

Aventura 500

Workshop Manual - Engine



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RIEJU AVENTURA 500

Workshop manual - Engine

For maintenance, repairing and adjustment of engine LX267MR (KE500). We have prepared this service manual to bring convenience of guidance.

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1.Summary

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1.1 Repair advises

1. Always use spare parts provided by RIEJU S.A, as well as lubricants and other auxiliary materials approved and recommended by RIEJU S.A. You may damage motorcycle if the materials used do not meet the specifications or requirements approved by RIEJU.
2. Do not use non-metric tools when repairing the motorcycle. Metric bolts, nuts and screws are not interchangeable with imperial fasteners.
3. Replace washers, O-rings, cotter pins, and locking tabs with new ones when reassembling after disassembly.
4. Tighten the larger diameter bolt or inside bolt first when tightening bolts or nuts. Then tighten the bolts in diagonal order. Gradually tighten each bolt to its specified torque value, unless a special sequence is specified.
5. Apply lubricant to the sliding surfaces of the parts before assembly which disassembled and cleaned with detergent.
6. After reassembly, all the parts should be checked to see if they are correctly installed and operate properly. Please do the inspections of rotation, movement and operation.



1.2 General specifications

Engine specifications

	Item	Value
Engine	Model	LX 267MR
	Displacement	471 ml
	Cylinder arrangement and inclination angle	Left: 1, right: 2; 19°
	Cylinder diameter stroke	67×66.8mm
	Combustion chamber volume	15.6m
	Compression ratio	10.7: 1
	Maximum power and corresponding speed	35Kw/8500rpm
	Maximum torque and corresponding speed	43N·m/7000rpm
	Valve mechanism	Overhead cam
	Intake valve	Intake valve opening (when the intake valve lift is 1mm): -5 ° BTDC
		Intake valve clearance (at 1mm up): 35 ° ABDC
	Exhaust valve	Exhaust valve open (when inlet valve lift 1mm): 33 ° BBDC,
		Exhaust close (when inlet valve lift 1mm): -13 ° ATDC
	Lubrication system	Forced pressure lubrication + splash lubrication
	Cooling system	Water cooling
	Engine net mass	53kg
Drive system	Clutch	Multi-piece wet clutch
	Gear-box	International gear 6 gear
	Primary transmission ratio	2.029
	Final transmission	2.733

Drive System	Ratio	First gear: 3.285 Second gear: 2.105 Third gear: 1.600 Fourth gear: 1.300 Fifth gear: 1.150 Sixth gear: 1.043
	Gear ratio	1-N -2-3-4-5-6
Electrical system	Ignition system	FTI 1-2
	Start-up system	Electric start
	Lighting system	Battery
	Spark plug model	CPR 8EA-9 (NGK)
	Spark plug gap	0.8 - 0.9mm
	Voltage rectifier	Three-phase full-wave rectification

Cooling system specifications

Item		Specifications
Coolant capacity	Radiator and the engine	1.4L
	Water box	0.12 L
Pressure relief pressure of the radiator cover		108-137kPa
thermostat	Start opening the temperature	80-84 °C
	Full open temperature	95 °C
	Valve lift	8mm
The coolant is recommended		Ethanol without silicate coolant
Standard coolant concentration		Mix with distilled water 1:1

Lubrication specification

Item		Standard value	Maintenance limit value
Oil capacity	After oil change	2.5 L	---
	After removing the oil filter	2.7 L	---
	Remove the engine	3.2 L	---
Recommended oil		Engine: SG 10W -40 API quality level: SG or higher (do not use energy efficient oil noted on the circular API service label) JASO T 903 Standard: MA Viscosity: SAE 10W40	
Oil pressure sensor open pressure		At 1200 rpm / 80 °C: 93 kPa	---
Oil pump rotor	Leaf top gap	0.15	0.20
	The middle gap	0.15-0.21	0.35
	On both sides of the gap	0.02-0.09	0.12

Cylinder head/valve specification:

Items			Standard value (mm)	Maintenance limit value (mm)
Electric starting cylinder pressure			1372 Kpa	---
Valve gap		Intake valve	0.16+/-0.03	---
		Exhaust valve	0.27+/-0.03	---
Rocker arm, rocker arm shaft	Rocker arm inner diameter	Intake/ exhaust	10.000-10.015	10.10
	Rocker arm outer diameter	Intake/ exhaust	9.972-9.967	9.75
	Rocker arm and rocker arm shaft gap of	Intake/ exhaust	0.013-0.043	0.10

Items			Standard value (mm)	Maintenance limit value (mm)
Camshaft	Cam protrusion height	Intake	30.3955-30.6355	30.376
		Exhaust	30.1424-30.3824	30.122
	Gap between journal and hole		0.02-0.062	0.10
	Beat		---	0.04
Valves, valve guide pipe	Valve stem diameter	Intake	4.475-4.490	4.465
		Exhaust	4.465-4.480	4.455
	Inner diameter of valve guide pipe	Intake/ exhaust	4.500-4.512	4.54
	Valve stem to valve guide clearance	Intake	0.005-0.042	0.07
		Exhaust	0.015-0.052	0.08
	Guide pipe height	Intake/ exhaust	14.10-14.30	---
	Valve mount width	Intake/ exhaust	0.90-1.10	1.5
Free length of valve spring		Inner diameter	29.78	28.58
		Outer diameter	39.98	38.78
Flatness of cylinder head		---		0.10

Clutch and shift mechanism specification:

Items		Standard value (mm)	Maintenance limit value (mm)
Free stroke of clutch handle		10-20	---
Clutch	Free length of spring	43.2	42.0
	Friction plate thickness	2.30-2.50	2.27
	Flatness of driven plate	---	0.30
Clutch bushing	Inner diameter	22.000-22.021	22.031
	Outer diameter	27.987-28.000	27.977
Outer diameter of the main shaft at the clutch bushing		21.967-21.980	21.95

Magneto and starting clutch specification:

items	Standard value (mm)	Maintenance limit value (mm)
Outer diameter of starting disc gear shaft sleeve	51.705-51.718	51.685
inner diameter of starting disc gear shaft sleeve	68.362-68.392	68.402

Crankcase, driving system specification:

Items			Standard value (mm)	Maintenance limit value (mm)
Driving mechanism	Gear inner diameter	M5	28.000-28.021	28.04
		C1	24.007-24.028	24.04
		C2	31.000-31.025	31.04
	Outer diameter of shaft sleeve	M5, M6	27.959-27.980	27.94
		C2	30.970-30.995	30.94
		C3, C4	30.950-30.975	30.93
	Clearance between gear and shaft sleeve	M5	0.020-0.062	0.10
		C2	0.005-0.055	0.07
	Inner diameter of shaft sleeve	M5	25.000-25.021	25.04
		C2	28.000-28.021	28.04
	Spindle diameter	Matched with M5 shaft sleeve	24.967-24.980	24.96
		Matched with M5 shaft sleeve	27.967-27.980	27.95
	Clearance between shaft sleeve and shaft	M5, C2	0.020-0.054	0.07
Fork, fork shaft	Fork shaft diameter		11.957-11.968	11.95
	Inner diameter of fork		12.000-12.018	12.03
	Thickness of fork tip		5.93-6.00	5.9

Crankshaft, piston, cylinder, balance shaft specification:

Items			Standard value (mm)	Maintenance limit value (mm)
Crankshaft	Big head side clearance of connecting rod		0.05-0.20	0.25
	Connecting rod big head bearing bush and shaft handle pin clearance		0.030-0.052	0.06
	Crankshaft journal and bearing bush clearance		0.017-0.035	0.05
	Beat		---	0.05
Cylinder	Cylinder diameter		67.000-67.015	67.10
	Out-of-round quantity		---	0.10
	Conical degree		---	0.10
	Flatness		---	0.10
Piston, piston pin, piston ring	Piston base circle diameter		66.970-66.990	66.905
	Pin bore diameter		16.002-16.008	16.02
	Piston pin diameter		15.994-16.000	15.98
	Gap between piston and piston pin		0.002-0.014	0.04
	Closing clearance of piston rings	1st ring	0.10-0.20	0.4
		2nd ring	0.21-0.31	0.5
		Oil ring	0.20-0.70	1.0
	Clearance between piston ring and ring groove	Gap between one ring and groove	0.030-0.060	0.10
		Gap between two ring and groove	0.015-0.050	0.08
Cylinder gap			0.010-0.045	0.10
Inner diameter of connecting rod small end			16.030-16.044	16.05
Clearance between connecting rod and pin			0.03-0.05	0.07

1.3 Torque value

Standard torque value:

Items	Torque value (N.m)	Fastener type	Torque value (N.m)
5mm bolt & nut	5.2	5mm screw	4.2
6mm bolt & nut	10	6mm screw	9.0
8mm bolt & nut	22	6mm flange bolt (8mm head, small flange)	10
10mm bolt & nut	34	6mm flange bolt (8mm head, large flange)	12
12mm bolt & nut	54	6mm flange bolt (10mm head) & nut	12
		8mm flange bolt & nut	27
		10mm flange bolt & nut	39

Engine torque value:

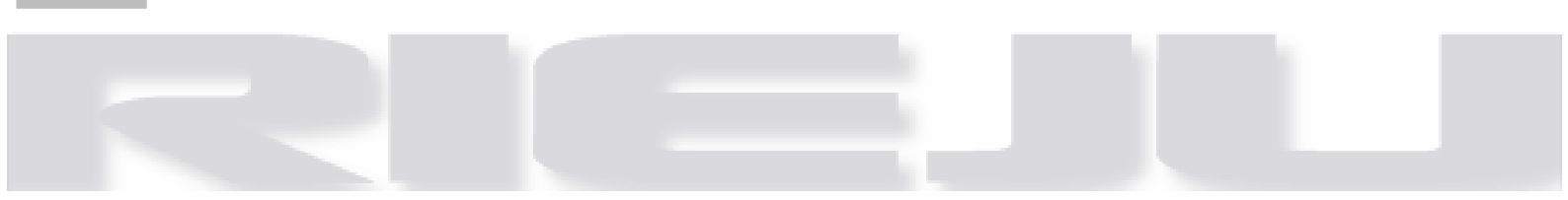
items	Qty	Thread diameter (mm)	Torque value (N.m)	Remark
Air filter cover screws	4	5	1.1	
Air filter element screw	4	5	1.5	
Spark plug	2	10	16	
Rocker arm shaft bolt	2	12	16	Apply engine oil to the threads and use new parts for the washers
Optic hole cover	1	45	12	Apply grease to threads
Engine oil drain bolt	1	12	28	
Fine filter	1	20	12	
Fine filter pipe joint	1	24	27	Apply fastening adhesive at a length of 6.5mm from the head

Cooling system:

Items	Qty	Thread diameter (mm)	Torque value (N.m)	Remark
Fan motor cover bolts	4	6	8.5	
Fan motor screws	3	4	2.8	
Fan nut	1	3	1.1	Apply sealant to threads
Water pump installation bolts	3	6	12	
Water pump cover bolts (including drain bolt)	2	6	10	
Cylinder head drain bolt	1	6	12	
Thermostat cover bolts	1	6	12	

Cylinder head & valve:

items	Qty	Thread diameter (mm)	Torque value (N.m)	Remark
Cylinder head bolt	6	9	47	Apply engine oil to the threads and seating surfaces
Camshaft bracket bolts	12	6	12	Apply engine oil to the threads and seating surfaces
Valve rocker arm shaft bolt	2	12	15	Apply engine oil to the threads and seating surfaces
Cylinder head cover bolts	4	6	10	
Tensioner adjustment bolt	1	6	10	Apply engine oil to the threads and seating surfaces
Cylinder body connecting bolts	2	6	10	



Clutch and gearshift mechanism:

Items	Qty	Thread diameter (mm)	Torque value (N.m)	Remark
Oil pump driven wheel bolt	1	6	12	Sealant on threads
Centre sleeve lock nut	1	18	128	Oil on threads and seating surfaces
Primary drive wheel bolts	1	10	103	Oil on threads and seating surfaces
Stop plate bolts	1	6	12	Sealant on threads
Five-star toggle plate locating bolts	1	8	23	Sealant on threads
Lift plate bolts	4	6	12	
Shift arm oil seal pressure plate bolts	1	6	12	Sealant on threads
Shift arm limit plate bolts	1	6	12	Sealant on threads
Shift arm locating bolt	1	8	27	
Right crankcase cover bolts	14	6	10	

Magnetos and starter clutch:

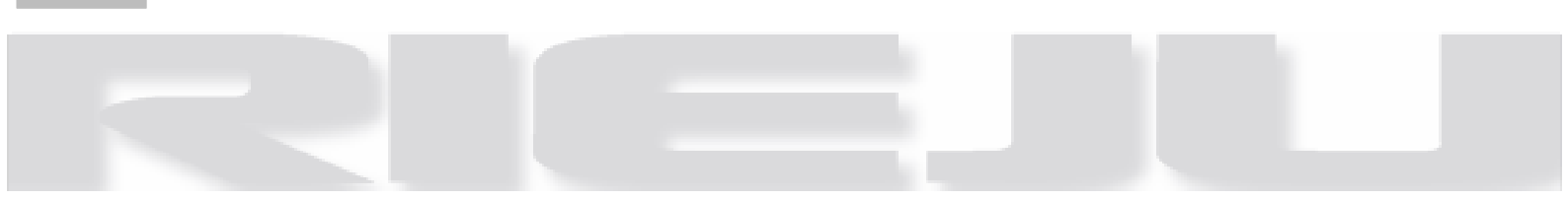
Items	Qty	Thread diameter (mm)	Torque value (N.m)	Remark
Starting clutch fastening bolts	6	8	29	Sealant on threads
Magneto rotor bolts	1	12	138	Oil on threads and seating surfaces
Magneto spindle bolts	4	6	10	Sealant on threads
Trigger fixing bolts	2	6	12	Sealant on threads
Left crankcase cover bolts	11	6	12	Sealant on threads

Crankcase and drive system:

Items	Qty	Thread diameter (mm)	Torque value (N.m)	Remark
Balance shaft/spindle bearing retainer	4	6	12	Sealant on threads
Main shaft bushing pressure plate	1	6	12	Sealant on threads
Shift drum bearing locating bolts	2	6	12	Sealant on threads
Main journal bolts	6	8	15+120°	Grease and replace bolts with new ones
Crankcase 10mm bolts	1	10	39	
Crankcase 8mm bolts	3	8	24	
Crankcase 6mm bolts	10	6	12	

Crankshaft, piston, cylinder, balance shaft:

Items	Qty	Thread diameter (mm)	Torque value (N.m)	Remark
Connecting rod cover nuts	4	8	33	Oil on threads and seating surfaces
Balance shaft/spindle bearing retainer	4	6	12	Sealant on threads

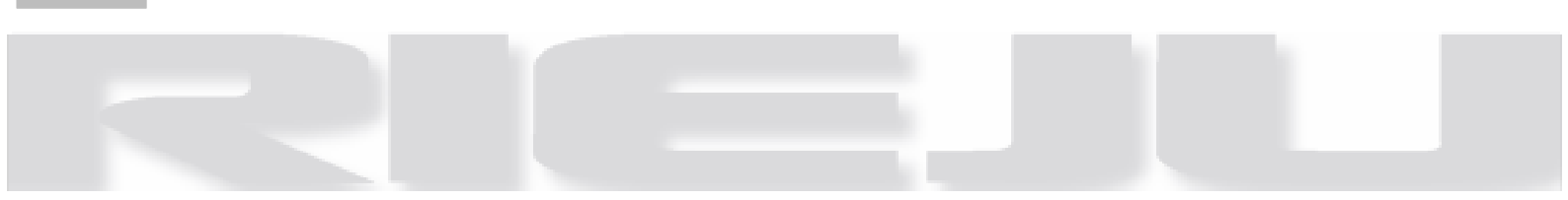


1.4 Lubrication and sealing position

Engine

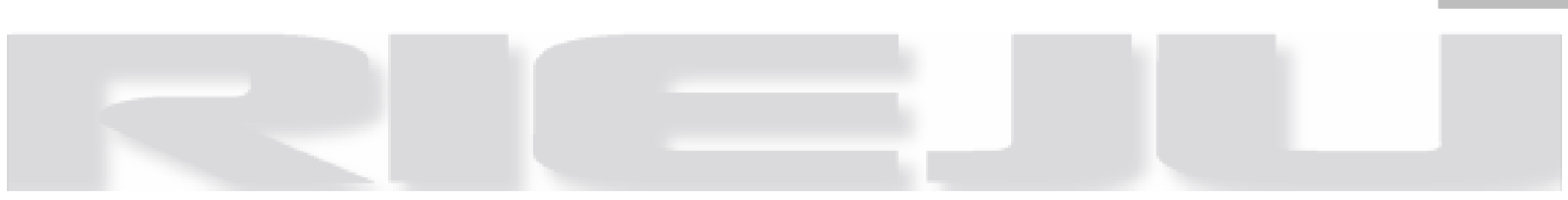
Material		Position	Remark
Sealant	1596	Crankcase bonding surface Cylinder head cover seal	
	1590	magneto outlet	
Engine oil		• The whole surface of oil pump inner and outer rotor • Rocker arm shaft surface • Rocker arm inner surface and roller surface • Valve stem sliding surface and stem end • The whole surface of timing chain • Camshaft rolling surface • Cylinder bore inner surface • Piston outer surface, piston pin hole and piston ring groove • Outer surface of piston pin • Entire surface of piston ring • Clutch friction disc entire surface • Clutch push rod sliding surface • Shift shaft rod and paddle plate • The entire surface of the duplex gear shaft • Starting overrunning clutch entire surface • The entire surface of the fork shaft • Inner surface of crankshaft connecting rod large head end shaft tile	

Engine Oil		• Bore of crankshaft connecting rod small end • Gear teeth (primary drive, crankcase, starting reduction) • Sliding surface of disc gear • Rotating area of each bearing • Surface of each O-ring	
Molybdenum disulphide oil		• rocker arm • Rocker Arm Shaft • Camshaft surface • Cylinder head camshaft bore	
Multi-purpose grease		• Starter Motor Seals • Speed sensor seal	
Degreaser		All bonding surfaces	



2. Maintenance

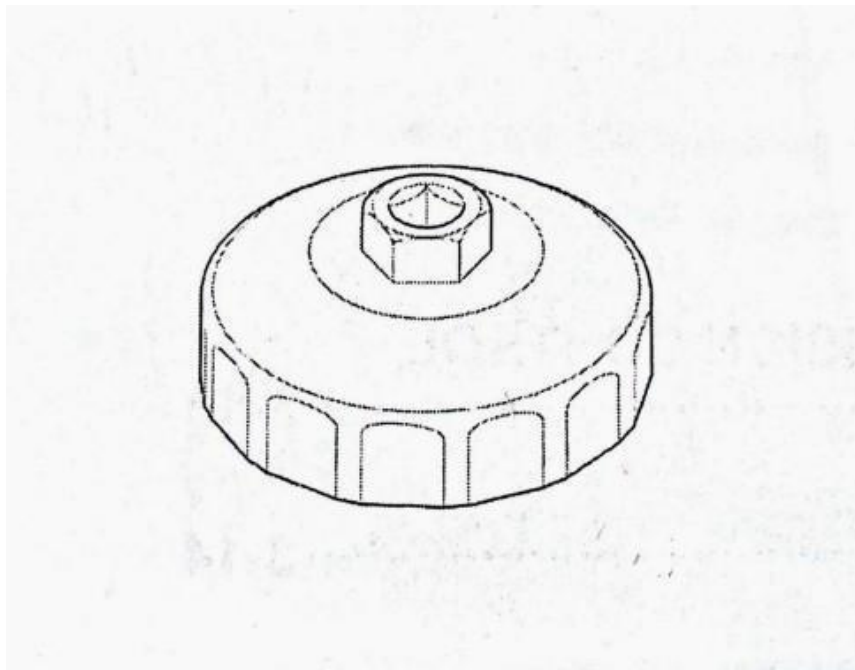
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2.1 Repair information

Before all operations, place the motorbike on a level surface.

Tool



2.2 Maintain specifications

Always follow the maintenance intervals in the Maintenance Table of the Instruction Manual.

I: Inspect, clean, adjust, lubricate or replace as necessary; **C**: Clean; **A**: Adjust; **L**: Lubricate.

The following maintenance items require some mechanical knowledge. Certain items (especially those marked with the * and ** symbols) may require more technical information as well as tools.

Maintenance intervals

			items	Odometer 1								
			interval	*500k m	0.5	8.5	16.5	24.5	32.5	40.5	48.5	
Emission-related	*	Oil pipe					I		I		I	
	*	Valve					I		I		I	
		Air filter				I	I	R	I	I	R	
		Exhaust nozzle	2			C	C	C	C	C	C	
	**	Spark plug	3						R			
	**	Valve gap						I			I	
		Engine oil			Initial = 500km or one month; R = Per 12800km							
	*	Oil fine filter			R		R		R		R	
		Idle			I		I		I		I	
	*	Coolant	5				I		I		R	
	*	Cool system					I		I		I	
	*	Secondary air replenishment system					I		I		I	
	Fuel Emission System	4					I			I		
Non-emission related		drive chain			Per 500km I,R							
		brake fluid				I	I	R	I	I	R	
		Brake pad				I	I	I	I	I	I	
		Brake system			I		I		I		I	
		headlight					I		I		I	
		Clutch system					I		I		I	

* : Repairs should be carried out by a RIEJU dealer.

Attention:

1. Maintenance should always be serviced at the intervals specified above.
2. Maintenance work should be performed more frequently than the intervals specified above when driving in particularly wet or dusty areas, driving in the rain or at full speed.
3. Replace every two years, or the odometer display data, whichever comes first.

2.3 Crankcase breather pipe

Attention:

- In the rain or dust, check to see if deposits are clearly visible in the clear portion of the air vent tube. To see if deposits are clearly visible. Remove the air filter cleaning tube plug [1] and direct the deposits into a suitable container.

Reposition the plug.

Remove the fuel tank and hold it in place.

Check the crankcase exhaust pipe [1] for cracks, deterioration, damage or looseness, deterioration, damage, or looseness.

If necessary, replace the exhaust pipe. Install the oil tank.

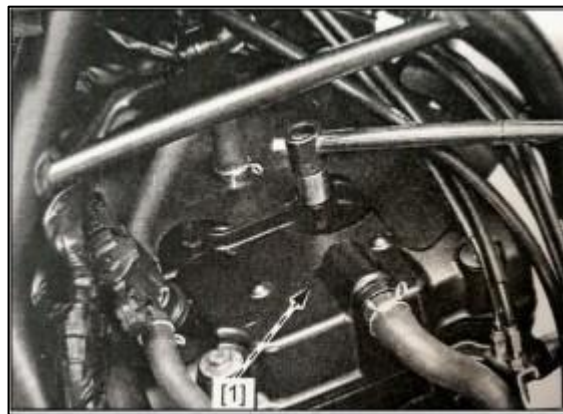
2.4 Spark plug

Remove the fuel tank.

Remove the spark plug [1].

Caution:

Before removing the spark plug use an air gun to clean the spark plug base around it and also make sure that no dust has fallen into the combustion chamber. Inspect the insulator for



cracks or damage, the electrodes for damage, dirt, and discoloration. If necessary, replace the spark plug if necessary.

Install the fuel tank.

Check the spark plugs:

Use a wire or special spark plug cleaner to clean the spark plug electrodes. Check the gap between the center electrode and the side electrodes with a plug gauge.

Spark plug gap: 0.80-0.90mm

If necessary, carefully bend the side electrodes to adjust the gap.

Install and manually tighten the spark plug to the cylinder head.

Then tighten the spark plug to the specified torque value.

Torque value: 16 N-m

2.5 Valve gap

Caution:

Check and adjust the valve lash with the engine cold (below 35°C).

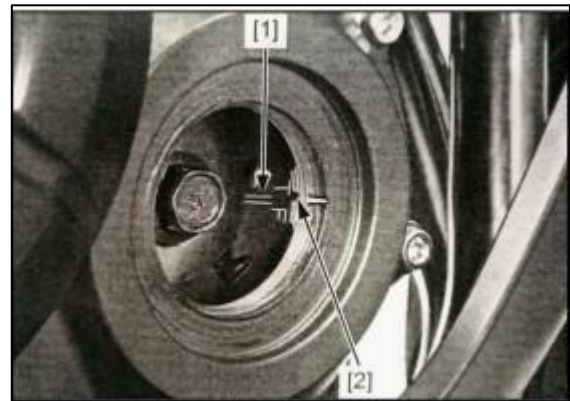
Check

Remove the following parts:

Cylinder head cover

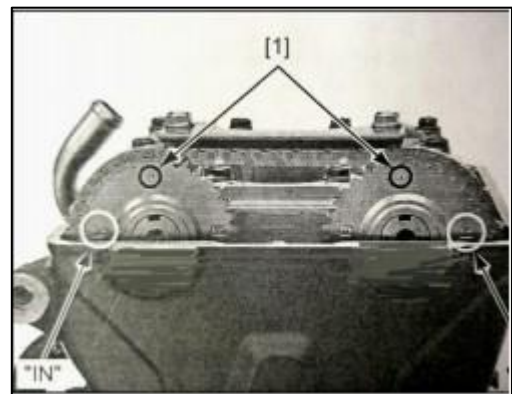
Cylinder head cover Sight hole cover and O-ring

Turn the crankshaft anticlockwise and connect the "T" mark [1] on the magnetic cylinder to the crankcase cover. Align the "T" mark [1] on the magnetic cylinder with the indicator notch [2] on the crankcase cover.



Ensure that the timing marks ("IN" and "EX") on the sprockets are aligned with the cylinder head surface. Ensure that the stamping marks are facing upwards.

If the timing mark is not in the specified position, turn the crankshaft one full turn (360°) counterclockwise to re-engage the "T" mark is aligned with the indicated notch.



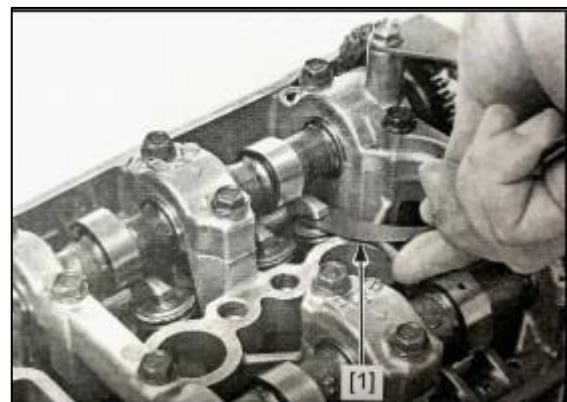
Check the exhaust valve clearance by inserting a plug gauge between the rocker arm of cylinder 1 (left) and cylinder 2 (right) and the gaskets.

Valve clearance:

EX: 0.27 ± 0.03 mm

Caution:

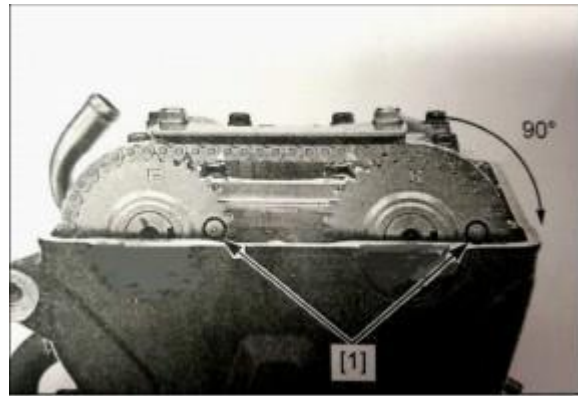
Record each valve lash to make it easier to adjust the valve lash when it needs to be adjusted. For reference in the selection of shims when valve lash adjustment is required.



Turn the crankshaft half a turn counterclockwise (180°) and place the stamped hole marks [1] on the sprocket with the cylinder head surface align. Check the intake valve lash of cylinders 1 and 2.

Valve clearance:

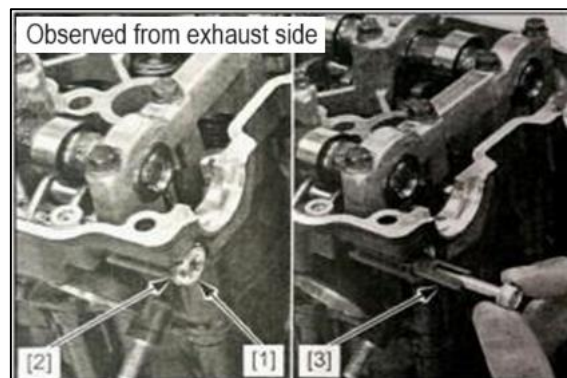
EX: 0.16 ± 0.001



Adjustment

Caution:

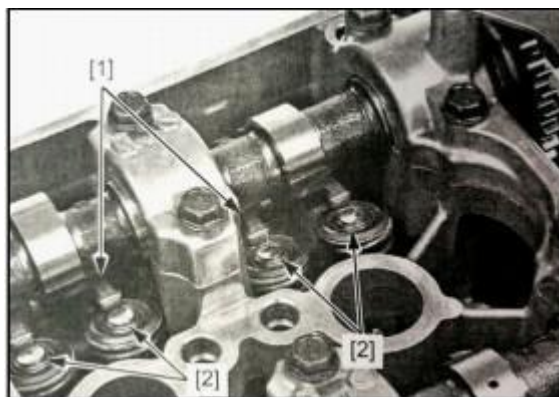
Valve clearance is adjusted by removing the rocker shaft. Before removing the rocker shaft, make sure the shaft is in the correct removable position. Remove the plug bolt [1] and the washer [2]. Attach the rocker arm and then remove the rocker shaft [3] with a 6mm bolt.



Slide the rocking arm shaft [1] and remove the gasket [2].

Caution:

Prevent the gasket point from falling into the crankcase and the spark plug hole. Mark all spacers to ensure that they can be installed in place during installation. With forceps or magnets, the pads will be easier to remove.



Measure the insert [1] thickness and record it.

Note:

There are 69 spacers of different thickness available, adjacent thickness difference of 0.025mm (1.200-2.900mm) to calculate the new spacer thickness with the following equation:

$$A = (B - C) + D$$

A: New spacer thickness

B: Valve clearance value recorded

C: specified valve clearance value

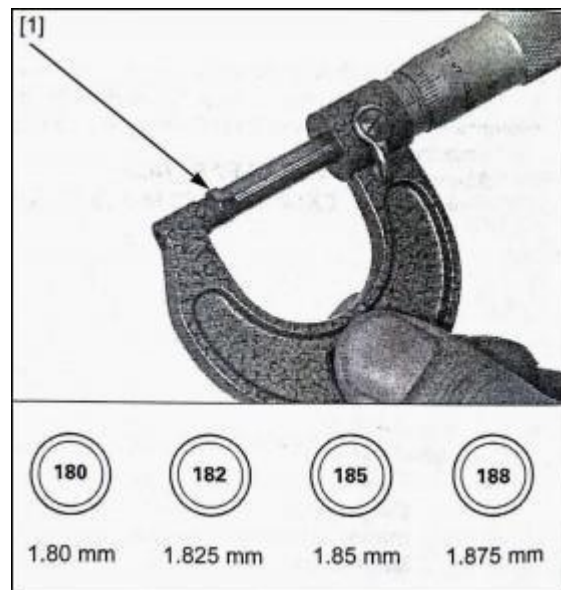
D: removed spacer thickness

Note:

Use the micrometer to ensure correct spacer thickness.

If the carbon deposition exceeds 2.9mm, rebuild the valve seat surface.

Apply the molybdenum disulfide solution to the end of the valve bar.

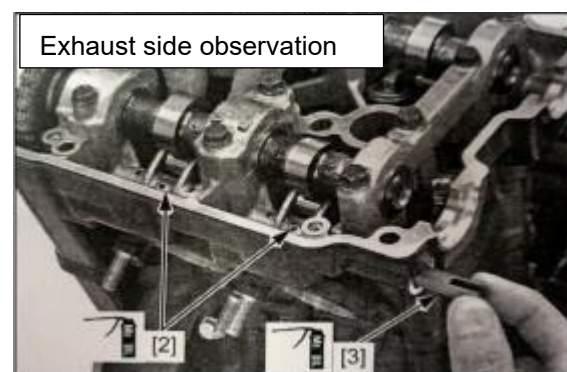


Install the new gasket [1] to the valve spring seat.

Apply the molybdenum disulfide solution to the sliding area of the rocker arm, the thrust surface and the outer surface of the rocker shaft.

Push the rocker shaft [2] away.

Fixed the rocker arm and insert the rocker arm shaft [3] into the cylinder head and rocker arm.



Apply oil to the plug bolt thread surface and install, pay attention to replace the new washer [2].

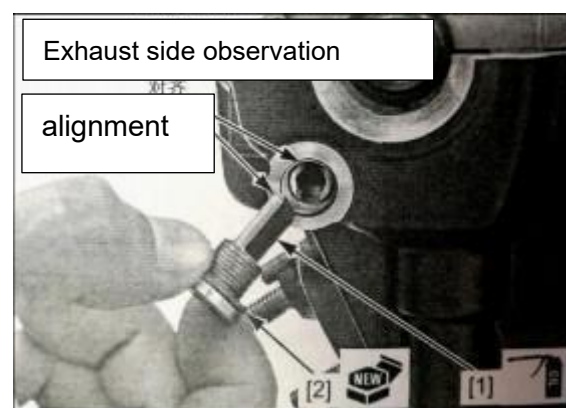
Tighten the bolts to the specified torque.

Torque: 16 N·m

Turn the camshaft several times.

Re-test the valve clearance.

Replace the new O-ring and apply oil.



Install it into the hole cover groove.

Apply grease to the view hole cover thread and install the view hole cover.

Tighten the visual hole cover to the specified torque.

Torque: 18 N·m

Install the cylinder head head.

2.6 Engine oil

Oil quantity inspection

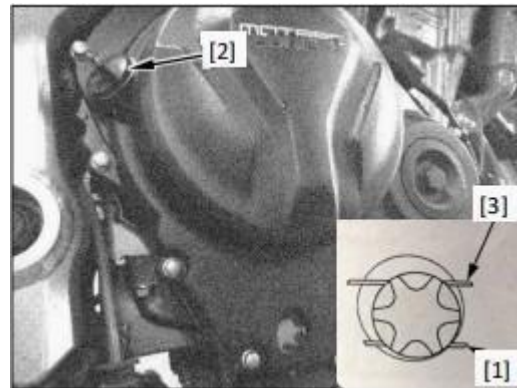
Start the engine and idle for 3-5 minutes.

Shut off the engine and wait for 2-3 minutes.

Put the motorcycle in an upright position on the horizontal plane.

Check the oil volume through the oil observation window.

If the oil level is below the minimum oil level line [1], remove the oil plug [2] and fill the crankcase with the specified oil with line [3] at the upper oil level.

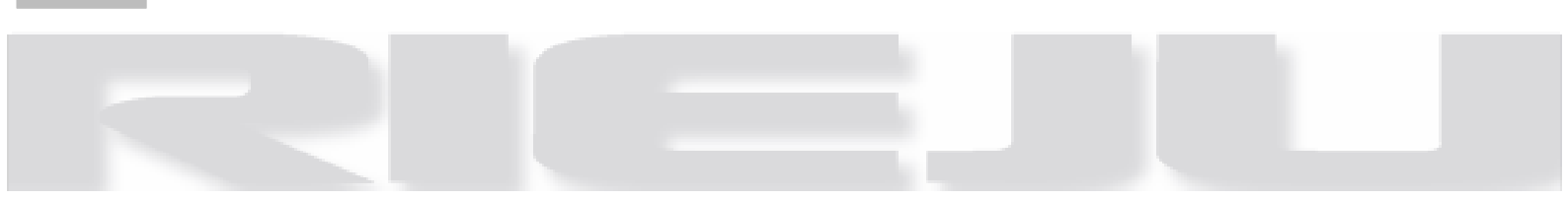


Install the oil plug.

Designated oil: SG 10 W-40

API Quality grade: SG or higher (do not use circular API service label on the oil)

JASO T903 Standard: MA Viscosity: SAE10W-40



Check whether the O-ring of the oil plug is in good condition, replace if necessary.

Apply the engine oil to the O-ring surface.

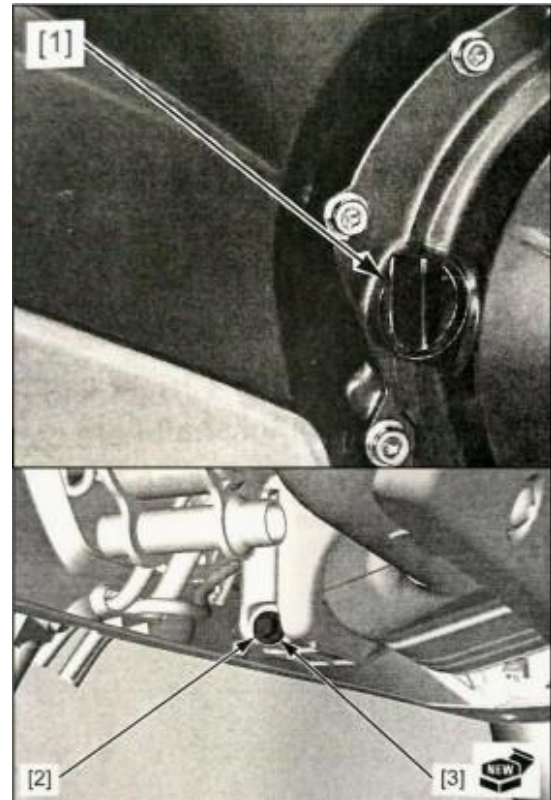
Oil change:

Heat engine. Close the engine and remove the oil filter cover [1].

Remove the oil bolt [2] and the washer [2] to discharge the oil. After fully draining the oil, install the oil drain bolts and replace the new washer.

Tighten the oil drain bolts to the specified torque.

Torque: 30 N · m



2.7 Oil fine filter

Dry oil.

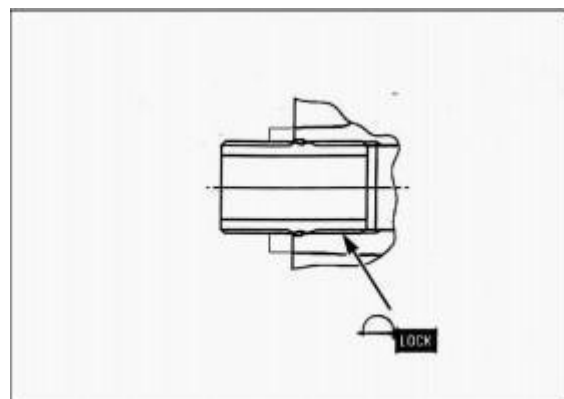
Remove the oil filter [1] with a special tool.

Tools:

[2] cap oil filter wrench

Install the filter connector and tighten to the specified torque.

Torque: 24 N · m

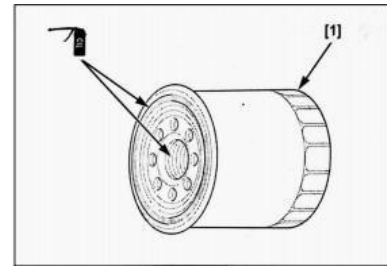


Apply oil to new oil filter [1] thread and O-ring. Install the oil essence filter and tighten to the specified torque.

Tool: [2] cap oil filter wrench

Torque: 12 N·m

Fill the crankcase with designated oil.



Note:

After completing all the engine maintenance items and confirming the specified range, check and adjust the idle speed. Before checking idle speed, check the following items:

- No fault indicator light flashing
- Spark plug status
- Air filter element status
- Throttle switch and throttle handle free trip

Must be in the state of the engine heat machine before accurately checking and adjusting idle speed.

Start the engine, heat to normal operating temperature and allow it to idle.

Check idle speed.

Idle: 1500 ± 100

If idle is not within the service limit value, check the following components:

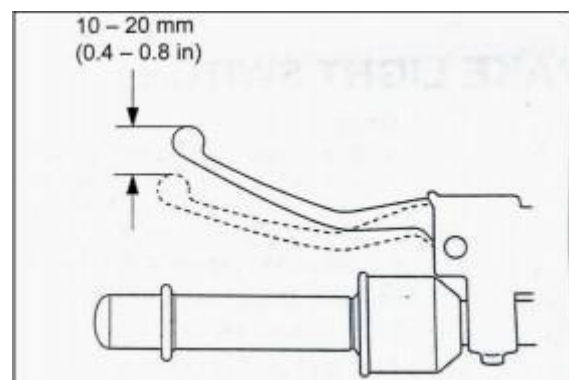
- -Air intake or engine tip problems
- -idle control valve operation.

2.9 Clutch

Check whether the clutch cable is twisted or damaged, and lubricate the clutch cable if necessary.

Measure the free trip of the clutch handle at the clutch handle end.

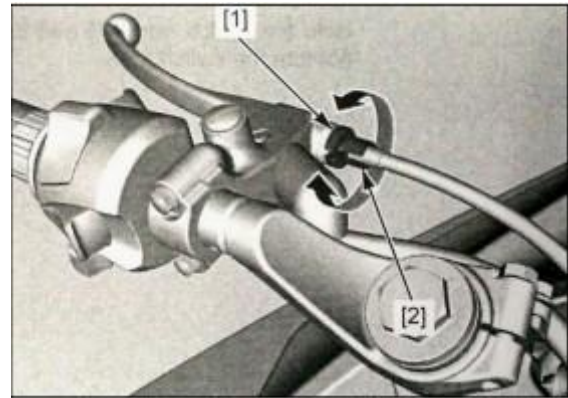
Free trip: 10-20mm



Small adjustments can directly adjust the regulator on the clutch handle.

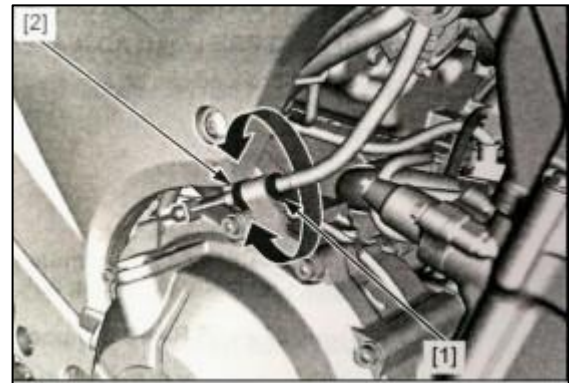
Release the lock nut [1] and turn the regulator as required.

Hold the regulator and tighten the lock nut. When the regulator thread is exceeded, an accurate free stroke cannot be obtained, and the master regulator is required.



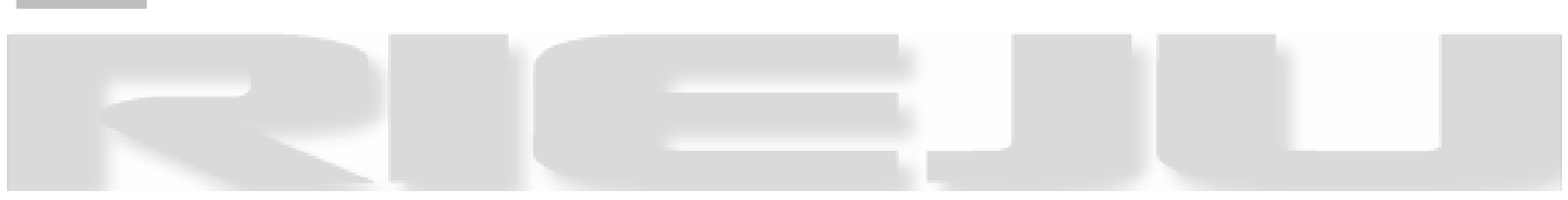
The master regulator operates by adjusting the regulator nut [1] located in the clutch control arm. Release the lock nut [1] and turn the regulator as required.

Hold the regulator and tighten the lock nut. If the correct clutch travel cannot be obtained, or the clutch slips during the trial ride, break down and check the clutch.



3. Cooling System

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3.11	Pipe joint	43



3.1 Repair Information

Caution!!!
Do not remove the radiator cover before engine and radiator cooling to prevent coolant spray and scald.

Caution

The use of coolant with added silicate inhibitor can cause premature wear of the pump sealing ring or blockage of the radiator channel. Using running water can lead to engine damage.

- Add coolant to the secondary tank. Do not remove the radiator cover except for adding or discharging coolant.
- No need to remove the engine from the frame while maintaining the cooling system.
- Avoid the leakage of the coolant to the painted surface.
- Check the leakage with the cooling system tester after the system maintenance.
- Coolant temperature indicator / water temperature sensor inspection.
- Fan control relay inspection.

3.2 Cooling Specifications

Items		Specification
Coolant capacity	Radiator & engine	1.4 liter
	Water tank	0.12 liter
Pressure relief pressure of the radiator cover		108-137 kPa
Thermostat	Start opening the temperature	80-84°C
	Fully open temperature	95°C
	Valve lift	Not be less than 8mm
Recommend to use coolant		Ethanol without silicate coolant
Standard coolant concentration		Mix with distilled water 1:1

3.3 Troubleshooting

Engine temperature is too high

- Coolant temperature indicator / water temperature sensor fault -section temperature valve not open
- Radiator cover fault
- Coolant insufficient
- Radiator channel, hose, water pipe blockage
- Circulation system intake
- Cooling fan motor fault
- Fan control relay fault
- Water pump fault

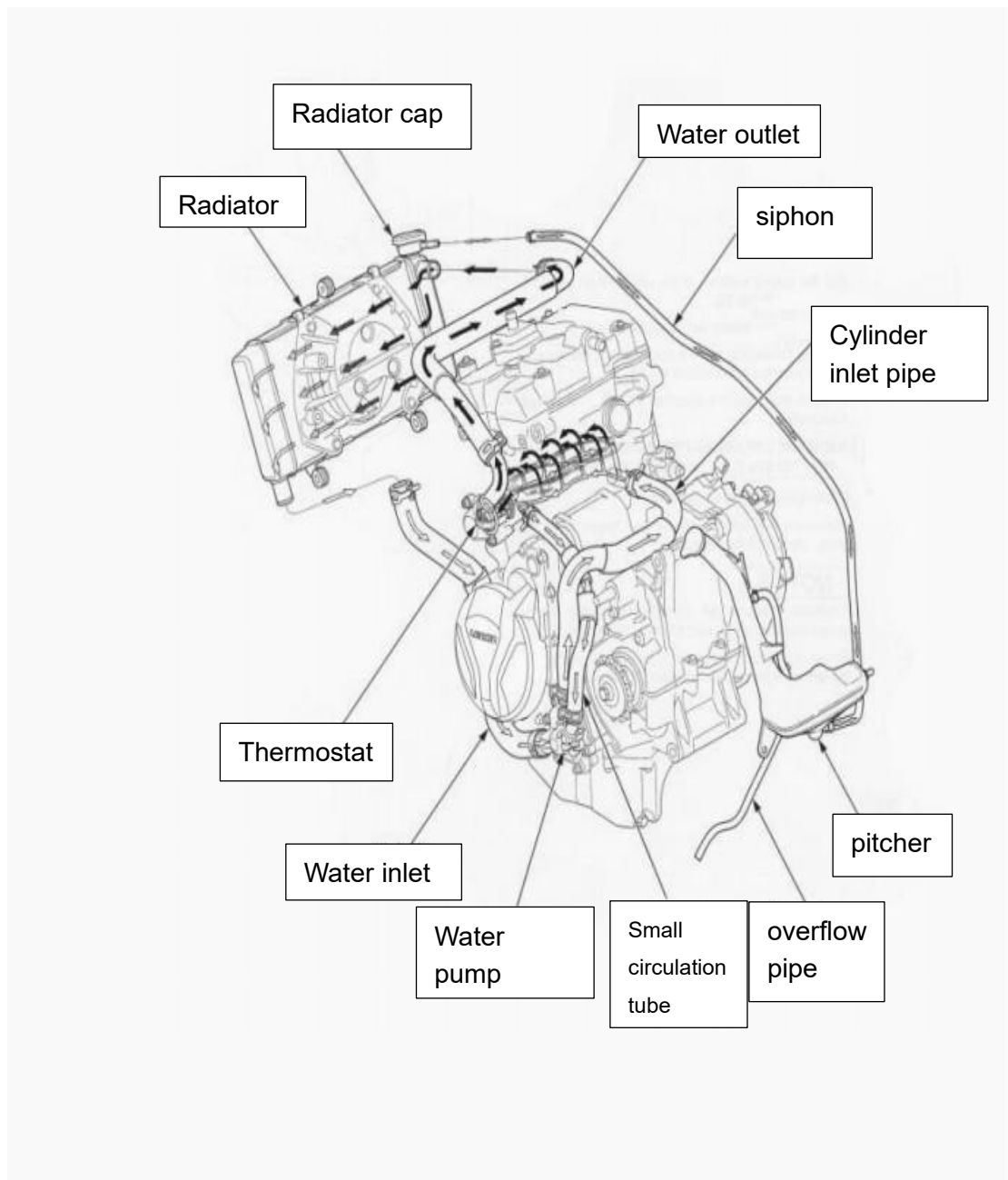
Engine temperature is too low

- Coolant temperature indicator / water temperature sensor fault -temperature valve open
- Fan control relay fault

Coolant leakage

- Defects on the water pump mechanical mechanism
- O-ring seal aging
- Radiator cover fault
- Cylinder head sealing ket is damaged or loosen the aging
- The hose connection is released or the pipe clamp is not clamped
- Damage or aging of the hose
- Radiator damage
- The heater cover, pump cover pipe joint is loose

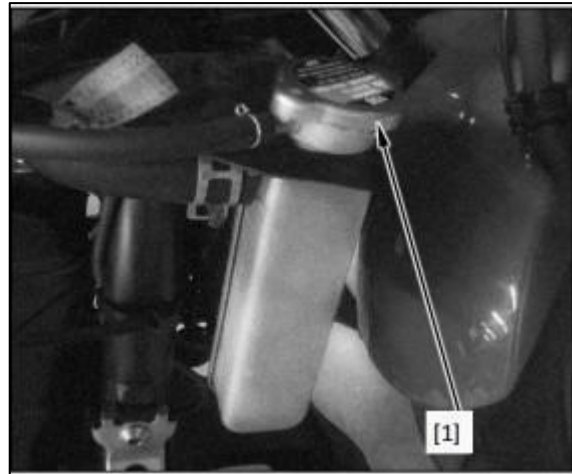
3.4 System Flow Mode



3.5 System Testing

Radiator cover / system pressure detection

remove fairing of right middle lobe
remove radiator cover [1]

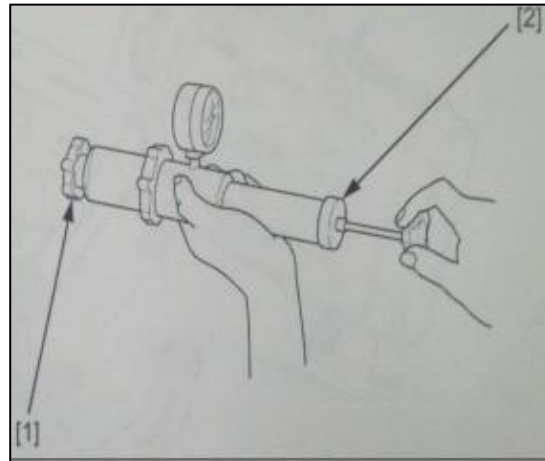


Wet the radiator cover gasket and install the cover into the detector [2].

Pressize the radiator cover with a detector.

If the radiator cover cannot keep the pressure or the released pressure is too high or too low, it needs to be replaced.

The radiator cover must be able to withstand a specified pressure of at least 6S.



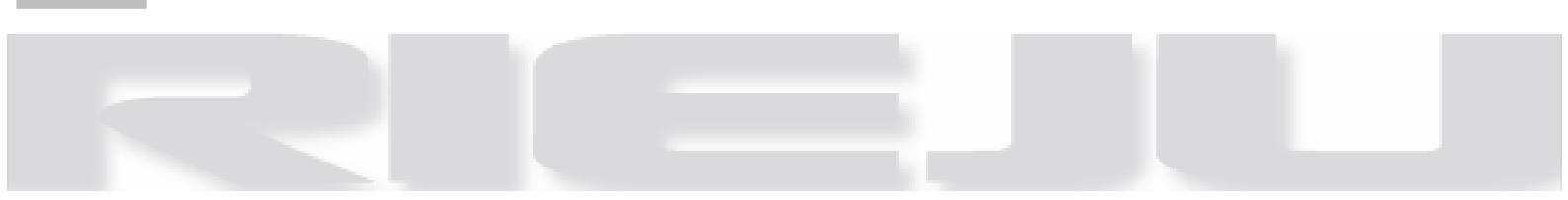
Radiator cover pressure: 108-137 KPa

Connect the detector to the radiator.

Pressize the radiator, engine and hose with a detector to detect air tightness.

Caution:

- Over pressure can damage the cooling system parts. Pressure should not exceed 137 KPa.
- If the system cannot withstand the specified pressure of at least 6S, repair or replace the parts.

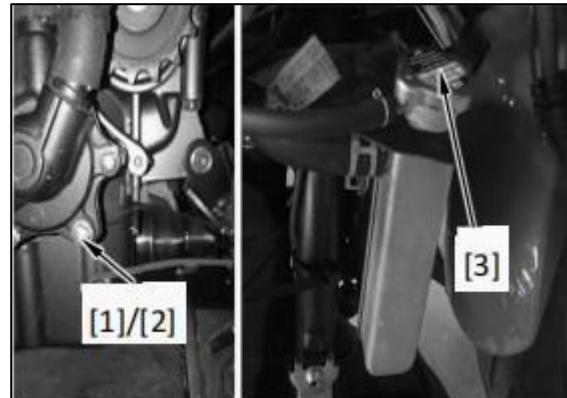


3.6 Coolant Change

Replace coolant / exhaust

Note: When adding coolant to the system or secondary tank or checking the coolant dose, the motorcycle should be placed horizontally and in an upright position.

Remove fan fairing remove water pump drain bolt [1] and washer [2].
Remove the radiator cover [3] and drain the coolant.



Remove the drain bolts [4] and flat washer [5] on the cylinder and drain the coolant.
After replacing the new flat washer, install the drain bolts. Tighten the drain bolts to the correct torque.



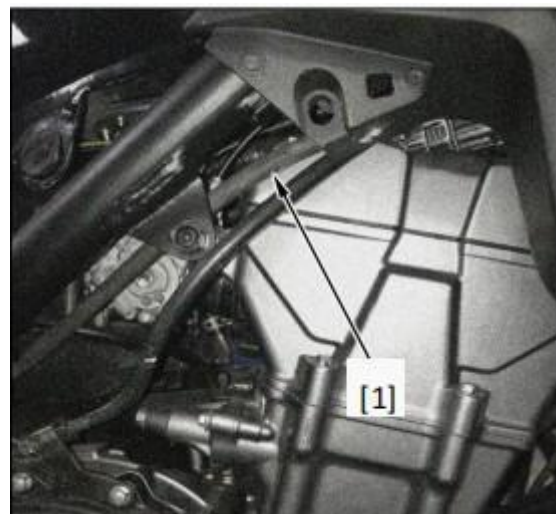
Torque:

Water pump drain bolt: 10 Nm (1.0 kgf m, 10 lbfft)

Cylinder head drain bolt: 12 Nm (1.2 kgf m, 10 lbfft)

Disoff the siphon hose [1] from the radiator.
Place the hose lower outside the engine frame and drain the coolant from the storage tank.

Drain the coolant and rinse the inside storage tank with water. Install the hose into the pipe clamp and onto the radiator.



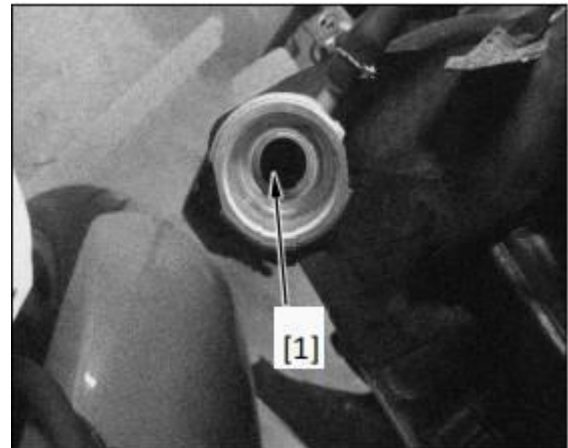
Pass the injection hole and fill the cooling system with recommended coolant to the neck [1].

Recommended antifreeze:

Ethanol without siliceous acid coolant

Coolant concentration standard:

Mix with distilled water 1:1



3.7 Thermostat

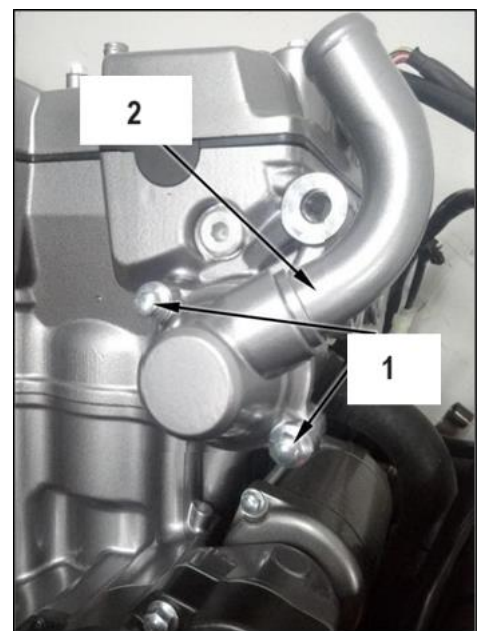
Removing / installing

Drain the coolant. Remove the bolt [1] and the thermostat cover [2].

Remove the thermostat valve from the cylinder head. The installation process is the opposite to the disassembly process.

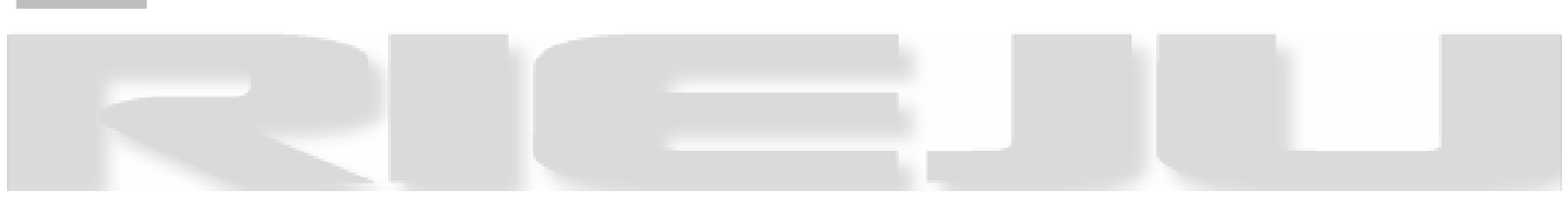
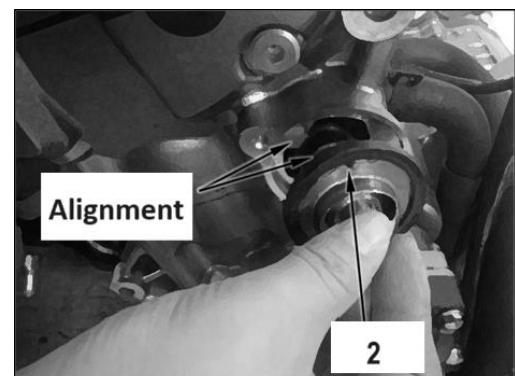
Torque:

Thermostat cover bolt: 12N·m(1.2kgf · m, 9 lbf · ft)



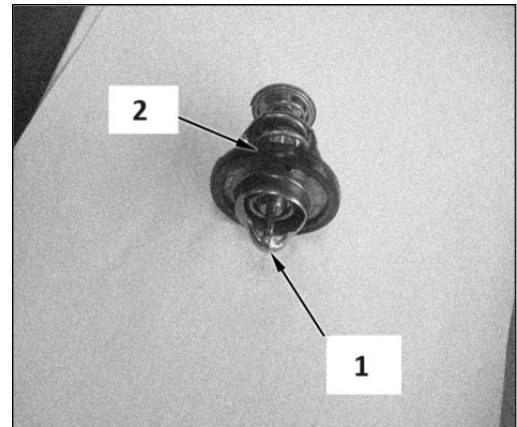
Note:

When installing the thermostat, pay attention to align with the vent [2], and adjust the bump with the groove on the cylinder head. The system fills up and discharges the coolant



Check

Thermostat [1] appearance for damage. If the thermostat valve is open at room temperature, need to replace. Check the sealing ring [2] for damage and, if required, need to replace.



Note:

Wear heat insulation gloves and take appropriate eye protection measures.
Keep the flammable materials away from the electrical components.

Do not let the thermostat and thermometer [1] touch the chassis or you will get the wrong reading.
Water was heated to operating temperature and maintained for 5 minutes.

Hang the thermostat [2] in the hot water to check for any abnormal function.

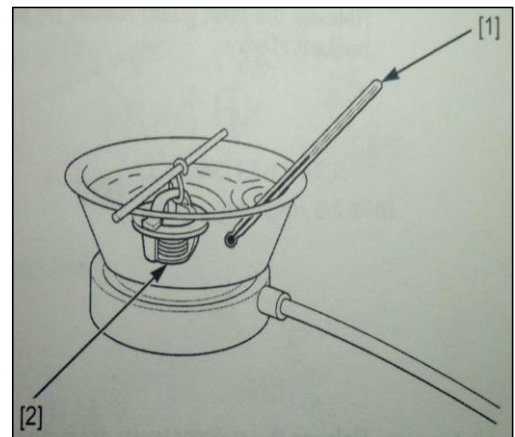
Thermostat start opening temperature:

80-84°C (176-183 °F)

Full opening height:

not less than 8mm (0.3 in) at 95°C (203°F)

If the thermostat does not open at the specified temperature, it needs to be replaced.



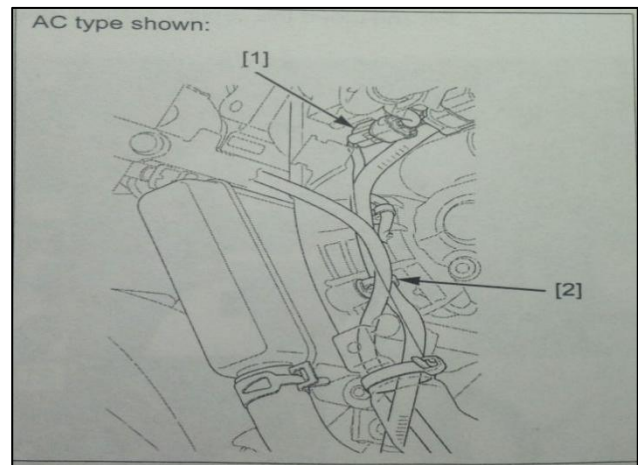
3.8 Radiator

Disassembly/Installation

Drain the coolant Disconnect the fan motor 2P (black) connector [1],

And remove it from its original state.

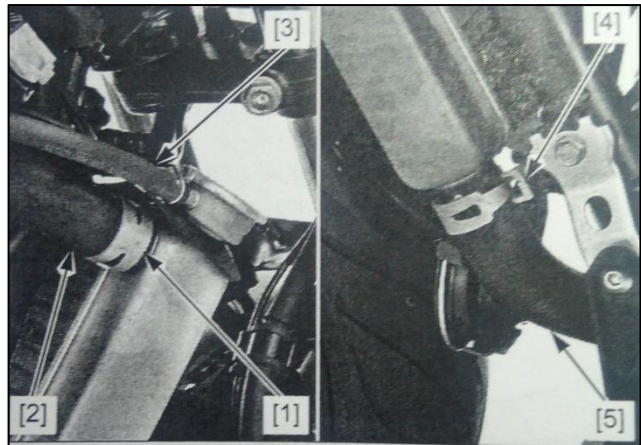
Remove the wire clip from the fan motor cover [2].



Release the pipe clamp [1] and release the hose on the radiator [2].

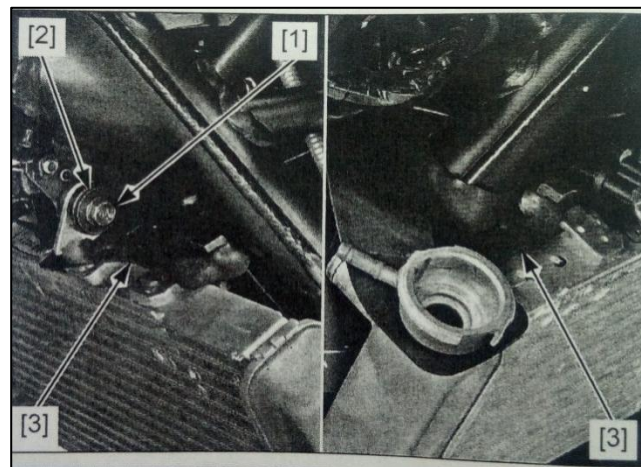
Loosen the siphon hose [3].

Release the pipe clamp [4] and release the hose under the radiator [5].



Remove the upper mounting bolts [1] and washers [2].

Release the thermal protective rubber from the filler neck, bend, and cable.

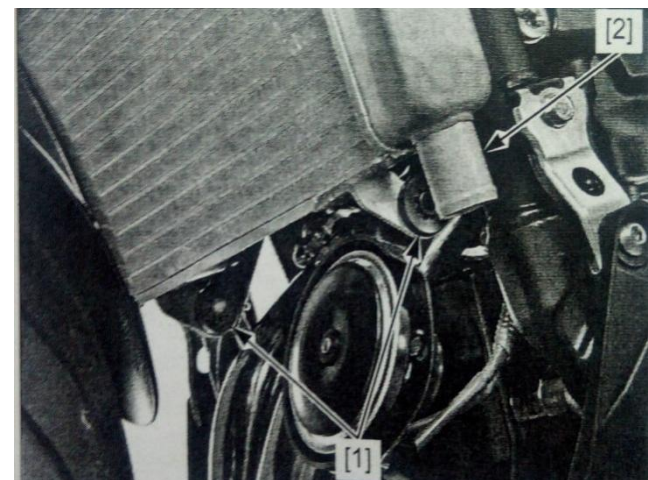


Be careful not to damage the radiator fins.

Release the lining ring [1] from the convex column by moving the heat sink to the left and remove the heat sink [2].

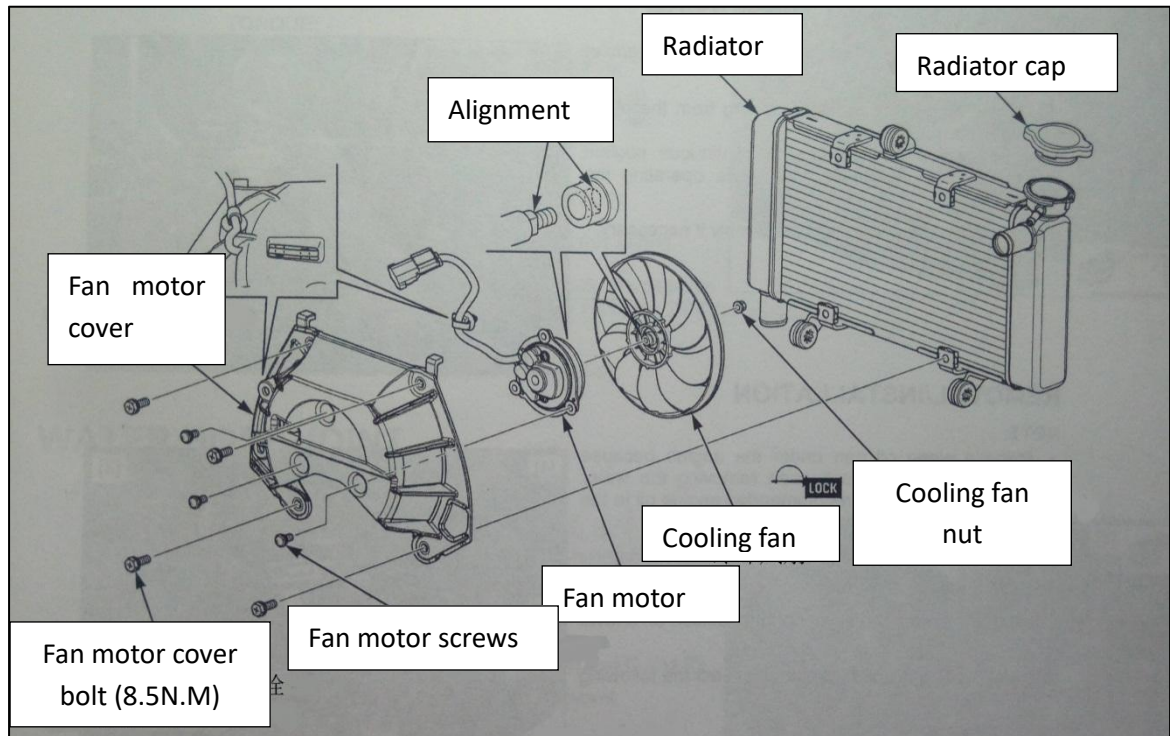
The installation sequence is opposite to the disassembly sequence.

Filling and draining the system with coolant



Disassembly/Assembly

Disassemble and assemble the radiator as shown in the following figure.



3.9 Water Tank

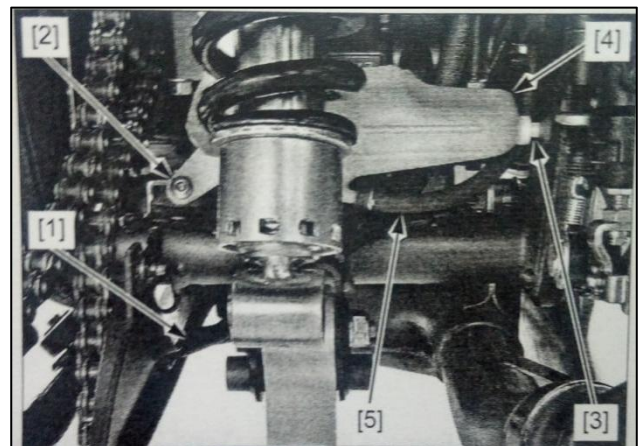
Disassembly/Installation

The disassembly steps are as follows:

- Fan motor cover
- Fan and motor

Remove the overflow pipe from the ventilation cap below [1].

Remove the bolts [2], and then remove the water tank [4] and support ears [3] from the frame.

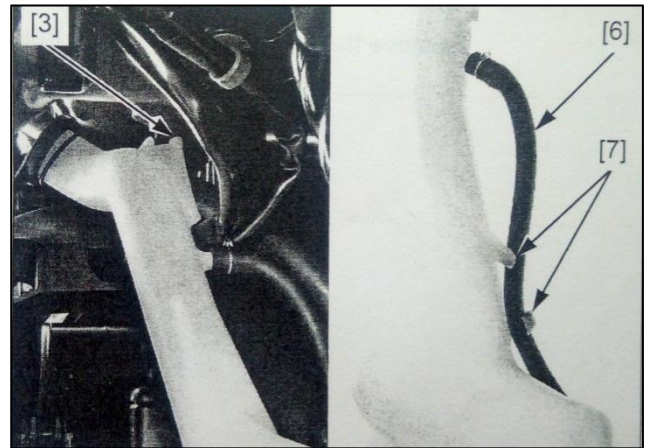


Loosen the siphon hose [5], drain the coolant, and remove the radiator tank.

Disconnect the overflow pipe [6] and remove it from the guide plate [7].

The installation sequence is opposite to the disassembly sequence.

Fill the water tank with the recommended coolant.



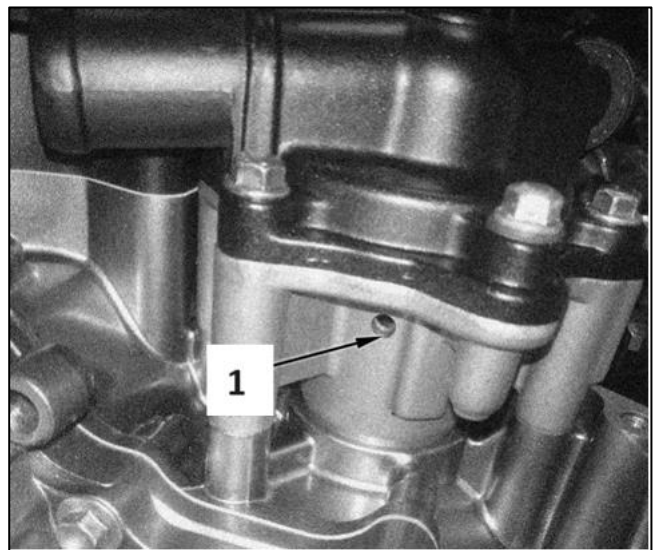
3.10 Water pump

End face sealing inspection

Check the overflow hole of the water pump [1] to confirm if there is any coolant leakage.

- It is normal for a small amount of coolant to flow out.
- Ensure that there is no continuous coolant leakage when starting the engine.

If necessary, replace the water pump assembly.



Disassembly/Installation

Attention:

- Place a clean oil pan under the engine, and oil will flow out when disassembling the water pump body. After installation, add the designated oil to the designated location (see lubrication system maintenance guide for details).

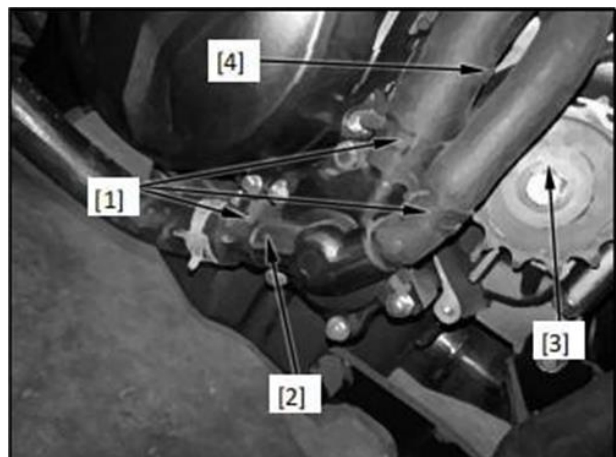
Drain the coolant.

Remove the drive sprocket cover.

Keep the motorcycle upright on a level surface.

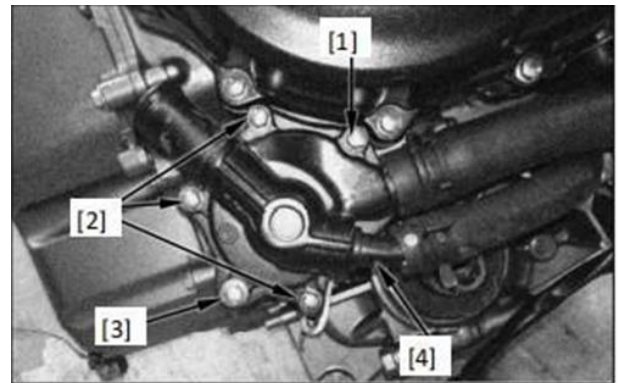
Release the pipe clamp [1] and release the following devices from the water pump:

- Lower radiator pipe [2]
- Small circulating water pipe [3]
- Water inlet pipe [4]



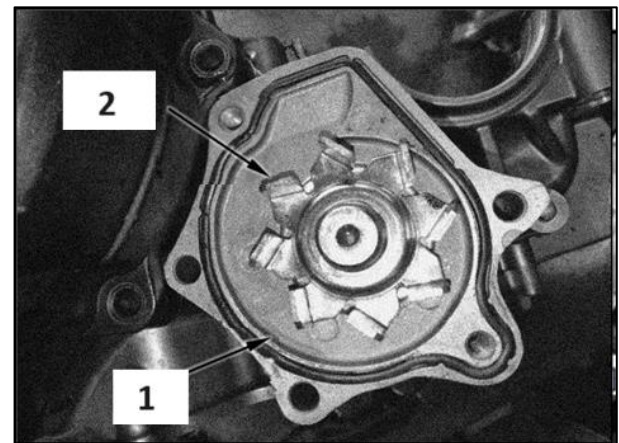
Remove the following components:

- Water pump cover bolt [1]
- 3 mounting bolts [2]
- Drain bolt [3]
- Water pump cover [4]



Remove the O-ring from the water pump cover [1].

Remove the water pump from the crankcase [2].



Remove the water pump O-ring [1].

The installation sequence is opposite to the disassembly sequence.

Torque:

Water pump mounting bolts:

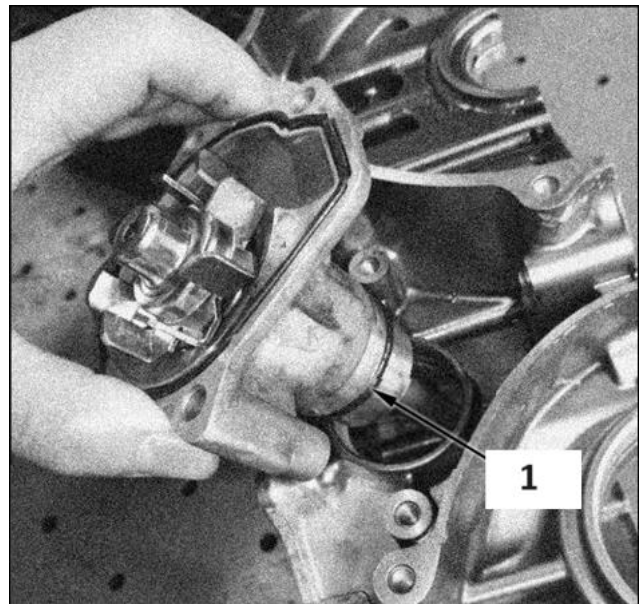
12N · M (1.2kgf · m, 9lbf · ft)

Water pump cover bolts:

10N · M (1.0kgf · m, 10lbf · ft)

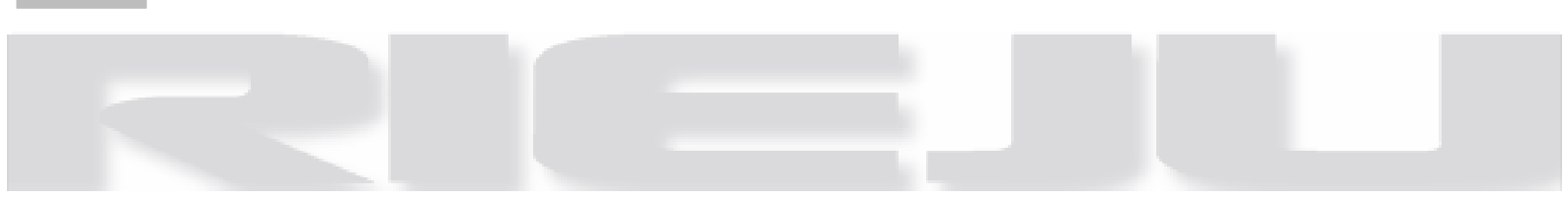
Attention:

- Do not disassemble the water pump body.
- Replace the O-ring.
- Oil should be applied to the O-ring of the water pump body.
- The O-ring of the water pump cover is not lubricated.
- Align the groove on the water pump shaft with the tail end of the oil pump shaft by rotating the water pump impeller.



Check the oil level.

Filling and draining the system with coolant



3.11 Pipe joint

Disassembly/Installation

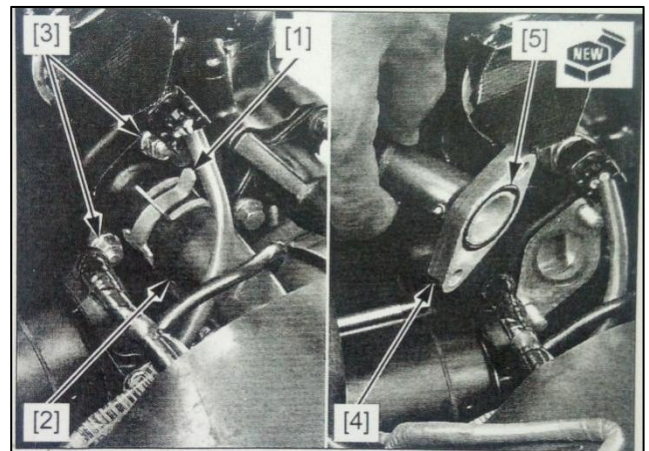
Drain the coolant.

Remove the throttle valve/air filter assembly.

Release the pipe clamp [1] and remove the water inlet pipe [2].

Remove the nut [3], pipe joint [4], and O-ring [5] .

The installation sequence is opposite to the disassembly sequence.



Attention:

- Replace the O-ring.

Filling and draining the system with coolant

Replacement of Stud Bolts

Remove the water hose connector.

Screw the nut onto two bolts, tighten them, and then use

Wrench the double headed bolts out.

Use new double headed bolts to lock the device.

Install the double head bolts onto the intake cylinder block, as shown in the figure

Show.

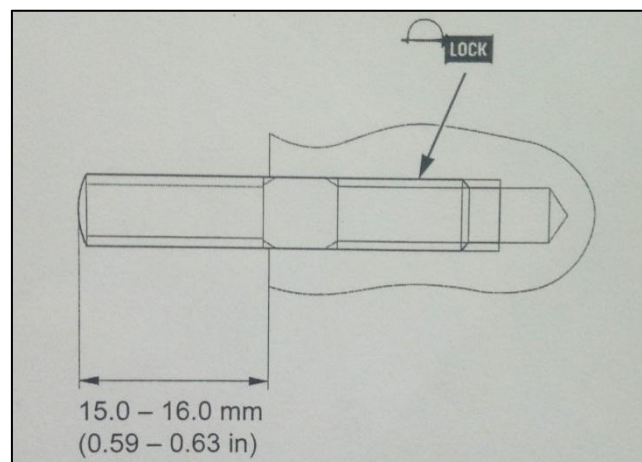
After installing the double head bolts, check the bolt heads to

Is the length of the cylinder block surface within the specified length

Inside.

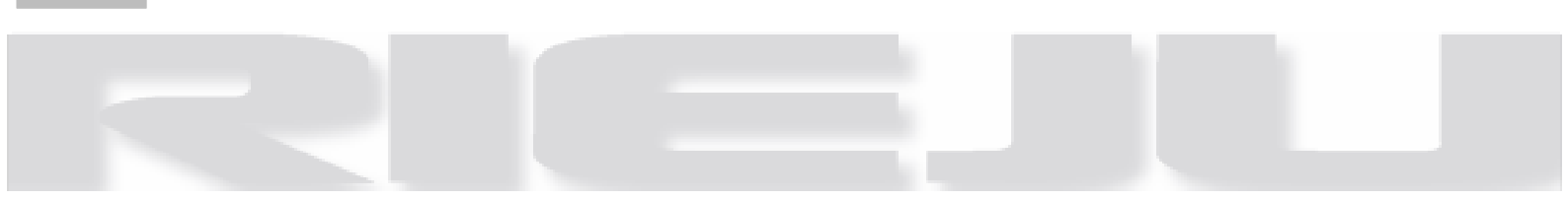
Specified length: 15.0-16.0mm

Install the pipe joint



4. Lubrication system

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4.3	Troubleshooting	47
4.4	Lubrication flow diagram	48
4.5	Oil pressure inspection.....	49
4.6	Oil pump	49
4.7	Pressure relief valve.....	51
4.8	Oil filter.....	52



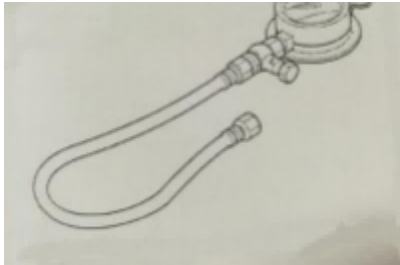
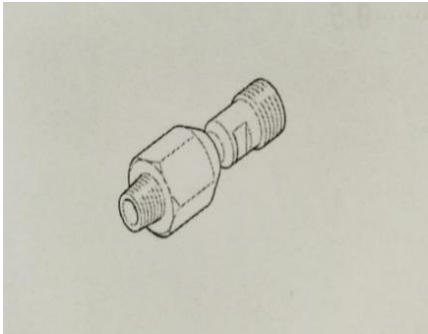
4.1 Maintenance information

Warning

Repeated and long-term skin contact with used engine oil can cause skin cancer. This is rare unless you touch the oil every day. However, we recommend that you use an appropriate protection. After working with oil, wash your hands in a soap box with clean water as soon as possible.

- No need to remove the engine from the frame while repairing the oil pump.
- The premise of the maintenance steps in this chapter is to drain the engine oil.
- When removing and installing the oil pump, be careful not to let dust and dirt into the engine.
- If any oil pump component wear exceeds the specified service limits, replace the entire oil pump assembly.
- After installing the oil pump, check for oil leakage and check whether the oil pressure is correct,
- Check the engine oil pressure display and the EOP switch.
- Piston injection jet repair.

Tool

Oil pressure measuring instrument	Oil pressure gauge attachment
	



4.2 Lubrication system specifications

Item		Standard value (mm)	Maintenance limit value (mm)
Oil capacity	After changing the oil	2.5 L	—
	After removing the oil filter	2.7 L	—
	Remove the engine	3.2 L	—
Recommended oil		The recommended engine oil is: SG 10W -40 API quality level: SG or higher (do not use energy efficient oil noted on the circular API service label) JASO T 903 Standard: MA Viscosity: SAE 10W-40	
Oil pressure sensor open pressure		At 1,200 rpm / 80°C: 93 kPa	—
Oil pump rotor	Leaf tip gap	0.15	0.20
	The middle gap	0.15-0.21	0.35
	On both sides of the gap	0.02-0.09	0.12



4.3 Troubleshooting

Oil level too low

- High oil consumption
- Oil leakage from external components
- Wear or inadequate installation of piston rings
- Cylinder wear
- Worn core shaft seal
- Worn valve guide

Oil pressure too low

- The oil level is too low
- The oil filter screen is blocked and blocked
- Internal components leak oil
- Incorrect use of engine oil

No oil pressure

- The oil level is too low
- Oil pressure safety valve stuck open
- The oil pump transmission chain is broken
- The teeth of the main and driven wheels of the oil pump are damaged
- Damaged oil pump
- Internal components leak oil

Oil pressure too high

- The oil pressure safety valve is closed
- Clogged oil filter screen, return hole, and measuring hole
- Incorrect use of engine oil

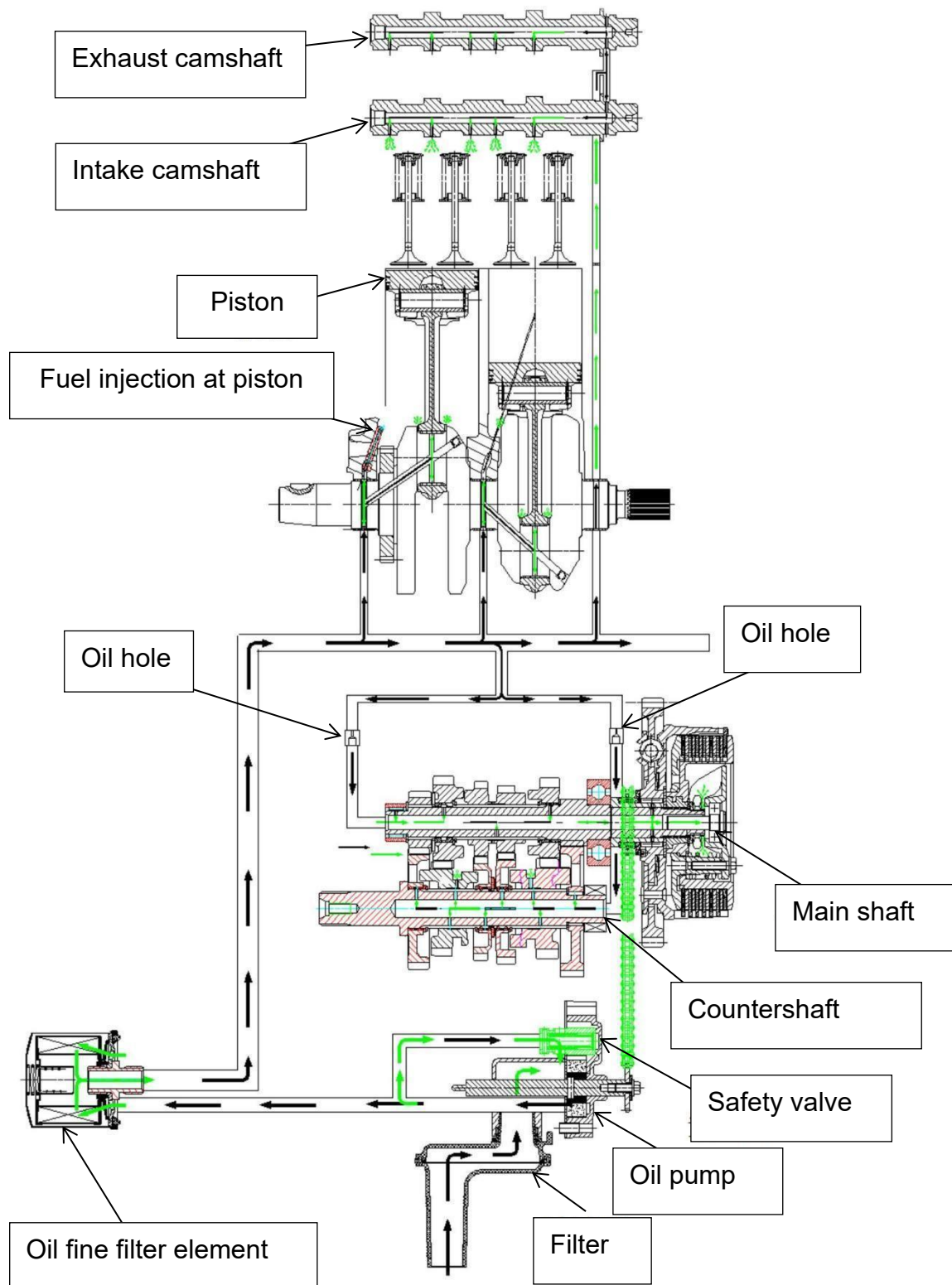
Dirty oil

- Failure to regularly replace the engine oil and filter screen
- Damaged piston ring

Oil emulsification

- Cylinder head cover expansion and cracking
- Leakage of coolant channel
- The engine is flooded with water.

4.4 Lubrication flow diagram



4.5 Oil pressure inspection

Attention:

- When the engine is running, if the engine oil pressure gauge remains constant, check the pressure gauge system before applying oil pressure.

Remove the oil pressure sensor.

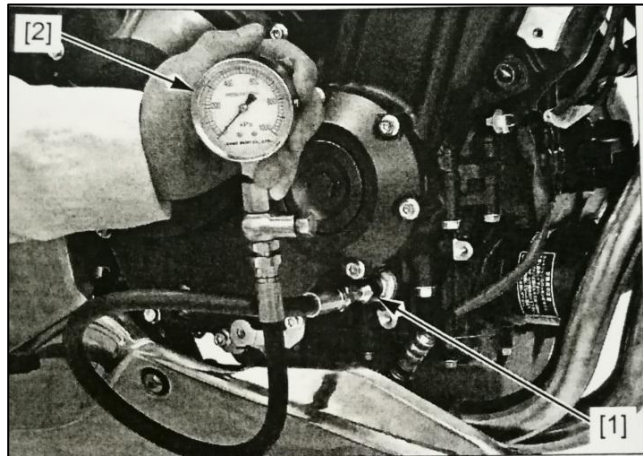
Install the oil pressure measuring instrument accessory [1] into the switch base.

Connect the oil pressure measuring instrument [2] to the instrument accessories.

Tools:

Oil pressure measuring instrument

Oil pressure gauge attachment



Check the oil level and recommend using engine oil, if necessary, Heat the engine to operating temperature (approximately 80 °C/176 °F) and increase the engine speed to 1200r/min,

Read the oil pressure value

Standard: At 1200rpm/80 °C, the reading is: 93kPa (0.9kgf/cm²,13psi)

Turn off the engine and remove the tool.

Install the oil pressure sensor.

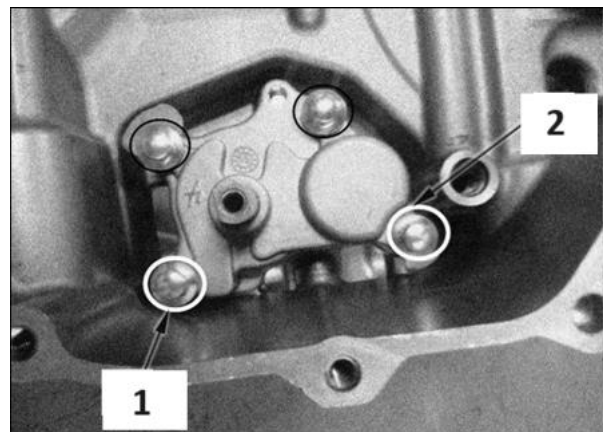
4.6 Oil pump

Disassembly/Installation

Remove the clutch.

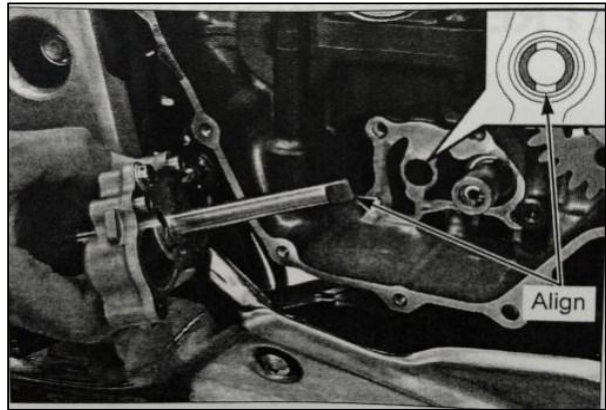
Remove the bolts [1] and the oil pump [2].

The installation process is the opposite of the disassembly process.



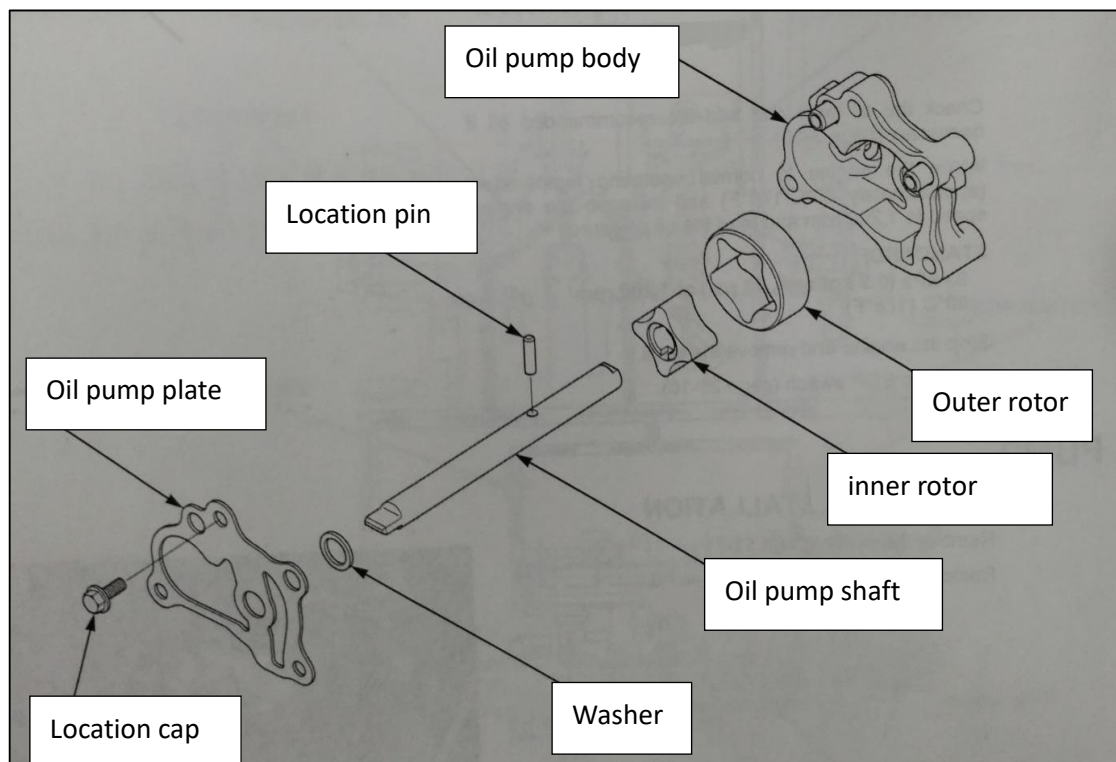
Attention:

- Align the groove between the oil pump shaft and the water pump shaft
Align.



Disassembly/Assembly

The disassembly and assembly of the oil pump are as follows:



Inspection:

- Inspection of the main and driven wheels and driving chains of the oil pump.

Check the following components for damage, abnormal wear, deformation, and combustion.

- Oil pump shaft
- Locating pin
- Inner rotor
- Outer rotor
- Oil pump seat body

Measure the oil pump clearance according to the lubrication system specifications.

If any measured values exceed the specified repair limit, replace the entire oil pump assembly.

4.7 Pressure relief valve

Disassembly/Installation

Remove the oil pump (P6).

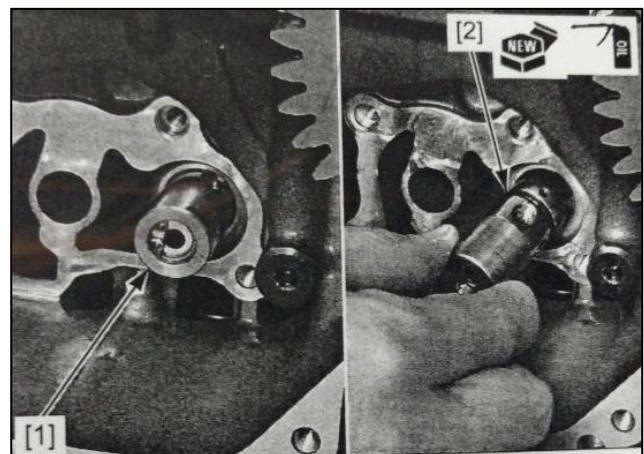
Remove the pressure relief valve [1] and O-ring [2].

Replace with a new O-ring.

Install the O-ring into the relief valve groove.

Install the pressure relief valve into the groove of the crankcase body.

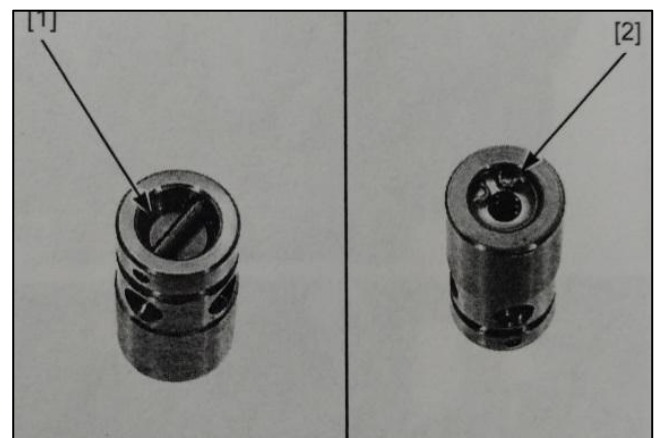
Install the oil pump (P6).



Inspect

Check the operation of the relief valve by pushing the control valve push rod [1].

Remove the circlip [2] and disassemble the pressure relief valve.

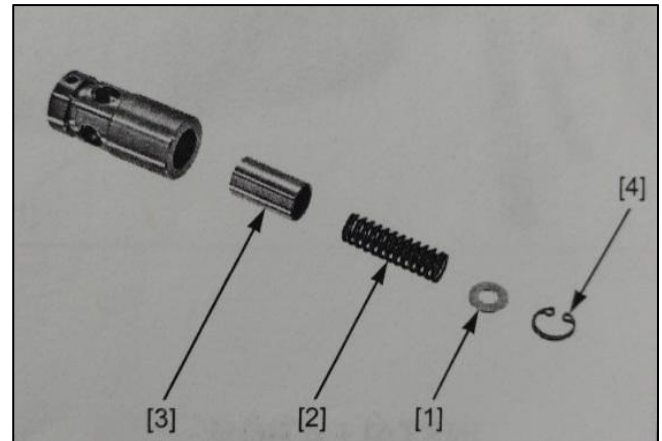


Remove the washer [1], spring [2], and piston [3].

Check the control valve push rod for wear, scratches, or damage.

Check whether the spring is fatigued or damaged.

The installation sequence of the pressure relief valve is opposite to the disassembly sequence.



Attention:

- When installing the elastic retainer ring, its chamfered surface should face outward.
- Ensure that the circlip is installed into the groove

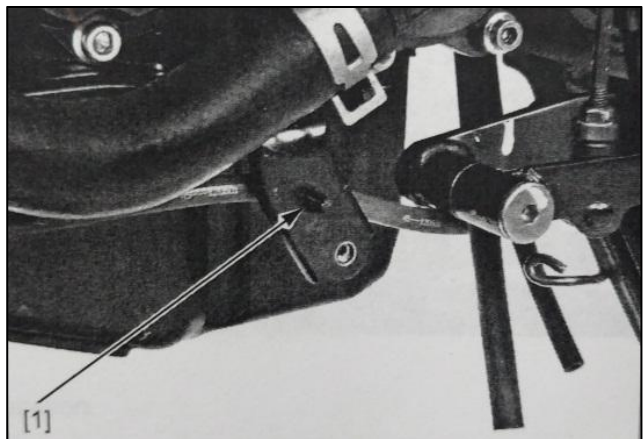
4.8 Oil filter

Disassembly

Drain the oil.

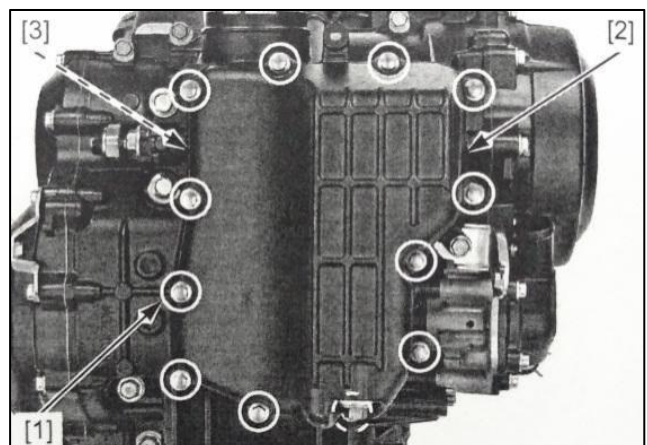
Remove the exhaust pipe.

AC series: Remove the drain pipe clamp from the bottom shell [1].



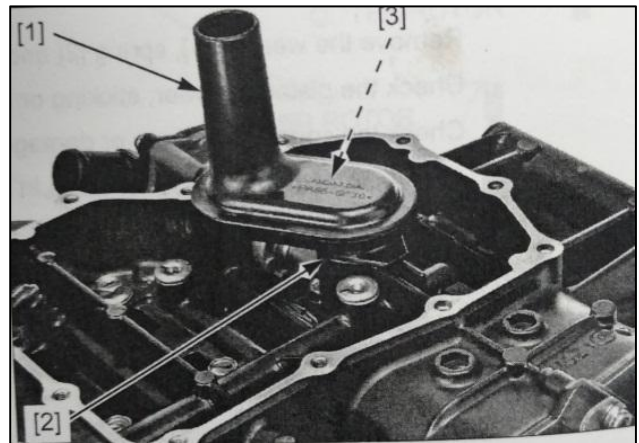
Remove the oil pan bolts diagonally [1] and remove the oil pan

Shell [2] and sealing gasket [3].



Remove the oil filter [1] and sealing ring [2].

Clean the filter mesh [3] and check for damage.



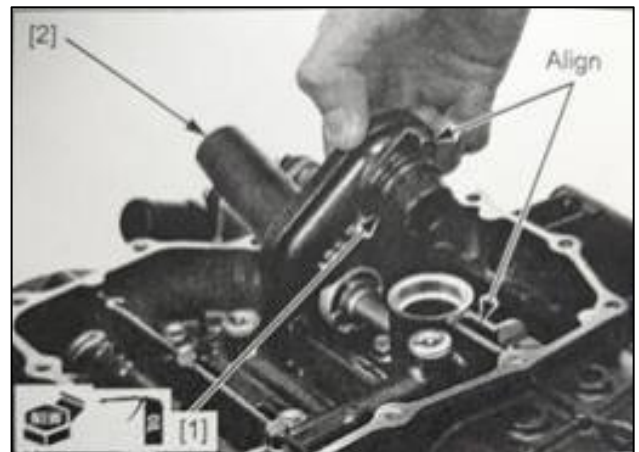
Installation

Attention:

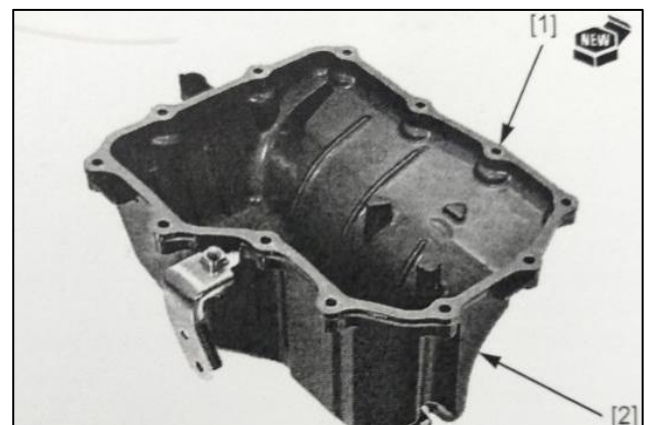
Do not damage the installation surface. Clean the sealing gasket on the oil pan installation surface.

Replace with a new sealing ring [1] and install it on the filter [2].

Install the filter into the crankcase, aligning the convex shaft on the filter with the groove on the crankcase.

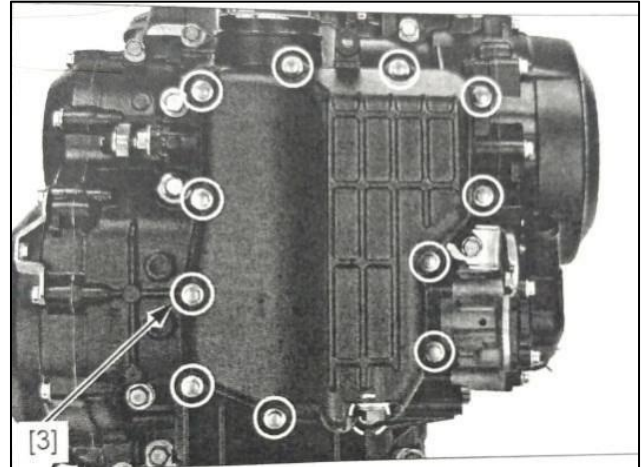


Replace with a new sealing gasket [1] and install the oil pan [2].



Install the oil pan and bolts [3] onto the crankcase body.

Tighten the bolts in diagonal order.

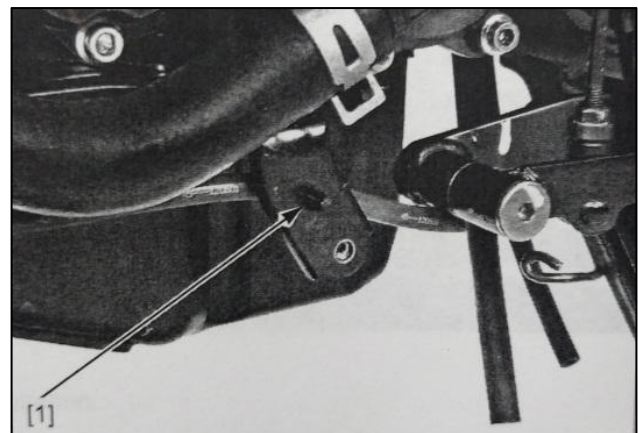


AC series:

Install the drainage pipe bracket [1].

Install the drainage pipe.

Suggest adding oil to the engine, and check for oil leaks



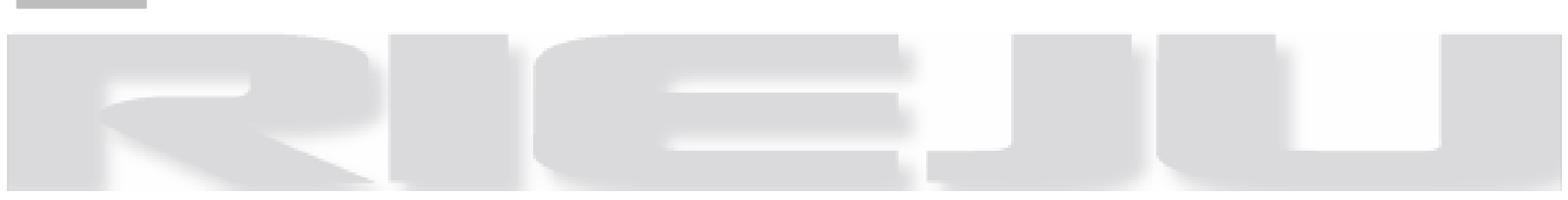
5. Cylinder head and valve

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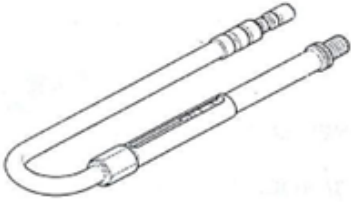
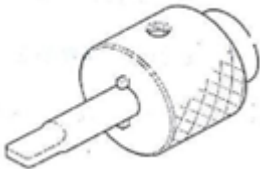
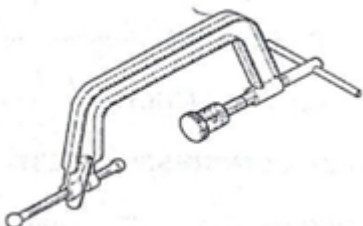
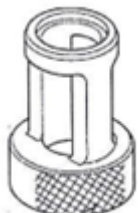
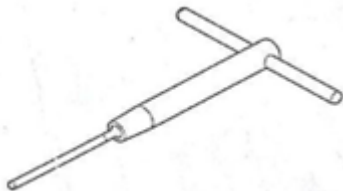


5.1 Maintenance Information

- This chapter covers the maintenance and inspection of cylinder heads, valves, camshafts, and rocker arms.
- When repairing the camshaft, rocker arm, and tensioner adjustment screw, there is no need to remove the engine from the frame; Maintenance gas
- When removing the cylinder head and valve, the engine must be removed from the frame.
- When disassembling, the disassembled parts should be marked and placed properly to ensure correct positioning during reassembly.
- Before inspection, all dismantled components should be cleaned with cleaning agent and blown dry with compressed air.
- The camshaft lubricating oil is injected through the oil pipes inside the cylinder head and cylinder head cover. Therefore, before assembling the cylinder head and cylinder head cover, the oil pipes should be cleaned.
- When disassembling the cylinder head and cylinder head cover, be careful not to damage the joint surface.



Tool

Compression table attachment	Tensioning device clamp B	Valve spring compression tool
		
Valve spring compression attachment	Valve guide drive device, 4.5mm	Valve guide adjustment driver
		
Valve guide reamer, 4.5mm	Knife holder, 4.5mm	Valve seat trimming tool, 27.5mm (IN, 45 °)
		
Valve seat trimming tool, 24mm (EX, 45 °)	Flat milling cutter, 28mm (IN, 32 °)	Flat milling cutter, 24mm (EX, 32 °)
		
Internal milling cutter, 26mm (IN, 60 °)	Internal milling cutter, 32mm (EX, 60 °)	
		

5.2 Cylinder head / valve specifications

Item			Standard value (mm)	Maintenance limit value (mm)
Electric start cylinder pressure			1372kPa	—
Valve clearance		Intake valve	0.16±0.03	—
		Exhaust valve	0.27±0.03	—
Rocker arm, Rocker shaft	Shake arm inner diameter	Intake / exhaust	10.000-10.015	10.10
	Shake arm outer diameter	Intake / exhaust	9.972-9.967	9.75
	Gaps between the rocker and rocker axes	Intake / exhaust	0.013-0.043	0.10
Camshaft	Cam bulge height	Intake	30.3955-30.6355	30.376
		Exhaust	30.1424-30.3824	30.122
	Clearance between journal and hole		0.020.062	0.10
	Beat		-	0.04
Valve and valve catheter	The valve pole diameter	Intake	4.475-4.490	4.465
		Exhaust	4.465-4.480	4.455
	Internal diameter of valve catheter	Intake / exhaust	4.500-4.512	4.54
	Space between valve lever to valve catheter	Intake	0.005-0.042	0.07
		Exhaust	0.015-0.052	0.08
	Catheter height	Intake/ exhaust	14.10-14.30	—
	Valve seat width	Intake/ exhaust	0.90-1.10	1.5
Valve spring free length		Bore size	29.78	28.58
		External diameter	39.98	38.78
Cylinder head planarity		—		0.10

5.3 Troubleshooting

- Top failure of the engine usually affects engine performance. These faults can be diagnosed through compression testing, detection rods or stethoscopes can also be used to track the source of engine noise, with a tracking range up to the top tip.
- If the engine performs poorly at low speeds, please check if there is white smoke in the crankcase ventilation pipe. If the **hose** is smoking, please check if the piston ring is stuck.

When the engine is running at low speed, the compression pressure is too low, it is difficult to start, or the performance is poor

Valve

- Improper adjustment of valve clearance
- Valve burning or bending
- Improper valve timing
- Valve spring broken

Cylinder head

- Leakage or damage to the cylinder head gasket
- Cylinder head warping or cracking
- Loose spark plug

Wear of cylinder, piston, and piston ring

Excessive compression pressure, overheating, or knocking sound

- Excessive carbon accumulation in the piston head or combustion chamber

Excessive smoking

Cylinder head

- Worn valve stem or valve guide
- Damaged valve stem seal
- Wear of cylinder, piston, and piston ring

Excessive noise

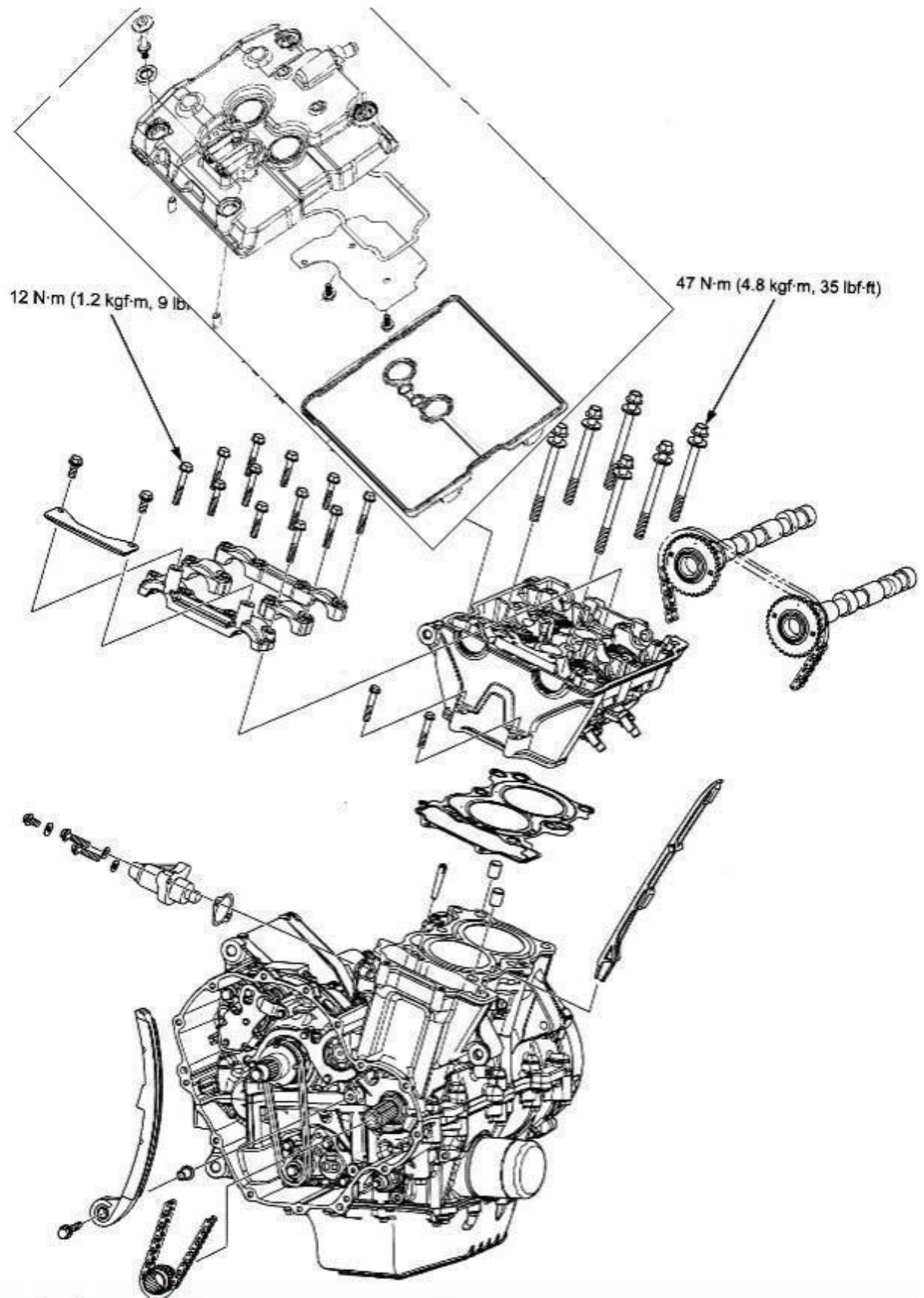
Cylinder head

- Improper adjustment of valve clearance
- Valve stuck or valve spring broken
- Worn or damaged camshaft
- Rocker arm or rocker shaft wear
- Rocker arm and valve stem end wear
- Loose or worn cam chain
- Timing chain wear
- Worn cam sprocket teeth

Wear of cylinder, piston, and piston ring. Poor idle speed

- The cylinder compression pressure is too low

5.4 Component location



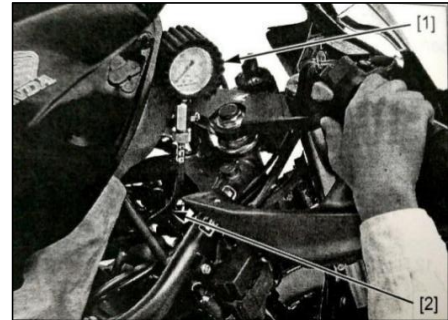
5.5 Cylinder compression test

Heat the engine to normal operating temperature.

Stop the engine and remove the spark plug.

Temporarily install the harness connection 33 (black) connector for the ECM.

Install the threaded end of the cylinder pressure gauge [1] into the spark plug hole.



Tools: [2] Compression instrument accessories

Turn the ignition switch to the 'on' position and start the engine

Turn the machine switch to ". 

Shift to neutral.

Keep opening the maximum throttle and start the engine until the pressure gauge reading no longer increases.

The maximum reading usually lasts for 4-7 seconds.

Compression pressure: 1372kPa at 450rpm

Analysis of Low Voltage Causes:

- Leakage of cylinder head gasket
- Improper adjustment of valve clearance
- Valve leakage
- Wear of piston rings or cylinders

Analysis of High Voltage Causes:

- - Carbon buildup on the top of the combustion chamber or piston

5.6 Cylinder head cover

Disassembly/Installation

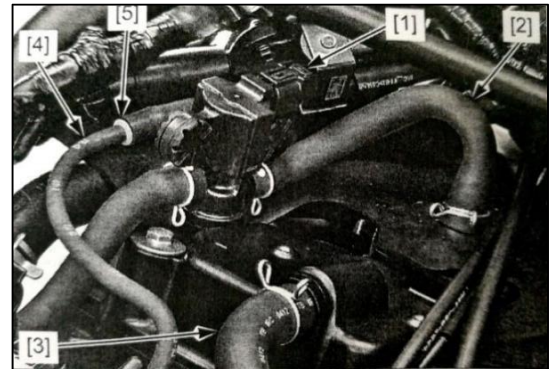
Attention:

- The maintenance of the cylinder head cover does not require the engine to be removed from the frame.

Remove the fuel tank under the tray.

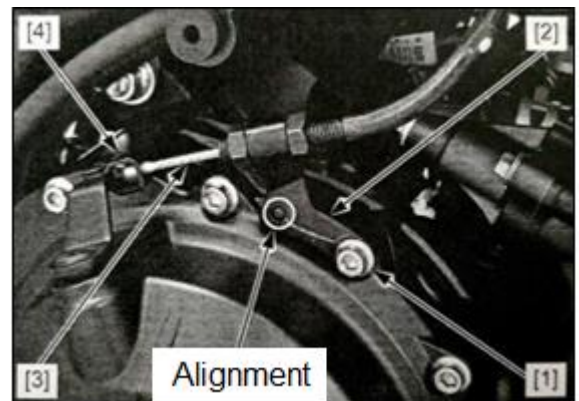
Remove the following components:

- Remove the secondary air supply valve plug [1]
- Remove the secondary air intake pipe [2]
- Remove the ventilation pipe [3]
- Fuel evaporation control system [4] [5]



Remove the bolt [1], clutch tension bar positioning plate, and remove the clutch cable [4] from the clutch cable hanger [3].

Move the clutch cable out of the frame.



Loosen the throttle cable adjuster lock nut A [1] and Adjust the adjuster [2], and then remove the throttle cable A [3] from the throttle

The air drum and cable bracket are loose.

Release the throttle cable adjuster B [4], and then apply the oil

Release the door cable B [5] from the throttle drum and cable bracket

Out.

Move the throttle cable out of the frame.

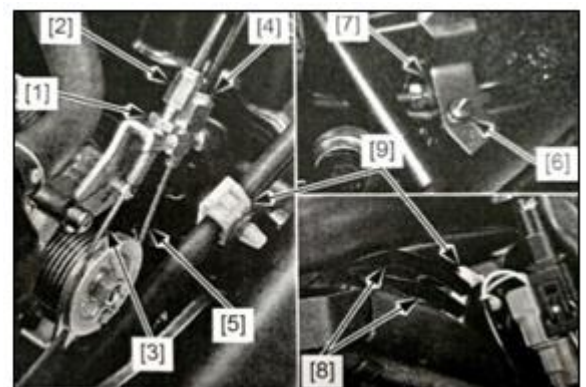
Remove the mounting bolts on the radiator.

CBR500RA/CB500FA/XA: Removing bolts [6]

And brake line connector [7].

Remove the brake pipe [9] from the two clamps [8] and

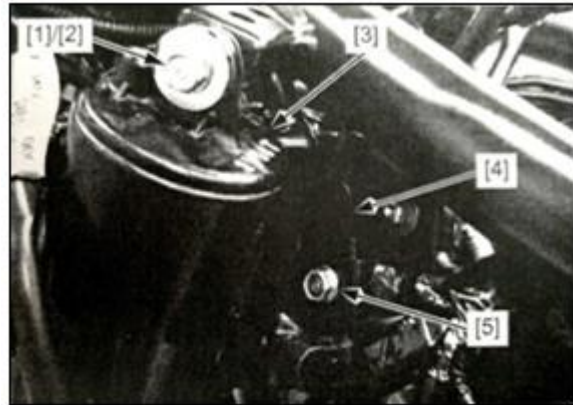
Remove the wire clamp from the frame.



Fuel evaporation system: Remove the carbon canister mounting bolts [1]
And the gasket [2], remove the carbon canister [3].

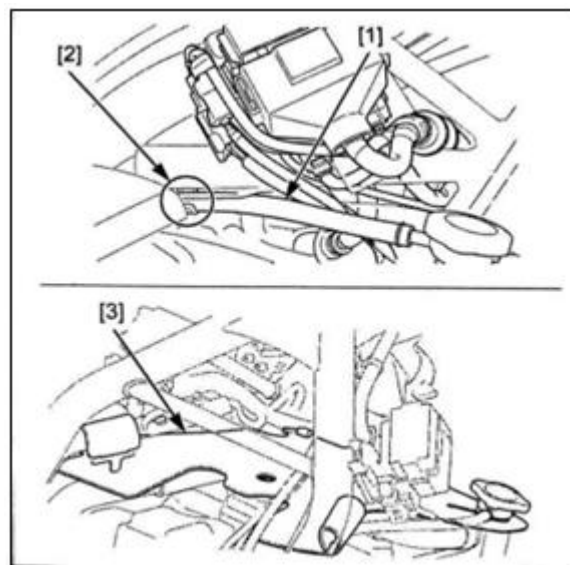
Remove the bolt [4] and the connecting cable [5].

Fuel evaporation system: removing the evaporator from the frame
Release the control solenoid valve.
Remove the clip from the frame.



Release the overflow pipe from the pipe clamp [1] [2].

Remove the insulation rubber plate at the overflow pipe and place it on the right side of the frame.



Attention:

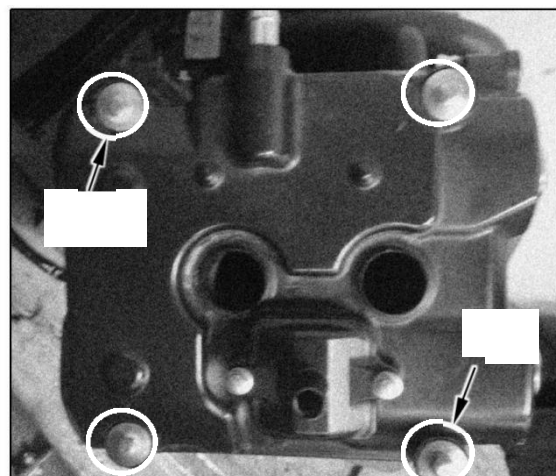
- To prevent the cylinder head from moving, please stick it with tape.

Remove the cylinder head cover bolts [1] and the rubber seat [2].

Remove the cylinder head cover from the cylinder head [3].

Attention:

- Do not forcefully disassemble the cylinder head cover locating pin.



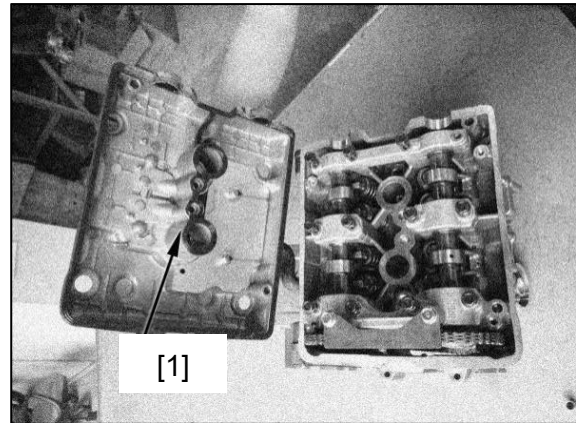
Remove the cylinder head cover sealing ring from the cylinder head cover [1].

The installation sequence is opposite to the disassembly sequence.

Torque:

Cylinder head cover bolt: 10 N · m

Right crankcase cover bolt: 10 N · m



Attention:

- Replace the cylinder head cover sealing ring with a new one.
- When installing, pay attention to installing the cylinder head cover sealing ring into the cylinder head cover groove.
- Align the positioning plate hole of the clutch tension rod with the convex column on the crankcase.

Adjust the following:

- Free stroke of throttle lock
- Free stroke of clutch handle

5.7 Camshaft

Attention:

When repairing the camshaft, there is no need to remove the engine from the frame.

Remove the cylinder head cover.

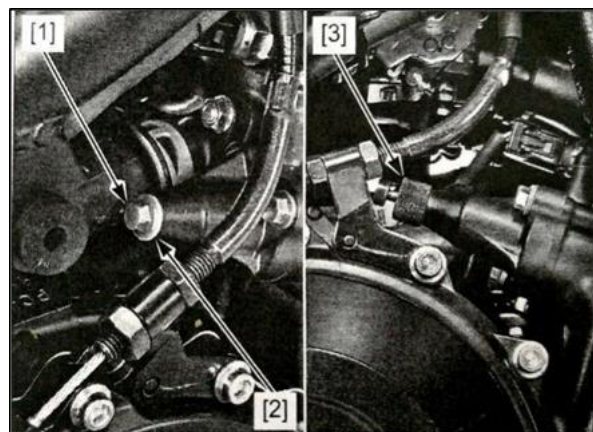
Ensure that the first cylinder piston is at the top dead center of the compression stroke.

Remove the sealing bolt [1] and sealing washer [2].

Use a special tool to fully retract the tensioner adjusting screw (clockwise).

Tools:

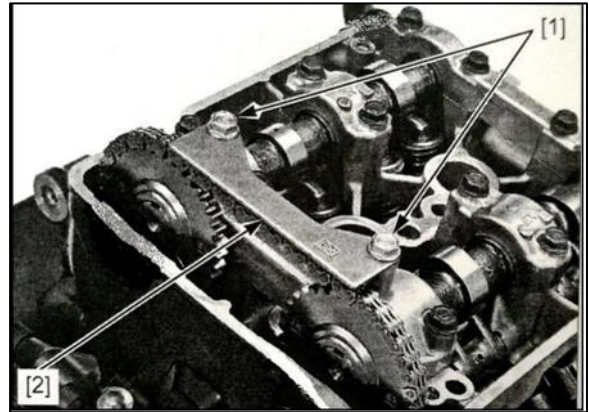
[3] Tensioning device clamp B



Attention:

- Be careful not to let the chain limit plate bolts fall into the crankcase.

Remove the bolts [1] and the chain limit plate [2].

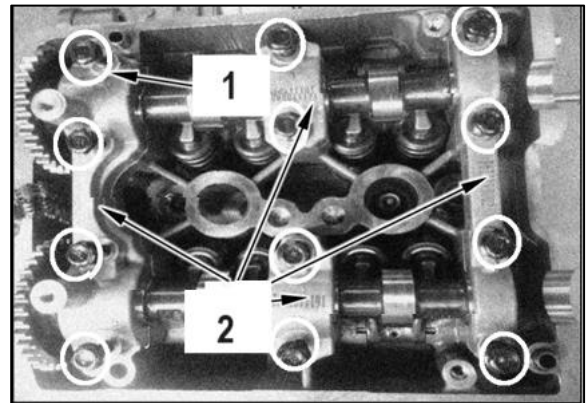
**Carefully**

From the outside to the inside, loosen the camshaft bracket bolts in a staggered manner several times, otherwise the camshaft bracket may be damaged.

Be careful to prevent the camshaft bracket bolts from falling into the crankcase.

Loosen the camshaft bracket bolts [1] in a staggered manner in 2-3 steps and remove them.

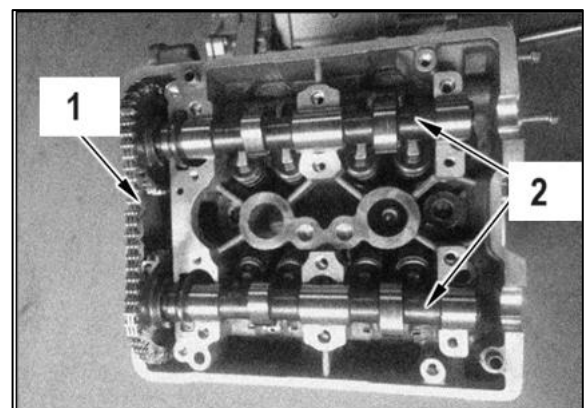
Remove the camshaft bracket [2] and locating pin from the cylinder block.

**Attention:**

- Do not forcefully remove the locating pin from the camshaft bracket.

Hang the cam chain with a wire to prevent it from falling into the crankcase.

Remove the chain [1] from the sprocket and remove the camshaft [2].

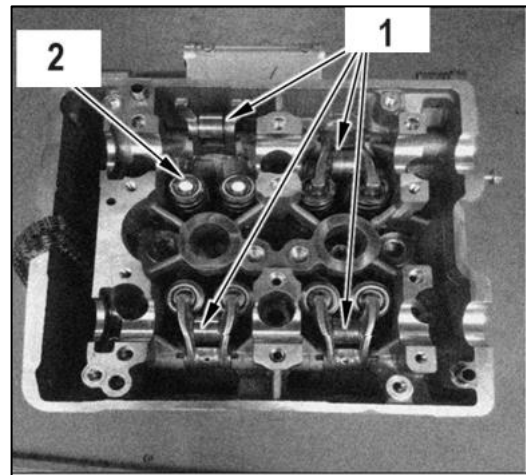


Lift the rocker arm [1].

Remove the valve adjustment gasket [2].

Attention:

- Be careful to prevent the valve adjustment gasket from falling into the crankcase.
- Mark the gasket to ensure that it is in its original position during installation.
- Gaskets are easier to remove with tweezers or magnets.

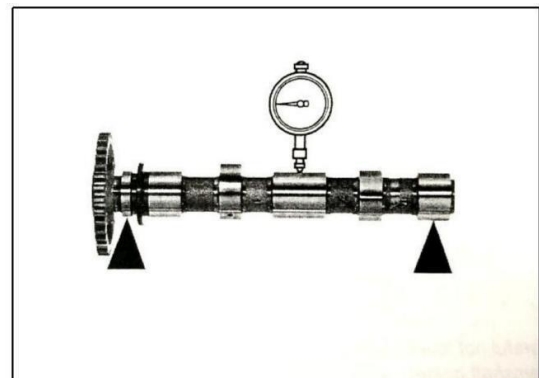


Inspect

Check the following components for damage, abnormal wear, deformation, burning, or blocked oil passages.

- Cam sprocket/camshaft
- Camshaft bracket/locating pin
- Cam chain pressure plate

Measure each part according to **the cylinder head/valve specifications**.



Camshaft runout

Fix both ends of the camshaft with V-shaped blocks and measure its runout with a dial.

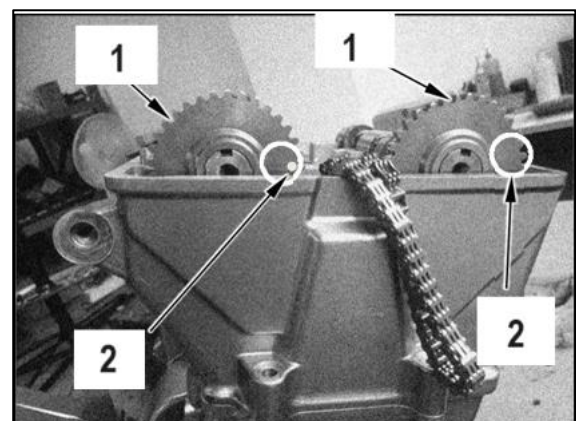
Maintenance limit value: 0.04mm

Camshaft oil gap

Wipe off the oil from the camshaft, cylinder head, and camshaft bracket.

Install the camshaft on the cylinder head.

- Align the machining mark [2] on the intake cam sprocket [1] with the upper surface of the cylinder head, as shown in the figure.
- Align the "EX" mark on the exhaust camshaft [3] with the lower mark on the cylinder head surface, as shown in the figure.



Place a plastic line clearance gauge longitudinally at the top of the camshaft journal [1], taking care to avoid oil holes.

Attention:

- During the inspection process, do not rotate the camshaft.

Ensure that the locating pin on the camshaft bracket is aligned with the cylinder head. Align the pin holes on it.

Install each camshaft bracket in its corresponding position, And ensure that the arrow [1] points towards the intake side, as shown in the figure.

- camshaft bracket A [2]
- camshaft bracket B [3] ("IN" sign: in Air side bracket)
- camshaft bracket C [4] ("EX" mark: row Air side bracket)
- camshaft bracket D [5]

Pay attention to threading and sealing the bolts of each camshaft bracket

Apply engine oil to the surface.

Camshaft bracket bolts:

6 × 39.5mm bolt [1]

6 × 32mm bolt [2]

Attention

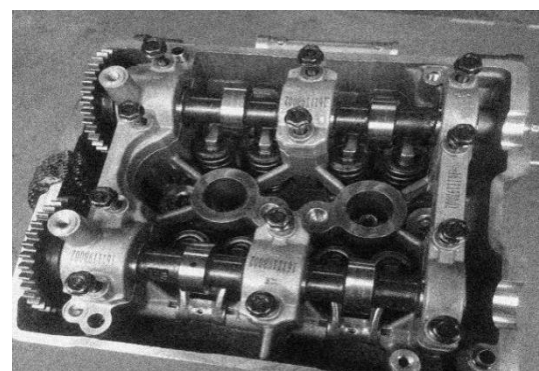
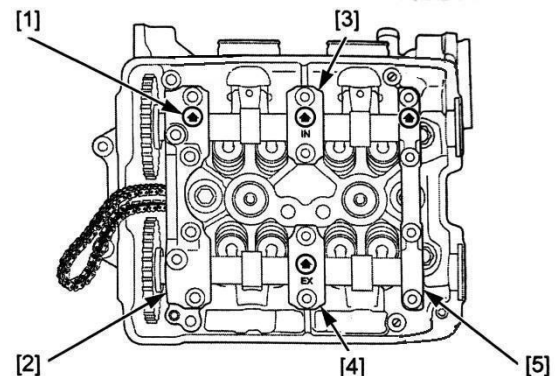
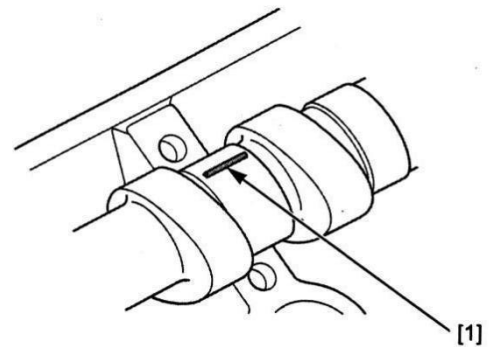
Tighten the camshaft bracket bolts in a staggered manner from the inside out, otherwise the camshaft bracket may be damaged.

From the inside out, tighten the camshaft bracket bolts in a staggered manner several times until the camshaft bracket is installed in place.

Drill the camshaft bracket bolts in 2-3 staggered directions

Specify the torque value.

Torque: 12N · m



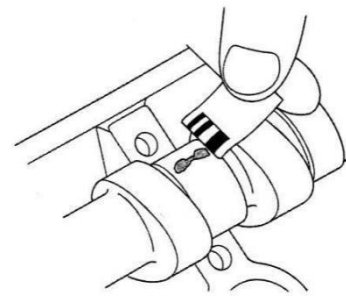
Remove the camshaft bracket and measure the width of each plastic line gap gauge.

The widest thickness determines the oil gap.

Maintenance limit value: 0.10mm

When the maintenance limit is exceeded, replace the camshaft and retest the oil gap.

If the oil gap still exceeds the repair limit, replace the camshaft bracket and cylinder head as a group.

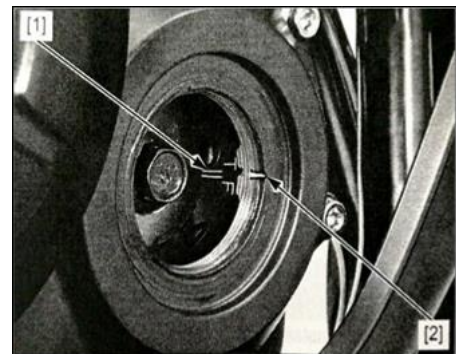


Installation

Attention:

When rotating the crankshaft, do not force the cam chain into the timing sprocket.

Rotate the crankshaft clockwise and align the "T" mark on the primary driving gear [1] with the index mark on the right crankcase cover [2].

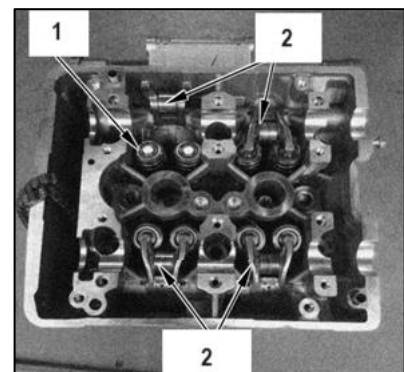


Attention:

Be careful to prevent the valve adjustment gasket from falling into the crankcase.

Install the valve adjusting gasket [1] back into its original position on the valve seat insert in sequence.

Lower the rocker shaft [2].



Each camshaft has an identification mark:

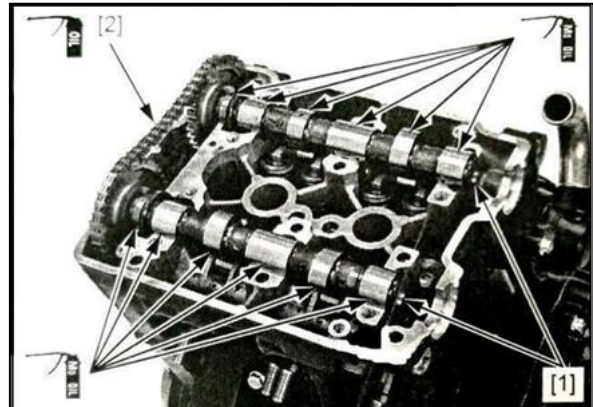
- "IN" sign [1]: intake camshaft
- "EX" logo [2]: exhaust camshaft



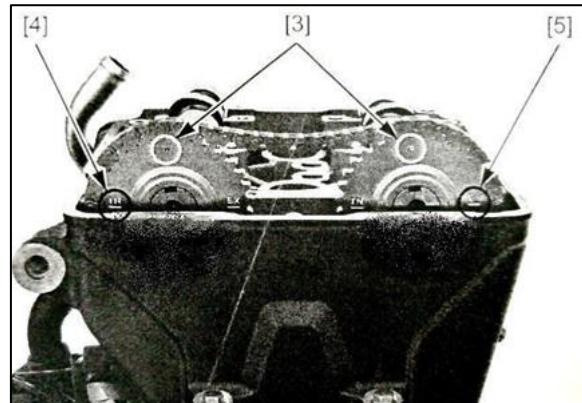
Apply two strokes to the camshaft cam [1], journal, and stress surface Molybdenum sulfide solution

Apply oil to the entire surface of the cam chain [2].

Fit the cam chain with the cam sprocket and install the camshaft on the cylinder head.



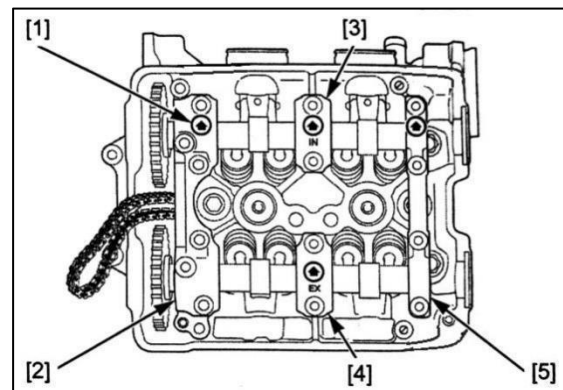
Move the punching mark [3] on the cam sprocket upwards and align the lower mark of the "IN" mark [4] and "EX" mark [5] with the upper surface of the cylinder head, as shown in the figure.



Ensure that the locating pin on the camshaft bracket is aligned with the pin hole on the cylinder head. And ensure that all arrows on the camshaft bracket point towards the intake side.

Install each camshaft bracket in its corresponding position and ensure that the arrow [1] points towards the intake side, as shown in the figure.

- Camshaft bracket A [2]
- Camshaft bracket B [3] ("IN" sign: in Air side bracket)
- Camshaft bracket C [4] ("EX" mark: row Air side bracket)
- Camshaft bracket D [5]

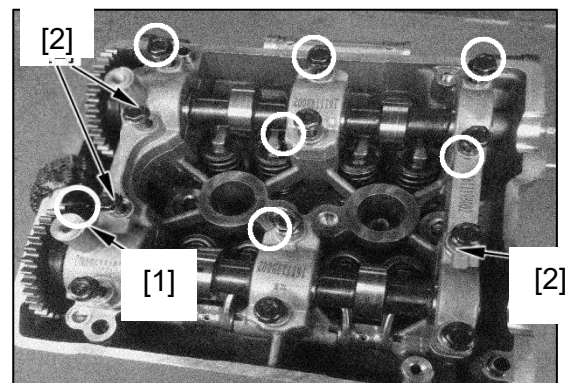


Pay attention to applying oil to the bolt threads and sealing surfaces of each camshaft bracket.

Camshaft bracket bolts

6 × 39.5mm bolt [1]

6 × 32mm bolt [2]



Attention:

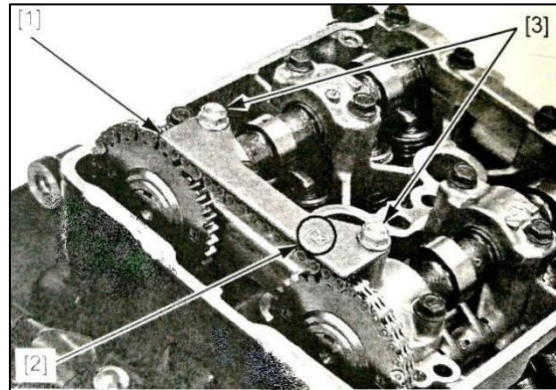
Tighten the camshaft bracket bolts in a staggered manner from the inside out, otherwise the camshaft bracket may be damaged.

From the inside out, tighten the camshaft bracket bolts in a staggered manner several times until the camshaft bracket is installed in place.

Drill the camshaft bracket bolts in 2-3 staggered directions

Specify the torque value.

Install the cam chain pressure plate [1], and pay attention to the "EX" sign [2] facing the exhaust side.

**Attention:**

Be careful to prevent the cam chain pressure plate bolts from falling into the crankcase.

Install and tighten the cam chain pressure plate bolts [3].

Torque: 12N · m

Remove the tensioner from the tension adjusting screw [1].

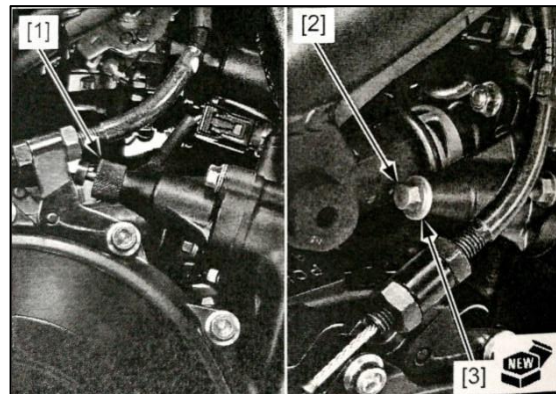
Rotate the crankshaft clockwise several times, then align the "T" mark on the primary driving gear with the index mark on the right crankcase cover.

Recheck the valve timing.

Check the valve clearance.

Install the sealing bolt [1] and pay attention to replacing it with a new sealing gasket [2].

Install the cylinder head cover.



5.8 Rocker arm

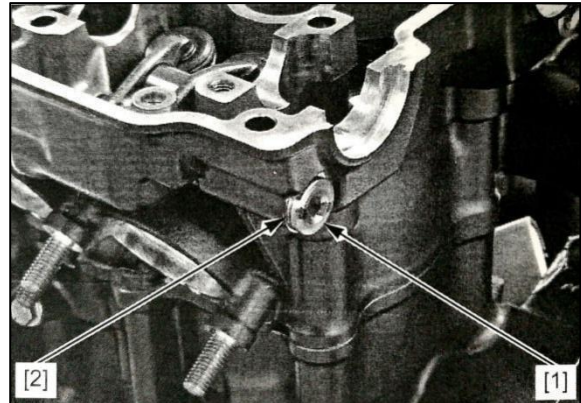
Disassembly/Installation

Attention:

When repairing the rocker shaft, there is no need to remove the engine from the frame. The maintenance steps for the rocker arm shaft of the intake and exhaust valves are the same.

Remove the camshaft.

Remove the rocker shaft bolt [1] and sealing gasket [2]

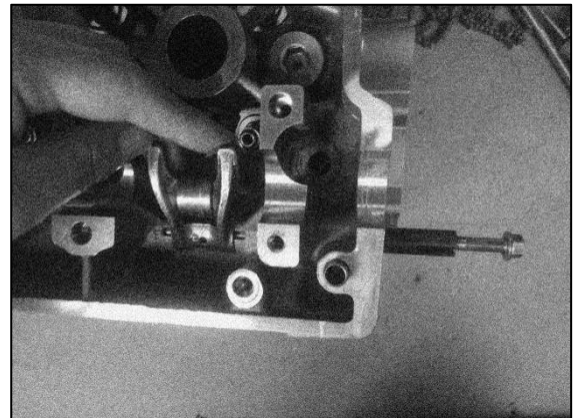


Fix the rocker arm [1] and then use 6mm bolts [2]

Remove the rocker arm shaft [3].

Remove the rocker arm.

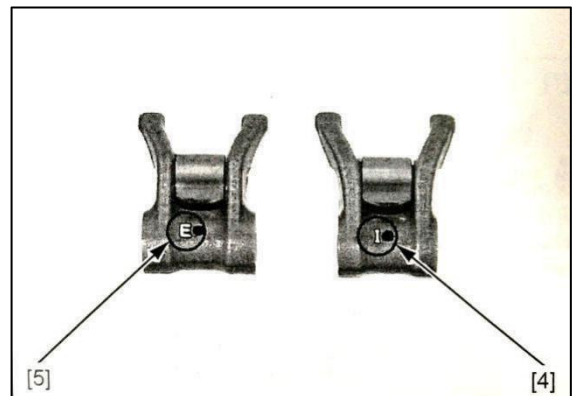
Molybdenum disulfide solution is coated on the sliding area of the rocker arm, the bearing surface and the outer surface of the rocker shaft.



Install the rocker arm and the rocker arm shaft.

Note:

- The rocker arm can be identified by print mark:
 - "I" mark [4]: intake side rocker arm
 - "E" mark [5]: exhaust side rocker arm



Install the latch bolt [1], pay attention to applying oil to the thread and replacing it with a new sealing gasket [2], and align the blade with the groove.

Tighten the bolt to the specified torque.

Torque: 15N · m

Installing camshafts

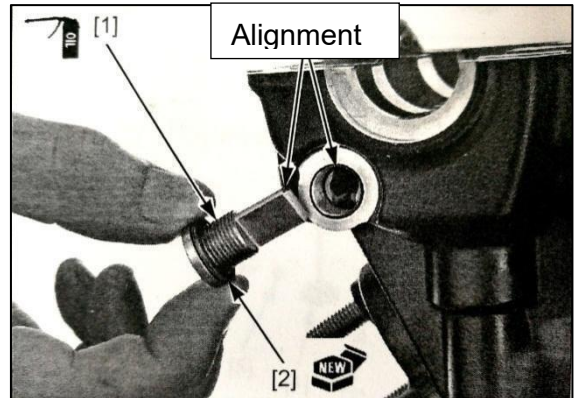
Inspect

Check the following components for damage, abnormal wear, deformation, burning, or blocked oil passages.

- Rocker arm
- Rocker arm shaft

Measure each part and clearance according to **the specifications of the cylinder head/valve**.

Replace any component that exceeds the maintenance limit



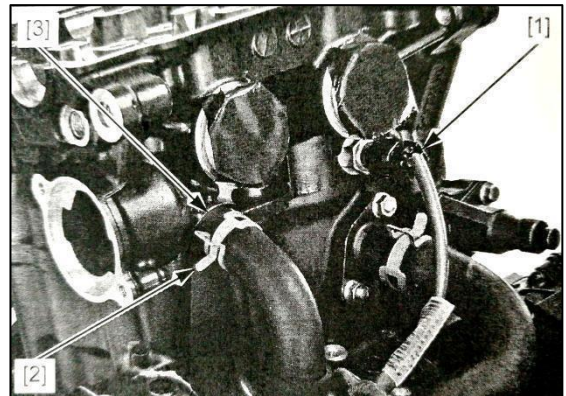
5.9 Cylinder head

Disassembly

Remove the following components in sequence:

- Engine
- Rocker arm
- Radiator

Release the pipe clamp [2] and remove the small circulating water pipe [3].

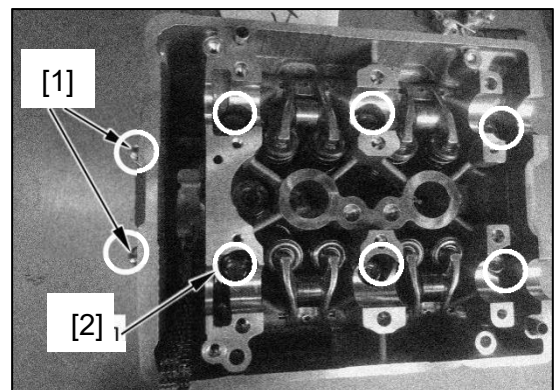


Remove the 6mm bolt [1].

Before removing the bolts, first suck out the oil from the 9mm barbed bolt groove.

Loosen the 9mm cylinder head bolts in 2-3 staggered steps [2], and then remove the bolts.

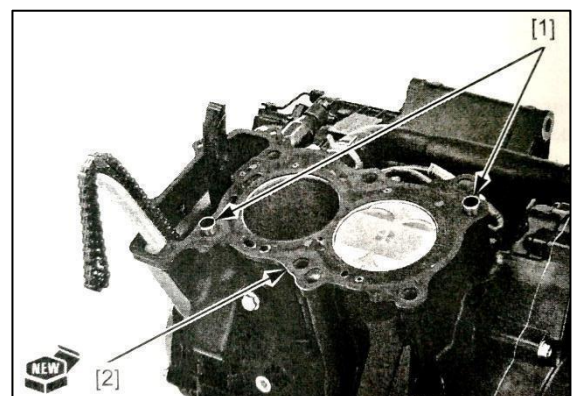
Remove the cylinder head [3].



Attention:

- Hang the cam chain with a wire to prevent it from falling into the crankcase.
- Do not excessively strike the cylinder head, and do not use any tools as levers to damage the joint surface.

Remove the locating pin [1] and the sealing gasket [2].



Remove the chain guide plate, [1]

Remove the waterproof rubber rod [1].

Check for deterioration or damage to the waterproof rubber rod

Disassemble

Disassemble the following components:

- Spark plug
- Water temperature sensor

Attention:

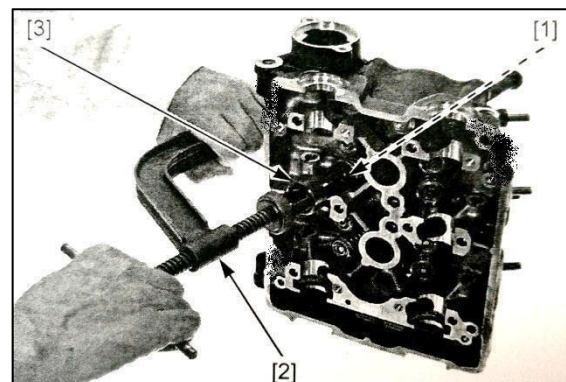
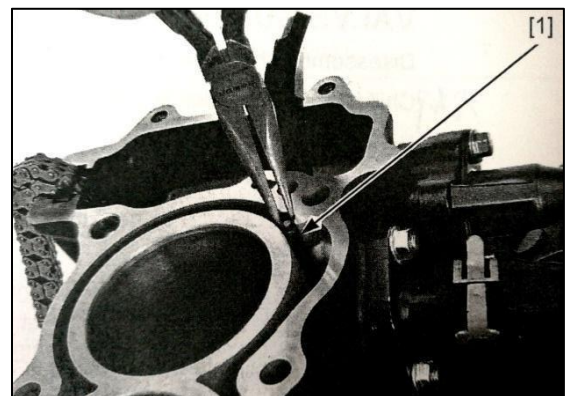
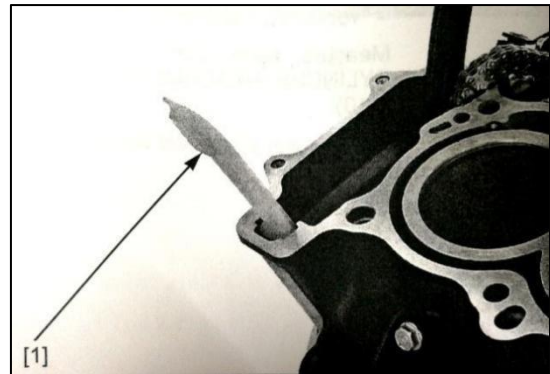
To prevent permanent deformation of the valve spring, do not excessively compress the valve spring during disassembly.

Use a special tool to remove the valve lock clip [1].

Tools:

[2] Valve spring compression tool

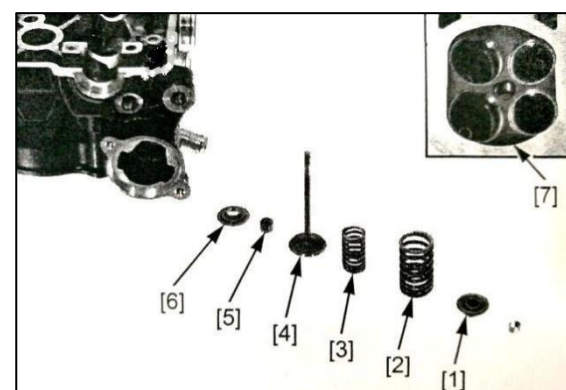
[3] Valve spring compression attachment



When disassembling, pay attention to marking each component for easy installation.

Remove the valve spring compression tool and the following components:

- Upper valve spring seat ring [1]
- External valve spring [2]
- Inner valve spring [3]
- Valve [4]
- Oil shield [5]
- Lower valve spring seat [6]



Be careful not to damage the mating surface of the cylinder block and valve seat surface

Clean the carbon deposits in the combustion chamber and the surface of the cylinder head gasket.

Inspect

Check the following components for damage, abnormal wear, deformation, burning, or blocked oil passages.

- Cylinder head
- Inner/Outer Spring
- Valve
- Valve guide
- Chain guide plate

Measure each part and clearance according to the specifications of the cylinder head/valve.

Replace any component that exceeds the maintenance limit.

- Before measuring the guide tube, clean the carbon deposits in the guide tube with a valve guide reamer.
- Please refer to the valve seat inspection.

Replacing the valve guide

Disassemble the cylinder head.

Cool the new valve guide in the freezer for one hour.

Attention:

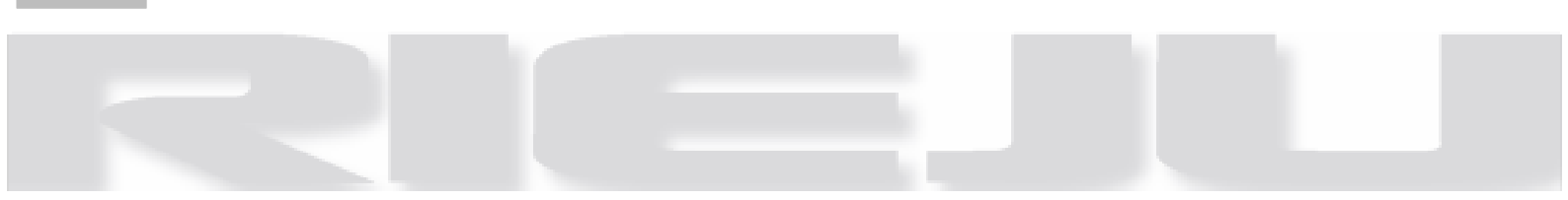
- Pay attention to wearing insulated gloves to avoid burning when operating hot cylinder heads.
- Heating the cylinder head with a torch will cause warping. Heat the cylinder head with a hot plate or oven to 130-140 °C. Using a temperature indicator to ensure the cylinder

Heat the head to the appropriate temperature, and the temperature indicator rod can be purchased from a welding supplies store.

Support the cylinder head and push the valve guide and guide clip out of the cylinder head from the direction of the combustion chamber.

Tools:

Valve guide driver, 4.5mm



Take out the new valve guide from the freezer [1].

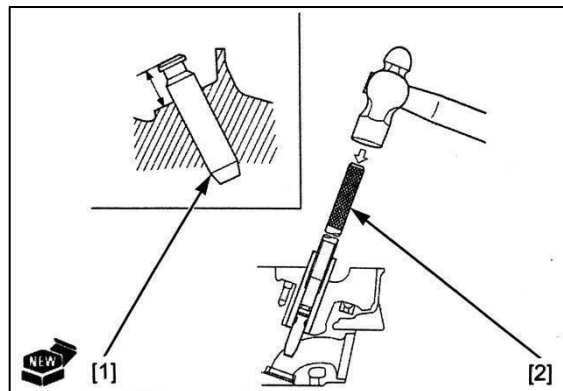
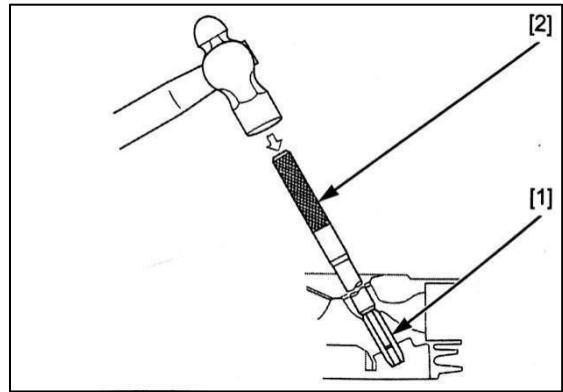
While the cylinder head is still hot, install the new valve guide from the camshaft until the exposed length reaches the specified value.

Tools:

Slide the spindle component on the upper crankcase body and remove the right bearing of the spindle.

[2] Valve guide adjustment driver

Specified value: inlet/outlet: 14.10-14.30mm

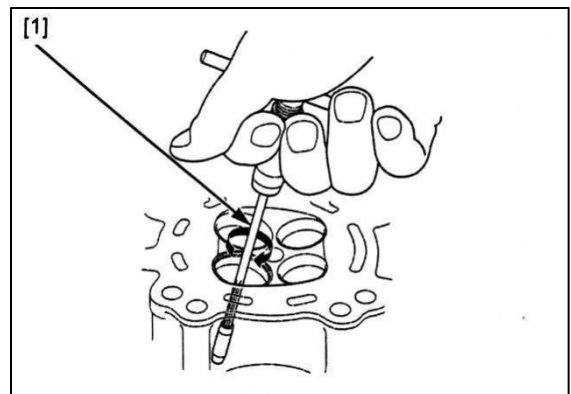


Installation requirements:

Mark the depth of the valve guide with a marker.

Adjust the correct depth using the valve guide driver. Allow the cylinder head to cool to room temperature.

After installation, use a reamer to adjust the new valve guide.



Attention:

- When reaming, be careful not to tilt or tilt the reamer inside the valve guide.
- During this operation, pay attention to using cutting lubricating oil.

Insert the reamer from the combustion chamber direction of the cylinder head and always turn the reamer clockwise.

Tools:

Valve guide reamer, 4.5mm

Thoroughly clean the cylinder head to remove any metal debris after reaming, and trim the valve seat.

Inspection and trim of the valve seat

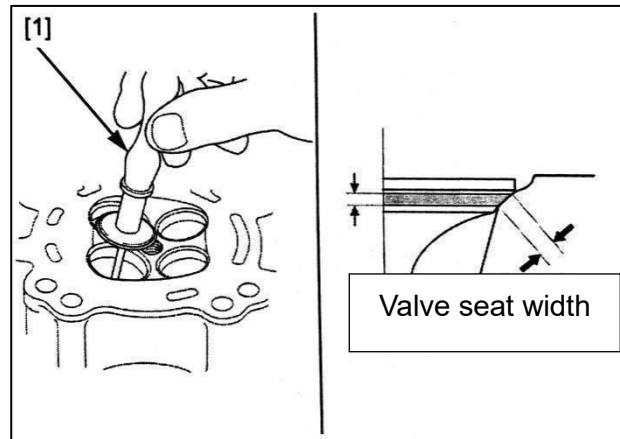
Inspection

Break down the cylinder head head.

Clean the carbon deposition from the intake / exhaust door completely.

Apply a thin layer of iron blue to each valve.

Towards the valve seat direction with the hand research tool [1] gently knock on the valve, do not make the valve rotation, check the contact of the valve seat.



Remove the valve and check the width of each valve seat surface. The contact surface width of the valve seat shall be within the specified range, and the width around the valve seat shall be flat.

Standard value: 0.90-1.10mm

Maintenance limit value: 1.5mm

If the width of the valve seat is not within the specified range, the valve seat should be repaired.

The valve cannot be polished. If the valve contact surface is ablated or severely worn, or if the valve seat is uneven, replace the valve.

Check the valve seat face for the following conditions:

- The contact face of the valve seat is uneven
- -Bend or fold the valve stem, replace the valve and trim the valve seat.
- Seat face wear
 - Replace the valve and retrim the valve seat.
- Contact area (too high or too low)
 - Replace the valve seat

Trimming

Use the following tools to repair the valve seat.

Tools:

Knife holder, 4.5mm 07781-0010600

**Valve seat trimming tool, 27.5mm (IN, 45°)
07780-0010200**

**Valve seat trimming tool, 24mm (EX, 45°)
07780-0010600**

**Flat milling cutter, 28mm (IN, 32°)
07780-0012100**

**Flat milling cutter, 24mm (EX, 32°)
07780-0012500**

**Internal milling cutter, 26mm (IN, 60°)
07780-0014500**

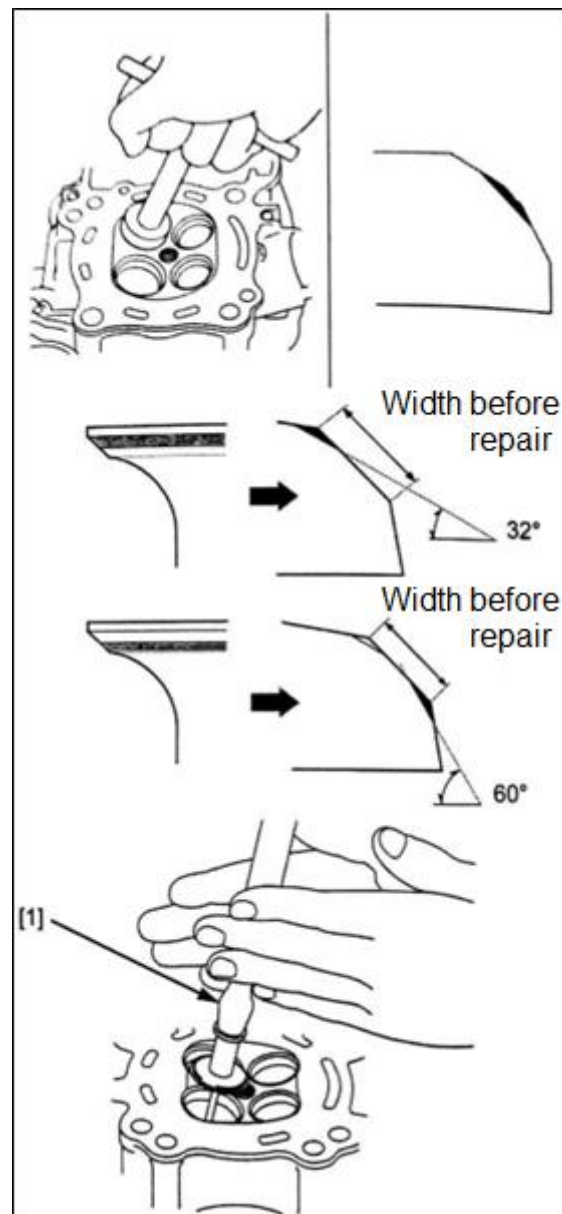
**Internal milling cutter, 26mm (EX, 60°)
07780-0014202**

Valve seat width: 0.90-1.10mm

Attention:

- Follow the instructions provided by the surface polisher manufacturer.
- Be careful not to grind the valve seat too much.

1. First, use a 45 ° trimming tool to cut off the rough or irregular parts of the valve seat.
2. Then use a 32 ° flat milling cutter to cut off 1/4 of the upper ring of the valve seat working surface.
3. Then use a 60 ° internal milling cutter to cut off 1/4 of the bottom ring of the valve seat.
4. Then use a 45 ° trimming tool to grind the valve seat to a suitable width.
5. Ensure that the roughness and unevenness on the valve seat have been removed
6. Regular surface.
7. After completing the valve seat grinding, apply grinding agent to the valve surface and gently grind the valve.



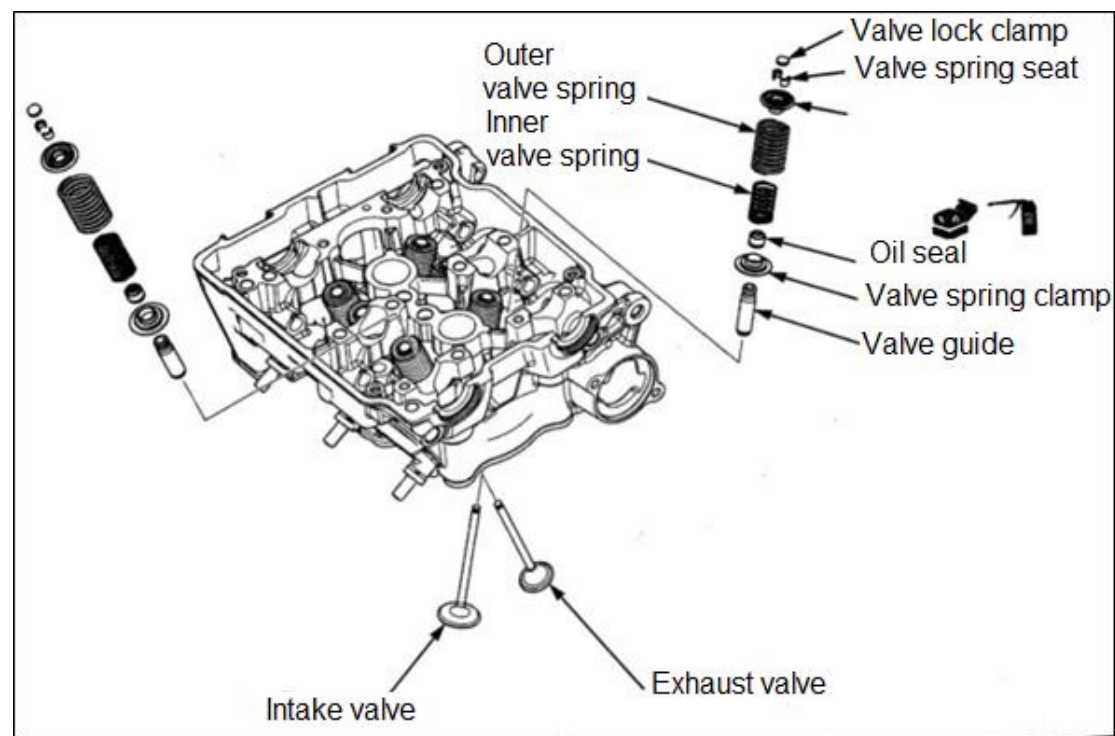
Attention:

Excessive grinding pressure may cause deformation or damage to the valve seat. It is necessary to frequently change the angle of the grinding tool to prevent uneven grinding of the valve seat.

Do not allow the grinding agent to enter between the valve stem and guide tube.

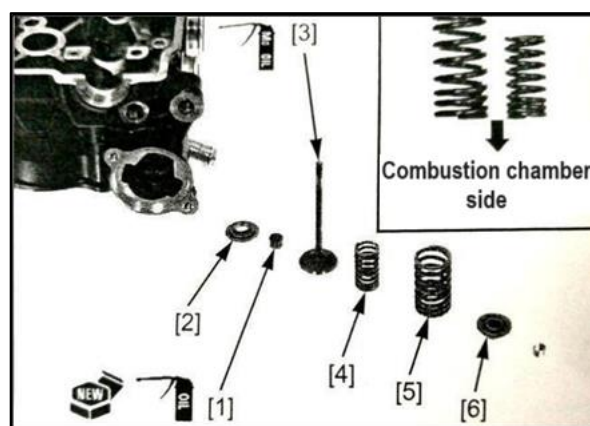
After grinding, rinse the residual remaining from the cylinder head and valve, and reexamine the contact surface of the valve seat.

Assemble the cylinder head.

Assemble

Wash the cylinder head assembly with solvent and blow all oil channels with compressed air. Lubricate the new shield [1] with oil. Install the lower valve spring seat [2] and the oil shield. Lubricate the slide surface and the bar end of each valve bar with a molybdenum disulfide solution. Insert the valve [3] into the valve catheter and turn the valve slowly during insertion. To prevent damage to the oil shield.

Install the inner valve spring [4] and the outer valve spring [5] to position the dense side of the coil toward the combustion chamber



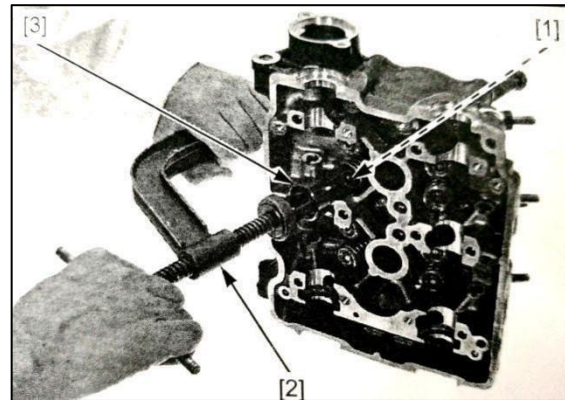
Install the air lock clip [1] with a special tool. Lubricate the opening pin to reduce the installation resistance, to prevent the spring from losing elasticity, do not excessively tighten the spring.

Tool:

[2] Valve Spring Compression Tool
07757-0010000

[3] Valve Spring Compression Tool
Attachment 07959-KM30101

Install the upper valve spring seat ring [6].

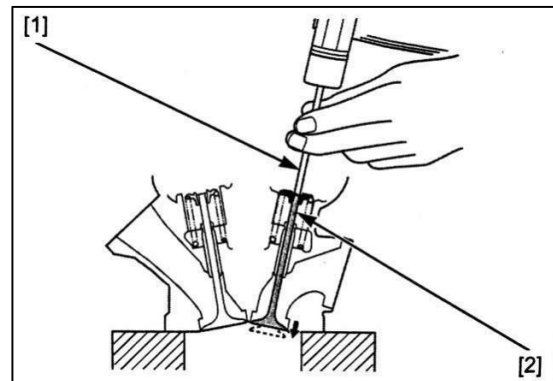


Support the cylinder head on the bench to prevent damage to the valve.

Place the appropriate tool [1] into the valve catheter [2]. Tap the tool to firmly install the lock clip.

Install the following components:

- water temperature sensor
- spark plug



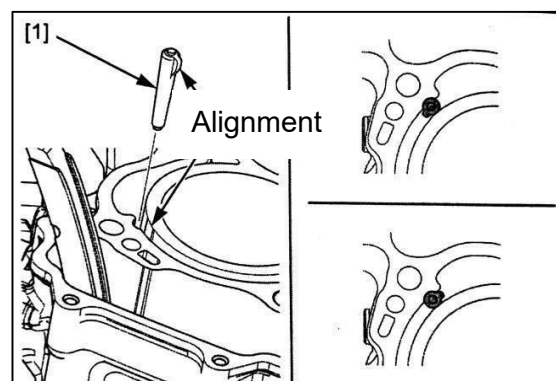
Install

Remove the sealing gasket material from the cylinder mating surface.

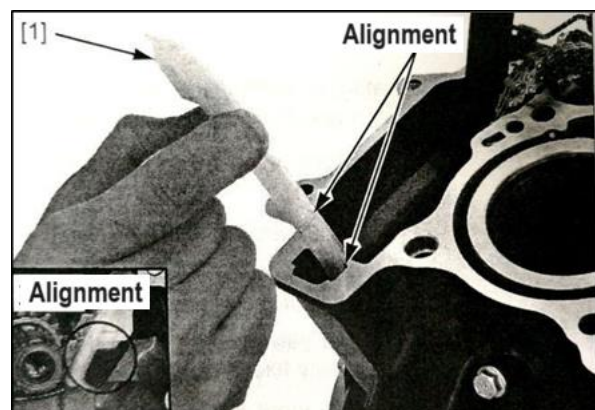
Note: Do not allow dust and debris to enter the cylinder.

Install the waterproof rubber rod [1] on the right intake side of the intake cylinder head, with the cone facing downwards, and align its flange with the cylinder water jacket.

Note: The flange can be on the right or left.



Install the chain guide plate [1] and align its protruding part with the groove on the cylinder, with its bottom in the crankcase groove



Install the locating pin [1] and a new sealing gasket [2].

Thread the timing chain through the cylinder head and install the cylinder head [1] To the cylinder.

Thoroughly clean the threads and seating surfaces of the cylinder head sealing bolts (9mm) and wipe dry.

Apply engine oil to the threads and seating surfaces of the cylinder head sealing bolts (9mm).

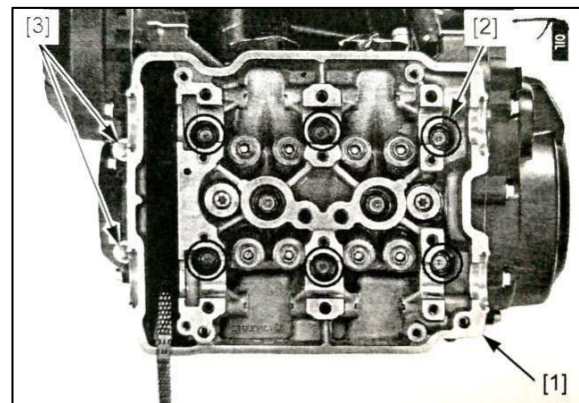
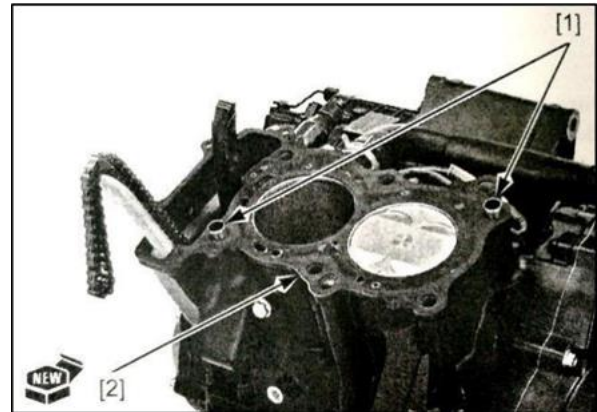
Install the cylinder head sealing bolts in 2-3 staggered steps (9mm) [2] and tighten to the specified torque.

Torque: 47N • m

Install and tighten the cylinder head bolts (6mm) [3].

Install the following components:

- Thermostat
- Rocker arm
- Engine



5.10 Tensioner adjusting screw

Removing / installing

Attention:

- The maintenance of the tensioner adjustment screw does not require the engine to be removed from the frame.

Remove the sealing bolt [1] and sealing ring [2].

Turn the tensioner adjusting screw clockwise with a special tool to ensure it is fully tensioned.

Tools:

[3] Tensioner device clamp

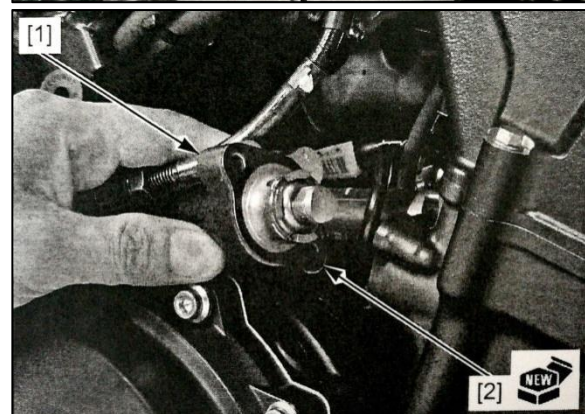
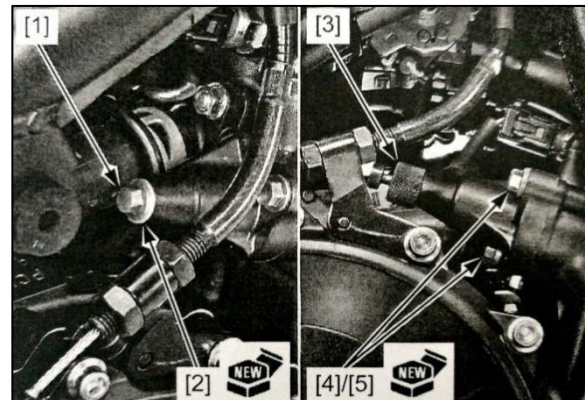
Remove the tensioner mounting bolt [4] and sealing ring [5].

Remove the tensioner adjusting screw [1] and sealing gasket [2].

The installation sequence is opposite to the disassembly sequence.

Attention:

Replace with new sealing rings and gaskets.

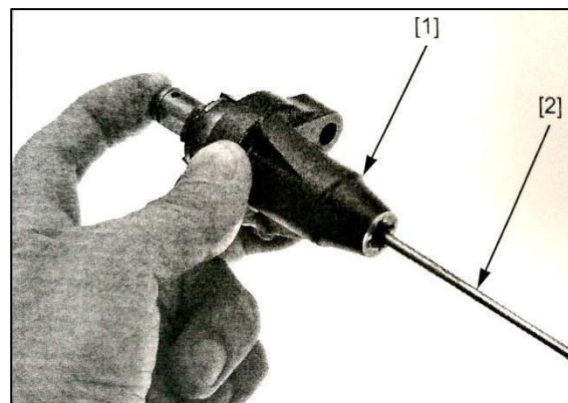


Inspect

Check the operability of the tensioner adjusting lever [1].

-When the tensioner lever, the lever shall not be pressed into the regulator.

-When the lever is turned clockwise with a cross card or screwdriver [2], the lever shall be pressed into the regulator; when the tool is removed, the regulator is ejected immediately.



5.11 Timing chain/sprocket

Disassemble

Disassemble the following components:

- Cylinder head
- Primary driving gear combination
- Clutch sleeve

Remove the bolt [1], chain tensioning plate [2], and bushing [3]

Remove the timing chain [1] and the timing sprocket [2] from the crankshaft.

Inspect

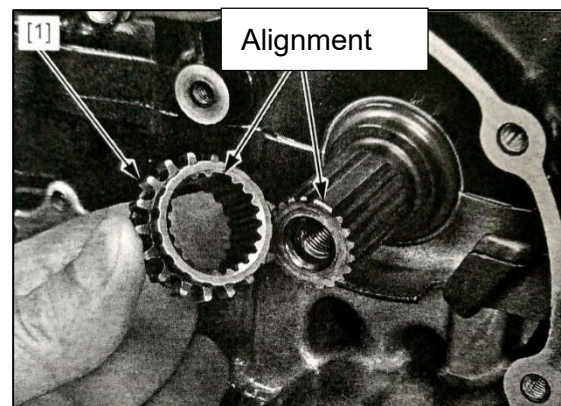
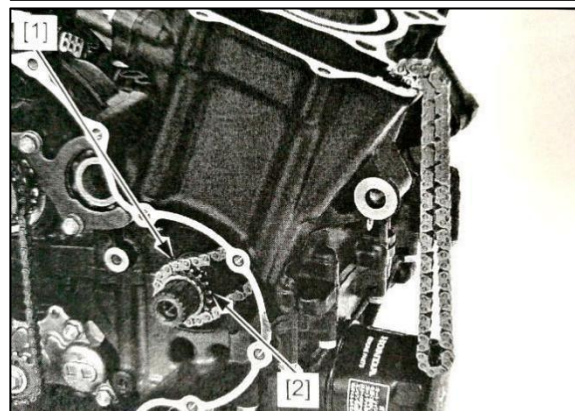
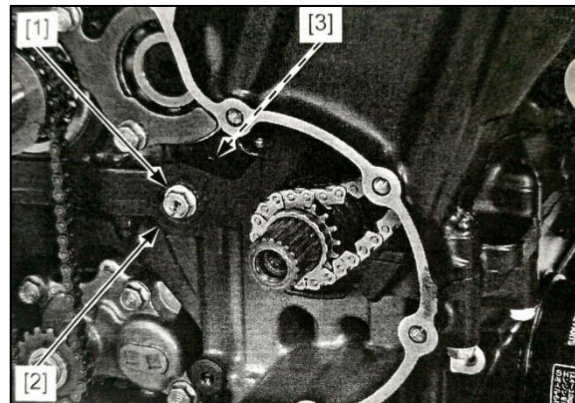
Check the following components for scratches, damage, abnormal wear, and deformation. If necessary, replace it.

- Timing chain
- Chain tensioning plate
- Timing sprocket

Install

Install the timing sprocket [1] and align the inner spline width with the wide bond groove on the crankshaft.

Apply engine oil to the entire surface of the timing chain [1], and
Install in conjunction with the timing sprocket.



Apply tightening adhesive to the threads of the tensioning plate installation bolts. Install the bushing [1], chain tensioning plate [2], and bolts [3].

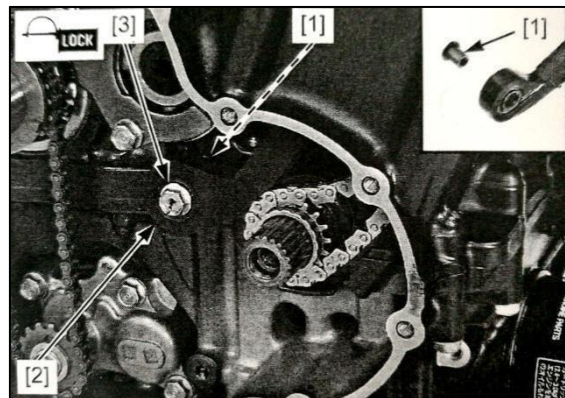
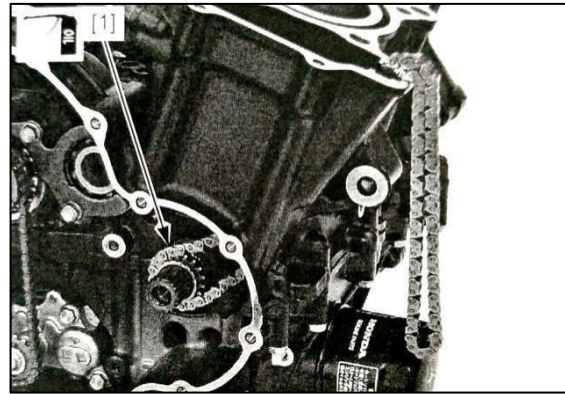
The installation direction of the bushing is shown in the figure.

Tighten the chain tension plate mounting bolts to the specified torque.

Torque: 12N • m

Install the following components:

- Clutch sleeve
- Primary driving gear combination
- Cylinder head



6. Clutch and gear shifting mechanism

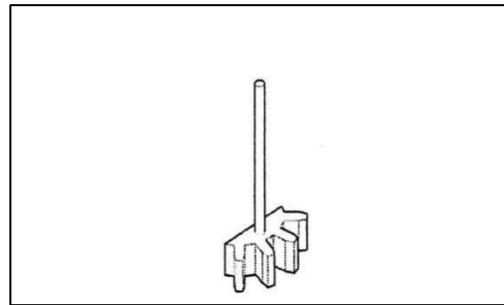
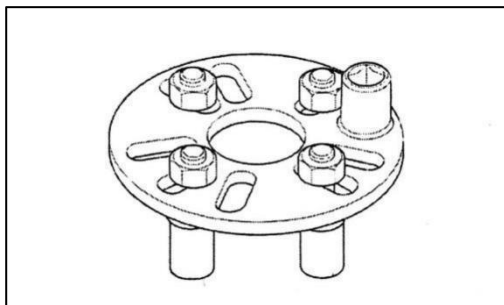
6.1	Maintenance Information.....	85
6.2	Specification of clutch and shift mechanism	85
6.3	Troubleshooting	86
6.4	Right crankcase cover.....	89
6.5	Clutch.....	91
6.6	Primary driving gear	98
6.7	Shift system	101



6.1 Maintenance Information

- This chapter explains the maintenance of the clutch and shift mechanism. All operations do not require the engine to be removed from the frame.
- The viscosity and oil level of the engine oil can affect clutch separation. When the clutch is not disengaged or the motorcycle is still moving slowly, the oil level should be checked before repairing the clutch system.

Tool



6.2 Specification of clutch and shift mechanism

Item		Standard value (mm)	Maintenance limit value (mm)
Free stroke of clutch handle		10-20	—
Clutch	Free length of spring	43.2	42.0
	Friction plate thickness	2.30-2.50	2.27
	Flatness of driven plate	—	0.30
Clutch lining	Internal diameter	22.000-22.021	22.031
	External diameter	27.987-28.000	27.977
Outer diameter of the main shaft at the clutch bushing		21.967-21.980	21.95

6.3 Troubleshooting

Difficulty in gripping the clutch handle

- The clutch cable is damaged, tangled or too dirty
- Improper wiring of clutch cable
- Clutch thrust mechanism damaged
- Clutch push rod bearing failure
- Improper installation of clutch control lever

Clutch slipping during acceleration

- Clutch push rod stuck
- Active friction plate wear
- Insufficient elasticity of clutch spring
- Clutch handle has no free stroke
- Molybdenum disulfide or graphite additives are added to the engine oil

When the clutch is not disengaged or disengaged, the motorcycle still moves forward at a slow speed

- Excessive free stroke of clutch handle
- Clutch friction plate warping
- High oil level, improper use of oil viscosity, or use of oil additives
- The locking nut of the clutch center sleeve is loose
- Clutch thrust mechanism damaged
- Improper installation of clutch control lever
- Worn clutch housing slot and clutch gear slot
- Improper clutch operation

Difficulty changing gears

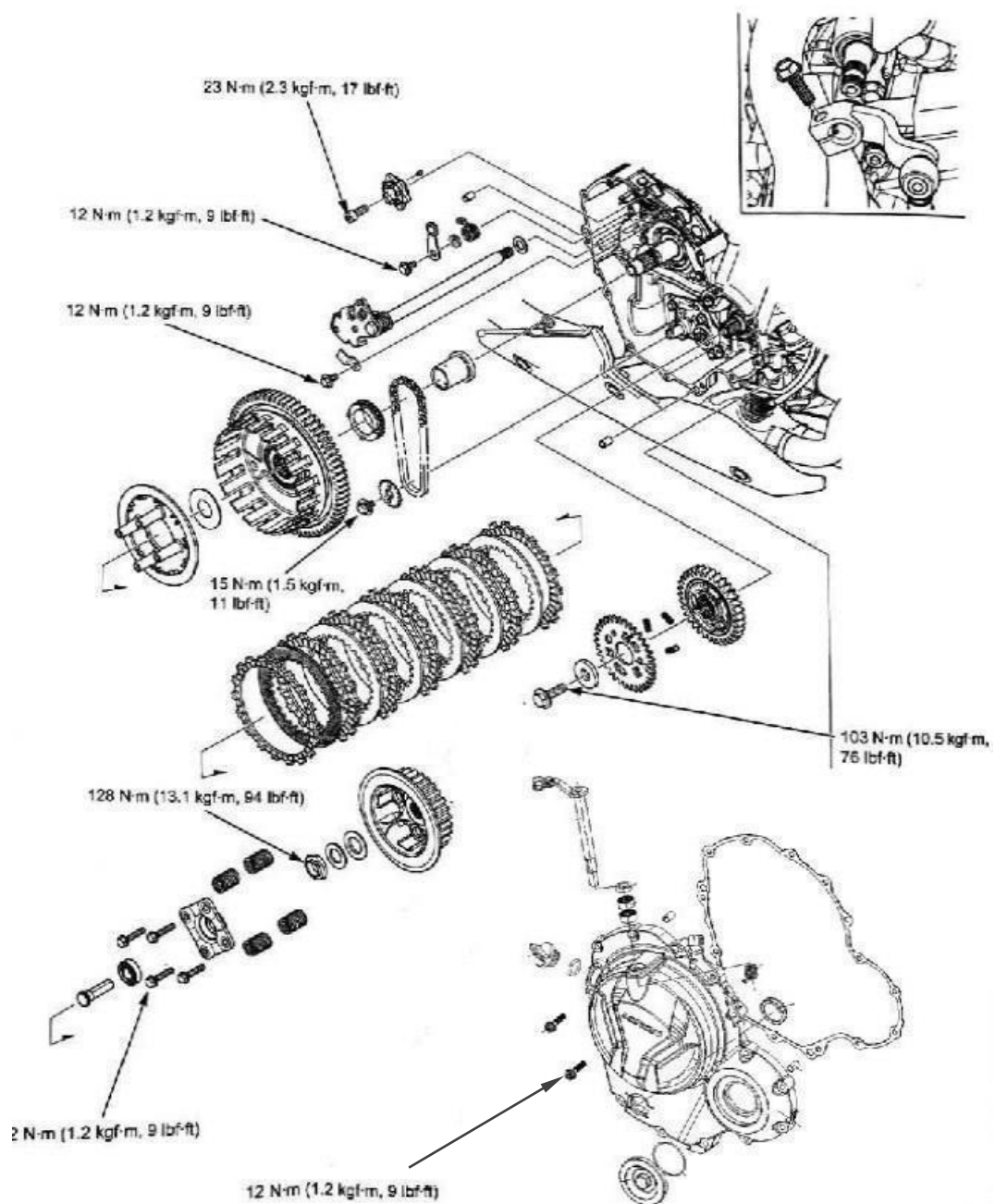
- Improper adjustment of clutch cable
- Improper clutch operation
- Improper use of engine oil viscosity
- Damaged or bent fork
- Bending of shift fork shaft
- Bending of fork claw
- The bolt of the five-star paddle is loose
- The five-star paddle is damaged
- Damaged guide groove of variable speed drum
- Worn or damaged five-star paddle

Transmission gear jumping

- Wear of the stop plate
- Insufficient or damaged elasticity of the return spring of the stop plate
- The bolt of the five-star paddle is loose

- The five-star paddle is damaged
- Bending of shift fork shaft
- Damaged or bent fork
- Damaged gear meshing surface or tooth groove
- **Shift pedal does not return**
- Insufficient or broken elasticity of the shift shaft return spring
- Gearshift shaft bent or damaged

Component layout



6.4 Right crankcase cover

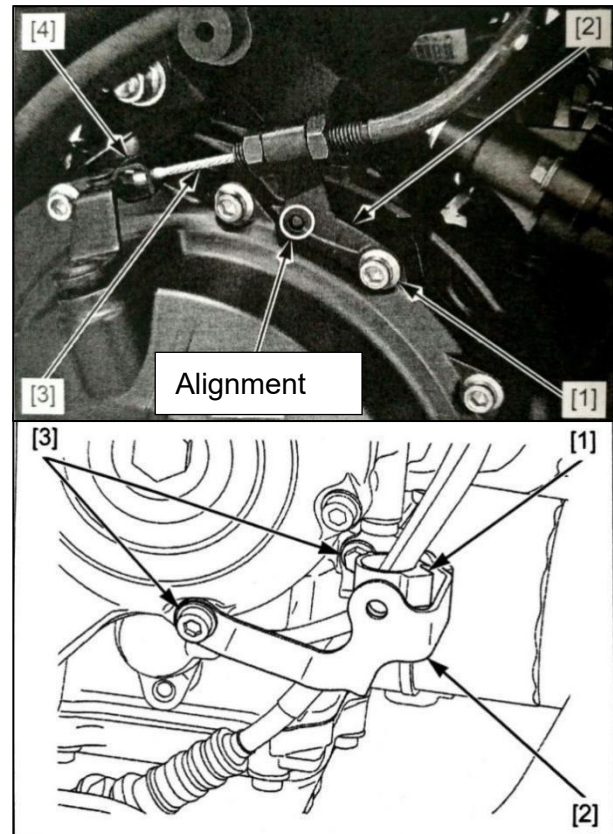
Disassembly/Installation

Remove the skid plate under the motorcycle.

Drain the engine oil.

Remove the bolt [1] and the cable clutch plate [2] and remove the clutch cable [4] from the clutch operating arm [3].

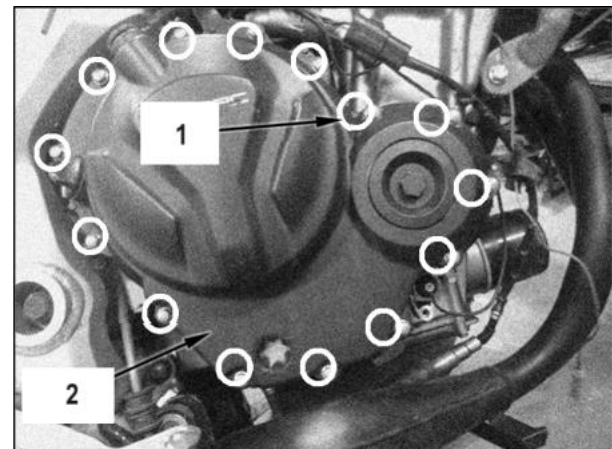
Remove the clip [2] from the skid plate support plate [1] under the motorcycle. Remove the bolt [3] and the support plate [4].



Release the right crankcase cover bolt [1] in 2-3 times.

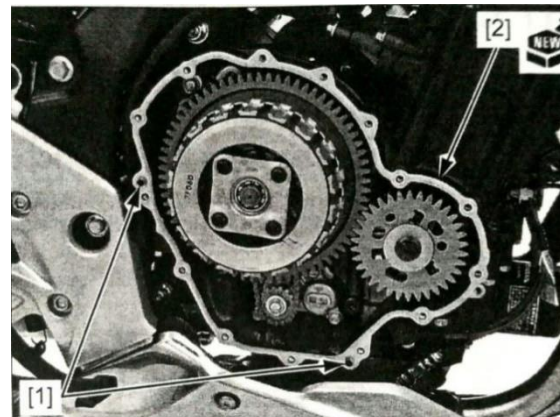
Remove the following components:

- Bolt [1]
- Right crankcase cover [2]



Remove the locating pin [1] and the gasket [2]. Clean up the gasket material on the joint surface of the crankcase and cover. Be careful not to damage the binding surface. The installation sequence is opposite to the disassembly order.

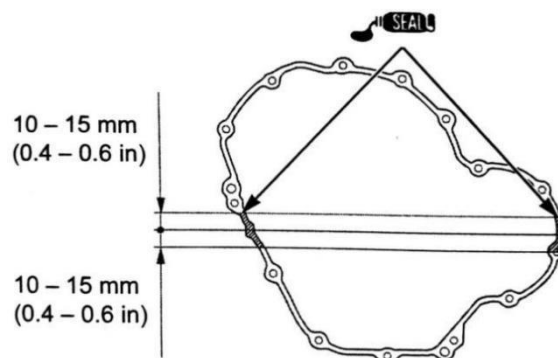
Torque: right crankcase cover bolt:
12N • m



Attention:

- Apply end face sealant to the joint part of the crankcase, as shown in the figure.
- Replace with a new sealing gasket for the right crankcase cover.
- Align the hole on the clutch rib positioning plate with the right side

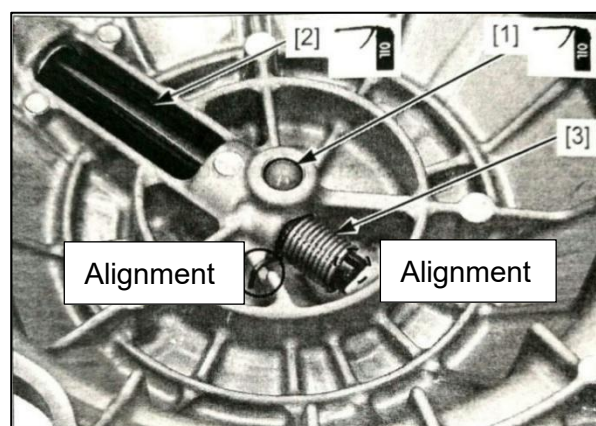
Align the protrusions on the crankcase cover.
Adjust the free stroke of the clutch handle.
Add recommended oil to the crankcase and check if there is no oil leakage

**Disassembly/Assembly**

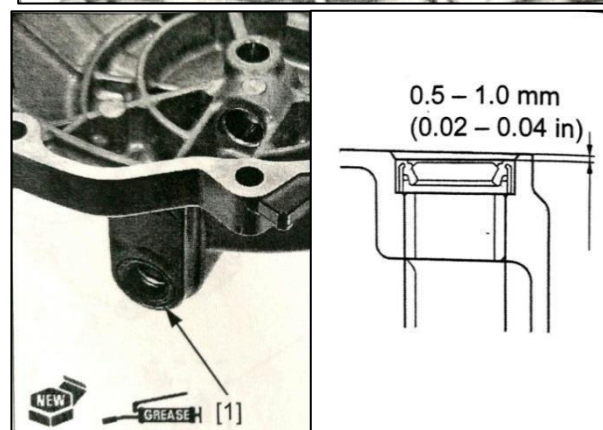
Rotate the clutch control arm [1] and remove the clutch small push rod [2].

Remove the clutch control arm and return spring from the right crankcase cover [3].

Remove the oil seal from the right crankcase cover [1]. The assembly sequence is opposite to the disassembly sequence

**Attention:**

- Apply grease to the new oil seal.
- Install the oil seal to the specified depth, as shown in the figure.
- Align the hook on the return spring with the notch in the right crankcase.
- Align the return spring with the groove of the clutch control arm.
- Apply oil to the sliding surfaces of the clutch control arm and push rod.

**Inspect**

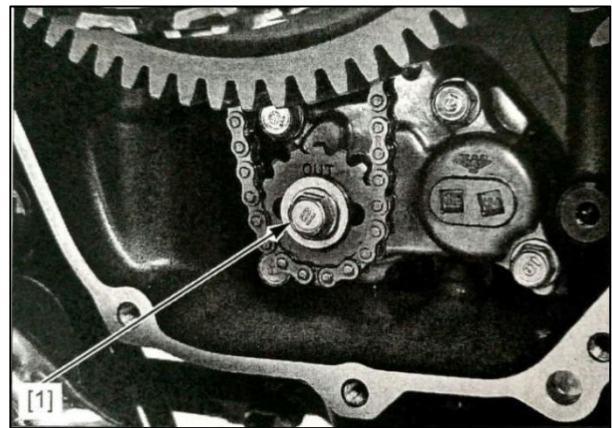
Check the following components for scratches, damage, abnormal wear, and deformation.

- Clutch control arm sleeve
- Clutch control arm
- Return spring
- Small push rod

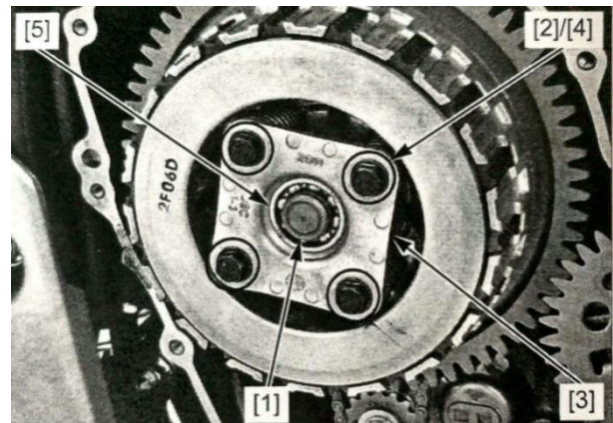
6.5 Clutch

Disassemble

Remove the right crankcase cover. If you need to remove the clutch bush, remove the oil pump, and remove the driven wheel seal bolt when the clutch is still installed



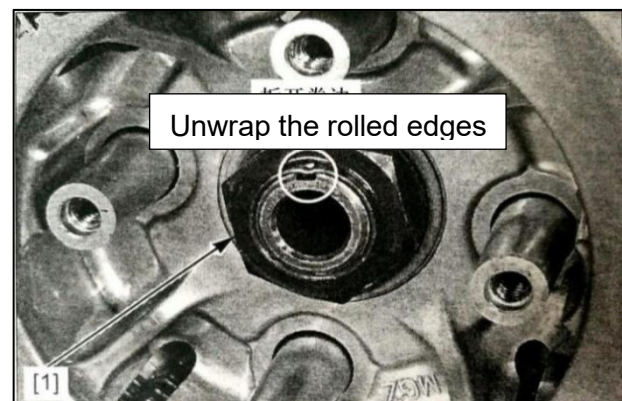
Remove the clutch large push rod [1]. Release the clutch lift plate bolt [2], remove the bolts, the push plate [3] and the clutch spring [4]. Remove the lift plate bearing [5] from the push plate.



Disassemble the locking rim of the clutch center lock nut.

Note: Do not damage the spindle thread.

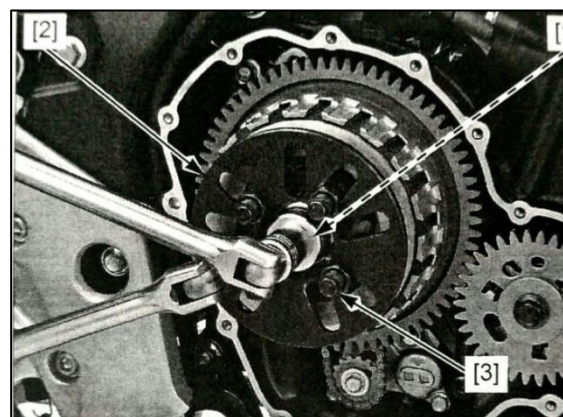
Use the tool to secure the clutch press plate while loosen the lock nut [1].



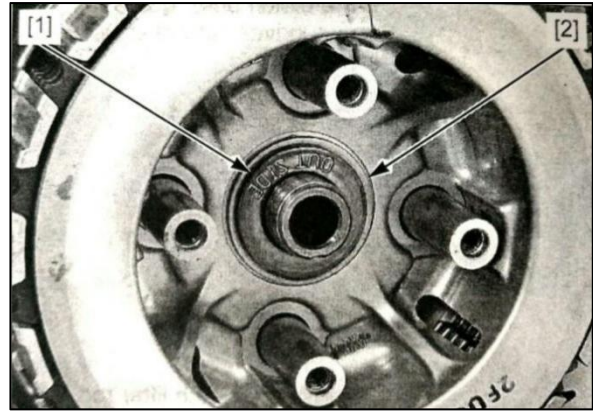
Tool:

[2] center set positioning plate

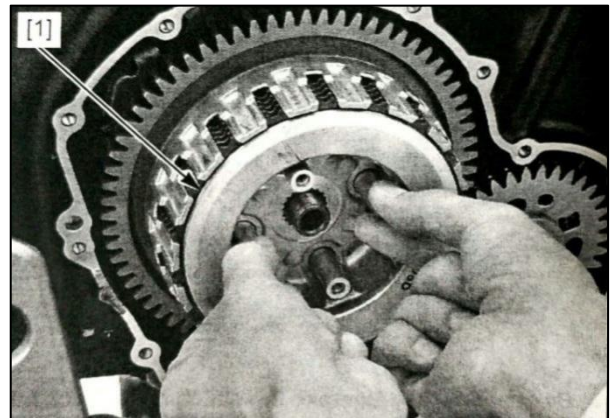
With a 640mm stud [3]. Remove the locking nut.



Remove the lock washer [1] and gasket [2]

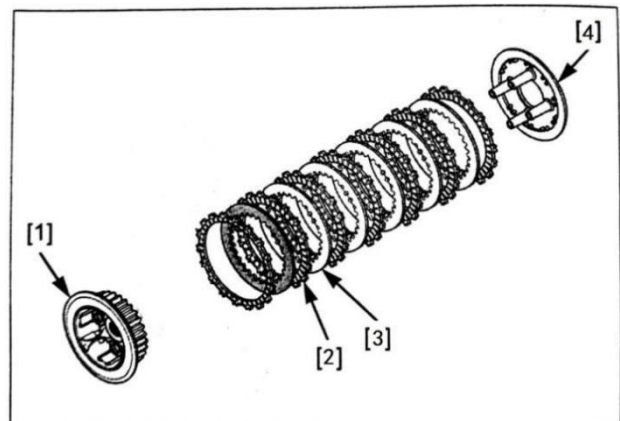


Remove the clutch center sleeve assembly [1].

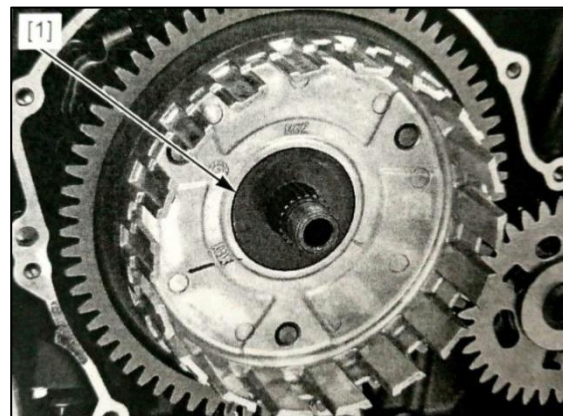


Remove the following components:

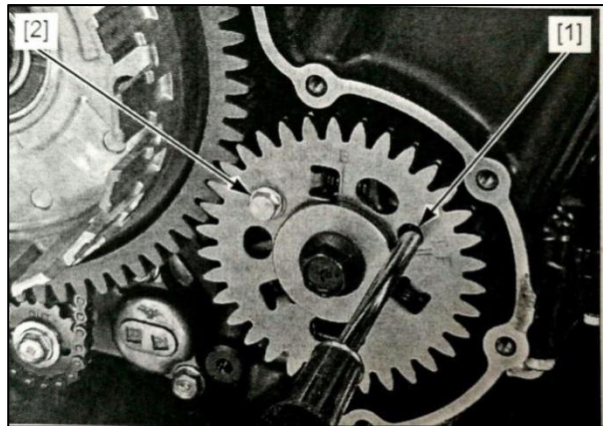
- Center sleeve [1]
- Clutch active friction plate [2]
- Clutch driven friction plate [3]
- Pressing plate [4]



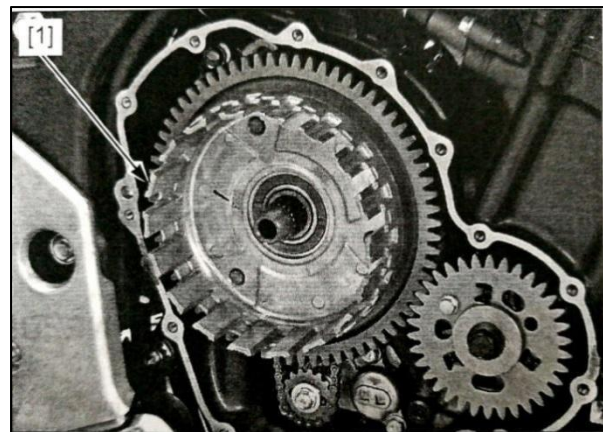
Remove the thrust washer [1].



Insert a screwdriver into the groove of the primary driving gear [1] and move the gear to align the gear teeth with the primary driven gear. Install a 6×14mm bolt at the positioning hole of the primary driving gear [2].

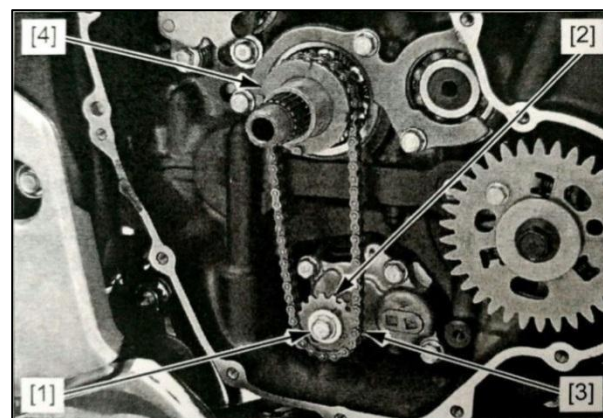


Remove the clutch cover [1].

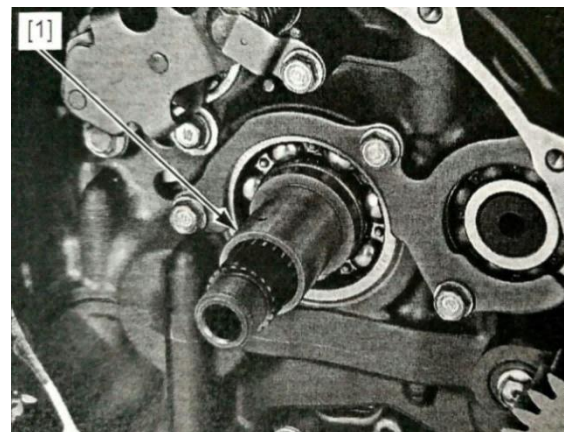


Remove the following components:

- Oil pump driven sprocket fastening bolt [1]
- Oil pump driven sprocket [2]
- Oil pump chain [3]
- Oil pump drive sprocket [4]



Remove the clutch bushing [1]



Inspect

Check the following components for scratches, damage, abnormal wear, and deformation. If so, please replace it.

- Clutch large push rod
- Clutch lifting plate bearing
- Clutch lifting plate
- spring
- Center sleeve
- Flat washer
- Disc spring
- Master-slave motion film
- -Clutch housing/primary driven gear/needle bearing
- Clutch bushing
- Oil pump main driven sprocket
- Oil pump chain
- Main shaft

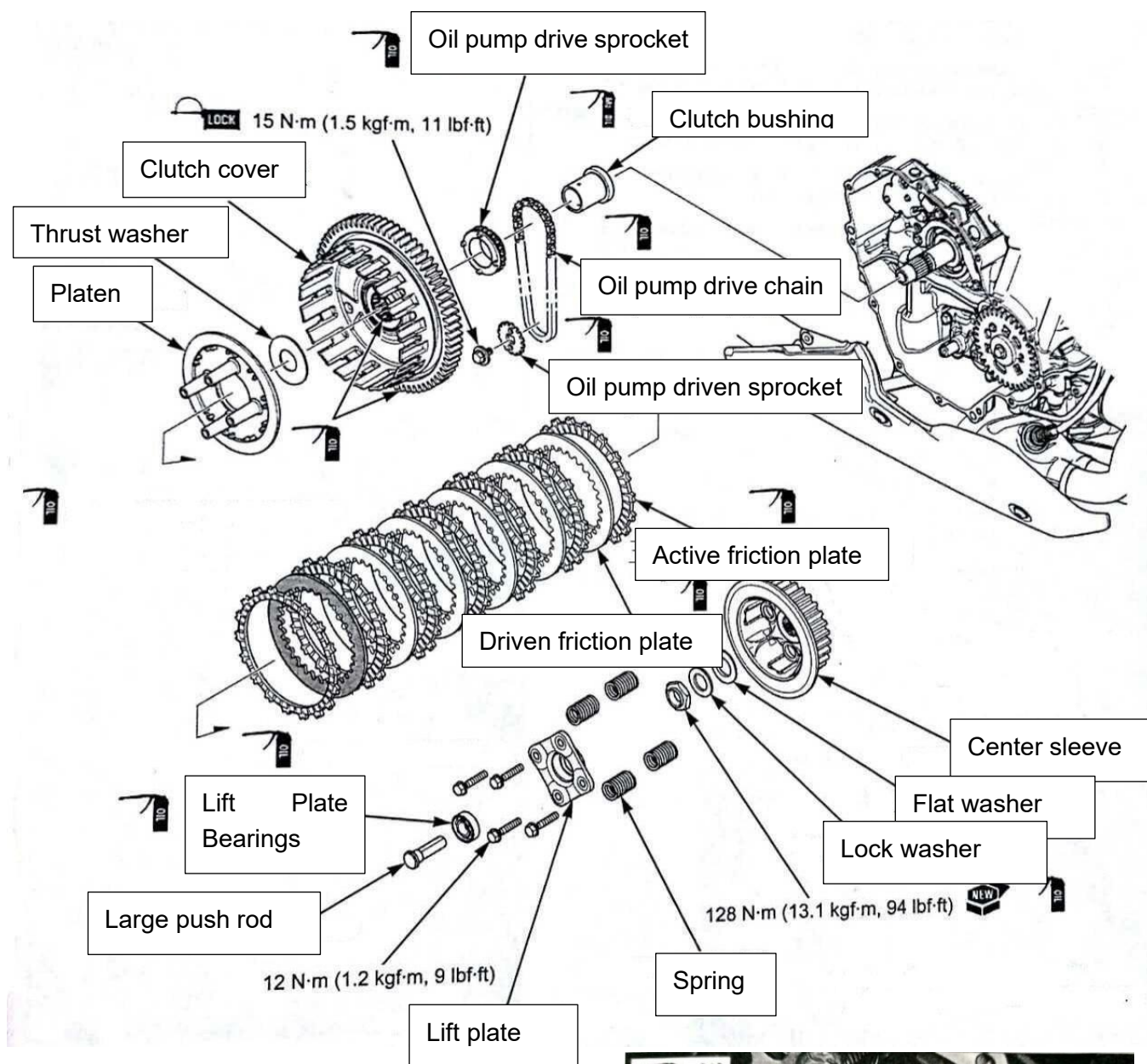
Measure each part according to **the specifications of the clutch and shift mechanism.**

If any part exceeds the maintenance limit, please replace it.

Attention:

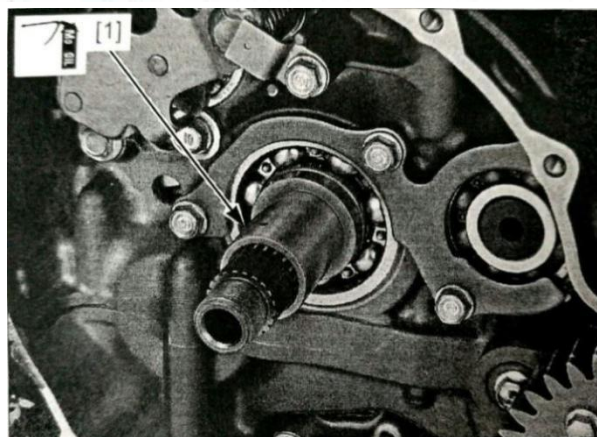
- Replace the clutch springs in groups.
- Replace the main and driven friction plates in groups.

Install



Apply molybdenum solution to the outer surface of the clutch outer sleeve [1] and install it onto the spindle.

Apply clean engine oil to the main and driven gear teeth of the oil pump and the drive chain.

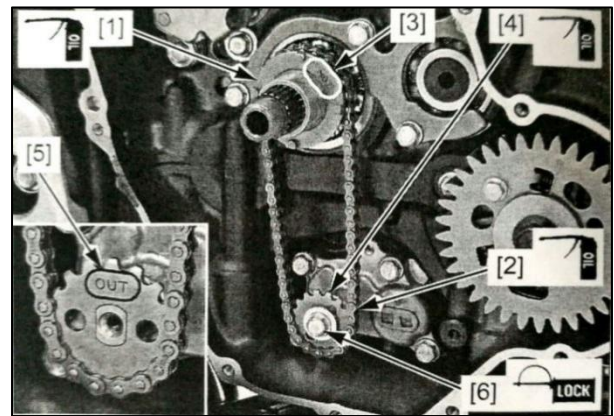


Install the oil pump drive wheel [1] and drive chain [2], paying attention to facing up the "MGZ" mark [3] on the drive wheel.

Install the oil pump driven wheel [4], ensuring that the "OUT" sign [5] is facing upwards and aligned with the horizontal plane.

Apply sealant to the threaded surface of the oil pump driven wheel sealing bolt.

Install the oil pump driven wheel sealing bolts [6].



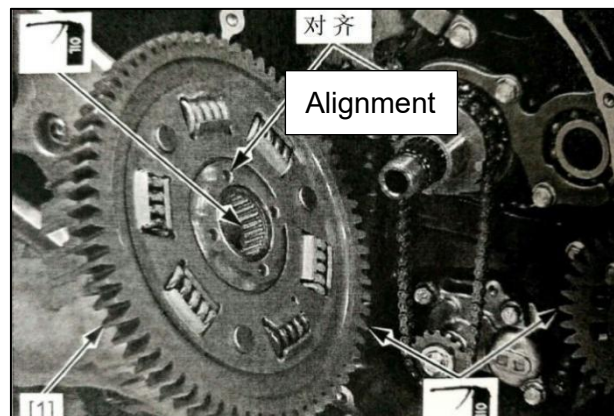
Attention:

- After installing the clutch, tighten the driven wheel bolts to the specified torque.

•
Apply clean engine oil to the inner and outer holes of the needle bearing in the clutch housing, as well as the teeth of the primary driving and driven gears.

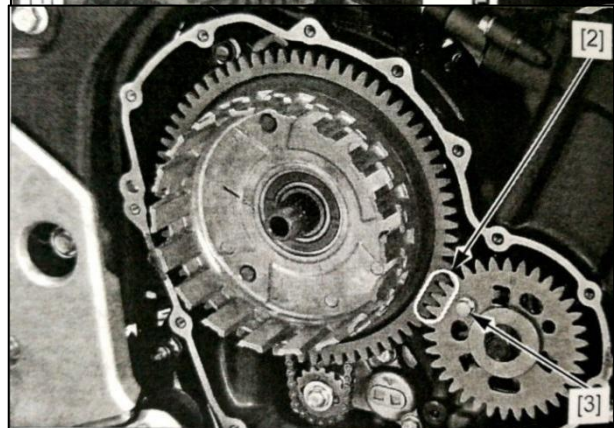
Install the clutch cover [1] and align the holes on the cover with the protrusions on the oil pump drive wheel.

When installing the outer cover, rotate the oil pump driven wheel.



Attention:

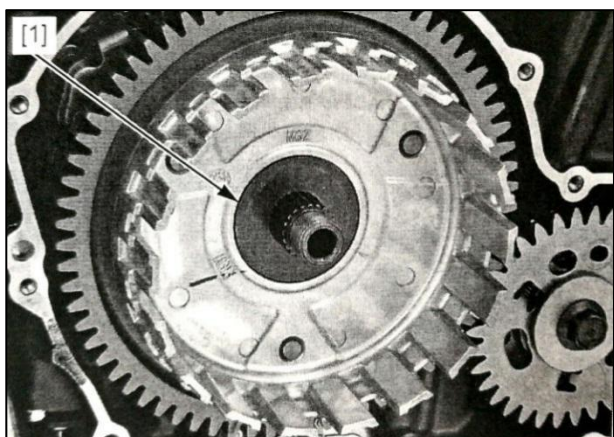
- Ensure the correct meshing of the primary main and driven gears. Remove 6 from the primary driving gear $\times$ 14mm bolt [3].



Attention:

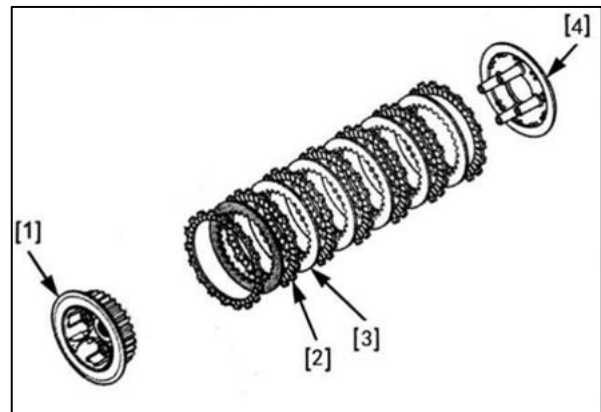
- After installing the clutch cover, do not forget to remove it

Install the thrust washer [1]



Apply clean engine oil to the clutch friction plate. Starting from the active disk [1], take turns installing the active disk

Install the clutch driven plate and pressure plate [3] onto the clutch center sleeve [4], and align the "0" mark on the pressure plate and center sleeve.



Install the clutch center sleeve assembly [1] onto the clutch housing, align the teeth of the driving disc with the grooves on the housing one by one, and align the splines on the center sleeve with the splines on the spindle.

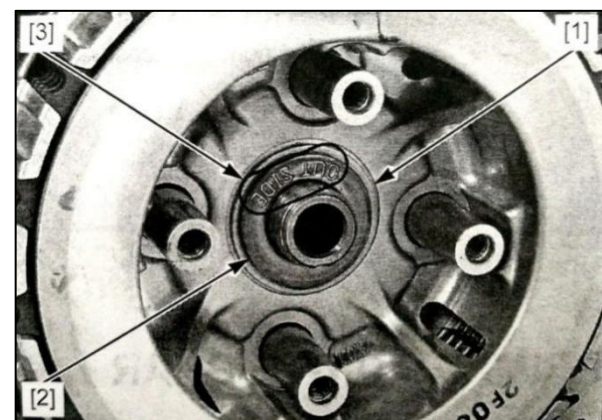


Install the washer [1].

Install the lock washer [2], making sure that the "OUTSIDE" sign faces outward.

Apply clean engine oil to the threads and seating surface of the clutch lock nut.

Install the lock nut [1] on the spindle.



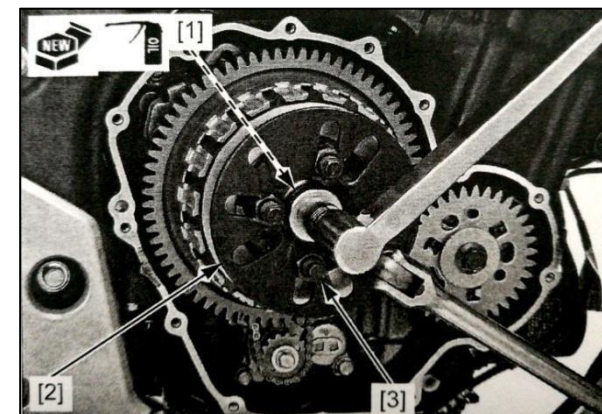
Fix the pressure plate with a tool and then tighten the locking nut to the specified torque.

Tools:

[2] Center sleeve fixing plate

Matching 6 × 40mm bolt usage

Torque: 128N • m



Install the convex column on the locking nut [1] into the groove on the spindle. Be careful not to damage the thread of the spindle

Apply clean engine oil to the rotating part of the lift plate bearing.

Install the lifting plate bearing [1] into the lifting plate [2].

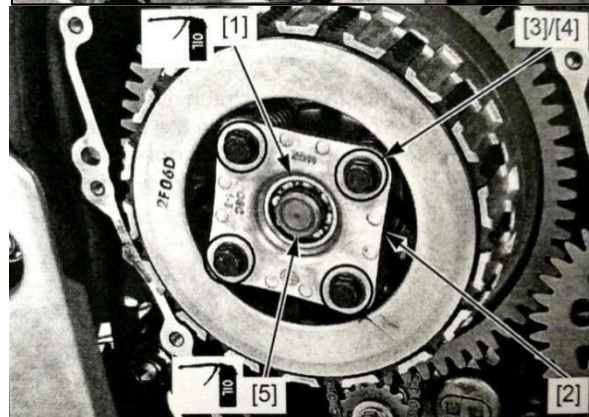
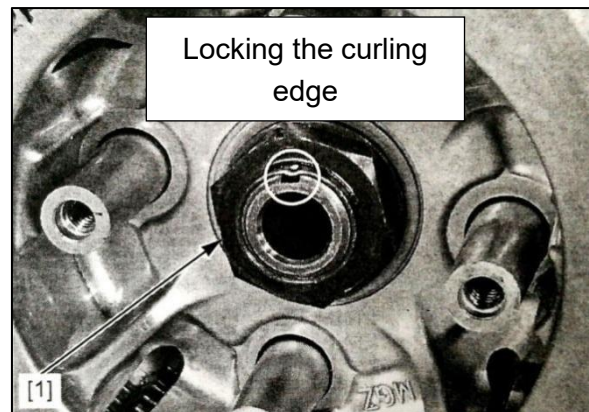
Install the clutch spring [3], the lifting plate, and the lifting plate bolts [4].

Tighten the lifting plate bolts in 2-3 staggered steps and tighten to the specified torque.

Torque: 12N · m

Apply clean engine oil to the sliding surface of the small push rod.

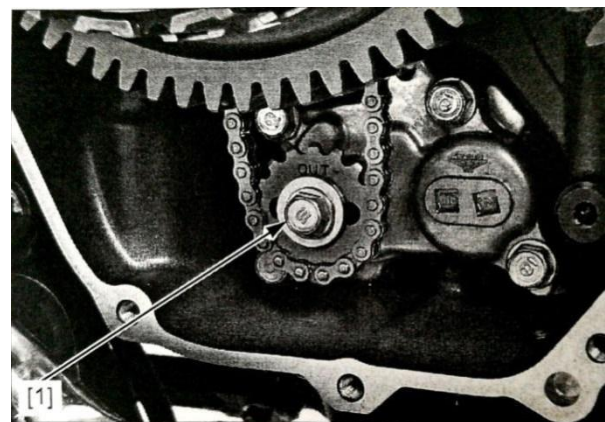
Install the small push rod [5]



Tighten the locking bolt [1] of the oil pump driven sprocket to the specified torque.

Torque: 12N · m

Install the right crankcase cover.

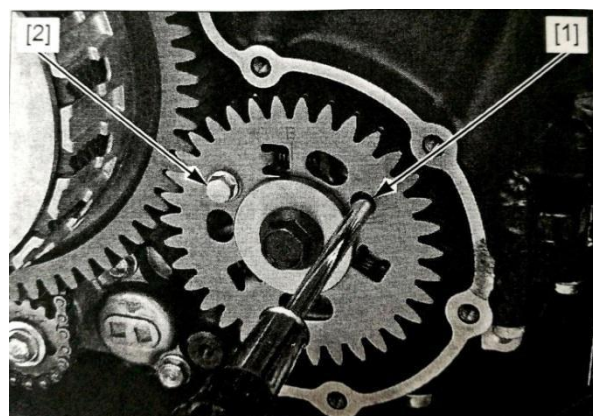


6.6 Primary driving gear

Disassembly

Remove the right crankcase cover.

Insert a screwdriver into the groove of the primary driving gear [1] and move the gear to align the gear teeth with the primary driving gear. Install a 6 at the positioning hole of the primary driving gear × 14mm bolt [2].

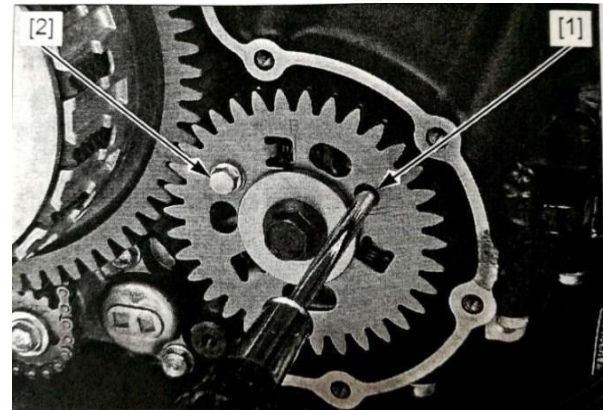


Fix the primary driving gear [1] with a tool and remove the primary driving gear bolt [2] and washer [3].

Tools:

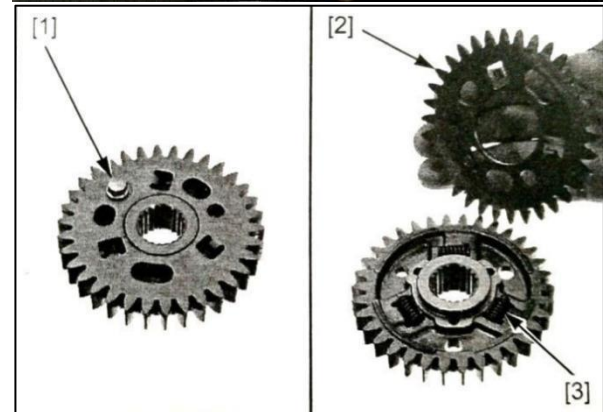
[4] Tooth stopper, 2.5

Remove the gear stopper and primary driving gear.



Remove 6 × 14mm bolt [1] and primary driving gear pair teeth [2].

Remove the spring from the secondary tooth slot [3].



Inspect

Check the following components for scratches, damage, abnormal wear, and deformation. If necessary, please replace it.

Primary driving gear main gear

Accessory tooth

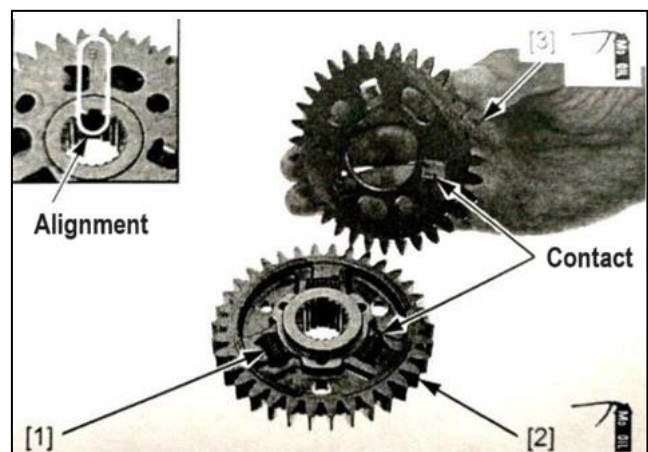
Spring

Install

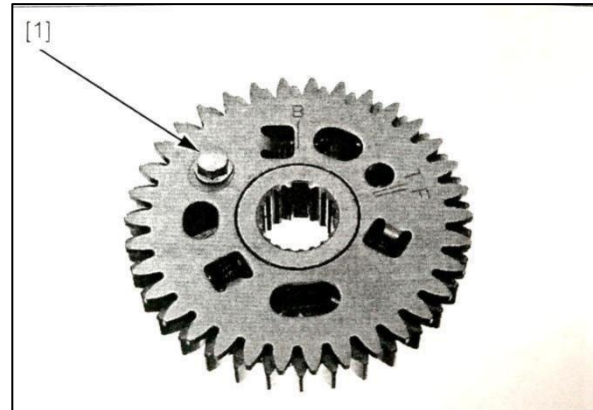
Apply the molybdenum solution to the sliding surface of the primary active teeth and secondary teeth.

Install the spring [1] into the groove of the primary tooth [2].

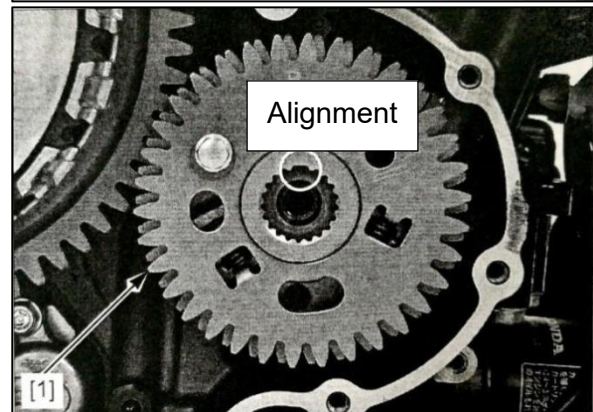
Install the secondary tooth [3] on the primary active tooth so that the label is at the end of the spring, and the index line of the "B" mark is aligned with the broad tooth as shown.



Install a 614mm [1] bolt to prevent gear release.



Install the primary active tooth [1] onto the crankshaft.



Insert the screwdriver into the primary active gear slot [1] and move the gear so that the secondary gear coincides with the primary driven gear.



Apply clean engine oil to the thread and joint section of the primary active tooth bolt. Install the washer [1] and primary tooth bolt [2].

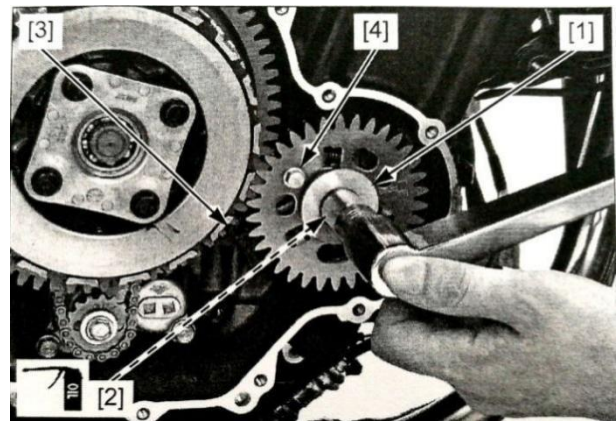
Hold the primary active teeth with the tool and screw the primary tooth bolt to the specified torque.

Tool:

[3] Tooth stopper, 2.5

07724-0010100 / 07724-001A100

Torque: 103 N • m



Remove gear stopper.

Remove the 614 mm bolt [4] from the primary driving gear

Note:

- Do not forget to remove the 614mm bolt [4] after installing the primary active teeth. Install the right-side crankcase cover

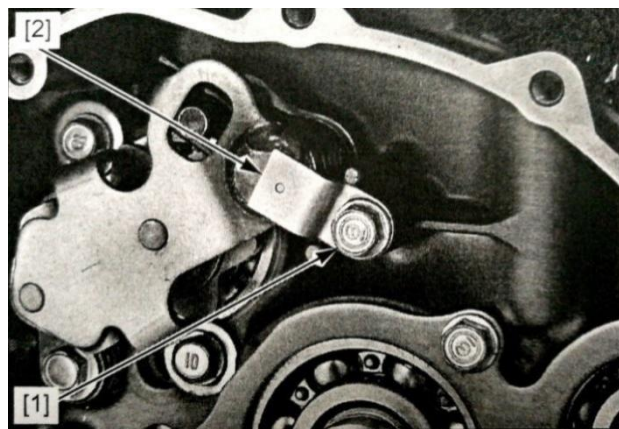
6.7 Shift system

Disassemble

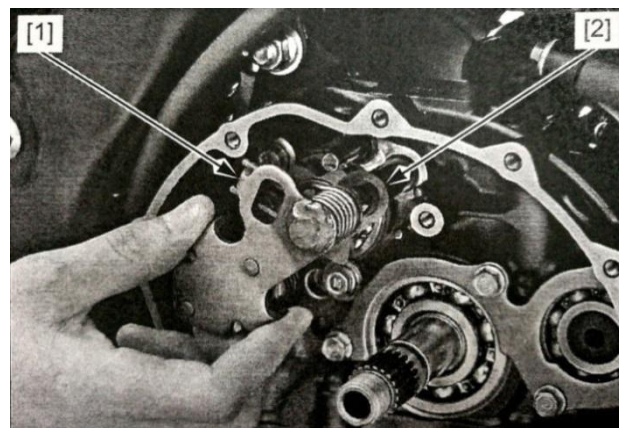
Remove the following components:

- Clutch
- Shift arm

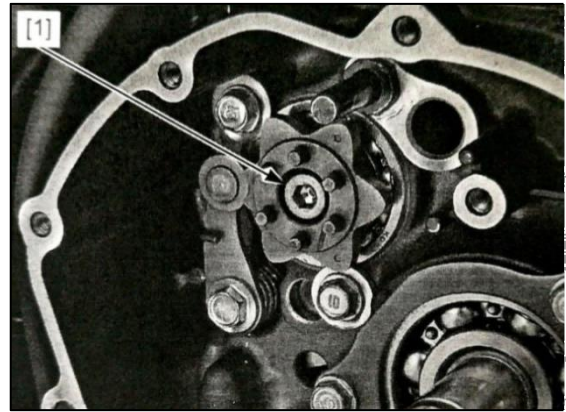
Clean up the dirt on the shift shaft spline. Remove the bolt [1] and the limit plate [2].



Remove the shift shaft assembly [1] and thrust washer [2] from the curve
Pulling out the axle box



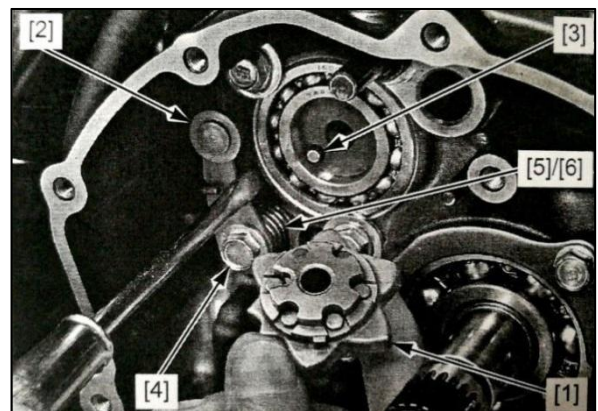
Remove the hexagon bolt [1] inside the five-star dial



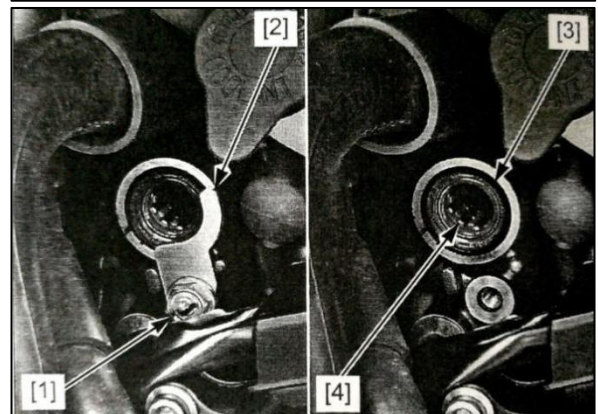
Attach the stop plate [1] with a screwdriver and remove the five-star dial plate [2] as shown.

Remove the following components:

- Positioning pin [3]
- Retaining plate positioning bolt [4]
- Stop plate
- Washers [5]
- Return spring [6]



Remove the bolt [1], shift arm oil seal plate [2], oil seal [3] and needle roller bearing [4].



Inspect

Check the following components for damage, abnormal wear, or deformation. Replace it, if necessary.

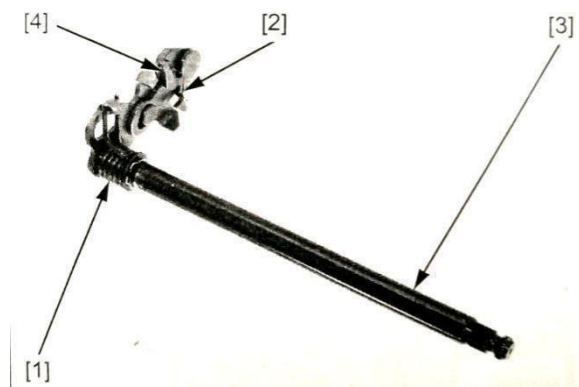
- Five-star paddle
- Stop plate
- Stop plate return spring
- Shift arm needle bearing

Shift arm

Check the shift arm torsion spring [1] and [2] for fatigue or wear, if necessary. Check the shift shaft [1] for wear or bending.

Check the shift dial [2] for wear, damage, or deformation.

If you need to be replaced, replace the shift shaft in groups.

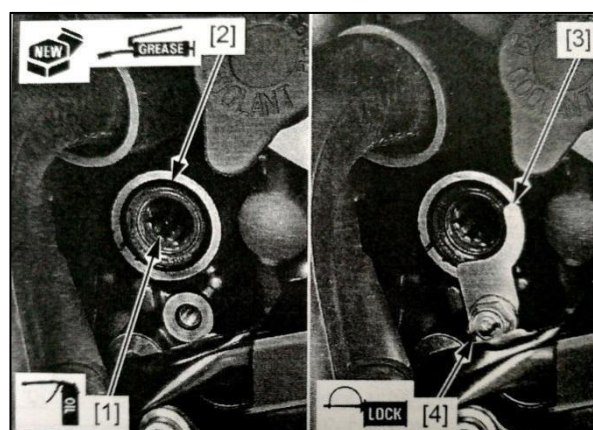


Install

Apply clean engine oil to the shift arm roll

Install the needle bearing [1] onto the crankcase. Apply butter to the edge of the new oil seal [2] and install it into the crankcase, ensuring that its surface is aligned with the crankcase. The root of the chamfer is flush. Apply tightening agent to the shift arm oil seal pressure plate bolt thread.

Install the shift arm oil seal pressure plate in the direction shown in the figure [3] Tighten the bolts [4] to the specified torque.



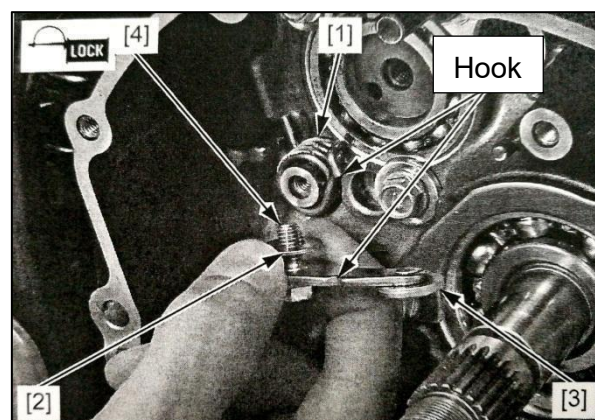
Torque: 12N • m

Apply tightening agent to the threads of the stop plate bolts.

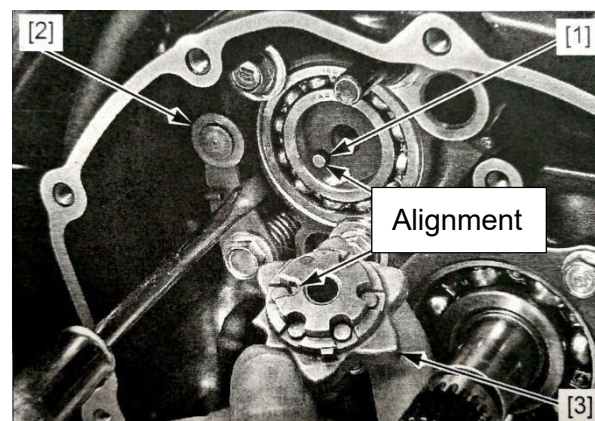
Install the return spring [1], gasket [2], and stop plate [3] Hook the return spring into the groove of the stop plate. Install and tighten the stop plate bolts [4] to the specified torque

Torque: 12N • m

Check whether the stop plate can operate normally.

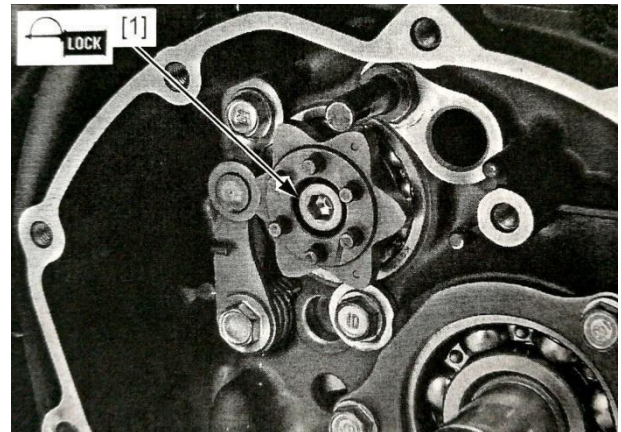


Apply fixing agent to the positioning bolts of the five-star paddle on the thread. Install the locating pin [1] into the pin hole on the variable speed drum. Secure the stop plate [2] with a screwdriver as shown in the figure.



Install the five-star dial plate [3] and tighten the slot on it to the positioning bolt [1] for the installation of the five-star dial plate, and tighten it to the specified torque.

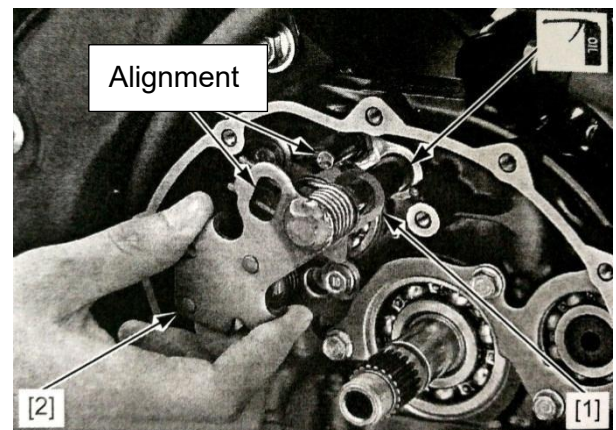
Torque: 23N • m



Apply clean engine oil to the surface of the shift shaft face.

Install the thrust washer [1] and shift arm combination [2]

In the crankcase, align the end of the aftertaste spring with the aftertaste spring Position spring pin.



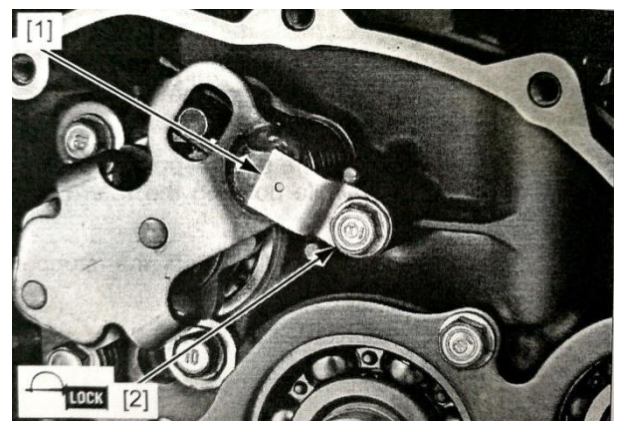
Apply fixing agent to the threads of the pressure plate bolts.

Install the pressure plate [1], bolts [2], and tighten to the specified torque

Torque: 12N • m

Install the following components:

- Gear lever
- Clutch



Shift-shift pedal removal / installation

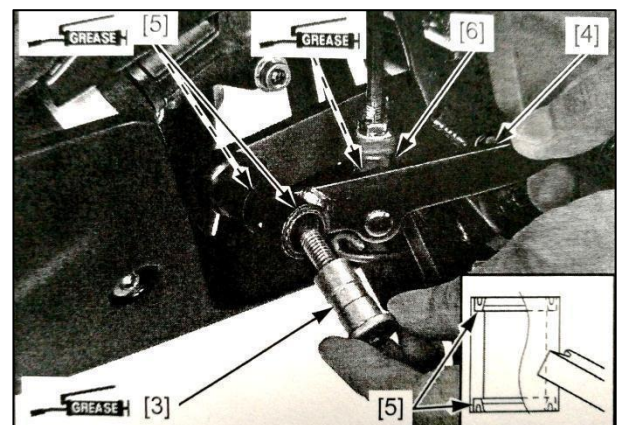
Remove the lock bolt [1] and the lever [2] from the shift shaft.

Remove the positioning bolt [3] and the shift pedal [4].

Remove the dust ring [5].

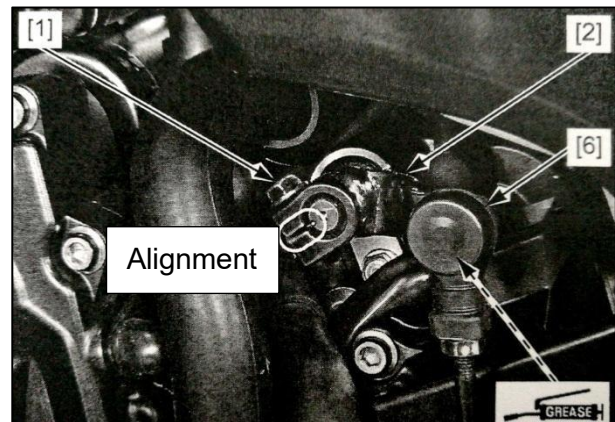
Check if the dust ring and lever ball joint dust cover are damaged.

Chemical or wear, if necessary, please replace. The installation sequence is opposite to the disassembly sequence.



Torque:**Shift pedal positioning bolt: 27N • m****Attention:**

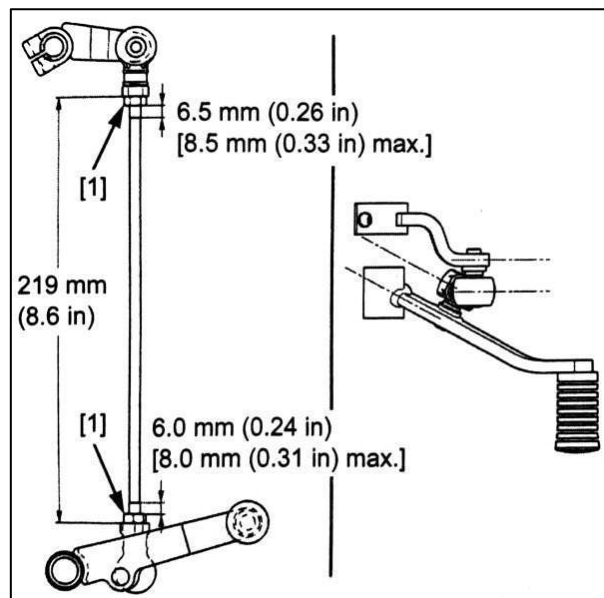
- Apply fixing agent to the edge of the dust ring.
- When installing the dust ring, pay attention to its edge facing outward.
- Apply fixing agent to the pivot bolt area where the shift pedal slides.
- Apply fixing agent to the ball joint of the shift pedal lever. Align the slit on the shift arm with the machined hole on the shaft.



When adjusting the height of the shift pedal, loosen the lock nut [1] and pay attention to the following points:

Attention:

- When tightening the nut at the shift arm end, turn the thread to the left. Adjust the length of the pull rod to the standard distance between the two ball joint ends, as shown in the figure.
- After the adjustment is completed, tighten the lock nut of the shift pedal adjustment.

**Attention:**

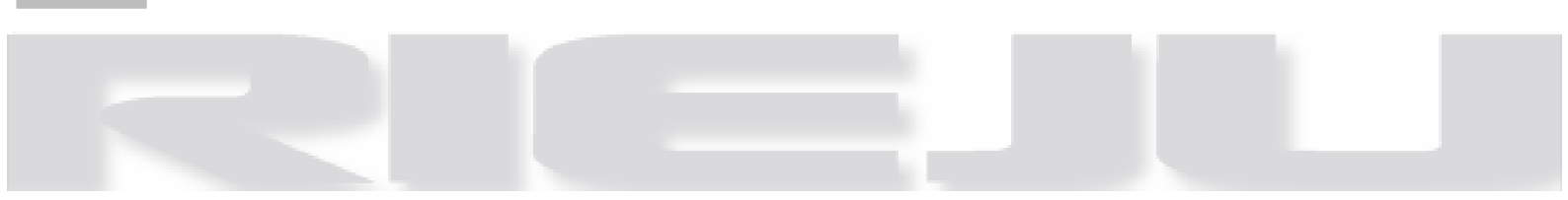
- Tighten the locking nut and position the ball joint parallel to the shift arm and shift pedal.
- Ensure that the thread length of the locking nut is less than the specified value.

Shift arm end: 8.5mm

Shift pedal end: 8.0mm

7. Magneto and starting clutch

7.1	Maintenance Information.....	107
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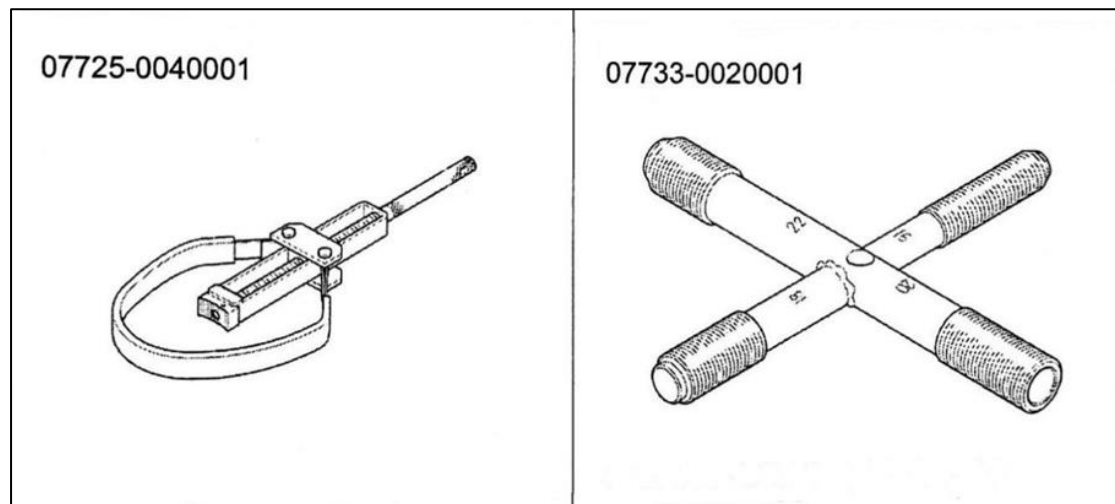
7.1 Maintenance Information

- This chapter explains the maintenance of the stator and rotor of a magneto. All operations do not require the engine to be removed from the frame.
- Inspection of the charging coil of the AC generator.
- Inspection of triggers.
- Maintenance of the starting motor.

7.2 Specifications for magneto and starting clutch

Project	Standard value	Maintenance limit value (mm)
Outer diameter of starting disc gear shaft sleeve	51.705-51.718	51.685
Inner diameter of the starting clutch housing	68.362-68.392	68.402

Tool

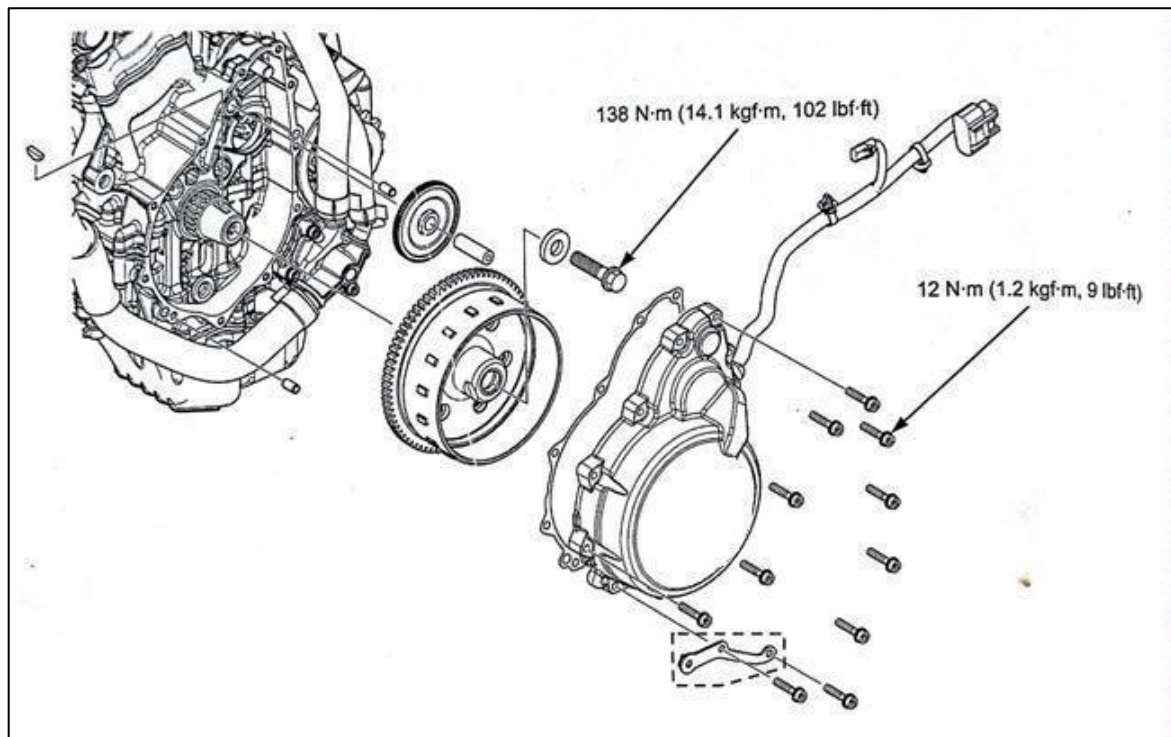


7.3 Troubleshooting

Starting motor rotates, engine does not start

- Starting clutch failure
- Starting motor dual gear or shaft failure
- Starting motor pinion failure or wear
- Starter drive gear failure

7.4 Component position relationship



7.5 Left crankcase cover

Disassembly/Installation

Attention:

- When removing the left crankcase cover, remove it from the bottom of the engine.
After installation, add the recommended engine oil to the specified level quantity.

Place the motorcycle on a level ground and maintain an upright position.

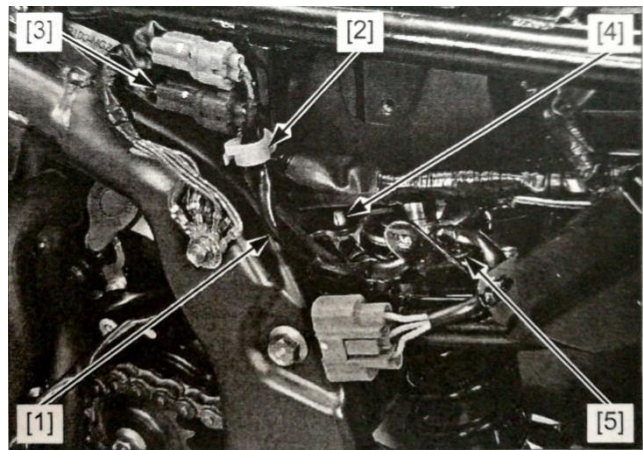
Remove the following components:

- Under Cowl
- Drive sprocket cover
- Voltage regulating rectifier

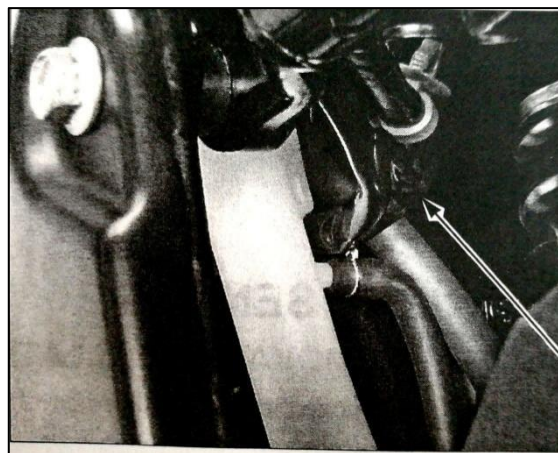
Remove the trigger cable from the clamp [1] [2].

Disconnect the red connector of the trigger [3].

Remove the magnetic motor stator and trigger wiring harness clip (brown [4], black [5]) from the frame.



Remove the magneto spindle and trigger wiring harness from the frame in the workshop [1]



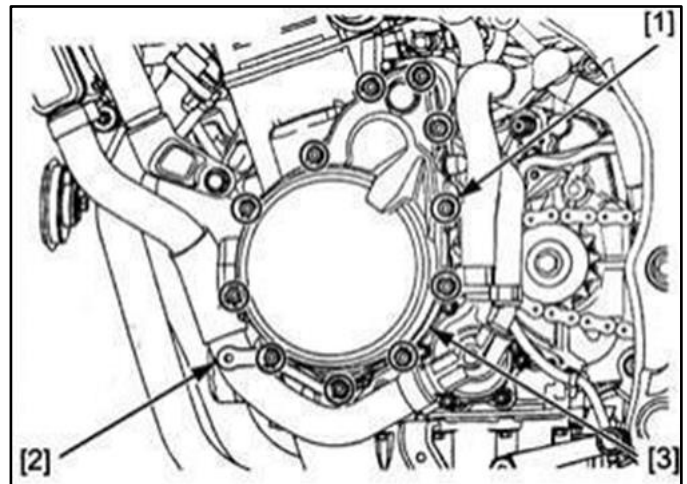
Loosen the left crankcase cover bolts in several diagonal steps [1].

Remove the following components:

- Bolt [1].
- Cover mounting plate [2]
- Left crankcase cover [3]

Attention:

- The left crankcase cover (spindle) bears the magnetic attraction of the rotor, so be careful during disassembly and installation.



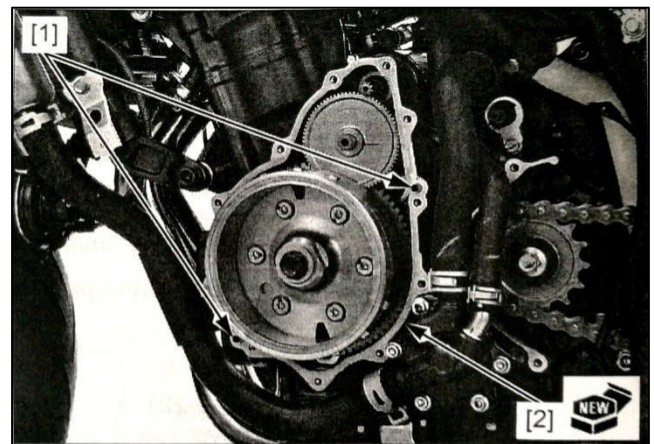
Remove the positioning pin [1] and the paper pad [2].

Remove all sealing gasket materials from the joint surface between the left crankcase and the box cover.

The installation sequence is opposite to the disassembly sequence.

Torque:

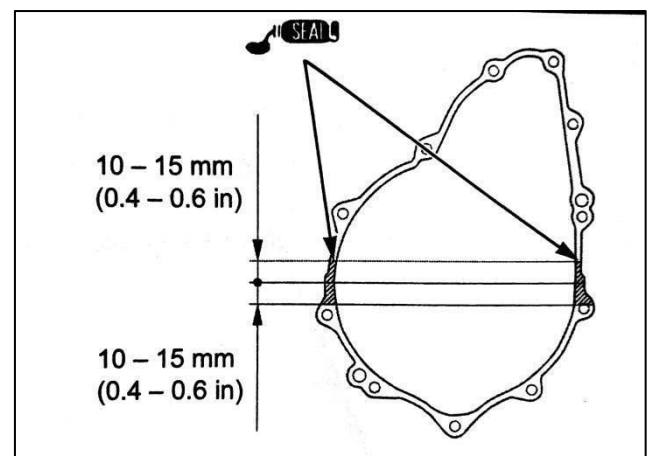
Left crankcase cover bolt: 12N • m



Attention:

- Apply end face sealant to the joint area of the crankcase, as shown in the figure.
- Replace the left crankcase cover paper pad with a new one. Check the oil level.

Ensure that there are no oil leaks.



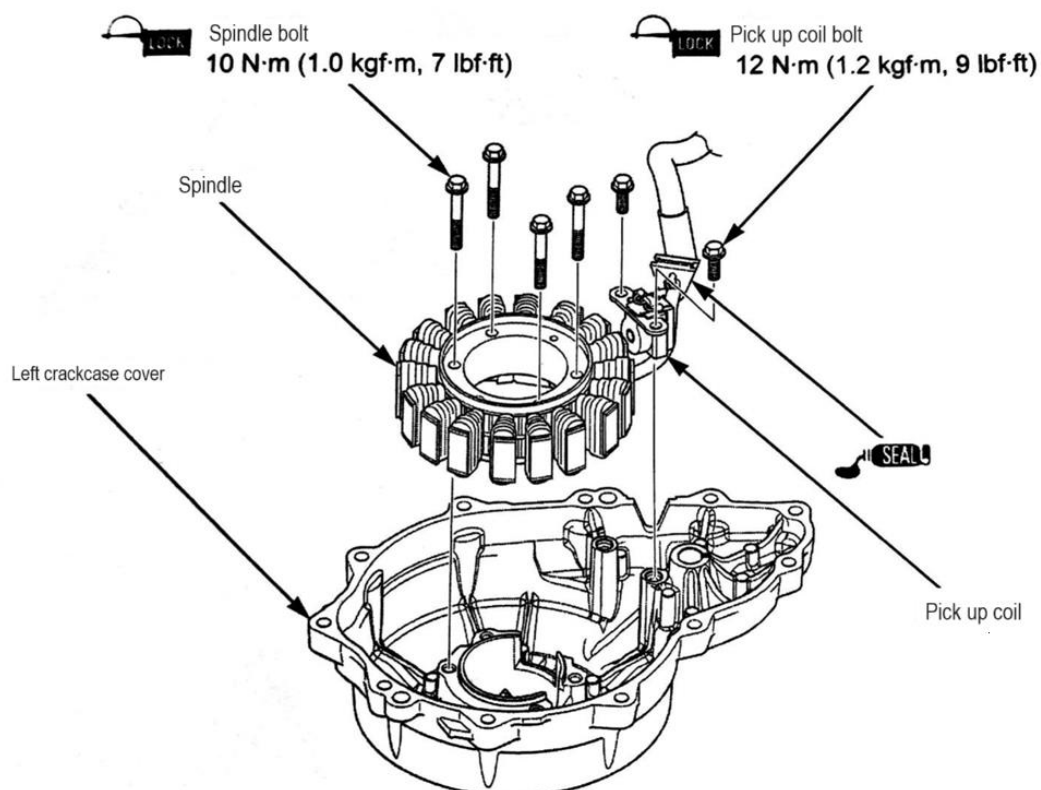
7.6 Magneto spindle and trigger

Disassembly/Installation

Remove the left crankcase cover.

Disassemble and install the spindle/pick up according to the following diagram.

- Apply thread sealant to the threads of the spindle and trigger bolts.
- Apply end face sealant to the sealing surface of the magneto/pick up wiring sleeve ring. The installation sequence is opposite to the disassembly sequence.

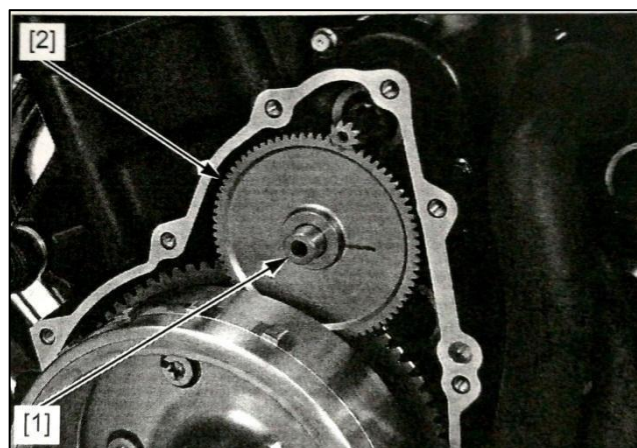


7.7 Magneto rotor

Disassembly

Remove the left crankcase cover.

Remove the double gear shaft [1] and the double teeth [2].



Secure the magneto rotor with a magneto retainer [1] and remove the bolts [2].

Attention:

- Install the fixing block of the magneto rotor retainer to prevent the rotor from rotating.

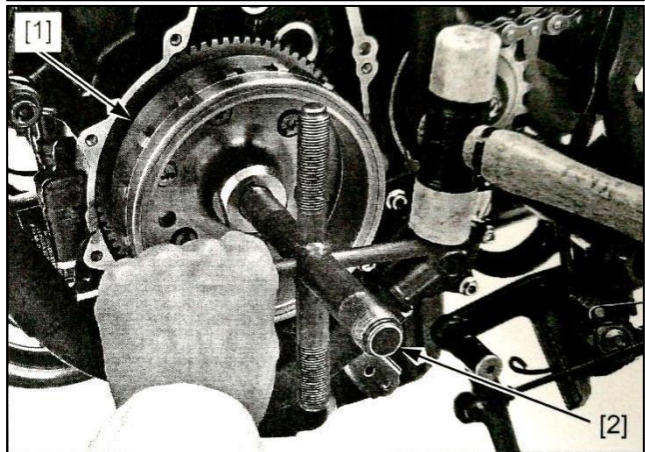
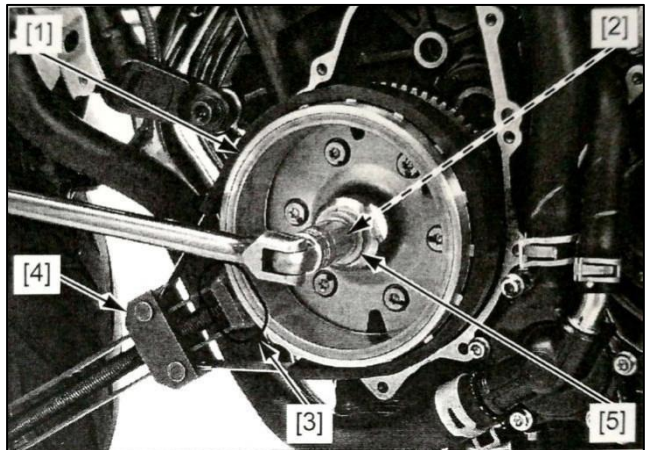
Remove the rotor bolts and washers [5].

Use a tool to remove the rotor [1].

Tools:

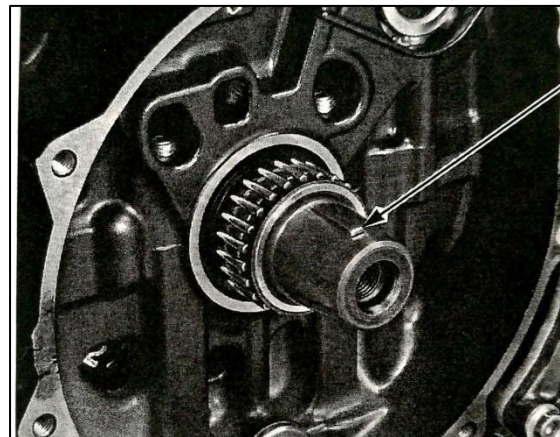
[2] Rotor remover

07733 0020001/07933 3950000



Remove the woodruff key [1].

Be careful not to damage the half round keyway and crankshaft.



Inspect

Inspect the following components for scratches, damage, abnormal wear, or deformation. If necessary, please replace it.

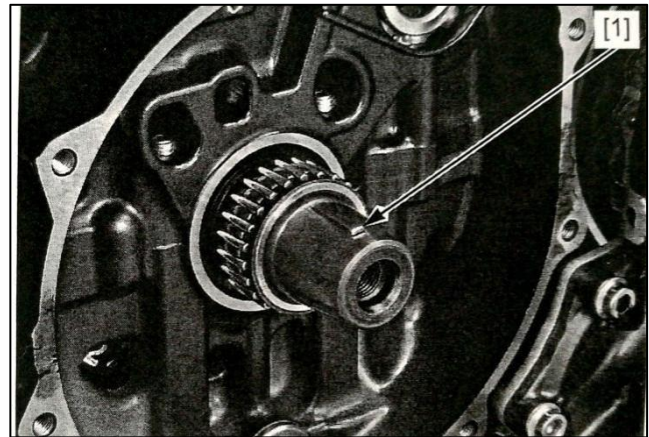
- Double gear shaft
- Double teeth
- Semicircle key
- Needle bearing

Install

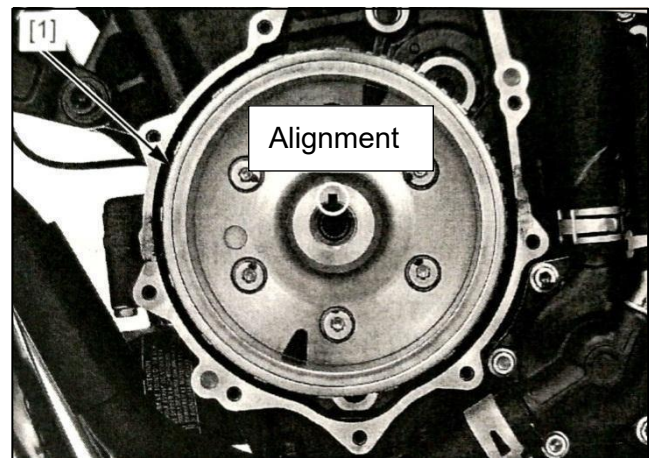
Install the woodruff key [1].

Apply engine oil to the rolling area of the needle bearing [2].

Be careful not to damage the half round keyway and crankshaft.



Thoroughly clean the oil from the crankshaft cone and rotor bore. Install the rotor [1], paying attention to aligning the half round key on the crankshaft with the keyway on the rotor.



Apply clean engine oil to the threaded and mounting surfaces of the rotor bolts.

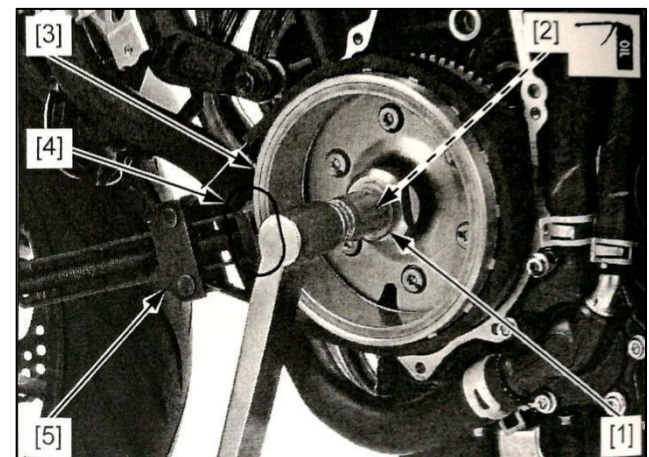
Install the gasket [1] and rotor bolts [2].

Secure the magneto rotor with a magneto retainer [1] and tighten the bolts to the specified torque.

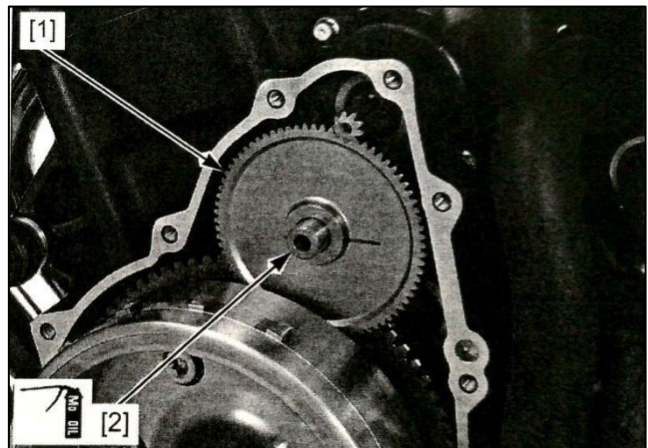
Attention:

- Install the fixing block of the magneto rotor retainer to prevent the rotor from rotating.

Torque: 138N • m



Apply molybdenum disulfide solution to the outer surface of the dual gear shaft. Install the dual gear [1] and shaft [2]. Install the left crankcase cover.



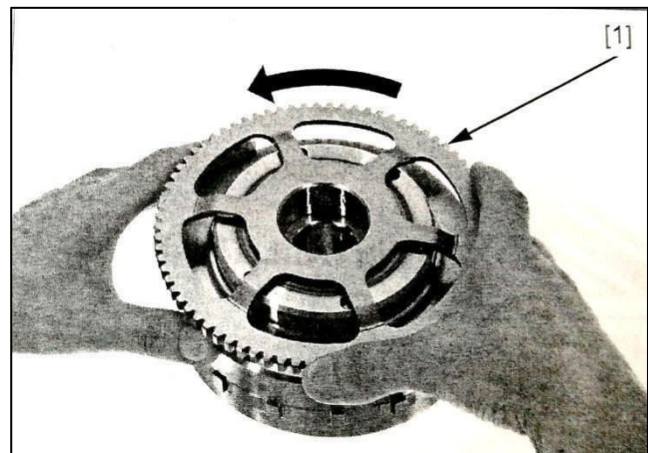
7.8 Starter clutch

Starter clutch operation check

Remove the rotor.

Check the operability of the starting clutch by rotating the disc teeth [1].

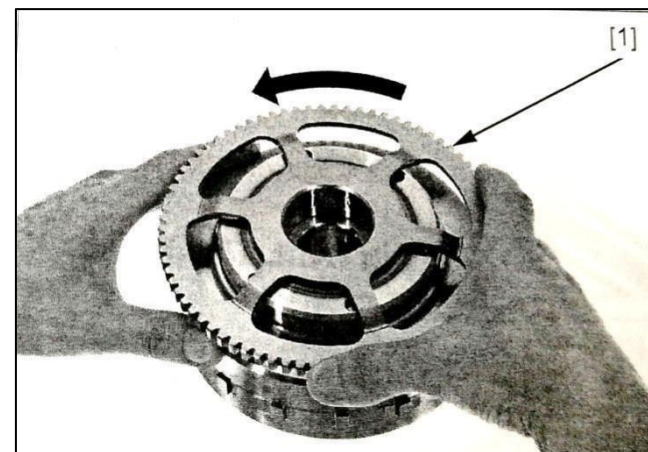
Check if the disc teeth rotate counterclockwise smoothly and if there is no clockwise rotation.



Disassembly

Remove the rotor.

Rotate the disc teeth counterclockwise and remove them [1].

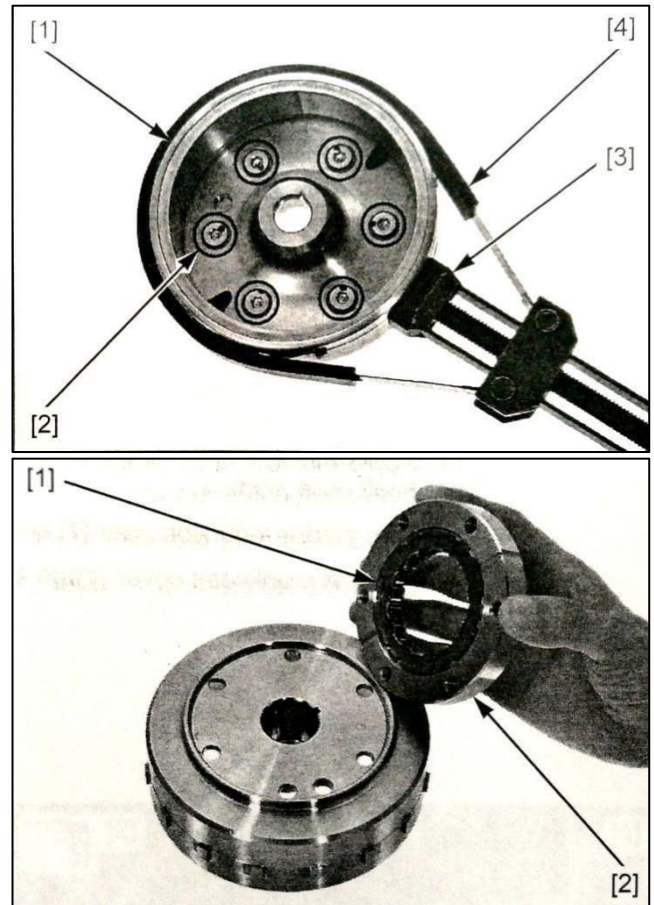


Fix the magneto rotor with a magneto retainer [1], and remove the fastening bolts of the starting clutch [2].

Attention:

- Install the magneto rotor retainer [3] and the fixing block [4] to prevent the rotor from rotating.

Remove the starting clutch combination.
Remove the starting clutch from the outer cover [1].



Inspect

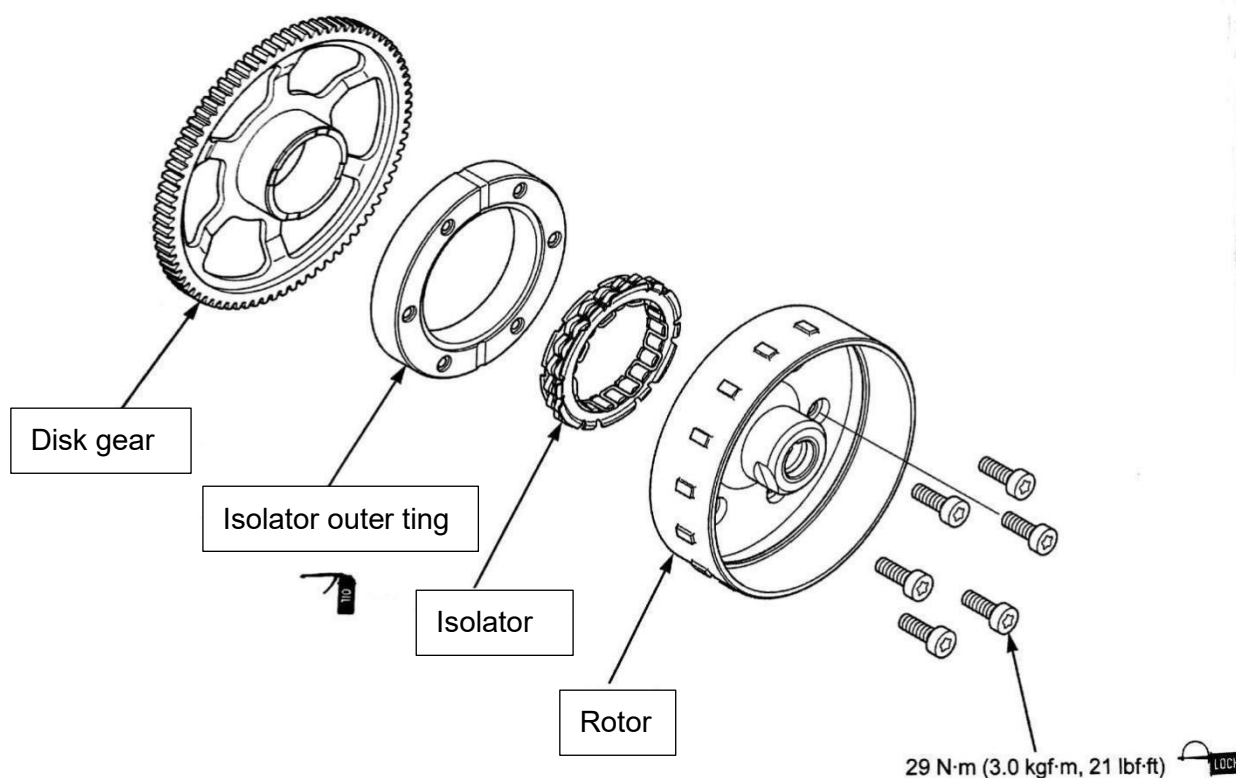
Inspect the following components for scratches, damage, abnormal wear, or deformation. If necessary, please replace it.

- Disc tooth
- Clutch cover
- Start clutch

Ensure that all components **meet the specifications of the magneto and starting clutch.**

Replace the component if it exceeds the repair limit.

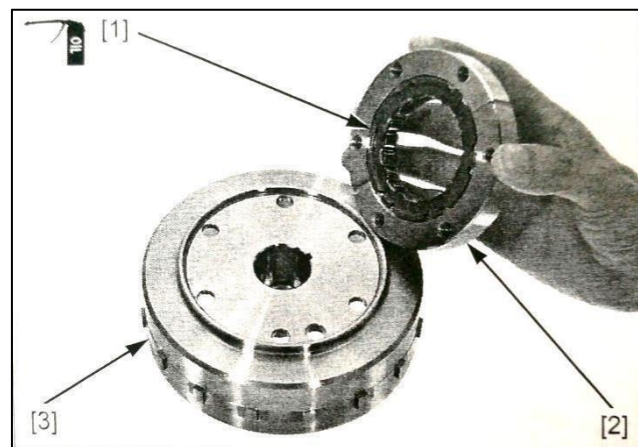
Install



Apply clean engine oil to the contact surface of the starting clutch.

Install the starting clutch [1] onto the starting clutch housing [2].

Install the starting clutch combination onto the rotor [3].



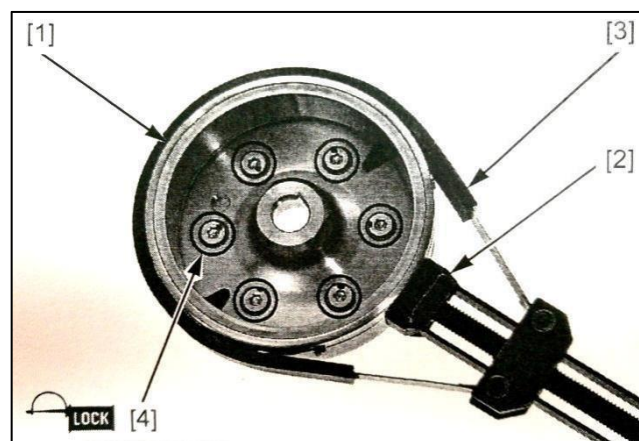
Fix the rotor with the rotor [1] retainer.

Attention:

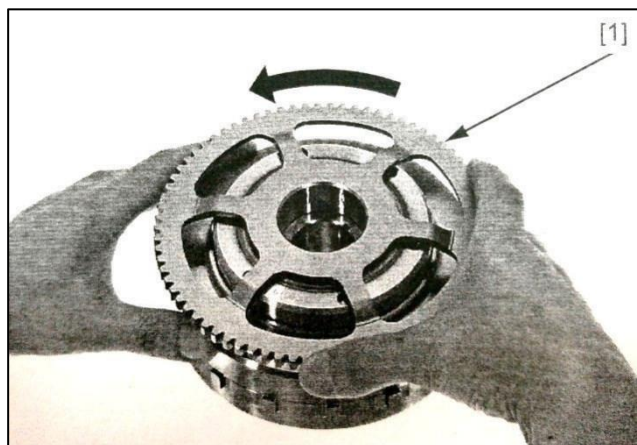
- Install the magneto rotor retainer [2] fixing block [3] To prevent the rotor from rotating.

Apply tightening agent to the threads of the clutch fastening bolts. Install and tighten the fastening bolts [4] to the **specified torque**.

Torque: 29N · m



Rotate the disc teeth counterclockwise [1] and install them into the rotor. Check the operation of the starting clutch. Install the rotor



8. Crankcase and power train specifications

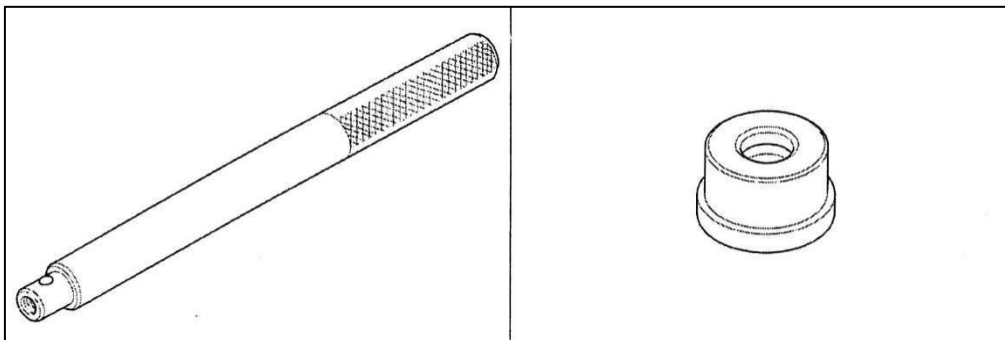
8.1	Maintenance information	119
8.2	Crankcase and power train specifications	120
8.3	Troubleshooting	121
8.4	Component layout	122
8.5	Power train.....	123
8.6	Crankcase.....	126



8.1 Maintenance information

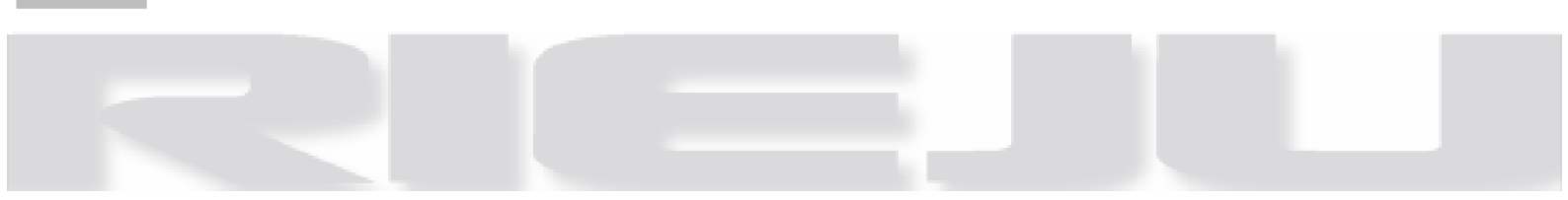
- The crankcase must be separated to serve the following components:
 1. Transmission system
 2. Crankshaft
 3. Balance shaft
 4. Piston, connecting rod, cylinder block
- The following components must be removed before separating the crankcase:
 1. Engine
 2. Shift system
 3. Magneto components
 4. Cylinder head components
 5. Tensioner
 6. Tensioning plate and guide plate
 7. Oil coarse filter
 8. Pressure relief valve
 9. Oil fine filter
 10. Water pump
 11. Water pipes
 12. Oil pressure sensor
 13. Vehicle speed sensor
 14. Gear display switch components
- Be careful not to damage the joint surface of the box during maintenance.
- Before assembling the crankcase, clean the oil passage.
- Before closing the box, evenly apply the end face sealant on the surface of the box, and clean any excess sealant.
- Select suitable color markings for the connecting rod big end bearing shells and main shaft bearing shells. The selection of bearing shells should be in accordance with the requirements in the bearing shell selection table. After the installation of the bearing shells, check the oil gap. Incorrect oil gaps can cause significant damage to the engine.

Tool:



8.2 Crankcase and power train specifications

Item			Standard value (mm)	Maintenance limit value (mm)
Transmission mechanism	Gear inner diameter	M5	28.000-28.021	28.04
		C1	24.007-24.028	24.04
		C2	31.000-31.025	31.04
	Outer diameter of shaft sleeve	M5, M6	27.959-27.980	27.94
		C2	30.970-30.995	30.94
		C3, C4	30.950-30.975	30.93
	Clearance between gear and shaft sleeve	M5	0.020-0.062	0.10
		C2	0.005-0.055	0.07
	Inner diameter of shaft sleeve	M5	25.000-25.021	25.04
		C2	28.000-28.021	28.04
	Spindle diameter	With M5 Bushing fit	24.967-24.980	24.96
		With C2 Bushing fit	27.967-27.980	27.95
	Clearance between shaft sleeve and shaft	M5, C2	0.020-0.054	0.07
Fork, fork shaft	Shift fork shaft diameter		11.957-11.968	11.95
	Inner diameter of shift fork		12.000-12.018	12.03
	Thickness of fork tip		5.93-6.00	5.9



8.3 Troubleshooting

Difficulty shifting gears

- Improper clutch operation
- Improper oil viscosity
- Fork deformation
- Deformation of shift fork shaft
- Fork and pawl deformation
- The guide rail groove of the variable speed drum is damaged
- Gearshift arm deformation

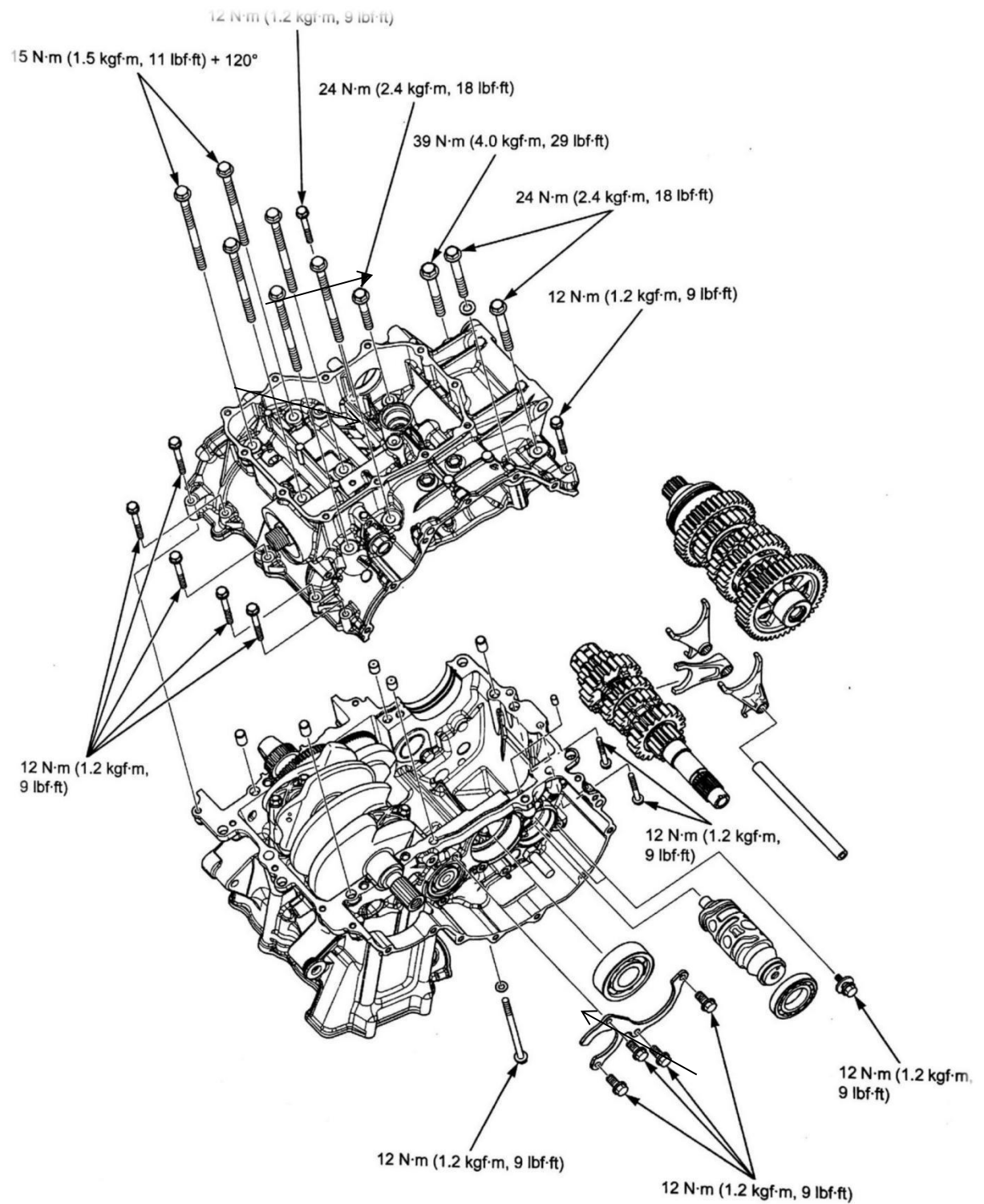
Gearshift gear skip

- Gear wear
- The guide rail groove of the variable speed drum is worn
- Deformation of shift fork shaft
- Damaged variable speed drum
- Damaged positioning plate torsion spring
- Wear or deformation of the shift fork
- Damaged shift arm

Excessive engine noise

- Worn or damaged transmission gears
- Worn or damaged transmission bearings

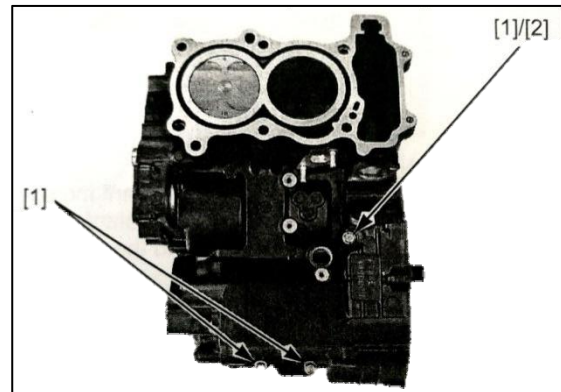
8.4 Component layout



8.5 Power train

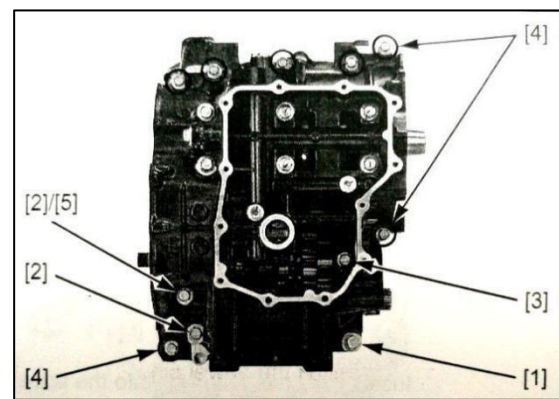
Disassembly and assembly

Remove the lower crankcase body (13-5).
Align the scale line of the balanced driving gear with the mating surface of the box.



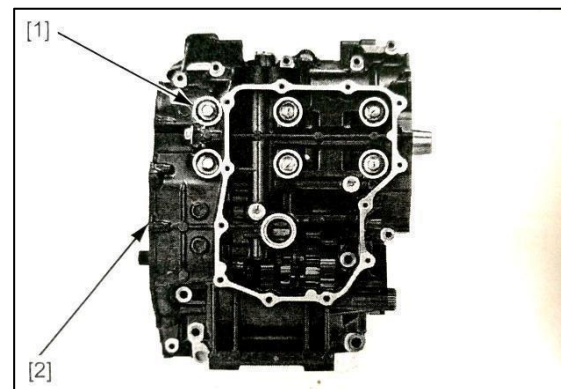
Turn the engine upside down.

Loosen the M10 bolts [1] and M8 on the box in 2 or 3 times × 75 bolts [2], M8 × 55 bolts [3] and M6 bolts [4], then remove all bolts and flat washers [5].

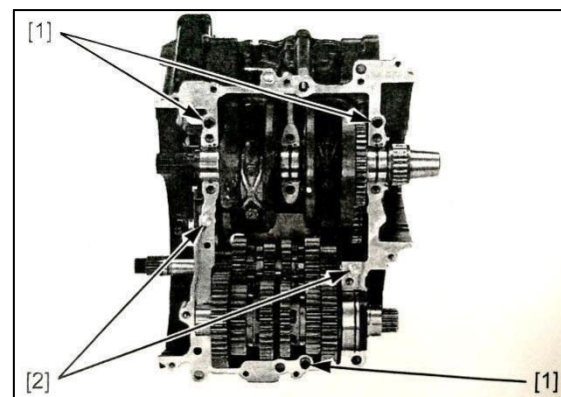


Loosen the box spindle bolts [1] in 2 or 3 times and remove the bolts.

Remove the lower crankcase body [2] from the upper crankcase body (note: do not use a screwdriver to pry the crankcase sealing surface).



Remove dowel pin [1] and oil duct plug [2].



Assembling

Clean the joint surface of the upper and lower crankcase bodies, taking care not to damage the joint surface.

Check if the oil passage in the box is blocked, and if necessary, clean the oil passage.

Apply end face sealant evenly on the joint surface of the lower box as shown in the right figure.

Attention:

- Do not apply excessive end face sealant.
- Do not apply the end face sealant to the position of the main journal bolt and the oil passage hole.

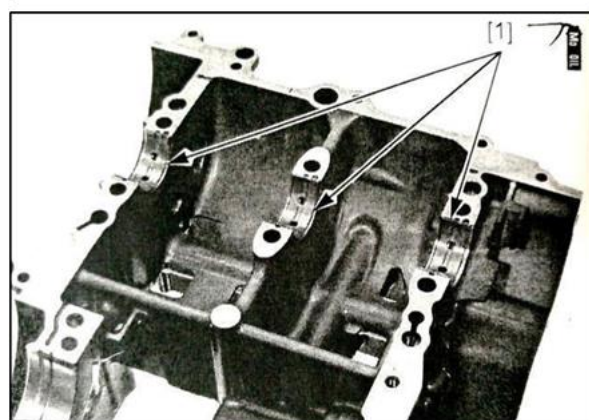
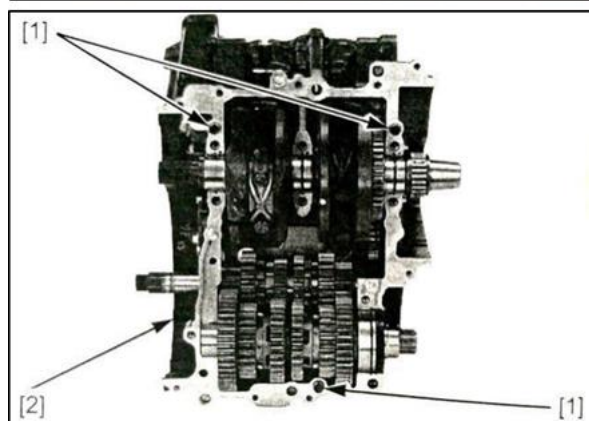
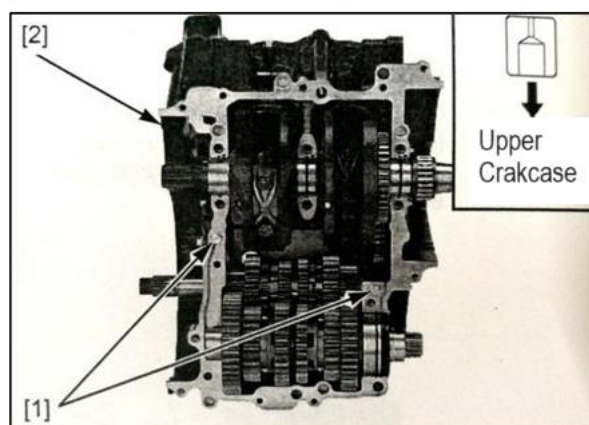
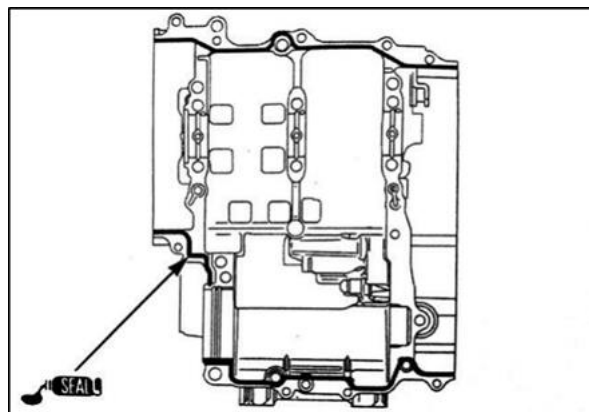
Clean the oil duct plug.

Check if the oil duct plug is blocked, and replace the oil duct plug if necessary.

Install the oil duct plug [1] onto the upper crankcase body [2], and place the larger side of the hole into the upper crankcase body during installation.

Install the locating pin [1] into the upper crankshaft housing [2].

Apply engine oil to the main journal bearing shells of the upper and lower crankcase bodies.



Install the lower crankcase body [1] onto the upper crankcase body.

Install new main journal bolts [2].

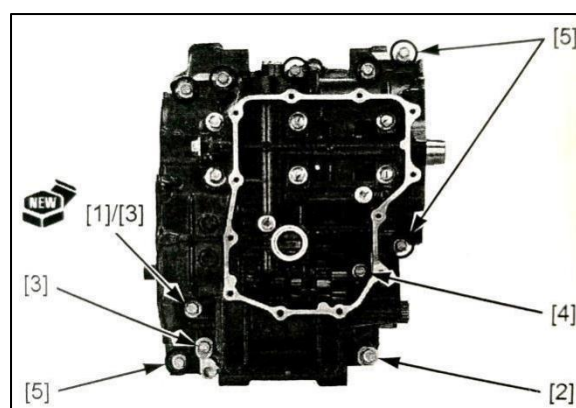
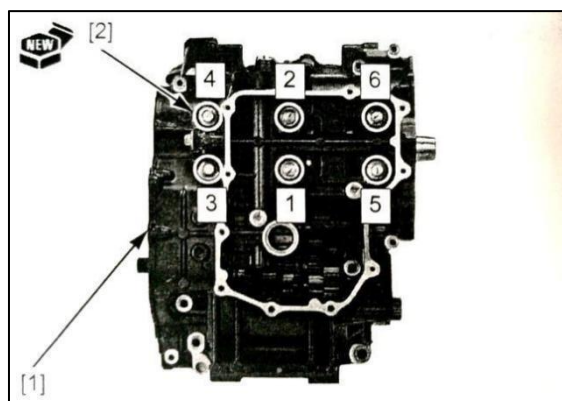
Attention:

- Tighten the main journal bolts using the cross method.
- Do not use used main journal bolts because the axial tension of the bolts is incorrect.

Before installing the main journal bolts, oil should be pre coated to increase their axial tensile stability. Do not wipe off the oil on the surface of the bolt during installation.

Confirm whether the upper and lower crankshaft boxes are securely installed. Tighten the main journal bolts in 2-3 steps according to the sequence shown in the diagram to the specified torque. Rotate the main journal bolts by 120° to further tighten them.

Torque: 15N. m+120 °



Replace with new flat washers and box bolts.

Tighten the box bolts 2-3 times to the specified torque. Attention:

Install the flat washer at the position shown in the right figure [1].

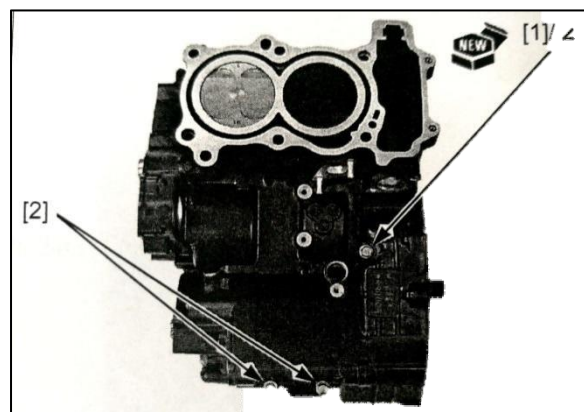
Torque:

M10 bolt [2]: 39N. m

M8 × 75 bolts [3]: 24N. m

M8 × 55 bolts [4]: 24N. m

M6 bolt [5]: 12N. m



Turn the engine over to the bottom facing down.

Install new flat washers and M6 box bolts.

Attention:

- Install the flat washer at the position shown in the right figure [1].
- Tighten the M6 bolts to the specified torque.

Torque: 12N. m

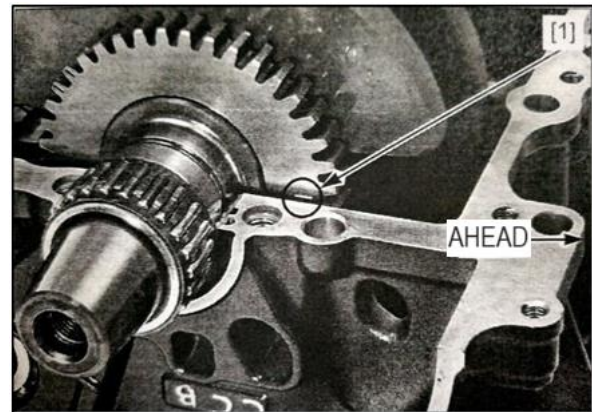
Install the removed components in the reverse order of disassembly

8.6 Crankcase

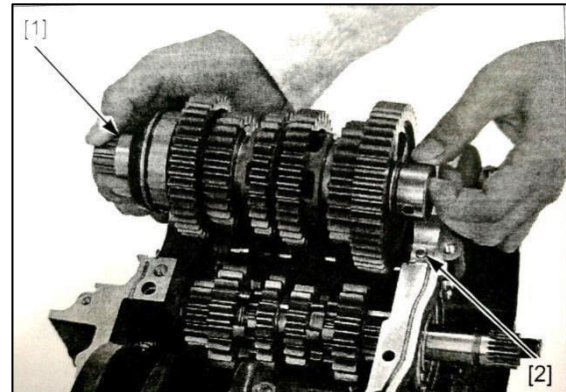
Disassembly and assembly

Disassemble the upper and lower crankcase bodies.

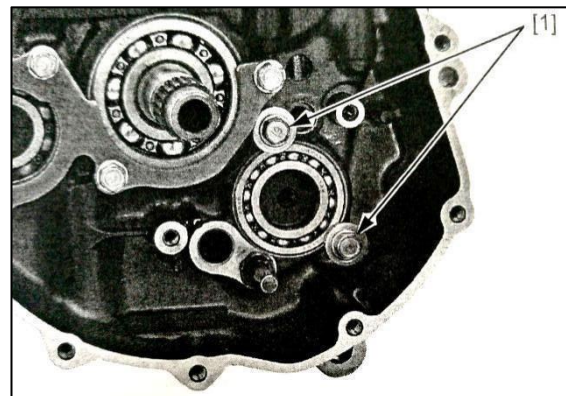
Make the scoring line on the balance gear [1] flush with the sealing surface of the upper crankshaft box and face forward



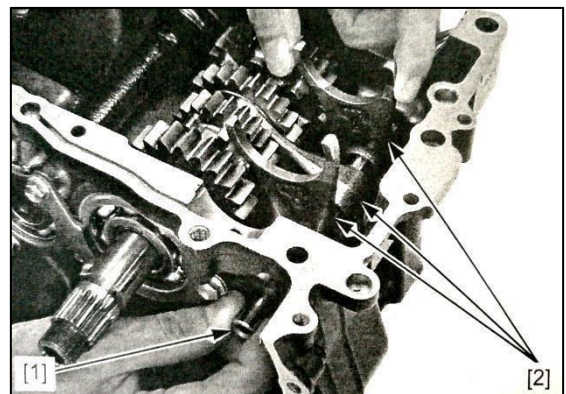
Remove the auxiliary shaft assembly [1] and the pin shaft [2].



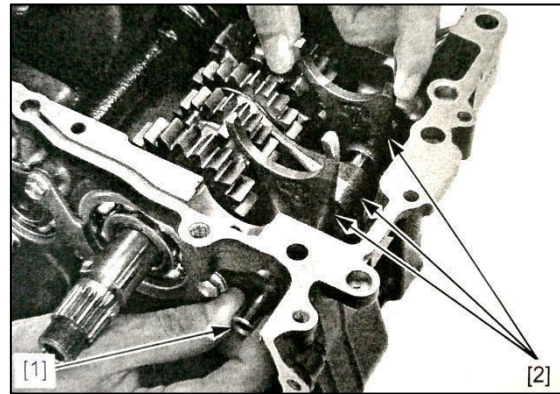
Remove the limit bolt of the variable speed drum bearing [1].



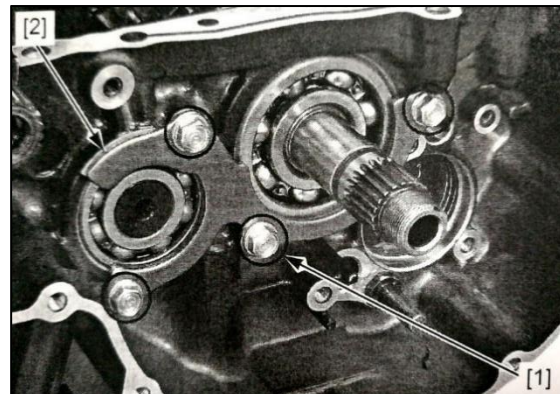
Remove the fork shaft [1] and fork [2]



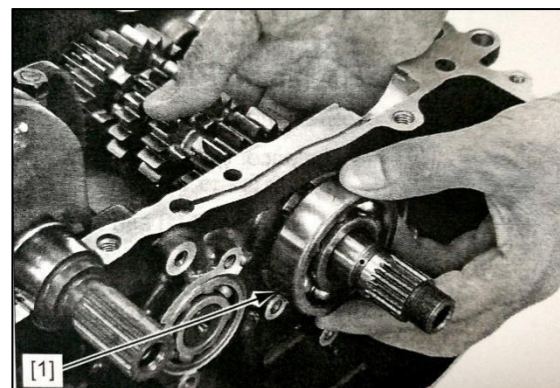
Remove the variable speed drum [1] and the variable speed drum bearing [2]



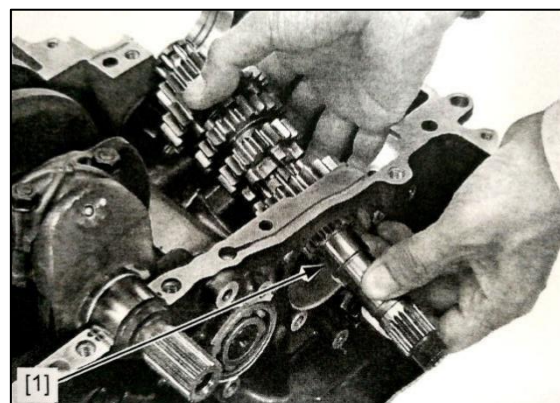
Remove the bolts [1] and the spindle bearing pressure plate [2].



Slide the spindle component on the upper crankcase body and remove the right bearing of the spindle.



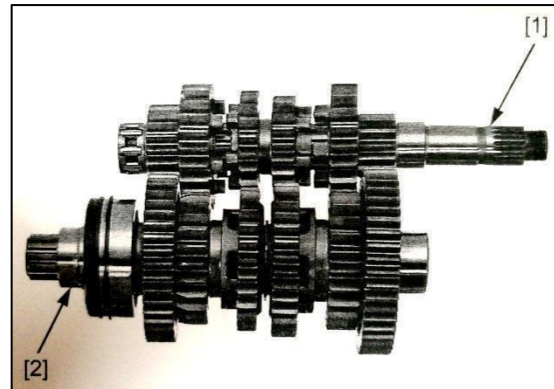
Remove the spindle components.



Disassemble the main and secondary shaft components.

Attention:

- Place the ring in a dedicated container or press it straight line placement.
- Do not expand the snap ring beyond its limit. When disassembling the snap ring, first expand the snap ring, and then use the gear behind the snap ring to push it out.

**Inspect**

Inspect the following parts for scratches, damage, abnormal wear, and deformation. Replace parts if necessary.

- Transmission gear
- Transmission shaft sleeve
- Transmission bearing
- Variable speed drum/variable speed drum bearing
- Shift fork
- Shift fork shaft

Measure the dimensions of each part and calculate the fit clearance according to the standard.

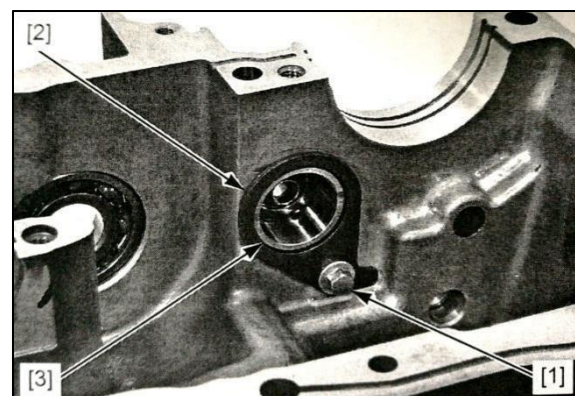
If the fit clearance exceeds the standard limit value, replace the component.

Disassemble the following parts:

- Balance shaft
- Piston

Remove the bolts [1] and the bearing retainer plate [2].

Use a special tool to remove the outer ring of the left bearing of the spindle [3].

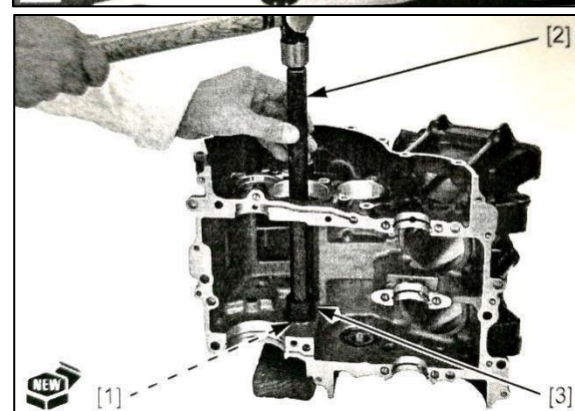


Use a special tool to tap the new outer ring of the left bearing of the main shaft into the lower crankcase body from above until it is fully seated.

Tools:

Extension rod

Bushing

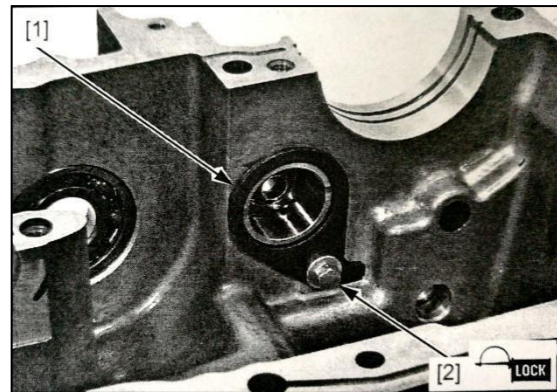


Apply thread tightening adhesive to the threaded part of the outer ring baffle bolt of the bearing seat.

Install the outer ring baffle of the bearing seat and tighten the bolts to the specified torque.

Torque: 12N. m

Install the removed parts in the order of disassembly.



Assembling

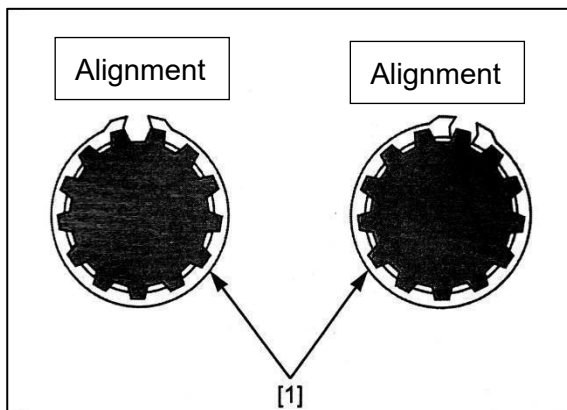
Clean all parts with solvent and allow them to dry thoroughly. Apply oil to the gear teeth, rotating surfaces, and bearings.

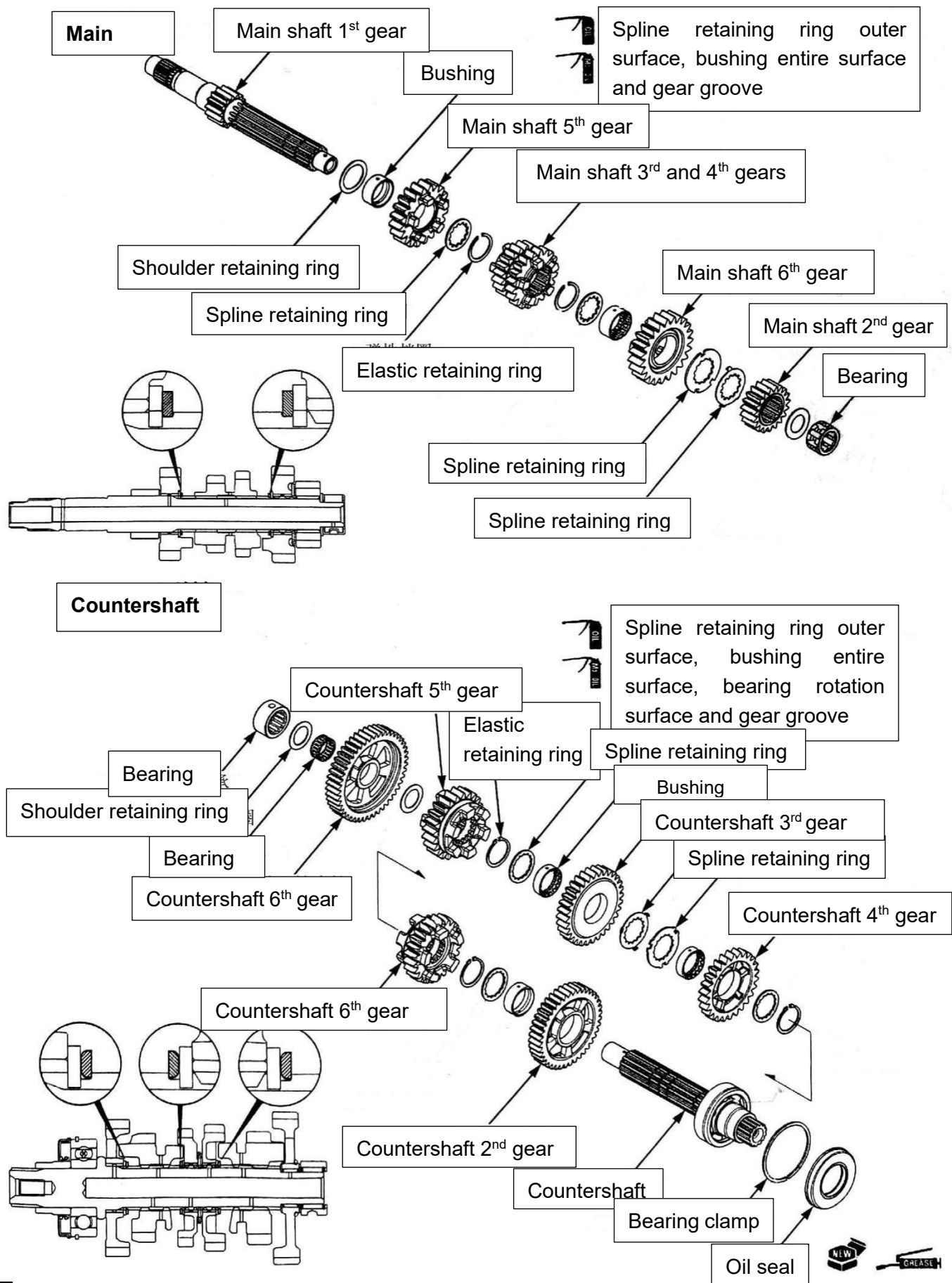
Apply oil to the outer surface of the gear spline sleeve, the entire surface of the gear liner, the rotating area of the needle bearing, and the area of the gear transmission groove.

Install the main and secondary shaft components.

Attention:

- Apply oil to each gear and check for smooth rotation.
- Align the splines inside the spline washer with the keyway.
- When installing the thrust washer, always follow the axial thrust surface of the gear.
- When installing the snap ring, align the opening gap with the spline groove [1].
- -After installation, ensure that the snap ring is completely installed in the shaft groove.

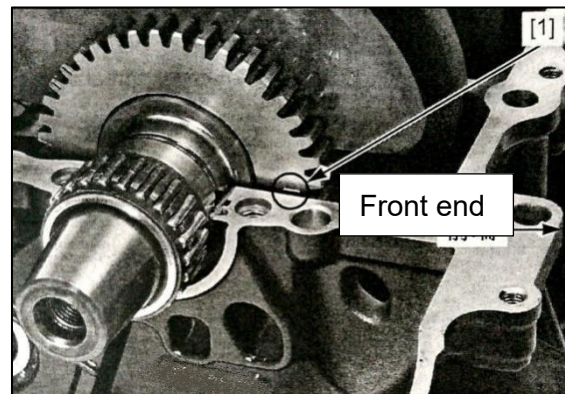




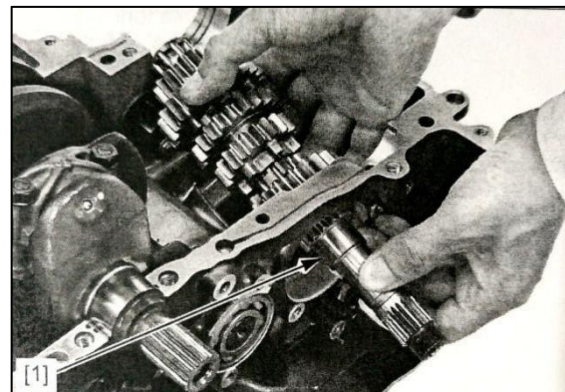
Install

Rotate the crankshaft to balance the scale line on the driving gear front end

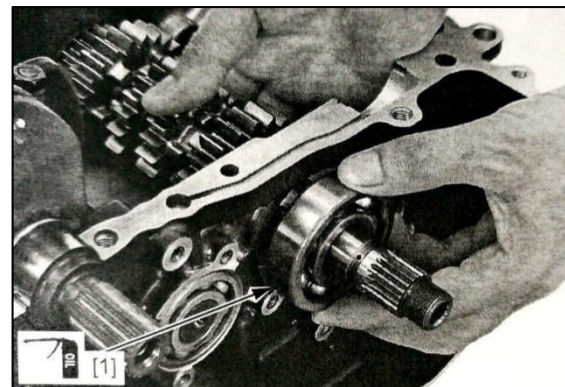
[1] Align with the box and face forward.



Install the spindle component [1] into the upper crankcase body.



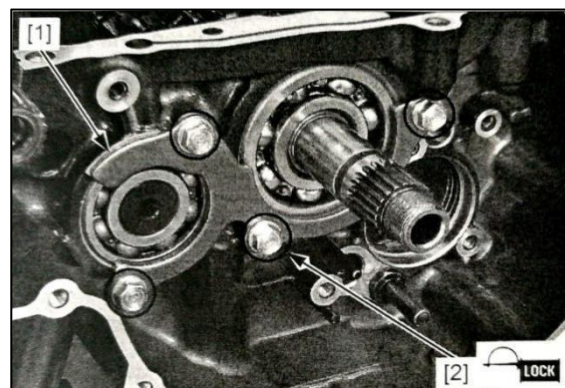
Apply engine oil to the right bearing of the main shaft and install it into the upper crankcase. When installing the right bearing of the main shaft, pay attention to facing outward with the engraved side.



Install the spindle bearing pressure plate [1] and bolts [2], and apply thread tightening adhesive to the threaded part of the bolts before installation.

Tighten the bolts to the specified torque.

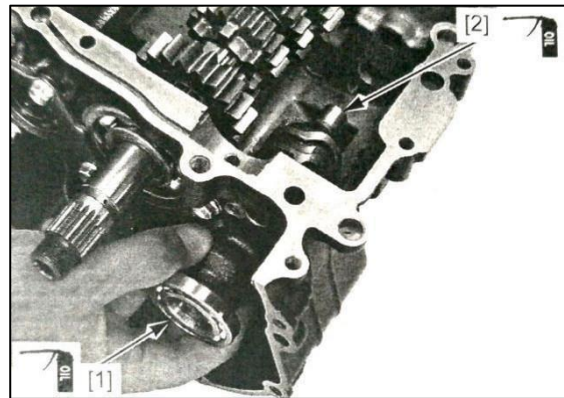
Torque: 12N. m



Apply oil to the bearing and outer surface of the variable speed drum.

Install the variable speed drum bearing [1] on the variable speed drum [2]. When installing, the marked side of the variable speed drum bearing faces outward.

Install the combination of variable speed drum and variable speed drum bearing onto the upper crankcase body.



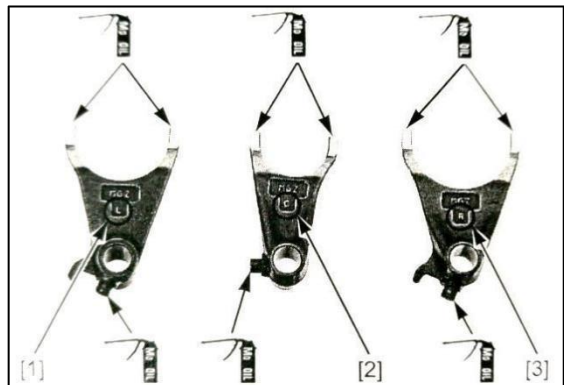
The shift fork has the following identification marks:

'L' [1]: Left shift fork

'C' [2]: Middle shift fork

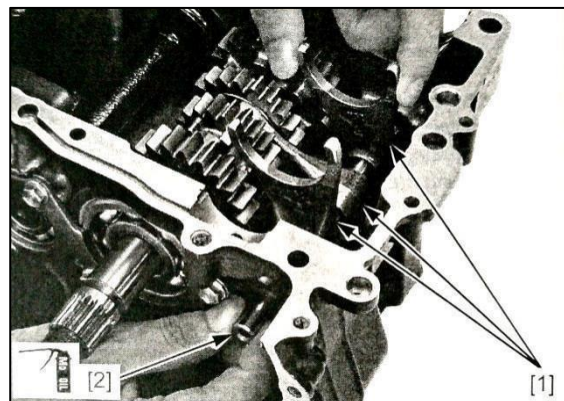
'R' [3]: Right shift fork

Apply oil to the shift guide area and guide pin position of the shift fork.



Apply oil to the surface of the shift fork shaft.

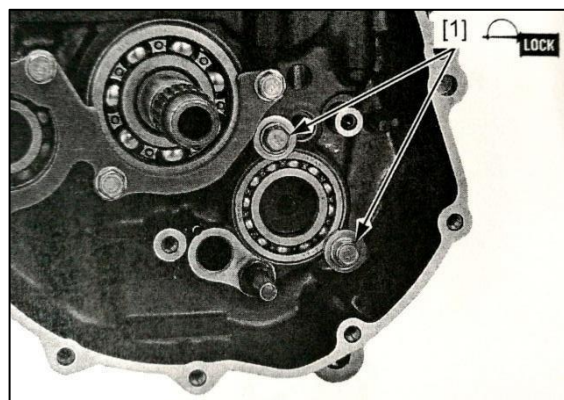
Install the shift fork [1] onto the guide groove and shift groove (middle shift fork) of the variable speed drum, with the identification mark facing the right side of the engine, and then insert the shift fork shaft [2].



Apply thread sealant to the threaded part of the variable speed drum bearing washer bolt.

Install the variable speed drum bearing washers and bolts in place and tighten the bolts to the specified torque.

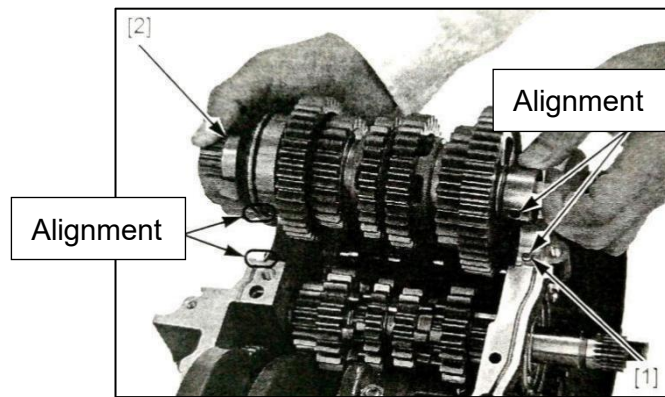
Torque: 12N. m



Install the cylindrical pin into the upper crankcase body.

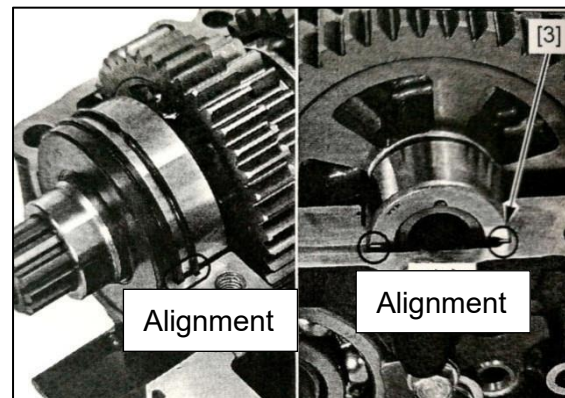
Install the secondary shaft components onto the upper crankcase body, and install the oil seal and stop ring into the box groove during installation

Align the holes in the outer ring of the needle roller bearing with the cylindrical pin.



Attention:

- Ensure that the marking lines on the needle bearing cover align with the box surface. Assemble the crankshaft housing.



9. Crankshaft, piston, cylinder block, balance shaft

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9.6	Main journal bearing shells.....	143
9.7	Crank pin bearing bush	146
9.8	Piston/cylinder block	149
9.9	Piston fuel nozzle	152
9.10	Balance shaft	153



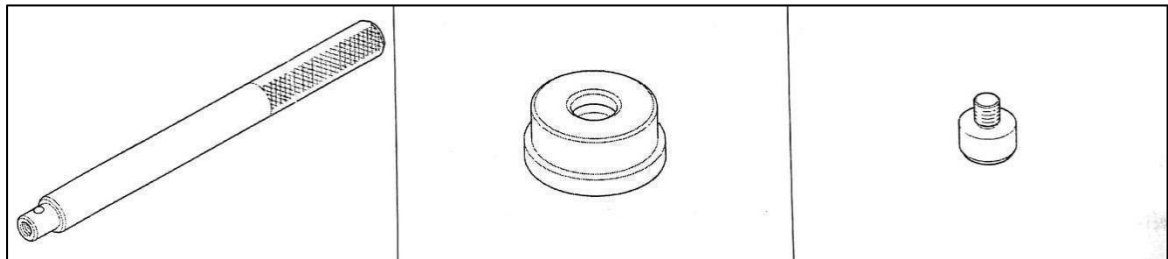
9.1 Maintenance Information

When maintaining the crankshaft, balance shaft, cylinder block, piston/connecting rod, and fuel injection nozzle, the crankcase must be separated. The method of separating the crankcase can be found in the crankcase section.

Mark and store the connecting rod big end, connecting rod cap, and bearing shell to ensure that the above components are in the correct position during reassembly.

The crank pin and main journal bearing shell are selected and paired through color. Select bearing shells based on the color matching table. After selecting a new bearing shell, confirm the oil film gap again with a plastic plug gauge. Incorrect oil film clearance can cause severe engine wear.

Tool



9.2 Specification of crankshaft, piston, cylinder block, and balance shaft

Item			Standard value	Maintenance limit value (mm)
Crankshaft	Connecting rod big end side clearance		0.05-0.20	0.25
	Clearance between connecting rod big end bearing shell and shaft shank pin		0.030-0.052	0.06
	Clearance between crankshaft journal and bearing shell		0.017-0.035	0.05
	Beat		—	0.05
Cylinder	Cylinder diameter		67.000-67.015	67.10
	Out of round quantity		—	0.10
	Taper		—	0.10
	Flatness		—	0.10
Piston, piston pin, piston ring	Piston base circle diameter		66.970-66.990	66.905
	Pin aperture		16.002-16.008	16.02
	Piston pin diameter		15.994-16.000	15.98
	Clearance between piston and piston pin		0.002-0.014	0.04
	Closing clearance of piston ring Clearance between piston ring and ring groove Closing clearance of piston ring	One ring	0.10-0.20	0.4
		Bicyclic	0.21-0.31	0.5
		Oil ring	0.20-0.70	1.0
	Clearance between piston ring and ring groove	Gap between one ring and groove	0.030-0.060	0.10
		Clearance between the second ring and groove	0.015-0.050	0.08
Cylinder clearance			0.010-0.045	0.10
Inner diameter of connecting rod small end			16.030-16.044	16.05
Clearance between connecting rod and pin			0.03-0.05	0.07



9.3 Troubleshooting

Low cylinder pressure, difficulty starting, or poor low-speed performance.

- Leakage of cylinder head sealing gasket
- Wear, jamming or damage of piston rings
- Wear or damage to cylinder head/piston

Excessive cylinder pressure, overheating or knocking of the cylinder block

- Excessive carbon accumulation at the top of the piston or in the combustion chamber

Excessive exhaust gas

- Wear of cylinder block, piston or piston ring Incorrect assembly of piston ring
- Piston or cylinder wall scratches

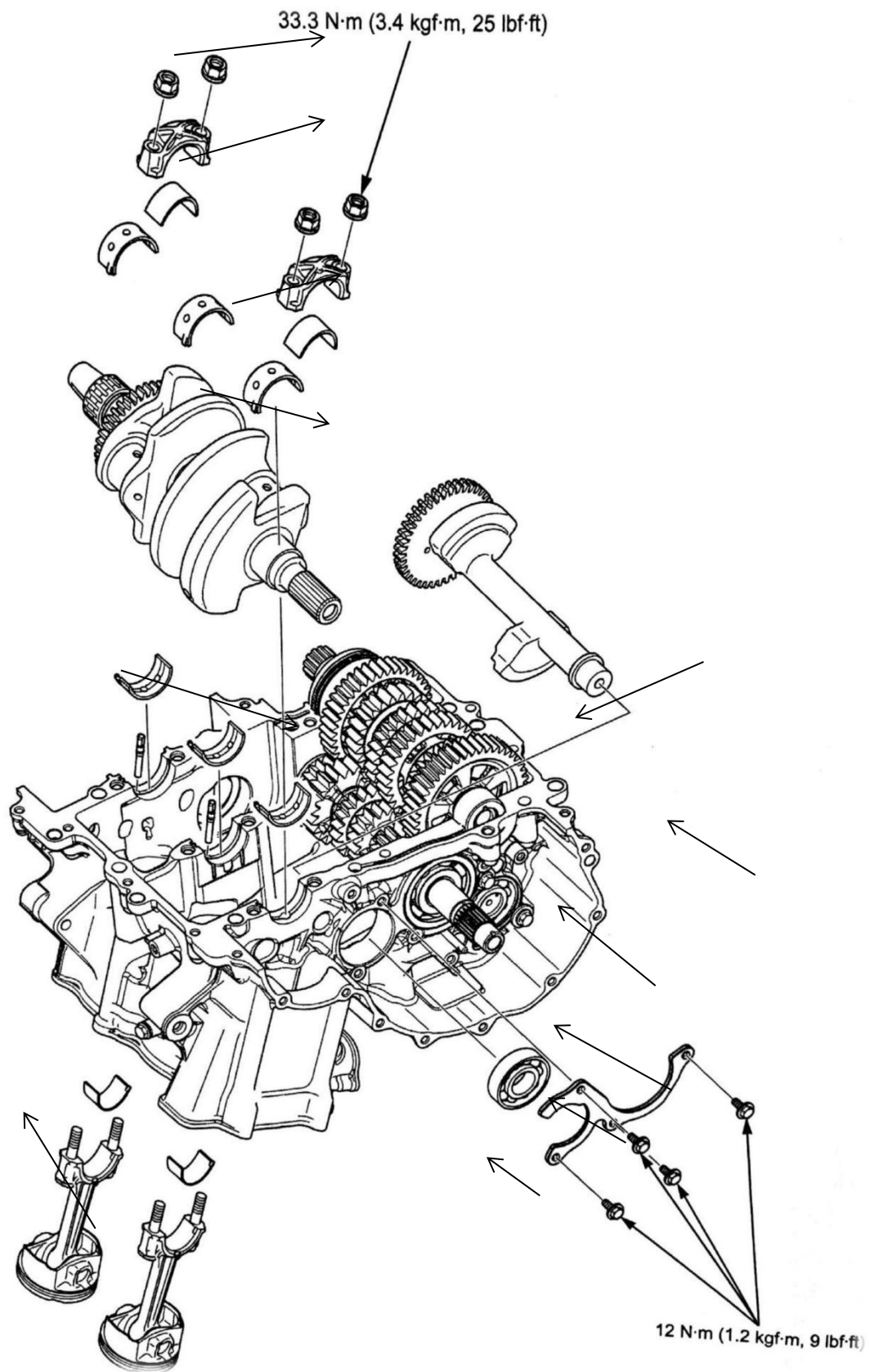
Abnormal engine noise

- Wear of piston pin or piston pin hole
- Wear on the small end of the connecting rod
- Wear of cylinder block, piston or piston ring Wear of crank pin bearing bush

Engine vibration

- - Excessive crankshaft runout

9.4 Component layout diagram



9.5 Crankshaft

Side gap inspection

Separate the upper and lower crankcase bodies.

Measure the side clearance of the connecting rod.

Maintenance limit value: 0.25mm.

If the clearance exceeds the maintenance limit, replace the connecting rod. Reconfirm the side clearance, and if it still exceeds the limit, replace the crankshaft.



Remove

Attention:

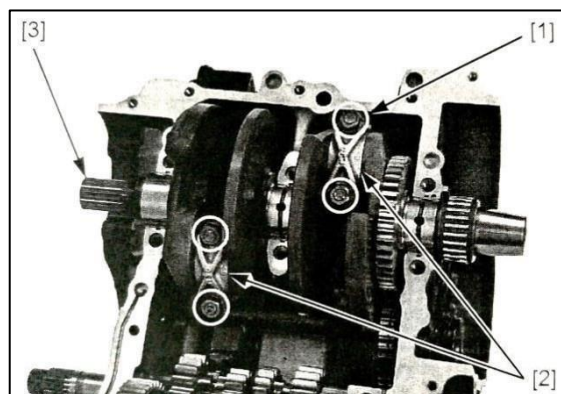
Do not change the position of the bearing shells. The bearing shells must be installed in their original position, otherwise it will damage the correct oil film clearance and cause engine damage.

Separate the upper and lower crankcase bodies.

Mark the connecting rod cap and bearing shells before removing them to ensure proper reassembly.

Remove the connecting rod cap nut [1] and the connecting rod cap [2]. Be careful not to damage the crank pin, main journal, and bearing shells.

If the connecting rod cap is difficult to remove, lightly tap the side of the connecting rod cap. Remove the crankshaft [3]



Attention:

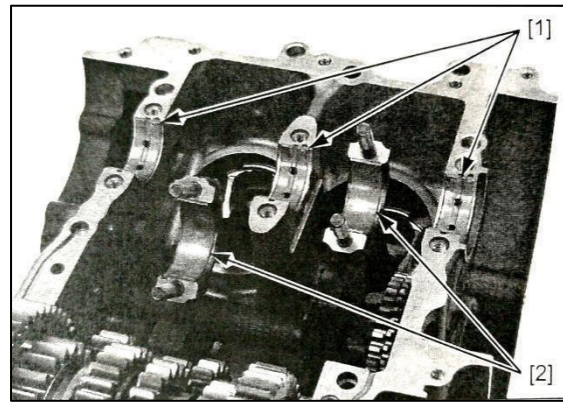
Before removing the crankshaft, push the piston to the top dead center to prevent damage to the crank pin.

Remove the main journal bearing shells from the upper and lower crankcase bodies [1].

Remove the crank pin bearing shells from the connecting rod big end and connecting rod cap [2].

Attention:

Do not change the position of the bearing shells. The bearing shell must be installed in its initial position, otherwise it will damage the correct oil film gap



Inspect

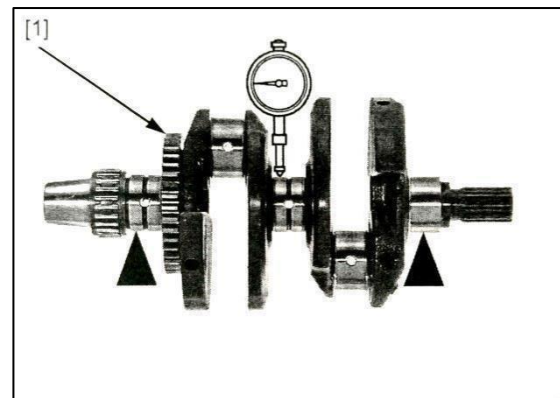
Support the journals at both ends of the crankshaft.

Place a dial indicator above the middle main journal, avoiding oil grooves and holes.

Rotate the crankshaft two revolutions (720°) and read the runout value.

Maintenance limit: 0.05mm

Check the balance shaft driving gear [1] for abnormal wear or damage.



Fit out

Install the spindle journal bearing bush [1] and the crank pin bearing bush [2] in their original positions.

- spindle journal bearing bush
- crank pin bearing bush

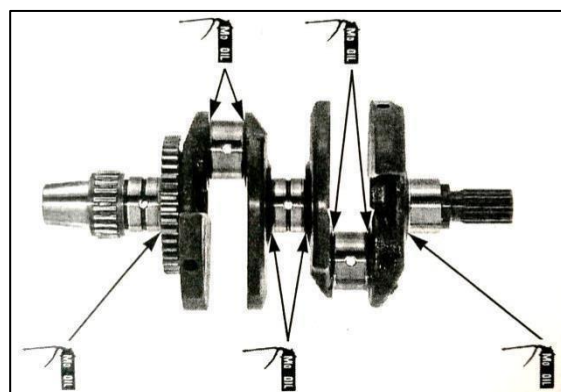
Attention:

Do not change the bearing position. The bearing bush must be installed in the initial position, otherwise it will destroy the correct oil film gap and cause engine damage.

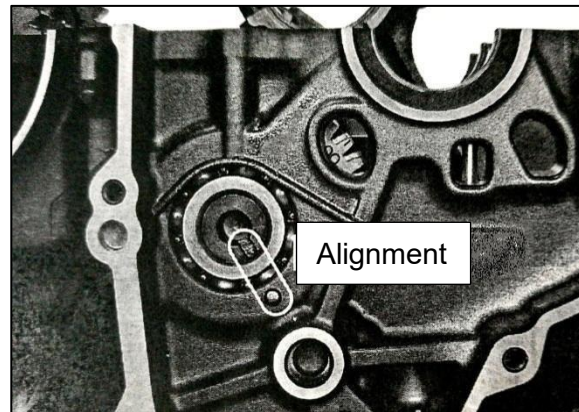
Main journal bearing shells and positions located in the upper crankcase
On the inner surface of the crank pin bushing in the connecting rod big end
Apply engine oil.

Align the end of the piston skirt with the edge of the cylinder block.

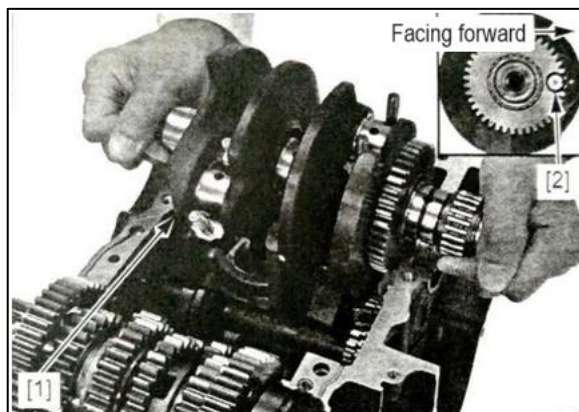
As shown in the picture, apply oil to the crankshaft thrust surface.



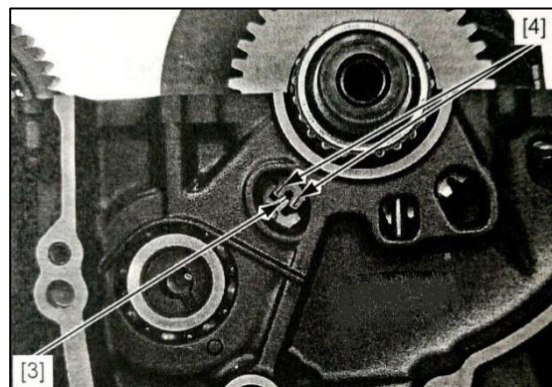
Align the end recess of the balance shaft with the upper crankcase projection



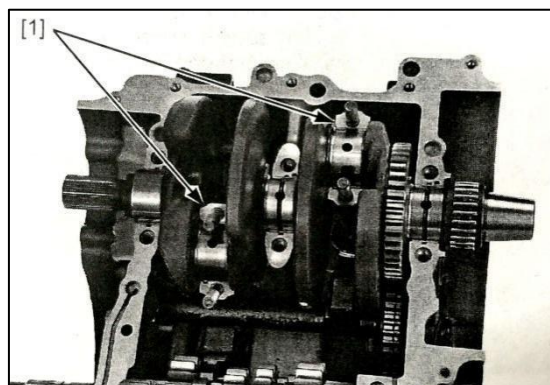
Carefully place the crankshaft [1] above the crankcase, with the "△" mark on the driving gear of the balance shaft [2] facing towards the front of the engine, and then place the crankshaft pin in the connecting rod big end (be careful not to damage the crankshaft pin, main journal, and bearing shells).



Install the crankshaft into the upper crankcase, ensuring that the indicator line [3] of the driven gear of the balance shaft is placed between the indicator lines [4] of the driven gear of the balance shaft, as shown in the picture.

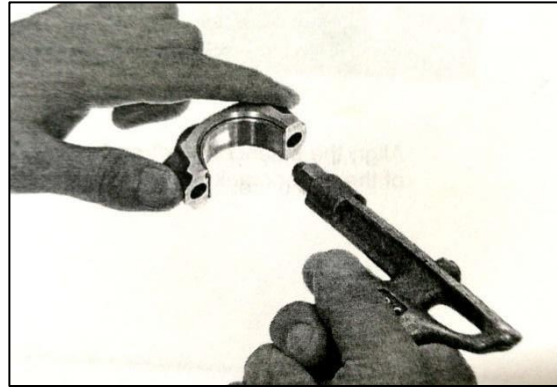


Place the large end of the connecting rod [1] in the crank pin.



Clean the joint surface between the connecting rod big end and the connecting rod cap, and blow dry with compressed air.

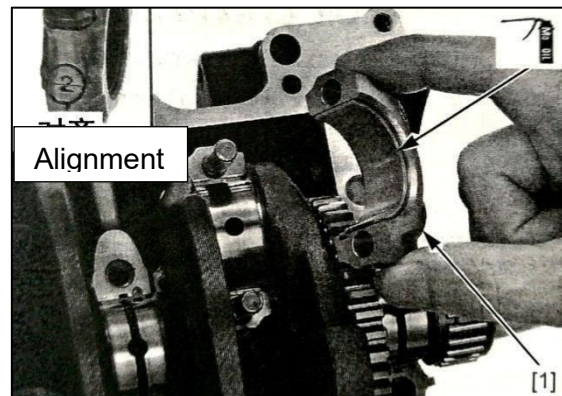
Apply oil to the inner surface of the crank pin bushing on the connecting rod cap.



Install the connecting rod cap by pairing the inner diameter letter numbers on the connecting rod cap and the connecting rod big end [1].

Attention:

Ensure that each part is installed in its original position, the same position identified prior to disassembly



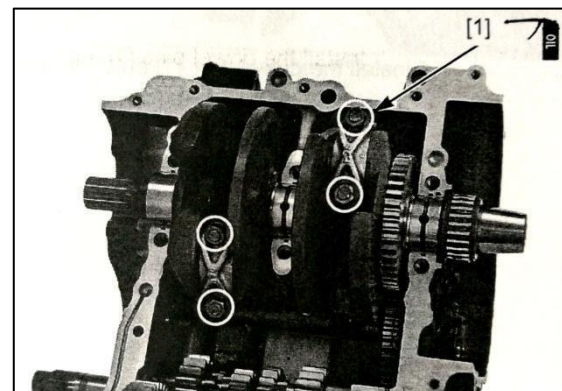
Apply engine oil to the thread and nut seat of the connecting rod cap nut

Install and tighten the connecting rod cap nut [1], divided into 2 or 3 parts

Tighten alternately to the specified torque.

Torque: 33N · m

Assemble the upper and lower crankcases (13-6).



9.6 Main journal bearing shells

Attention:

Do not change the position of the bearing shells. The bearing shells must be installed on the initial position, otherwise it will damage the correct oil film Gap, causing engine damage.

Check the bearing shells

Remove the crankshaft.

Check if the main journal bearing shells [1] are abnormally worn or peeled off fall.

Check the bearing pad boss [2] for damage.

If the main journal bearing shells are damaged, select the bearing shells for repair

Replace.



Check oil gap

Remove the crankshaft.

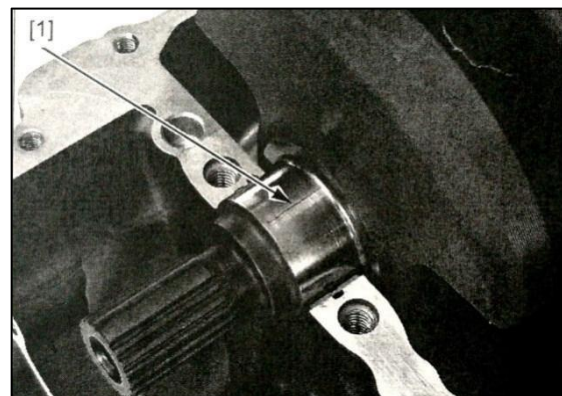
Wipe all oil from bearing bush and spindle neck.

Install the crankshaft into the upper crankcase.

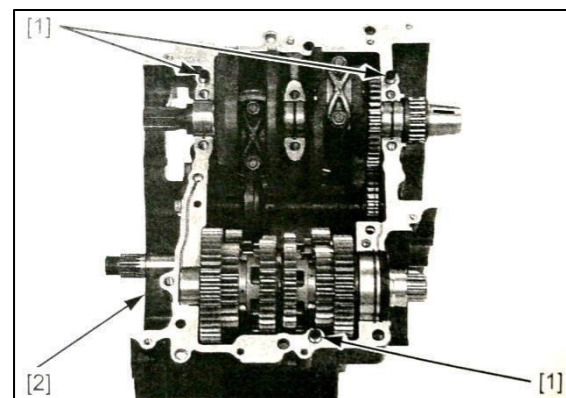
On each spindle neck, place lengthwise, avoiding oil holes

Put a plastic gap gauge [1]. Check the oil gap.

During the process, do not rotate the crankshaft).



Install dowel pins [1] into upper crankcase [2].



Install the lower crankcase [1] above the upper crankcase.

Clean spindle neck closing bolt with solution (repeat Use) and blow dry thoroughly.

Thread and thread seat face of main shaft neck closing bolt

Apply oil.

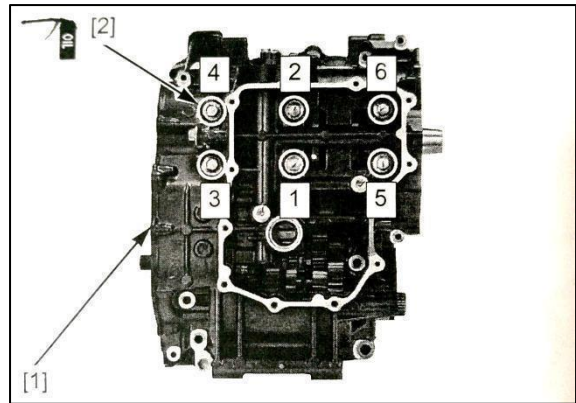
Install spindle neck closing bolt [2].

Ensure that the upper and lower crankcases are securely installed.

Cross 2 or 3 times according to the numbers shown in the picture

Tighten spindle neck closing bolt to specified torque.

Further tighten the main by rotating 120°



Torque: 15N. m+120 °

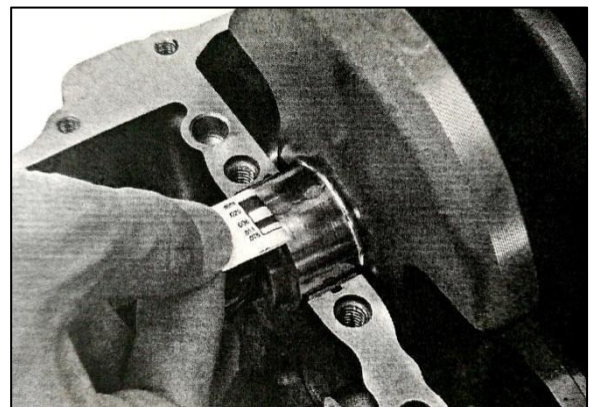
Remove the main journal box bolts and lower crankcase.

Measure the extruded plastic on each main journal

The maximum width of the clearance gauge is used to confirm the oil gap.

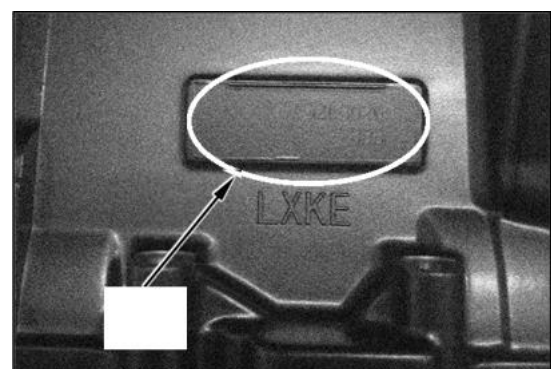
Maintenance limit: 0.05 mm

If the oil gap exceeds the maintenance limit, select the bearing pad to enter line replacement.

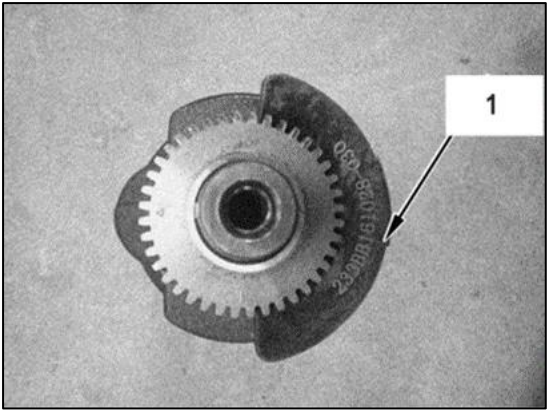


Select bearing shells[1]

Record the letter number [1] of the inner diameter of the bearing shell installation hole located on the left side of the upper crankcase, as shown in the figure (the letter (A, B, or C) on the left side of the upper crankcase represents the inner diameter of the bearing shell installation hole, which is numbered from left to right)



If the crankshaft needs to be replaced, record the corresponding number [1] located on the crankshaft counterweight block (the number (1, 2, or 3) on the crankshaft counterweight block represents the outer diameter number of the main journal in order from left to right).



Cross reference the main journal and bearing pad installation hole numbers to select replaceable bearing pad colors [1].

Main journal bearing pad thickness:

- A: Black: Thicker**
 - B: Brown:**
 - C: Green:**
 - D: Yellow:**
 - E: Pink: Thinner**
-



Spindle journal bushing pairing table:

			Inner diameter number of bearing bush installation hole		
			A	B	C
			37.000-37.006mm (1.4567-1.4569 in)	37.006-37.012mm (1.4569-1.4572 in)	37.012-37.018mm (1.4572-1.4574 in)
Main journal outer diameter number	1	34.000-34.006mm (1.3386-1.3388in)	E (pink)	D (yellow)	C (green)
	2	33.994-34.000mm (1.3383-1.3386in)	D (yellow)	C (green)	B (brown)
	3	33.988-33.994mm (1.3381-1.3383in)	C (green)	B (brown)	A (black)

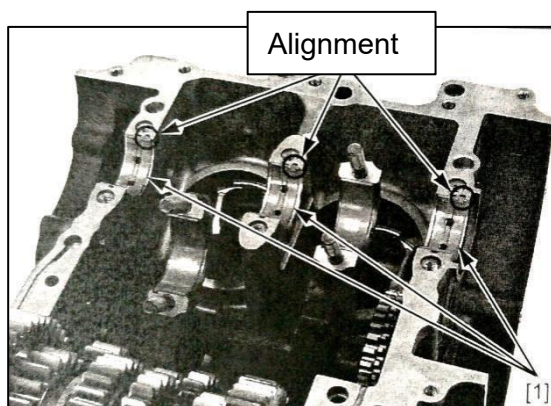
Note: After selecting a new bearing shell, recheck the clearance using a plastic clearance gauge.



Installing bearing shells

Clean the outer surface of the bearing shell and the installation hole of the crankcase bearing shell.

Install the main journal bearing shells [1] into the mounting holes of the crankcase bearing shells, aligning each boss and groove.



9.7 Crank pin bearing bush

Attention:

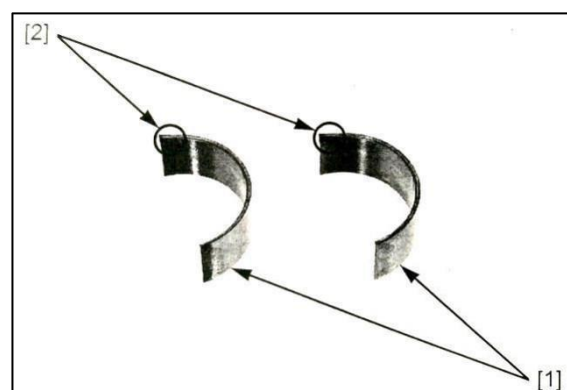
Do not change the position of the bearing shells. The bearing shells must be installed in their original position, otherwise it will damage the correct oil film clearance and cause engine damage.

Remove the crankshaft.

Check the crank pin bearing shells [1] for abnormal wear or peeling.

Check if the bearing pad boss [2] is damaged.

If the crank pin bearing shell is damaged, select the bearing shell for replacement.



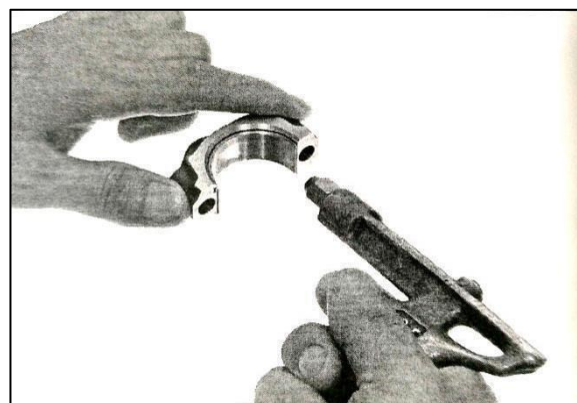
Check the oil gap

Remove the crankshaft (pages 14-4).

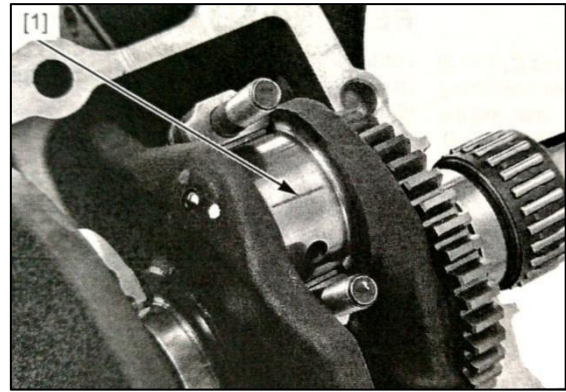
Clean the joint surface between the connecting rod big end and the connecting rod cap with a solution and blow dry with compressed air.

Wipe off all oil from the bearing shells and crank pins.

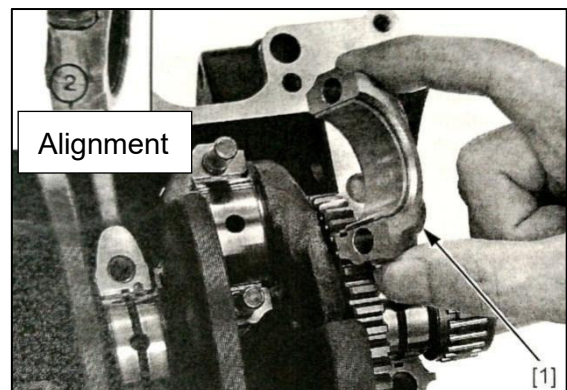
Install the crankshaft into the upper crankcase (See 9.5).



Remove the piston ring and install the connecting rod big end into the crank pin. On each main journal, place a plastic clearance gauge longitudinally avoiding the oil hole [1] (do not rotate the crankshaft while checking the oil gap).



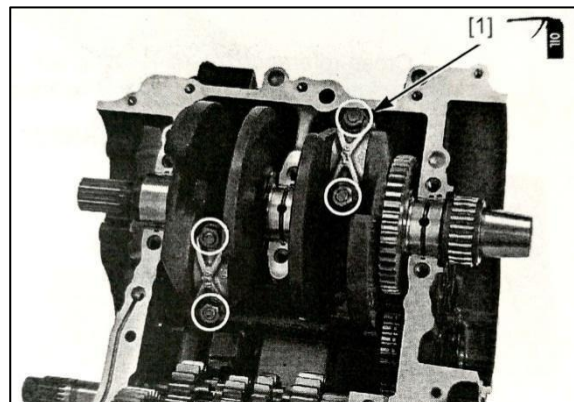
Install the connecting rod cap by pairing the inner diameter letter numbers on the connecting rod cap and the connecting rod big end [1]



Attention:

Ensure that each part is installed in its original position, as marked when removed

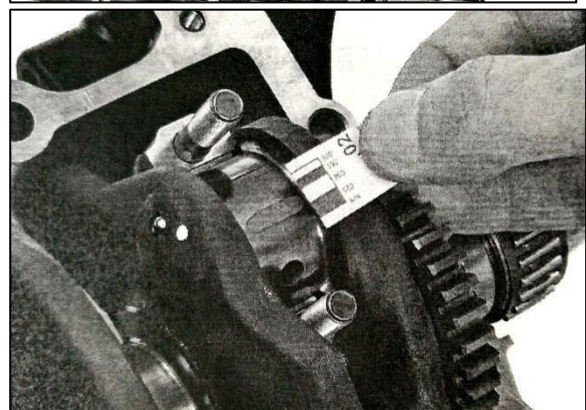
Apply oil to the threads of the connecting rod cap nut and the nut seat. Install and tighten the connecting rod cap nuts [1], alternately tightening them in 2 or 3 steps to the specified torque.



Torque: 33N. m

Remove the connecting rod cap.

Measure the maximum width of the plastic gap gauge squeezed on each crank pin to confirm the oil gap.

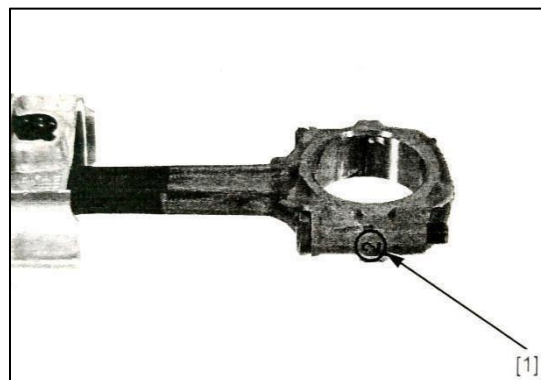


Maintenance limit: 0.06mm

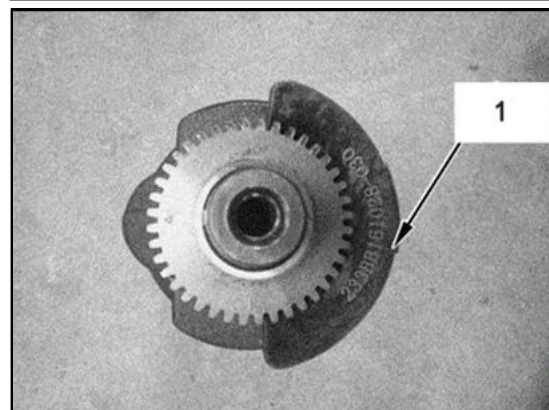
If the oil gap exceeds the maintenance limit, select the correct bearing shell for replacement.

Select bearing shells

Record the letter number [1] located on the rod head bore (the number above the rod head (1, 2 or 3) represents the rod head bore number), or install the rod cover to the rod and measure the bore diameter without the bearing bush.



If the crankshaft needs to be replaced, record the corresponding number [1] located above the crankshaft counterweight block (the crank pin outer diameter numbered from left to right by the letters (A, B, or C) above the crankshaft counterweight block).

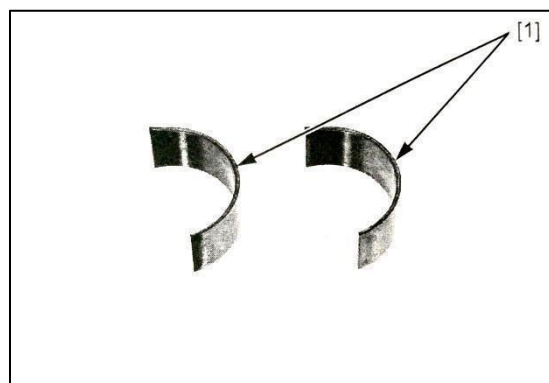


If the crankshaft is reused, measure the outside diameter of the crank pin with a micrometer

Cross reference the connecting rod big end and crank pin numbers to select the color of replaceable bearing shells [1].

Thickness of crank pin bearing shell:

A: Blue: thicker
 B: Black:
 C: Brown:
 D: Green:
 E: Yellow: thinner



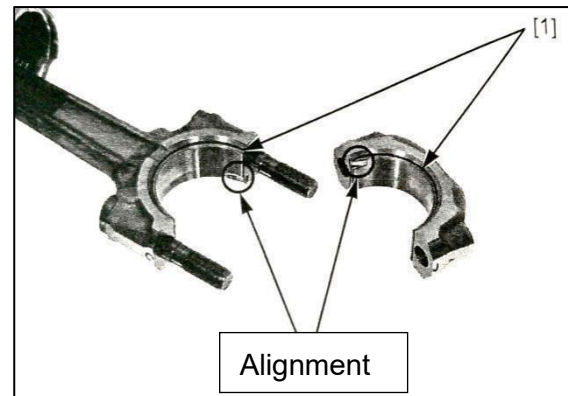
Matching table of crank pin bearing shells:

			Connecting rod big end inner diameter number		
			1	2	3
			39.000-39.006mm (1.5354-1.5357in)	39.000-39.006mm (1.5354-1.5357in)	39.012-39.018mm (1.5359-1.5361in)
Crank pin outer diameter number	A	35.994-36.000mm (1.4171-1.4173in)	E (yellow)	D (green)	C (brown)
	B	35.988-35.994mm (1.4168-1.4171in)	D (brown)	C (brown)	B (black)
	C	35.982-35.988mm (1.4166-1.4168in)	C (brown)	B (black)	A (blue)

Note: After selecting a new bearing shell, recheck the clearance using a plastic clearance gauge

Installing bearing shells

Clean the outer surface of the bearing shell, connecting rod cap, and connecting rod big end. Install the crank pin bearing shells [1] into the connecting rod cap and connecting rod big end, aligning each boss and groove.



9.8 Piston/cylinder block

Remove the piston/connecting rod assembly

Attention:

- Before removing the piston, wrap a clean, lint-free cloth around the large end of the connecting rod to prevent damage to the cylinder liner.
- Do not attempt to remove the piston/connecting rod assembly from the bottom of the cylinder block, as these components will be damaged in the cylinder liner and
- The interface of the upper box is stuck.
- Do not change the position of the bearing shells. The bearing shells must be installed in their original position, otherwise it will damage the correct oil film clearance and cause engine damage.

Remove the following components:

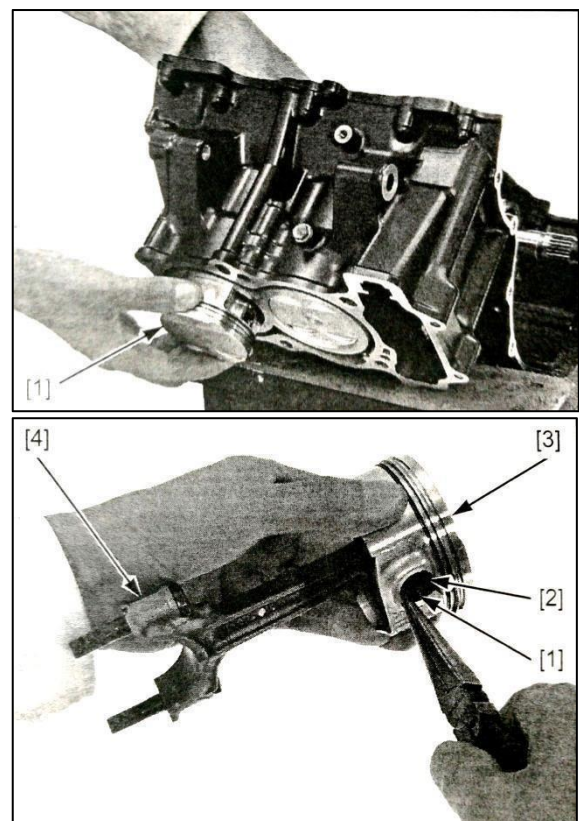
- Balance shaft
- crankshaft

Removing the piston

Use tweezers to remove the steel wire retainer [1].

Push the piston pin [2] out of the piston [3] and connecting rod small end [4], and then remove the piston.

Remove the piston/connecting rod assembly [1] from the top of the cylinder block.

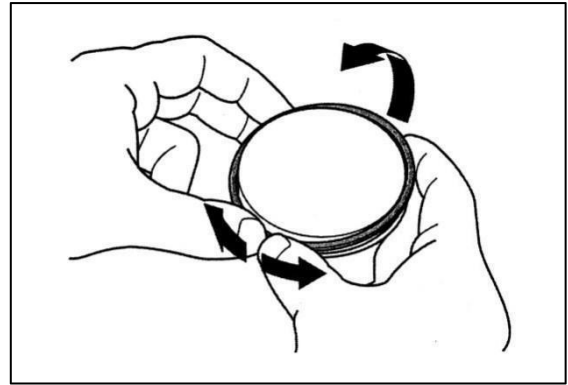


Removing piston rings

Separate the ports of each piston ring and remove the ring upwards along the opposite position of the piston ring opening.

Attention:

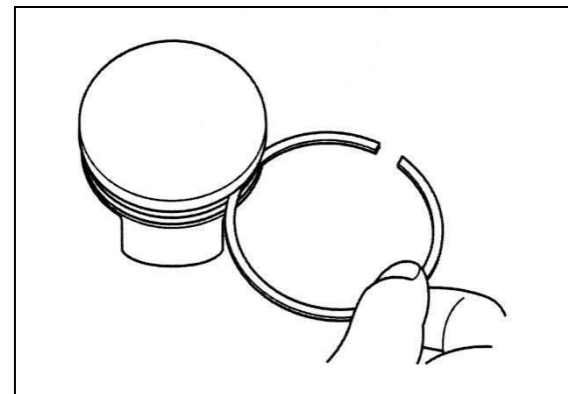
- Do not separate the ports too far to avoid damaging the piston rings.
- Be careful not to scratch the piston when removing the piston ring.



Use the piston ring that is ready to be discarded to remove carbon deposits from the piston ring groove.

Attention:

- Do not use a steel brush to avoid scratching the piston ring.



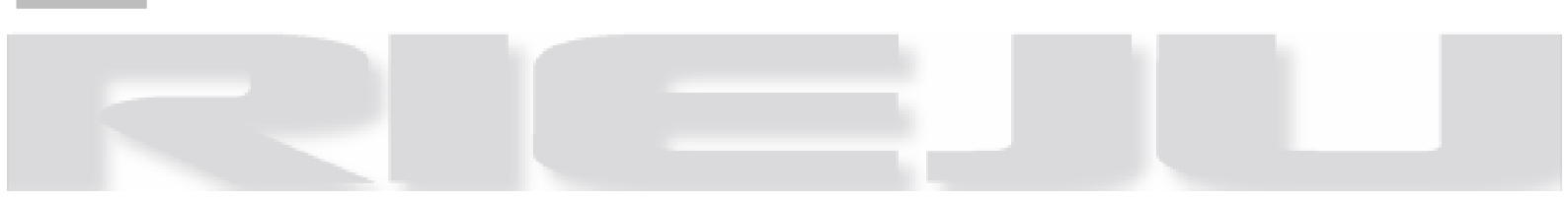
Inspect

Check the following components for scratches, damage, abnormal wear, deformation, burns, and blocked oil passages.

- Cylinder block
- Piston
- Piston ring
- Piston pin
- Connecting rod small end

Measure each component and calculate the clearance according to the technical specifications of the **crankshaft/piston/ cylinder block /balance shaft**.

Replace any components that exceed the maintenance limit.



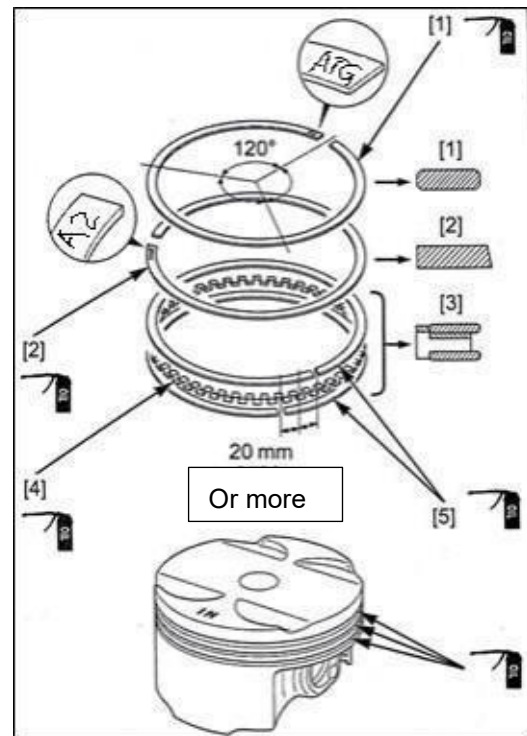
Installation of piston ring

Thoroughly clean the piston ring groove and install the piston ring.

- Apply engine oil to the entire surface and groove of the piston ring.
- During installation, prevent damage to the piston and piston rings.
- During installation, place the marked side of the piston ring facing upwards.
Mark 'ATG': First ring [1].
Mark 'A2': Second Ring [2].
- When installing the oil ring assembly [3], first install the lining ring [4], and then install the scraper ring [5].

Cross the piston ring openings 120 ° with each other.

Stagger the opening position of the scraper ring, as shown in the figure.



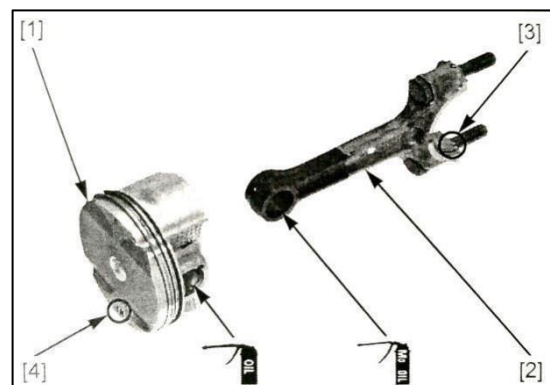
Installation of piston

Install the crank pin bearing shells in their original position (See 9.7).

Apply engine oil to the inner surface of the piston pin hole.

Apply engine oil to the inner surface of the connecting rod small end.

When assembling the piston [1] and connecting rod [2], place the boss of the crank pin bearing shell [3] towards the direction of the "IN" mark [4] on the piston.

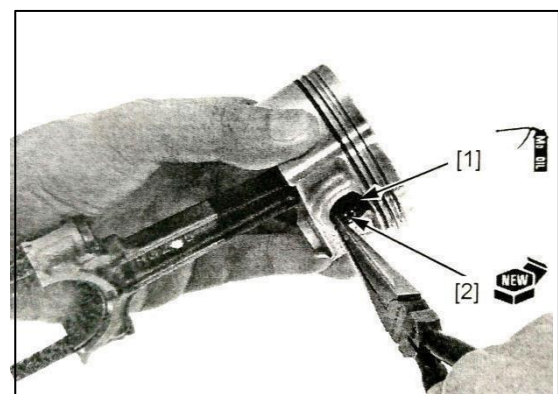


Apply engine oil to the outer surface of the piston pin.

Install the piston pin [1] and secure it with a new wire retainer [2].

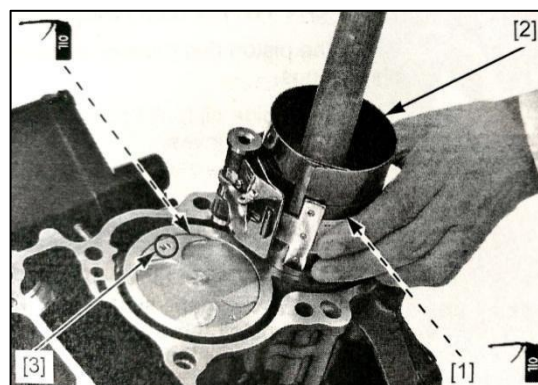
Attention:

- Ensure that the steel wire retainer is installed in place.
- Do not align the opening of the wire retainer with the notch of the piston.
- Install it in its original position.



Attention:

- When installing the piston, be careful not to damage the upper surface of the piston, especially do not damage the parts that match the cylinder bore.
- Be careful not to damage the cylinder liner and crank pin by the connecting rod.



Use a plastic hammer or similar tool to gently tap the piston into the cylinder block (ensuring that the piston ring compression tool is flat on the surface of the cylinder block).

Install the following components:

- Crankshaft
- Balance shaft

9.9 Piston fuel nozzle

Remove/Install

Remove the piston/connecting rod assembly.

Push the nozzle outward from the cylinder block side towards the main journal side (be careful not to damage the nozzle oil hole).

Remove the O-ring from the nozzle.

Thoroughly clean the nozzle with solution.

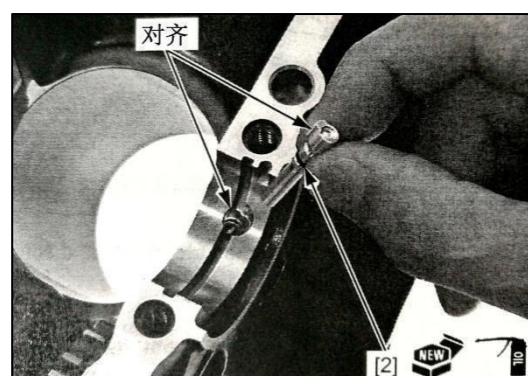
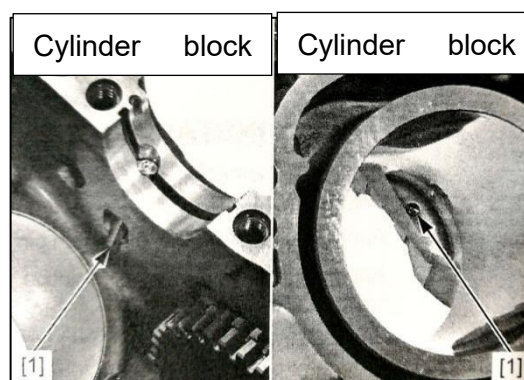
Check if the nozzle is blocked and replace it if necessary.

Blow clean the oil passages in the upper crankcase and nozzle with compressed air.

Install a new O-ring at the nozzle groove and apply oil before installation.

Install the nozzle into the upper crankcase until the nozzle is fully seated. Align the nozzle boss with the crankcase groove during installation.

Install the removed components in the reverse order of removal.

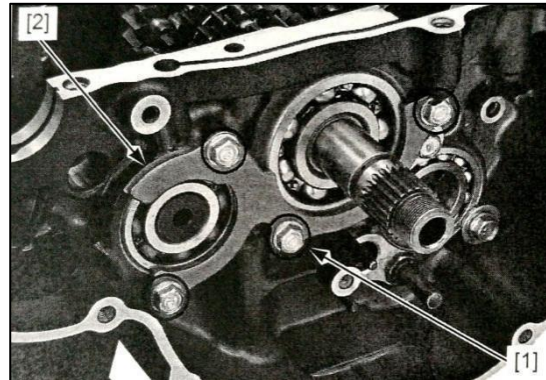


9.10 Balance shaft

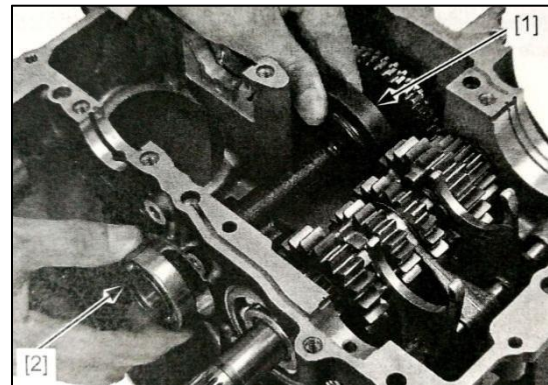
Remove

Remove the piston/connecting rod assembly.

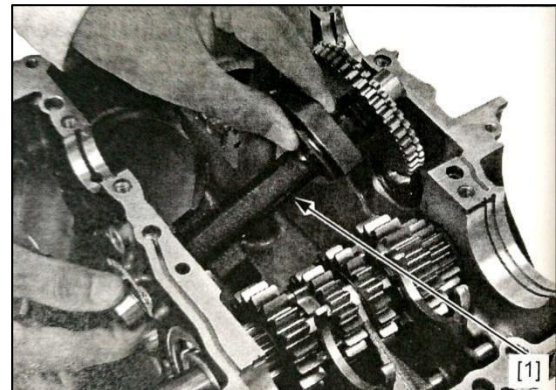
Remove the bolts [1] and the balance shaft/spindle right bearing pressure plate [2].



Rotate the balance shaft so that the left balance weight [1] is facing upwards. Slide the balance shaft to the right in the upper crankcase, and then remove the right bearing of the balance shaft [2].



Remove the balance shaft [1]



Inspect

Check the following components for scratches, damage, abnormal wear and deformation, and replace them if necessary

- Balance shaft driven gear
- Balance shaft driven gear auxiliary
- Driven gear press spring
- Balance shaft

Balance shaft bearing

Replace the left bearing of the balance shaft

Gently tap out the left bearing of the balance shaft from the upper crankcase.

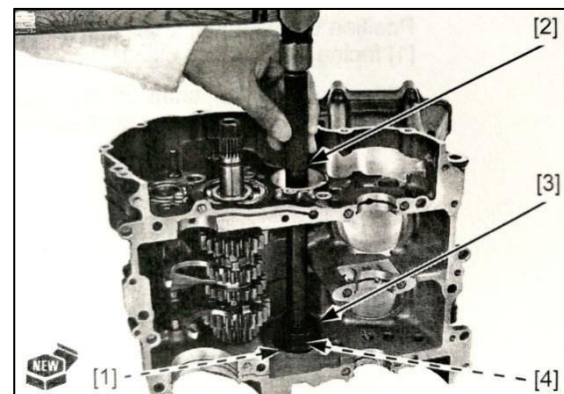
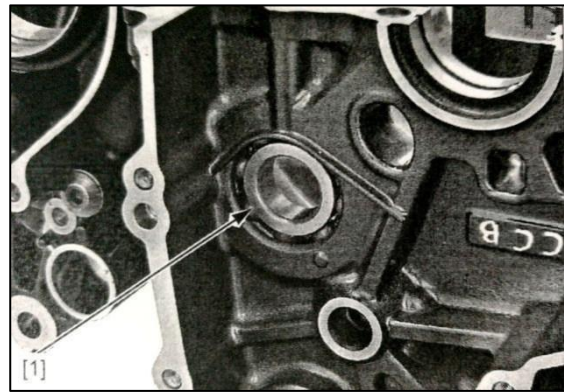
Use a special tool to install a new balance shaft left bearing in the upper crankcase [1], lightly tap until the bearing is fully seated (lightly tap at a right angle, with the marked side of the bearing facing upwards).

Tools:

[2] Drive rod

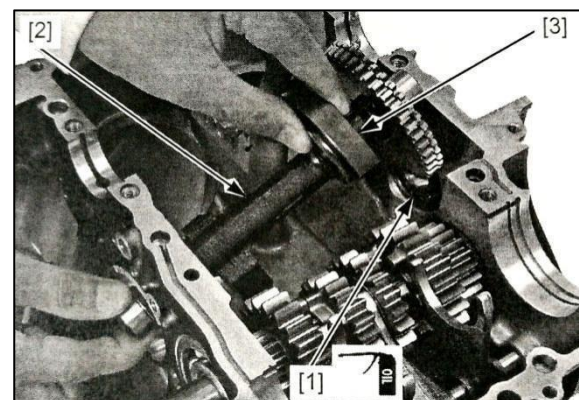
[3] Buffer element

[4] Guide block



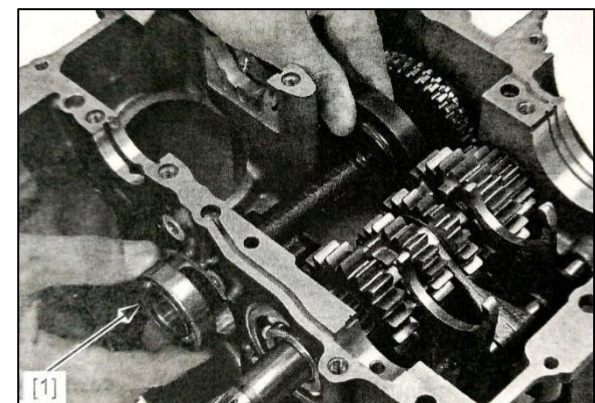
Install

Apply oil to the left bearing of the balance shaft [1]. Install the balance shaft [2] into the upper crankcase with the left balance weight [3] facing upwards.



Apply oil to the right bearing of the balance shaft.

Install the right bearing of the balance shaft [1] into the upper crankcase (with the marked side facing upwards when installing the bearing).

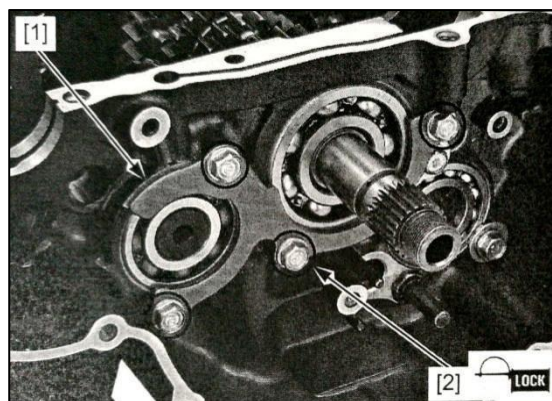


Apply thread glue to the thread of the balance shaft/spindle right bearing clamp bolt.

Install balance shaft/spindle right bearing clamp [1] and clamp bolt [2]. Tighten clamp bolt to rated torque.

Torque: 12N.m

Install the piston/connecting rod assembly.





RIEJU, S.A. c/.Borrassà, 41

E-17600 FIGUERES, GIRONA (SPAIN)

Telf. +34 972500850 Fax +34 972506950

www.riejumoto.com / e-mail rieju@riejumoto.com