tire.

- When removing the high-speed tire, avoid damaging the tire bead (special plastic seat), tire liner (internal anti-leak material) and rim flange (bead base).
- Apply vegetable soapy water to the contact area between the tire bead and rim, and use a tire iron for installation.
- It will cause tire deformation when removing the tire forcedly as the figure shown. Be sure to remove the tire following the instructions given in the manual.
- The tight joint of tire and rim can prevent air leaks. As long as the rim is deformed, air leaks will occur easily. Therefore, do not remove or install the tire forcedly. Use special tools and rim protector for servicing. Frequently check if there is any deformed part and do not use tools of poor quality.
- Rust and rubber materials on bead base are the main cause of air leaks. Remove them thoroughly.
- Be sure to remove and install the tire following the procedures provided in the manual.





*
- When removing or installing a high-speed tire, do not damage the axle bearing. Draw or pull the rubber on the rim lower part.
- It is difficult to remove a tire when the rim valve is pressed by tire flange. In this situation, do not remove it forcedly because the rim valve hole will be damaged.

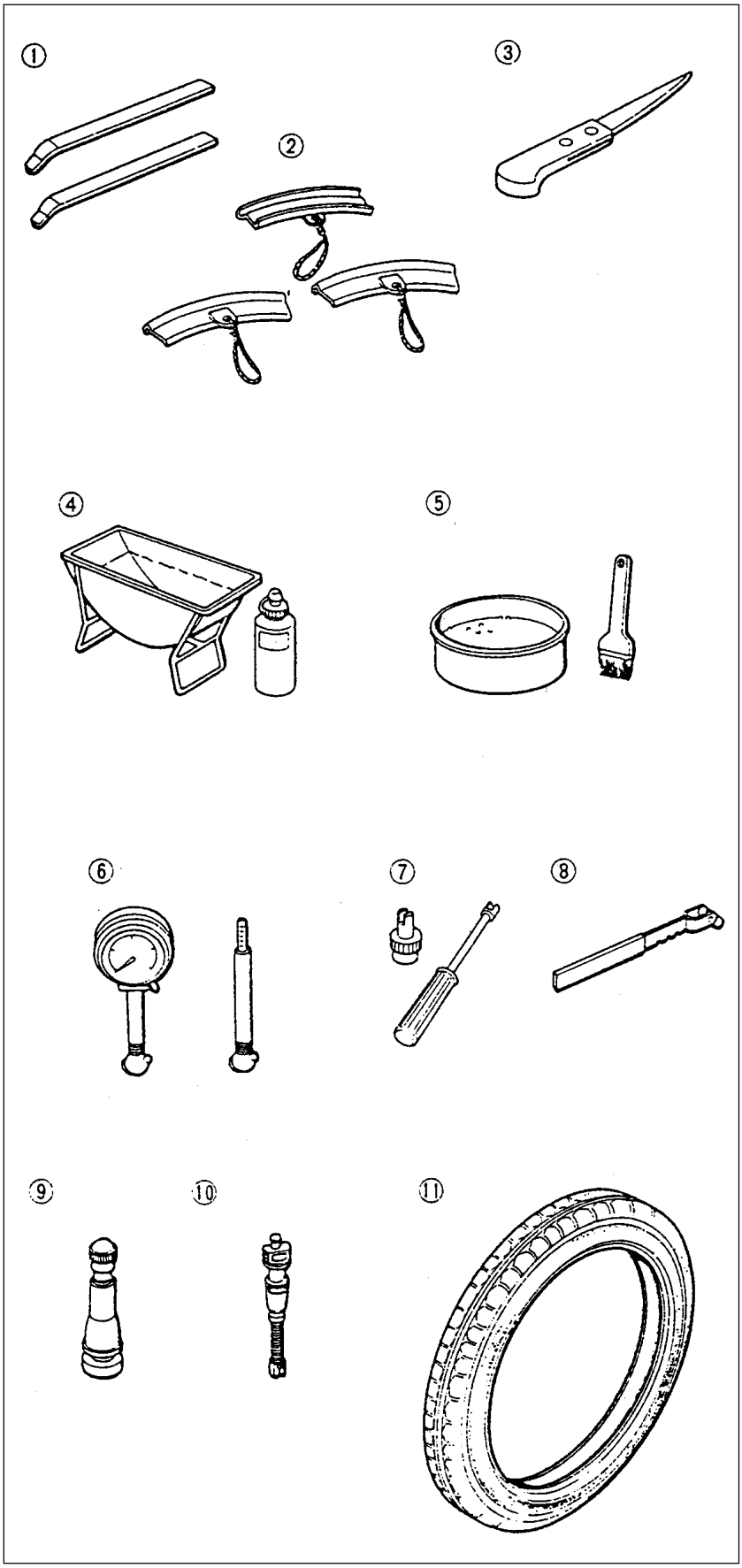
21. HIGH-SPEED TIRE

TOOLS & PARTS REQUIRED FOR SERVICING

①Tire iron
Tool No.
②Wheel rim protector
Tool No.
③Knife
④Water pan and probe
⑤Vegetable soapy water
⑥Pressure gauge
⑦Valve core assembly tool
⑧Valve assembly tool
⑨Rim valve used for high-speed tire
⑩Valve core
⑪ High-speed tire

High-speed tire Model: KYMCO KBE150 Tire size: 100/90-10 (Front) 120/70-10 (Rear)

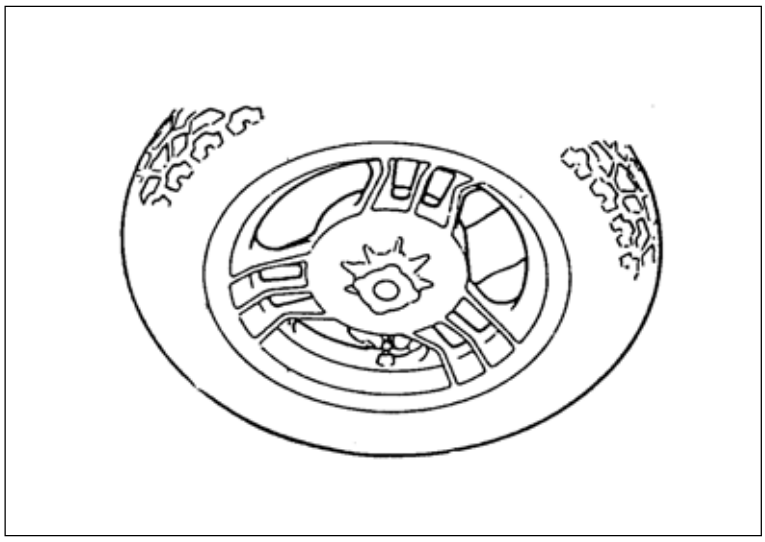
Make sure to use KYMCO-recommend high-speed tire and rim valve.



REMOVAL METHODS

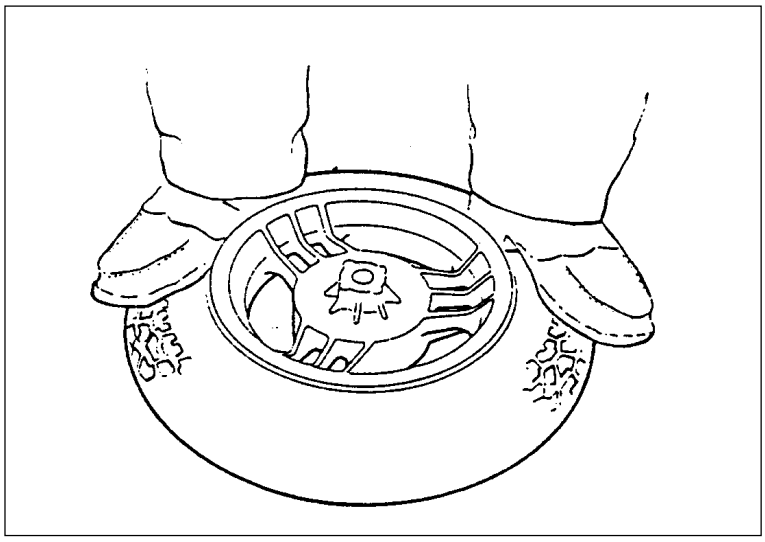
①Use the valve core assembly tool to take the valve core out and bleed air from the tire.

* When removing the valve core, be careful that the high tire pressure may force out the valve



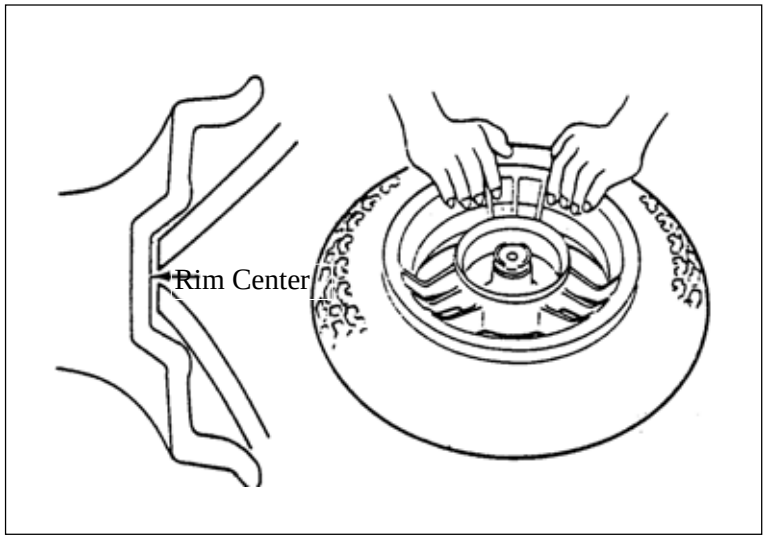
②If there is no special tool to pry off the tire bead, use your feet to do this as the figure shown.

* •Don‘t step on the wheel rim and spoke wire.
  •Before installing the tire, make sure that the rim and axle bearing are not damaged. Be careful during installation.

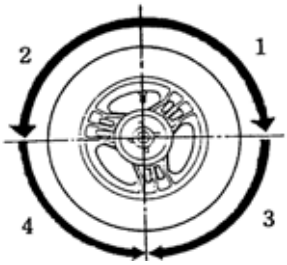


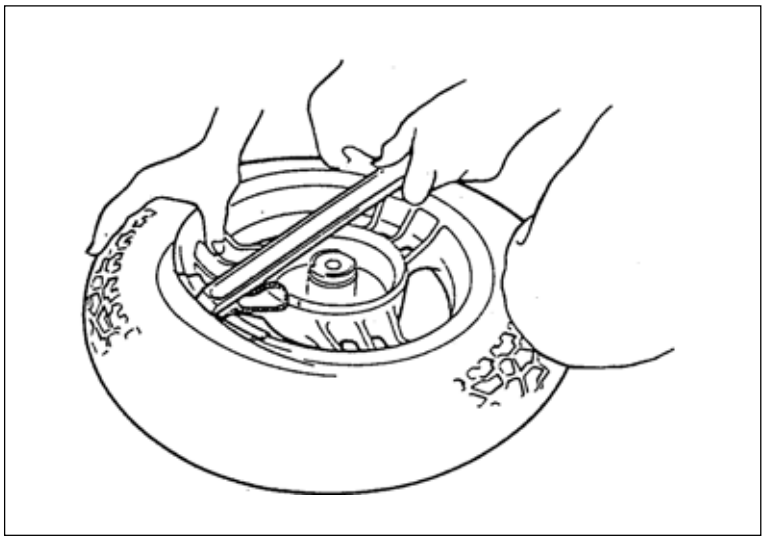
③After the tire bead is separated from the rim and before removing the tire, press the tire bead at the back of the valve into the rim groove completely, Then push the tire to the same side.

* It is easier to remove the tire when it is pushed to the same side of rim.



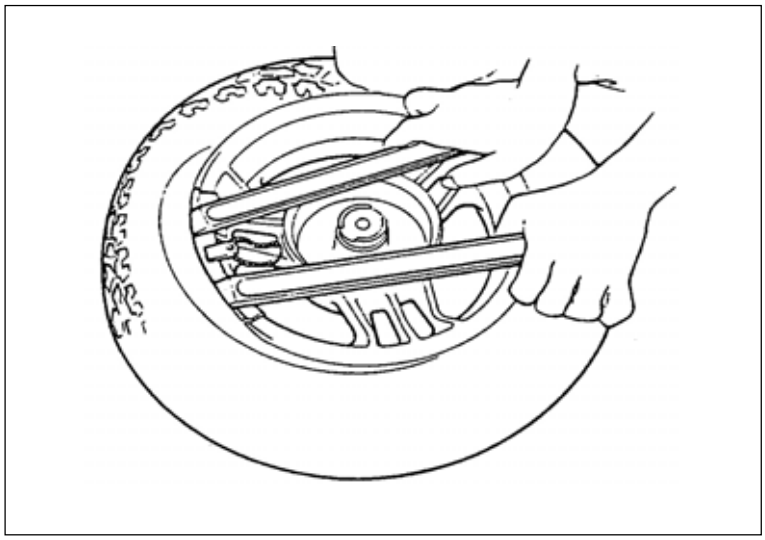
④Apply vegetable soapy water to the area between the rim and tire and install the rim protector at the rim side. Then insert the tire iron to pry off the tire bead from the rim. At this time, the tire bead at the back side of the valve is in the rim groove completely. After making sure the above mentioned is done, remove the tire by following the sequence of 1→2→3→4.





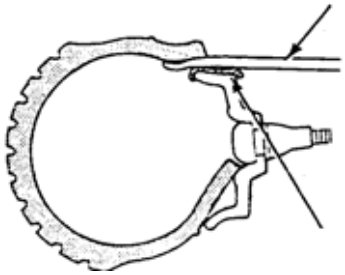
* Do not use a tool other than the tire iron for motorcycle tire removal. Use the wheel rim protector for removal.

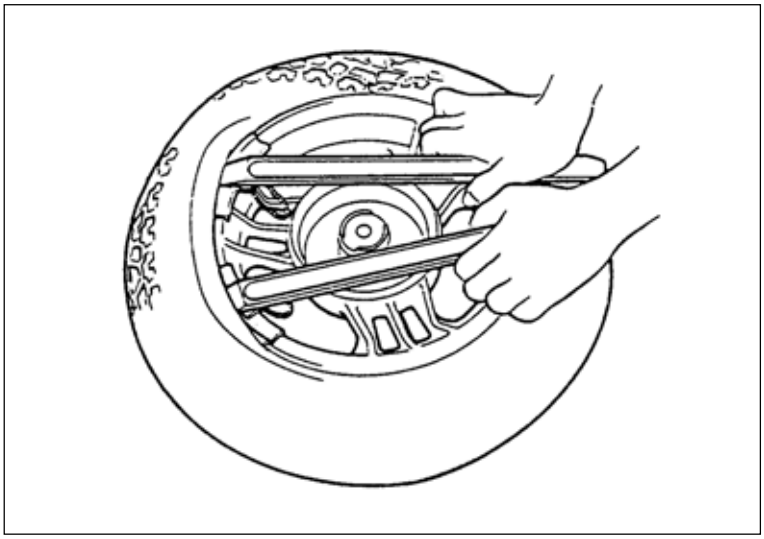
⑤Insert the second tire iron 30～50mm from the first one. Then separate the tire bead from the rim.



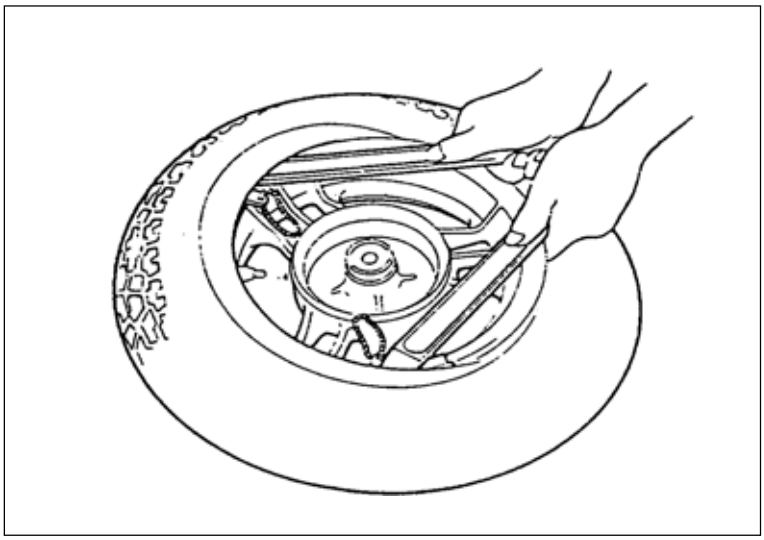
* If you want to separate the tire bead from the rim only by one tire iron, the tire bead will be deformed due to using too much force. The rim will also be damaged seriously. Avoid this way of removal.

⑥It is the same as ⑤. Use the first tire iron to pry off tire bead from the rim, then use the second one to pry off another part of the tire rim from the rim (distance: 30～50mm) slowly.

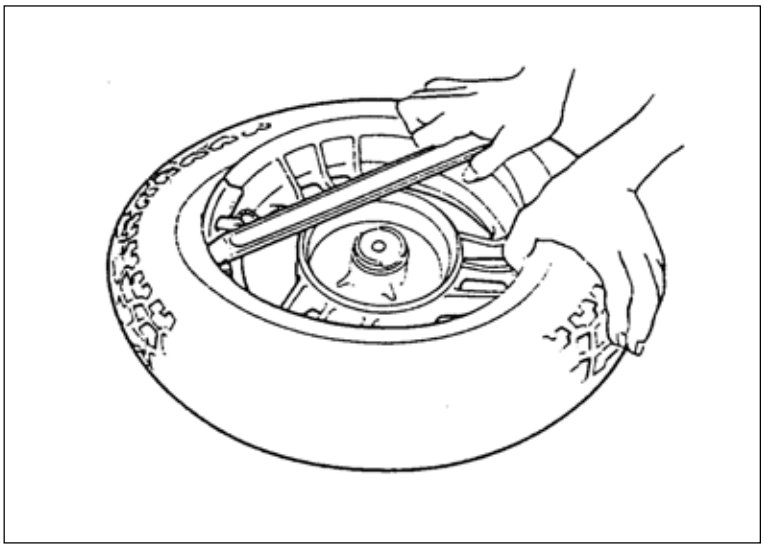




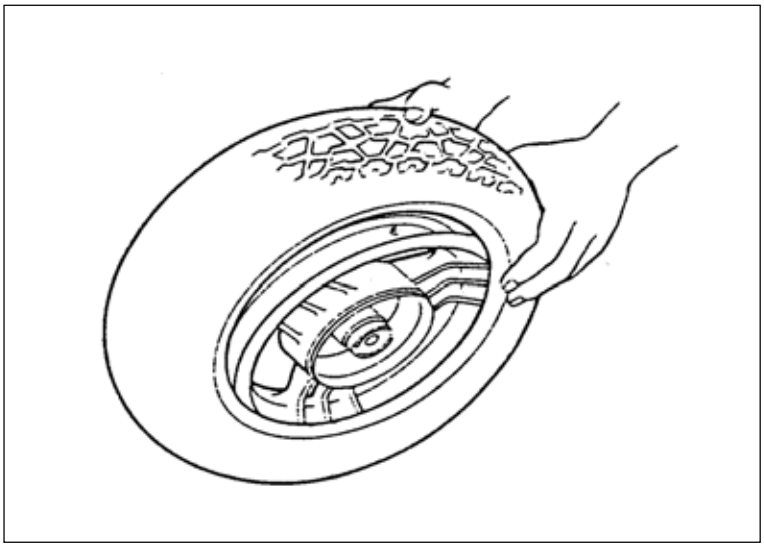
⑦The procedure is the same as ⑤ and ⑥. If 1/3 of the tire bead is separated from the rim, the whole tire is easily taken off.



⑧When 1/2 of the tire bead is pried off the rim, the tire will be easily removed by using only one tire iron.

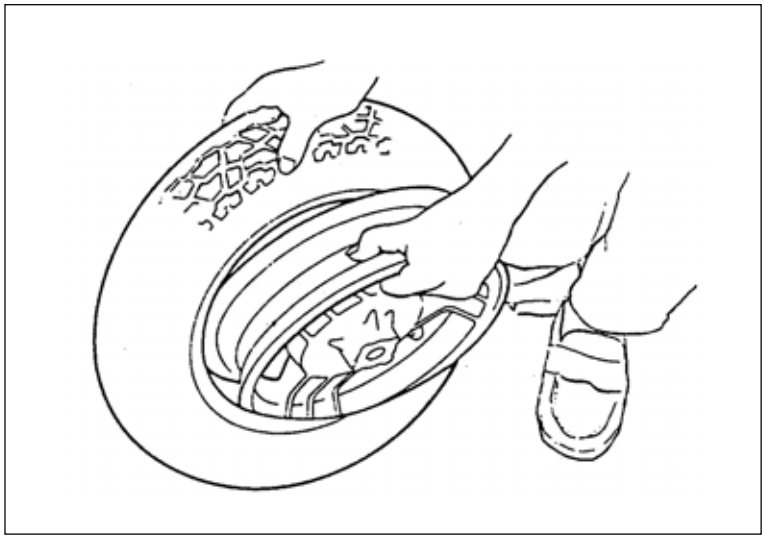


⑨The bead at the back side can be pried off in the same procedures described in ④～⑧.



⑩Take out the rim from the tire.
Check the rim valve for damage.
Replace any faulty parts.

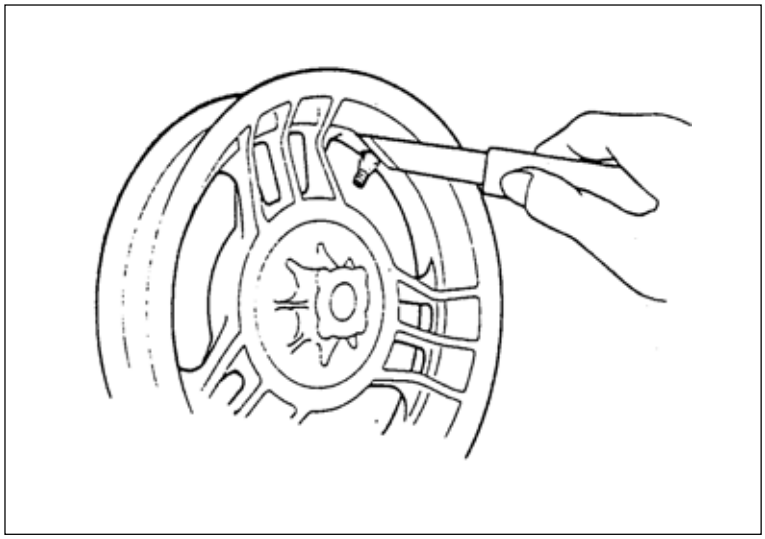
* When the tire is replaced, replace the valve as a set.



RIM VALVE REMOVAL

Cut the rim valve from it bottom.

* Be careful not to damage the rim valve hole.



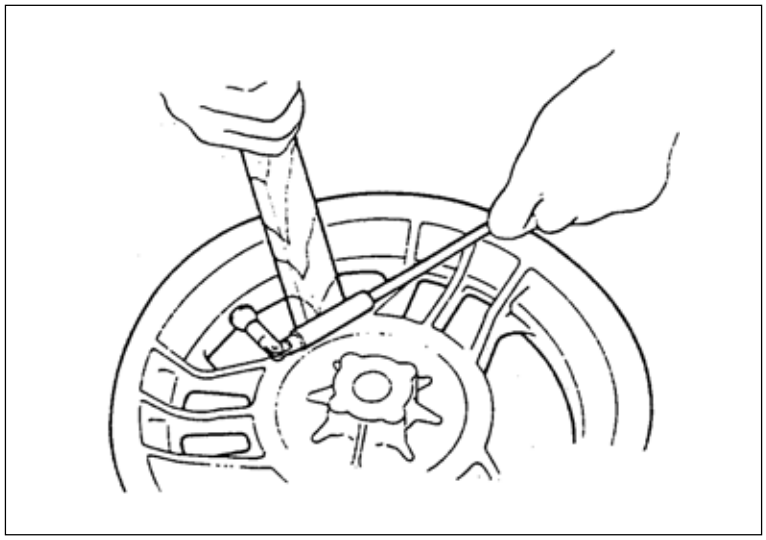
RIM VALVE INSTALLATION

Apply vegetable soapy water to facilitate the installation of rim valve. Apply after other foreign objects are removed.

- Apply around the valve when installation.
- Apply to the tire bead while assembling the tire and rim.

* Do not use oil or gasoline. Use vegetable soapy water only.

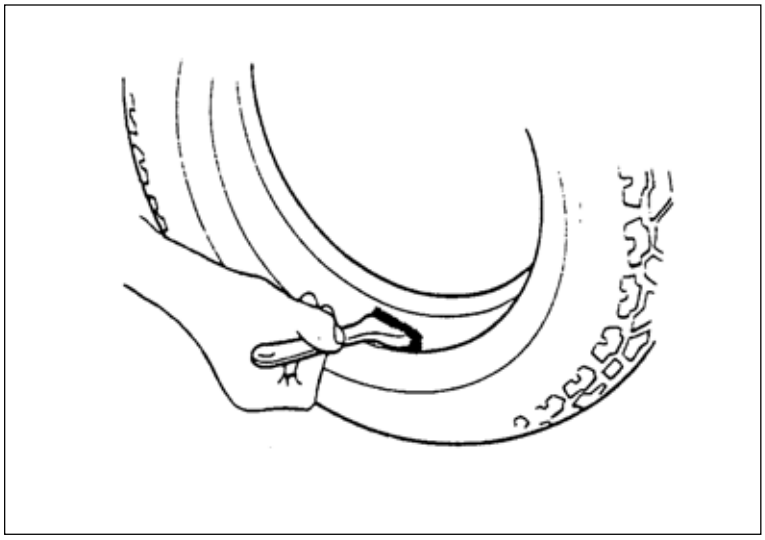
Apply vegetable soapy water to the inner side of rim valve and then use a special tool to pull the valve out.



RIM AND TIRE INSPECTION

RIM INSPECTION

Check the rim and remove rust and rubber materials from the rim.
Air leak will be caused by rim deformation or cracks.
When the tire or rim has cracks, do not repair them and immediately replace with a new one.

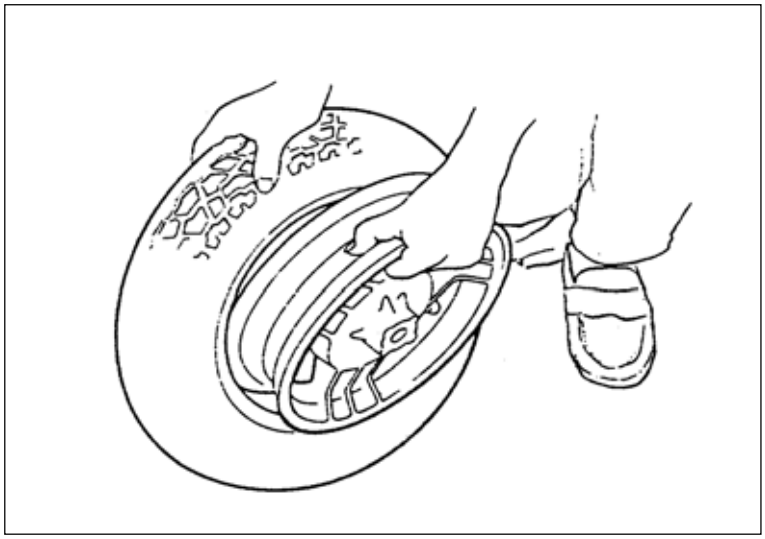


THE DEPTH AND WIDTH OF TIRE SCAR IS OVER 0.5MM AND 1.0MM

TIRE INSPECTION

The tire cannot be repaired and must be replaced with a new one under the following conditions.

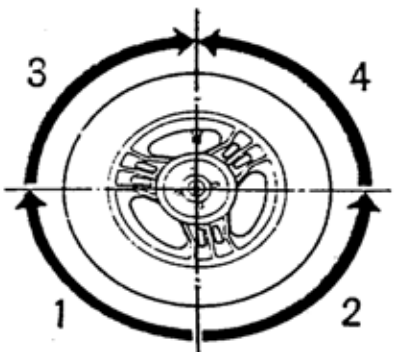
- Tire crack or break is caused by a foreign object of 6mm outer radius.
- The layer of tire-contact part falls off.
- Worn tire tread.
- Worn tire bead.
- Broken tire bead stiffener or other bead damage.
- Broken fabrics.
- Deflection caused by dragging force.
- Rubber cutting damage.
- Abnormal internal anti-leak rubber.
- Side wall breaks or damage.
- Tire tread depth is under 0.8mm



INSTALLATION

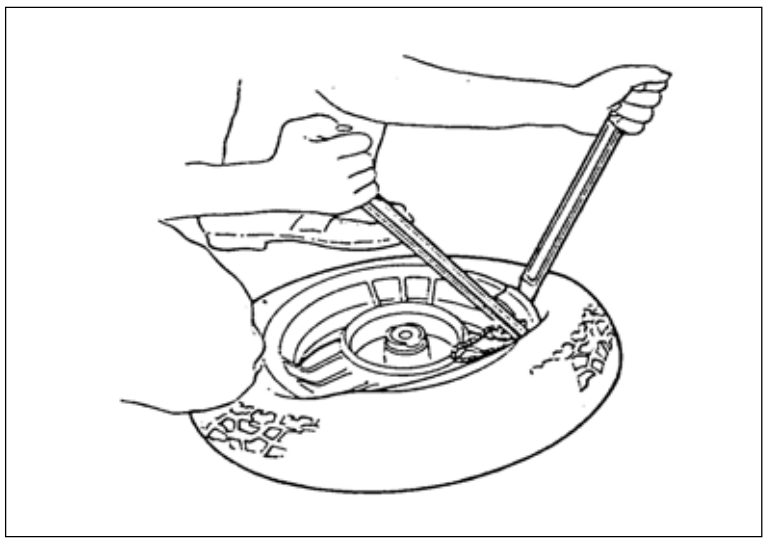
Before installation, check the tire inside for damage.

* When the tire is deformed, repair and correct the deformed part by hand.

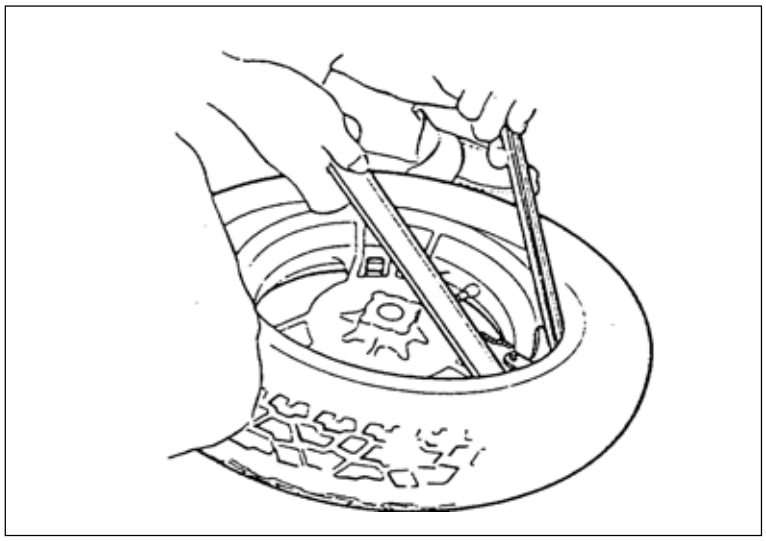


Apply vegetable soapy water to the right and left sides of tire bead. Keep the tire upright and start to install the tire from the back of the rim valve according to the order of 1→2→3→4. Then, push the tire into the rim by hand to the part where hands can reach in.

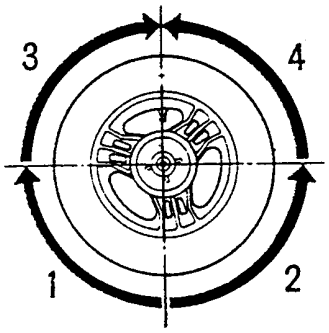
Put the wheel horizontally and put the rim protector on the rim. Use 2 tire irons to install the tire bead into the rim slowly (30～50mm).

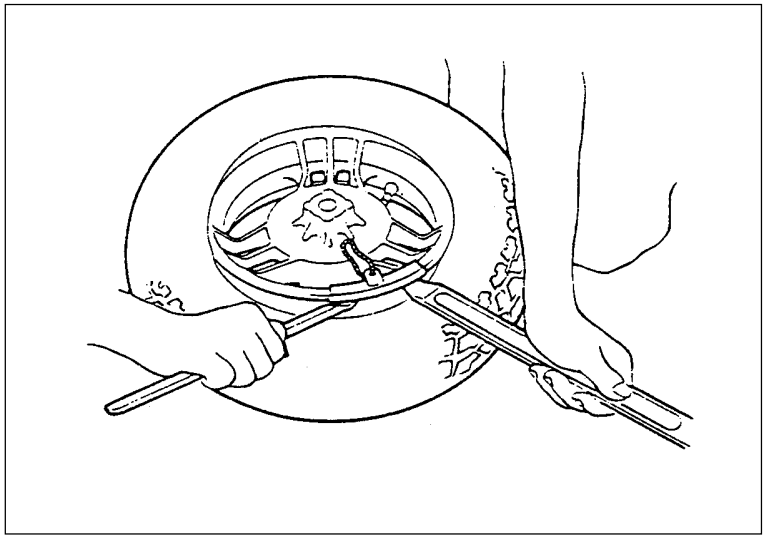


Use 2 tire irons to install the tire bead for the last 50～60mm part. By this way, one side of the tire bead is installed.

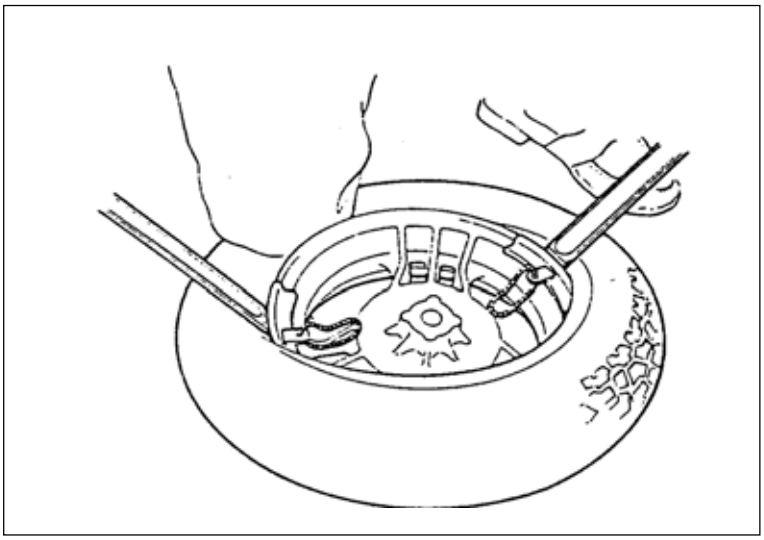


The installation of the other side of tire bead should be started from the opposite side of the tire valve according to the order of 1→2→3→4.





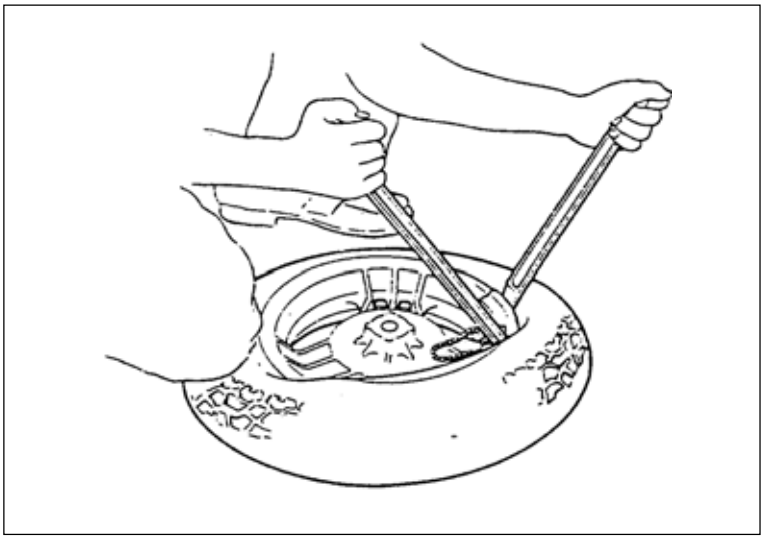
Install the rim protector and insert 2 tire irons at an interval of 30mm to install the tire bead into the rim. Press to hold the installed part of tire bead by knees.



After 1/2 of tire bead is installed, insert 2 tire irons at an interval of 30 ～40mm to finish the installation in order.

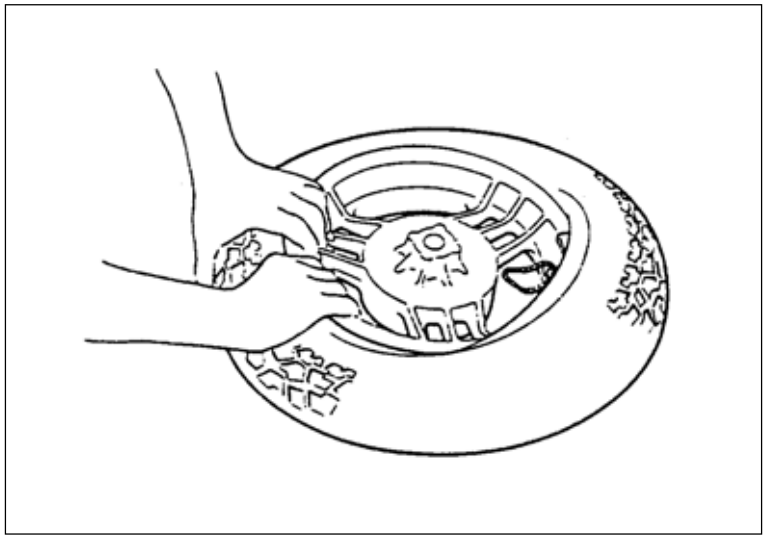
*
- Both tire irons should be pulled out at the same time.
- The already installed part should be pressed.

The pulled-out tire iron should be inserted beside the other tire iron which hasn‘t been pulled out.

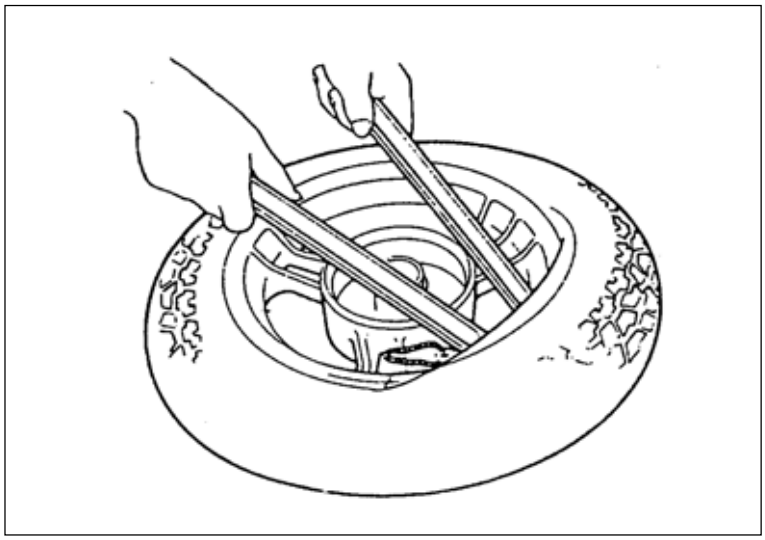


After 2/3 of the tire bead is installed into the rim, make sure if the installed tire bead is completely inserted into the rim groove.

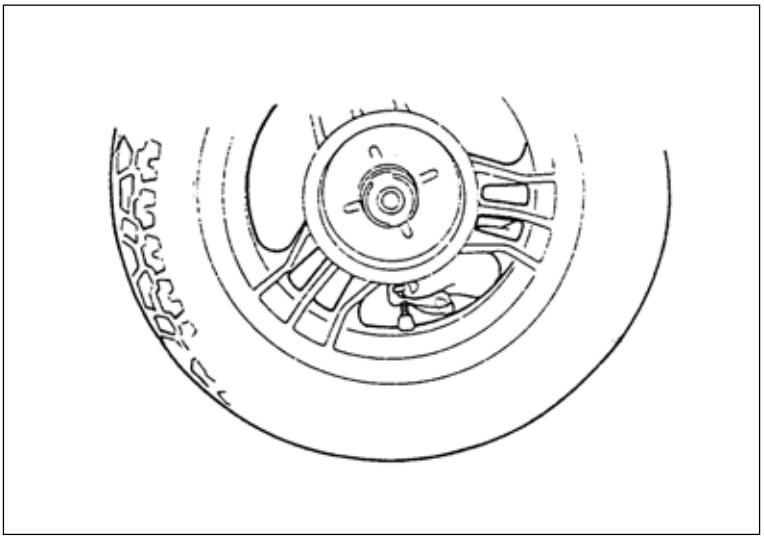
*
If the tire bead is not completely inserted into the rim groove, it will be more difficult to install the rest part of the tire bead. Moreover, the rim bead is easily damaged.



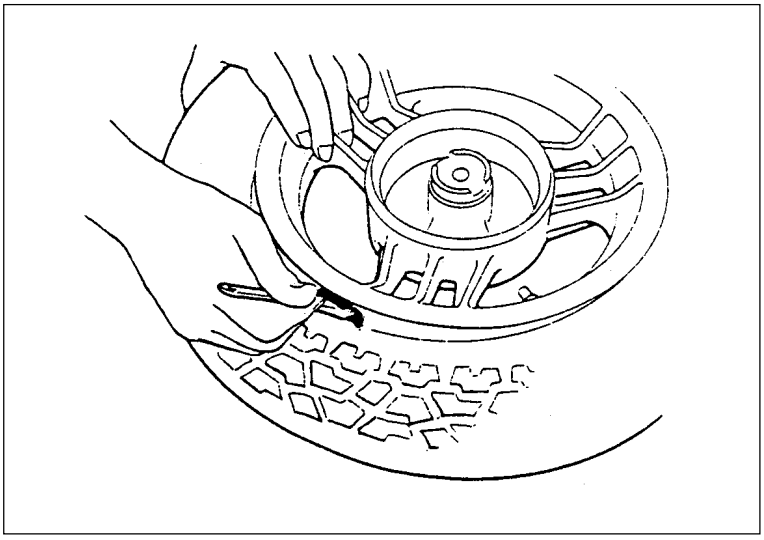
If 50～60mm of the tire bead is not installed, use 2 tire irons to install the rest part of tire bead.



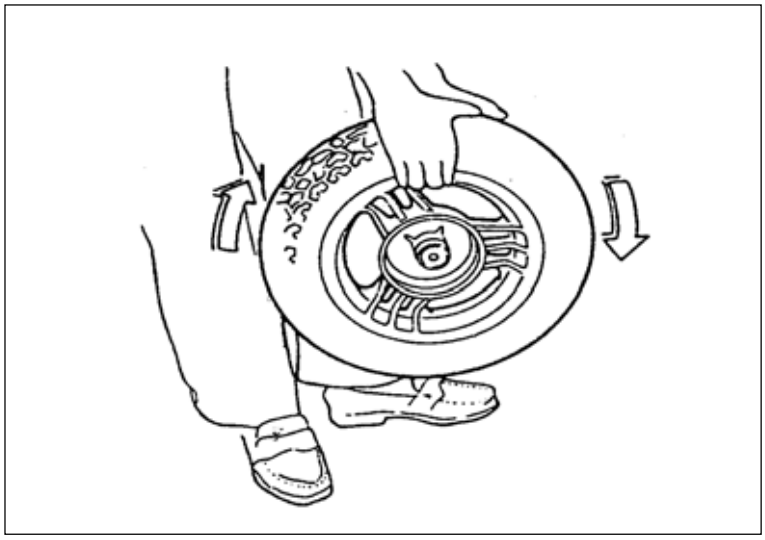
Use the valve core installer to install the valve core.



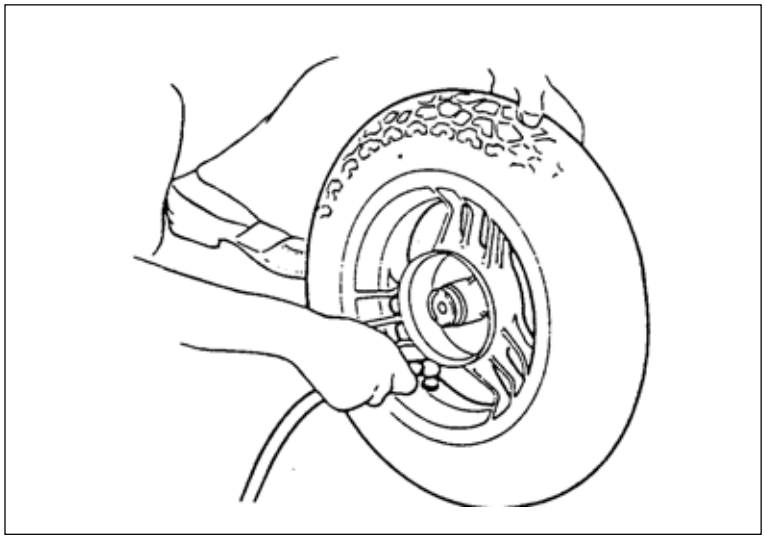
Apply vegetable soapy water to both sides of the tire bead.



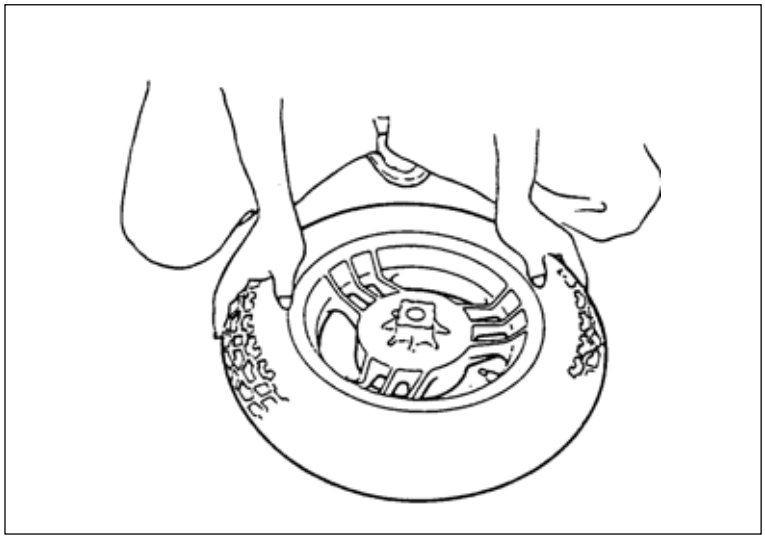
In order to ensure that the tire and the rim are well combined, raise the wheel and rotate it. Press around the tire by hand for several times to see if the tire is perfectly combined with the rim.



Pump the tire up to the specified tire pressure. If there is air leak between tire bead and rim after pumping, turn the valve down and press the upper side of the tire with hand to rotate the tire and pump the air in.



After pumping with specified air pressure, make sure if the tire bead is well installed into the rim.



HIGH-SPEED TIRE REPAIR

Repair the tire using the repair methods and repair agents recommended by the manufacturers.

REPAIR PROCEDURES

- First remove the tire from the wheel.
- Find the crack and mark it.
  Take out foreign objects and check if the tire can be repaired.
- Tire repair
  Repair methods are divided into external and internal repairs.
  Perform the external repair first and then the internal repair.
  When repair agent is used, follow the instructions provided by the manufacturer.
- Remove dust and dirt from the tire bead.
  Clean out the tire inside. Recheck the repaired portion and make sure there is no other damage.
- Install the tire and wheel rim.

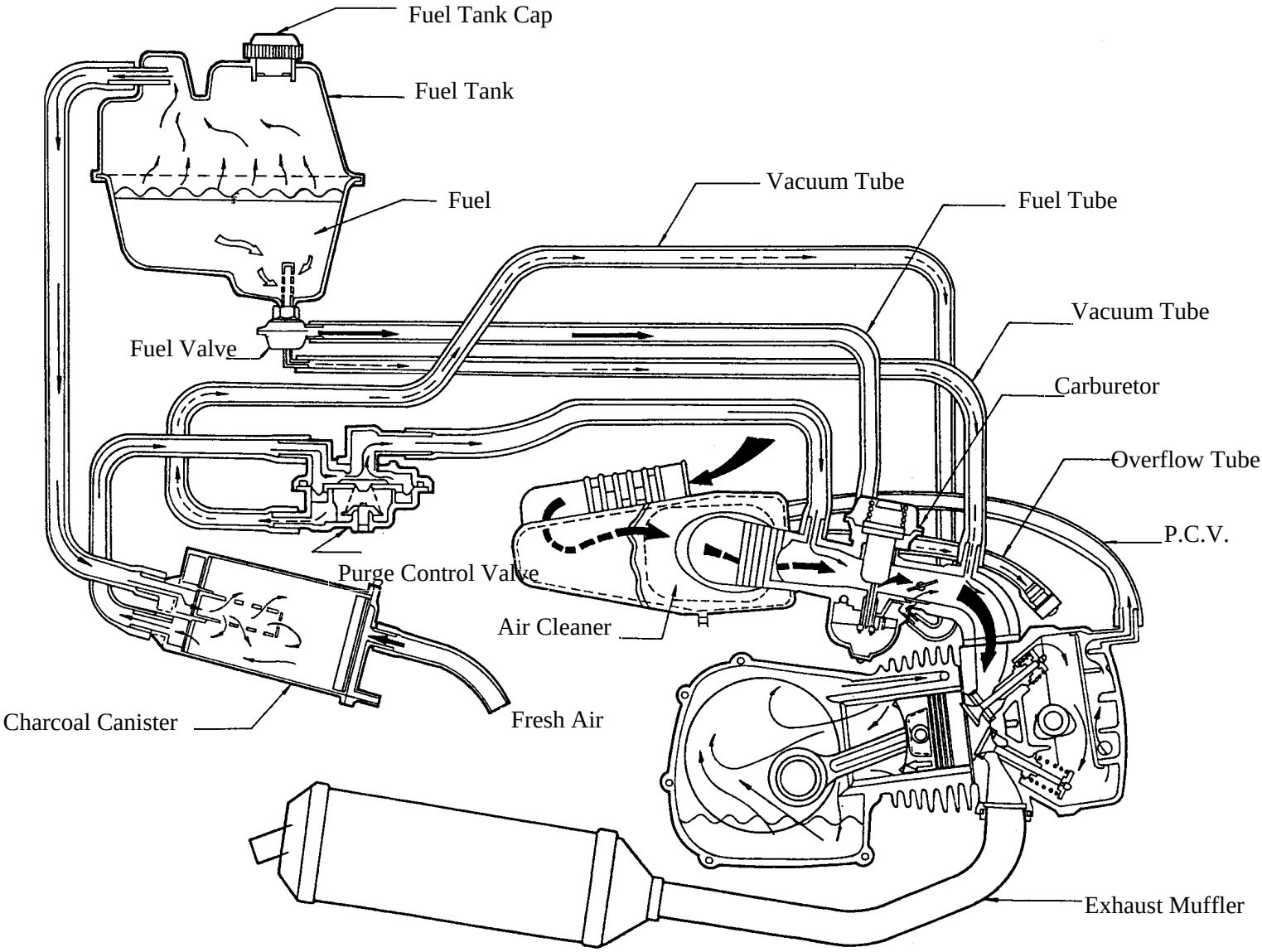
*
- Check the rim valve when removing the tire and wheel rim.
- The gum on the repaired portion may not completely stick to the tire within 24 hours after repair, be careful to control the driving speed for safety.

EVAPORATIVE EMISSION CONTROL SYSTEM

22

22. EVAPORATIVE/EXHAUST EMISSION CONTROL SYSTEM

EVAPORATIVE EMISSION CONTROL SYSTEM DIAGRAM



22. EVAPORATIVE/EXHAUST EMISSION CONTROL SYSTEM

EVAPORATIVE EMISSION CONTROL SYSTEM FUNCTION

FOREWORD:

The Evaporative Emission Control System is abbreviated to E.E.C. System. This device collects the fuel vapor from the carburetor and fuel tank and then the fuel vapor is drawn into the engine for re-burning to avoid air pollution caused by the fuel vapor diffused into the air.

FUNCTION

Item	Purpose	Function
Purge Control Valve	Control vaporized HC from fuel tank not to diffuse into the air.	The charcoal canister absorbs vaporized HC from the fuel tank. When the engine is running and the purge control valve is open, the fuel vapor in the charcoal canister is drawn into the engine for re-burning.
Charcoal Canister	Absorb and store the vaporized HC from the fuel tank and carburetor.	The vaporized HC is absorbed in the charcoal canister and the specified volume of HC in the emission should not exceed 2g.
P.C.V.	Completely recover the HC of blow-by gas in the crankcase for re-burning.	Through the P.C.V. system, the blow-by gas from the crankcase is separated into fuel vapor and fuel and then drawn into the cylinder for re-burning.

SERVICE INFORMATION

GENERAL INSTRUCTIONS

- Do not smoke or allow flames or sparks near the working area.
- Note the locations of tubes for proper installation.
- Replace any damaged tube with a new one.
- Make sure to tighten the connector of each tube securely

TOOLS

- Vacuum pump —
- Pressure pump —

SPECIFICATIONS

Purge control valve vacuum pressure	45mm/Hg
Charcoal canister capacity	90cc
Charcoal canister installation angle	tilt 60°

TROUBLESHOOTING

Engine loses power or runs erratic at idle speed

- Clogged P.C.V. system
- Clogged air cleaner
- Faulty purge control valve
- Loose or broken E.E.C. system tubes or connectors

Engine idles or accelerates roughly

- Faulty fuel cut-off valve
- Faulty purge control valve
- Clogged or faulty charcoal canister

22. EVAPORATIVE/EXHAUST EMISSION CONTROL SYSTEM

1. EMISSION CONTROL SYSTEM MAINTENANCE SCHEDULE:

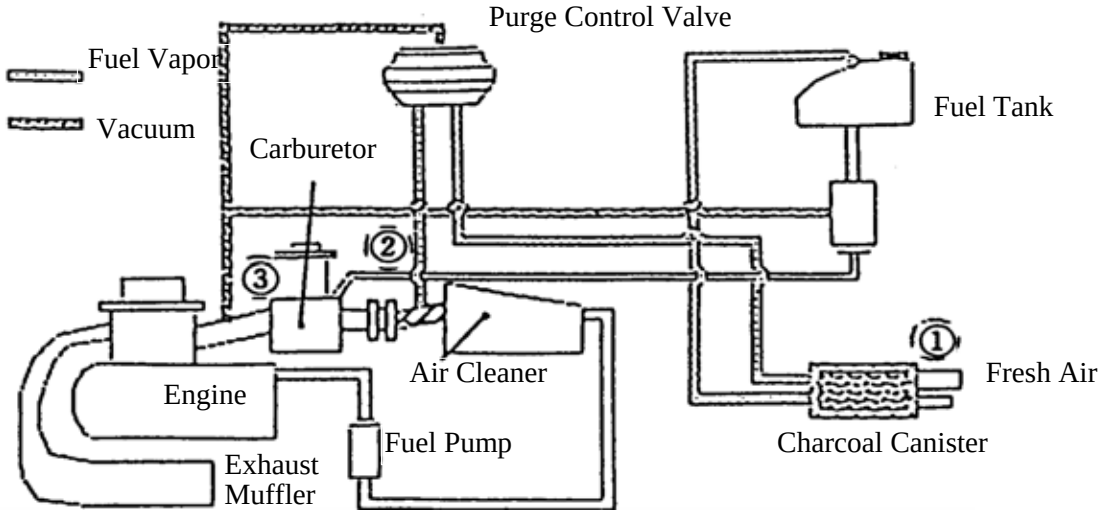
Item		Inspection	Service Mileage (KM)						
			300	1000	3000	5000	7000	9000	10000
Engine Parts	Drive belt	Belt thickness					○		
	Drive chain	Chain tension & length		○	○	○	○	○	○
	Cam chain	Chain length		○	○	○		○	
	Valve clearance	IN/EX clearance		○	○	○		○	○
	Manifold & cylinder head bolts	Lock bolt	○			○			
	Air Cleaner	Clean or replace air cleaner element	Clean at every 3000km and replace if necessary						
	Cooling water	Check for engine cooling	Replace at every 10000km or every year						
	Engine oil	Engine lubrication	○	Replace at every 1000km					
Fuel System	Gear oil	Inspect or add gear oil							○
	Fuel filter	Clean or replace fuel filter screen			○	○		○	
	Choke system	Check for proper operation		○	○	○			
	Fuel line connectors	Check for leaks, block or breakage		○	○	○	○	○	○
	Carburetor idle speed	Inspect, clean or adjust	○			○			○
	Oil filter	Clean filter screen	○			○			○
Ignition Parts	Ignition timing	Inspect ignition timing		○	○	○	○	○	○
	Spark plug	Clean, inspect or replace		○	○	○	○	○	○
	Ignition system wire connection	Check wire connectors		○	○	○	○	○	○
Exhaust Emission Control System	Secondary air inlet line	Check for leaks, clogged or loose pipe connection			○		○		○
	Intake manifold bolt	Check manifold connector and replace if necessary		○	○	○	○	○	○
Evaporative Emission Control System	Engine compartment pipe connection	Check for leaks, clogged or loose pipe connection		○	○	○	○	○	○
	Charcoal canister	Check air vent hole for damage and clean it		○	○	○	○	○	○
	Purge control valve	Check for loose or broken tube connectors		○	○	○	○	○	○

2. EMISSION CONTROL SYSTEM IRREGULAR MAINTENANCE:

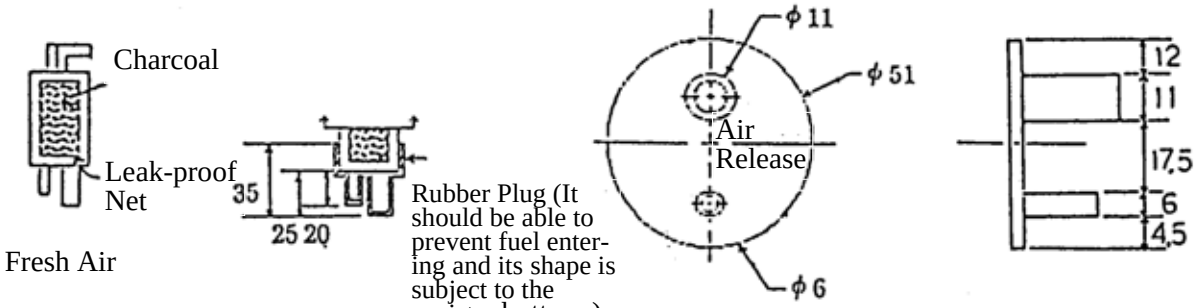
Item	Contents
∗Burned crankshaft bearing	Before riding, inspect the engine for engine oil leaks to avoid crankshaft bearing burning during riding.
∗Burned cylinder or piston	Long-time or severe use may cause worn or seized cylinder or piston. Clean or replace them with new ones.

MOTORCYCLE ENGINE EVAPORATIVE EMISSION CONTROL SYSTEM TEST

A. LEAKAGE TEST PIPING DIAGRAM (SIMPLE)



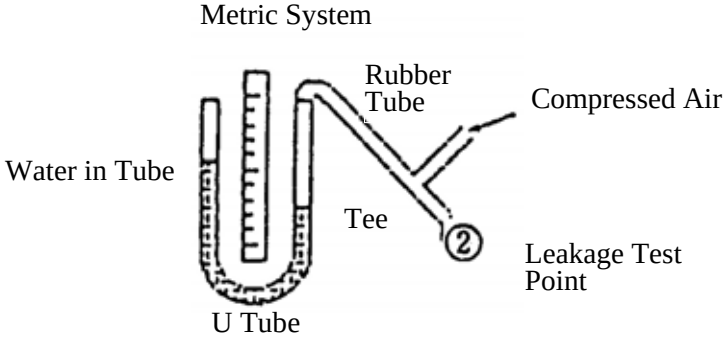
1. Charcoal Canister Plug (Point ①)



B. LEAKAGE TEST LOCATIONS (SIMPLE)

1. Charcoal canister, fuel tank (Point ②)
   Blow compressed air into the tube at Point ② to test leakage.
2. Vacuum tube (Point ③)
   Blow compressed air into the tube at Point ③ to test leakage.

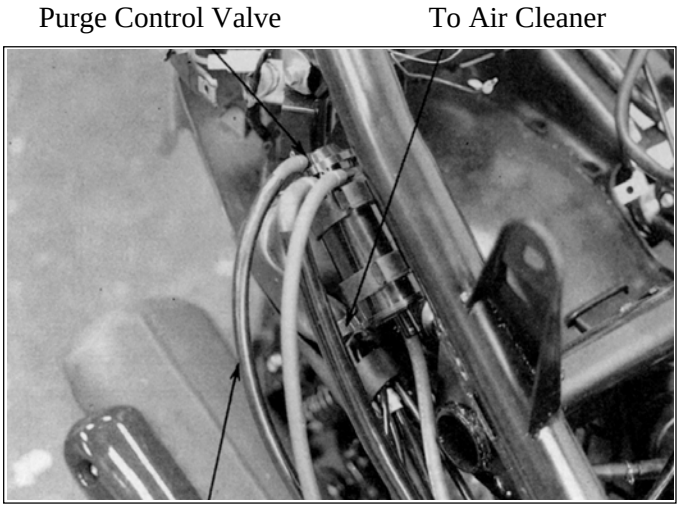
C. LEAKAGE TEST DIAGRAM (SIMPLE)



PURGE CONTROL VALVE

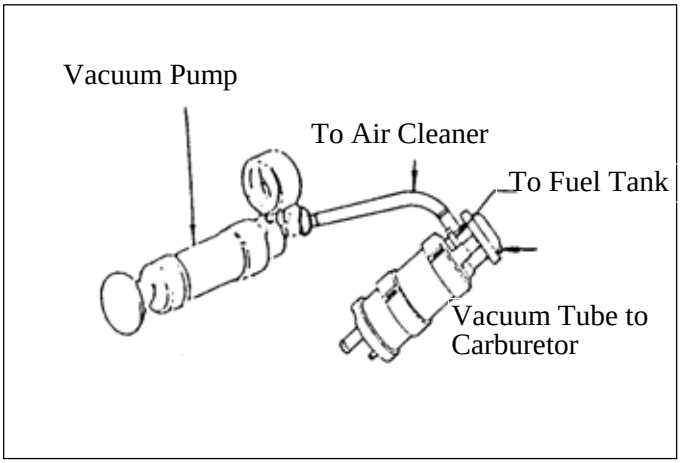
REMOVAL

Remove the frame right cover.
Disconnect the purge control valve vacuum tube that goes to the carburetor and the tubes that go to the air cleaner and charcoal canister.
Remove the purge control valve.

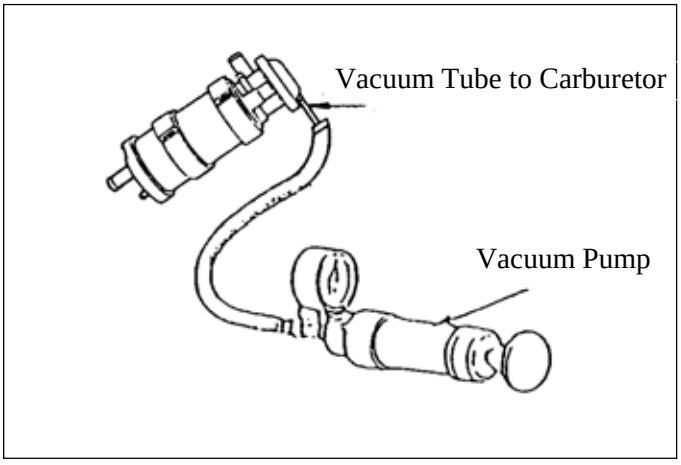


INSPECTION

Connect a vacuum pump to the purge control valve tube that goes to the air cleaner and apply vacuum pressure of 250mm/Hg. The specified vacuum must be maintained for one minute. Replace the purge control valve with a new one if vacuum is not maintained.



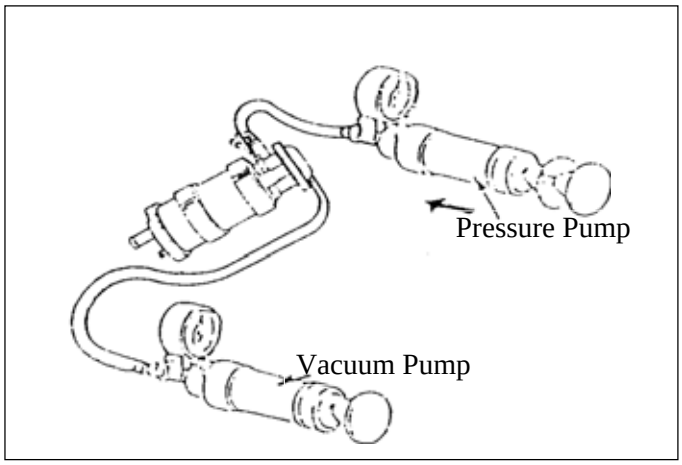
Connect a vacuum pump to the purge control valve tube that goes to the carburetor vacuum tube and apply vacuum pressure of 45mm/Hg. The specified vacuum must be maintained for one minute. Replace the purge control valve with a new one if vacuum is not maintained.



PURGE CONTROL VALVE FLOW INSPECTION

Connect a vacuum pump to the vacuum tube that goes to the carburetor and apply vacuum pressure of 45mm/Hg.

Connect a pressure pump to the tube that goes to the charcoal canister and apply pressure. The flow must be over 9.4 liters per minute and replace the purge control valve with a new one if the specified flow is not reached.



* To prevent damage to the purge control valve, do not use high air pressure sources. Use a hand operated pressure pump only.

INSTALLATION

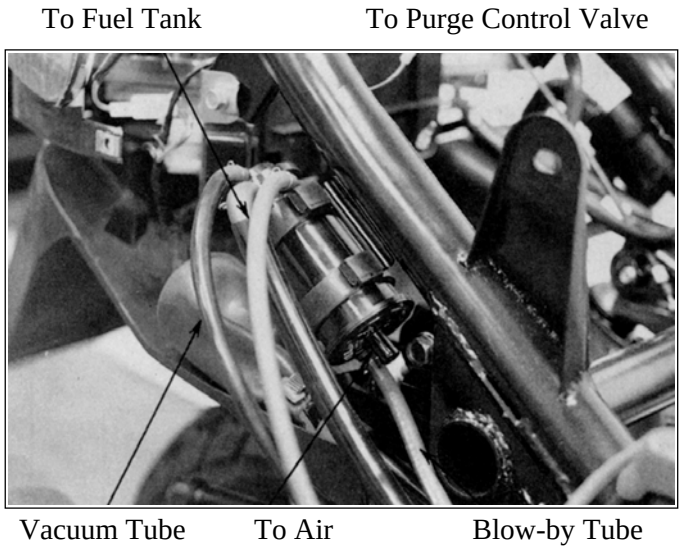
Install the purge control valve in the reverse order of removal.
Route and reconnect the purge control valve tubes properly and securely.

* Be careful not to bend, twist or kink the tubes during installation.

CHARCOAL CANISTER

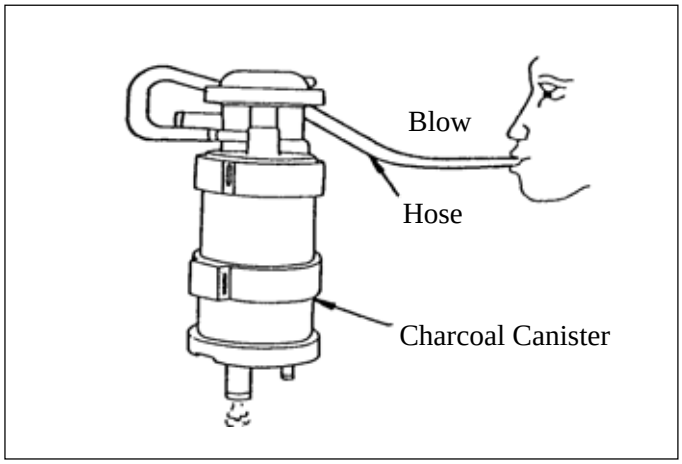
REMOVAL

Disconnect the charcoal canister tubes that go to the fuel tank and purge control valve.
Remove the charcoal canister.



INSPECTION

1. Plug the tube that goes to the fuel tank and plug the blow-by tube.
2. Connect a vacuum pump to the vacuum tube.
3. Connect a hose to the canister tube that goes to the air cleaner. Blow the hose with mouth. The charcoal canister is normal if air can be blown into it. If clogged, replace it with a new one.
4. Check the charcoal for cracks and replace if necessary.

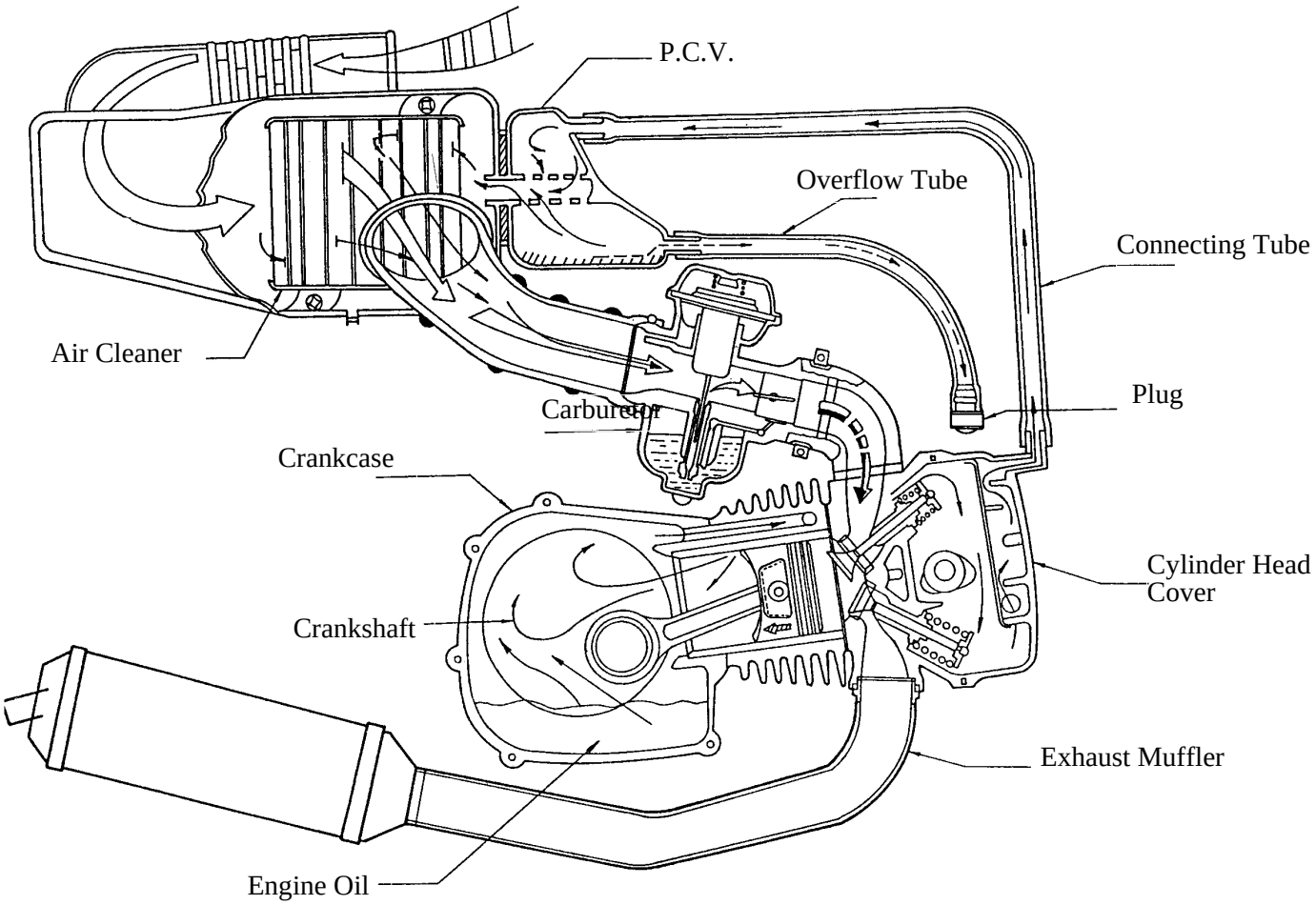


INSTALLATION

Install the charcoal canister in the reverse order of removal.

*
- The charcoal canister must be installed at its original position to avoid damage of performance.
- Do not bend, twist or kink the tubes during installation.

P.C.V. SYSTEM


P.C.V.
Overflow Tube
Connecting Tube
Air Cleaner
Plug
Carburetor
Crankcase
Cylinder Head Cover
Crankshaft
Exhaust Muffler
Engine Oil

P.C.V. (POSITIVE CRANKCASE VENTILATION) SYSTEM

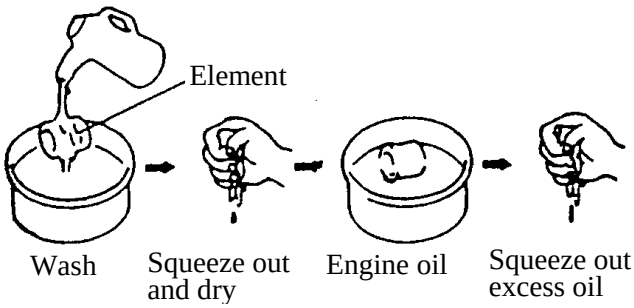
P.C.V. REMOVAL

Remove the frame right cover.
Remove the P.C.V. and replace with a new one.

P.C.V.

AIR CLEANER CLEANING

- Wash the air cleaner element , squeeze out and allow to dry. Soak the element in clean engine oil and squeeze out the excess oil.
- Install the air cleaner in the reverse order of removal.



*
- Be sure to install the air cleaner properly to avoid dust entering the air cleaner.

EXHAUST EMISSION RELATED SYSTEM INSPECTION

Clean or replace the air cleaner. (⇨3-5)

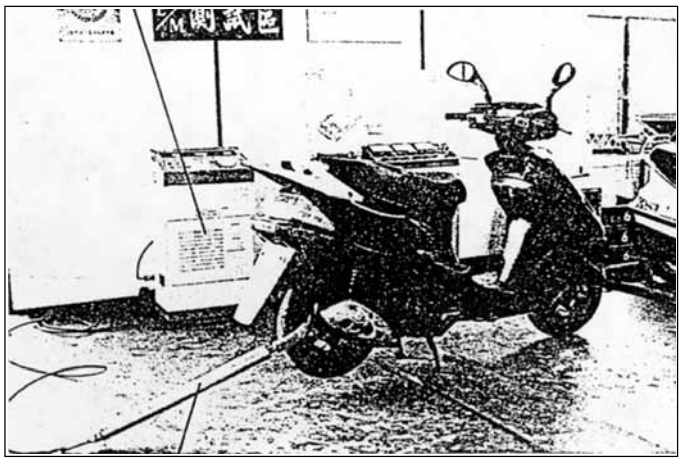
Clean and adjust the carburetor. (⇨13-12, 3-5)

Inspect the auto choke system.

Clean and inspect the spark plug. (⇨3-5)

Inspect the ignition system. (⇨3-7)

Emission Tester



Sampling Pipe

EXHAUST EMISSION TEST AND ADJUSTMENT

1. Start the engine and warm up for several minutes. (Engine surface temperature 60℃～80℃)
2. Adjust the idle speed to 1500±100 rpm.
3. Connect the emission tester sampling pipe to the exhaust muffler.
   Standard: CO: 2.0～3.0% max.
   HC: 4000PPM max.
4. If CO or HC exceeds the specified values, adjust the carburetor pilot screw (P.S.) until CO and HC are within the specified standard values.
   P.S. Adjusting turns: 2¼±½
5. If the adjustment of carburetor makes no difference, inspect exhaust emission related system.