Preface

New structure and technology are adopted with the increasingly more types of motorcycle appeared. We worked out this user manual for better adjustment and maintenance for LX500 engine face to customers and maintenance workers, which also as a guidance for repair and its technology.

Directory

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Summary

Rules of repair

1. Please adopt the spare parts, lubricant or other auxiliary materials produced, permitted or recommended by Loncin, in case the materials above fall short of meeting Loncin demands, the motorcycle may be damaged.

2. Use metric tools is necessary when repairing. Metric bolt, nut and screw are not exchangeable with the ones of imperial units.

3. After parts removed and before re-installed, replace for new washer, O-ring, split pin or locking piece.

4. Screw up the bolts or nuts with bigger diameter and the ones inside first. Fasten the bolts to specified torque according to diagonal sequence, unless other sequence stipulated.

5. Wash the removed parts by cleanser. Spread lubricant on contacting surface of parts before re-installation.

6. After re-installed, check the installation and operation of each parts by rotating, moving and operating.

Specification

Common specification

	Items	Data
Engine	Type	LX267MR
	Displacement	471ml
	Cylinder arrangement and angle	Left: 1, Right: 2; 19°
	Bore×stroke	67×66.8mm
	Volume of combustion chamber	15.6m
	Compression ratio	10.7: 1
	Max.power and its rotation	35Kw/8500rpm
	Max.torque and its rotation	43N·m/7000rpm
	Valve set	Top set cam
	Air inlet valve	Open (The valve lift to 1mm): -5° BTDC
		Close (The valve lift to 1mm): 35° ABDC
	Gas exhaust valve	Open (The valve lift to 1mm): 33° BBDC
		Close (The valve lift to 1mm): -13° ATDC
	Lubricant system	Forced pressure lubrication+Splashing
Transmission system	Clutch	Multiple layers and wet
	Gear box	International 6 gear
	Primary transmission ratio	2.029
	End transmission ratio	2.733
	Gear transmission ratio	1st gear: 3.285 2nd gear: 2.105
		3rd gear: 1.600 4th gear: 1.300
		5th gear: 1.150 6th gear: 1.043
	Gearshift	1-N-2-3-4-5-6
Electrical system	Ignition system	FTI 1-2
	Starting system	Electrical starting
	Illumination system	Battery
	Spark plug type	CPR8EA-9 (NGK)
	Spark plug clearance	0.8-0.9mm
	Rectifier regulator	Three-phase full wave rectification

Specification of coolant system

Items		Specification
Coolant volume	Heat radiator and	1.4 L
Coolant volume	Water tank	0.12 L
Releasing pressure of radiator cover		108-137kPa
Thermostat	Initial temperature	80-84℃
Thermostat	Complete temperature	95℃
Thermostat	Valve lifting distance	8mm
Suggest coolant		Coolant with ethanol but without silicate
Standard coolant density		1:1 mixture with distilled water

Specification of lubricant system

Unit: mm

Items		Standard	Repair limit
Oil volume	After oil replaced	2.5 L	—
Oil volume	After oil filter removed	2.7 L	—
Oil volume	After engine removed	3.2 L	—
Oil recommended		Engine oil suggested: SG10W-40 API quality grade: SG or higher (No circular API service lable with energy conservation mark is allowed) JASO T903 Standard: MA	—
Opening pressure of oil sensor		Under 1200rmp/80℃: 93kpa	—
Oil pump rotor	Blade tip gap	0.15	0.20
Oil pump rotor	Middle gap	0.15-0.21	0.35
Oil pump rotor	Sides gap	0.02-0.09	0.12

Cylinder head/valve specification

Unit:mm

Items			Standard	Repair limit
Cylinder pressure of electrical starting			1372kPa	—
Valves gap		Air inlet valve	0.16±0.03	—
Valves gap		Air exhaust valve	0.27±0.03	—
Swinging arm,	Arm inner diameter	Inlet/Exhaust	10.000-10.015	10.10
Arm, shaft	Arm outer diameter	Inlet/Exhaust	9.972-9.967	9.75
Arm, shaft	Gap between swinging arm and shaft	Inlet/Exhaust	0.013-0.043	0.10
Camshaft	Cam protrusion	Inlet	30.3955-30.6355	30.376
Camshaft	Cam protrusion	Exhaust	30.1424-30.3824	30.122
Camshaft	Gap between trunnion and hole		0.020.062	0.10
Camshaft	Runout		—	0.04
Valve, guide tube	Valve rod diameter	Inlet	4.475-4.490	4.465
Valve, guide tube	Valve rod diameter	Exhaust	4.465-4.480	4.455
Valve, guide tube	Rod inner diameter	Inlet/Exhaust	4.500-4.512	4.54
Valve, guide tube	Valve to its rod	Inlet	0.005-0.042	0.07
Valve, guide tube	Valve to its rod	Exhaust	0.015-0.052	0.08
Valve, guide tube	Height of guide rod	Inlet/Exhaust	14.10-14.30	—
Valve, guide tube	Width of valve seat	Inlet/Exhaust	0.90-1.10	1.5
Free length of valve spring		Inner diameter	29.78	28.58
Free length of valve spring		Outer diameter	39.98	38.78
Cylinder head flatness		—		0.10

Unit: mm

Clutch and gearshift specification

Items		Standard	Repair limit
Free travel of clutch lever		10-20	—
Clutch	Free length of spring	43.2	42.0
Clutch	Thickness of friction plate	2.30-2.50	2.27
Clutch	Driven plate flatness	—	0.30
Clutch collar	Inner diameter	22.000-22.021	22.031
Clutch collar	Outer diameter	27.987-28.000	27.977
Mainshaft outer diameter at clutch collar		21.967-21.980	21.95

Specification for magneto and starting clutch

Unit: mm

Items	Standard	Repair limit
Shaft sleeve outer diameter of plate gear	51.705-51.718	51.685
Inner diameter of starting clutch house	68.362-68.392	68.402

Specification for crankcase and transmission system

Unit: mm

Items			Standard	Repair limit
Transmission	Inner diameter of hole	M5	28.000-28.021	28.04
Transmission	Inner diameter of hole	C1	24.007-24.028	24.04
Transmission	Inner diameter of hole	C2	31.000-31.025	31.04
Transmission	Outer diameter of	M5, M6	27.959-27.980	27.94
Transmission	Outer diameter of	C2	30.970-30.995	30.94
Transmission	Outer diameter of	C3, C4	30.950-30.975	30.93
Transmission	Gap from gear to sleeve	M5	0.020-0.062	0.10
Transmission	Gap from gear to sleeve	C2	0.005-0.055	0.07
Transmission	Inner diameter of	M5	25.000-25.021	25.04
Transmission	Inner diameter of	C2	28.000-28.021	28.04
Transmission system	Mainshaft diameter	Match with M5 shaft	24.967-24.980	24.96
Transmission system	Mainshaft diameter	Match with C2 shaft sleeve	27.967-27.980	27.95
Transmission	Gap from shaft to its	M5, C2	0.020-0.054	0.07
Gear fork and its	Shaft diameter of gear fork		11.957-11.968	11.95
Gear fork and its	Inner diameter of gear fork		12.000-12.018	12.03
Gear fork and its	Tip thickness of gear fork		5.93-6.00	5.9

Specification for crankshaft, piston, cylinder and balancing shaft

Unit: mm

Items			Standard	Repair limit
Crankshaft	Gap on bigger side of connecting		0.05-0.20	0.25
Crankshaft	Gap between shaft pad and shaft		0.030-0.052	0.06
Crankshaft	Gap between shaft pad and		0.017-0.035	0.05
Crankshaft	Runout		—	0.05
Cylinder	Bore		67.000-67.015	67.10
Cylinder	Out of round		—	0.10
Cylinder	Taper		—	0.10
Cylinder	Flatness		—	0.10
Piston and its pin	Diameter of piston base circle		66.970-66.990	66.905
Piston and its pin	Diameter of hole on pin		16.002-16.008	16.02
Piston and its pin	Diameter of piston pin		15.994-16.000	15.98
Piston and its pin	Gap between piston and its pin		0.002-0.014	0.04
Piston and its pin	Closing gap of piston	1st ring	0.10-0.20	0.4
Piston and its pin	Closing gap of piston	2nd ring	0.21-0.31	0.5
Piston and its pin	Closing gap of piston	Oil ring	0.20-0.70	1.0
Piston and its pin	Piston ring and its	Gap	0.030-0.060	0.10
Piston and its pin	Piston ring and its	Gap	0.015-0.050	0.08
Gap of cylinder matching			0.010-0.045	0.10
Inner diameter of smaller end of connecting rod			16.030-16.044	16.05
Matching gap between connecting rod and its pin			0.03-0.05	0.07

Torque

Standard torque

Fastening parts	Torque N.m	Parts type	Torque N.m
5mm bolt and nut	5.2	5mm screw	4.2
6mm bolt and nut	10	6mm screw	9.0
8mm bolt and nut	22	6mm flange bolt (8mm head, small	10
10mm bolt and nut	34	6mm flange bolt(8mm head,big flange)	12
12mm bolt and nut	54	6mm flange bolt (10mm head) and nut	12
12mm bolt and nut	54	8mm flange bolt and nut	27
12mm bolt and nut	54	10mm flange bolt and nut	39

Engine torque

Items	Numbers	Thread diameter	Torque N.m	Note
Screw on air filter cover	4	5	1.1	
Screw on filter element	4	5	1.5	
Spark plug	2	10	16	
Swing arm shaft bolt	2	12	16	Spread oil on thread and adopt new washer
View hole cover	1	45	12	Spread grease on thread
Engine oil drainage bolt	1	12	28	
Secondary filter	1	20	12	
Tube joint of secondary filter	1	24	27	From head 6.5mm and spread fastening glue

Coolant system

Items	Numbers	Thread diameter	Torque N.m	Note
Fan cover bolt	4	6	8.5	
Fan motor screw	3	4	2.8	
Fan nut	1	3	1.1	Coat thread with sealing
Water pump installing	3	6	12	
Water pump cover bolt	2	6	10	

bolt)				
Cylinder head drainage	1	6	12	
Thermostat cover bolt	1	6	12	

Cylinder head and valves

Items	Numbers	Thread diameter	Torque N.m	Note
Cylinder head bolt	6	9	47	Coat thread and seat
Camshaft bracket bolt	12	6	12	Coat thread and seat
Swing arm shaft bolt	2	12	15	Coat thread and seat
Cylinder head cover bolt	4	6	10	
Tensioner adjusting bolt	1	6	10	Coat thread and seat
Cylinder body connecting	2	6	10	

Clutch and gearshift

Items	Numbers	Thread diameter	Torque N.m	Note
Oil pump driven wheel	1	6	12	Coat thread with sealing
Central case locking nut	1	18	128	Coat thread and seat
Primary driving wheel	1	10	103	Coat thread and seat
Check plate bolt	1	6	12	Coat thread with sealing
Location bolt	1	8	23	Coat thread with sealing
Lift plate bolt	4	6	12	
Pressure plate bolt	1	6	12	Coat thread with sealing
Limiting plate bolt	1	6	12	Coat thread with sealing
Gearshift locating bolt	1	8	27	
Right crankcase cover	14	6	10	

Magneto and starting clutch

Items	Numbers	Thread	Torque	Note
Clutch fastening bolt	6	8	29	Coat thread with sealing glue
Magneto rotor bolt	1	12	138	Coat thread and seat surface with
Magneto stator bolt	4	6	10	Coat thread with sealing glue
Trigger fixing bolt	2	6	12	Coat thread with sealing glue
Left crankcase cover bolt	11	6	12	Coat thread with sealing glue

Crankcase body and transmission system

Items	Numbers	Thread diameter	Torque N.m	Note
Balancing shaft/Check	4	6	12	Coat thread with sealing
Pressure plate for	1	6	12	Coat thread with sealing
Gearshift drum bearing	2	6	12	Coat thread with sealing
Mainshaft trunnion bolt	6	8	15+120°	Coat with oil and adopt new
Crankshaft case 10mm bolt	1	10	39	
Crankshaft case 8mm bolt	3	8	24	
Crankshaft case 6mm bolt	10	6	12	

Crankshaft, piston, balancing shaft

Items	Numbers	Thread diameter	Torque N.m	Note
Connecting rod cover nut	4	8	33	Coat thread and seat
Balancing	4	6	12	Coat thread with sealing

Positions for lubrication and sealing

Engine

Material		Position	Note
Sealing glue	1596	Contact surface of crankcase Seal ring of cylinder head cover	
Seal	1590	Magneto wiring port	
Engine oil		Surface of inner and outer rotor of oil pump Surface of swing arm shaft Inner surface of swing arm and surface of roller Sliding surface between valve rod and its end The surface of timing chain Rolling surface of camshaft Inner surface of cylinder hole Piston outer surface, pin hole and piston ring groove Outer surface of piston pin Surface of piston ring Surface of clutch friction plate Sliding surface of clutch pushing rod Gearshift rod and fork Surface of double gear shaft Surface of surpass clutch Surface of gearshift fork shaft Inner surface of shaft pad and bigger end of connecting rod Inner hole of small end of connecting rod Gear teeth(Primary transmission, crankcase, starting deceleration)	
Supramoly oil		Swing arm Swing arm shaft Camshaft surface Cylinder head camshaft hole	
Multi-role lubricant		Starting motor seal ring Speed sensor seal ring	
Degreaser		All the contact surface	

2

Maintenance

Repair information

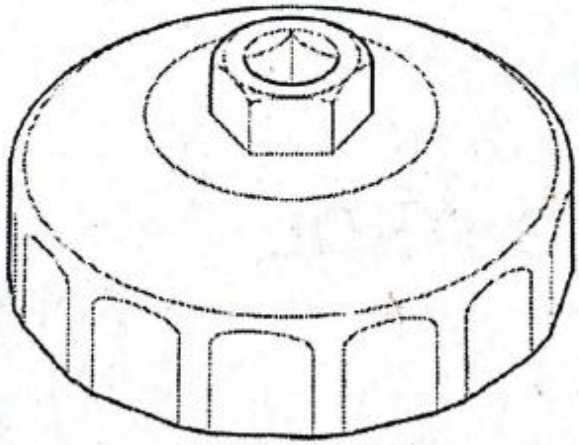
Summary

- Lay the motorcycle on horizontal plane before all the operation.

Tool

Cap-shaped secondary oil filter spanner

帽式机油精滤器扳手



Maintenance specification

Please make periodic inspection according Maintenance table in user manual.

I: Checking, and clean, adjust, lubricate, or replace when it is necessary;
C: Clean; A: Adjust; L: Lubricate. Maintenance below require the user equipped mechanical knowledge. Some items, especially with * or **, and more tools or technology information may need.

Periodic maintenance table

			Items	Odometer Note 1							
			Period	×1000km	1.0	6.4	12.8	19.2	25.6	32.0	38.4
Relate to emission	*	Oil tube					I		I		I
	*	Throttle valve					I		I		I
		Air filter						R			R
		Gas nozzle	Note 2			C	C	C	C	C	C
	**	Spark plug	Note 3						R		
	**	Valve gap			I				I		
		Engine oil			Initial=1000km or 1 month; R=Each						
	*	Secondary oil			R		R		R		R
		Idling			I		I		I		I
	*	Coolant	Note 5				I		I		R
	*	Coolant system					I		I		I
	*	Secondary air					I		I		I
		Fuel drainage	Note 4					I			I
Irrelevant to emission		Transmission			Each 800km I,R						
		Brake liquid				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

*Repair shall be done by Loncin dealer, unless the user equipped mechanical knowledge.

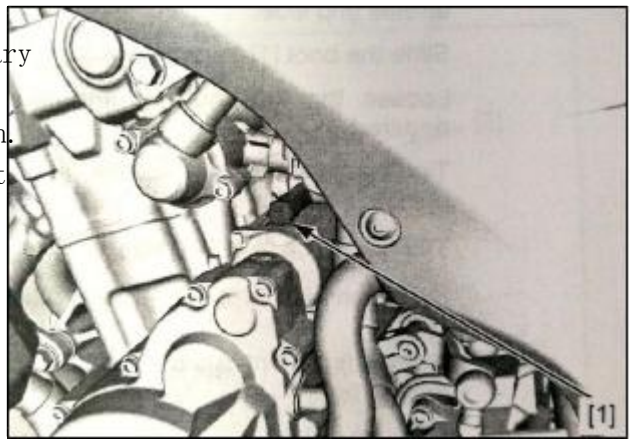
In case repair or maintain by user themselves, refer to this manual is also necessary
** From the view of safety, we suggest these items maintain by Loncin dealers.
Caution:
1. In case odometer is with long mileage, periodic maintenance is necessary refer to stipulation above.
2. In case driving in wet or dusty area, more frequent maintenance is necessary.
3. Driving in rain or under high speed, more times for maintenance is necessary
4. Replace each 2 years, or replace according to odometer showing, who firstly reached will be adopted. Replacement needs knowledge of mechanical technology.

Crankcase breathing tube

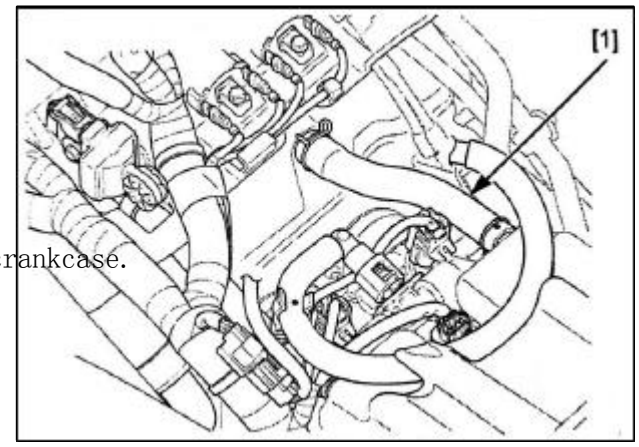
Caution:

- More times of maintenance is necessary after drove in rain, high speed,or after washing or placing upside down. Check sediment from transparent part of breathing tube to confirm it is visible.

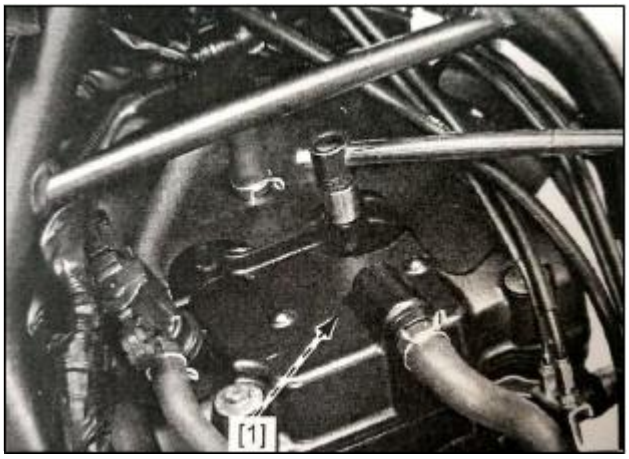
Pull out tube plug[1] of air filter and input the sediment into container and reset the tube plug.



Remove the fuel tank and hold on.
Check if there is crack,Aged, damage e or runout of waste gas tube[1] of crankcase.
Replace the tube if needed.
Install the fuel tank.



Spark plug



Remove the fuel tank.

Remove the spark plug[1]。

Caution:

Blow and wash the surroundings by air gunof seat of spark plug for ensuring no dust in combustion chamber.

Check if there is crack or damage on insulator, or damage, dirt, and discoloration on electrodes. Replace the spark plug if necessary.

Check the spark plug:

Wash electrodes of spark plug by iron wire or its washer.

Check the gap between central and side electrodes by plug gauge.

Spark plug gap: **0.80-0.90mm**

Cautiously bend the electrodes for adjusting the gap when it necessary.

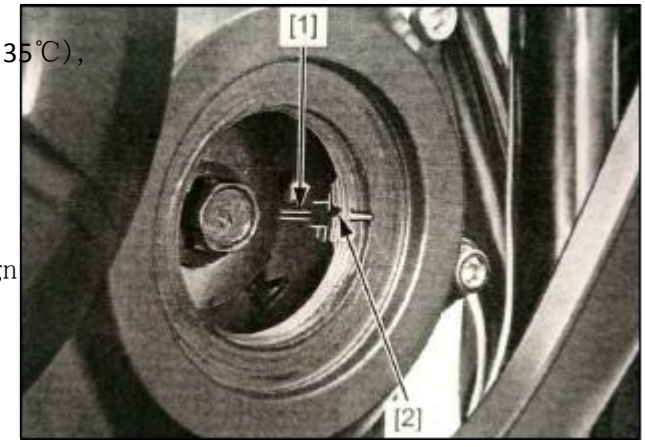
Install and screw up spark plug to cylinder head by hand, and fasten to Stipulated torque.

Torque: **16N・m**

Install the fuel tank.

Valves gap

Check



Caution:

- Check under cold status(lower than 35℃), check and adjust valve gap.

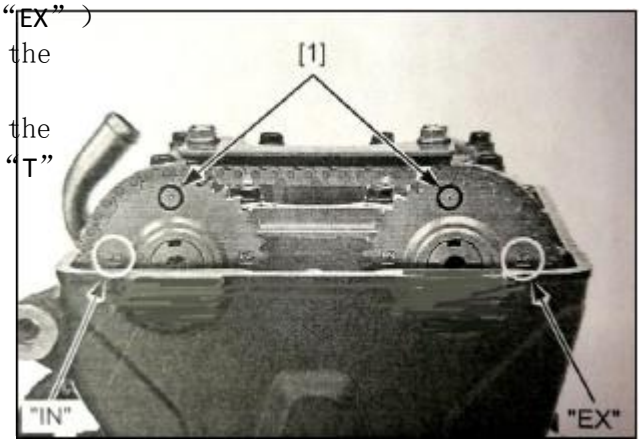
Remove the parts below:

- Cylinder head cover
- View hole cpver and O ring

Turn the crankshaft clockwise, and align mark [1] "T" with indication groove[2] on crankcase cover.

Make sure the timing marks on sprocket wheel (“IN” “EX”) align with surface of cylinder head, and also ensure the punched mark face upwards,

In case the timing mark is not at the position, turn the crankshaft clockwise by 360°, align again the mark “T” and indication groove.



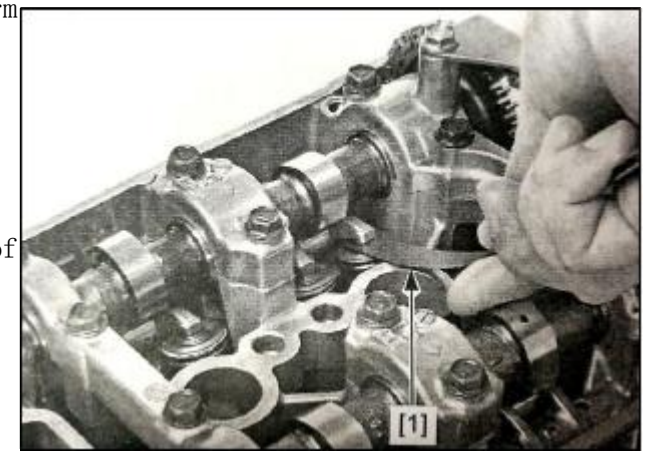
Insert the plug gauge between swing arm and shim of 1st cylinder(left) and 2nd cylinder(right) to check the valve gap.

Valve gap:

EX: 0.27±0.03mm

Caution:

Record each gap for convenient choice of shim when adjusting valves.

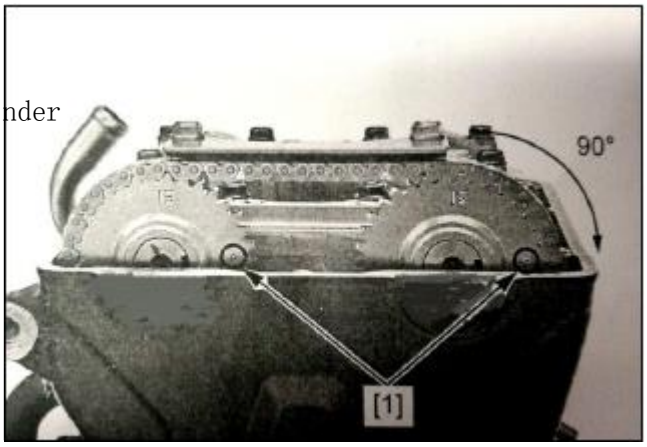


Turn the crankshaft clockwise for 180°, and align the punching hole mark [1] on sprocket wheel and surface of cylinder head.

Check gaps of air inlet valves of both cylinders.

Valve gap

EX: 0.16±0.001



Adjustment

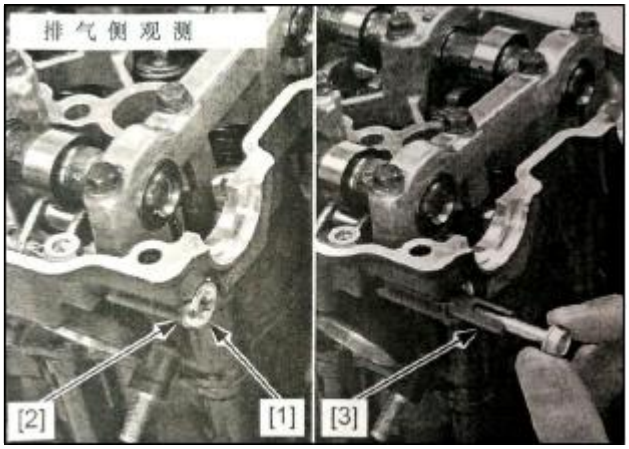
Caution:

- Adjust valve gap through remove swing arm shaft.

Before removing, make sure it is on the correct position of removeavle.

Remove plug bolt [1] and washer[2].

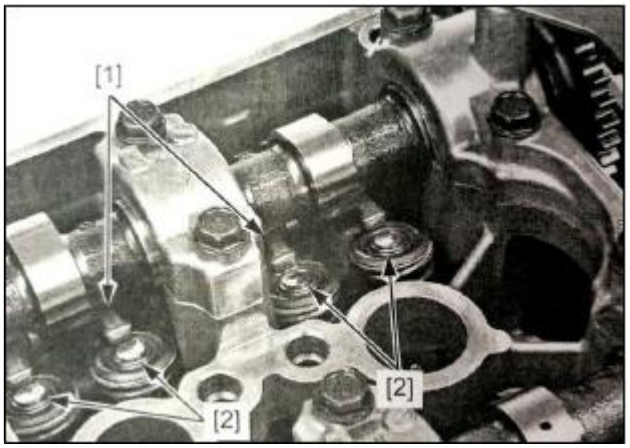
Fix the swing arm, remove swing arm shaft [3] by bolt of 6mm.



Slide swing arm shaft [1] outwards and remove shim[2].

Caution:

- Pay attention to and prevent the shim drop into crankcase of spark plug hole
- Mark all the shims for ensuring Correct re-installation.
- Use nipper or magnet for more Conveniently removing the shims.



Measure the thickness of shim[1] and record

Caution:

- T here are 69 shims with different thickness for choice with difference of 0.025mm （1.200-2.900mm）

Calculate thickness of new shims by equation below:

A=(B-C)+D

A: Thickness of new shim

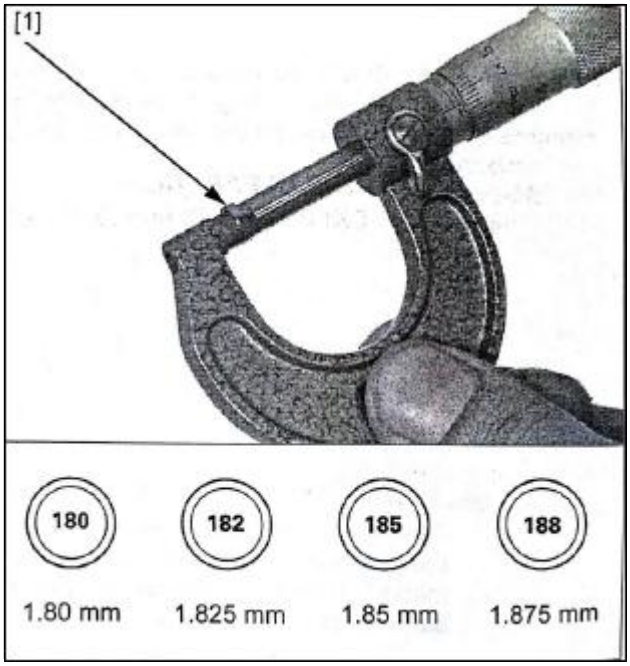
B: Record valve gap

C: Stipulated valve gap

D: Thickness of removed shims

Caution:

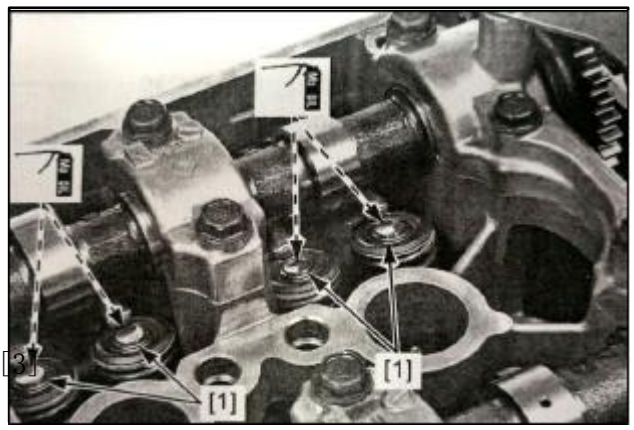
- Ensure the correct thickness of shim by micrometer.
- Incase the result of alculation is more than 2.9mm due to carbon buildup, clean the seat surface of valves.



Coat end of valve rod with supramoly solution.

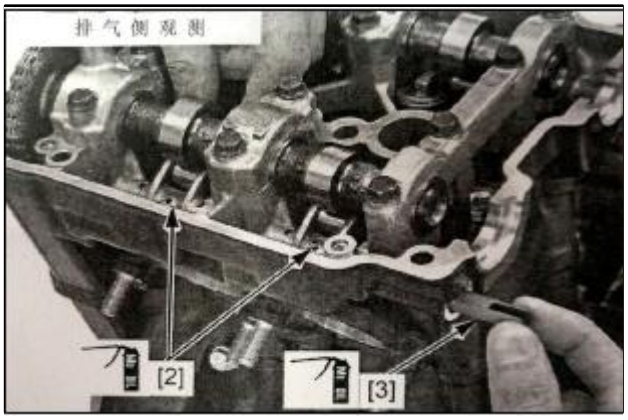
Install new shim[1] to spring seat of valve.

Coat sliding and pushing area of swing arm, and outer surface of the arm shaft with supramoly solution.



Push swing arm[2] in.

Fix the swing arm, and insert the swing arm[3] into cylinder head and swing arm.



Coat bolt and thread of plug with oil and install, replace for new shim[2].

Screw up the bolt to stipulated torque.

Torque：**16N・m**

Turn crankshaft clockwise for turning camshaft several times

Check and measure valve gap again.

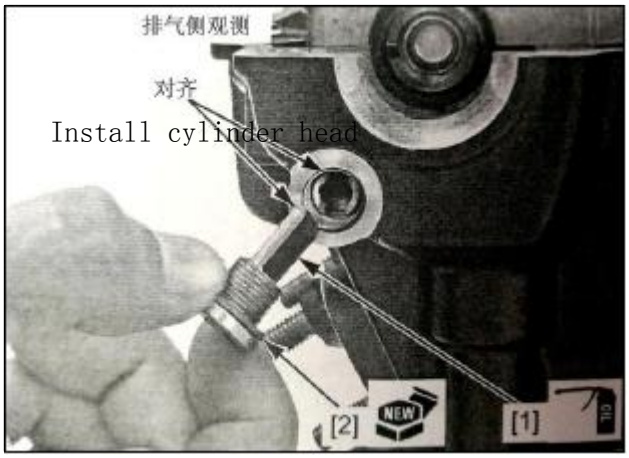
Replace for new O-ring and coat with oil, then install

Into groove on view hole cap.

Coat lubricant grease on thread of view hole cap and install.

Screw up the view hole cap to stipulated torque.

Torque：**12N・m**



Engine oil

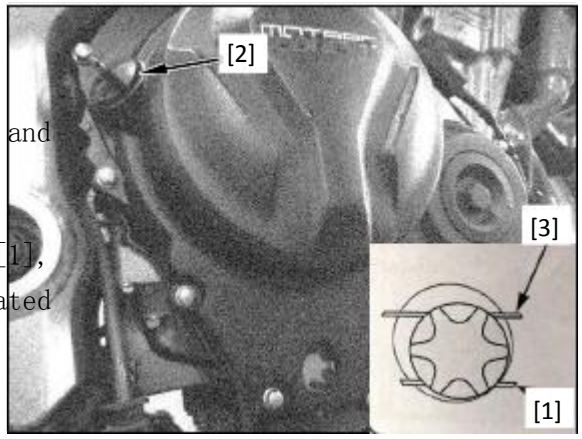
Check the oil

Start engine and idling for 3-5 minutes.

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

Lay the motorcycle on horizontal plane and upright

Check oil through oil view window.



In case the oil is lower than scale line[1], remove oil plug[2],and fulfill by stipulated oil to scale line[3] on crankcase

Stipulated oil:

SG10W-40

API quality grade: SG or higher (Use circular API service label with energy saving mark is not allowed) .

JASO T903 Standard: MA

Viscosity: SAE10W-40

Check O-ring on oil plug, replace if necessary.

Coat surface of O-ring with oil.

Install oil plug.

Oil replacement

Start the engine and make it hot.

Turn off the engine and remove oil Filter cover[1].

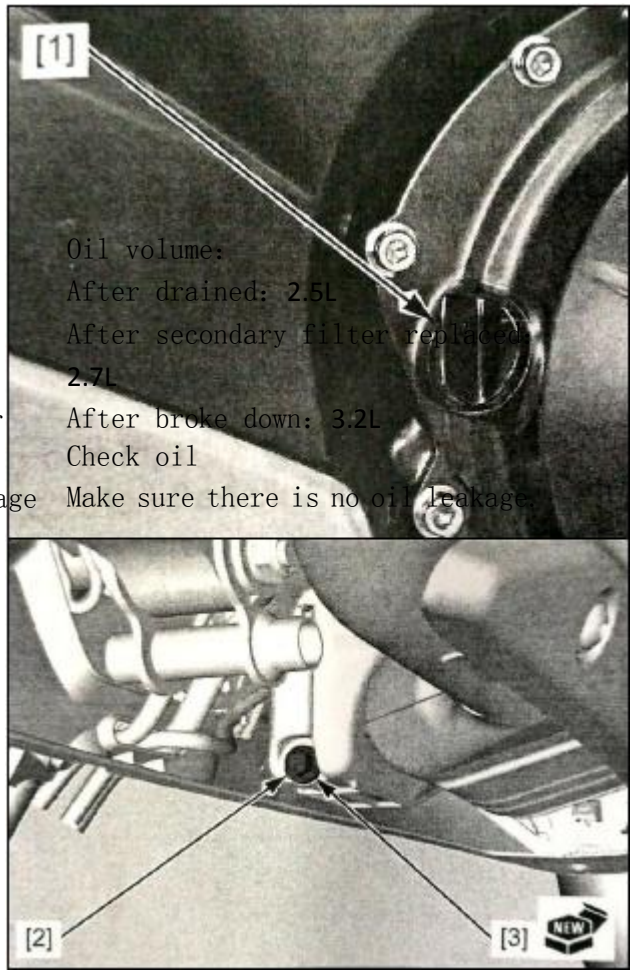
Remove oil drainage bolt[2] and washer [2], and drain off the oil.

After oil drained off,install the drainage bolt and replace for new washer.

Screw up the oil drainage bolt to stipulated torque.

Torque: **30 N・m**

Fill-up the crankcase by stipulated oil.



Oil volume:

After drained: 2.5L

After secondary filter replaced: 2.7L

After broke down: 3.2L

Check oil

Make sure there is no oil leakage.

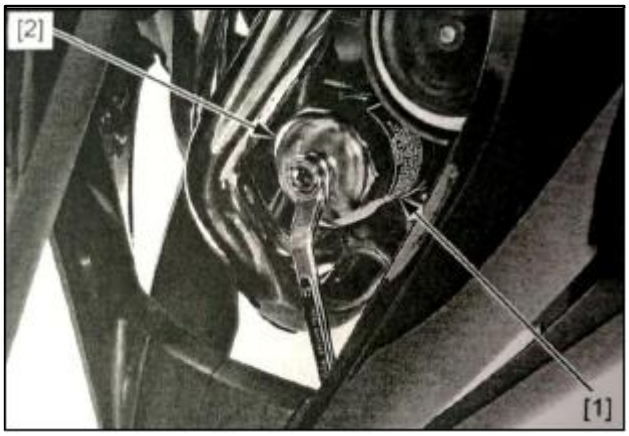
Secondary oil filter

Drain off the oil

Remove secondary oil filter[1] by specified tool.

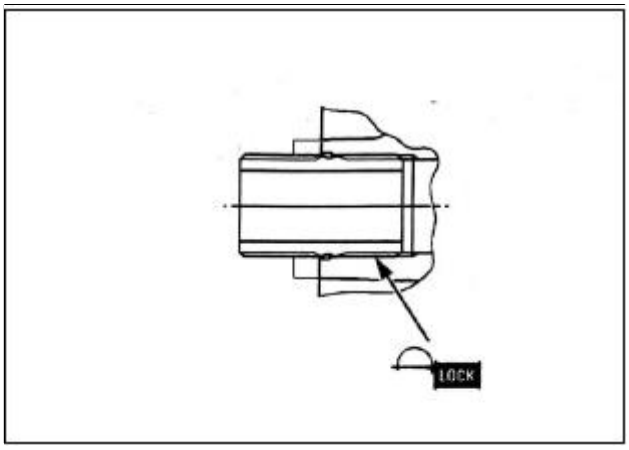
Tool:

[2]Cap secondary oil filter spanner.



Install tube joint of secondary oil filter
And screw up to stipulated torque.

Torque: **24 N・m**



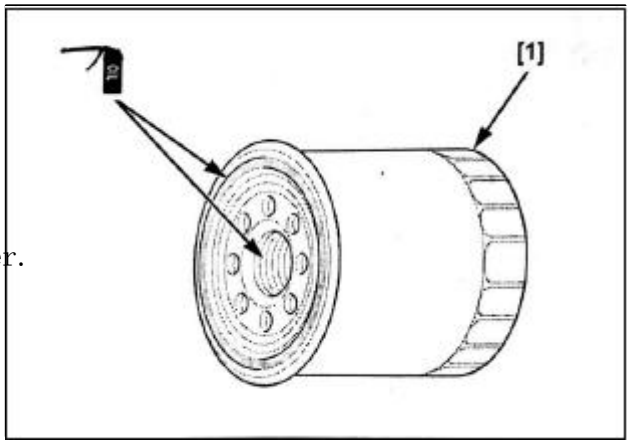
Coat thread and O-ring with oil to new secondary oil filter[1].

Install the secondary oil filter and screw up the stipulated torque.

Tool: [2]Cap secondary oil filter spanner.

Torque: **12 N・m**

Fill-up the crankcase by stipulated oil.



Engine idling

Caution:

- Check and adjust idling after all maintenance items finished and at stipulated
- range.

Check items below before inspect idling:

- Failure indicator lights not flashing
- Status of spark plug
- Status of air filter element
- Free travel of throttle switch and lever

- Check and adjust idling when the engine is hot.

Start the engine and let it reached normal hot,and then check the idling.

Idling speed: **1500±100**

In case idling speed is out of repair limit, check parts as below:

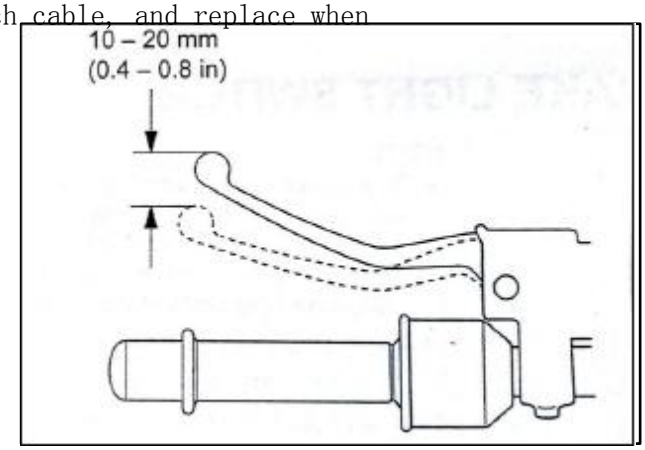
- Air inlet leakage or problems on cylinder head
- Failure of idling control valve

Clutch

Check the distorsion or damage of clutch cable, and replace when it necessary.

Measure the free travel at the end of clutch lever

Free of travel: **10-20mm**

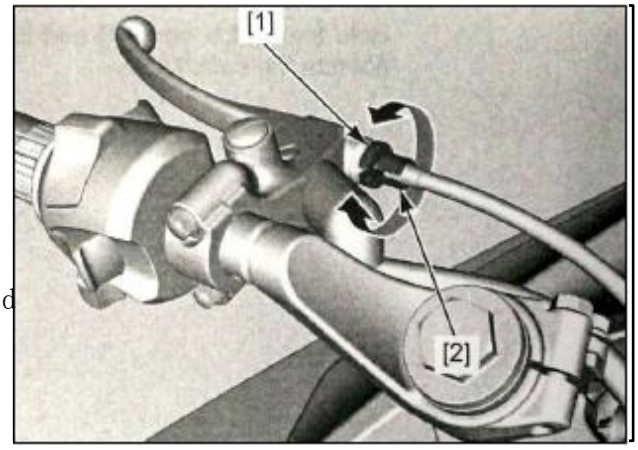


Tiny adjustment could be done by adjustor on clutch lever.

Screw off locking nut[1], and turn the adjustor according to demands.

Hold the adjustor while screwing up the locking nut.

When it exceeded the line travel of adjustor, the exact free travel could not be obtained, in this case, adjust the main adjustor.

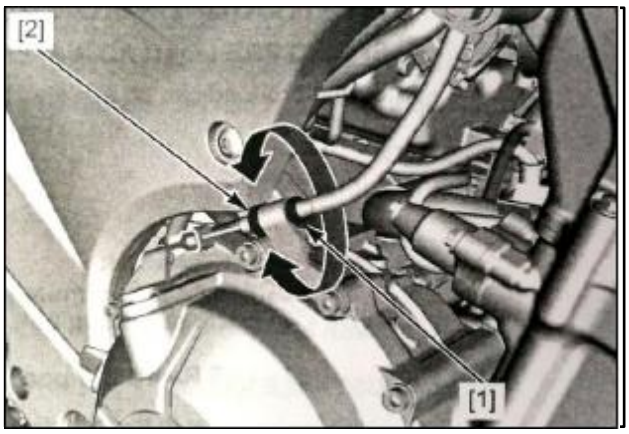


Adjust the main adjustor through the nut [1] at clutch operation arm.

Srew off the nut[1], and turn the adjustor according to demands.

Hold the adjustor, while screwing up the locking nut.

In case correct clutch travel is unable to be obtained or clutch skidding when trial driving, break down and check the clutch.



3
Coolant system

Maintenance infromation

Summary

! Warning

Remove heat radiator cover before it cool down is not allowed for preventing splashing hot coolant hurt people.

Caution

The coolant with silicate corrosion inhibitor may lead to abrasion for seal ring of water pump or block passageway of heat radiator.
Use running water may damage the engine.

- Fill up coolant into expansion tank. Remove heat radiator cover is not allowed except fill up or drain off the coolant.
- Remove engine from frame is unnecessary when repairing coolant system.
- Coolant touch painting surface is not allowed.
- Check leakage by coolant system tester after maintained.
- Check coolant temperature indicator/Water temperature sensor.
- Check power relay of fan control.

Coolant system specification

Items		Specification
Coolant capacity	Radiator and engine	1.4 L
	Water tank	0.12 L
Releasing pressure of radiator cover.		108-137kPa
Thermostat	Initial temperature	80-84℃
	Complete	95℃
	Rising of valve	No smaller than 8mm
Coolant suggested		With ethanol but without silicate
Standard density of coolant		Mix with distilled water by ratio of 1:1

Trouble shooting

Too hot the engine

- Failure of coolant temperature indicator/water temperature sensor
- Thermostat valve is closed
- Thermostat cover failure
- Insufficient coolant
- Passageway, hose or water tube of heat radiator blocked.
- Air inlet into circulation system
- Failure of cooling fan motor
- Failure of power relay of fan control
- Water pump failure

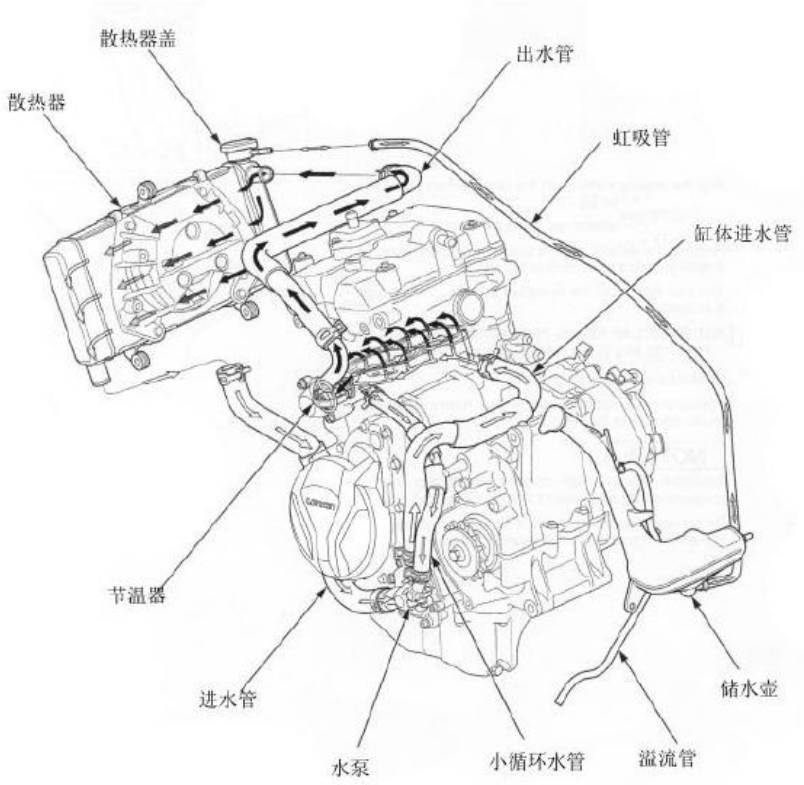
Too low the engine temperature

- Failure of coolant temperature indicator/water temperature sensor
- Thermostat valve opened
- Failure of power relay of fan control

Coolant leakage

- Defects on water pump mechanism
- Aged O-ring
- Heat radiator cover failure
- Aged or damaged cylinder head gasket
- Hose joint loosened or clip untight
- Soft hose damaged or aged
- Heat radiator damaged
- Flexible tube joint of thermostat cover or water pump cover

System flow mode



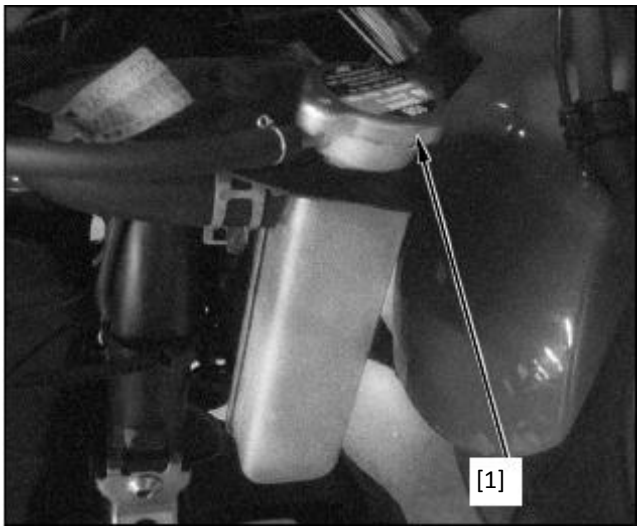
散热器：Heat radiator 散热器盖：Heat radiator cover 出水管：Water outlet tube虹吸管：Siphon tube 缸体进水管：Cylinder water inlet tube节温器：Thermostat 进水管：Water inlet tube 水泵：Water pump 小循环水管：Sub-circulation tube 溢流管：Overflow tube储水壶：Water reservoir

System test

Test for heat radiator cover/system pressure

Remove the fairing of right middle blade.

Remove the heat radiator cover[1]



Get the gasket of radiator cover wet, and install the cover into tester[2].

Compress the radiator cover by tester.

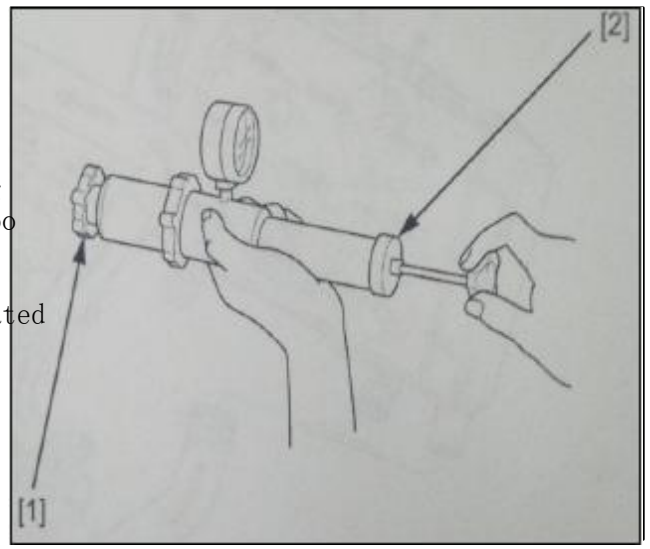
In case the radiator cover failed keeping the pressure, or the released pressure too high or low, replacement is needed.

The radiator cover undertakes the stipulated pressure shall be at least for 6 seconds.

Pressure on heat radiator cover:

108-137 KPa

Connect the tester to heat radiator.



Compress heat radiator, engine or soft hose by tester for checking its air tightness.

Caution

Over-compressed may damage coolant system. Pressure should not be more than 137 KPa。

In case the time of undertaking pressure is less than 6 seconds, repair or replacement is needed.

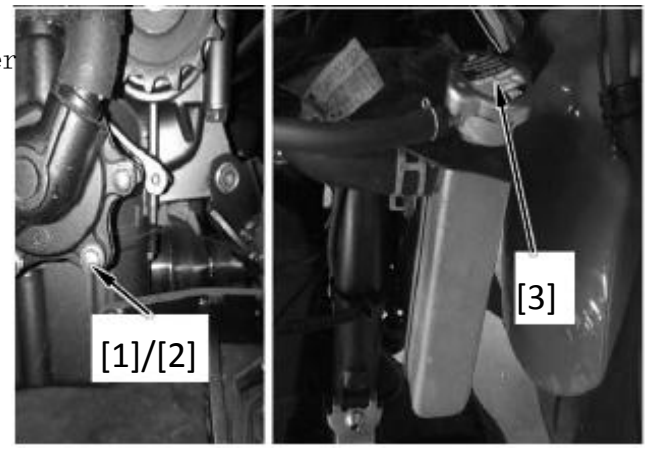
Replace coolant

Replace coolant/Air outlet

Caution: Lay the motorcycle on honrizontal ground and upright before filling up the system or expansion tank with coolant.

Remove the fairing of fan

Remove the water drainage bolt[1] of water pump and flat washer[2].



Remove heat radiator cover[3] and drain off the coolant.

Remove water drainage bolt[4] and flat washer[5] on the cylinder and drain off the coolant.

After the flat washer replaced, install the water drainage bolt.

Screw up the water drainage bolt to correct torque.

Torque:

Water pump drainage bolt:

10N . m (1.0 kgf . m, 10 lbf . ft)

Cylinder head drainage bolt:

12 N . m (1.2 kgf . m, 10 lbf . ft)

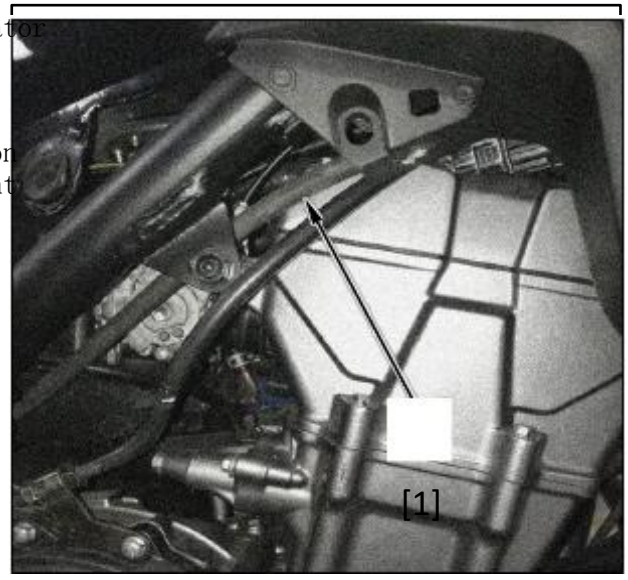
Disconnect siphon tube[1] from heat radiator.

Pull out siphon tube from its clamp.

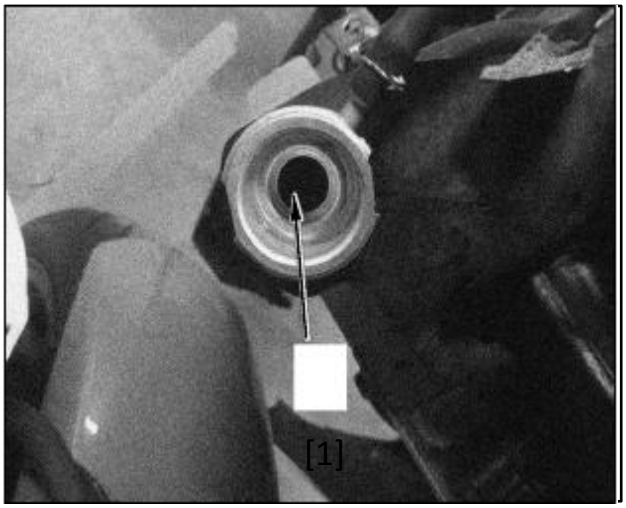
Lay the soft hose in relative low position out of engine frame, and drain off coolant in reservoir.

Drain off coolant and wash internal reservoir.

Install the soft hose into its clamp and heat radiator.



Fill up by recommended coolant through water injection hole until it reached the position[1].



Recommended coolant:

With ethanol but without silicate.

Coolant density standard:

Mix with distilled water by ratio of 1:1

Outlet the air in system by steps below:

1. Shift the engine to neutral gear.

   Starting engine and idling for 2-3 minutes.

2. Open and close throttle for 3-4 times for outlet the air in system.

3. Turn off the engine, and fill up coolant if necessary.

4. Install heat radiator cover.

Fill up the reservoir tank by coolant.

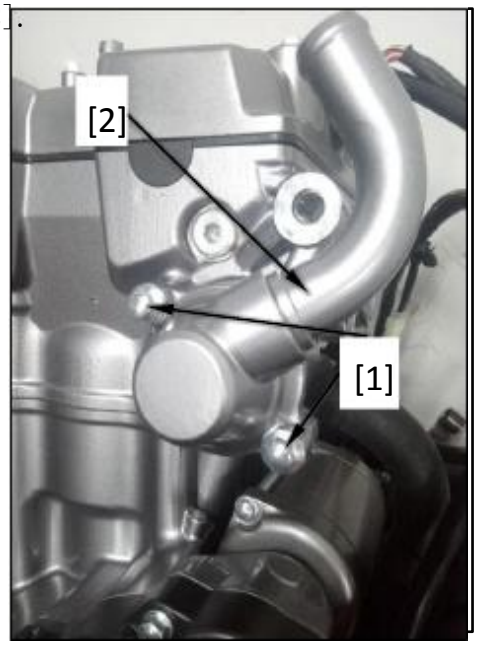
Install the fairing.

Thermostat

Removing/Installation

Drain off the coolant.

Remobe the bolt[1] and thermostat cover[2].



Remove thermostat valve from cylinder head.

Installation procedure is opposite to removing.

Torque:

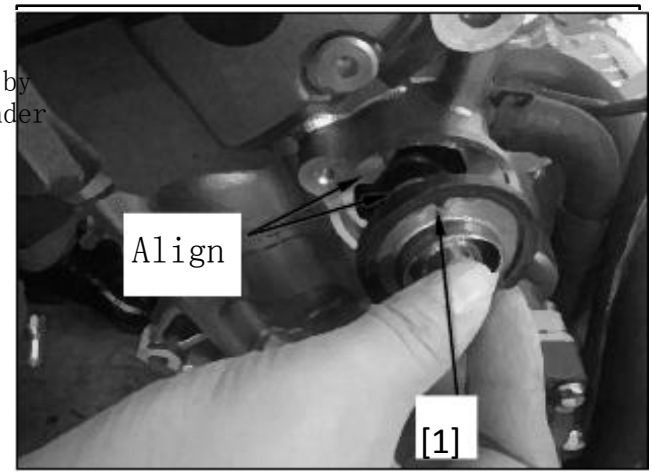
Bolt on thermostat cover:

12N • m (1.2kgf • m, 9lbf • ft)

Caution:

- When installing the thermostat, align with the air outlet hole[2] by adjusting screw on groove of cylinder cover.

  Fill up system by coolant.

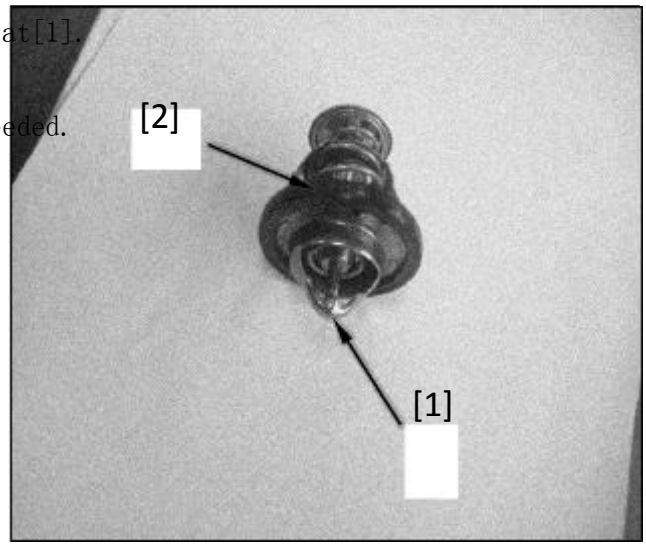


Check/Inspection

If there is damage on surface of thermostat[1].

In case the thermostat valve is open under room temperature, replacement is needed.

Check if there is damage on seal ring [2], replace if needed.



Caution:

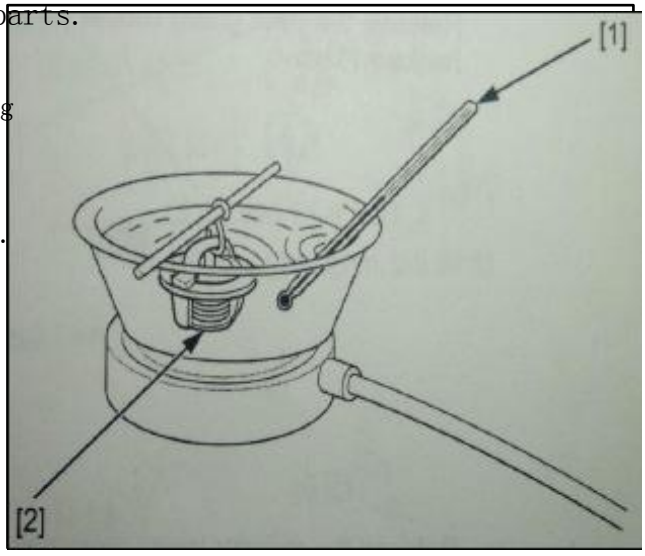
Wear oven gloves and suitably protect eyes.

Keep inflammables far from electrical parts.

Thermostat or thermometer[1] touches bottom is not allowed, or you may get wrong indication.

Heat the water to working temperature by electrical stove and keep for 5 minutes.

Hang the thermostat[2] in hot water for checking is function.



Opening temperature of thermostat:

80-84℃ (176-183℉)

Height when valve completely opened:

In 95℃ (203℉) not less than 8mm(0.3 in)

In case the thermostat opened out of stipulated temperature, replacement is needed.

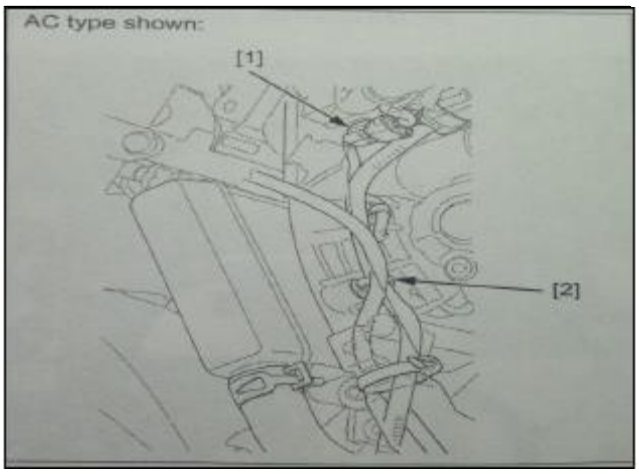
Heat radiator/Cooling fan

Removing/Installation

Drain off the coolant

Cut off motor of fan 2P9(Black) and connector[1], and then remove.

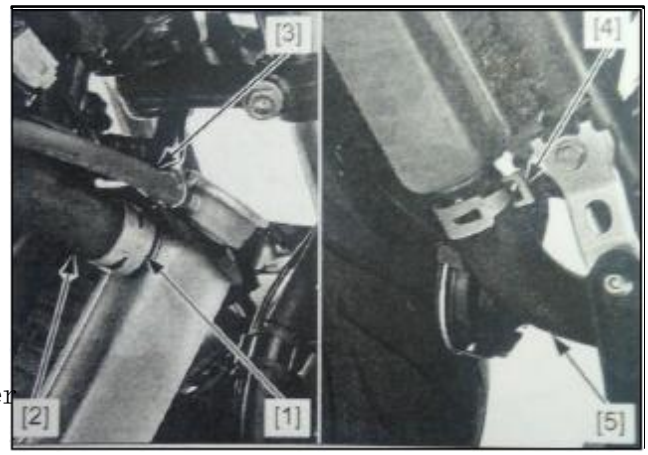
Remove wire clamp[2] from motor case of the fan.



Loosen the clamp[1] and soft hose[2].

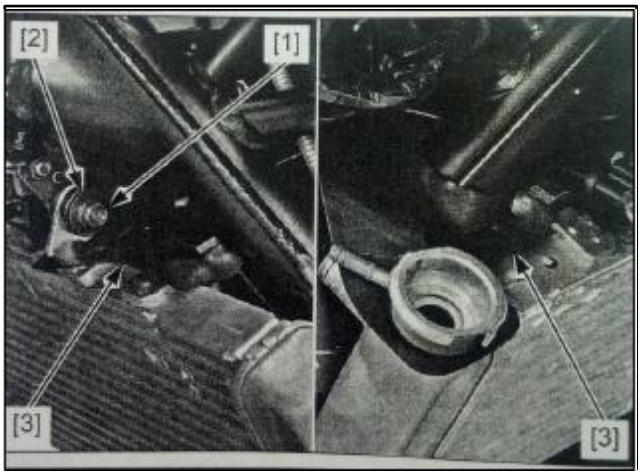
Loosen the siphon hose[3].

Loosen clamp[4] and soft hose[5] under heat radiator.



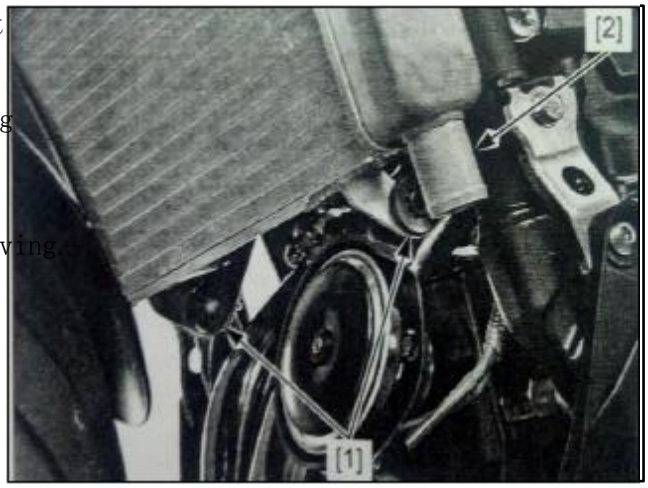
Remove the installation bolt[1] and washer [2].

Loosen heat protective rubber from Filling-up tube, bending and cable.



Damage the heat radiation blade is not allowed.

Move the heat radiator left to linner ring [1]'s protrusion pillar, then loosen and remove the heat radiator.

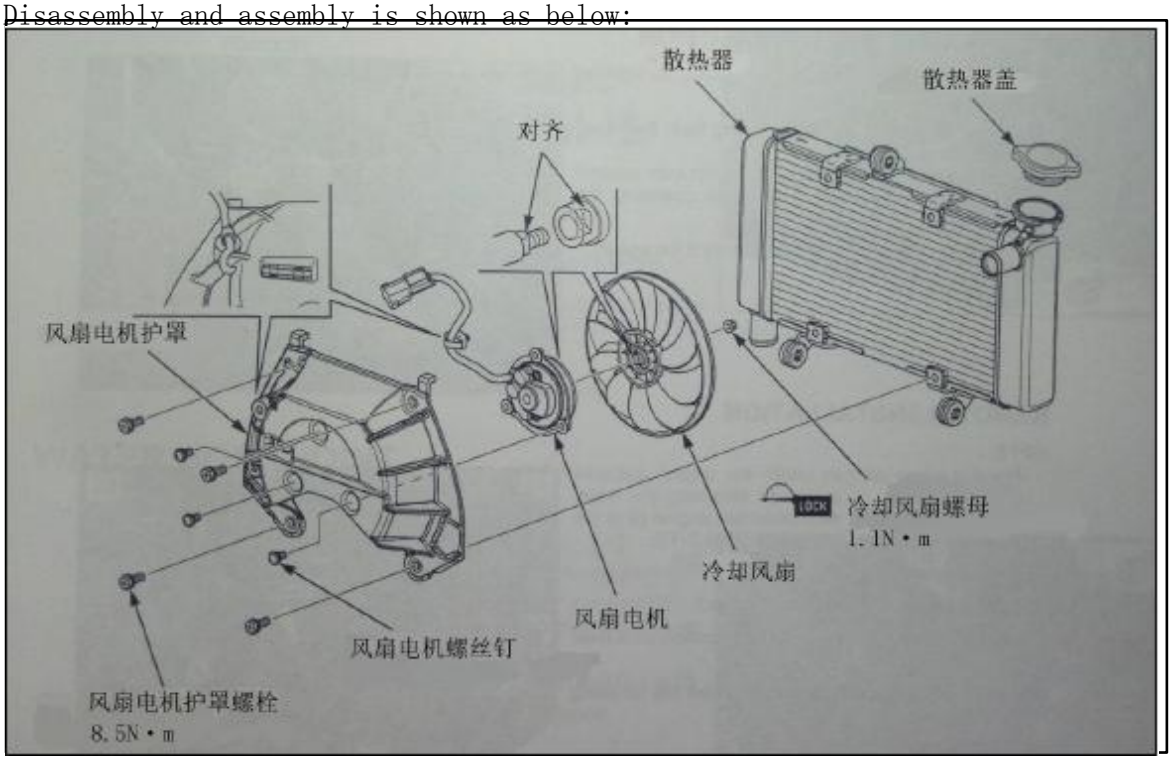


Installation sequence is opposite to removing.

Fill-up the system and drain off coolant.

Disassembly/Aseembly

Disassembly and assembly is shown as below:



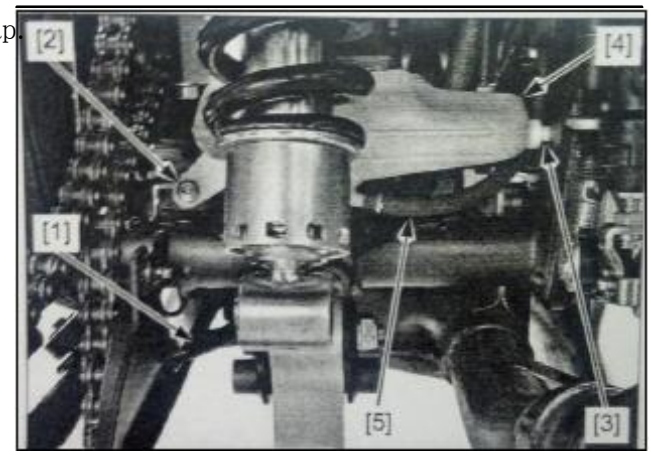
Water tank of heat radiator

Removing/Installation

Removing is as below:

- Fan motor house
- Fan and its motor

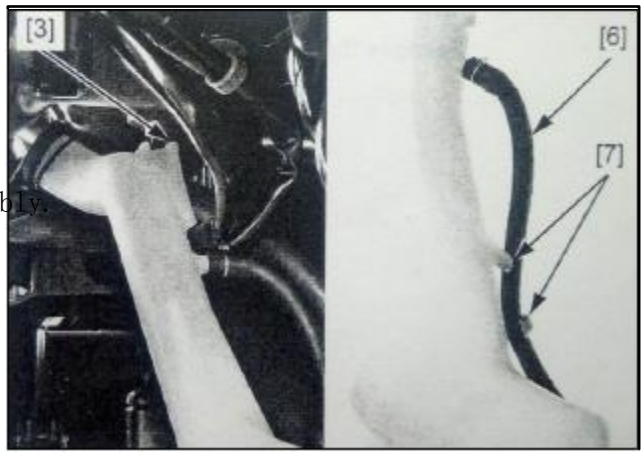
Remove overflow tube[1] from breathing cap. Remove bolt[2], then water tank[4],and lug[3] from the frame.



Loosen the siphon tube[5], drain off the coolant and remove the water tank. Disconnect overflow tube[6], and remove from guiding plate[7].

Assembly sequence is opposite to disassembly.

Fill up the water tank by recommended coolant.



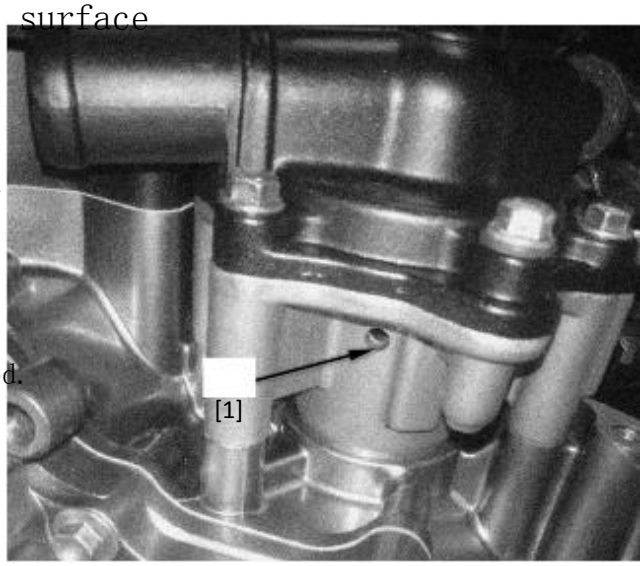
Water pump

Check sealing performance on end surface

Check the coolant leakage on overflow Hole[1] of water pump.

- A few coolant overflowed is normal.
- Ensure no coolant leakage when the engine is working.

Replace the water pump component if needed.



Removing/Installation

Caution:

- Lay a clean oil plate under the engine, and the oil may outflow when removing water pump body, and then fill up the stipulated oil(Refer to Maintenance guidance).

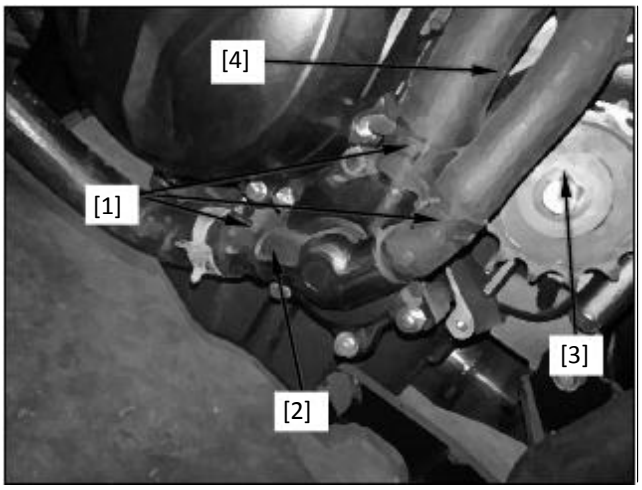
Drain off the coolant.

Remove the house of sprocket wheel.

Lay the motorcycle on horizontal ground and upright.

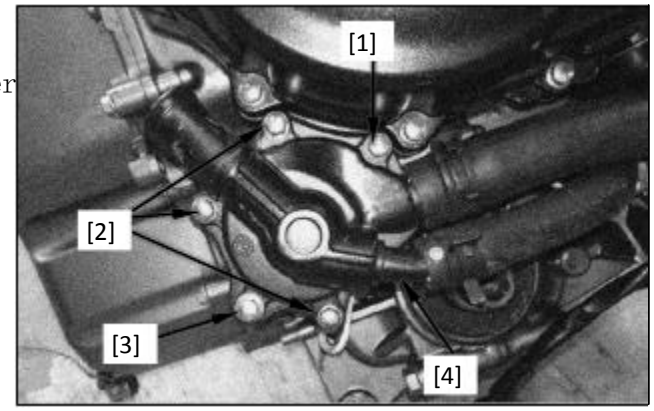
Loosen clamp[1], and loosen the device below on water pump:

- Heat radiator tube[2] below
- Sub water circulation tube[3]
- Water inlet tube[4]



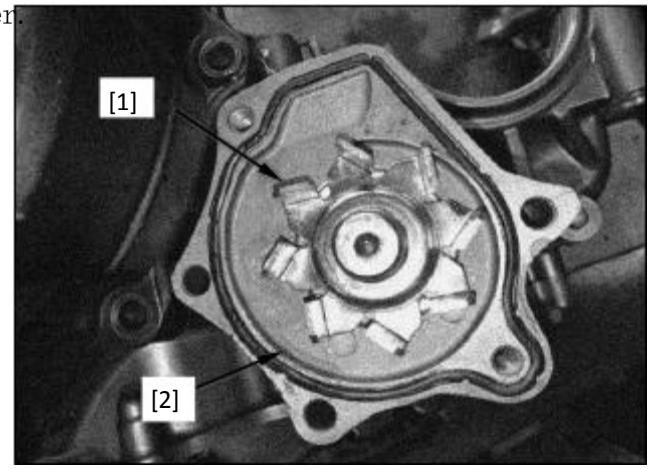
Remove the parts below:

- Remove the bolt[1] on water pump cover
- 3 pcs of installation bolt[2]
- Water drainage bolt [3]
- Water pump cover[4]



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

Remove water pump[2] from crankcase



Remove O-ring[1] on water pump.

Assembly sequence is opposite with disassembly.

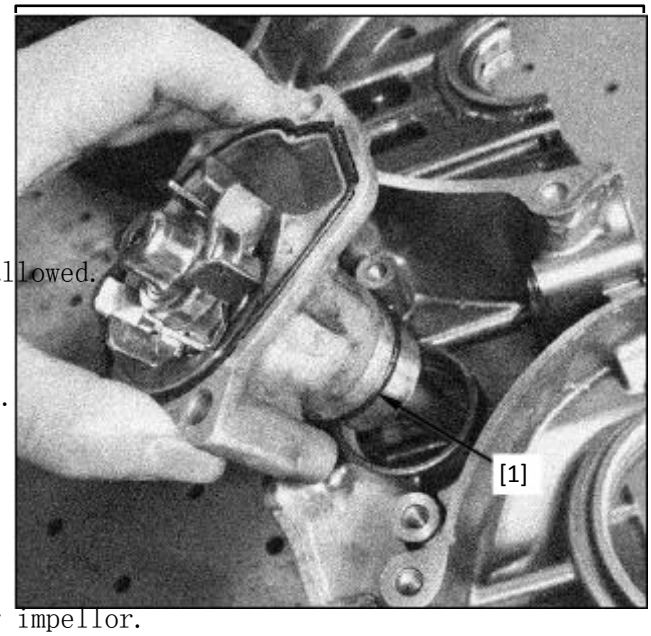
Torque:

Water pump installation bolt:

12N·M (1.2kgf·m, 9lbf·ft)

Water pump cover bolt:

10N · M (1.0kgf · m , 10lbf·ft)



Caution:

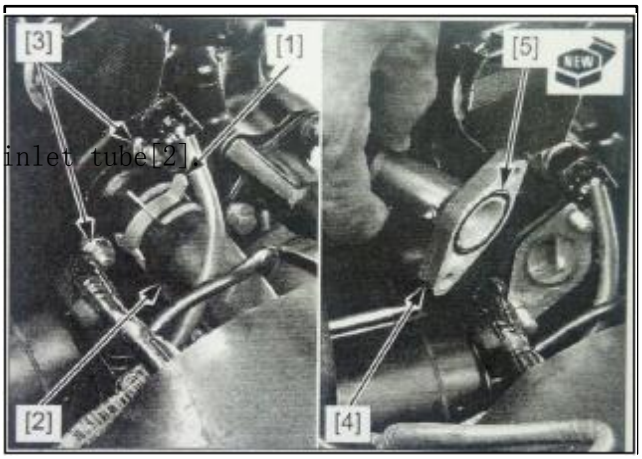
- Break down the pump body is not allowed.
- Replace the O-ring.
- Coat O-ring on pump body with oil.
- O-ring on pump cover without oil
- Align the groove on pump shaft with tail end of shaft by turning impellor.

Check the oil

Fill up the system and drain off the coolant.

Tube joint

Disassembly/Assembly



Drain off the coolant

Remove throttle valve/Air filter set.

Loosen the clip[1], and remove water inlet tube[2].

Remove nut[3], tube joint[4] and O ring [5]

Assembly sequence is opposite to Disassembly.

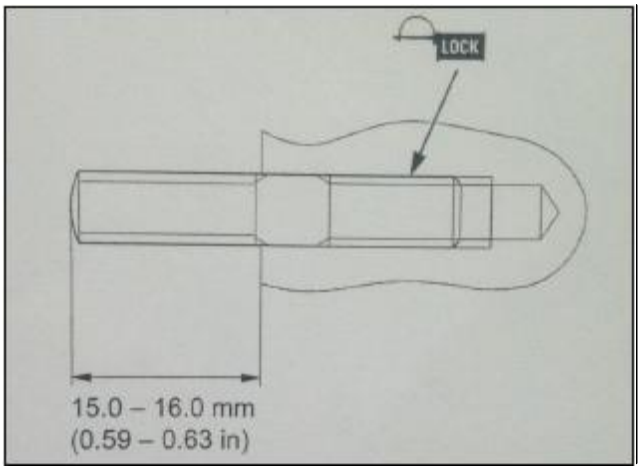
Caution:

- Replace the O-ring.

Fill up the system and drain off the coolant

Replacement of stud bolt

Remove the water hose



Screw up 2 nuts on Bolts, and screw off the stud bolt by spanner.

Lock up the device by new stud bolt.

Install the stud bolt into the cylinder as shown.

After the stud installed, check and confirm the length to the surface of cylinder body is within stipulation.

Stipulated length: 15.0-16.0mm

Install the tube joint

4
Lubrication system

Maintenance information

Summary

- Warning

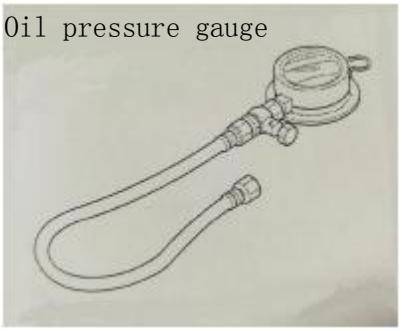
The skin usually touches the replaced oil may lead to skin cancer, but this kind of situation is scarce, unless you touches oil everyday. We suggest you wash hands immediately when you disposed the replaced oil by soap and water。

- Remove the engine from frame is unnecessary when repairing the oil pump.
- The pre-condition of each operation in this chapter is draining off the oil I engine.
- No dust or dirt drop into engine is allowed when removing or installing the oil pump.
- Any part of oil pump wore out of maintenance limit, please replace the oil pump.

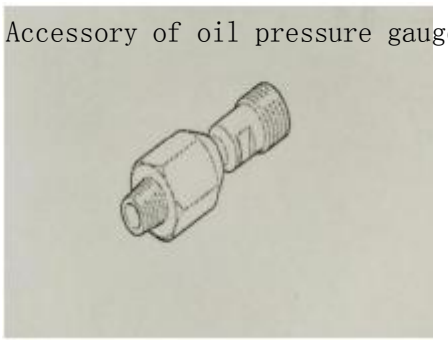
- After the oil pump installed, check and confirm the leakage and oil pressure.
- Check oil pressure indicator of engine and EOP switch
- Repair of piston oil injection flow

Tool

Oil pressure gauge



Accessory of oil pressure gauge



Lubrication system specification

Unit: mm

Items			Standard	Repair limit
Oil capacity	After oil replaced		2.5 L	—
Oil capacity	After oil filter		2.7 L	—
Oil capacity	After engine removed		3.2 L	—
Oil recommended			Engine oil recommended: SG10W-40 API quality grade: SG or higher (Use circular API service label with energy saving is not allowed) JASO T903 Standard: MA	—
Opening pressure of oil sensor			Under 1200rmp/80℃: 93kpa	—
Oil pump rotor		Blade gap	0.15	0.20
Oil pump rotor		Middle gap	0.15-0.21	0.35
Oil pump rotor		Sides gap	0.02-0.09	0.12

Trouble shooting

Too low the oil level

- Massive oil consumption
- Component outer leakage
- Piston ring wore out or incorrect installation
- Cylinder body wore out
- Core shaft seal wore out
- Valve guiding ring wore out

Too low the oil level

- Too low the oil level
- Oil filtering screen blocked
- Component internal leakage
- Incorrectly use the oil

No oil pressure

- Too low the oil level
- Oil pressure safety valve seized
- Oil pump driven chain cracked
- Teeth of driving or driven sprocket wheel of oil pump cracked
- Oil pump damaged
- Internal parts leakage

Too high the oil pressure

- Oil pressure safety valve closed
- Oil filtering screen, returning hole or gauging hatch blocked
- Incorrectly us the oil

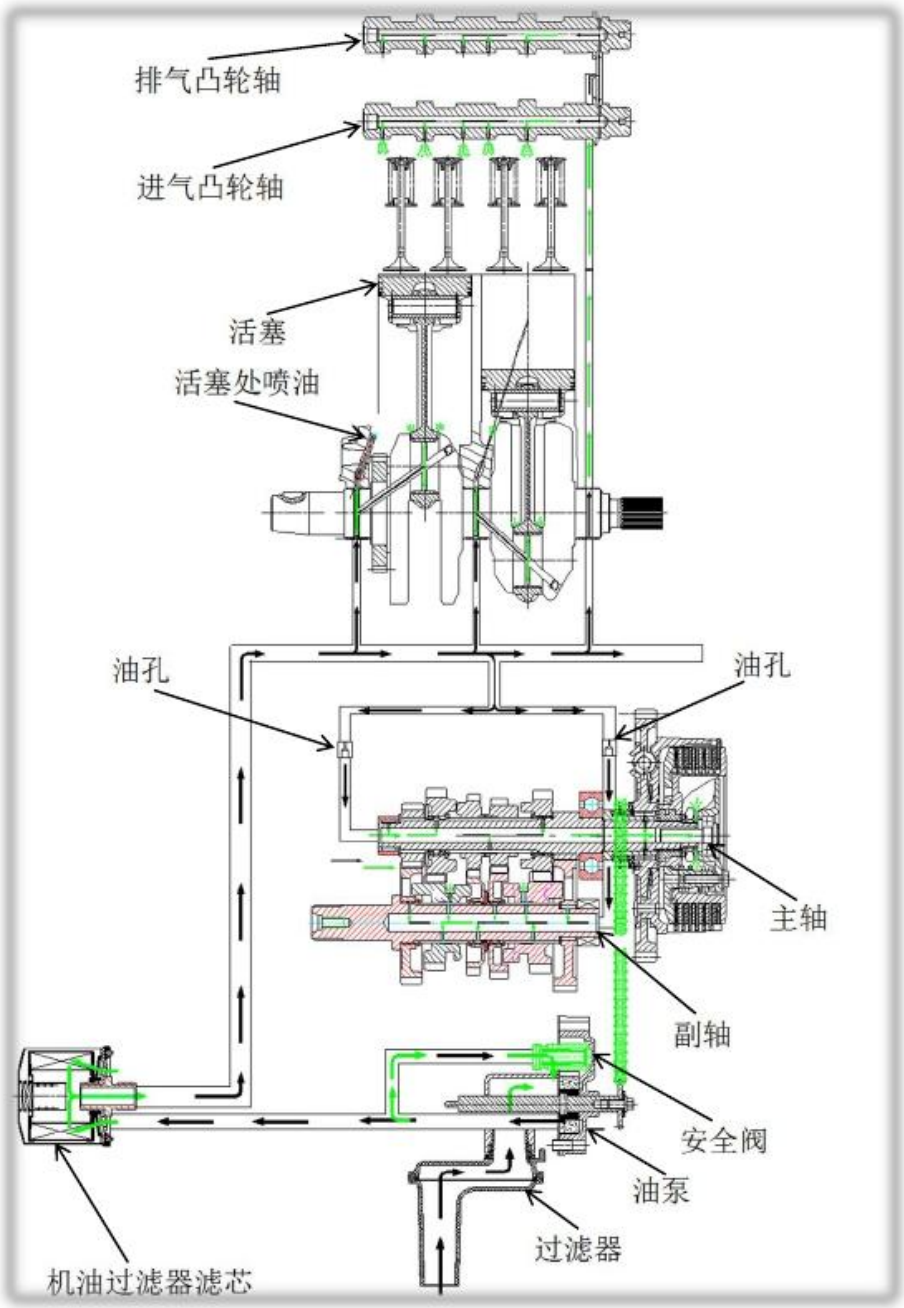
Dirty oil

- Without periodic change of oil or its filtering screen
- Piston ring damaged

Oil emulsified

- Cylinder head expanded and cracked
- Coolant passageway leaked
- Water entered the engine

Lubrication system diagram



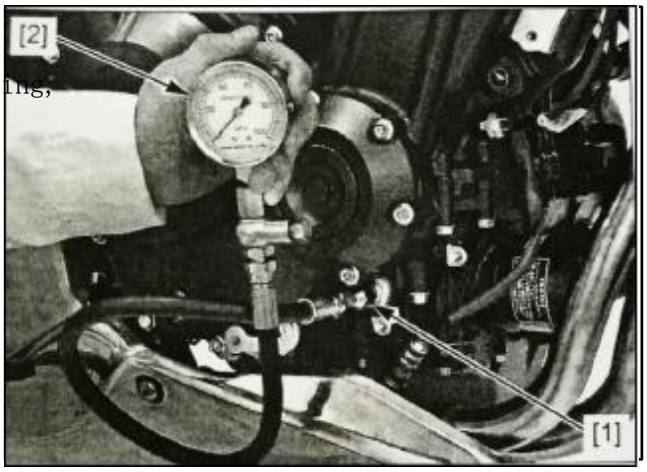
排气凸轮轴：Air exhaust camshaft 进气凸轮轴：Air inlet camshaft 活塞：Piston 活塞处喷油：Oil injection at piston油孔：Oil hole 主轴：Mainshaft 副轴：Countershaft 安全阀：Safety valve 油泵：Oil pump 过滤器：Oil filter 机油过滤器滤芯：Oil filter element

Oil pressure checking

Caution:

- In case the oil pressure gauge keeps increasing when engine working, check the pressure gauge first.

Remove the oil pressure sensor
Install the accessory[1] into switch seat.
Connect the pressure gauge[2] with its accessory.



Tool:

Oil pressure gauge
Accessory

Check the oil level and fill up recommended oil if necessary.
Start engine to working temperature (about 80℃/176℉), and accelerate to 1200r/min, then read the oil pressure.

Standard:

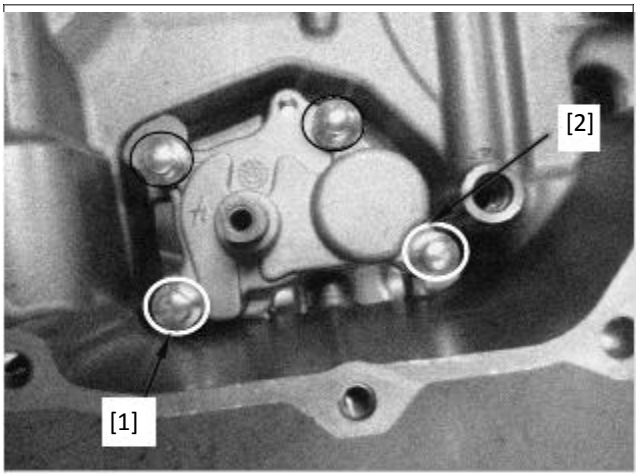
When at 1200rmp/80℃, Date: 93kPa (0.9kgf/cm2,13psi)

Turn off the engine and remove the tool
Install oil pressure sensor.

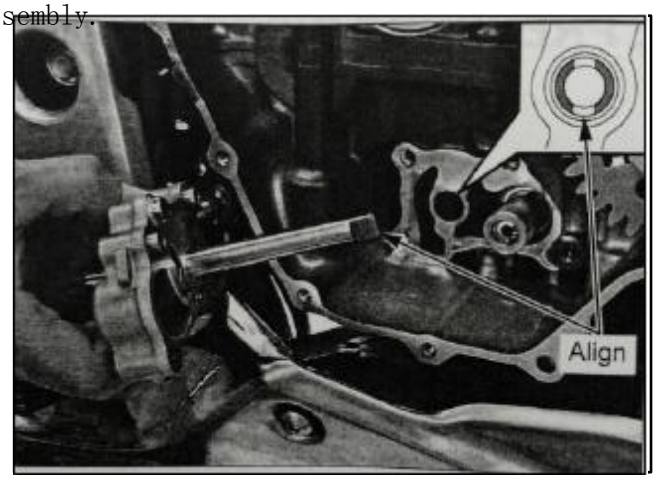
Oil pump

Disassembly/Assembly

Remove the clutch
Remove the bolt [1] and oil pump[2]



Assembly process is opposite with disassembly.

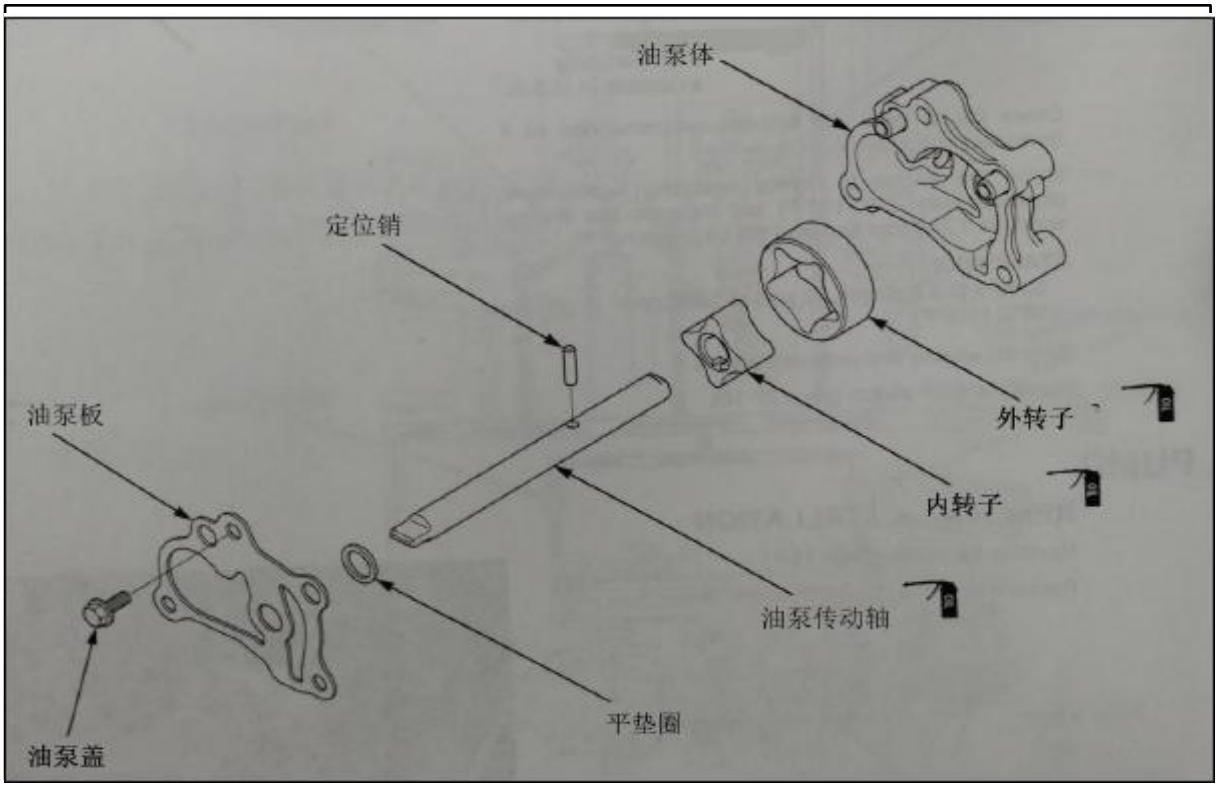


Caution:

- Align the grooves on oil pump and water pump shafts

Disassembly/Assembly

Disassembly and assembly of oil pump:



Check:

- Driving and driven sprocket wheel and chain of oil pump.

Check damage, abnormal abrasion, distortion and combustion of parts below.

- 机油泵轴 Oil pump shaft
- 定位销 Positioning pin
- 内转子 Inner rotor
- 外转子 Outer rotor
- 油泵座体 Oil pump seat

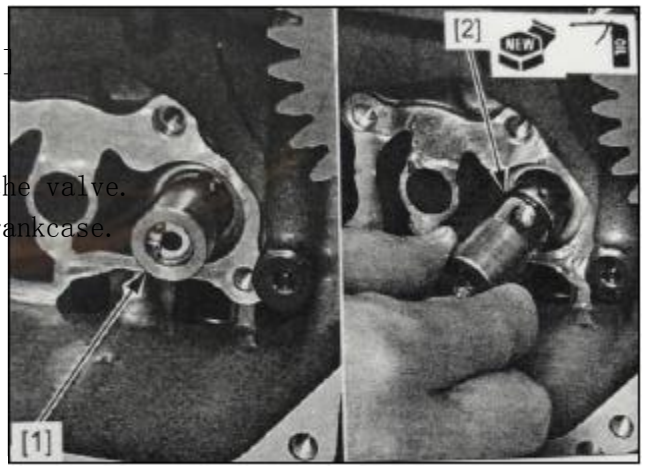
Measure the oil pump gap according to lubrication system specification

Any measuring data exceeded the repair limit, please replace the oil pump component.

Pressure release valve

Disassembly/Assembly

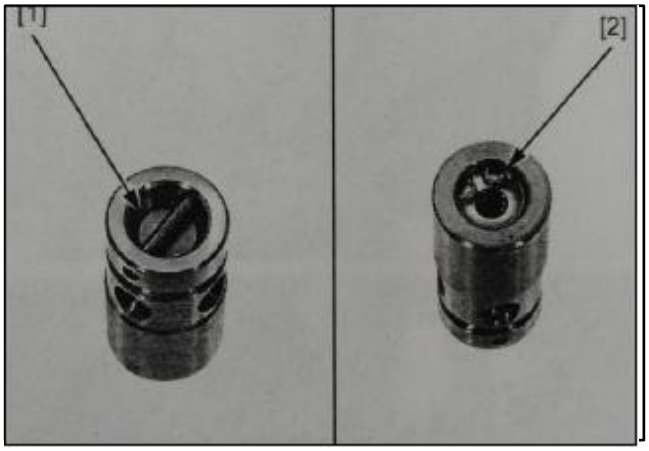
Remove the oil pump (P6)
Remove the pressure release valve[1] and O-ring[2].
Replace for new O-ring
Install the O-ring into groove on the valve.
Install the valve into groove on crankcase.
Install the oil pump (P6) .



Check

Check working situation of release valve by pushing or drawing its pushing rod[1].

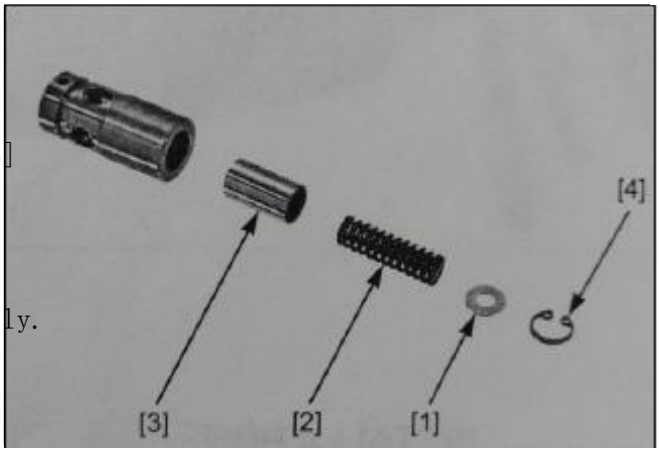
Remove the elastic Retaining ring [2] for breaking down the valve.



Remove washer[1], spring[2], and piston[3]
Check abrasion, scratch or damage of pushing rod of control valve.
Check the fatigue and damage on spring.
The valve assembly is opposite to disassembly.

Caution:

- The chamfer faces outwards when installing elastic circlip.
- Ensure the elastic circlip install in place



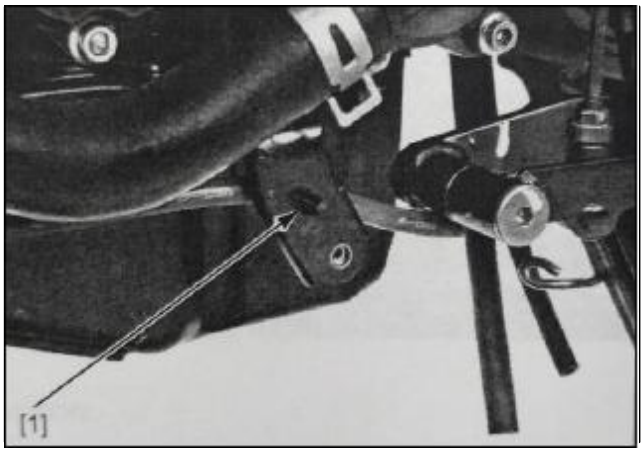
Oil filter

Disassembly

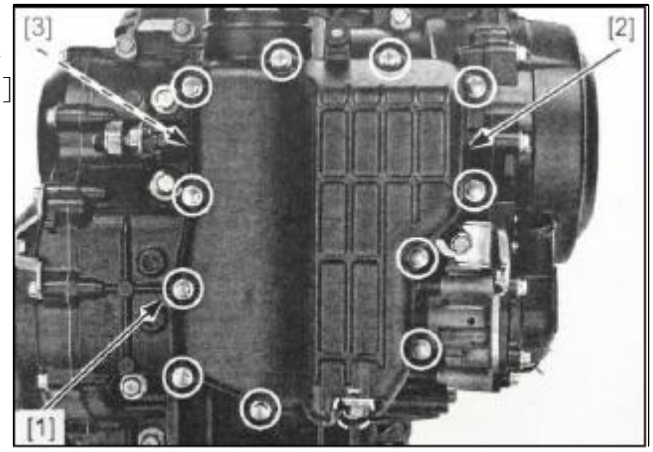
Drain off the oil

Remove the exhaust pipe

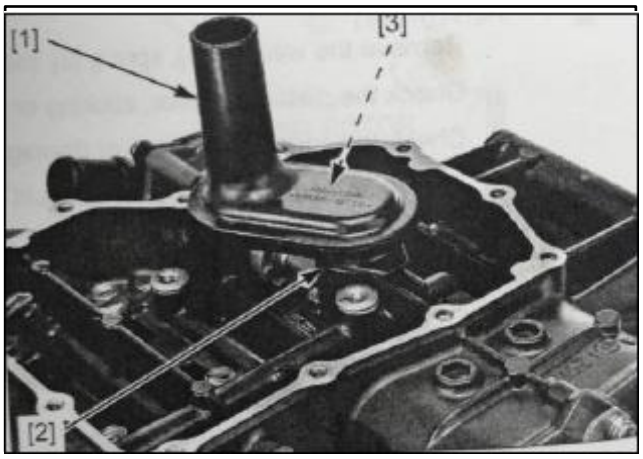
AC series: Remove the tube clamp[1] of water drainage from bottom case.



Remove bolt[1] on bottom case according to diagonal sequence, remove the case[2] and its gasket[3].



Remove the oil filter[1] and seal ring[2] , and clean the filtering screen and[3], and check the damage.



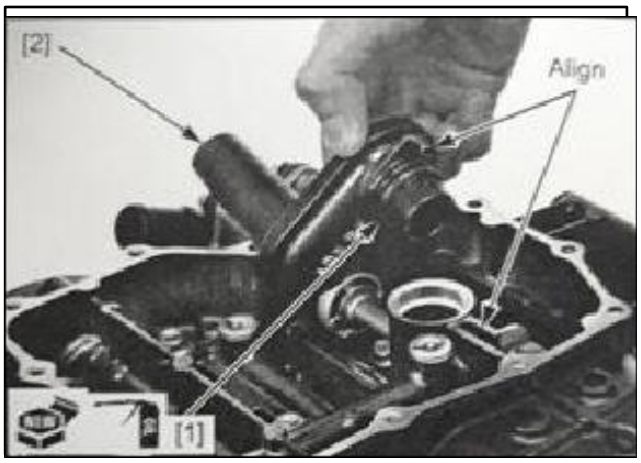
Assembly

Caution: Damage the assembly surface is not allowed

Clean up the gasket on assembly surface of bottom case.

Replace for a new seal ring[1]
and install on air filter[2].

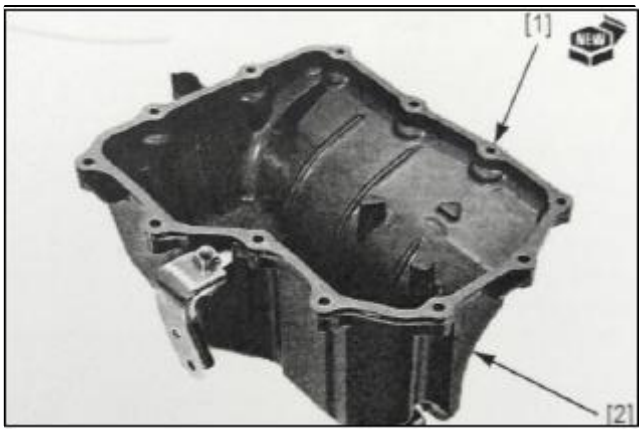
Install the filter into crankcase and align the grooves on camshaft and crankcase.

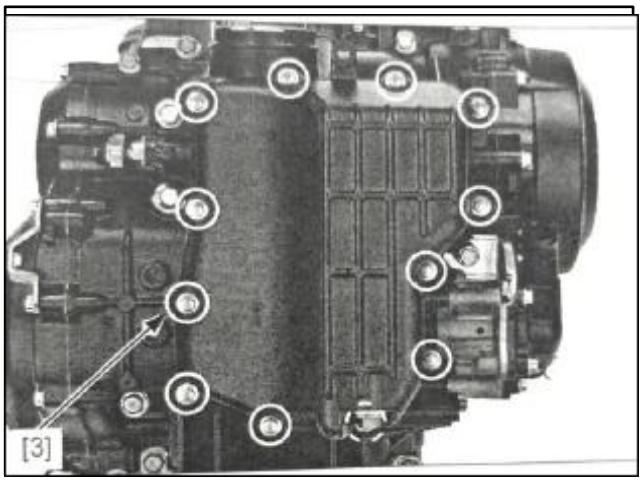


Replace for gasket [1] and assemble the oil bottom case[2].

Install the bottom case and the bolt[3] onto crankcase.

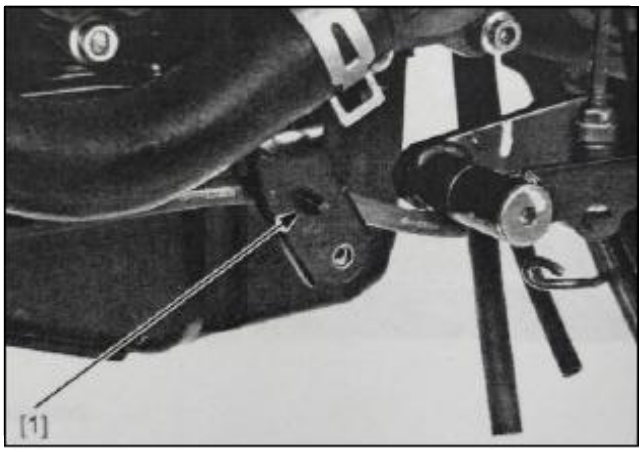
Screw up and fasten the bolts by diagonal sequence.





AC Series: Assemble the drainage tube bracket [1] to the drainage tube

Fill up the engine with recommended oil and confirm the leakage



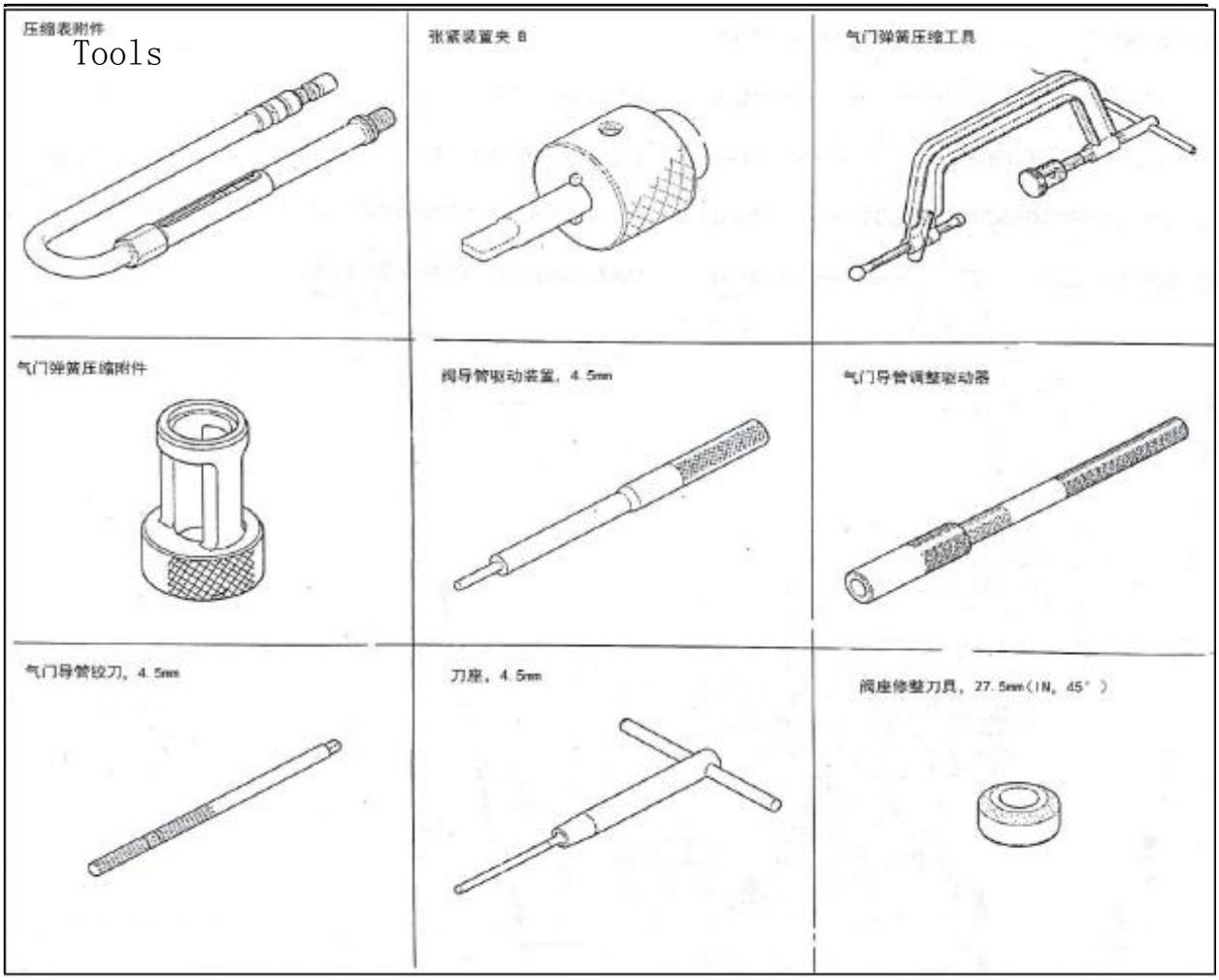
5
Cylinder head and valves

Maintenance information

Summary

- This chapter includes checking and maintenance for cylinder head, valves, camshaft and swing arm.
- Remove the engine from frame is unnecessary when reparing cam shaft, swing arm, tensioner and adjustment stud, but engine removing is needed when repairing cylinder head and valves.
- Suitably mark the removed parts when disassembling for ensuring re-assembly.
- Before checking, clean the removed parts by cleanser, and dry up by compressed air.
- Lubricant on camshaft is filled up through oil tube in cylinder head and its cover, in this case, clean up the oil tube before assembling the cylinder head and its cover.
- Damage on contacting surface is not allowed when removing the cylinder head and its cover.

Tools



阀座修整刀具，24 mm（EX，45°） 	平铣刀，28mm（IN，32°） 	平铣刀，24mm（EX，32°） 
内铣刀，26mm（IN，60°） 	内铣刀，32mm（EX，60°） 	

Cylinder head/Valve specification

Unit: mm

Items			Standard	Repair limit
Electrical starting cylinder pressure			1372kPa	—
Valve clearance		Inlet valve	0.16±0.03	Valve clearance
Valve clearance		Exhaust valve	0.27±0.03	Valve clearance
Swing arm and shaft	Arm inner	Inlet/Exhaust	Swing arm and shaft	Arm inner
Swing arm and shaft	Arm outer	Inlet/Exhaust	Swing arm and shaft	Arm outer
Swing arm and shaft	Gap between arm and its shaft	Inlet/Exhaust	Swing arm and shaft	Gap between arm and its shaft
Camshaft	Cam protrusion	Air inlet	Camshaft	Cam protrusion
Camshaft	Cam protrusion	Air exhaust	Camshaft	Cam protrusion
Camshaft	Trunnion and gap between holes		0.020.062	Camshaft
Camshaft	Runout		—	Camshaft
Valve and guide	Valve rod	Air inlet	Valve and guide tube	Valve rod
Valve and guide	Valve rod	Air exhaust	Valve and guide tube	Valve rod
Valve and guide	Tube inner	Inlet/Exhaust	Valve and guide tube	Tube inner
Valve and guide	Valve to its rod	Air inlet	Valve and guide tube	Valve to its rod
Valve and guide	Valve to its rod	Air exhaust	Valve and guide tube	Valve to its rod
Valve and guide	Guide tube	Inlet/Exhaust	Valve and guide tube	Guide tube height
Valve and guide	Valve seat	Inlet/Exhaust	Valve and guide tube	Valve seat width
Free length of valve spring		Inner diameter	29.78	Free length of
Free length of valve spring		Outer diameter	39.98	Free length of
Cylinder head flatness		—		0.10

Trouble shooting

- Failure on the top of engine may decrease its performance. Diagnose these failures by compression test or track the engine noise by detective rod or stethoscope until reached the top.
- In case the engine performance is poor in low rotation speed, check if there is white smoke in breathing tube of crankcase, in case it is, check if the piston jam.

.

When the engine in low rotation speed, the compression is too low to start or with poor performance

- Valve
  - Improper adjustment of valve clearance
  - Valve burned out or bent
  - Incorrect valve timing
  - Valve spring cracked
- Cylinder head
  - Cylinder head gasket damaged or leaked
  - Cylinder head warped or cracked
  - Flexible spark plug
- Cylinder, piston and its rings worn out

Too high the compression, overheat or engine knocking

- Too much the carbon buildup on piston head or combustion chamber

Smoky

- Cylinder head
  - Abrasion on valve rod or valve guide tube
  - Sealing piece of valve rod damaged
- Cylinder, piston and its rings worn out

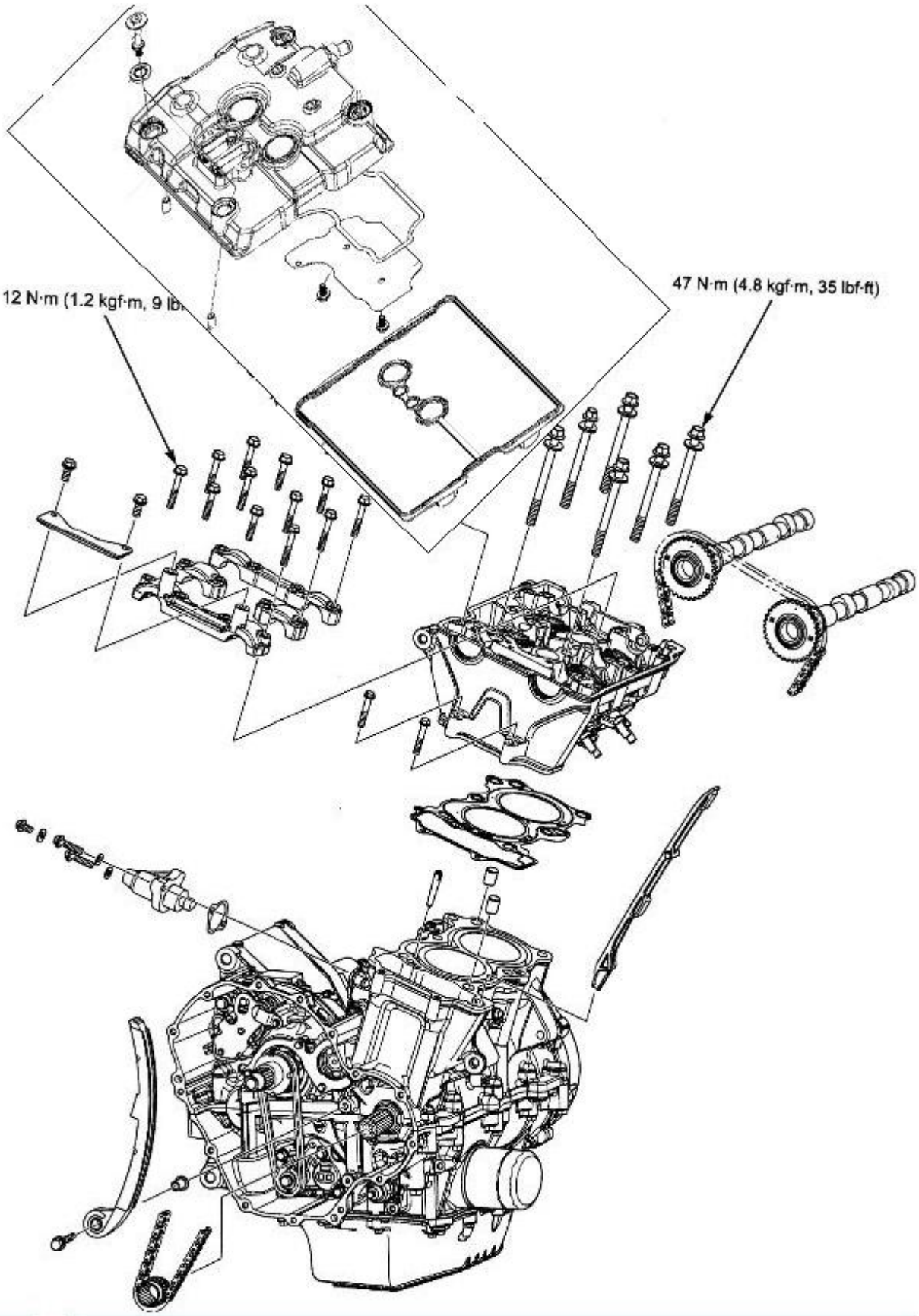
Noisy

- Cylinder head
  - Improper adjustment of valve clearance
  - Valve jammed or valve spring racked
  - Camshaft wore out or damaged
  - Swing arm and its shaft worn out
  - Swing arm and end of valve rod worn out
  - Flexible chain of cam or worn out
  - Timing chain worn out
  - Cam sprocket wheel worn out
- Cylinder, piston or its rings worn out

Poor idling

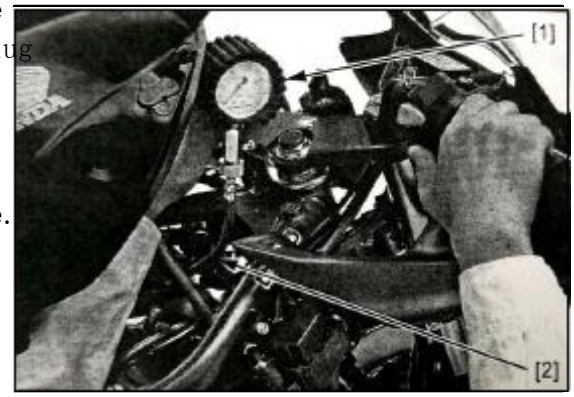
- Too low the compression in the cylinder

Component position



Cylinder compression test

Start the engine to working temperature
Stop the engine and remove the spark plug
Temporarily install ECM wire to
connect 33(black) connector.
Install the threaded end of cylinder
pressure gauge [1] into spark plug hole.
Tool:
[2] Accessory of compression meter.



Turn the ignition switch to “On”, and turn the engine switch to “ “
Shift the gear to neutral
Start the engine to full throttle until the compression meter ceased rising.
The max.data may usually keep 4-7 seconds.
Compression pressure:
When 450rmp , 1372kPa
Analysis for low pressure:
- Cylinder head gasket leakage
- Improper adjustment for valve clearance
- Valve leakage
- Piston or cylinder worn out

Analysis for high pressure:
- Carbon buildup in combustion chamber or piston top

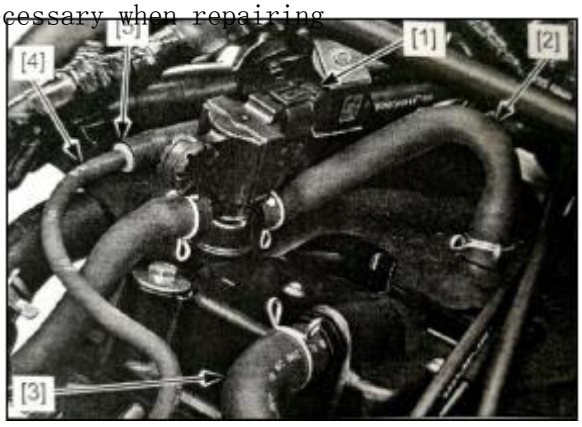
Cylinder head cover

Disassembly/Assembly

Caution:
- Remove the engine from frame is unnecessary when repairing

Remove the fuel tank under the tray
Remove the parts below:
- Remove the plug[1] of secondary air
- supply valve
- Remove the air inlet tube [2] of
- secondary air supply

Remove the breathing tube[3]
Fuel evaporation system [4] [5]



Remove the bolt[1],clutch cable locating plate and cable lug[3], then the clutch cable[4]

Remove clutch cable out of frame

从车架上卸下线夹。

Loosen locking nut A[1] of throttle cable adjustor[2], then loosen out the throttle cable[3] from the throttle drum and cable bracket.

Loosen the throttle cable adjustor B[4], and then loosen out the cable[5] from throttle drum and cable bracket.

Remove the throttle cable out of the frame.

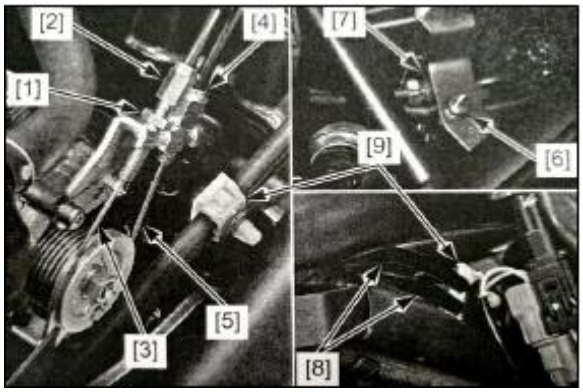
Remove the installation bolt on the heat radiator.

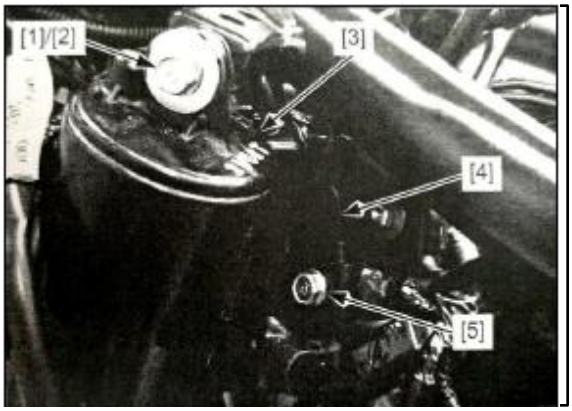
CBR500RA/CB500FA/XA: Remove the bolt[6] and brake wire joint[7].

Remove the brake tube[9] from 2 wire clamps[8], and remove the fuel evaporation system: [1]Remove installation bolt[1] and washer[2] of canister, then remove the canister[3].

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

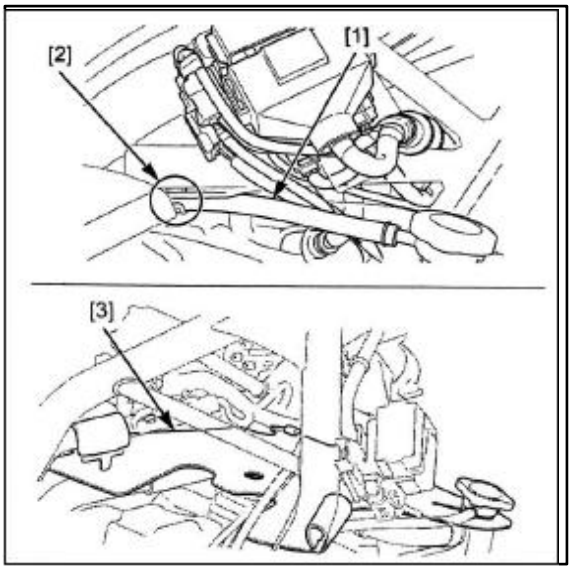
Fuel evaporation system: Remove the solenoid valve of evaporation controller from the frame.





Loosen the overflow tube[2] from clip[1].

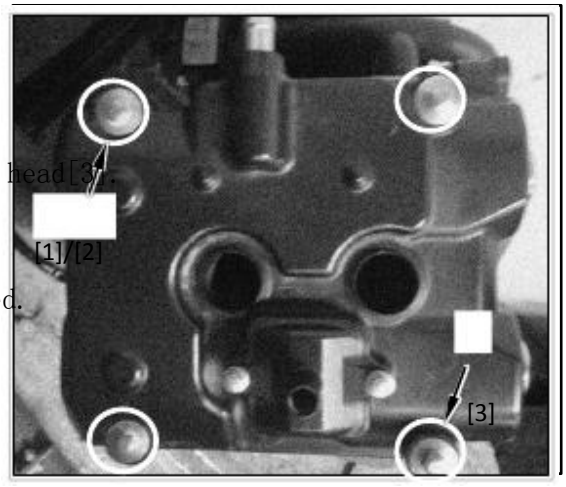
Remove the insulation rubber plate[3] at overflow tube, and then lay it on right side of frame.



Caution:

Stick by adhesive tape for preventing runout.

Remove cylinder bolt[1] and rubber base [2], and remove the cover from cylinder head[3].



Caution:

- Forced removing for positioning pin on cylinder head cover is not allowed.

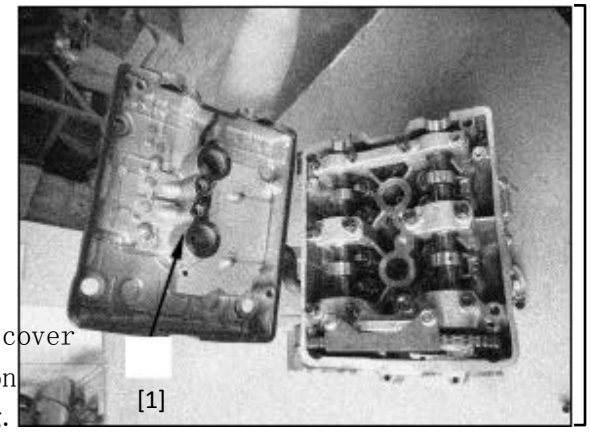
Remove seal ring[1] from cylinder head cover.

Assembly is opposite to disassembly process.

Torque:

Cylinder head cover bolt: 10N·m

Right crankcase cover bolt: 10N·m



Caution:

- Replace seal ring on cylinder head cover
- Install the seal ring into groove on cylinder head cover when assembling.

- Align the holes on locating plate of clutch cable and protrusion on crankcase.

Adjust the below:

- Free travel of throttle cable
- Free travel of clutch lever

Camshaft

Caution:

●Remove the engine from frame is unnecessary when repairing the camshaft.

Remove the cylinder head cover.

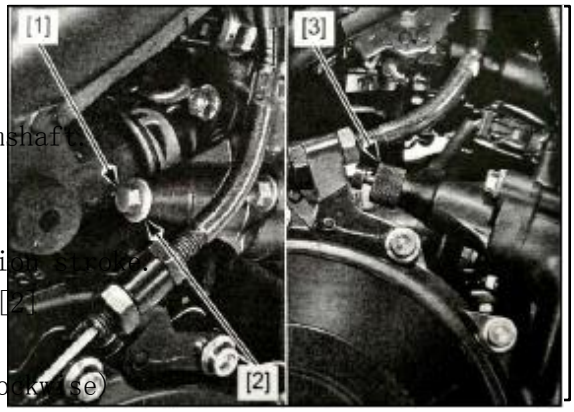
Make sure the piston of 1st cylinder is at the upper stopping point of compression stroke.

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

Completely move adjustmeng stud of tensioner backwards by special tool.(Clockwise)

Tool:

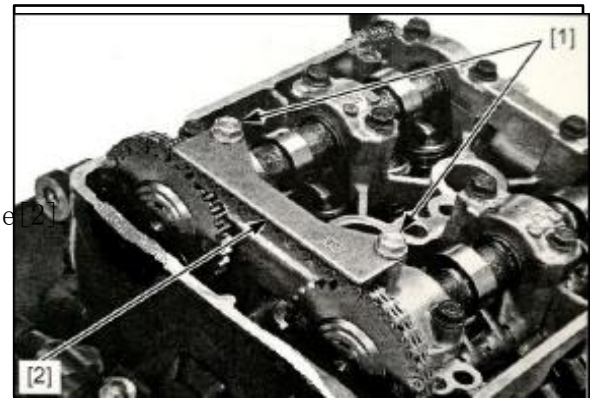
[3]Tensioner fixture B



Caution:

Chain limiting plate drop into crankcase is not allowed.

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



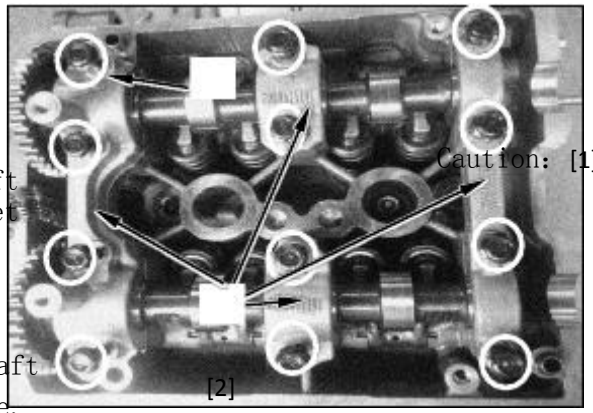
Caution:

Alternately loosen the bolts on camshaft bracket by times inwards, or the bracket is eassy to be broken

The bolt on bracket drop into crankcase is not allowed.

Alternately loosen the bolt[1] of camshaft bracket by 2 or 3 times, and then remove.

Remove camshaft bracket[2] and the positioning pin from cylinder body.

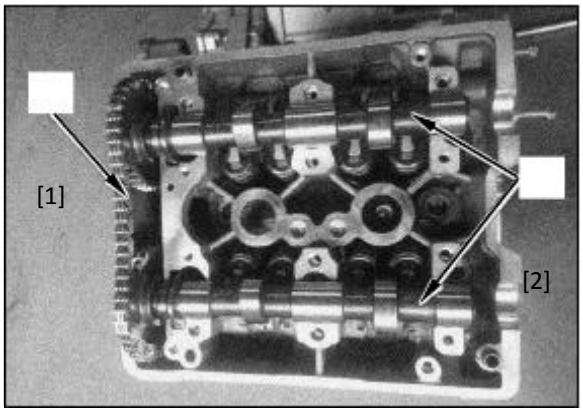


Caution:

●Forced removing of positioning pin from camshaft bracket is not allowed.

Suspend the chain of cam by wire for preventing dropping into crankcase.

Move the chain[1] apart from sprocket wheel and remove the camshaft[2].

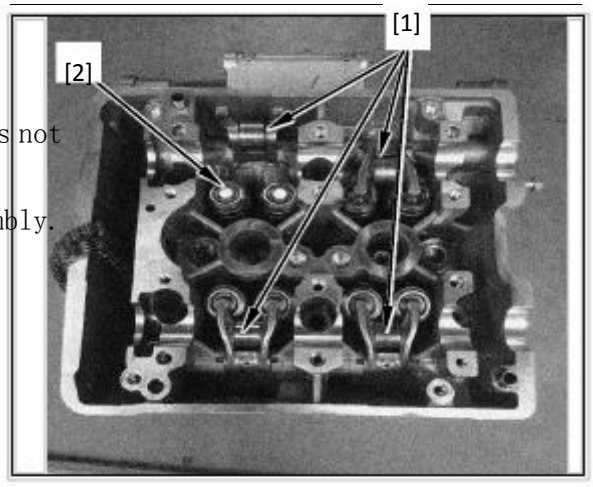


Lift the swing arm[1]。
Remove the adjustment shim[2] of valve.
Caution：

●-15Adjustment shim drop into crankcase is not allowed.

●-15Mark the shims for ensuring re-assembly.

●-15Take out the shim by nipper or magnet is easier.



Check

Check damage, abnormal abrasion, distortion, burning out or block in oil tube for components below:

--34 Cam sprocket wheel/Camshaft ‘’

--34 Camshaft bracket/Positioning pin

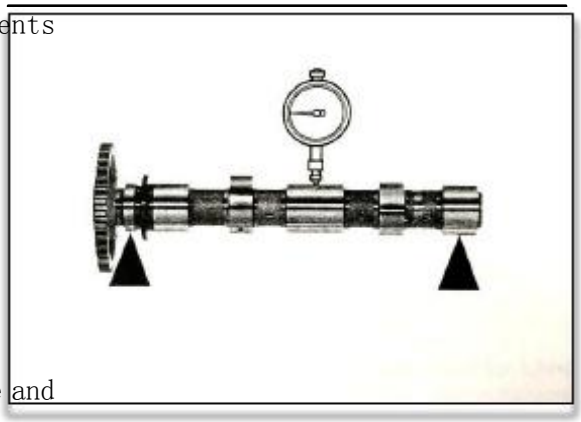
--34 Pressing plate for chain of cam

Measure each parts according to cylinder head/valve specification.

Runout of camshaft

Fix both ends of camshaft by V-shaped piece and measure its runout by dial scale.

Repair limit：0.04mm



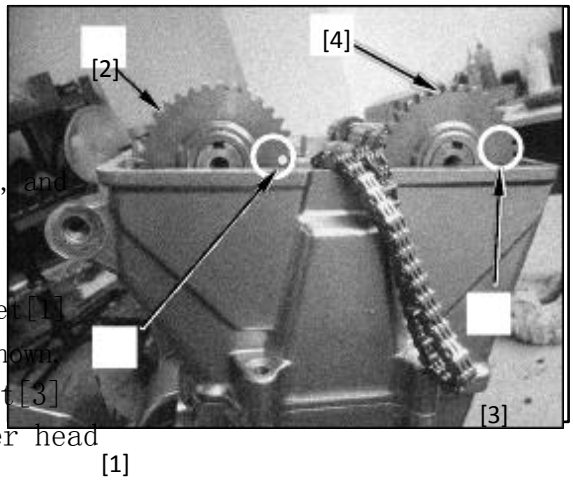
Oil gap of camshaft

Wipe up the oil on camshaft, cylinder head, and camshaft bracket.

Install the camshaft on cylinder head.

●- Align the machining mark on cam sprocket[1] with upper surface of cylinder head as shown.

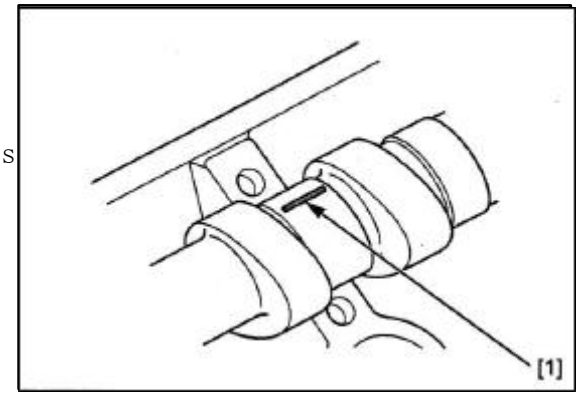
● Align the mark “EX”[4] on camshaft[3] with the upper surface of cylinder head as shown.



Lay a plastic cleanrance gauge[1] vertically on the top of trunnion of camshaft, and avoid the oil hole.

Caution:

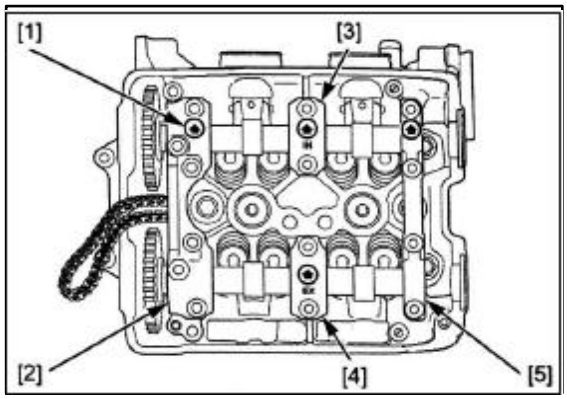
- Turn the camshaft during checking is not allowed.



Make sure the positioning pin on camshaft bracket aligned with the pin hole on cylinder head.

Install each camshaft bracket on its corresponding position, and make sure the arrow[1] point the air inlet side

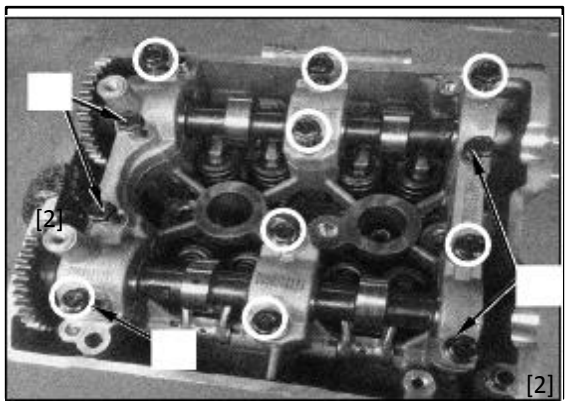
- Camshaft bracket A[2]
- Camshaft bracket B[3] (“IN”: Bracket on inlet side)
- Camshaft bracket C[4] (“EX”: Bracket on exhaust side)
- Camshaft bracket D[5]



Coat thread and seal surface of bracket bolt of camshaft bracket with oil

Camshaft bracket bolt:

- 6×39.5mm Bolt[1]
- 6×32mm Bolt[2]



Caution

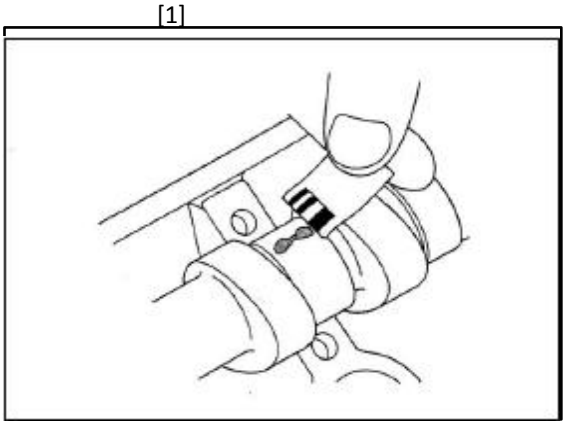
Alternately screw up the bracket bolt outwards by times, or the bracket may damage.

Alternately screw up the bracket bolt outwards by times until the bracked installed in place.

Alternately screw up the bolt to stipulated torque by 2 or 3 times.

Torque: 12N·m

[1]



Remove the camshaft bracket and measure the width of plastic clearance gauge.

The oil clearance decided by the biggest width.

Repair limit: 0.10mm

When the limit is exceeded, replace the camshaft and check the oil clearance.

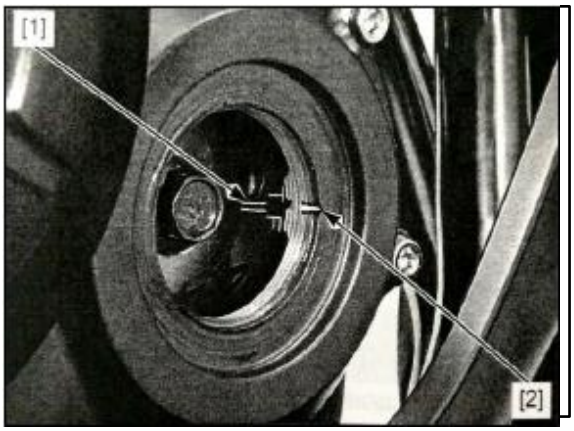
In case the oil clearance still exceeded, replace camshaft bracket and cylinder together.

[1] [2]

Assembly

Caution: Forcely press the chain of cam into timing sprocket is not allowed when turning the crankshaft.

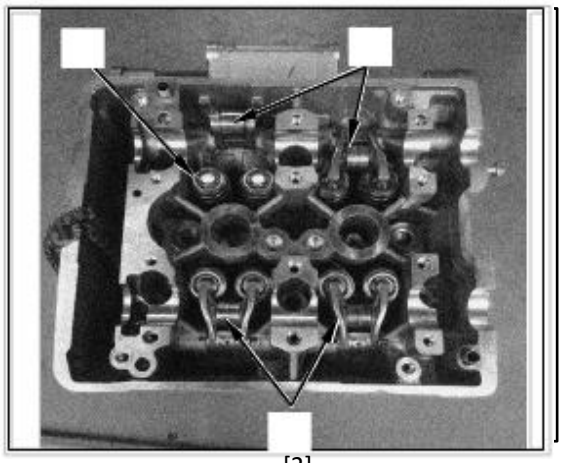
Turn the crankshaft clockwise, and align the mark[1]"T" on primary gear with index mark[2] on right crankcase cover.



Caution: Adjustment shim of valve drops into crankcase is not allowed.

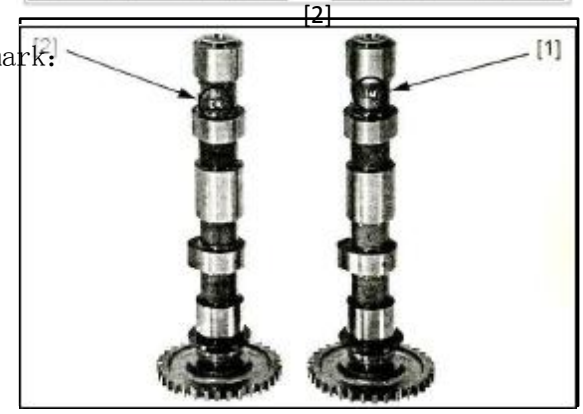
Install the adjustment Shin[1] back to valve seat ring by sequence.

Release the swing arm shaft[2]。

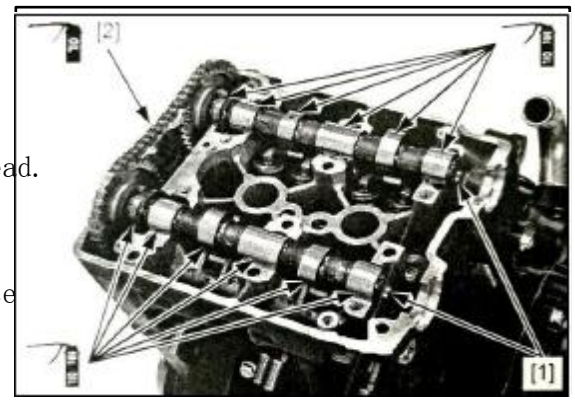


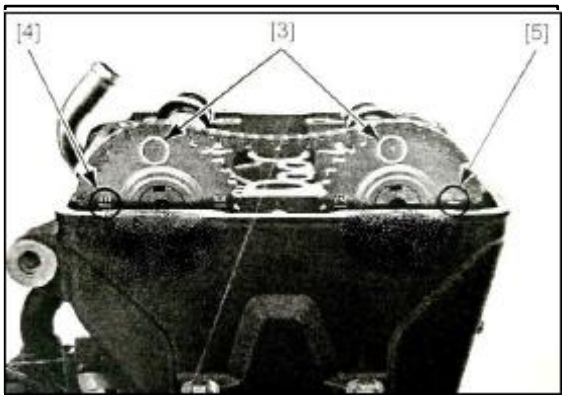
Each camshaft is with indentification mark:

- "IN" Mark[1]: Air inlet camshaft
- "EX" Mark[2]: Air exhaust camshaft



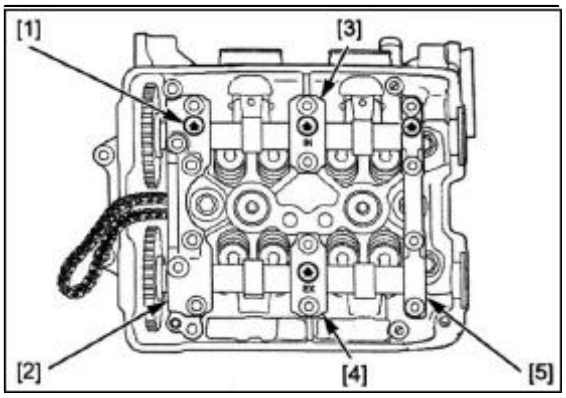
Coat the cam[1], trunnion and stress surface with supramoly solution.
Coat the surface of chain[2] with oil.
Assemble the chain and sprocket of cam, and install the camshaft to cylinder head.
The puch hole[3] on sprocket face upwards, and align mark[4] and lower scale line of mark[5] with upper surface of cylinder head as shown.





Make sure the positioning pin on camshaft bracket aligned with the pin hole on cylinder head.
Install each camshaft bracket on its corresponding position,and make sure the arrow[1] point the air inlet side

- Camshaft bracket A[2]
- Camshaft bracket B[3] (“IN”: Air inlet side bracket)
- Camshaft bracket C[4] (“EX”: Air exhaust side bracket)
- Camshaft bracket D[5]

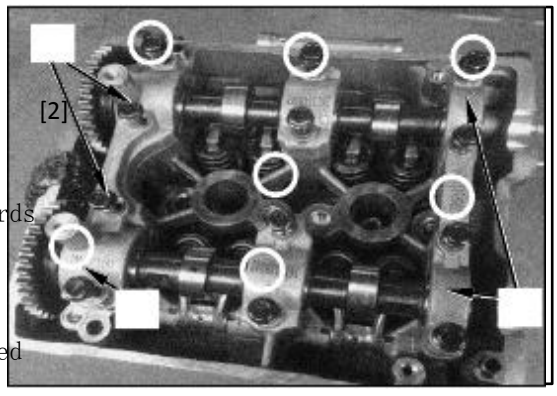


Coat thread and seal surface of bracket bolt of camshaft bracket with oil.
Camshaft bracket bolt

- 6×39.5mm Bolt[1]
- 6×32mm Bolt[2]

Caution:

Alternately screw up the bracket bolt outwards by times, or the bracket may damage.
Alternately screw up the bracket bolt outwards by times until the bracked installed in place.



[1] [2]

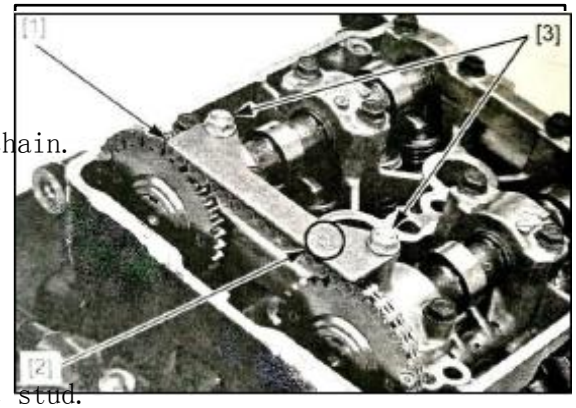
Alternately screw up the bolt to stipulated torque by 2 or 3 times.

Install the pressing plate[1] of sprocket and mark[2] “EX” face to exhaust side.

Caution：Bolt of pressing plate drop into crankcase is not allowed.

Screw up bolt[3] of pressing plate of chain.

Torque：12N·m



Remove the tensioner[1] from adjustment stud.

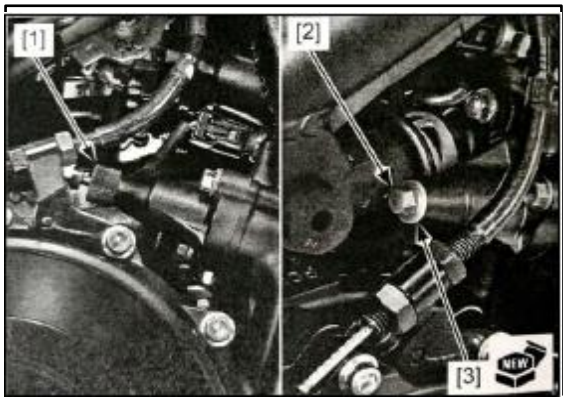
Turn the crankshaft clockwise for times and align the scale line"T' on primary gear with index mark on right crankcase.

Re-check the valve timing.

Check the valve clearance

Install seal bolt[1], and replace the gasket[2].

Install cylinder head cover.



Swing arm

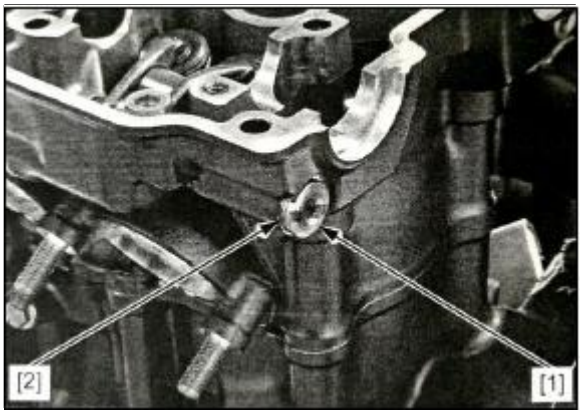
Disassembly/Assembly

Caution：

- Remove the engine from frame is unnecessary when repairing.
- Procedure of repairing swing arms for both inlet and exhaust are the same.

Remove the camshaft

Remove bolt[1] of swing arm shaft pin and gasket[2].



Fix the swing arm[1], and remove by 6mm` bolt[2]

Remove the swing arm shaft[3]。

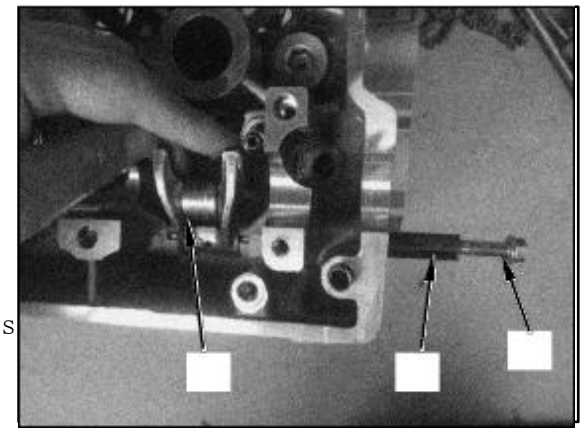
Remove the swing arm

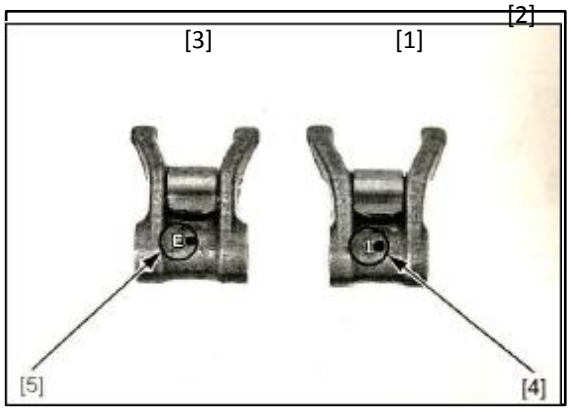
Coat sliding area, stress surface, and outer surface of swing arm shaft with supramoly solution.

Install swing arm and its shaft.

Cautin:

- Swing arm could be identified by its mark:
  - “I”[4]: Air inlet swing arm
  - “E”[5]: Air exhaust swing arm.



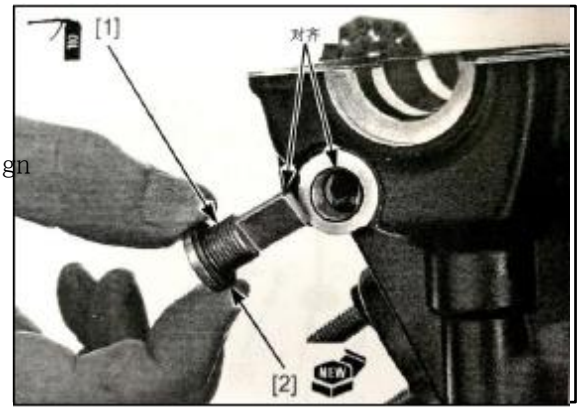


Install bolt[1] of pin, coat thread with oil and replace gasket[2], and align blade with the groove.

Screw up the bolt of pin to stipulated torque.

Torque: 15N•m

Install the camshaft.



Check

Check and confirm the damage, abnormal abrasion, distortion, burningout of oil tube blocking on the parts below:

- Swing arm
- Swing arm shaft

Measure each part and clearance according to cylinder head/valve specification

Any parts exceeded repair limit need be replaced.

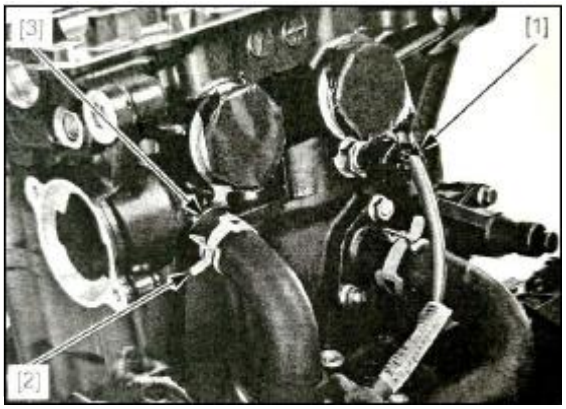
Cylinder head

Disassembly

Remove parts below by sequence:

- Engine
- Swing arm
- Heat radiator

Loosen the clamp [2] and remove sub circulation water tube[3].



Remove 6mm bolt[1].

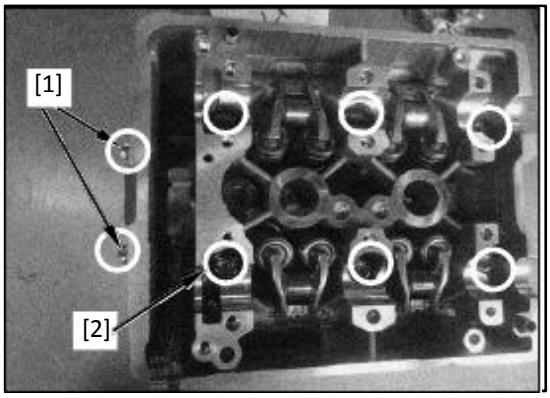
Suck out oil in groove of 9mm cylinder head bolt first before removing.

Loosen 9mm bolt[2] alternately by 2 or 3 times and then remove.

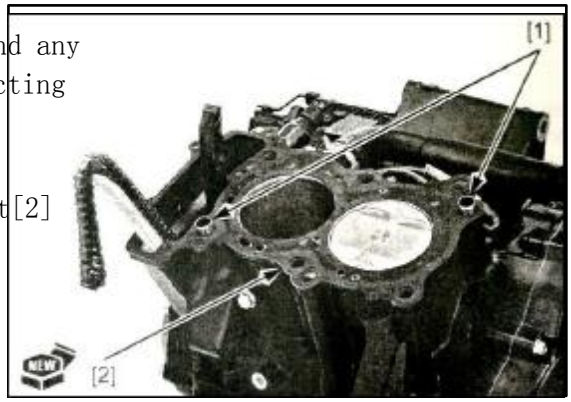
Remove the cylinder head[3]。

Caution:

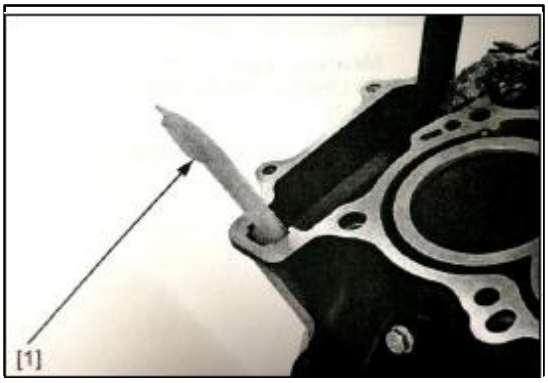
- Suspend the chain of cam by wire for preventing drop into crankcase.
- Powerfully knock the cylinder head is not allowed, and any tools as lever and damage the contacting surface is not allowed



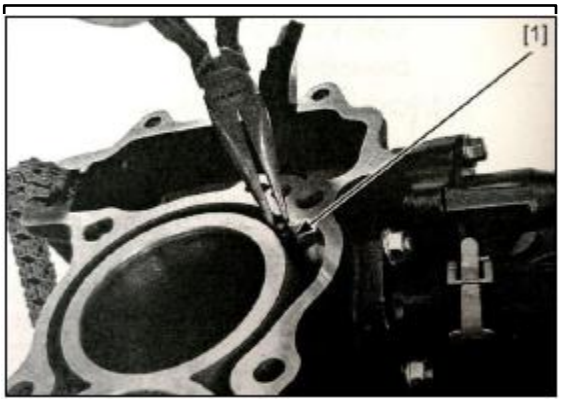
Remove the positioning pin[1] and gasket[2]



Remove the chain guide plate[1].



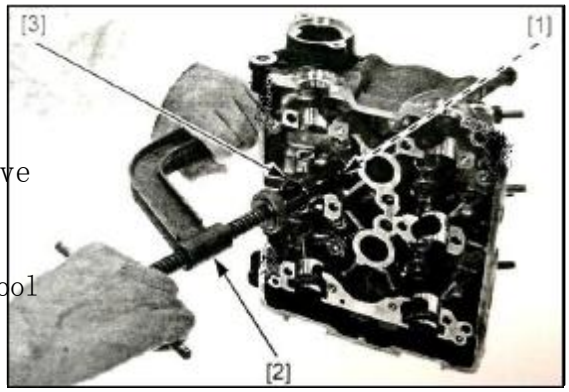
Remove the rubber rod [1] of waterproof.
Check the rubber rod aged or damaged.



Disassembly
Remove the parts below:

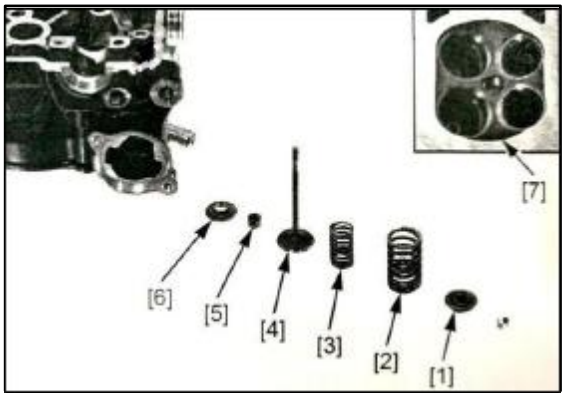
- Spark plug
- Water temperature sensor

Cantion: No powerful pressing on valve spring is allowed for preventing permanent distortion.
Remove the locking clip[1] by special tool
Tool:
[2]Valve spring compressing tool
[3]Accessory of compressing tool



Mark the removed parts for re-installation.
Remove the tool and parts below:

- Spring seat ring [1] of upper valve
- Spring [2] of outer valve
- Spring [3] of inner valve
- Valbe[4]
- Oil shielding cover[5]
- Spring seat of lower valve[6]



Damage contacting surface of cylinder body and valve seat surface is now allowed.
Clean up carbon buildup in combustion chamber and surface of cylinder head gasket.

Check

Check the damage, abnormal abrasion,distortion, burning out or oil tube blocking for the parts below:

- Cylinder head
- Inner/Outer spring
- Valve
- Valve guide tube
- Chain guide plate

Measur each parts and clearance according to cylinder/valve specification.

Any parts exceeded the repair limit need be replaced.

- Clean up carbon buildup in guide tube before measuring.
- Check and refer to valve seat.

Replace valve guide tube.

Break up the cylinder head.

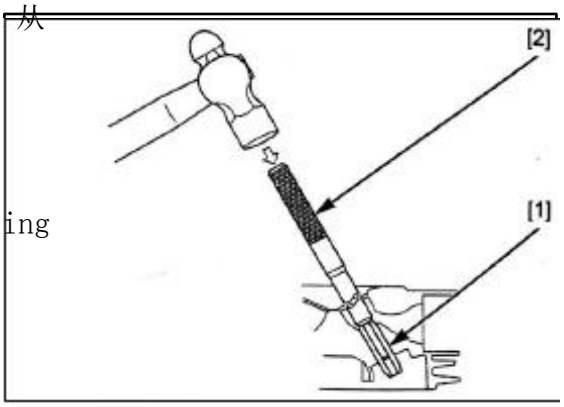
Cooling down the new guide tube in refrigerator for an hour.

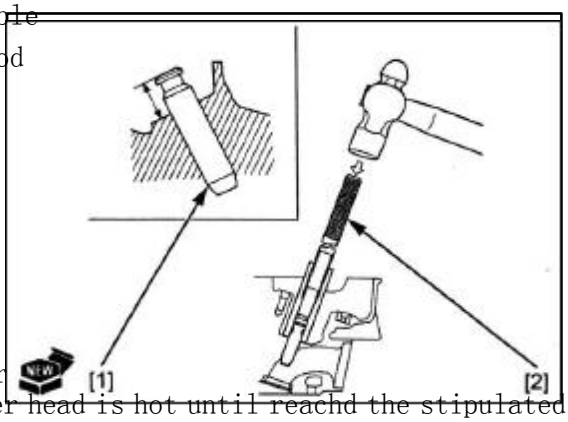
Caution:

- Wear the oven gloves for preventing scald when repairing
- Heat the cylinder head by fire may lead to distortion.

Heat the cylinder head to 130-140℃ by hot plate or oven. Ensure the suitable temperature by temperature indicator rod which could be bought in welding shop.

Hold the cylinder and push out the guide tube and its clamp from the combustion chamber.





Tool:

Valve guide tube driver, 4.5mm

Take new guide tube[1] from refrigerator and install from camshaft when the cylinder head is hot until reachd the stipulated exposing length.

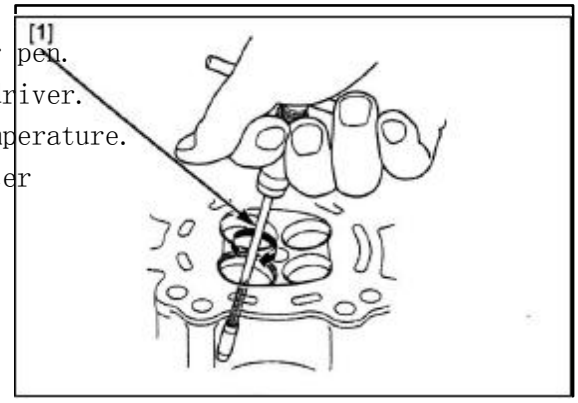
Tool:

Slide the mainshaft component on upper crankcase body and then remove Right bearing of mainshaft

[2]Adjustment driver of valve guide tube

Stipulated data: In/Ex: 14.10-14.30mm

Requirement for installation:
Mark out the valve tube depth by marker pen.
Adjust the depth of guide tube by the driver.
Cool down the cylinder head to room temperature.
Adjust the new guide tube by reamer after installed.



Caution:
The reamer inclining or turning up in guide tube when it working is not allowed.
Pay attention to cutting lubricant during this operation.
Insert the reamer from the direction of combustion chamber of cylinder head, and always turn the reamer clockwise.
Tool:
Guide tube reamer, 4.5mm
Totally clean up the metal chips in cylinder head after reamed,
and then trim and repair the valve seat.

Check and trim the valve seat

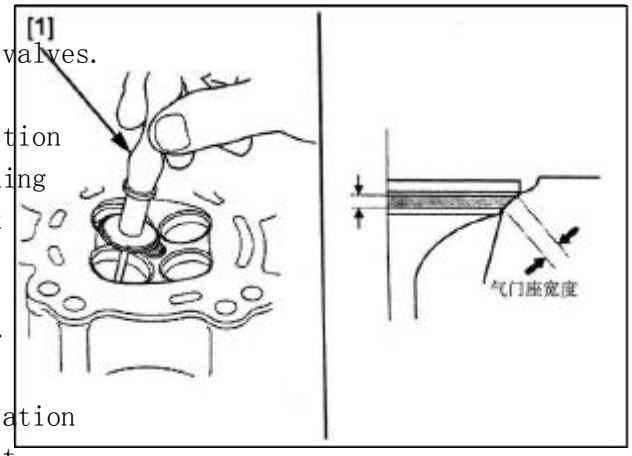
Check

Break down the cylinder head cover.

Totally clean up the carbon buildup in valves.

Coat valves with thin iron blue.

Slightly knock valves to its seat direction by hand lapping tool[1], and valve turning is not allowed at the moment, and check the contacting status of valve seat.



Remove the valve and check the width of its seat surface.

Valve seat width shall be within stipulation

Surroundings of valve seat shall be flat.

Standard data：0.90-1.10mm

Repairing limit：1.5mm

In case the width of valve seat is out of stipulation, trim the seat.

Grind valve is not allowed. In case the contacting surface of valve turned out or worn out, or its seat uneven, replace the valve.

Check and confirm the situation below of valve seat surface:

- Uneven valve seat contacting surface
  - Valve rod bent or folded, replace the valve and trim its seat.
- Seat surface abrasion
  - Replace the valve and trim its seat.
- Contacting area (Too high or too low)
  - Replace valve seat

Trimming

Trimming tools are as below.

Tool：

Cutter holder,4.5mm 07781-0010600

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

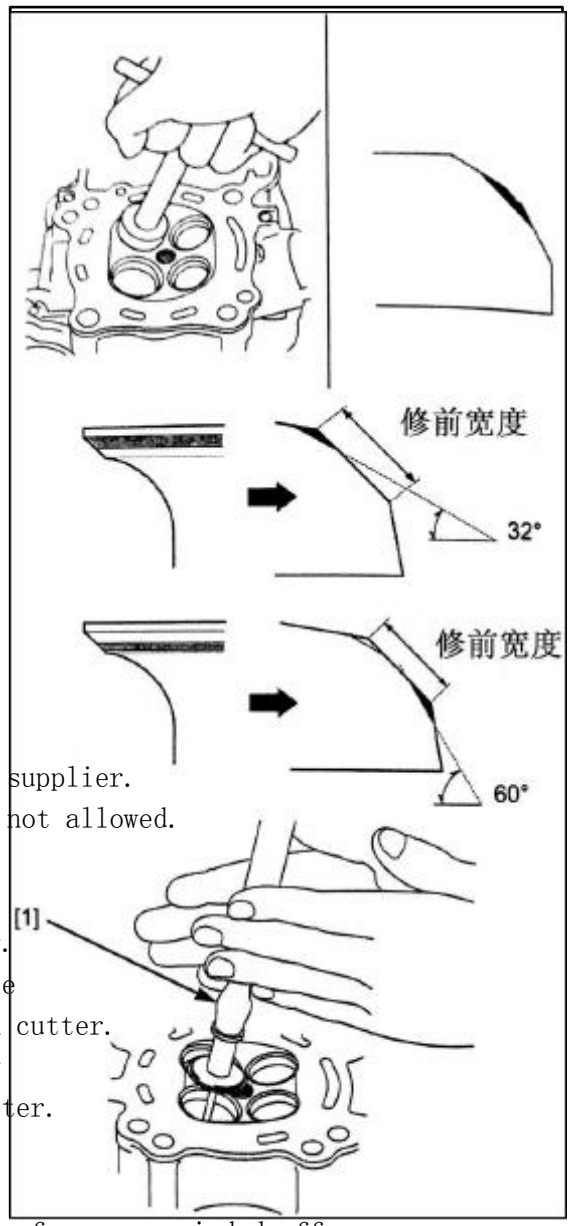
Valve seat trimming tool,24mm (EX, 45°) 07780-0010600

Plain cutter,28mm (IN, 32°) 07780-0012100

Plain cutter,24mm (EX, 32°) 07780-0012500

Internal milling cutter,26mm(IN, 60°) 07780-0014500 07780-0014202

Internal milling cutter,26mm(EX, 60°)



Valve seat width：0.90-1.10mm

Caution：

- Follow the user manual of Polishing supplier.
  Excessive grinding on valve seat is not allowed.
-

1、Cut off the rough or irregular part of valve seat by 45° trimming cutter.

2、Cut off upper ring of working surface of the seat by 1/4 through 32° plain cutter.

3、Cut off bottom ring of valve seat by 1/4 through 60° internal milling cutter.

4、Grind the seat to suitable width by 45° trimming tools.
Ensure the roughness and irregular surface was grinded off.

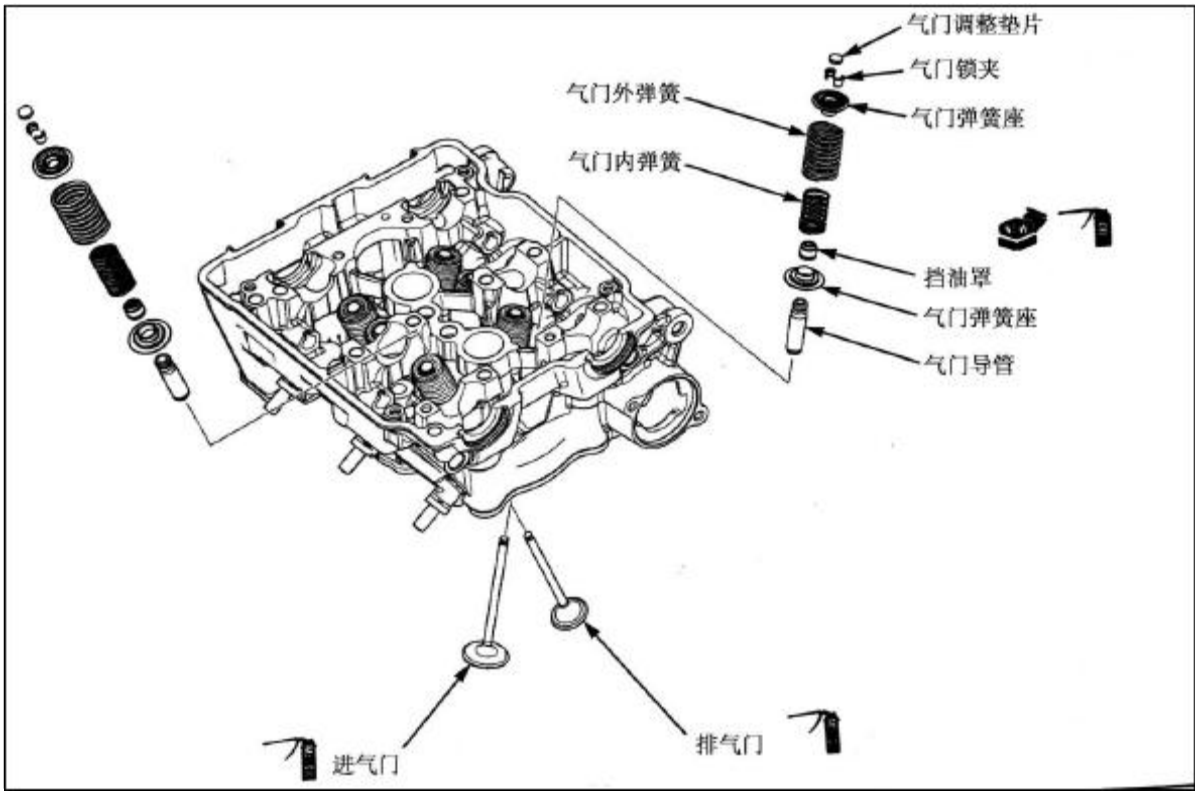
5、After grinded, coat valve surface with grind agent, and slightly grind the valve.

Caution：

- Too strong the grinding power may damage the valve seat or lead to distortion.
  Angle of grinding tools need be usually changed for preventing uneven grinding.
- Grinding agent enter between valve rod and guide tube is not allowed.
-

After grinded, wash and clean up remaining agent on cylinder head and valves, and check the contacting surface of valve, then assemble the cylinder head.

Assembly



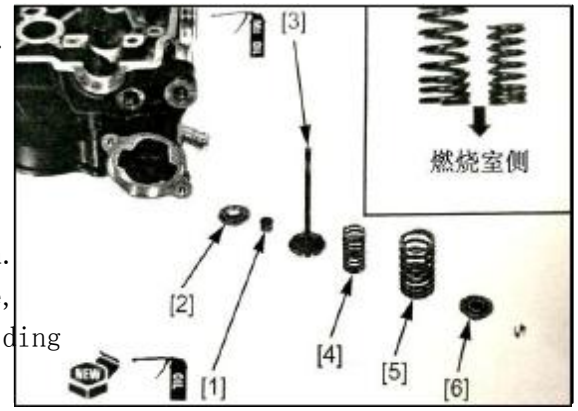
Wash the cylinder head by solvent and blow all the oil line by compressed air

Luricate new oil shield[1] by oil.

Assemble spring seat[2] of lower valve and oil shield.

Lubricate the sliding surface and ends of valve rod by supramoly solution.

Insert the valve[3] into its guide tube, while slowly turning the valve for avoiding damage oil shiled.

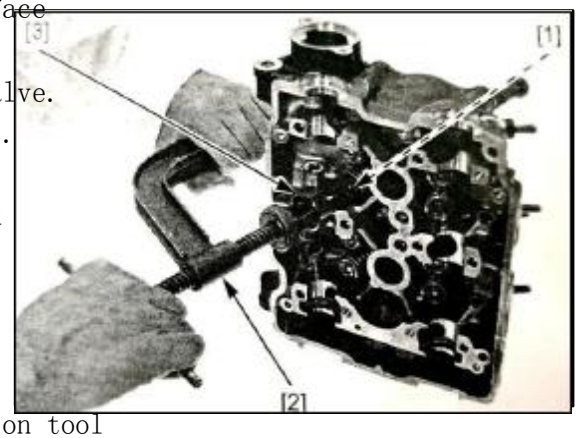


Assemble inner valve spring[4] and outer Spring[5], the compacted side of coil face to the combustion chamber.

Install spring seat ring[6] of upper valve.

Assemble valve clamp[1] by special tool.

Lubricate the split pin for decreasing resistance, excessive pressure may lead to lose elasticity



Tool:

[2]Valve spring compression tool

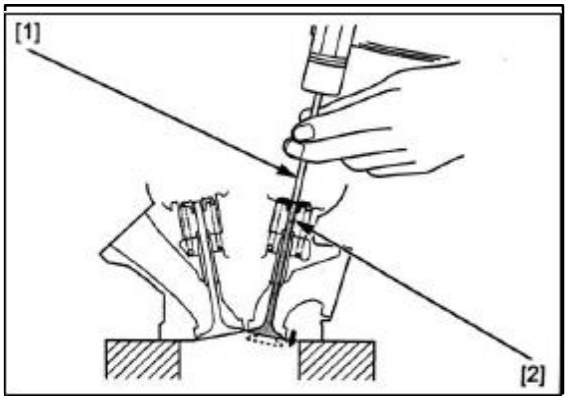
07757-0010000

[3] Accessory of valve spring compression tool

07959-KM30101

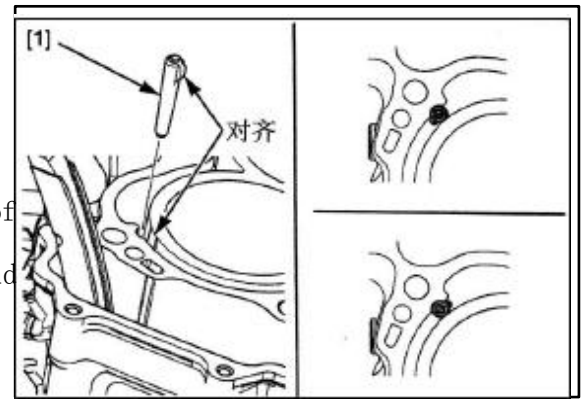
Hold the cylinder head on workbench for preventing damage the valve.
Input suitable tool[1] into valve guide tube[2].
Slightly knock the tool for fix the installation clamp.
Assemble the components below:

- Water temperature sensor
- Spark plug

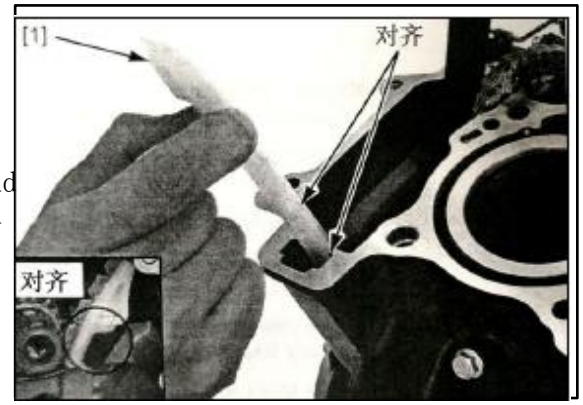


Assembly

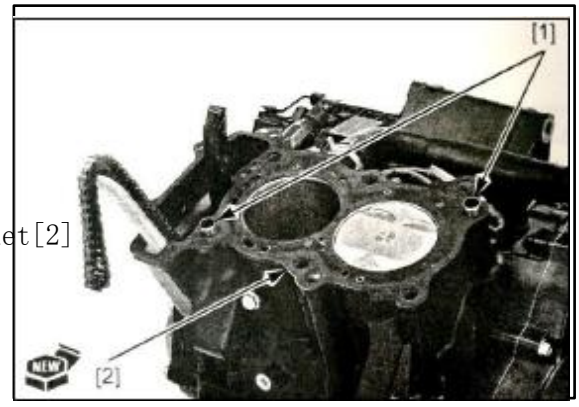
Clean up the gasket on contacting surface of cylinder,
Caution: No dust or dirt drop into cylinder is allowed.



Assemble the rubber rod[1] of waterproof on the right side of air inlet side whose conical surface face downwards and align with cylinder water jacket.
Caution: The edge could be on the left or right.



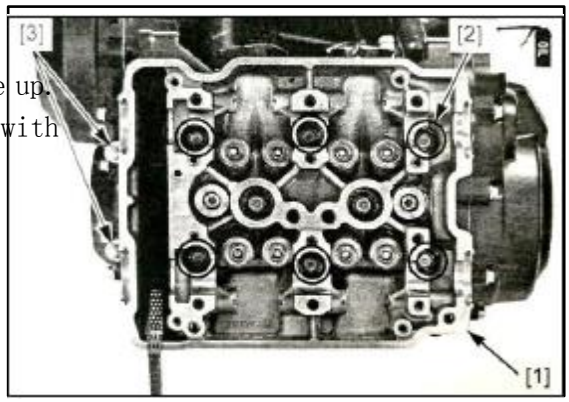
Assemble guide plate[1] of the chain and align its protrusion with the groove on cylinder which make its bottom in the groove of crankcase.



Install positioning pin[2] and new gasket[2]

Get the timing chain through the cylinder head[1] and install it on cylinder.

– Engine



Clean up the thread and seat surface of cylinder head seal bolt(9mm) and then wipe up.

Coat the bolt(9mm) and seat surface above with engine oil.

Alternately Install the cylinder head bolt[2](9mm) by 2 or 3 times.

Torque: 47N·m

Install and screw upthe bolt (6mm) [3].

Assemble the components below:

–

-34 Thermostat

–

-34 Swing arm

Adjustment stud of tensioner

Disassembly/Assembly

Caution:

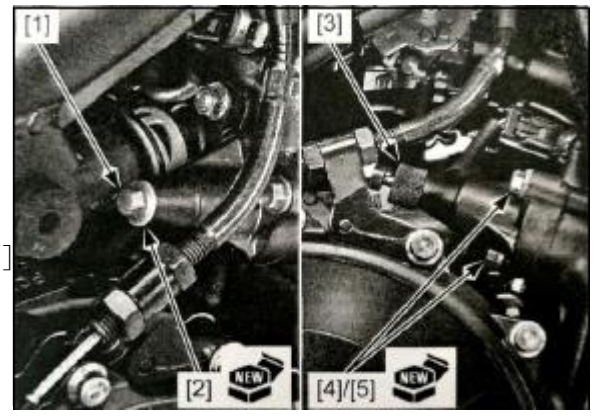
- Remove the engine from frame is unnecessary when repairing.。

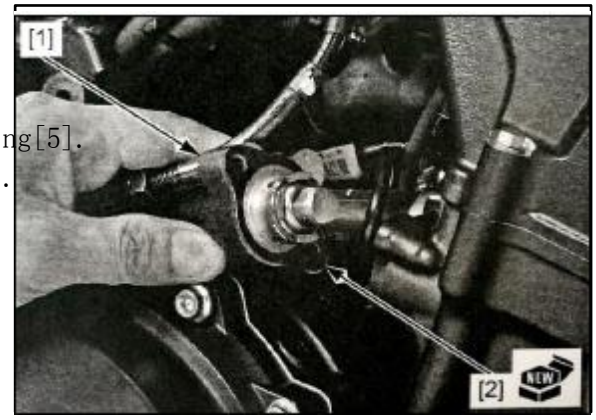
Remove the seal bolt[1] and seal ring[2]

Turn the tensioner clockwise by special tool for keeping its tightness.

Tool:

[3]Tensioner clam





Remove installation bolt[4] and seal ring[5].

Remove adjustment stud[1] and gasket[2].

Assembly is opposite to disassembly.

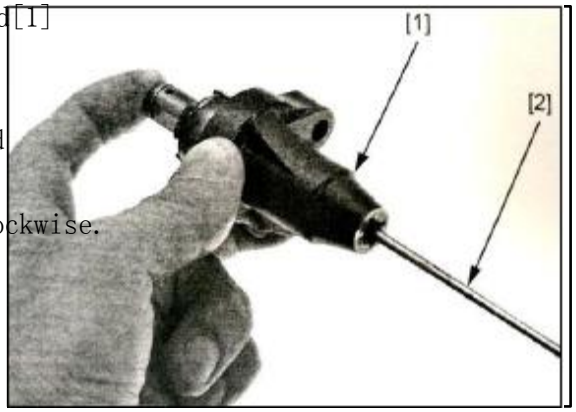
Caution:

- Replace the seal ring and gasket.

Check

Check the performance of adjustment stud[1]

- The adjustment stud shall not enter the adjustor when it is pressed.
- The adjustment stud shall be pressed into adjustor when the cross piece or screw driver[2] turn the stud clockwise. And when the tool removed, the stud jump out of adjustor.



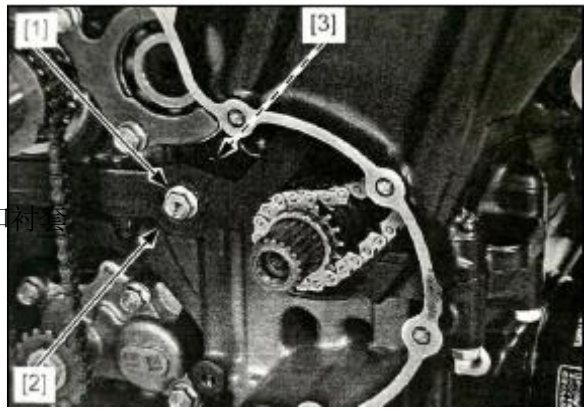
Timing chain/Sprocket wheel

Disassembly

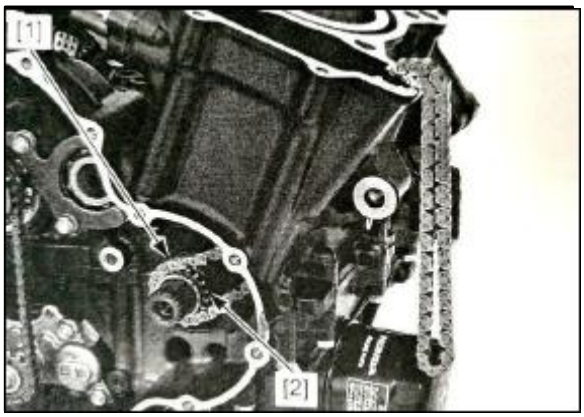
Remove the components below:

- Cylinder head
- Primary gear set
- Clutch housing

Remove the bolt[1], Chian tensioner[2]和衬套[3]。



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



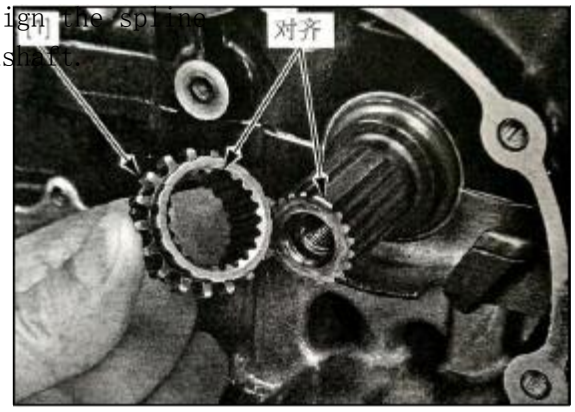
Check

Check the scratch, damage,abnormal abrasion or distortion on the parts below.

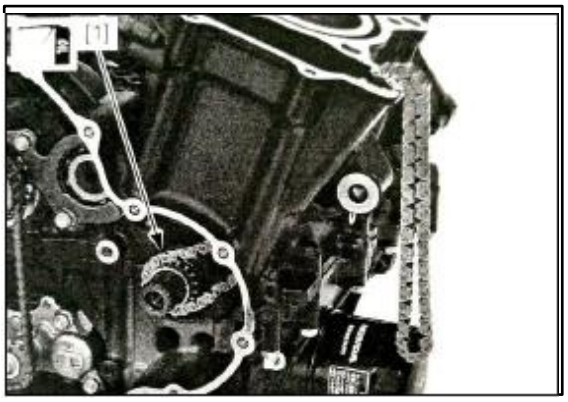
- Timing chain
- Sprocket tension plate
- Timing tension sprocket wheel.

Assembly

Assemble the timing sprocket[1], and align the spline tooth with the wide key groove on crankshaft.



Coat the timing chain[1] with oil and match with sprocket wheel.



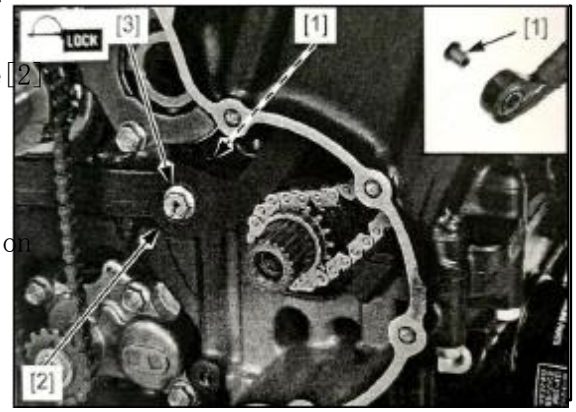
Coat the installation bolt of tensioner Plate with fastening glue.

Assembel the collar[1], tensioner plate[2] and bolt [3].

Installation direction of collar is as shown.

Screw up the tensioner plate installation bolt to stipulated torque.

Torque: 12N·m



Assemble the components below:

- Clutch housing
- Primary gear set
- Cylinder head

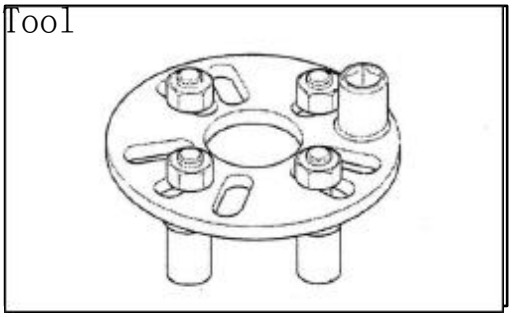
6
Clutch and gearshift set

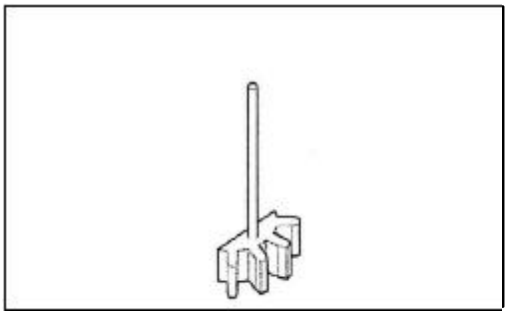
Maintenance information

Summary

- This chapter is about clutch disseassembly and gearshift maintenance. All the operation needn't remove the engine from frame.
- Oil thickness may influence the clutch separation. When the clutch failed separation or the motorcycle is slow when it seprating, check the oil level before clutch maintenance.

Tool





Clutch and gearshift specification

Unit: mm

Items		Standard	Repair limit
Clutch lever free travale		10-20	—
Clutch	Spring free length	43.2	42.0
	Friction plate thickness	2.30-2.50	2.27
	Driven plate flatness	—	0.30
Clutch collar	Inner diameter	22.000-22.021	22.031
	Outer diameter	27.987-28.000	27.977
Mainshaft outer diameter at clutch collar		21.967-21.980	21.95

Trouble shooting

Hard griping of clutch lever

- Clutch lever damaged, intertwined or dirty
- Inproper wiring of clutch cable
- Push mechanism of clutch damaged
- Bearing failure of clutch pushing rod
- Improper installation of clutch operation rod

Clutch skidding when accelerating

- Clutch pushing rod jammed
- Driving friction plate wore out
- Insufficient elasticity of clutch spring
- Clutch lever without free travel
- Oil with supramoly or black lead additive

Motorcycle is in low speed when clutch failed separation or already separated

- Clutch lever is with too big the free travel
- Clutch friction plate warped
- Too high the oil level or improper oil thickness or the oil with additive
- Locking nut of clutch housing loosened
- Clutch pushing mechanism damaged
- Improper installation of clutch operation rod
- Groove on clutch housing and gear worn out
- Improper clutch operation

Hard gearshift

- Improper adjustment for clutch cable
- Improper clutch operation
- Improper oil thickness
- Gearshift fork bent or damaged
- Shaft of gearshift fork bent
- Fork claw bent
- Bolt of gearshift drum plate loosened
- Gearshift drum plate damaged
- Guide groove on gearshift drum damaged
- Gearshift drum plate worn out or damaged

Transmission system runout

- Check plate worn out
- Insuffiient elasiticity or damage
- of returning spring of check plate
- Bolt of gearshift drum plate
- loosened

  Gearshift drum plate damaged

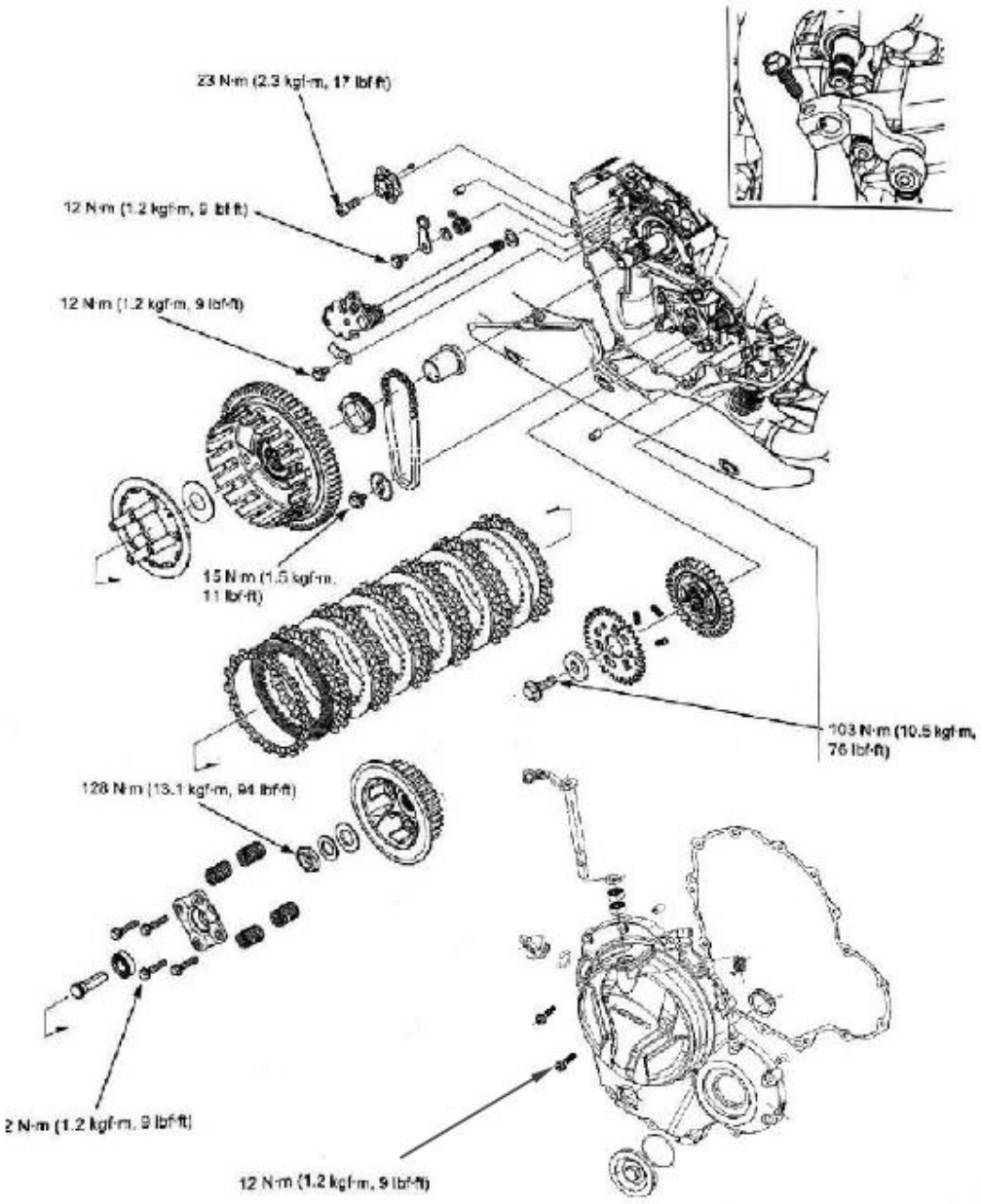
  Shaft of gearshift fork bent

- Gearshift fork damaged or bent
- Gear meshing surface or gear groove damaged

Gearshift pedal without returning

- Returning spring of gearshift shaft with insufficient elasticity or cracked
- Gearshift shaft bent or damaged

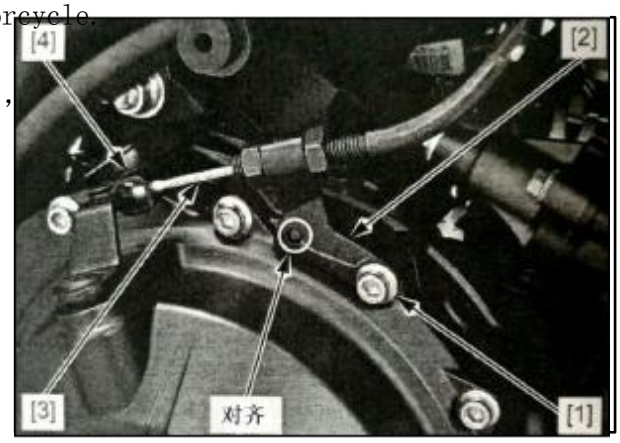
Components layout



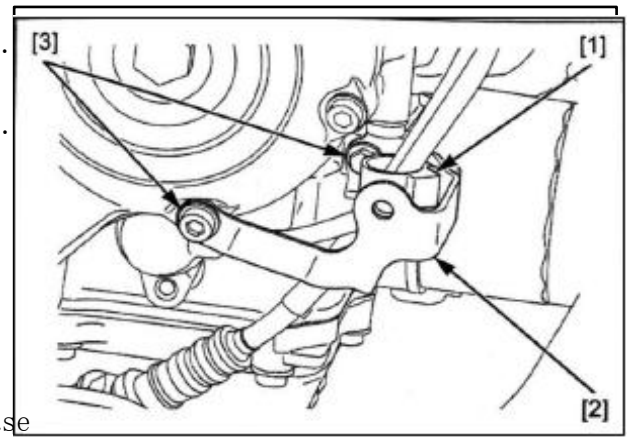
Right crankcase cover

Disassembly/Assembly

Remove the fairing cover under the motorcycle.
Drain off the oil in engine.
Remove the bolt[1]and locating plate[2], and remove the clutch cable[4] from clutch operation arm[3].

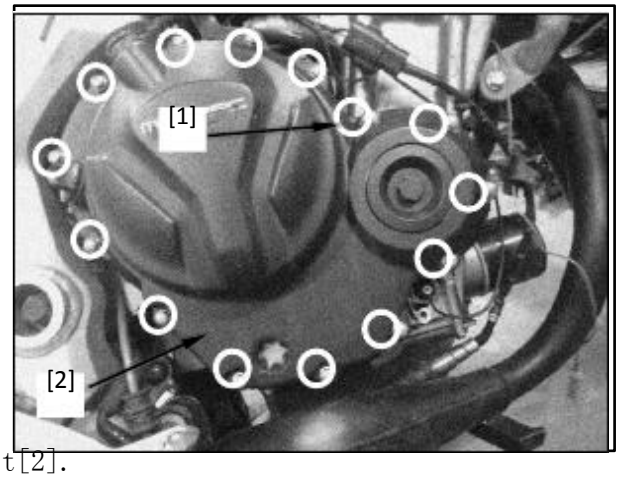


Remove the wire clamp[2]from holding plate of fairing cover under motorcycle.
Remove the wire clamp[2].
Remove the bolt[3] and holding plate[4].



Screw off the bolt [1] on right crankcase cover alternately by 2 or 3 times.
Remove the components below:

- Bolt
- Right crankcase cover [2]



Remove the positioning pin[1] and gasket[2].
Clean up the gasket on the contacting surface of crankcase and its cover, and damage the contacting surface is not allowed.
Assembly is opposite to disassembly.
Torque:

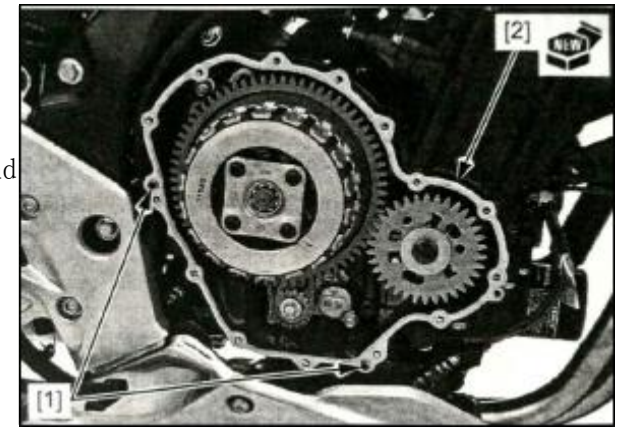
Bolt on right crankcase cover: 12N • m

Caution:

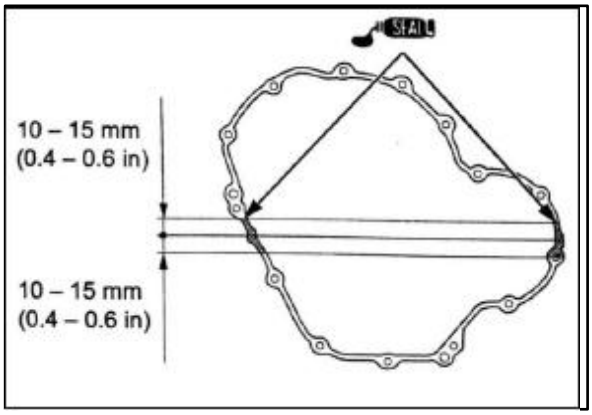
- Coat the contacting surface with seal glue as shown.
- Replace the gasket on the cover.
- Align the hole on locating plate and protrusion on crankcase cover

Adjust the free travel of clutch lever.

Fill up the recommended oil into the Crankcase and check the leakaged.

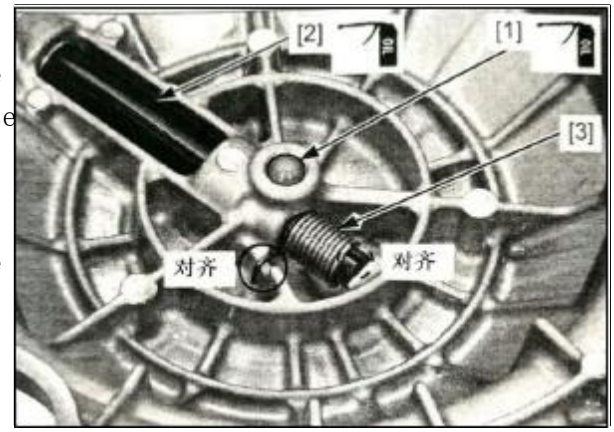


Disassembly/Assembly



Turn the clutch operation arm[1], and remove its small pushing rod[2].

Remove the clutch operation arm and the returning spring[3] from right crankcase cover.



Remove oil seal[1] from right crankcase cover.

Assembly is opposite to disassembly.

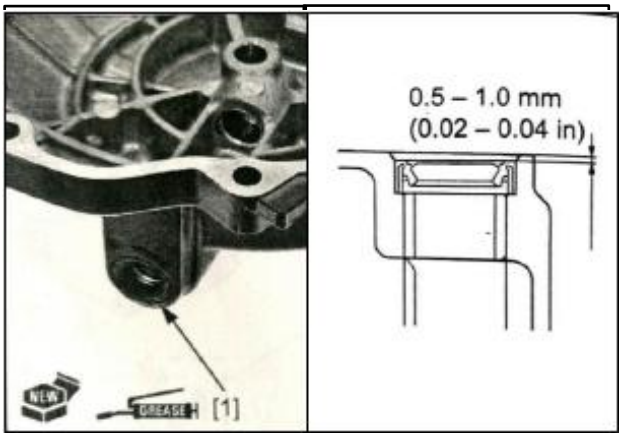
Caution:

- Coat the new oil seal with grease
- Install the oil seal to stipulated
- depth as shown.

- Align the hook on returning spring and notch on the right crankcase
- cover.

  Align the returning spring with groove on clutch operation arm.

  Coat the sliding surface of clutch operation arm and pushing rod with oil.



Check

Check scratch, damage, abnormal abrasion or distortion on the parts below:

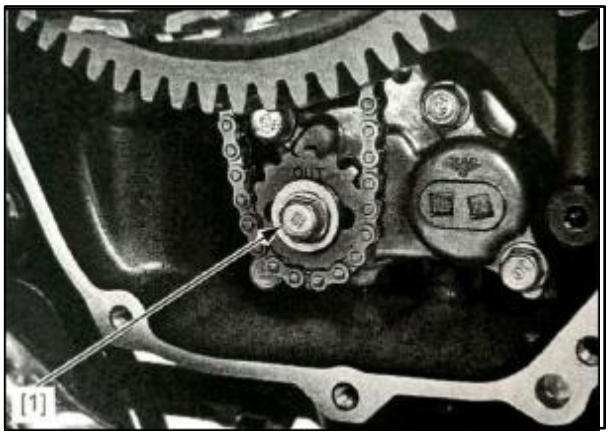
- Shaft sleeve of clutch operation arm
- Clutch operation arm
- Returning spring
- Small pushing rod

Clutch

Disassembly

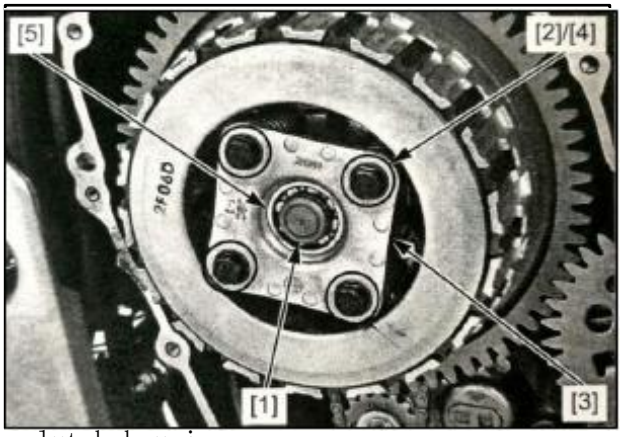
Remove the right crankcase cover.

Remove the clutch collar if needed, remove seal bolt from oil pump driven gear when the clutch is assembling.



Remove the clutch big pushing rod[1].

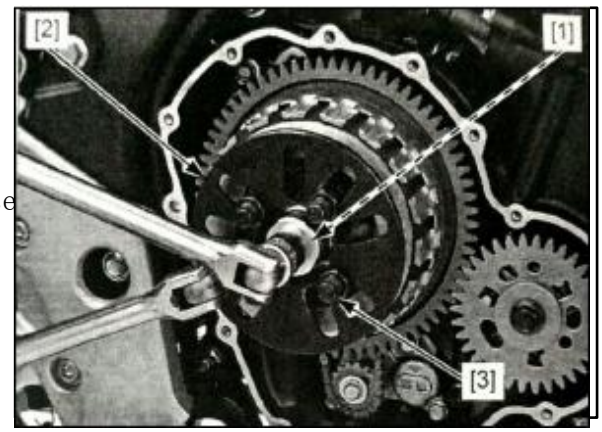
Alternately loosen the lift plate bolts [2] by 2 or 3 times, and remove the bolt pushing plate[3] and clutch spring[4], and remove the lift plate bearing[5] from the pushing plate.



Remove the locking beading of the nut on clutch housing.

Caution: Damage the mainshaft thread is not allowed.

Fix the clutch pressing plate by tool, while loosening the locking nut[1].

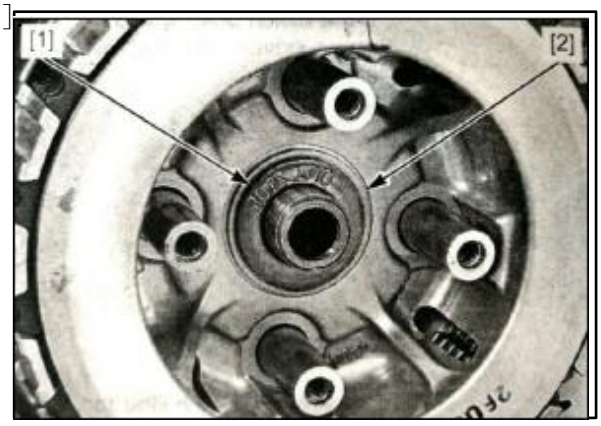


Tool:

[2]Locating plate of center housing, use Together with stud[3] 6×40mm[3].

Remove the locking nut.

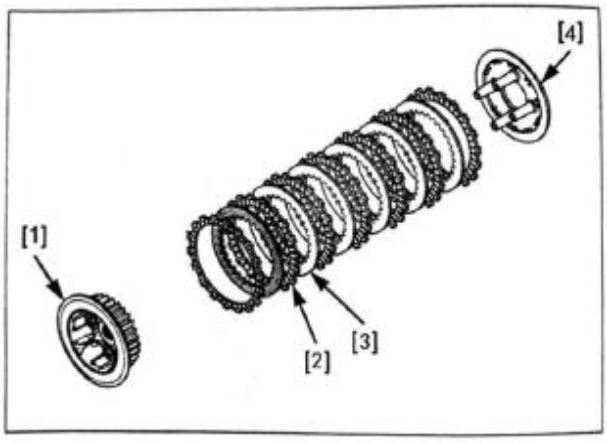
Remove the locking wasger[1] and shim[2].



Remove the clutch center housing set[1].

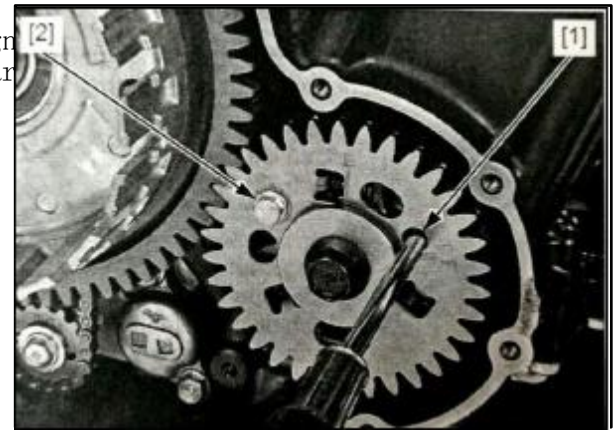
Remove the components below:

- Center housing[1]
- Driving friction plate[2]
- Driven friction plate[3]
- Pressing plate[4]

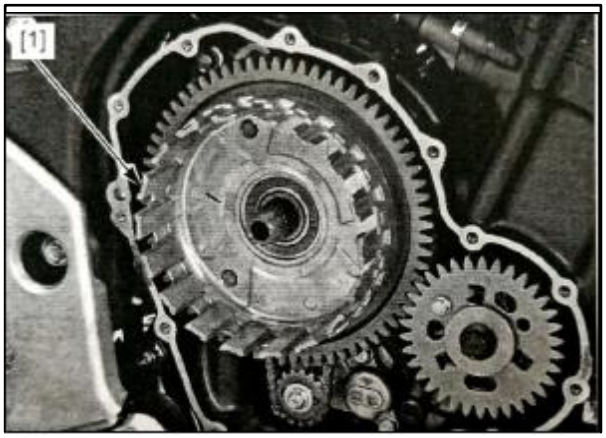


Remove the stopping washer[1].

Insert the screw driver in to groove[1] on primary gear and move the gear, align the wheel teeth and that of primary gear , and install a bolt[2] of 6×14mm at locating hole of primary gear.



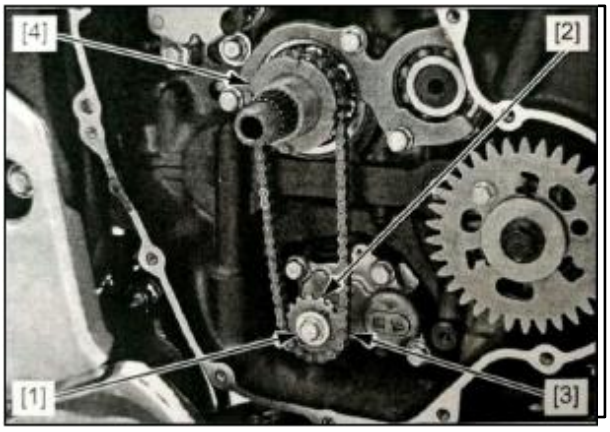
Remove the clutch housing[1].



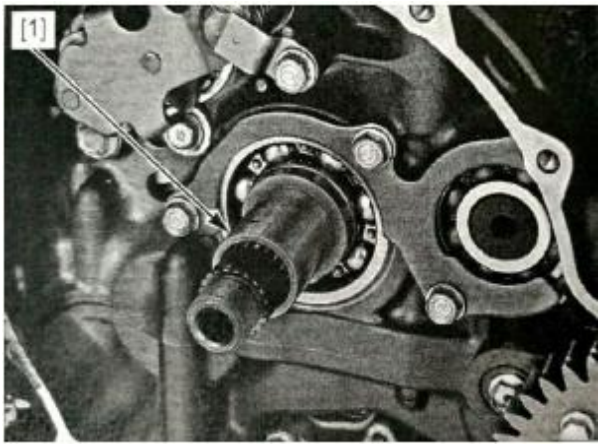
Remove the components below:

- Fastening bolt[1] of oil pump
- driven sprocket
- Oil pump driven sprocket[2]
- Oil pump chain[3]

  Oil pump driving sprocket[4]



Remove the clutch collar[1].



Check

Check the scratch, damage, abnormal abrasion or distortion on parts below, replace is needed.。

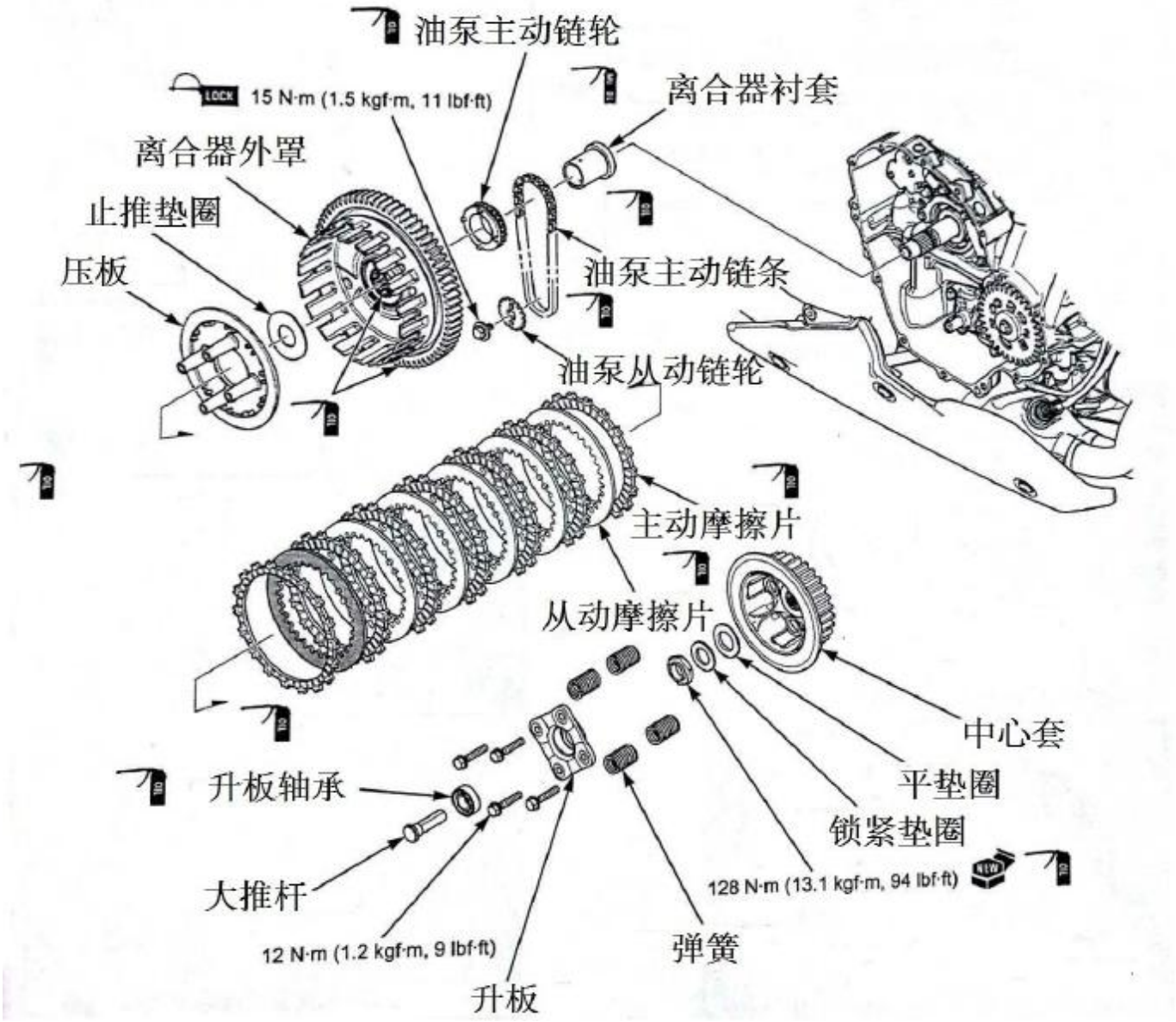
- Clutch big pushing rod
- Clutch lift plate bearing
- Clutch lift plate
- Spring
- Center housing
- Flat washer
- Disc plate
- Driving and driven friction plate
- Clutch case/Primary driven gear/Needle bearing
- Clutch collar
- Driving and driven sprocket of oil pump
- Chain of oil pump
- Mainshaft

Measure each parts on the basis of specification of clutch and gearshift mechanism. Any part exceed the repair limit, please replace.

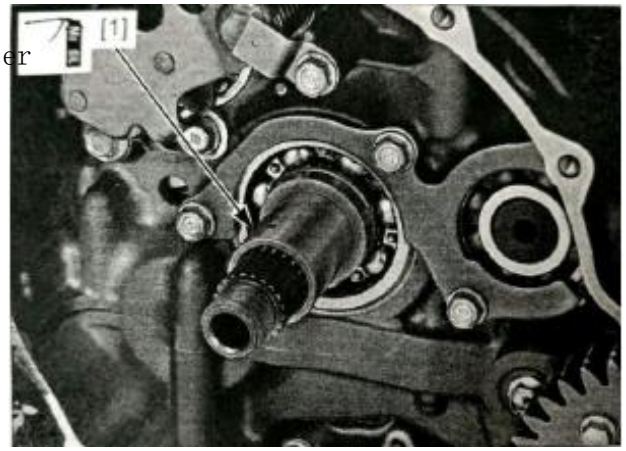
Caution:

- Replace springs on clutch as a set.
- Replace the driving and driven friction plate as a sent.

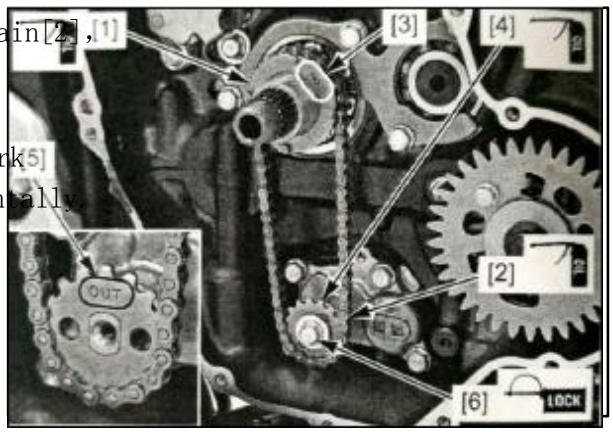
Assembly



Coat the outer surface[1] of clutch outer collar with molybdenum solution, and install to the mainshaft.



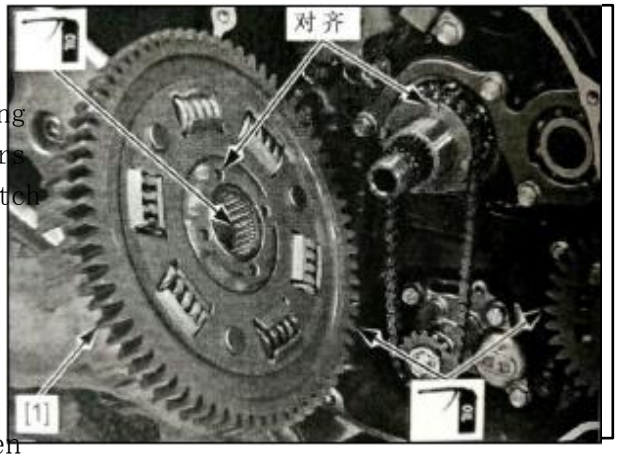
Coat the driving & driven sprocket of oil pump with clean 上engine oil and also on the chain.
Assemble driving sprocket[1] and the chain[2],
The mark “MGZ”[3] on driving sprocket faces upwards.
Assemble the driven sprocket[4], and mark “OUT”[5] faces upwards and align horizontally.
Coat the thread of driven sprocket seal bolt with seal glue.
Assemble the seal bolt[6]。



Caution:

- After clutch assembled, screw up the driven sprocket bolt to stipulated torque.

Coat the inner and outer holes of rolling bearing, primary driving and dirven gears with clean engine oil. Assemble the clutch outer case[1], and align its hole with protrusion pillar on pump driving gear. Turn the driven gear when assembling the outer case.



Caution:

- Ensure the correct meshing between driving and driven sprocket.

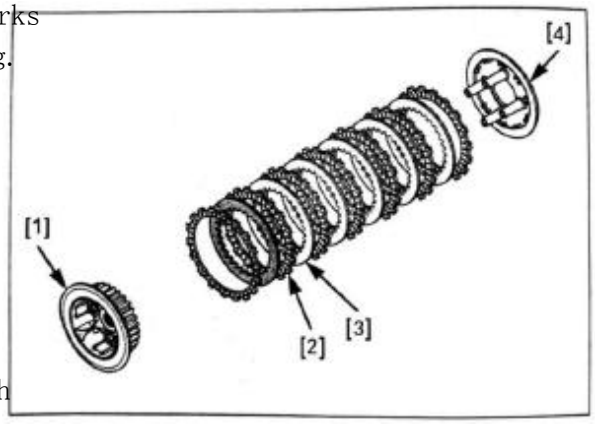
Remove 6×14mm bolt [3] from primary driving sprocket.

Caution:

- After the outer case assembled, don’t forget removing bolt of 6×14mm.

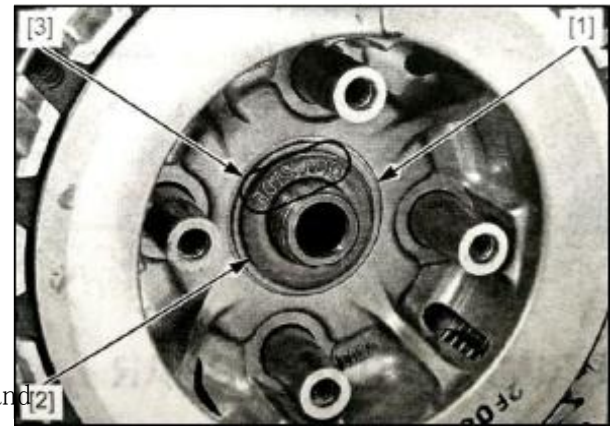
Assemble the thrust washer[1].

Coat the clutch friction plate with clean oil.
Alternately assemble the driving plate and driven plate[2] from the driving plate[1].
Assemble the driving, driven and pressire plate[3] to the center housing[4], and align the marks "0" on pressure plate and center housing.

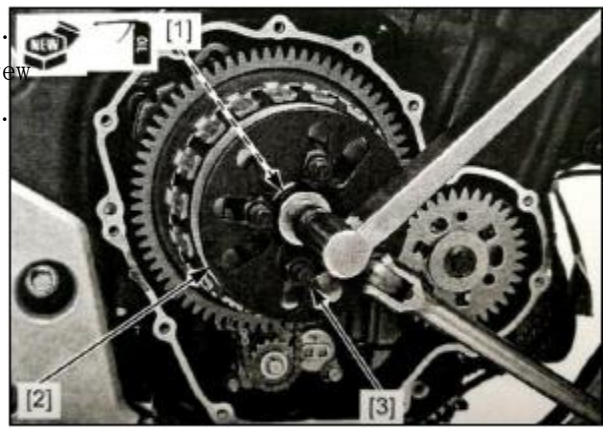


Assembel the center housing[1] to clutch outer case, and align the grooves on driving gear and outer case one another, and align the splines on center housing and mainshaft.

Assembel the washer[1]
Assemble the locking nut[2], and the mark "OUTSIDE" faces outwards.



Coat the thread of clutch locking nut and the seat surface with clean engine oil.
Assemble the locking nut[1]on mainshaft.
Fix the pressure plate by tool, and screw up the locking nut to stipulated torque.
Tool:
[2]Fixing plate of center housing
Use together with 6×40mm bolt
Torque: 128N·m



Assemble the protrusion pillar on the locking nut[1] into the groove on the mainshaft.

Damage on maishaft thread is not allowed.

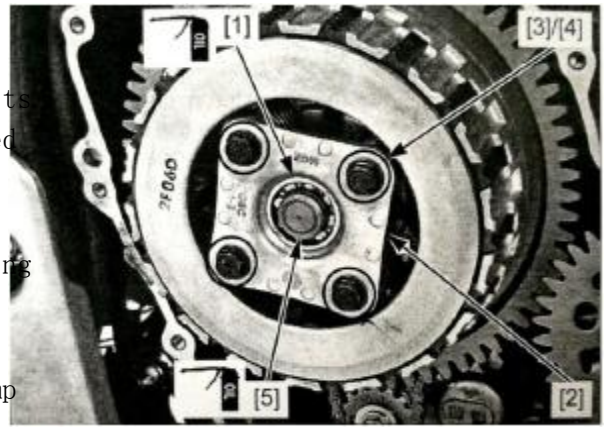
Coat the turning part of lift plate bearing with clean engine oil.

Assemble the lift plate bearing[1] into the plate[2].

Assemble clutch spring, lift plate and its bolt[4].

Alternately screw up the lift plate bolts by 2 or 3 times and fasten to stipulated torque.

Torque: 12N·m



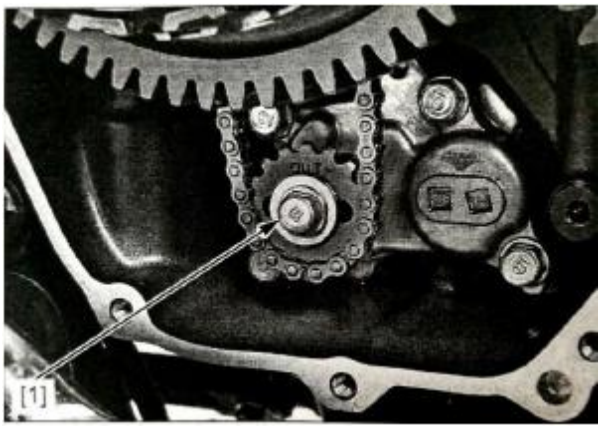
Coat the sliding surface of small pushing rod with clean engine oil.

Assemble the small pushing rod[5].

Screw up the locking bolt[1] of oil pump driven sprocket to stipuldated torque.

Torque: 12N·m

Assemble the right crankcase cover.



Primary driving gear

Disassembly

Remove the right crankcase cover.

Insert the screw driver into groove[1] on primary driving gear and move the gear which align with driven gear, and assemble a bolt[2] of 6×14mm at the locating hole on the driving gear.

Fix the primary driving gear[1] by tool, and remove its bolt[2] and washer[3].

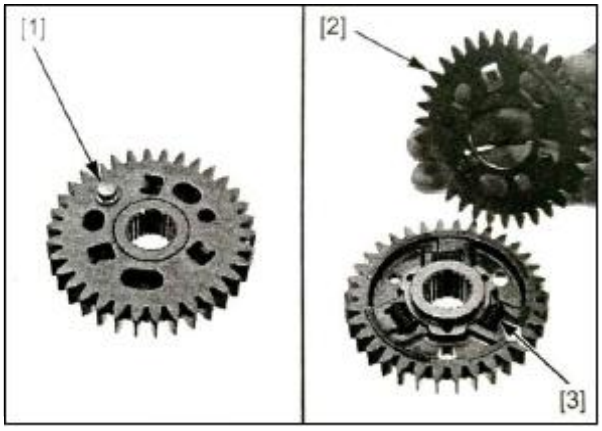
Tool:

[4]Gear resistance, 2.5

Remove the gear resistance and the primary gear.

Remove the bolt[1] 6×14mm and subsidiary gear[2] of primary driving gear.

Remove the spring[3] on groove of subsidiary gear.



Check

Check the scratch, damage, abnormal abrasion and distortion on the parts below, and replaceif necessary.

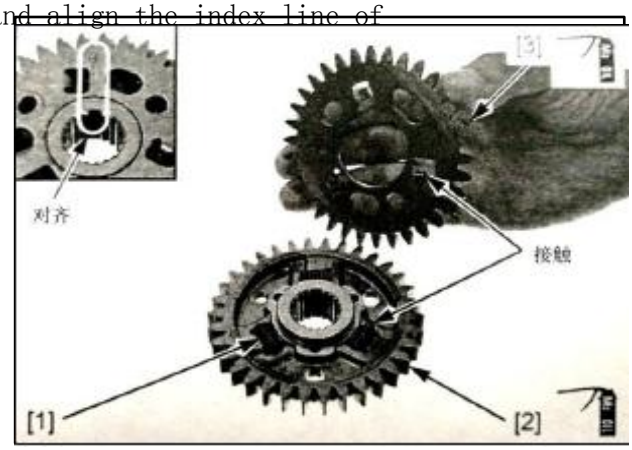
- Main gear of primary driving gear
- Subsidiary gear
- Spring

Assembly

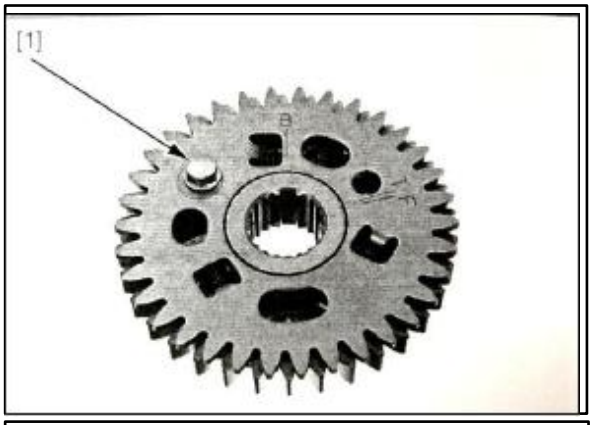
Coat the sliding surface of main and subsidiary gear of primary driving gear with molybdenum solution.

Assemble the spring[1] into groove on primary driving gear[2].

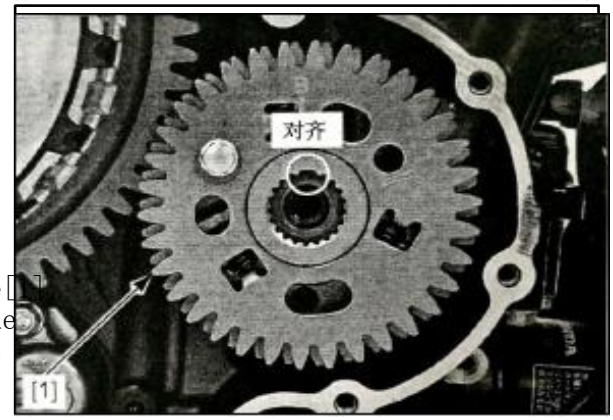
assemble the subsidiary gear[3] onto primary driving gear, and makes the label at the end of spring, and align the index line of mark “B” with wide gear as shown



Loosenly assemble a bolt 6×14mm[1] for preventing gear drop.



Assemble the primary driving gear[1] to crankshaft.

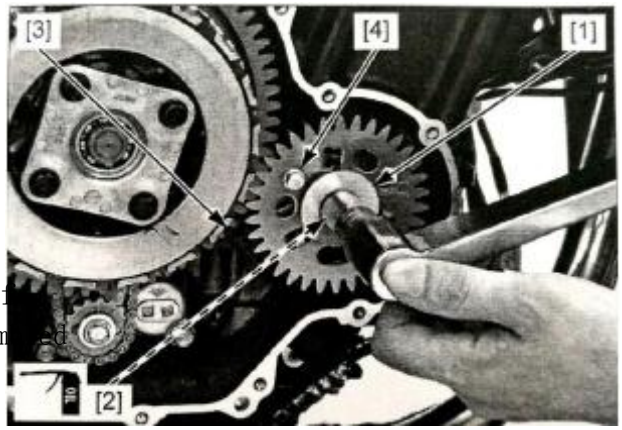


Insert the screw driver into the groove[1] of the primary driving gear and move the gear to make subsidiary gear coincident with primary driven gear.

Coat the sectional surface and thread of primary driving gear bolt with clean engine oil
Assemble the washer[1] and driving gear bolt[2].
Fix the driving gear by tool and turn its bolt to the stipulated torque.
Tool:
[3] Gear resistance tool, 2.5
07724-0010100/07724-001A100
Torque: 103N·m
Remove the gear resistance tool.
Remove the bolt of 6×14mm from the primary driving gear.
Caution:

- Don't forget to remove the bolt of 6×14mm after the driving gear assembled

Assemble the right crankcase cover.



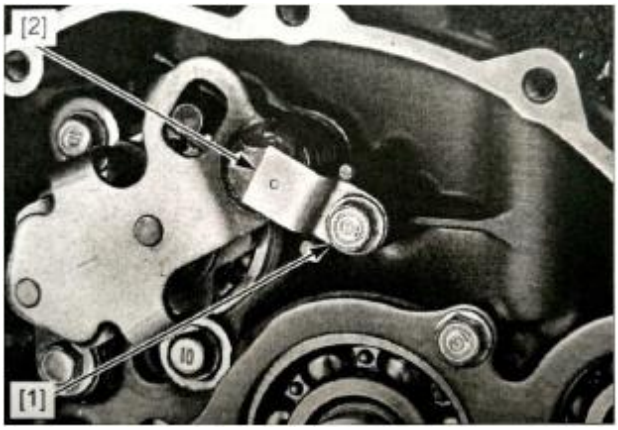
Gearshift system

Disassembly

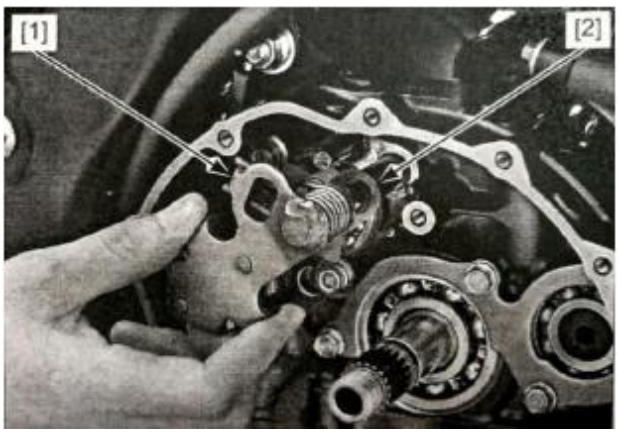
Remove the parts below:

- Clutch
- Gearshift arm

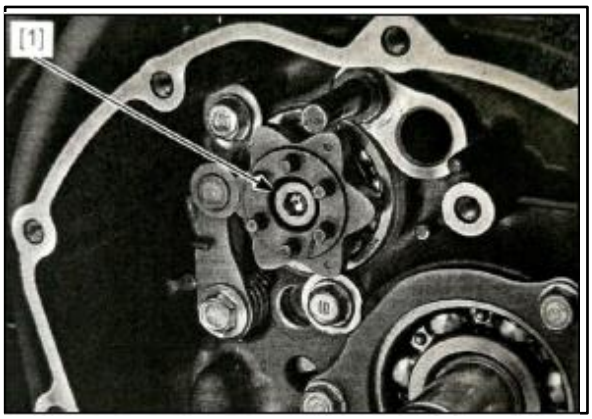
Clean up the dirt on gearshift shaft spline
Remove the bolt[1] and limit plate[2].



Pull out gearshift spindle set[1] and thrust washer[2] from crankcase.



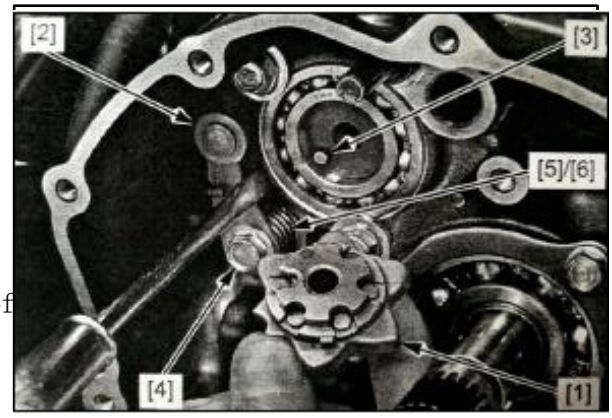
Remove the inner hex. bolt [1] of gearshift drum plate



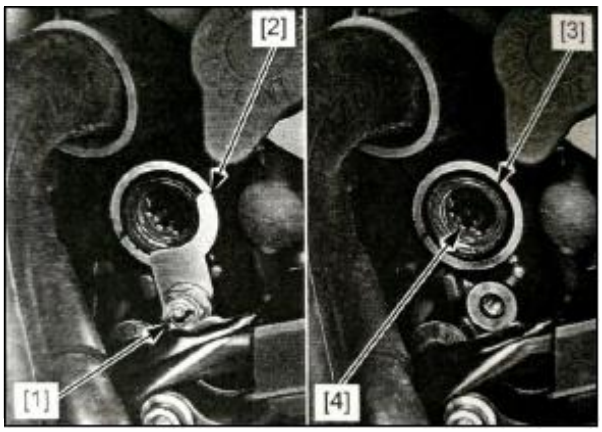
Fix the check plate[1] by screw driver, and remove the druma plate[2] as shown.

Remove the parts below:

- Positioning pin[3]
- Check plate locating bolt[4]
- Check plate
- Washer[5]
- Returning spring[6]



Remove the bolt[1], pressure plate[2] of oil seal on gearshift arm, oil seal[3] and needle bearing[4].



Check

Check the damage, abnormal abrasion or distortion on the parts below, and replace if necessary.

- Gearshift drum plate
- Check plate
- Check plate returning spring
- Gearshift arm needle bearing

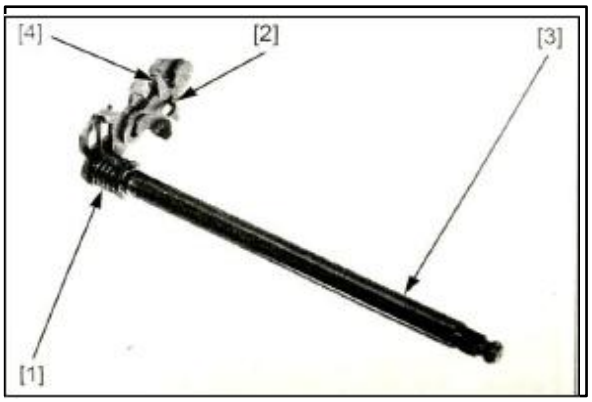
Gearshift arm

Checkthe fatigue or abrasion on gearshift arm turing spring[1] and that of turng spring[2] of gearshift plate, and replace if necessary.

Check abrasion or bending on gearshift shaft[1].

Check the abrasion, damage or distortion on gearshift plate[2].

If it is necessary, please replace gearshift shaft as a set.



Assembly

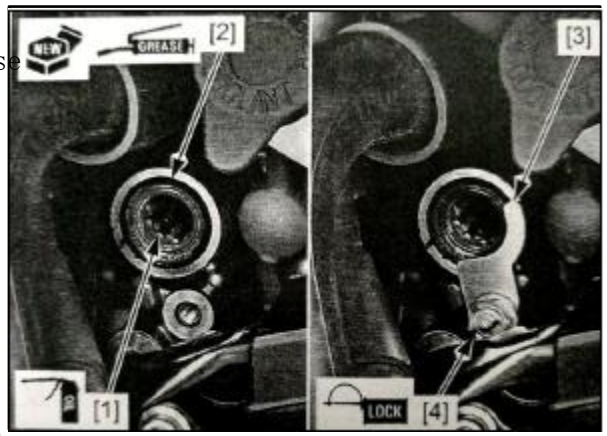
Coat the needle bearing[1] of gearshift shaft with clean engine oil.

Coat the edge of new oil seal[2] with grease and install into crankcase and align its surface with root of crankcase chamfer.

Coat the thread of oil seal pressing plate with fastening agent.

Assemble oil seal pressing plate[3] of gearshift arm along the direction as shown and screw up the bolt[4] to stipulated torque.

Torque：12N·m

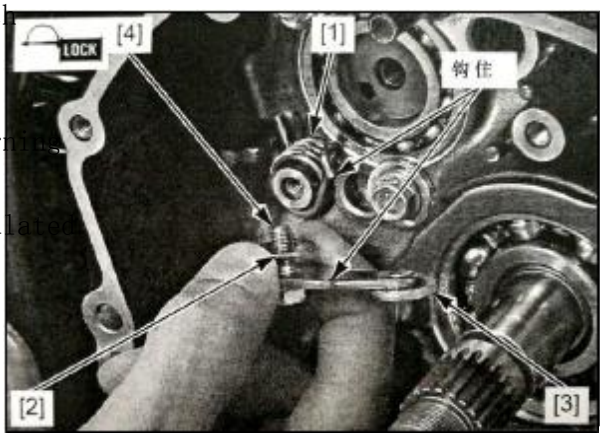


Check the normak working of check plate.

Coat the thread of check plate bolt with fastening agent.

Assemble returning spring[1], washer[2] and check plate[3], and clasp the returning spring into groove on check plate, and fasten the check plate bolt[4] to stipulated torque.

Torque：12N·m

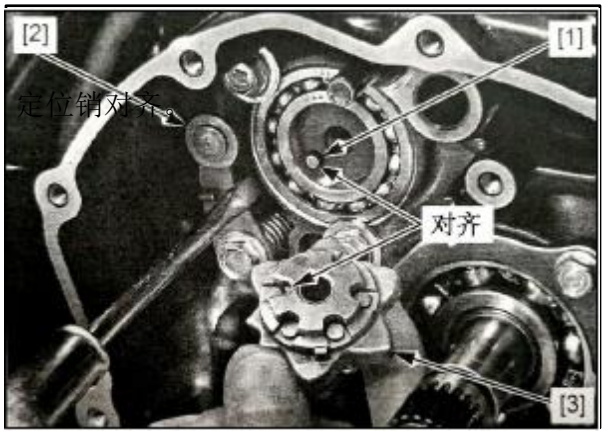


Coat the thread of locating bolt of gearshift drum
plate with fastening agent.

Assemble the positioning pin[1] into its hole on gearshift drum.

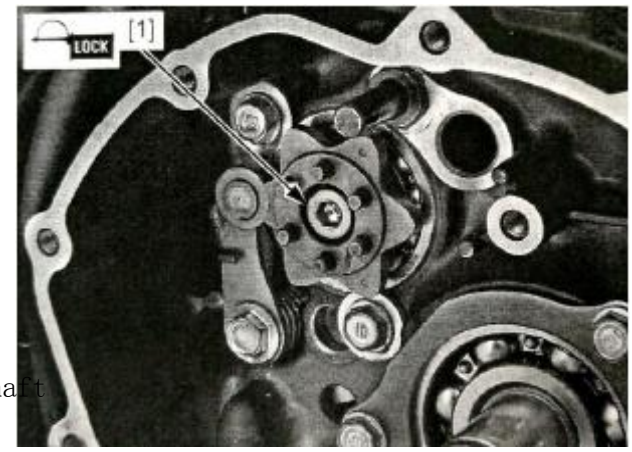
Fix the check plate[2] by screw driver as shown.

Assemble gearshift drum plate[3], and align its groove



Assemble the locating bolt[1] of gearshift drum plate and screw up to stipulated torque.

Torque: 23N·m



Coat the outer surface of gearshift shaft with clean engine oil.

Assemble the thrust shim[1] and gearshift Arm set[2] into crankcase, and align with the end of returning spring and its pin.

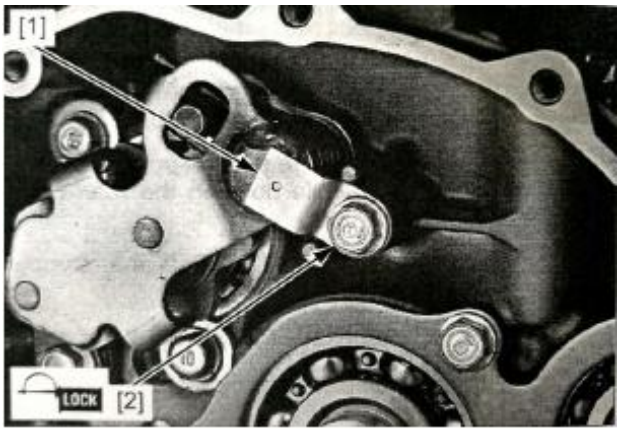
Coat the thread of pressing plate bolt with fastening agent.

Assemble pressing plate[1], bolt[2] and screw up to stipulated torque.

Torque: 12N·m

Assemble the parts below:

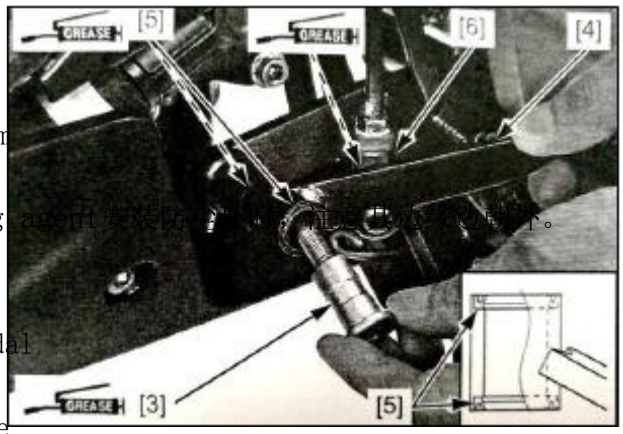
- Gearshift spindle
- Clutch



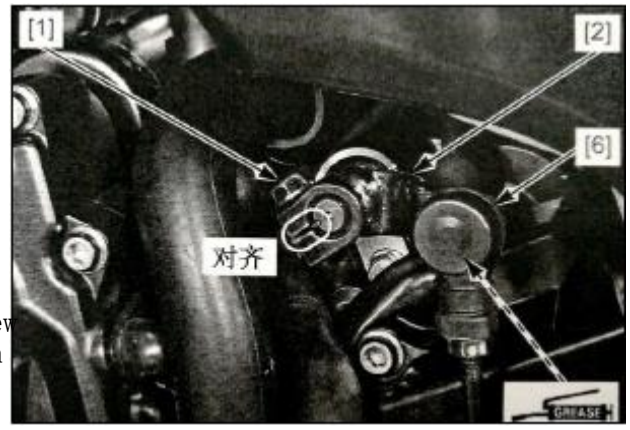
Disassembly/Assembly of gearshift pedal

Remove locking bolt[1] from gearshift shaft and the shift spindle[2].
Remove the locating bolt[3] and the gearshift pedal[4].
Remove the dust-proof ring[5].
Check the dust-proof cover and ring of ball joint of rod aged or worn out, and replace if necessary.
Disassembly is opposite to assembly.
Torque:
Locating bolt of gearshift pedal: 27N·m
Caution:

- Coat the ring edge with fastening agent
- Coat sliding area of gearshift bolt
- with fastening agent
  Coat the ball joint of gearshift pedal
- rod with fastening agent.



Align the seam on gearshift arm with the machining on the spindle.

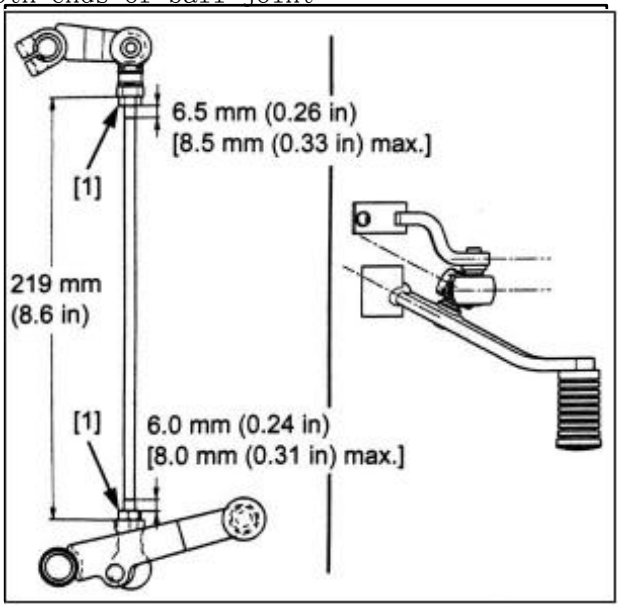


Adjust the gearshift pedal through screw up the locking nut[1] and pay attention to points below:
Caution:

- Turn left the thread when locking the nut on the end of gearshift arm.

Adjust to the standard length between both ends of ball joint as shown:
Adjustment finished,and screw up the locking nut of gearshift pedal
Fasten
Caution:

- Screw up the locking nut and make it parallel to gearshift arm and the pedal.
- Make sure the thread length of locking nut is smaller than the stipulation.
  - End of gearshift arm: 8.5mm
  - End of gearshift pedal: 8.0mm



7
Magneto and starting clutch

Maintenance information

Summary

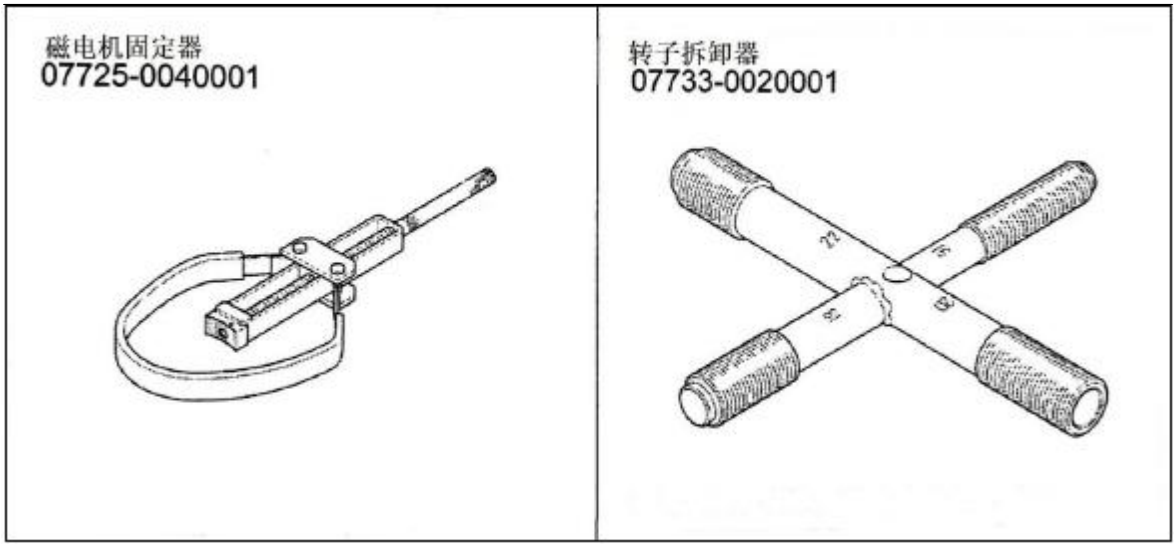
- This chapter is about the maintenance of rotor and stator for magneto, and remove the engine from the frame is unnecessary when in maintenance.
- Check the coil of AC generator.
- Check the trigger.
- Maintenance for starting motor

Specification for magneto and starting motor

Unit: mm

Items	Standard	Repair limit
Outer diameter of starting plate gear sleeve	51.705-51.718	51.685
Inner diameter of starting clutch case	68.362-68.392	68.402

Tool

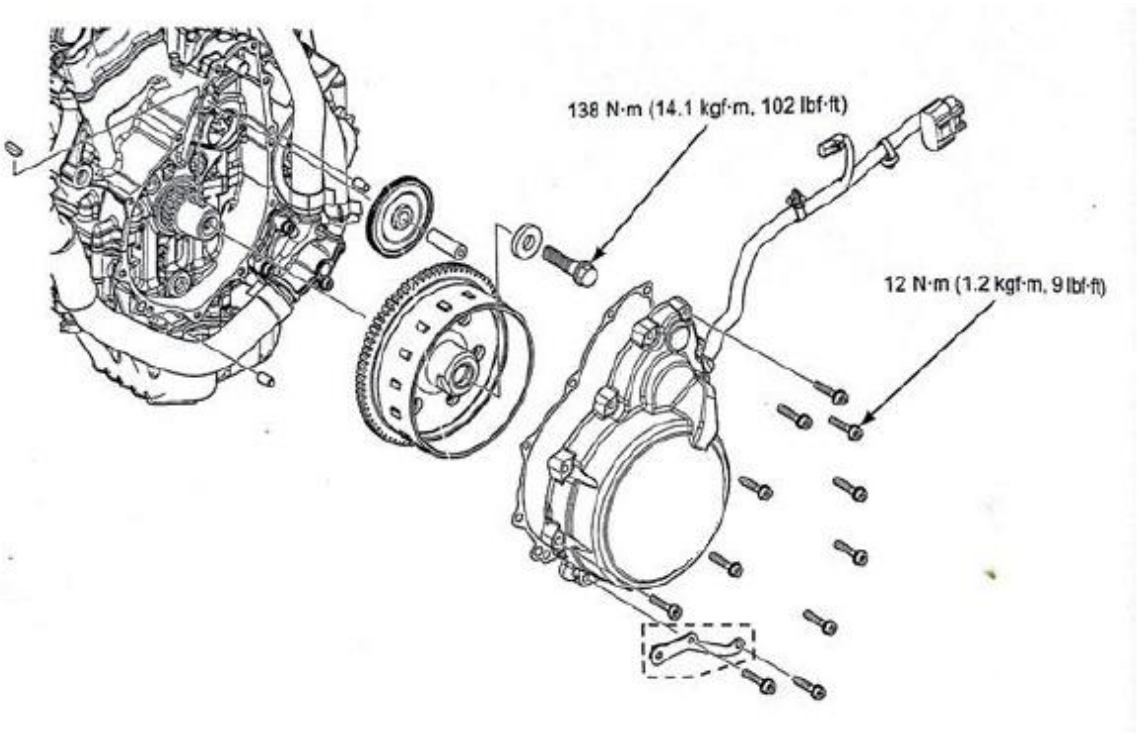


Trouble shooting

Starting motor works but engine starting failed

- Starting clutch failure
- Double gear or its shaft of
- starting motor failure
- Small gear of starting motor
  failure or abrasion
  Driving gear of starting motor
  failure

Components layout

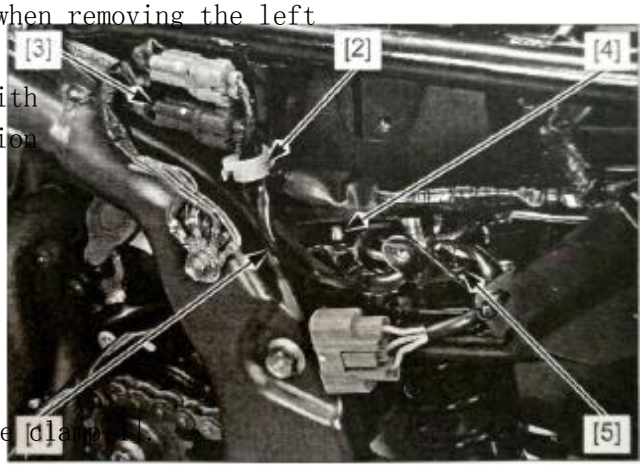


Left crankcase cover

Disassembly/Assembly

Caution:

- Lay a clean plate under the engine when removing the left crankcase cover for preventing oil overflow. After re-assembled fill with recommended oil follow the stipulation



Lay the motorcycle on flat ground and keep upright.

Remove the parts below:

- Bottom shield cover of motorcycle
- Driving sprocket cover
- Rectifier regulator

Remove the trigger wire[2] from the wire clamp.

Disconnect the red joint[3] on the trigger

Remove the stator and trigger line clamp(Brown[4], black[5] from the frame.

Remove the magneto stator and trigger wire[1] from the frame

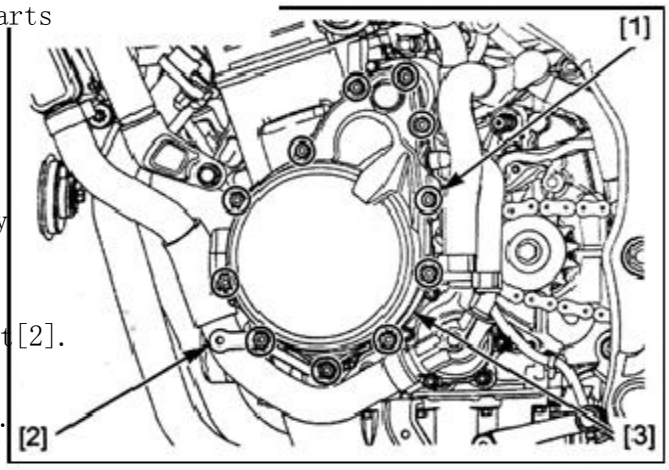
Remove the left crankcase cover bolt[1] by diagonal line sequence.

Remove the parts below:

- Bolt
- Installation plate[2] of covering parts
- Left crankcase cover[3]

Caution:

- Stator undertook the magnetic force and pay attention to the disassembly and assembly.



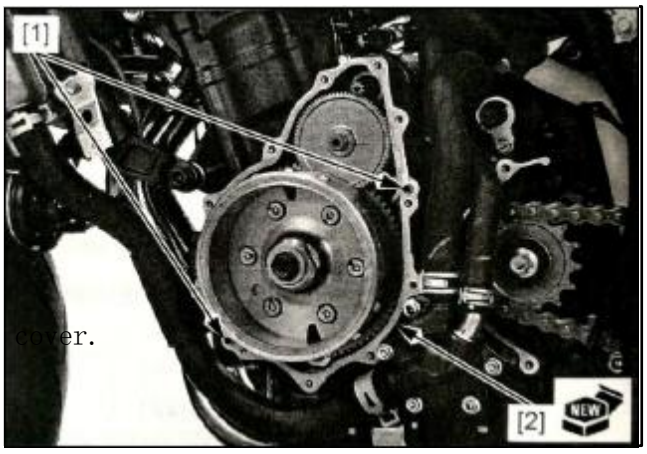
Remove the positioning pin[1] and gasket[2].

Clean up the gasket on the contacting surface of left crankcase and its cover.

Assembly is opposite to disassembly.

Torque:

Left crankcase cover bolt: 12N·m



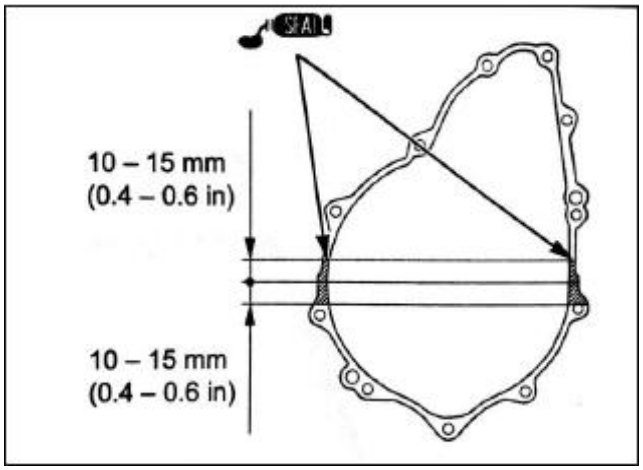
Caution:

- Coat the contacting area of Crankcase with sealing glue
- as shown.

Replace the gasket of left crankcase cover.

Check the oil level.

Ensure the oil without leakage.



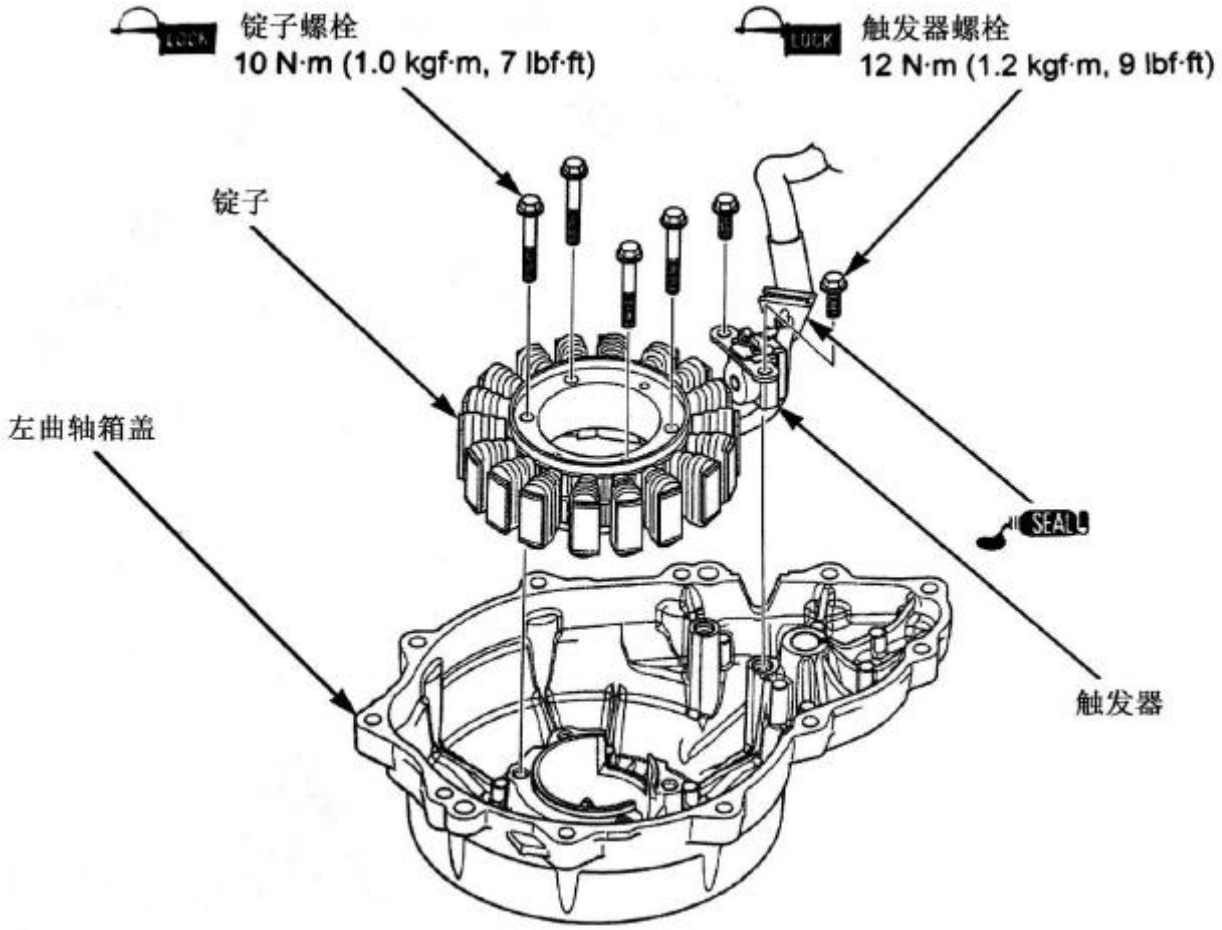
Magneto stator and trigger

Disassembly/Assembly

Remove the left crankcase cover.
Disassembel and assemble the stator/trigger as shown.

- Spread glue on thread of stator and trigger bolt.
- Spread seal glue to the sealing surface of wire connecting ring of magneto and stator.

Assembly is opposite to disassembly.

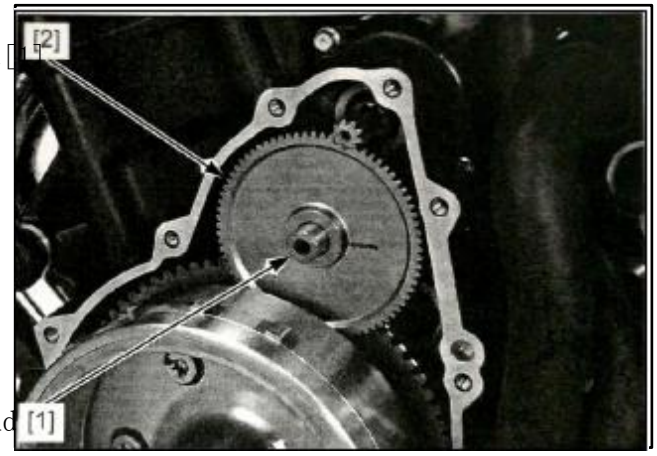


Magneto rotor

Disassembly

Remove the left crankcase cover.

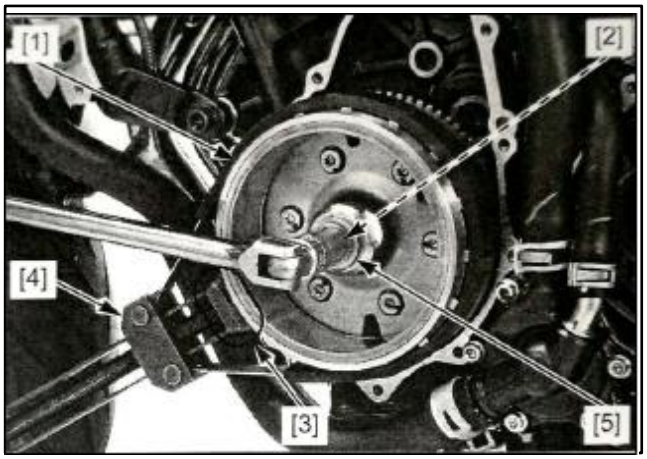
Remove the double gear[2] and its shaft[1].



Fix the rotor[1] by magneto retainer and remove the bolt[2].

Caution:

- Install the fixing piece of retainer for preventing rotor turning.



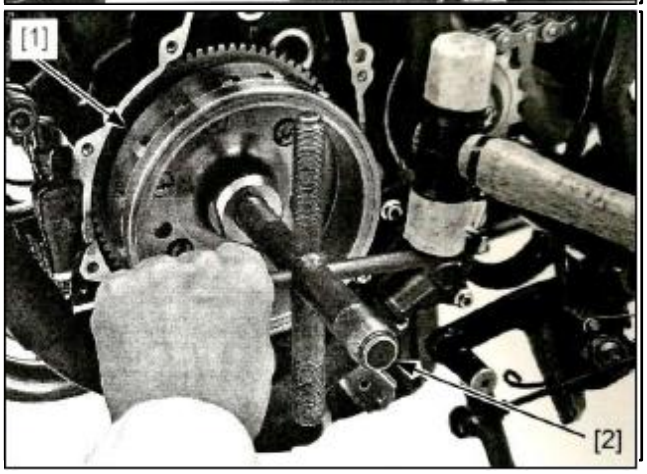
Remove the rotor bolt and washer[5].

Remove the rotor [1] by tool

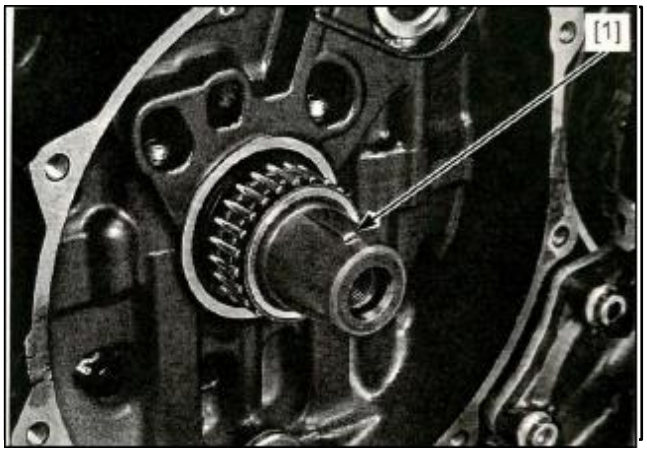
Tool:

[2]Rotor remover

07733-0020001/07933-3950000



Remove the semi-round key[1]。
Damage the key groove and crankshaft is not allowed.



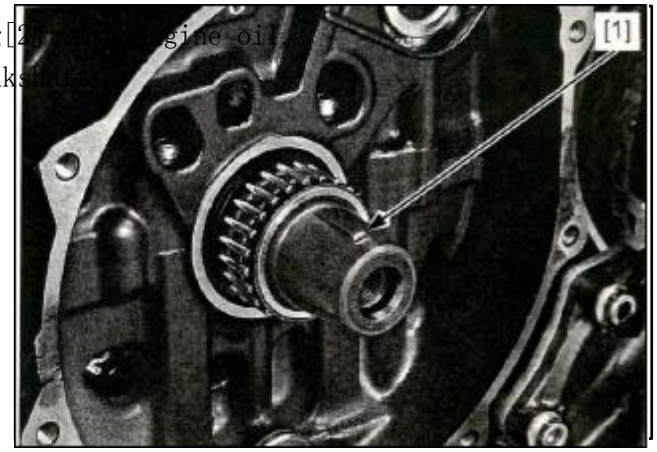
Check

Check the scratch, damage, abnormal abrasion or distortion on the parts below, replace if needed.

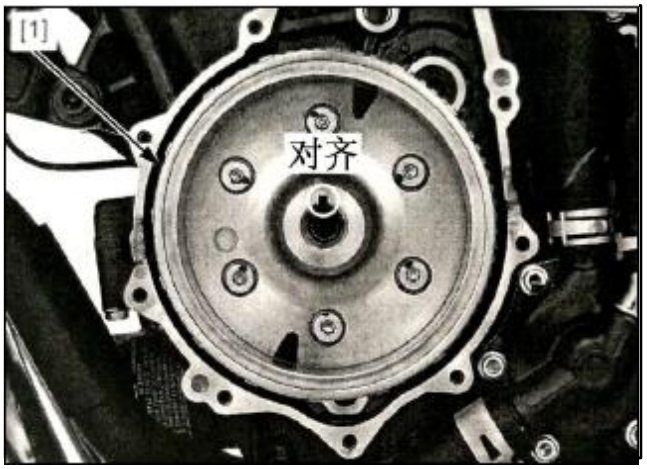
- Double gear shaft
- Double gear
- Semi-round key
- Needling bearing

Assembly

Assemble the semi-round key[1]
Coat the rolling area of needle bearing[2] with engine oil.
Damage on semi-round key groove or crankshaft is not allowed.



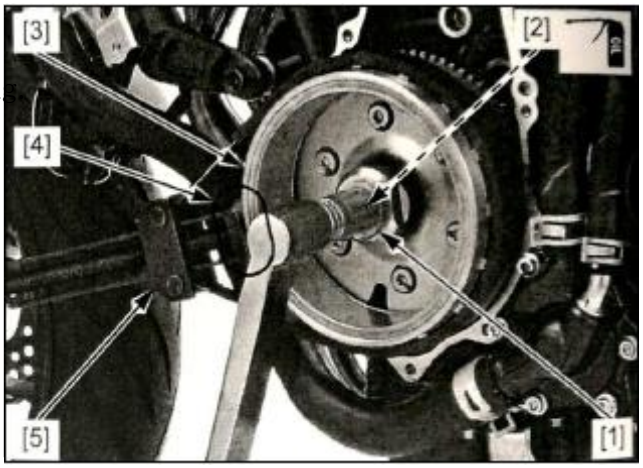
Clean up the oil in hole on rotor and conical surface of crankshaft.
Assemble the rotor[1], and align the grooves of semi-round key and that on crankshaft and rotor.



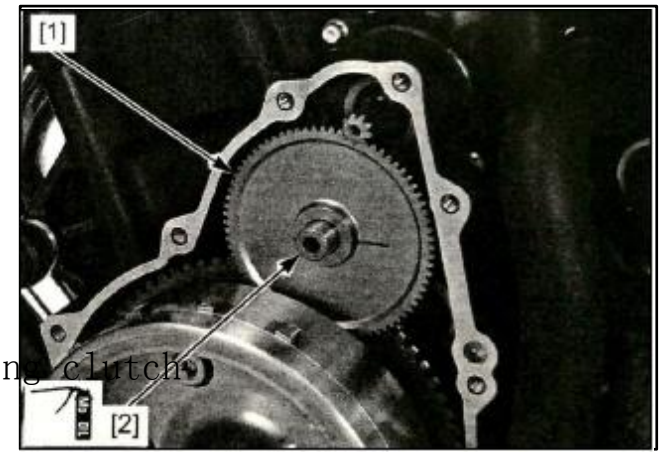
Coat the thread and mounting surface of rotor bolt with clean engine oil.
Assemble shim[1] and rotor bolt[2].
Fix the magneto rotor[1] by its fixer and fasten the bolt to the stipulated torque.
Caution:

- Assemble the fastening piece of rotor fixer for preventing turnin

Torque: 138N•m



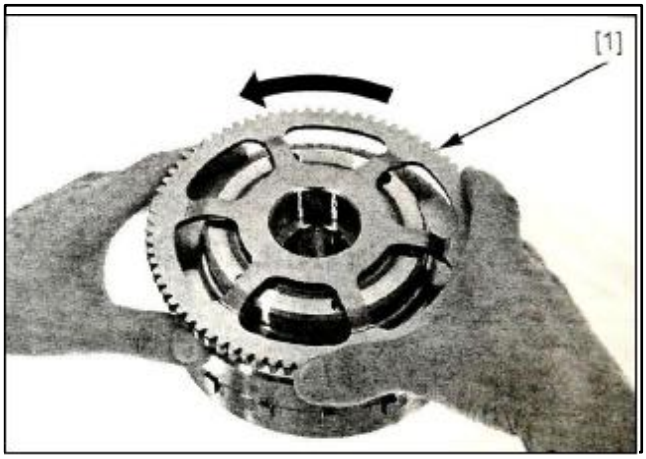
Coat the outer surface of double gear with supramoly solution.
Assemble double gear[1] and shaft[2].
Assemble left crankcase cover.



Starting clutch

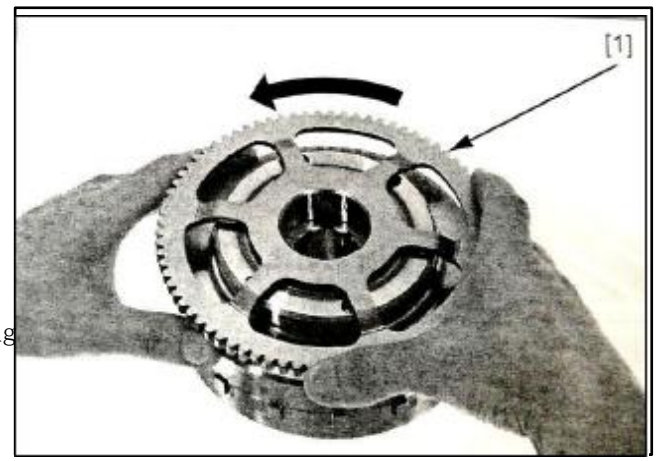
Check the operation of starting clutch

Remove the rotor.
Check the operation performance of starting clutch by turning the plate shaped gear[1].
Check the smooth clockwise turning of plate-shaped gear, or without clockwise turning.



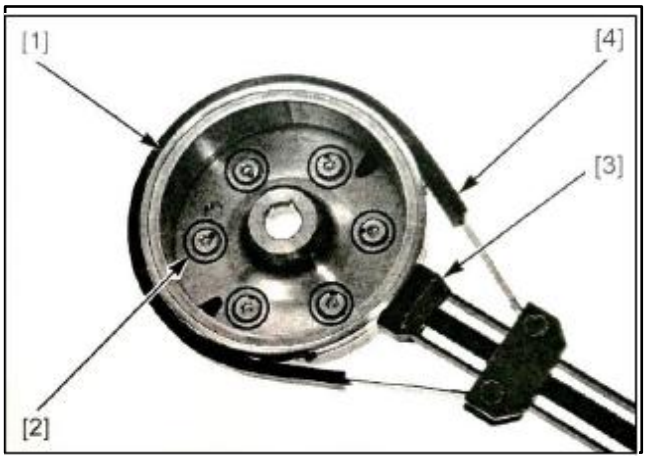
Disassembly

Remove the rotor.
Turn the plate-shaped gear clockwise and remove the gear[1].

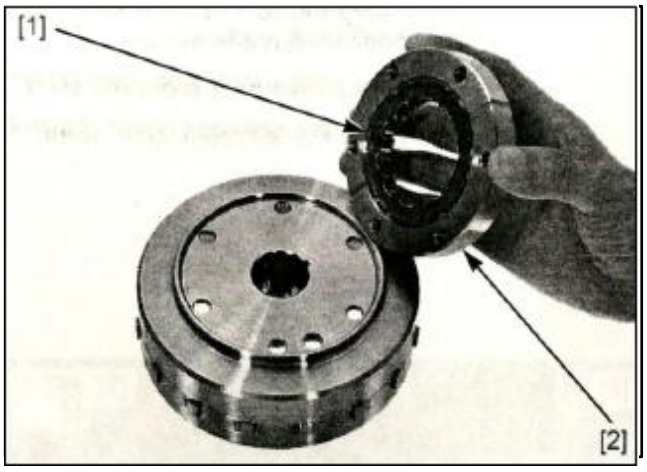


Fix the rotor[1] by its fixer,
Remove the fastening bolt[2] of starting clutch.
Caution:

- Assemble fastening piece[4] of rotor fixer[3] for preventing the rotor turning.



Remove the starting clutch component.
Remove the starting clutch[2] from its outer case[1].



Check

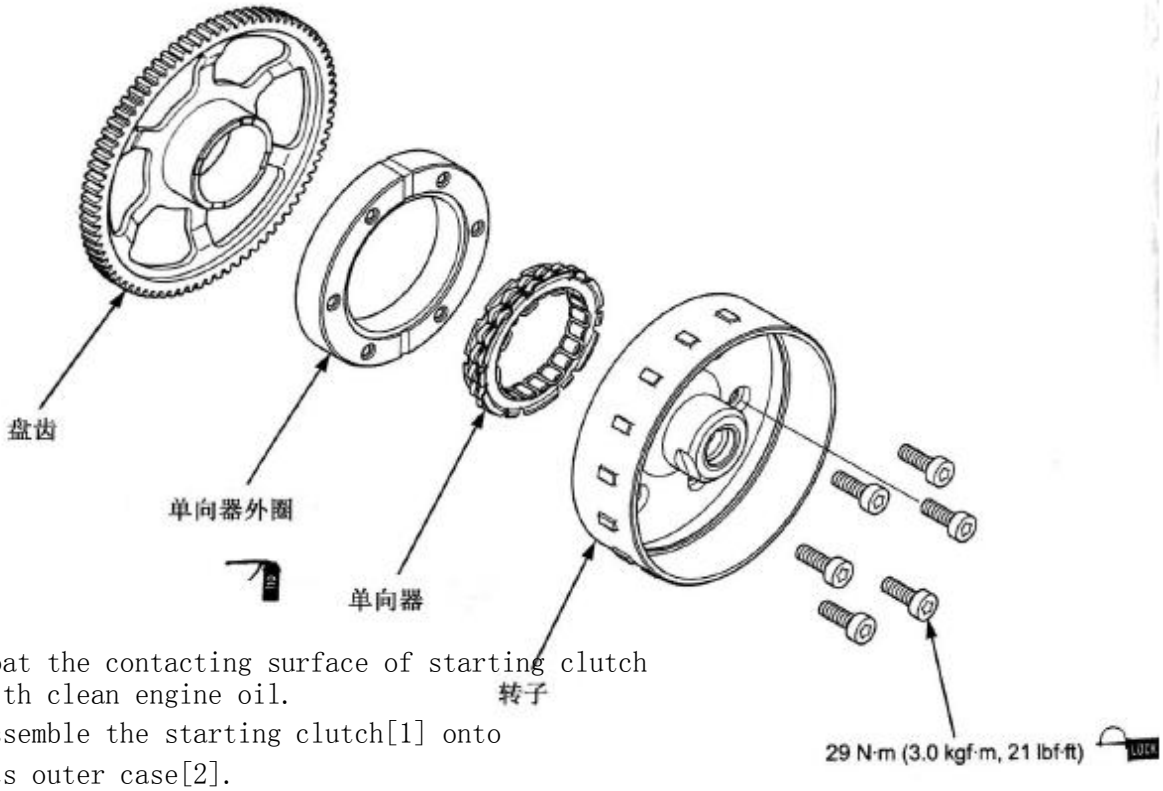
Check the scratch, damage, abnormal abrasion or distortion on the parts below, and replace ifnecessary.

- Plate-shaped gear
- Clutch outer case
- Starting clutch

Make sure each components meet the specification of magneto and starting clutch.

Replace the components in case exceeded the repairing limit.

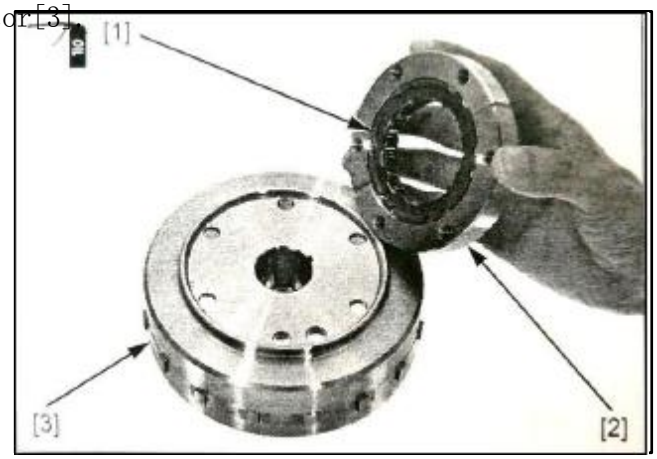
Assembly



Coat the contacting surface of starting clutch with clean engine oil.

Assemble the starting clutch[1] onto its outer case[2].

Assemble the starting clutch to the rotor[3].



Fix the rotor[1] by its fixer.

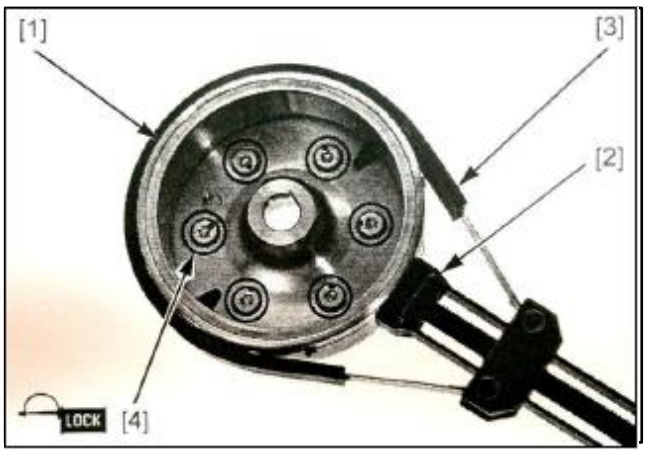
Caution:

- Assemble the fastening piece[3] of rotor fixer[2] for prebenting its turning.

Coat the thread of fastening bolt of clutch with fastening agent.

Assemble the fasterning bolt[4] and turn to stipulated torque.

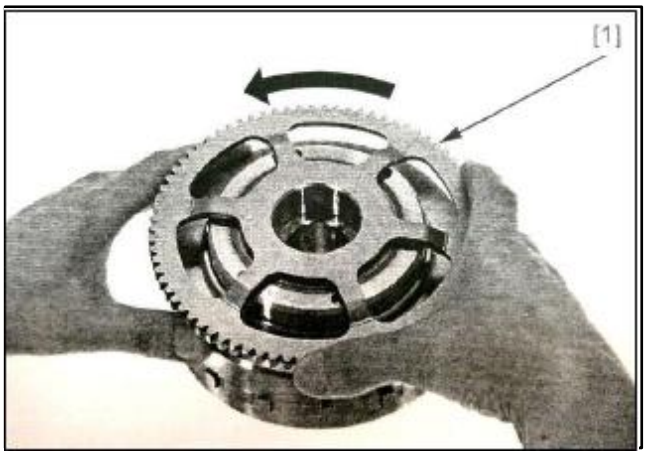
Torque: 29N·m



Turn the plate-shaped gear[1] clockwise, and assemble the gear into outer case of starting clutch.

Check the operation performance of starting clutch.

Assemble the rotor.



8

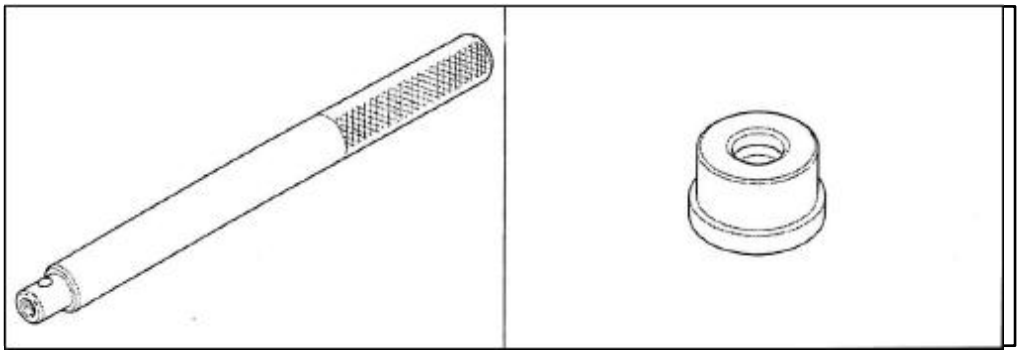
Crankcase and transmission system

Maintenance information

Summary

- Crankcase must be separated for servicing the parts below:
  1. Transmission system
  2. Crankshaft
  3. Balancing shaft
  4. Piston, connecting rod, cylinder body
- The parts below must be removed before crankcase separating:
  1. Engine
  2. Gearshift system
  3. Magneto component
  4. Cylinder head component
  5. Tensioner
  6. Tensioner, guide plate
  7. Oil primary filter
  8. Pressure releasing valve
  9. Secondary oil filter
  10. Water pump
  11. Water tube
  12. Oil pressure sensor
  13. Speed sensor
  14. Gear indicator component
- Damage on contacting surface of crankcase body is not allowed when repairing.
- Clean up the oil way before assembling the crankcase.
- Evenly spread seal glue on contacting surface of crankcase before it re-assembled.
- Mark the shaft pad on bigger head of connecting rod and that of mainshaft with different colour, choose the shaft pads according to its selection table, and check their oil clearance after the pads assembled, and wrong oil clearance may damage the engine.

Tool



Specification for crankcase body and transmission system

Unit: mm

Items			Standard	Repair limit
Transmission	Gear hole	M5	28.000-28.021	28.04
Transmission	Gear hole	C1	24.007-24.028	24.04
Transmission	Gear hole	C2	31.000-31.025	31.04
Tansmission	Sleeve outer	M5, M6	27.959-27.980	27.94
Transmission	Sleeve outer	C2	30.970-30.995	30.94
Transmission	Sleeve outer	C3, C4	30.950-30.975	30.93
Transmission	Gear and sleeve	M5	0.020-0.062	0.10
Transmission	Gear and sleeve	C2	0.005-0.055	0.07
Tansmission	Sleeve inner	M5	25.000-25.021	25.04
Transmission	Sleeve inner	C2	28.000-28.021	28.04
Transmission system	Mainshaft diameter	Match with M5 shaft sleeve	24.967-24.980	24.96
Transmission system	Mainshaft diameter	Match with C2 shaft sleeve	27.967-27.980	27.95
Transmission	Sleeve and shaft	M5, C2	0.020-0.054	0.07
Fork and its	Fork shaft diameter		11.957-11.968	11.95
Fork and its	Fork inner diameter		12.000-12.018	12.03
Fork and its	Fork tip thickness		5.93-6.00	5.9

Trouble shooting

Difficult gearshift

- Improper clutch operation
- Improper oil thickness
- Fork distortion
- Fork shaft distortion
- Fork ratchet distortion
- Damage on guide groove of gearshift drum
- Gearshift arm distortion

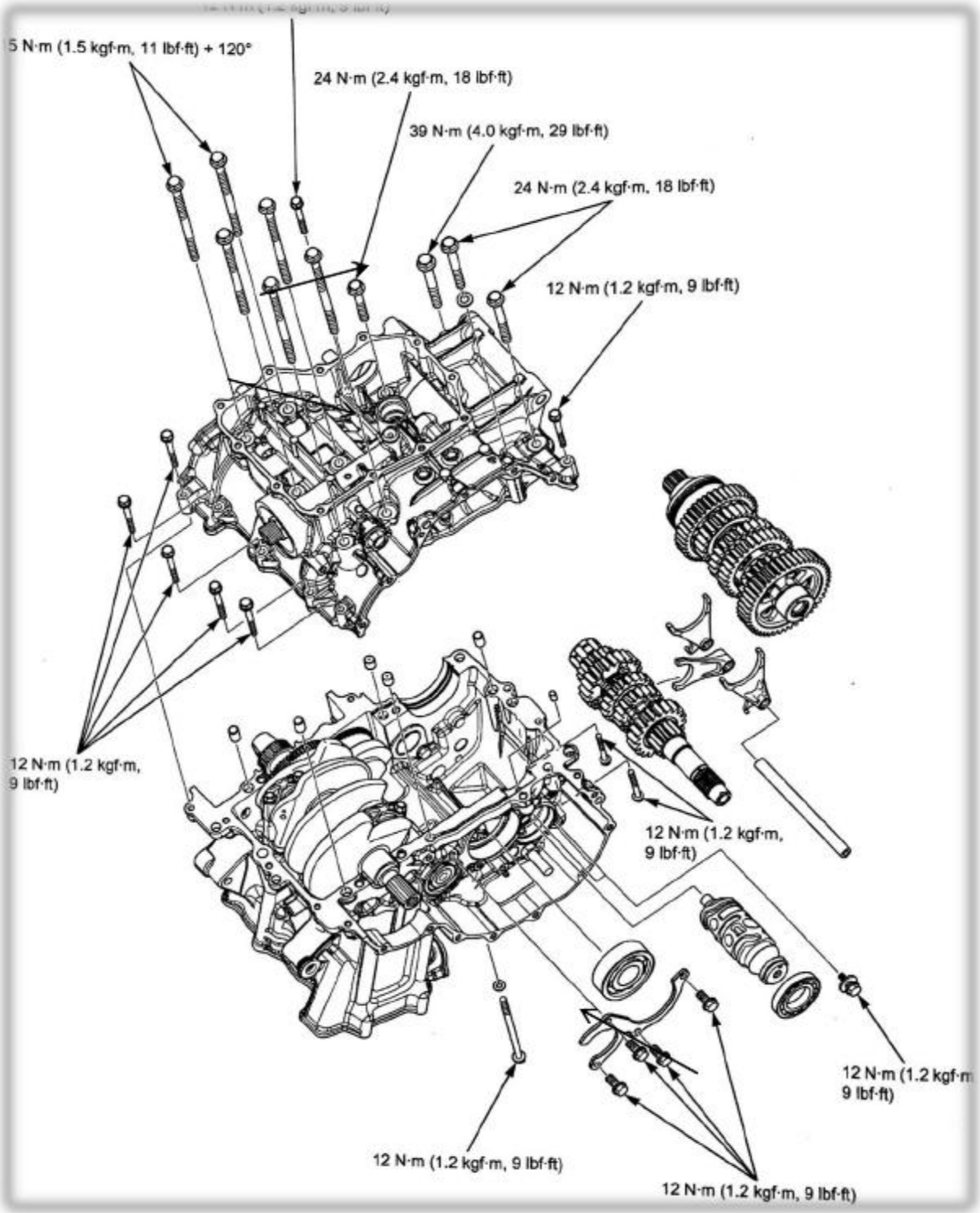
Gearshift system runout

- Gear abrasion
- Abrasion on guide groove of gearshift drum
- Gearshift fork shaft distortion
- Gearshift drum damage
- Turining spring of locating plate damaged
- Abrasion or distortion of gearshift fork
- Gearshift arm damaged

Noisy engine

- Abrasion or damage on transmission gear
- Abrasion or damage on transmission bearing

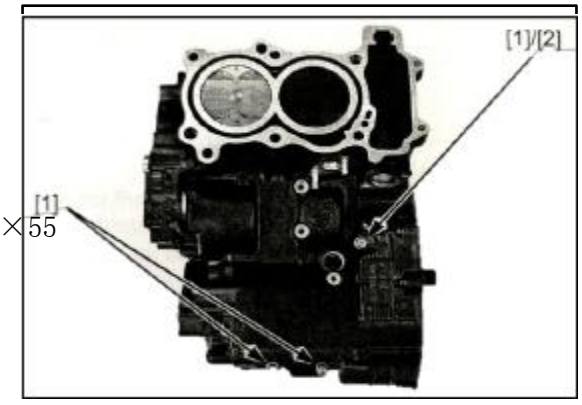
Components layout



Disassembly

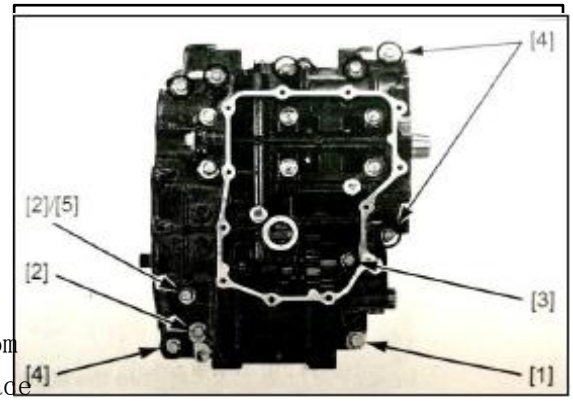
Remove the lower crankcase body(13-5).

Align the scale line on driving gear of balancing gear with contacting surface of crankcase body.



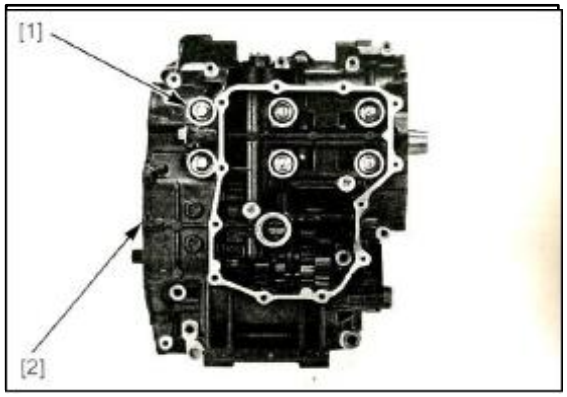
Lay the engine upside down.

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

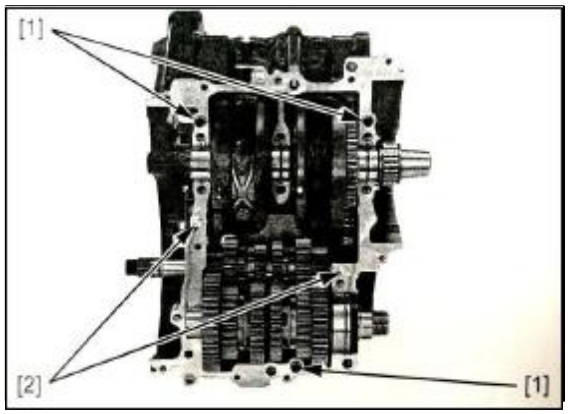


Loosen the bolts[1] of mainshaft on crankcase by 2 or 3 times and then remove.

Remove the lower crankcase body[2] from upper body(Pry up the contacting surface by screw driver is not allowed).



Remove the locating pin[1] and plug of oil passage.



Assembly

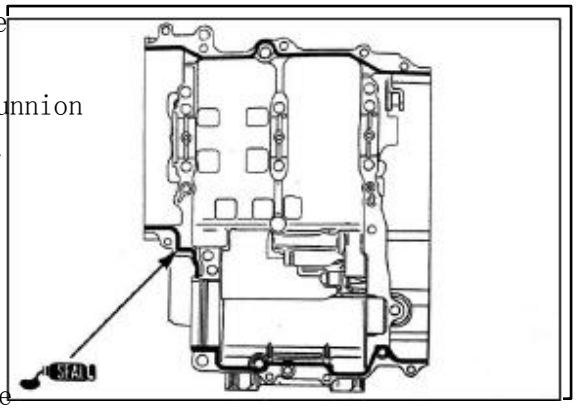
Wash up the contacting surface of upper and lower crankcase body and damage on contacting surface is not allowed.

Check if the oil passage of crankcase body blocked, and wash up when necessary.

Evenly spread seal glue on contacting surface of lower crankcase body as shown on right:

Caution:

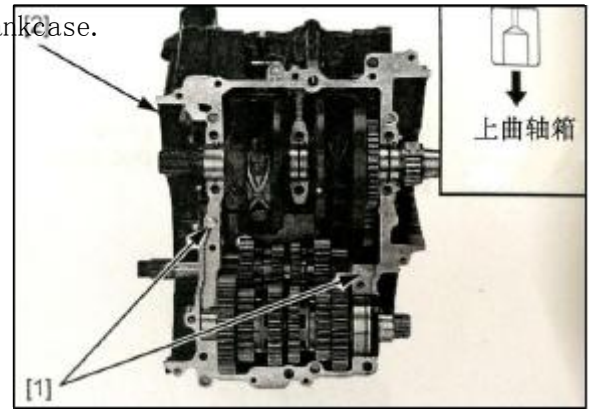
- Excessively spread the seal glue is not allowed.
- Coat the seal glue on mainshaft trunnion bolt or oil passage is not allowed.



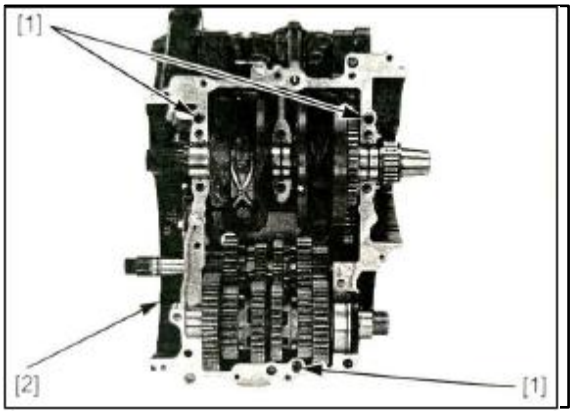
Wash up the oil passage plug.

Check if the oil passage plug blocked, and replace when necessary.

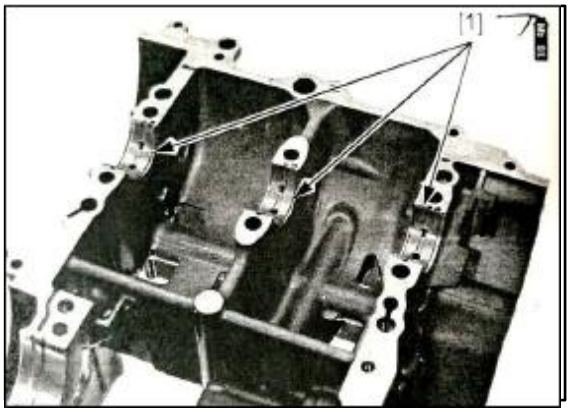
Assemble the oil passage plug[1] onto crankcase body[2], in which the surface with bigger hole diameter on upper crankcase.



Assemble the locating pin[1] onto upper crankcase body[2].

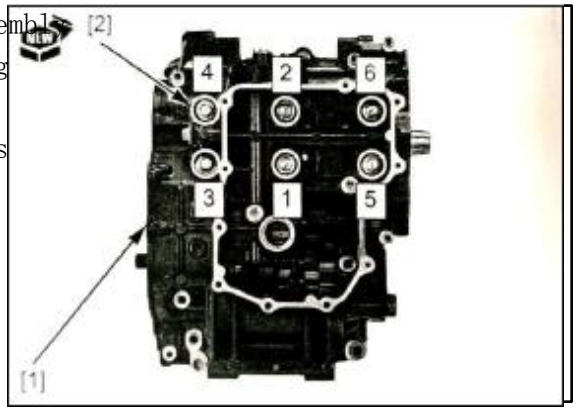


Coat the shaft pad[1] of mainshaft trunnion of upper and lower crankcase body with oil.



Assemble the lower crankcase body[1] onto upper case body.
Please use the new mainshaft trunnion bolt[2].
Caution:

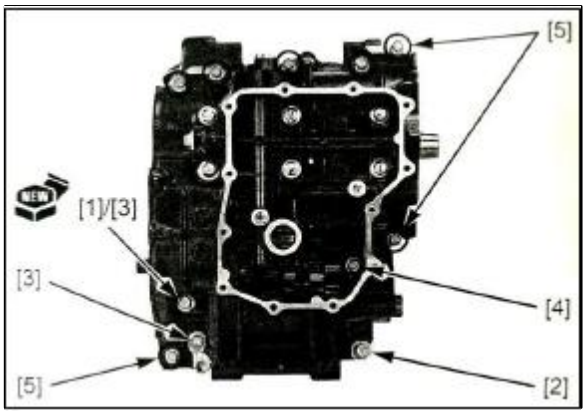
- Screw up the mainshaft trunnion bolts alternately.
- Adopt the used mainshaft trunnion bolt is not allowed due to incorrect axiel stress. Coat the bolts with oil before assembly
- for increasing its axial stretching stability, and wipe up the oil on the bolt surface when assembling is not allowed.



Confirm the firm installation of upper and lower crankcase body.
Screw up the mainshaft trunnion bolts to stipulated torque by 2 or 3 times as sequence in the picture.
Turn the mainshaft trunnion bolt by **120°** for further tightness.
Torque: **15N.m+120°**

Replace the flat washer and case bolts.
Screw up the case bolts to stipulated torqie by 2 or 3 times.
Caution:

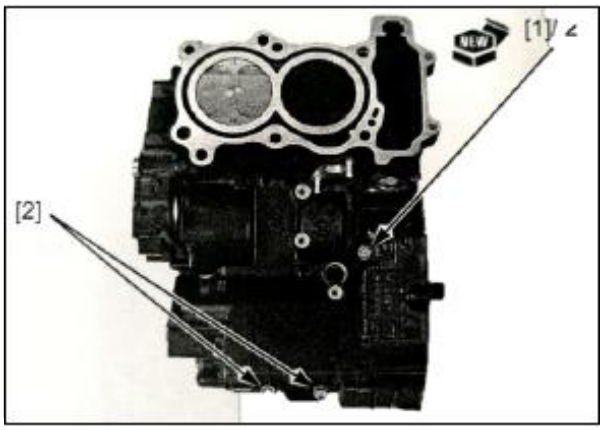
- Assemble the flat washer as shown[1].



Torque:
M10 Bolt[2]: **39 N.m**
M8×75 Bolt[3]: **24 N.m**
M8×55 Bolt[4]: **24 N.m**
M6 Bolt[5]: **12 N.m**

Lay the engine bottom face downwards.
Assemble the new flat washer and M6 case bolt.
Caution:

- The flat washer assemble as Shown[1].



Screw up the M6 bolt to the stipulated torque.
Torque: **12 N.m**

Assembly is opposite to disassembly.

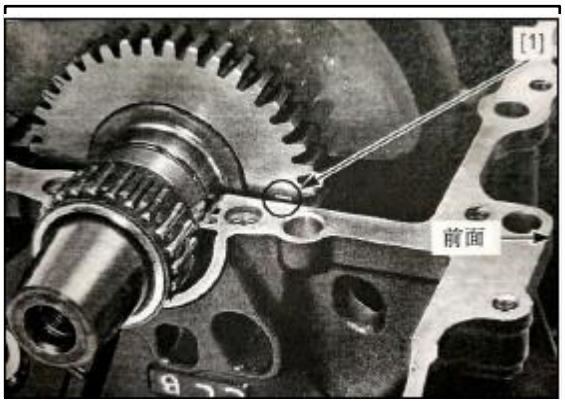
Crankcase body

Disassembly

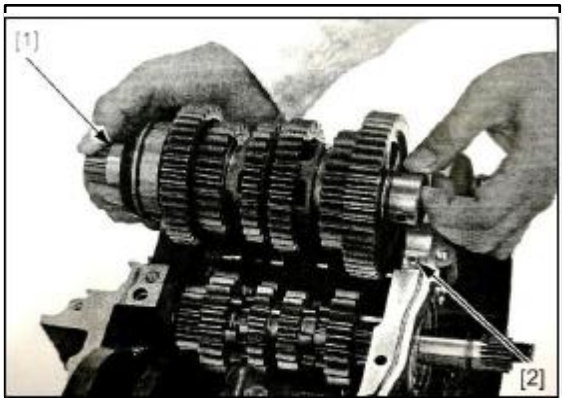
Breake up the upper and lower crankcase body.

Align the scale line[1] on balancing gear with the matching surface on crankcase body and face forwards.

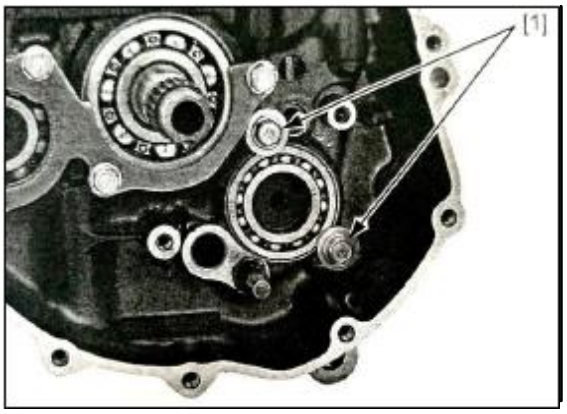
Remove the countershaft set[1] and pin shaft[2].

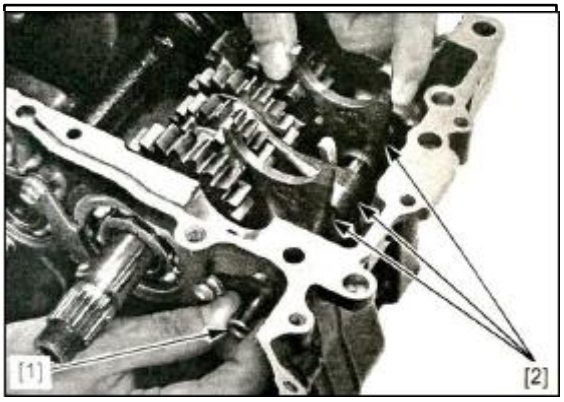


Remove the Limiting bolt[1] on gearshift drum bearing.



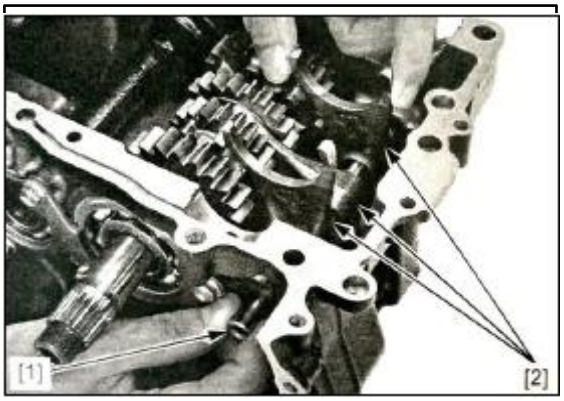
Remove the gearshift fork[2] and its shaft[1].



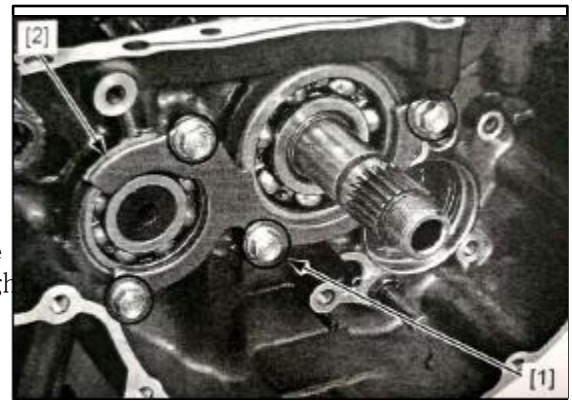


Remove the gearshift drum[1] and its bearing[2].

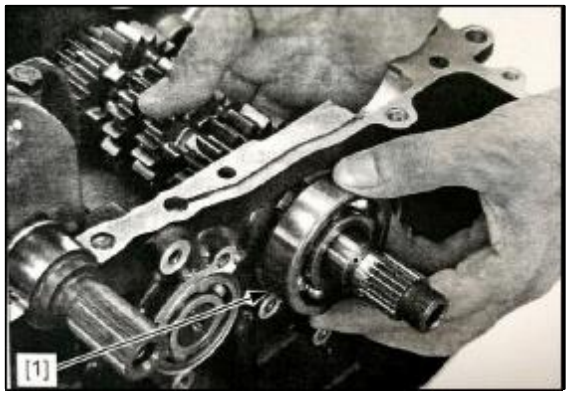
Remove the bolt[1] and mainshaft Bearing plate[2].



Slide the mainshaft on upper crankcase body and remove its bearing on the righ



Remove the mainshaft component.



Break up the mainshaft and countershaft components.

Caution:

- Lay the disassembled gear, collar, washer, and circlip in a special container in a line.
- Disassembling, expand it first, and push it out by the gear behind.

Expand the circlip over its limit is not allowed, when

Check

Check the scratch, damage, abnormal abrasion and distortion on the parts below, replace when necessary.

- Transmission gear
- Transmission shaft sleeve
- Transmission bearing
- Gearshift drum/Gearshift drum bearing
- Gearshift fork
- Gearshift fork shaft

Measure the size of each parts, and calculate the matching clearance according to the standard.

In case the matching clearance exceeded the limit, replace the part.

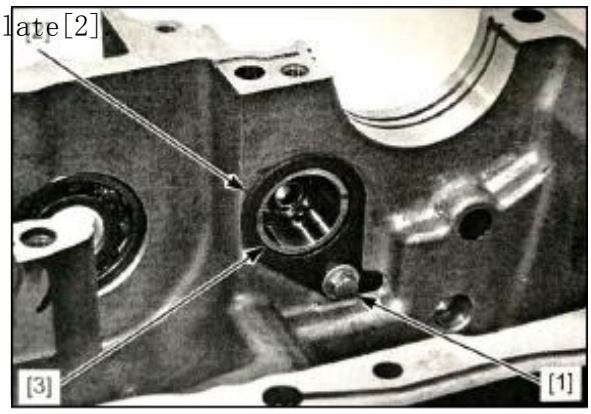
Replace the outer ring of mainshaft left bearing

Remove the parts below:

- Balancing shaft
- Piston

Remove the bolt[1] and bearing check plate[2]

Remove the outer ring[3] of mainshaft left bearing by special tool.

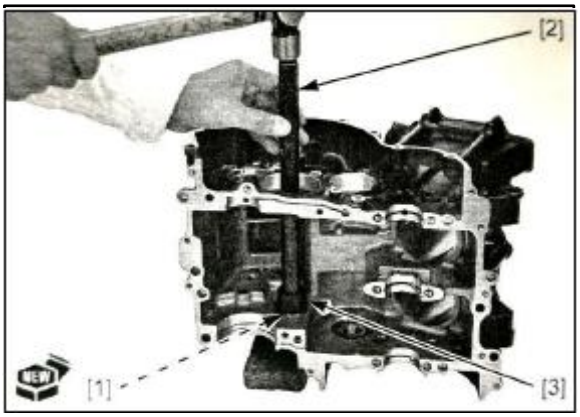


Knock the new bearing of mainshaft left bearing by tool until it is completely in its place in crankcase.

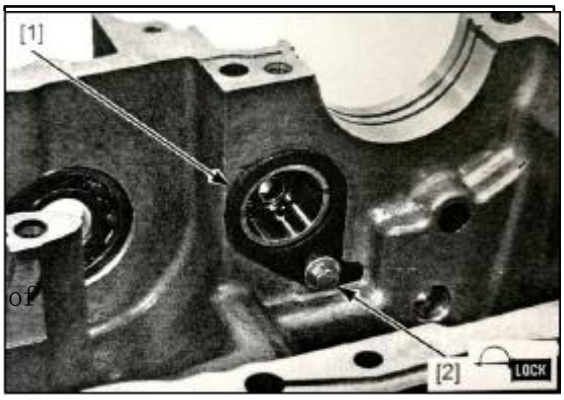
Tool:

Extension bar

Collar



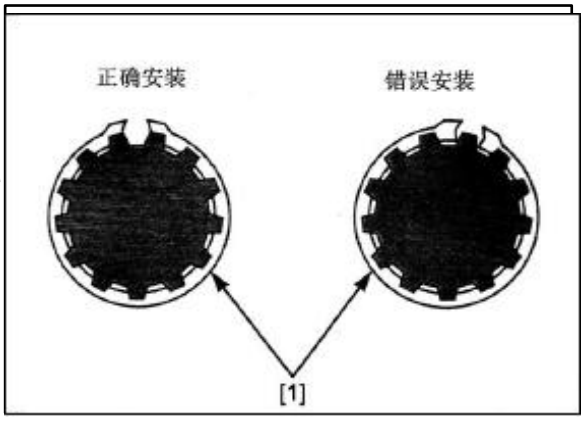
Coat the fastening glue on thread of bolt on bearing outer ring check plate.
Assemble the check plate of bearing outer ring and turn the bolt to stipulated torque.
Torque：12N.m
Assembly is opposite to disassembly.

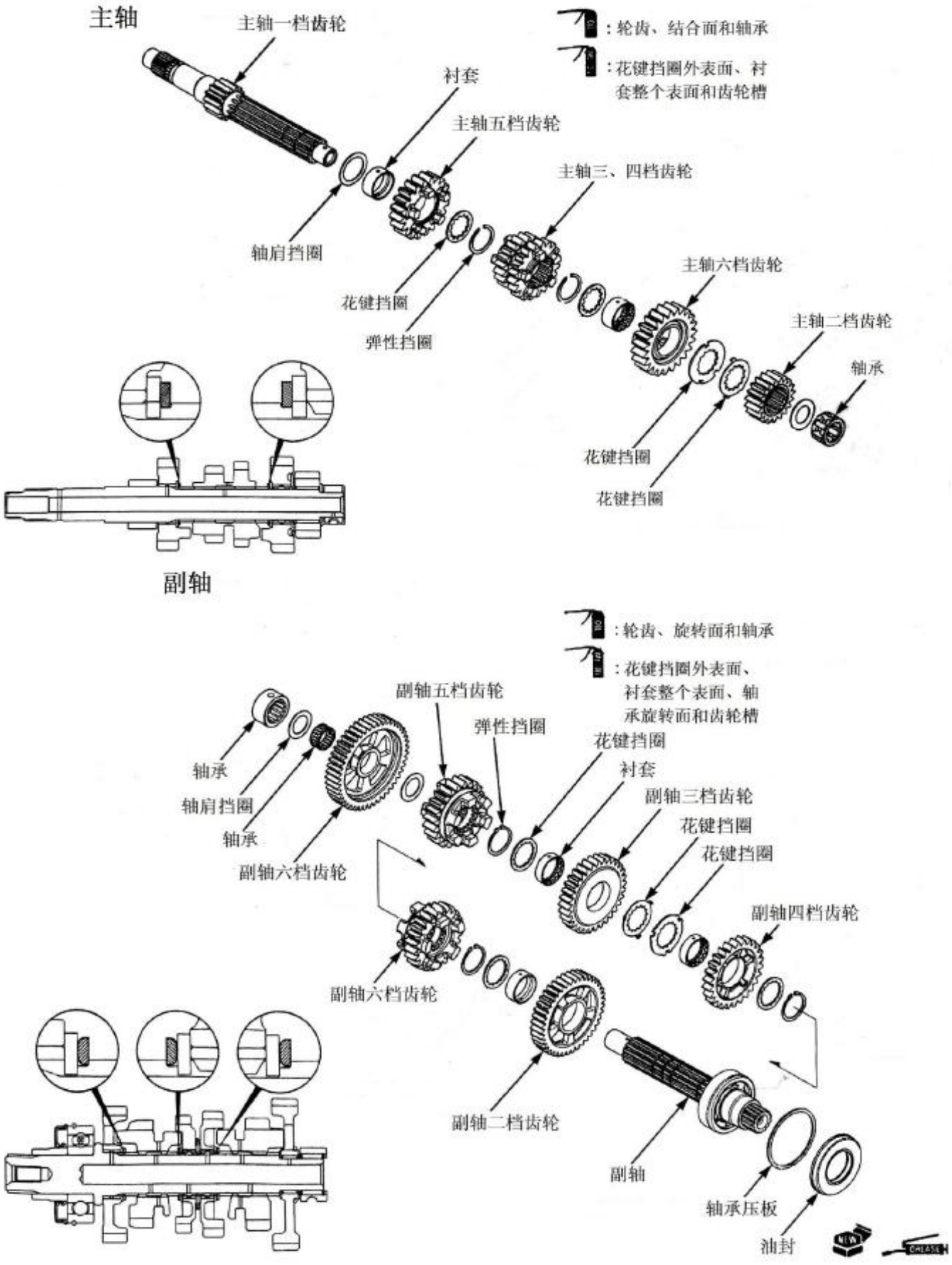


Assembly

Clean up all the parts by solvent and completely dry it up. Coat the surfaces of gear, turning, and bearing with oil.
Coat the surfaces of gear spline, gollar, turning area of needle bearing, and groove of gear box with oil.
Assemble the mainshaft and countershaft.
Cautionn：

- Coat each gear with oil and check their stable turning.
- Align the inner spline of spline washer with key groove.
- Assemble the thrust washer along axial thrust surface of gear.
- Align the opening with spline groove when assembling the circlip.
- Make sure the circlip is completely in the shaft groove after assembled.

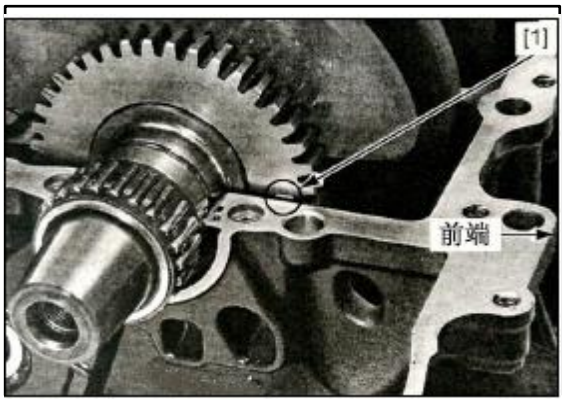



主轴
主轴一档齿轮
：轮齿、结合面和轴承
：花键挡圈外表面、衬套整个表面和齿轮槽
衬套
主轴五档齿轮
主轴三、四档齿轮
轴肩挡圈
花键挡圈
弹性挡圈
主轴六档齿轮
主轴二档齿轮
轴承
花键挡圈
花键挡圈
副轴
：轮齿、旋转面和轴承
：花键挡圈外表面、衬套整个表面、轴承旋转面和齿轮槽
副轴五档齿轮
弹性挡圈
花键挡圈
衬套
副轴三档齿轮
花键挡圈
花键挡圈
副轴四档齿轮
轴承
轴肩挡圈
轴承
副轴六档齿轮
副轴六档齿轮
副轴二档齿轮
副轴
轴承压板
油封
NEW
GREASE

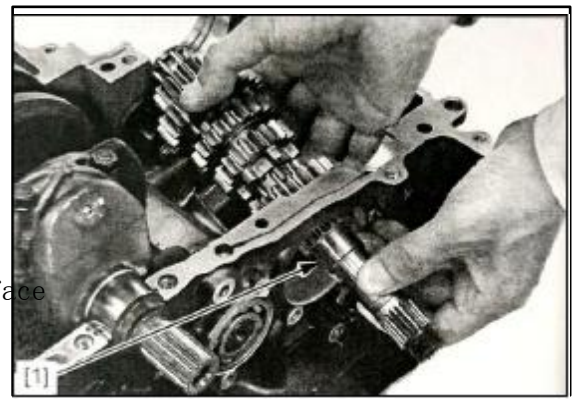
Assembly

Turn the crankshaft and make the upper scale line[1] on driving gear of balancing shaft align with crankcase matching surface and face forward.

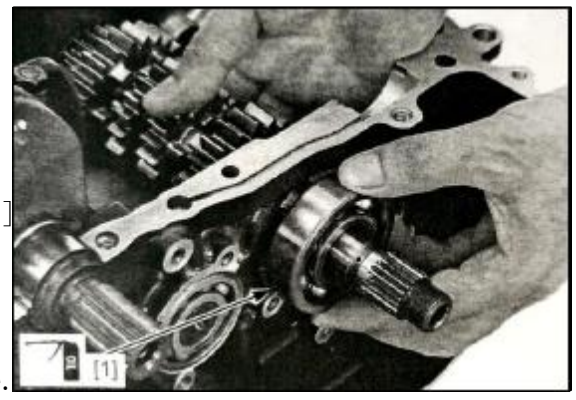
Assemble the mainshaft component[1] into crankcase body.

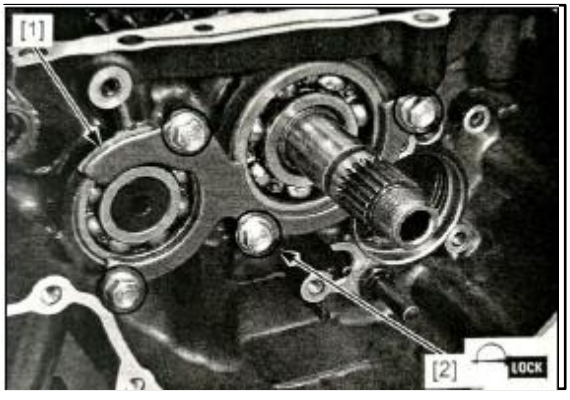


Coat the right bearing of mainshaft with oil, and assemble the bearing[1] into crankcase body, in which the surface with mark face outwards.

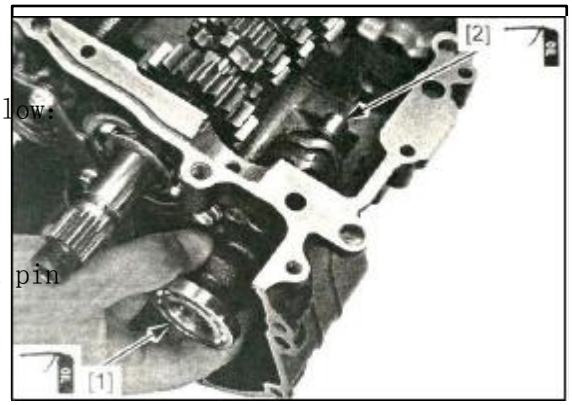


Assemble the mainshaft bearing plate[1] and the bolt[2], and coat the thread of bolt with fastening glue before assembling.
Screw up the bolt to stipulated torque.
Torque：**12N.m**

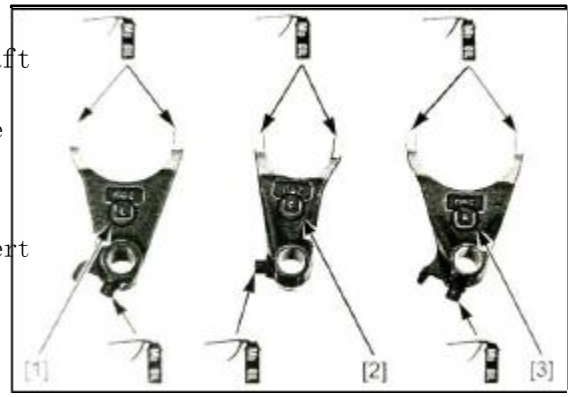




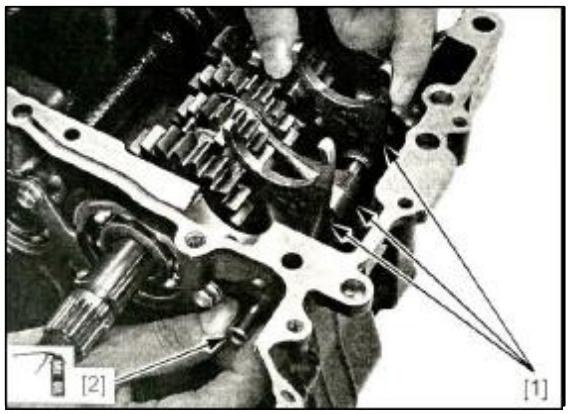
Coat the geartshift drum and its bearing with oil.
Assemble the gearshift drum bearing[1] onto the drum[2].
The side of gearshift drum with mark face outwards when assembling.
Assemble the gearshift drum and its bearing onto crankcase body as as set.



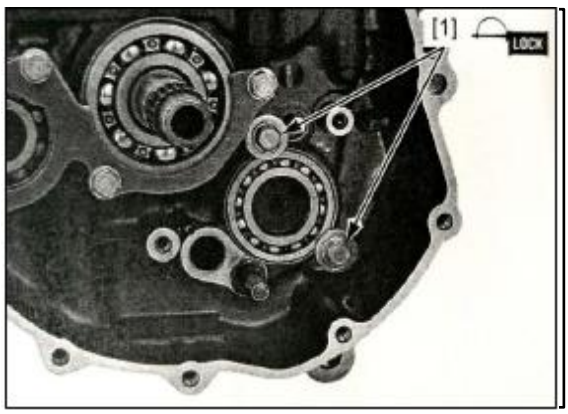
The gearshift fork is with the mark below:
“L” [1]: Left fork
“C” [2]: Middle fork
“R” [3]: Right fork
Coat the guiding area of fork and guid pin with oil.



Coat the surface of gearshift fork shaft with oil.
Assemble the fork[1] into gearshift groove (on the middle fork) and gearshift drum guide groove, and face the identification mark to the right side of engine, and insert the gearshift fork shaft[2].



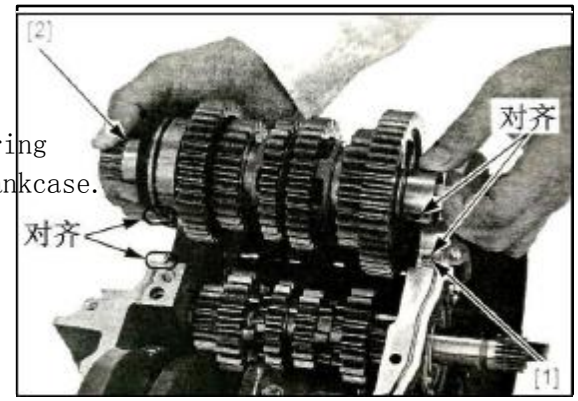
Coat the thread of bolt on gearshift drum bearing washer with seal glue.
Assemble the gearshift drum bearing washer and its bolt in place and turn to stipulated torque.
Torque：**12N.m**

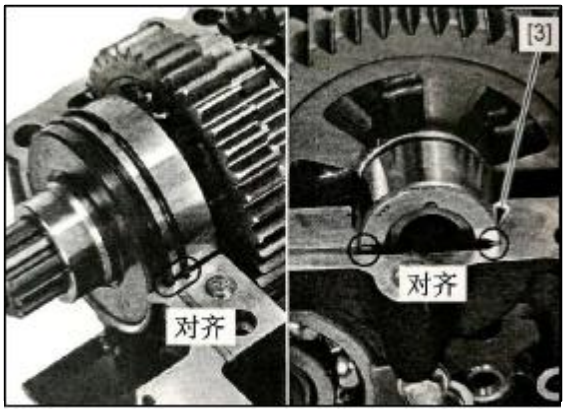


Assemble the dowel pin into upper crankcase body.
Assemble the countershaft into crankcase, meanwhile assembling the oil seal and check ring into groove inside the crankcase, and align the hole on outer edge of needle bearing with dowel pin.
Caution:

- Make sure the

  identification line on needle bearing
  align with matching surface of crankcase.
  Assemble the crankcase body.





9
Crankshaft, piston, cylinder and balancing shaft

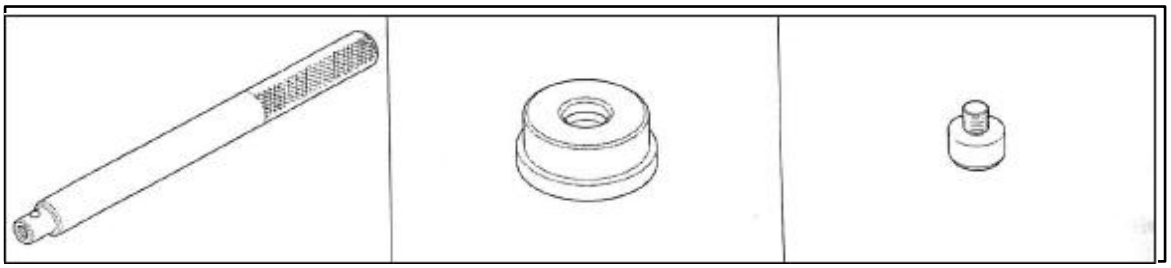
Summary

The crankcase must break up when maintaining the crankshaft, balancing shaft, cylinder, piston, connecting rod and nozzle, whose breaking way refer to crankshaft chapter.

Make mark on the bigger end of connecting rod, connecting rod cover and shaft pad, and then well stored for ensuring its correct re-assembly.

Match the crankshaft pin and mainshaft trunnion pad according to corresponding color, and select the shaft pad by color. After new shaft pad selected, confirm the oil film gap by plastic plug gauge, and make sure the oil film gap won't lead to engine worn out.

Tool



Specification of crankshaft, piston, cylinder and balancing shaft

Unit：mm

Items			Standard	Repair limit
Crankshaft	Gap on connecting rod bigger end		0.05-0.20	0.25
	Gap between bigger end and		0.030-0.052	0.06
	Gap between trunnion and pad		0.017-0.035	0.05
	Runout		—	0.05
Cylinder	Cylinder diameter		67.000-67.015	67.10
	Out off roundness		—	0.10
	Taper		—	0.10
	Flatness		—	0.10
Pistion, piston pin and piston ring	Basic circle diameter of piston		66.970-66.990	66.905
	Pin hole diameter		16.002-16.008	16.02
	Piston pin diameter		15.994-16.000	15.98
	Gap between piston and its pin		0.002-0.014	0.04
	Piston ring closing gap	1st ring	0.10-0.20	0.4
		2nd ring	0.21-0.31	0.5
		Oil ring	0.20-0.70	1.0
	Gap between piston ring and	1st ring and groove	0.030-0.060	0.10
		2nd ring and groove	0.015-0.050	0.08
Cylinder matching gap			0.010-0.045	0.10
Connecting rod small end and inner diameter			16.030-16.044	16.05
Matching gap between connecting rod and its pin			0.03-0.05	0.07

Trouble shooting

Low cylinder pressure, difficult starting or poor low speed performance

- Air leakage of cylinder gasket
- Piston ring damage, jamming or worn out
- Cylinder/Piston damaged or worn out

Cylinder high pressure, overheat or knocking

- Too much carbon buildup on piston top or in combustion chamber

Too much tail gas

- Cylinder, piston or its ring damaged or worn out
- Incorrect piston ring assembly
- Scratch on piston or cylinder wall

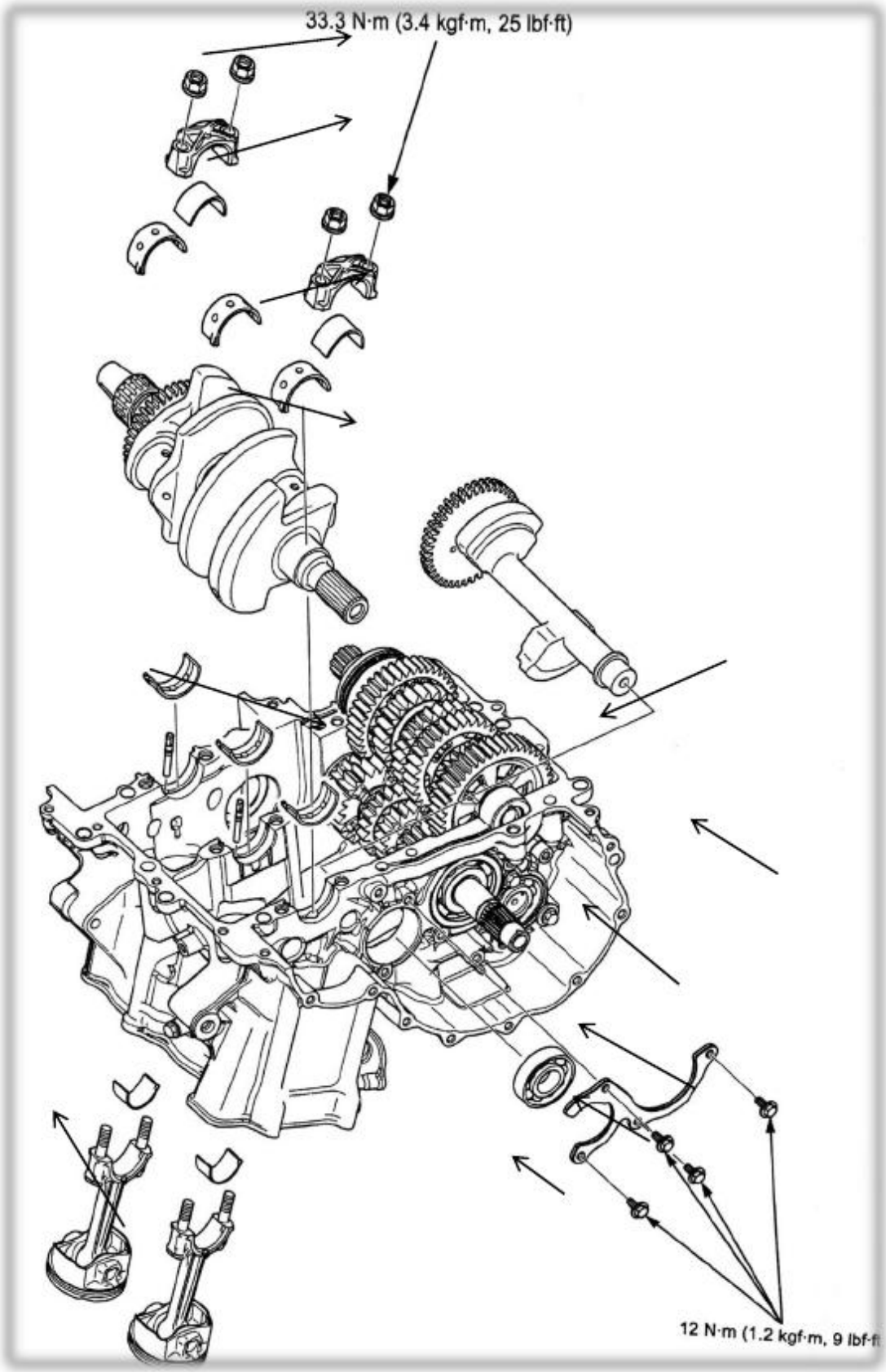
Engine abnormal noise

- Piston pin or its hole worn out
- Small end of connecting rod worn out
- Cylinder body, piston or its ring worn out
- Shaft pad of crankshaft pin worn out

Engine shocking

- Crankshaft strong runout

Components layout



Check the gap on sides

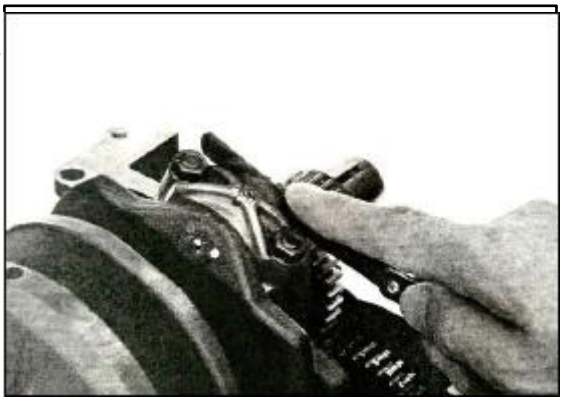
Break up the upper and lower crankcase body.

Measure the side gap of connecting rod.

Maintenance limit：**0.25mm**。

In case the gap exceeded the maintenance limit, replace the connecting rod.

Confirm again the side gap, in case exceeded still, replace the crankshaft.



Remove

Caution：

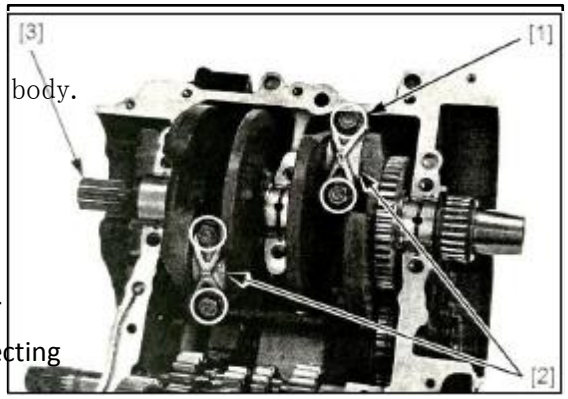
Change the pads position is not allowed. Shaft pads must be at its initial position, or the correct oil film gap may damage and then damage the engine.

Break up the upper and lower crankcase body.

Mark up the connecting rod cover and shaft pads for ensure re-assembly.

Remove the connecting cover[2] and its nut[1].

Damage on crankshaft pin, mainshaft trunnion and shaft pads is not allowed. In case the cover is hard to be removed, slightly knock the connecting rod side. Remove the crankshaft[3].



Caution：

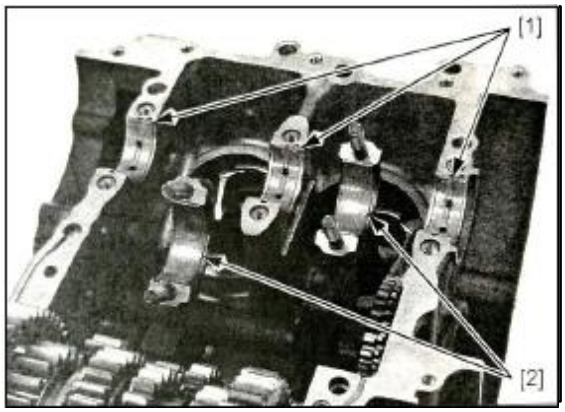
Push the piston to upper stopping point for preventing damage the crankshaft pin.

Remove the mainshaft trunnion pad[1] from upper and lower crankcase body.

Remove the crankshaft pin pad[2] from bigger end and cover of connecting rod.

Caution：

Change the pads position is not allowed. Shaft pads must be at its initial position, or the correct oil film gap may damage and then damage the engine.



Check

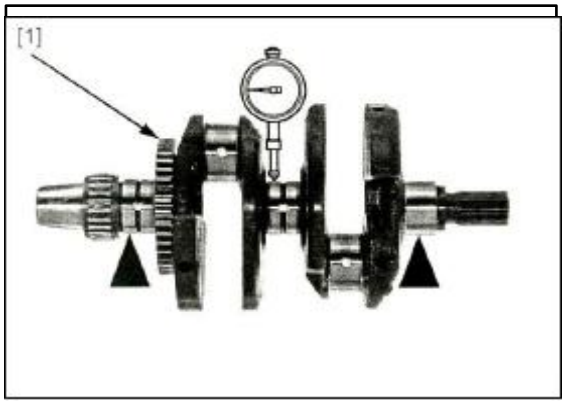
Hold the trunions on both sides of crankshaft.

Lay a micrometer on the middle trunnion which avoids the oil groove and oil hole.

Turn the crankshaft by 720°, and read the runout

Maintenance limit: **0.05 mm**

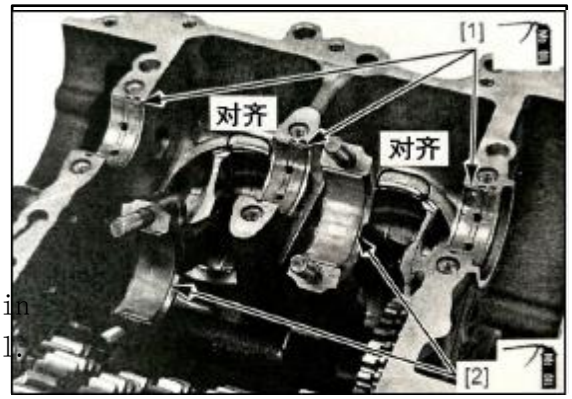
Check the abnormal abrasion or damage on driving gear[1] of balancing shaft.



Assembly

Assemble the trunnion pad[1] and pin pad[1] to their original position.

- Mainshaft trunnion pad
- Crankshaft pin pad



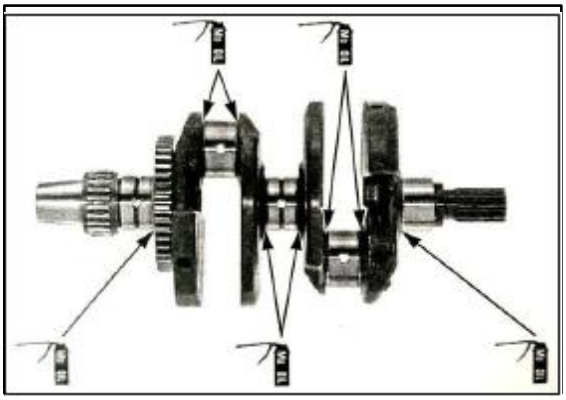
Caution:

Change the pads position is not allowed. Shaft pads must be at its initial position, or the correct oil film gap may damage and then damage the engine.

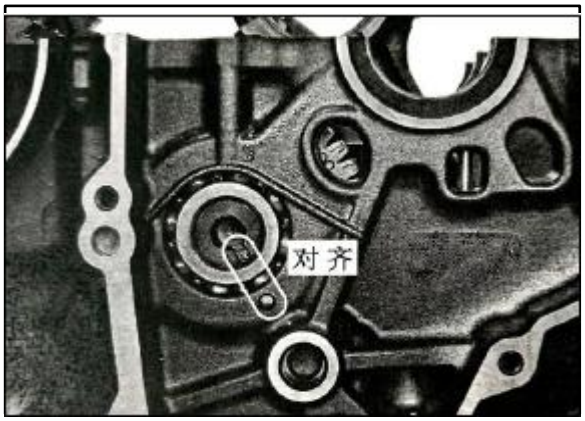
Coat the inner surface of crankshaft pin pad and mainshaft trunnion pad with oil.

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

Coat the thrust surface of crankshaft with oil as shown.

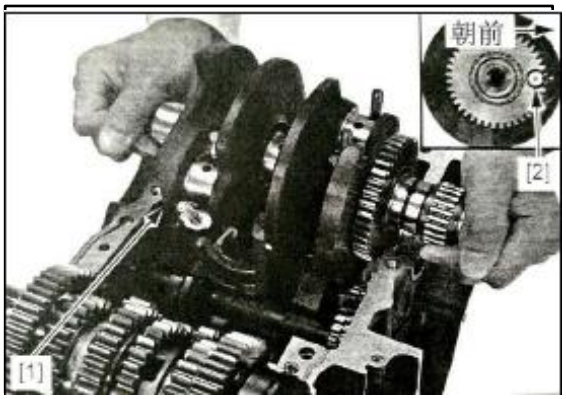


Align the groove on balancing shaft end with protrusion on crankcase.

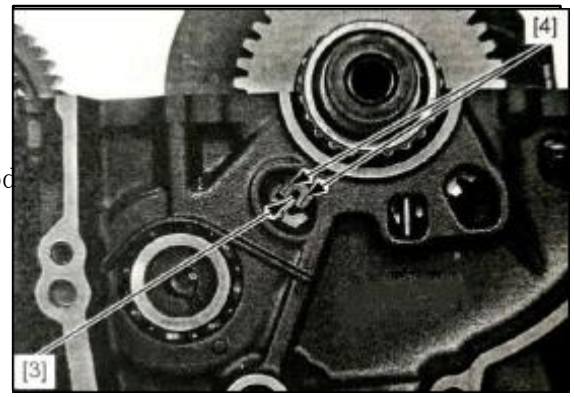


Lay the crankshaft[1] above crankcase, and the mark [2] “△” on driving gear of balancing shaft face forwards of engine, and lay the crankshaft pin into bigger end of connecting rod(damage on crankshaft pin, mainshaft trunnion and pads is not allowed).

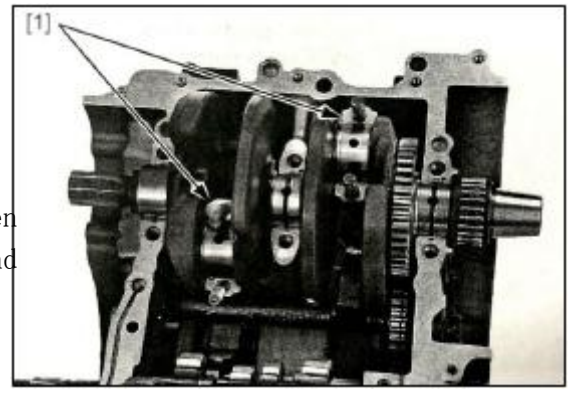
Assemble the crankshaft into crankcase, make sure the indication line[3] of driven gear on balancing shaft is between indication lines[4] of driving and driven gear of balancing shaft as shown when assembling.



Put the bigger end[1] of connecting rod into crankshaft pin.



Clean up the contacting surface between Bigger end and cover connecting rod and Dry up by compressed air.

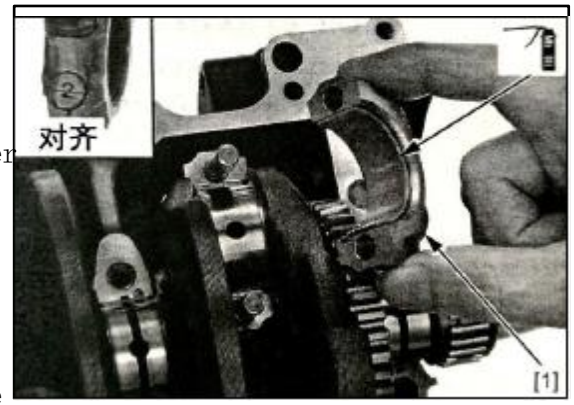


Coat the inner surface of crankshaft pad on connecting rod cover with oil.

Match the letter code of inner diameter on cover and bigger end of connecting rod for assembling the connecting rod cover[1].

Caution:

Make sure each parts are at original position when disassembling.

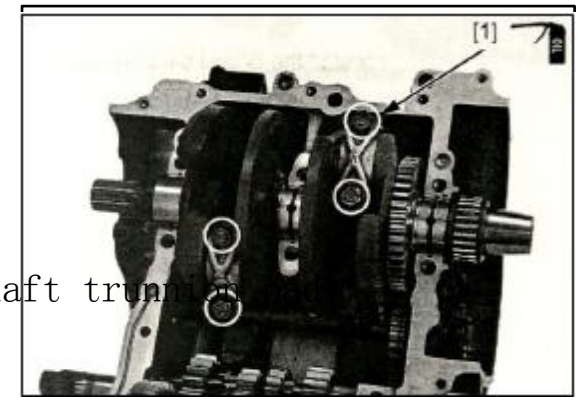


Coat the thread of connecting rod cover nut and its seat with oil.

Assemble and fasten the nut[1] of connecting rod cover by 2 or 3 times alternately to stipulated torque.

Torque：**33N・m**

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



Mainshaft trunnion

Caution:

Change the pads position is not allowed. Shaft pads must be at its initial position, or the correct oil film gap may damage and then damage the engine.

Check the shaft pad

Remove the crankshaft.

Check the stripping or abnormal abrasion of shaft pads[1] of mainshaft trunnion.

Check if there is damage on protrusion[2] on shaft pads.

In case the shaft pad on mainshaft trunnion damaged, replace for a new one.

Check the oil clearance

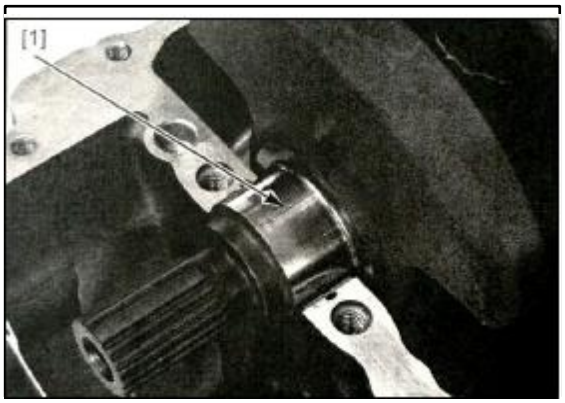
Remove the crankshaft

Wipe up the oil on pads and mainshaft trunnion.

Assemble the crankshaft into the crankcase.

Lay a plastic gap gauge[1] vertically on each mainshaft trunnion which avoid the oil hole.(Turn the crankshaft is not allowed when checking the oil clearance).

Assemble the positioning pin[1] into upper crankcase[2].



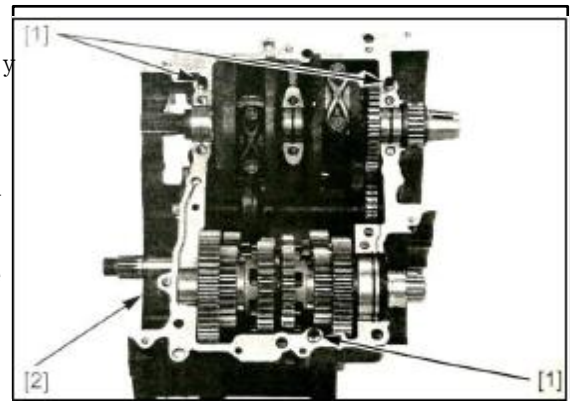
Assemble the lower crankcase[1] onto the upper crankcase.

Clean up the case joint bolt(repeatedly use) of mainshaft trunnion by solvent and completely dry up.

Coat the thread of case joint bolt and its seat surface with oil.

Assemble the case joint bolt[2] of the mainshaft trunnion.

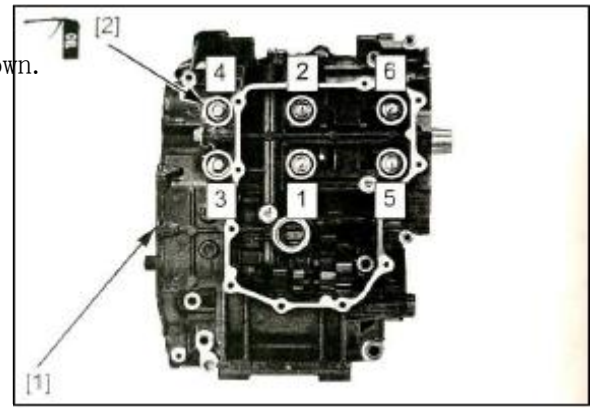
Make sure the firm installation of upper and lower crankcase.



Alternately turn the joint bolts by 2 or 3 times to stipulated torque as shown.

Further turn by **120°** for fastening the case joint bolt.

Torque：**15N.m+120°**

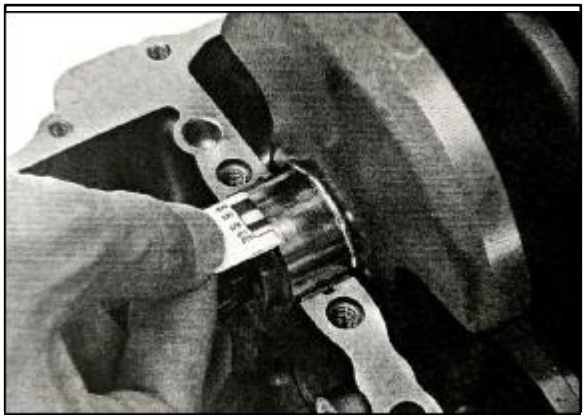


Remove the joint bolts and lower crankcase.

Measure the biggest width of plastic gap gauge which squeezed by mainshaft trunnion for confirming the oil gap.

Maintenance limit：**0.05 mm**

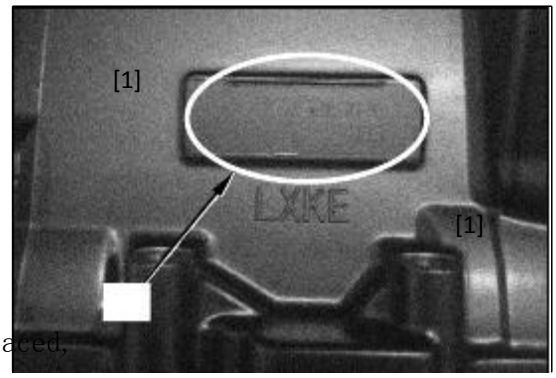
In case the oil gap exceeded the maintenance limit, replace for new shaft pad.



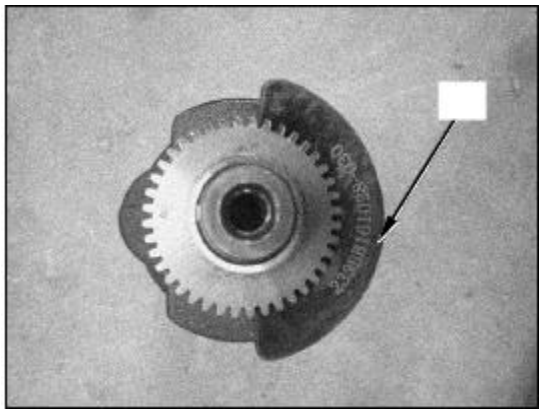
Select the shaft pad

Record the installation of shaft pad on the left of upper crankcase

The letter number[1] for inner diameter of hole as shown, and the letter A,B,or C on the left of crankcase stands for sequence from left to right of inner diameter number of hole for shaft pad installation.



In case the crankshaft need to be replaced, record the corresponding number[1] on weight piece of crankshaft(the number on weight piece(1, 2 or 3) standsf for the outer diameter number of mainshaft trunnion from left to right).



Select the replaceable pad colour[1] according to installation hole number of mainshaft trunnion and pad.

The thickness of mainshaft trunnion pad:

A: Black:

B: Brown:

C: Green:

D: Yellow:

E: Pink:

Thick

Thin

Matching table of mainshaft trunnion pad:

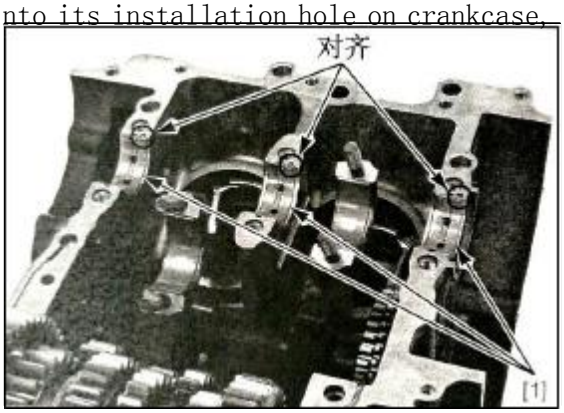
			Inner diameter number of shaft pad installation hole		
			A	B	C
			37.000-37.006 mm (1.4567-1.4569 in)	37.006-37.012 mm (1.4569-1.4572 in)	37.012-37.018 mm (1.4572-1.4574 in)
Outer diameter number of mainshaft trunnion	1	34.000-34.006 mm (1.3386-1.3388 in)	E (Pink)	D (Yellow)	C (Green)
	2	33.994-34.000 mm (1.3383-1.3386 in)	D (Yellow)	C (Green)	B (Brown)
	3	33.988-33.994 mm (1.3381-1.3383 in)	C (Green)	B (Brown)	A (Black)

Caution: After new pad selected, re-check the gap by plastic gap gauge.

Shaft pad installation

Clean up outer surface of shaft pad and installation hole of crankcase.

Assemble the mainshaft trunnion pad[1] into its installation hole on crankcase, and align each protrusion and groove.



Pad of crankshaft pin

Caution:

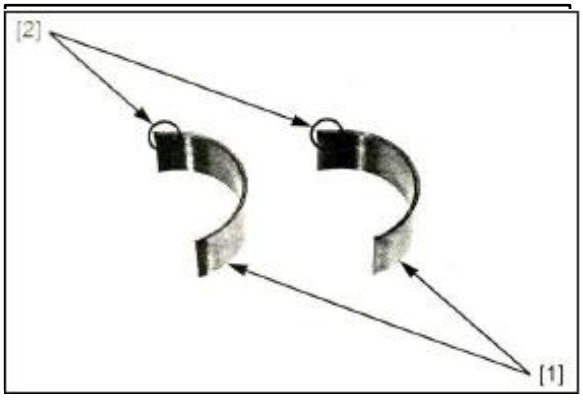
Change the position of shaft pad is not allowed. The pad must be assembled on its initial position, or the correct oil film gap may damage and lead to engine failure.

Remove the crankshaft

Check the abnormal abrasion or stripping of crankshaft pin pad[1].

Check if the protrusion[2] of the pad damaged.

In case the crankshaft pin pad damaged, select and replace the shaft pad.

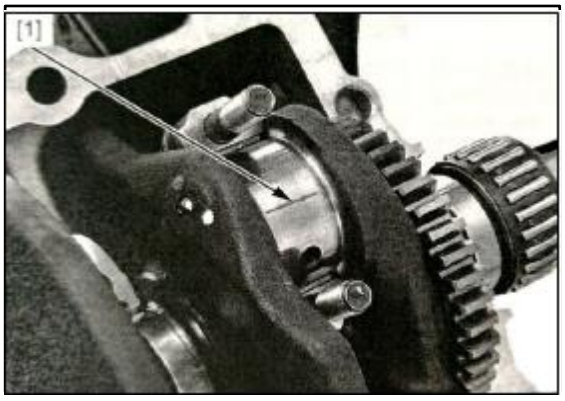


Check the oil clearance

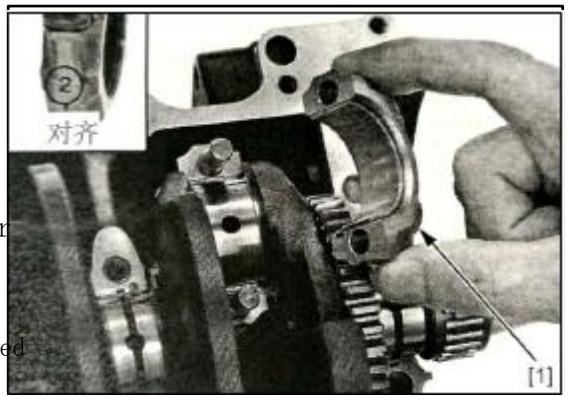
Remove the crankshaft（14-4 ）

Wash up the contacting surface between the bigger end and the cover of the connecting rod, and dry up by compressed air.

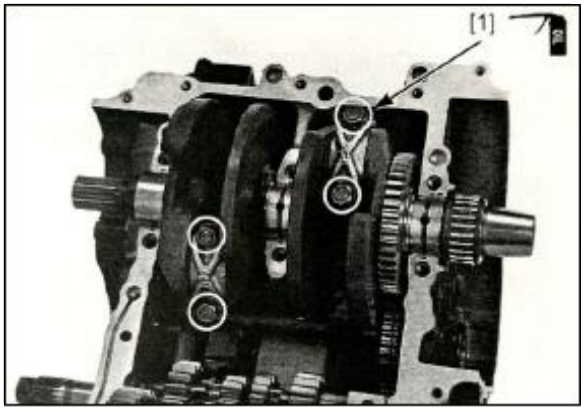
Wipe up all the oil on the pad and crankshaft pin.
Assemble the crankshaft into upper crankcase (14-5).
Assemble the bigger end of connecting rod into crankshaft pin.
Lay a plastic gap gauge[1] vertically on each mainshaft trunnion and avoid the oil hole(Turn the crankshaft is not allowed when checking the oil clearance).



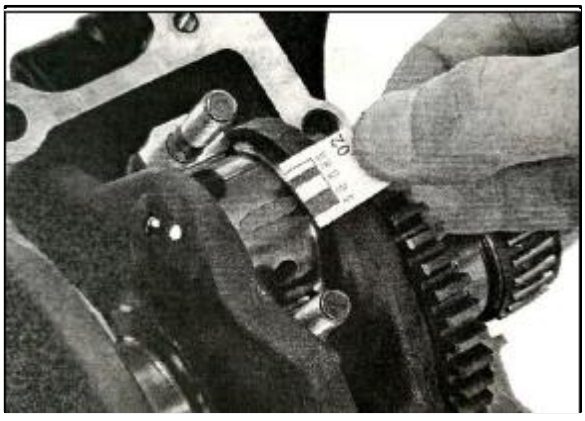
Assemble the connrecting rod cover[1] through matching the letter numbers of inner diameter the bigger end and cover of connecting rod.
Caution:
Ensure each part assembled on its Initial position which same with marks when disassembling.



Coat the thread of connecting rod cover nut and its seat with oil.
Assemble and fasten connecting rod cover Nut[1], and alternately fasten to stipulated torque by 2 or 3 times.
Torque: **33N.m**
Remove the connecting rod cover.

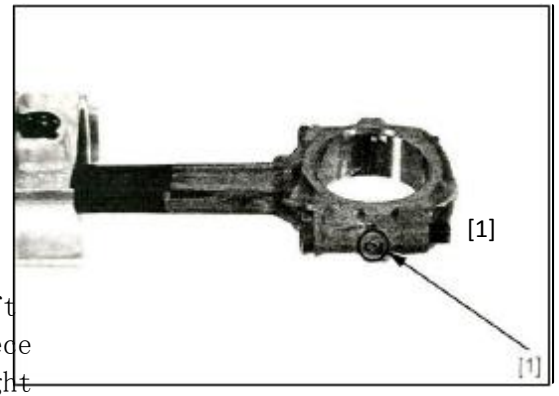


Confirm the oil clearance by measuring squeezed gap gauge on each crankshaft pin.
Maintenance limit: **0.06mm**
In case the oil clearance exceeded the maintenance limit, select the correct shaft pad and replace.

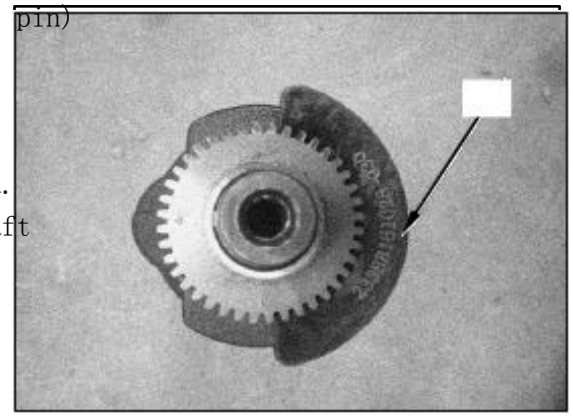


Select the shaft pad

Record the letter number at inner diameter of bigger end of connecting rod(The numners 1,2, or 3 on bigger end of connecting rod stands for the number of inner diameter of the connecting rod bigger end), of assemble the connecting rod cover on the rod, without pad measured inner diameter.



In case the crankshaft need to be replaced, record the corresponding number[1] on weight piece of crankshaft (The letter A,B,or C on the weight piece Stands for the sequence of left to right Of outer diameter number of crankshaft pin)



In case the crankshaft repeatedly used. Measure the outer diameter of crankshaft Pin by micrometer.

Select the replaceable pad colour[1] according to installation hole number of mainshaft trunnion and pad.
The thickness of mainshaft trunnion pad:

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

Thick

Thin

Matching table of mainshaft trunnion pad:

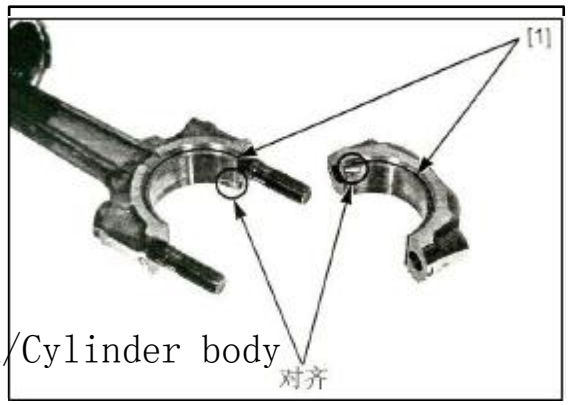
			Inner diameter number of bigger end of connecting rod		
			1	2	3
			39.000-39.006 mm (1.5354-1.5357 in)	39.006-39.012 mm (1.5357-1.5359 in)	39.012-39.018 mm (1.5359-1.5361 in)
Outer diameter	A	35.994-36.000 mm (1.4171-1.4173 in)	E (Yellow)	D (Green)	C (Brown)
	B	35.988-35.994 mm (1.4168-1.4171 in)	D (Green)	C (Brown)	B (Black)
	C	35.982-35.988 mm (1.4166-1.4168 in)	C (Brown)	B (Black)	A (Blue)

Caution: After new pad selected, re-check the gap by plastic gap gauge

Shaft pad installation

Clean up the outer surface of shaft pad, bigger end and cover of connecting rod.

Assemble the pad[1] of crankshaft pin into the bigger end and cover of connecting rod, and align each protrusion and groove.



Piston/Cylinder body

Remove the piston/Connecting rod assy.

Caution:

- Before removing the piston, bind a clean non-fiber clotch on the bigger end of connecting rod for preventing damage the cylinder liner.

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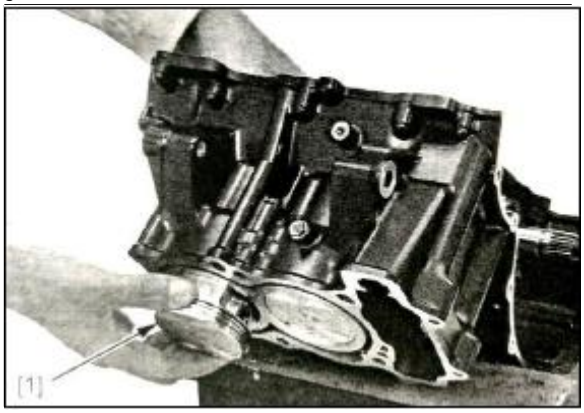
- Take out piston/connecting rod set from the bottom of cylinder is not allowed, which may seized by joint of cylinder liner and upper crankcase

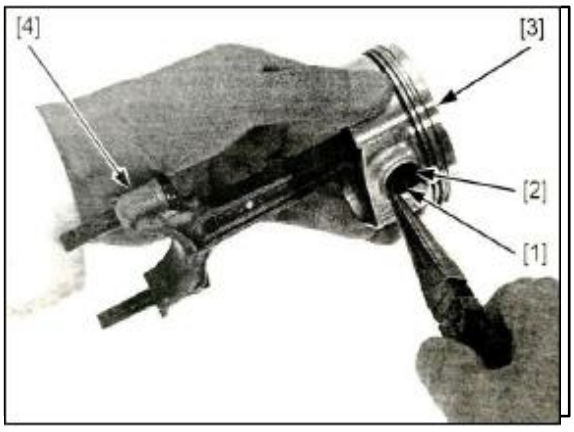


- Change the pads position is not allowed. Shaft pads must be at its initial position, or the correct oil film gap may damage and then damage the engine.

Remove the parts below:

- Balancing shaft
- Crankshaft

Take out the piston/connecting rod from the cylinder top as a set[1].



Remove the piston

Remove the steel circlip[1] by nipper.

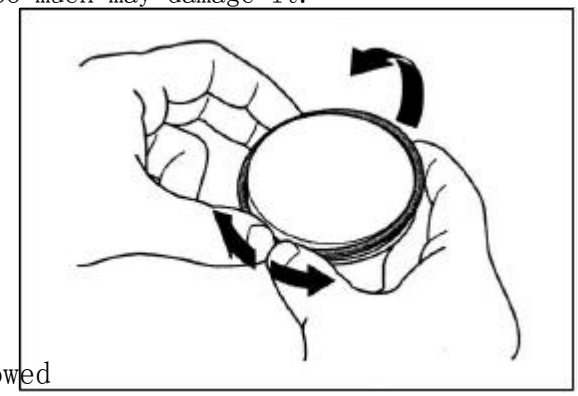
Push out the piston[3] and its pin[2] from the smaller end of connecting rod, and remove the piston.

Remove the piston ring

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

Caution:

- Separate the end of piston ring too much may damage it.

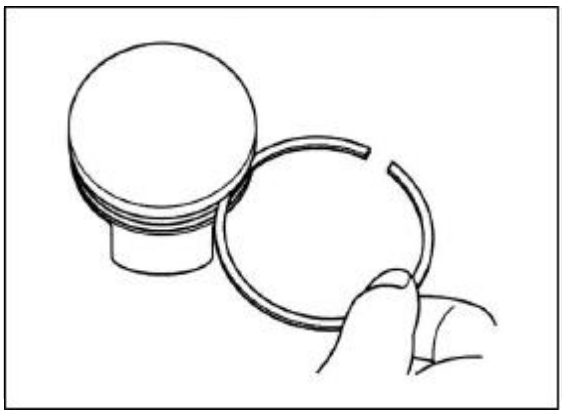


- Scrape the piston when removing Its ring is not allowed.

Clean up the carbon buildup in the groove by old piston ring.

Caution:

- Use the steel brush is not allowed for avoiding damage the piston ring.



Check

Check the scratch, damage, abnormal abrasion, distortion, burning out or oil passage block on parts below.

- Cylinder body
- Piston
- Piston ring
- Piston pin
- Smaller end of connecting rod

Calculate the clearance according to technology specification on the basis of measurement for each part such as crankshaft/piston/cylinder body/balancing shaft.

Any parts exceeded the maintenance limit shall be replaced.

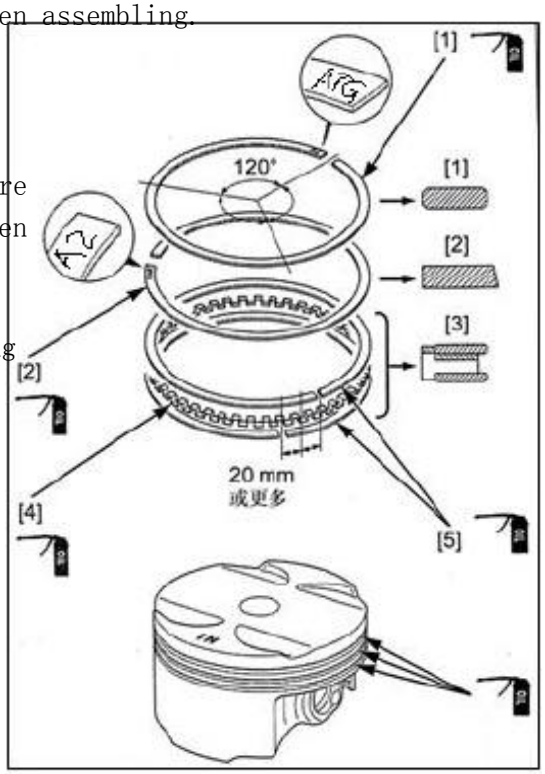
Piston ring assembly

Completely clean up the piston ring groove before assembling.

- Coat the piston ring surface and the groove with oil.

- Damage the piston and its ring when assembling is not allowed.

- The side with mark face upwards when assembling.



- “ATG”：1st ring[1]。
- “A2”：2nd ring[2]。

- Assemble linner ring[4] first before Assembling oil ring set[3], and then the scratch ring[5]

The openings of piston ring mutually cross by 120°, and stagger the opening of scratch ring.

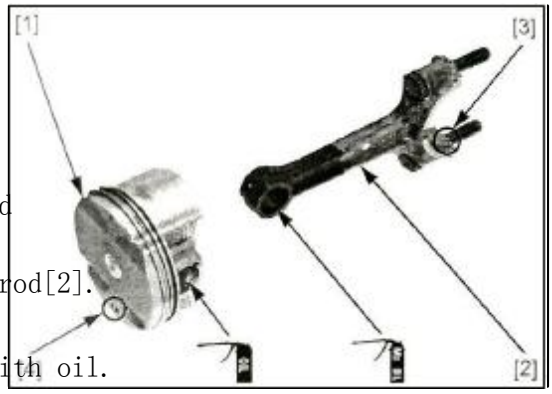
Piston assembly

Assemble the crankshaft pin pad on its Initial position(page 14-13)

Coat the inner surface of piston pin hole with oil.

Coat the inner surface of smaller end of connecting rod with oil.

The protrusion[3] of crankshaft pin pad face to “IN” mark[4] on piston when matching the piston[1] and connecting rod[2].



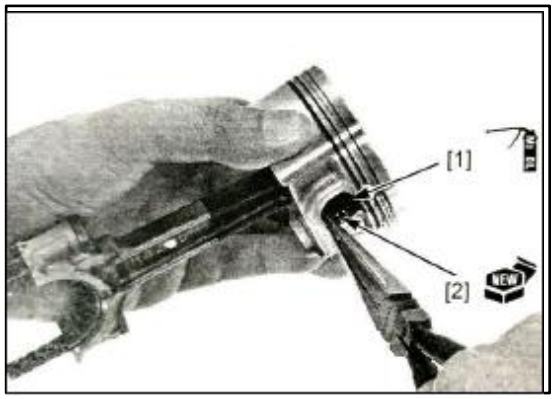
Coat the outer surface of piston pin with oil.

Assemble the piston pin[1] and fix by new steel wire circlip[2].

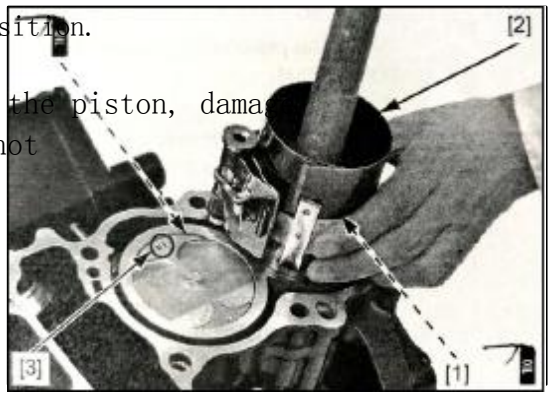
Caution：

- Ensure assemble the circlip in
- place.

  Align the openings on circlip and piston ring is not allowed.



Coat the cylinder wall and piston thrust surface with oil.
Adopt the piston ring compressing tool bought from market,
Assemble the piston/connecting rod set[1] into cylinder(The “IN” mark on piston face to air inlet direction when assembling piston/connecting rod set).
When assembling the re-used connecting rod,
it must be assembled on its initial position.



Caution:

- When assembling the piston, damag
  the upper surface of piston is not allowed, especially the part matching with cylinder hole
- The cylinder liner and crankshaft pin damaged by connecting rod is not allowed.

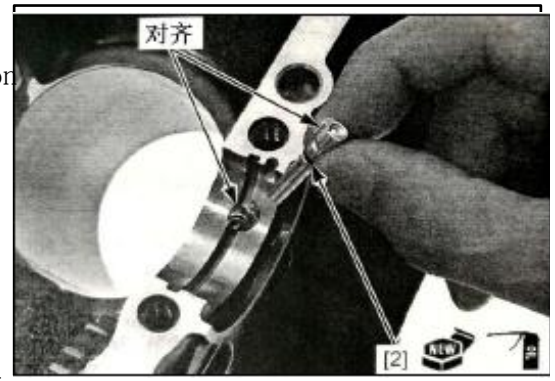
Slightly knock the piston into cylinder by plastic hammer or similar tool(Make sure the piston ring compressing tool smoothly lay on the upper surface of cylinder).
Assemble the parts as below:

- Crankshaft
- Balancing shaft

Piston nozzle

Removing/Assembly
Remove the piston/connecting rod set
Push the nozzle from cylinder side forward to mainshaft trunnion (Damage on oil hole of nozzle is not allowed).

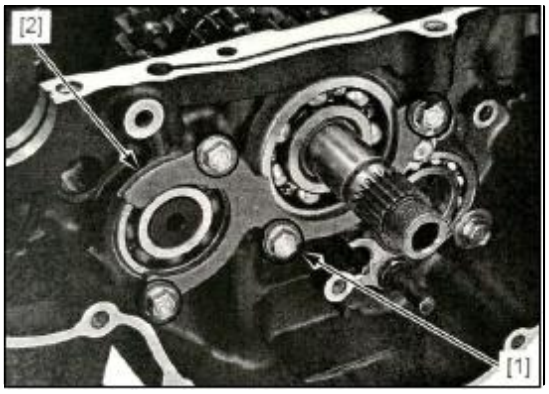
Remove the O-ring on nozzle.
Clean up the nozzle by solvent.
Check if the nozzle blocked, replace if necessary.
Blow and clean up the oil passage on upper crankcase and nozzle by compressed air.
Install a new O-ring on groove of nozzle and coat with oil before installation.
Assemble the nozzle into upper crankcase untill it completely in place. Align the protrusion on nozzle with groove on the crankcase.
Assembly is opposite to disassembly.



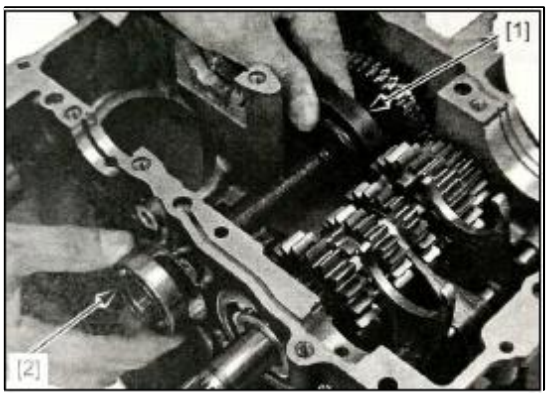
Balancing shaft

Removing

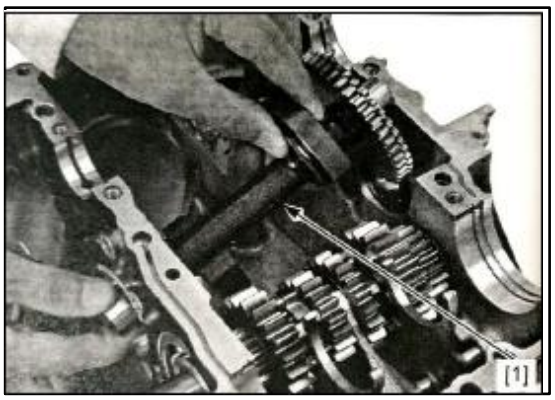
Remove the piston/connecting rod set.
Remove the bolt[1] and mainshaft right bearing plate[2].



Turn the balancing shaft, and make its left balancing piece[1] face upwards. Slide the balancing shaft to the right in crankcase, and remove the right bearing[2] of balancing shaft.



Remove the balancing shaft[1].



Check

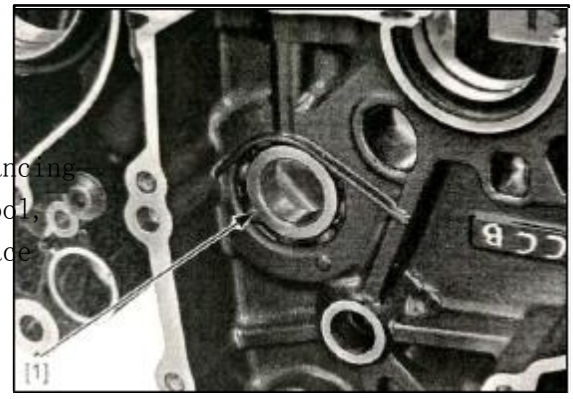
Check the scratch, damage, abnormal abrasion or distortion on the parts below, replace if necessary.

- Driven gear of balancing shaft
- Secondary gear of driven gear
- Pressing spring of driven gear

Balancing shaft
Balancing shaft bearing

Replace the left bearing of balancing shaft

- Slightly knock the left bearing of balancing shaft out from upper crankcase.
-

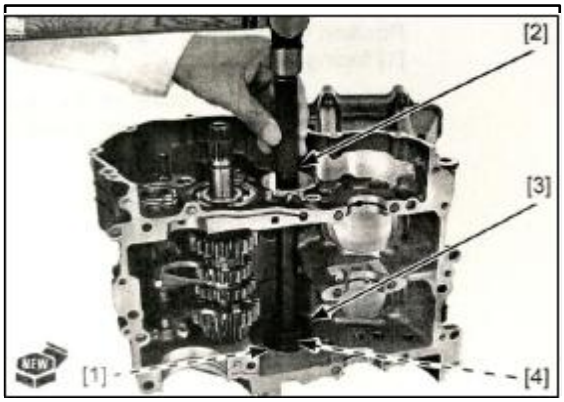


Assemble a new left bearing[1] of balancing shaft in upper crankcase by special tool, and knock it untill compeletely in place (Knock on right angle and the side of bearing with mark face upwards).

Tool:

[2] Driving rod [3] Dampping piece

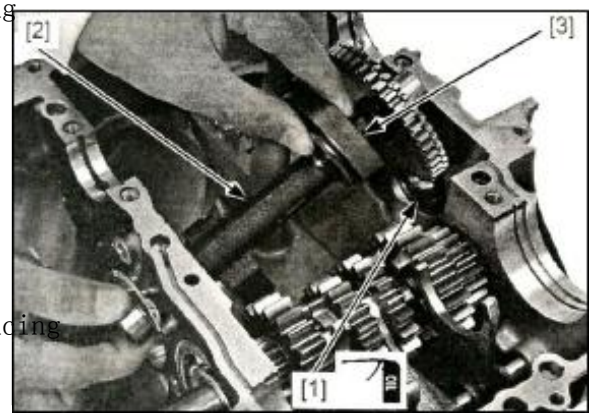
[4] Guide piece



Assembly

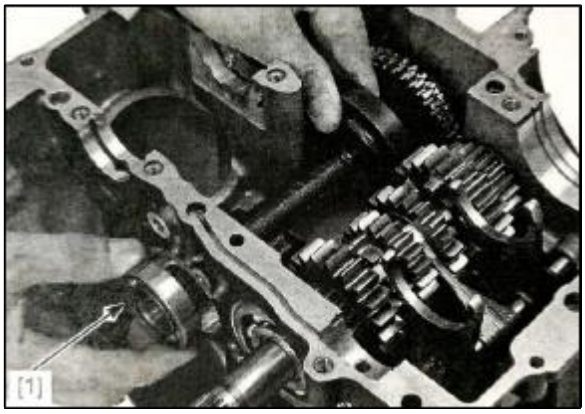
Coat the left bearing[1] of balancing shaft with oil.

Assemble the balancing shaft[2] into upper crankcase, and the left balancing piece[3] face upwards.



Coat the right bearing of balancing shaft with oil.

Assemble the right bearing[1] of balancing shaft into upper crankcase(The side with mark face upwards).



Coat the thread of balancing shaft/Bolt of mainshaft right bearing plate with thread glue.

Assemble the balancing shaft/mainshaft right bearing plate[1] and its bolt[2].

Fasten the bearing plate bolt to stipulated torque.

Torque：**12N.m**

Assemble piston/connecting rod set.