Service Manual for engine
KEL500F

Chongqing Loncin Motor co.ltd. **June 2021**

Foreword

There are more and more motorcycles getting onto market with each passing day, and new structure and technologies are also adopted. For all the Loncin users and service workers know well about the maintenance, adjustment and repair for engine LX268MR, we made this service manual, we hope which bring you more convenience when you need them.

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Content list

1 Summary

Rules for maintenance

1. Please adopt the Loncin motor co. ltd. produced or suggested spare parts, lubricant or other auxiliary materials when maintenance is necessary. In case materials were adopted fail to meet Loncin standard, it may damage your motorcycle.

2. When maintenance is necessary, please adopt the tools, bolt, nut and screw in metric standard, the ones out of metric standard such as imperial standard are not allowed.

3. When parts were replaced or re-assembled, please also replace their washer, o-ring, split pin and locking piece.

4. Please fasten the bolt or nut with bigger diameter or inside, then fasten the rest in alternative angle sequence, unless there is another specially stipulated sequence.

5. Wash up the removed parts by cleanser. Coat the moving surface with lubricant before re-assembling.

6. When re-assembled, please check and confirm the correct re-assembly and proper operation, turn, move and operate them for checking.

Specification

General specification

	Items	Data
Engine	Engine type	LX268MR
	Displacement	494ml
	Cylinder positions and angle	Left: 1, Right: 2; 19°
	Bore×Stroke	68×68mm
	Combustion chamber capacity	15.6m
	Compression ratio	11.5: 1
	Max. power and its rotation	40.5kW/8500rpm
	Max. torque and its rotation	50.2N·m/7000rpm
	Valve mechanism	Camshaft on the top
	Air inlet valve	Open (rising stroke of 1mm): Before upper stopping point by 10° Close (rising stroke of 1mm): Behind lower stopping point by 42°
	Air exhaust valve	Open (rising stroke of 1mm): Before lower stopping point by 42° Close (rising stroke of 1mm): Behind upper stopping point by 1°
	Lubricating system	Forced pressure + splashing
	Cooling system	Water cooling
	Engine net weight	53kg
Transmission system	Clutch	Multiple and wet layers
	Gear box	International 6 gears
	Primary transmission ratio	2.029
	End transmission ratio	2.733
	Gear transmission ratio	1st: 3.285 2nd: 2.105 3rd: 1.600 4th: 1.300 5th: 1.150 6th: 1.043
	Gearshift	1-N-2-3-4-5-6

Electrical system	Ignition system	FTI 1-2
	Starting system	Electrical starting
	Lighting system	Battery
	Specification for spark plug	CPR8EA-9 (NGK)
	Clearance of spark plug	0.8～0.9mm
	Rectifier regulator	Regulating of 3 phases and complete wave

Cooling system’s specification

Items		Specification
Coolant capacity	Heat radiator and engine	1.4 L
	Tank	0.12 L
Releasing pressure for radiator’s cap		108～137kPa
Thermostat	Initial temperature when opening	80～84℃
	Temperature when completely opened	95℃
	Rising travel of valve	8mm
The coolant we suggested		With ethanol without silicate
Standard density for coolant		Mixture with distilled water by ratio of 1:1

Specification for lubrication system

Unit: mm

Items		Standard	Limit
Oil capacity	When oil replaced	2.5 L	—
	When oil filter disassembled	2.7 L	—
	When engine disassembled	3.2 L	—
Oil we suggest		Engine oil we suggest:	—

		SG10W～40 API’s quality grade：SG or higher（Round lable for API service of energy saving is not allowed） JASO T903 Standard：MA Viscosity：SAE10W～40	
Opening pressure for oil pressure sensor		Under 1200rpm/80℃：93kpa	—
Rotor of oil pump	Clearance of tip of impeller	0.15	0.20
	Middle clearance	0.15～0.21	0.35
	Sides’ clearance	0.02～0.09	0.12

Specification for cylinder head/Valves

Unit:mm

Item			Standard	Limit
Pressure in cylinder of electrical starting			1372kPa	—
Valve clearance		Air inlet	0.13～0.19	—
		Air exhaust	0.24～0.30	—
Swinging arm and its shaft	Inner diameter of arm	In/Exhaust	10.000～10.015	10.10
	Outer diameter of arm	In/Exhaust	9.972～9.967	9.75
	Clearance between arm	In/Exhaust	0.013～0.043	0.10

	and shaft			
Camshaft	Height of protrusion	Air inlet	31.2123～31.3123	31.1923
		Air exhaust	31.2407～31.3407	31.2207
	Clearance between journal and hole		0.02～0.062	0.10
	Runout		—	0.04
Valve and its guiding tube	Rod diameter of valve	Air inlet	4.475～4.490	4.465
		Air exhaust	4.465～4.480	4.455
	Inner diameter of valve guiding tube	In/Exhaust	4.500～4.512	4.54
	Clearance between valve rod and its guiding tube	Air inlet	0.005～0.042	0.07
		Air exhaust	0.015～0.052	0.08
	Height of guiding tube	In/Exhaust	14.10～14.30	—
	Width of valve base	In/Exhaust	0.90～1.10	1.5
Free length of valve spring		Inner	31.5	30.3
		Outer	41.5	40.3
Flatness of cylinder head		—		0.10

Specification for clutch and gearshift device

Unit: mm

Items		Standard	Limit
Free travel for clutch lever		10～20	—
Clutch	Free length of spring	41.5	40.3
	Thickness of friction plate	2.9～3.1、	2.7
	Flatness of driven plate	—	0.30
Collar in clutch	Inner diameter	22.000～22.021	22.031
	Outer diameter	27.987～28.000	27.977
Outer diameter of main shaft in clutch's collar		21.967～21.980	21.95

Specification for magneto and starting clutch

Unit: mm

Items	Standard	Limit
Outer diameter of jacket of starting plate gear' shaft	51.705～51.718	51.685
Inner diameter for outer case of starting clutch	68.362～68.392	68.402

Specification for case body and transmission system

Unit: mm

Items			Standard	Limit
Transmission mechanism	Diameter of inner hole on gear	M5	28.000～28.021	28.04
		C1	24.007～24.028	24.04
		C2	31.000～31.025	31.04
	Outer diameter for shaft' s jacket	M5, M6	27.959～27.980	27.94
		C2	30.970～30.995	30.94
		C3, C4	30.950～30.975	30.93
	Clearance between gear and shaft' s jacket	M5	0.020～0.062	0.10
		C2	0.005～0.055	0.07
	Inner diameter of shaft' s jacket	M5	25.000～25.021	25.04
		C2	28.000～28.021	28.04
	Diameter for main shaft	Matched with jacket of M5	24.967～24.980	24.96
		Matched with jacket of C2	27.967～27.980	27.95
	Clearance between shaft and its jacket	M5, C2	0.020～0.054	0.07
Gearshift fork and its shaft	Diameter of fork shaft		11.957～11.968	11.95
	Inner diameter of fork		12.000～12.018	12.03
	Thickness of fork' s tip		5.93～6.00	5.9

Specification for crankshaft, piston and balancing shaft

Unit: mm

Items			Standard	Limit
Crankshaft	Clearance at bigger end of connecting rod		0.05～0.20	0.25
	Clearance between pad on bigger end of connecting rod and crankshaft's pin		0.030～0.052	0.06
	Clearance between journal of crankshaft and its pad		0.017～0.035	0.05
	Runout		—	0.05
Cylinder	Cylinder bore		68.000～68.015	68.10
	Roundness loss		—	0.10
	Taper		—	0.10
	Flatness		—	0.10
Piston, piston pin and piston rings	Diameter of basic circle for piston		67.970～67.990	67.905
	Diameter for pin's hole		16.002～16.008	16.02
	Diameter of piston pin		15.994～16.000	15.98
	Clearance between piston and its pin		0.002～0.014	0.04
	Closing clearance of piston ring	1st ring	0.10～0.20	0.4
		2nd ring	0.21～0.31	0.5
		Oil ring	0.20～0.70	1.0
	Clearance between piston ring and its groove	Clearance between 1st ring and its groove	0.030～0.060	0.10
		Clearance between 2nd ring and its groove	0.015～0.050	0.08
Clearance for cylinder matching			0.010～0.045	0.10
Smaller end of connecting rod and its inner diameter			16.030～16.044	16.05
Matching clearance between connecting rod and its pin			0.03～0.05	0.07

Torque

Standard torque

Fastening parts	Torque N.m	Fastening parts	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 flange)	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
		8mm flange bolt and nut	27
		10mm flange bolt and nut	39

Torque for engine

Items	Numbers	Thread diameter mm	Torque N.m	Note
Screw on air filter cover	4	5	1.1	
Screw on air filter element	4	5	1.5	
Spark plug	2	10	16	
Bolt on swinging arm shaft	2	12	16	Coat the thread with oil and replace the washer for a new one
View cover	1	45	12	Coat thread with grease
Engine drainage bolt	1	12	28	
Secondary oil filter	1	20	12	
Tube joint for secondary oil filter	1	24	27	Coat with Loctite from head by length of 6.5mm

Cooling system

Items	Numbers	Thread diameter mm	Torque N.m	Note
Bolt on fan’s case	4	6	8.5	
Screw on fan’s motor	3	4	2.8	
Nut of fan	1	3	1.1	Coat thread with sealing glue
Installation bolt for water pump	3	6	12	
Bolt on water pump’s cover (Include water drainage bolt)	2	6	10	
Water drainage bolt on cylinder head	1	6	12	
Bolt on thermostat’s cover	1	6	12	

Cylinder head and valves

Items	Numbers	Thread diameter mm	Torque N.m	Note
Bolt on cylinder head	6	9	47	Coat thread and base surface with oil
Bolt on camshaft bracket	12	6	12	Coat thread and base surface with oil
Bolt on swinging arm shaft of valve	2	12	15	Coat thread and base surface with oil
Bolt on cylinder head cover	4	6	10	
Adjusting bolt for	1	6	10	Coat thread and base

tensioner				surface with oil
Connecting bolt for cylinder body	2	6	10	

Clutch and gearshift device

Items	Numbers	Thread diameter mm	Torque N.m	Note
Bolt on driven wheel of oil pump	1	6	12	Coat thread with sealing glue
Locking nut for center case	1	18	135	Coat thread and base surface with oil
Bolt on primary driving wheel	1	10	95	Coat thread and base surface with oil
Bolt on check plate	1	6	12	Coat thread with sealing glue
Locating bolt for five-star turning plate	1	8	23	Coat thread with sealing glue
Bolt for lifting plate	4	6	12	
Bolt on pressing plate for gearshift arm's seal	1	6	12	Coat thread with sealing glue
Bolt on limit plate for gearshift arm	1	6	12	Coat thread with sealing glue
Locating bolt for gearshift arm	1	8	27	
Bolt on right crankcase cover	14	6	10	

Magneto and starting clutch

Items	Numbers	Thread diameter mm	Torque N.m	Note
Fastening bolt for starting clutch	6	8	29	Coat thread with sealing glue
Bolt on magneto's rotor	1	12	138	Coat thread and base surface with oil
Bolt on magneto's stator	4	6	10	Coat thread with sealing glue
Fixing bolt on trigger	2	6	12	Coat thread with sealing glue
Bolt on left crankcase	11	6	12	Coat thread with sealing glue

Case body and transmission system

Items	Numbers	Thread diameter mm	Torque N.m	Note
Balancing shaft/Check plate for main shaft bearing	4	6	12	Coat thread with sealing glue
Pressing plate for main shaft's collar	1	6	12	Coat thread with sealing glue
Locating bolt for gearshift drum's bearing	2	6	12	Coat thread with sealing glue
Bolt for journal of main shaft	6	8	15+120°	Coat with oil and replace for new bolt
Bolt of 10mm on crankcase	1	10	39	

Bolt of 8mm on crankcase	3	8	24	
Bolt of 6mm on crankcase	10	6	12	

Crankshaft, piston, cylinder body and balancing shaft

Items	Numbers	Thread diameter mm	Torque N.m	Note
Nut on connecting rod's cover	4	8	46	Coat thread and base surface with oil
Balancing shaft/Check plate for main shaft bearing	4	6	12	Coat thread with sealing glue
Plug for oil passage on crankshaft	2	8	8	Coat thread with sealing glue

Positions for lubrication and sealing

Engine

Material		Position	Note
Sealing glue	1596	Combination surface of crankcase Seal ring for cylinder head cover	
	1590	Wire outlet of magneto	
Oil in engine		The complete surface for inner and outer rotor of oil pump The complete surface of swing arm shaft Inner surface of swinging arm and surface of roller Moving surface of valve rod and its	

	end Complete surface of timing chain Rolling surface of camshaft Inner surface of hole on cylinder Outer surface of piston, piston pin’s hole and piston ring’s groove Outer surface of piston pin Complete surface of piston ring Complete surface of clutch friction plate Sliding surface of clutch pushing rod Gearshift spindle and check plate Complete surface of double gear shaft Complete surface of starting and overrunning clutch Complete surface of gearshift fork’s shaft Inner surface of pad on bigger end of connecting rod of crankshaft Inner hole on smaller end of connecting rod of crankshaft Gear (Primary transmission, crankcase, starting and deceleration) Sliding surface of plate-shaped gear Turning area of each bearing Surface of each o-ring	
Oil of molybdenum disulfide	Swinging arm Swinging arm shaft Surface of camshaft Hole of camshaft on cylinder head	
Lubricating grease for multi-function	Seal ring for starting motor Seal ring for speed sensor	
Degreaser	All surfaces for combination	

2 Maintenance

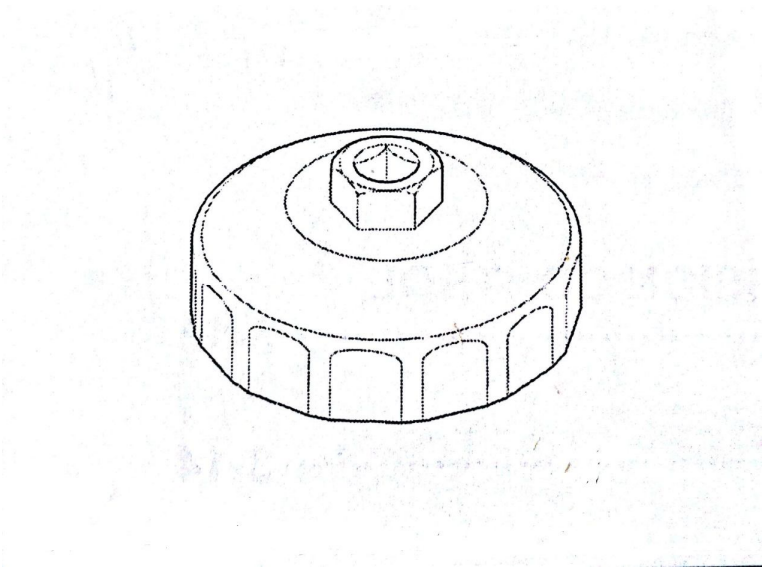
Information for maintenance

Summary

- Please put the motorcycle on a horizontal ground before all operations latter.

Tools

Cap-shaped wrench for secondary oil filter



Specification for maintenance

Please inspect according to <Periodic Maintenance table> in User Manual.

I: Inspection, clean it up, adjust, lubricate or replace when it was necessary. C: Clean up. A: Adjust. L: Lubricate.

The maintenance below need you know something about machinery. Some items (Especially with mark * and **), they may need more skill or tools and information.

Periodic Maintenance table

			Items	Odometer Note 1							
			Interval	× 1000km	1.0	6.0	12.0	19.0	25.0	31.0	37.0
Replated to waste gas emission	*	Oil tube					I		I		I
	*	Throttle valve					I		I		I
		Air filter						R			R
		Waste gas nozzle	Note 2			C	C	C	C	C	C
	**	Spark plug	Note 3						R		
	**	Valve clearance			I				I		
		Oil in engine			Initial=1000km or a month; R=Each 6000km						
	*	Secondary oil filter			R		R		R		R
		Idling run			I		I		I		I
	*	Coolant	Note 5				I		I		R

	*	Cooling system					I		I		I
	*	Secondary air supplementary system					I		I		I
		Fuel drainage system	Note 4					I			I
No relation to waste gas emission		Transmission chain			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

*Means this work shall be done by Loncin dealer, unless the user basically know something about machinery and has some tools, in case do this work by user himself, please refer to this book.

**From the view of safety, we suggest this work shall be done by Loncin dealer only.

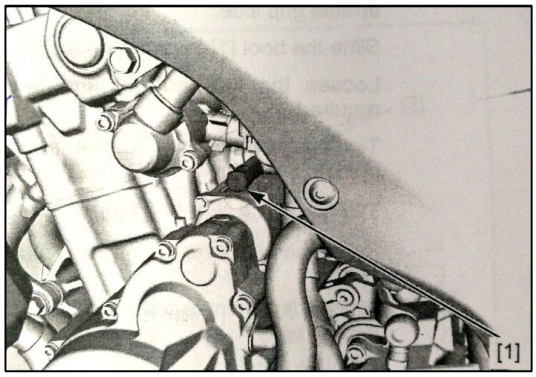
Note:

1. In case the mileage is long according to the odometer, please still make maintenance by referring to the table above.
2. More frequent maintenance is necessary in case driving under dusty or wet conditions.
3. Driving in rain or under full speed, the more maintenances are needed.
4. Replace each two years, or according to the mileage in odometer, who reaches first and then replace according to it. The work of replacement need you know something about machinery.

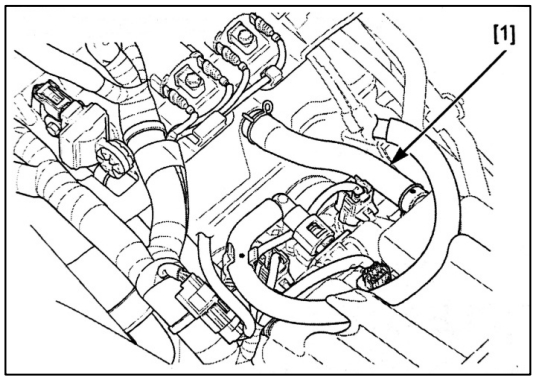
Breathing tube on crankcase

Note:
When driving in rain or under full speed, when washed or oppositely put the motorcycle, the more maintenance is needed. Check the sediment in breathing tube by viewing its transparent part.

Pull off the plug [1] of cleaning tube on air filter, then drain off the sediment into suitable container and re-assemble the plug.



Remove the fuel tank and hold it on. Check the crack, aging, damage or flexibility on waste gas tube [1], replace if it is necessary.
Re-assemble the fuel tank.



Spark plug

Remove the fuel tank

Remove the spark plug[1].

Note:

Before removing the spark plug, blow and wash its surroundings by air gun and make sure there is not any dust drops into the combustion chamber.

Check and confirm the damage or crack or insulators, also check the damage, dirt or color fading on terminal, please replace the spark plug in case it is necessary.

Check the spark plug:

Wash the terminal of spark plug by iron wire or the washer for it only.

Check the clearance between the central and side terminals by feeler gauge.

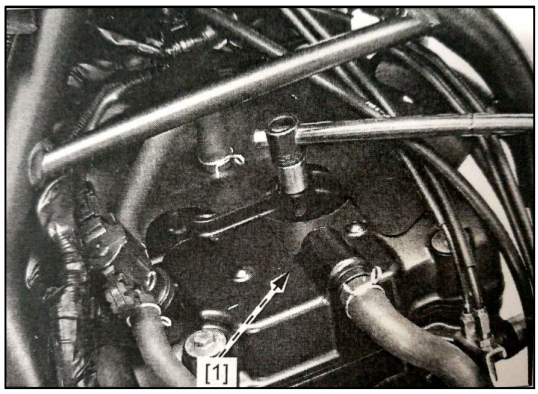
Clearance of spark plug: 0.80～0.90mm

Carefully get the side terminal bent to adjust the valve clearance if it is needed.

Install the fasten the spark plug to cylinder by hand, then fasten the spark plug to fixed torque.

Fastening torque: 16N • m

Re-assembly for fuel tank.



Valve clearance

Check

Note:

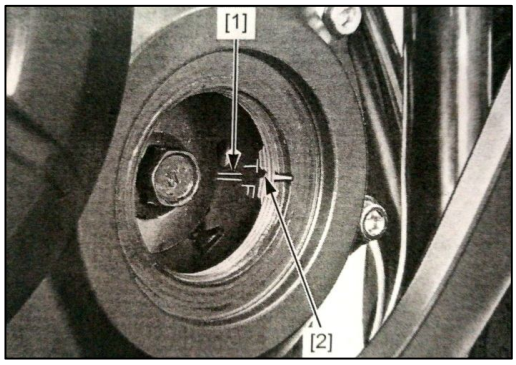
- Please check and adjust the valve clearance when the engine is cold

  (Under 35℃)

Please remove the parts below:

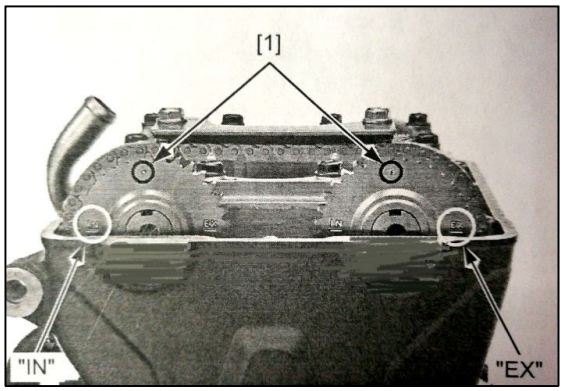
- Cylinder head cover
- View-hole's cover and its o-ring.

Turn the crankshaft anti-clockwise, get is mark "T" [1] on magnetic cylinder aligned with the indicating groove [2] on crankcase cover.



Make sure the timing marks (IN and EX) get aligned with the surface of cylinder head, and ensure the punching mark face upward.

In case the timing marks are not at the demanded position, turn the crankshaft anti-clockwise by 360 °, get the mark T aligned with indicating groove once again.



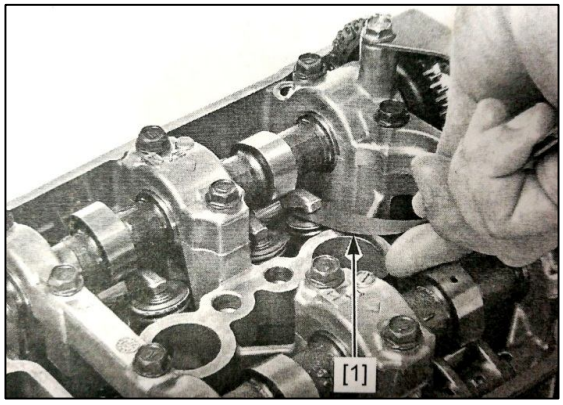
Insert the feeler gauge between the swinging arm and shim of cylinder 1st (Left) and cylinder 2nd (Right), to check the valve clearance.

Valve clearance:

EX：0.25～0.3mm

Note：

Take record for each valve clearance to get reference for selection of shims when adjustment was needed.

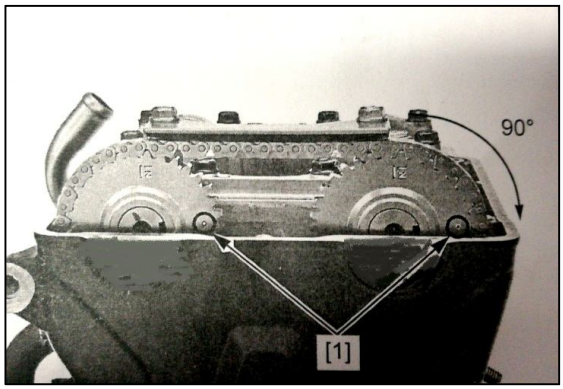


Turn the crankshaft anti-clockwise by 180 °, the get the punching mark [1] on sprocket wheel aligned with the surface of cylinder head.

Check the clearance between the cylinder 1st and 2nd.

Valve clearance

EX：0.15～0.2



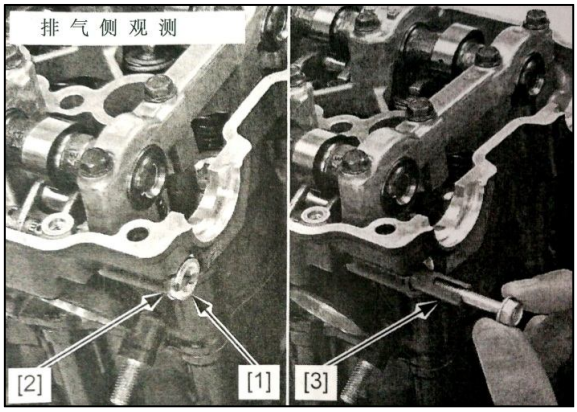
Adjustment

Note:

- Adjust the valve clearance by removing the shaft of swinging arm. Before removing, please make sure the shaft of swinging arm is at correct position which is removeable.

Remove the bolt [1] of socket plug and washer [2].

Fix the swinging arm, then remove its shaft [3] by bolt in size of 6mm.



Slide the shaft [1] of swinging arm outwards, then remove the shim [2].

Note:

- Avoid the shim drop into crankcase and spark plug's hole.
- Mark up all the shims to make sure their correct re-assembly.

Measure the thickness of shim [1] and take record.

Note:

- There are 69 different thickness of shims are selectable with difference of 0.025mm between each adjuscent two (1.200～2.900mm)

Calculate the thickness of new shim by equations below:

A=(B～C)+D

A: Thickness of new shim

B: Take record for valve clearance

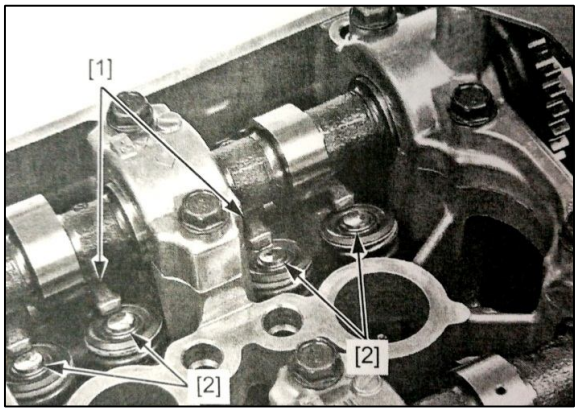
C: The stipulated valve clearance

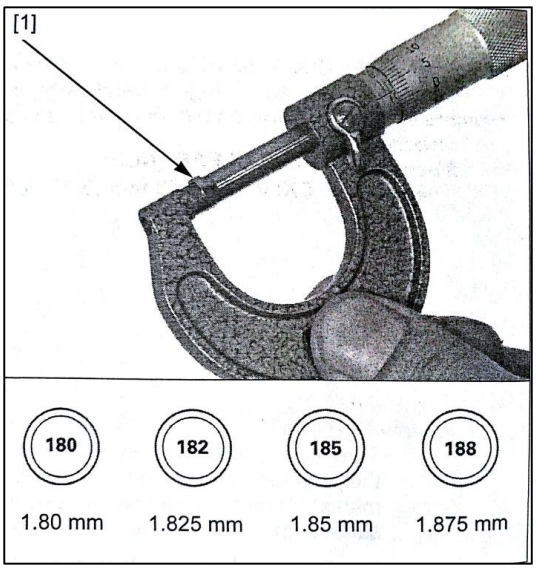
D: Thickness of removed shim

Note:

- Please adopt micrometer to make sure the correct thickness of shim.
- In case the carbon buildup lead to the result of calculation is more than 2.9mm, please repair once again the surface of valve base.

- Remove the shims by magnet or tweezers may let your work easier.





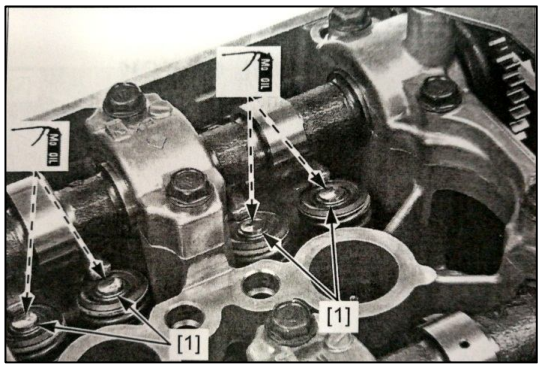
Coat the end part of valve rod with solution of molybdenum disulfide.

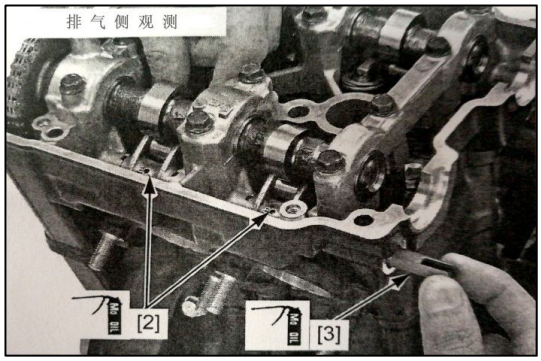
Re-assemble the new shim [1] to the valve spring's base.

Coat the sliding area, thrust surface and external surface of swinging arm's shaft with solution of molybdenum disulfide.

Push the swinging arm's shaft [2] in.

Fix the swinging arm, then insert its shaft [3] into cylinder head and the arm itself.





Coat the threaded part of bolt on socket plug with oil, then re-assemble, please replace the shim [2] for a new one.

Fasten the bolt to stipulated torque.

Fastening torque: 16N • m

Turn the camshaft for several times by the anti-clockwise shaft.

Measure the valve celearance once again.

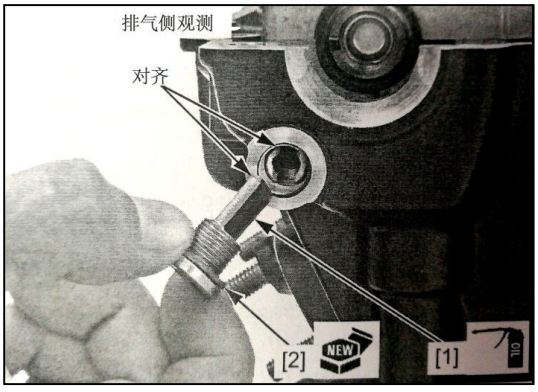
Replace the o-ring for a new one and coat it with oil, then install it into the groove of view-hole's cap.

Coat the thread of view-hole's cap with lubricant and install it in place.

Fasten the view-hole's cap to stipulated torque.

Fastening torque: 18N • m

Re-assemble the cylinder head cover.



Oil in engine

Check the residual oil in engine

Start and idly run the engine for 3~5 minutes.

Stop then engine and wait for 2~3 minutes.

Lay the motorcycle on horizontal ground and make it upright.

Check the oil level by its view-window.

In case the oil level is less than lower limit [1], remove the oil plug [2], fill up with oil of we appointed to crankcase until reached upper oil level line [3].

The appointed oil:

SG10W～40

API grade of quality: SG or higher(Adopt the one with round service label of API whose mark is energy saving is not allowed.）

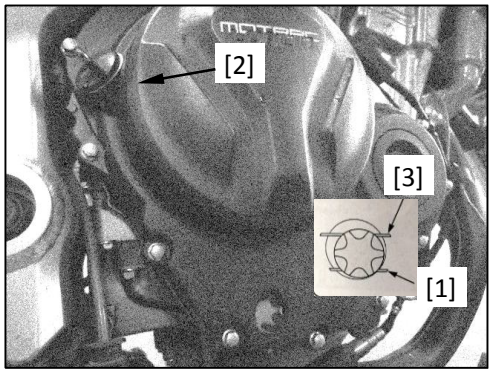
JASO T903 Standard：MA

Viscosity:SAE10W～40

Check the normal performance of o-ring on oil plug, replace if it is necessary.。

Coat the o-ring with oil.

Re-assemble the oil plug.



Replacement for oil

Start the engine first.

Stop the engine and remove the cover [1] of oil filter.

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

When the oil drained off, install the oil drainage bolt and replace the washer for a new one.

Fasten the oil drainage bolt to stipulated torque.

Fastening torque: 30 N • m

Fill up the crankcase with appointed oil.

Oil capacity:

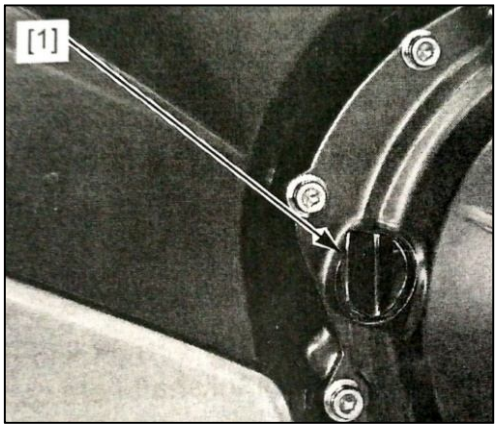
When drained off: 2.5L

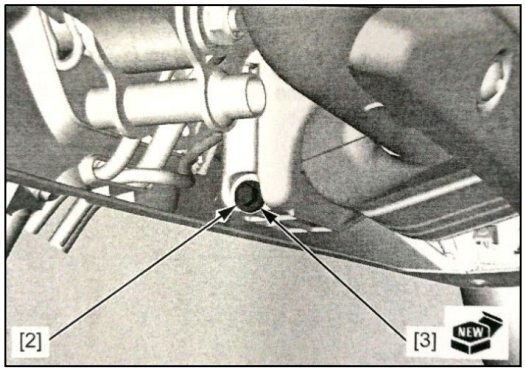
When secondary oil filter replaced: 2.7L

When breaking up: 3.2L

Check the oil amount.

Make sure there is not any oil leakage.





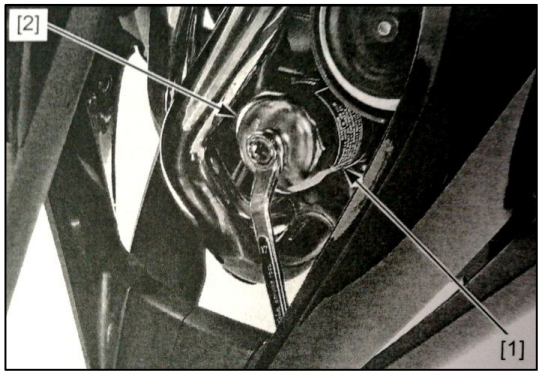
Secondary oil filter

Drain off the oil.

Remove the oil filter [1] by the tools for it only.

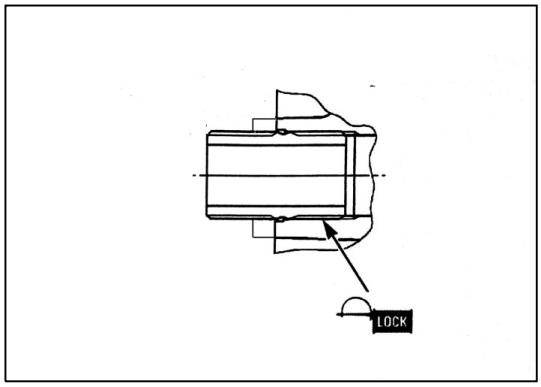
Tool(s):

[2] Cap shaped wrench for oil filter.



Install the tube joint of secondary oil filter and fasten to stipulated torque.

Fastening torque: 24 N • m



Coat the thread [1] of new secondary oil filter and its o-ring with oil.

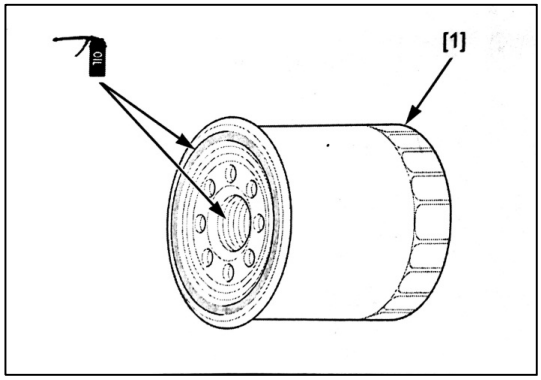
Install the secondary oil filter and fasten it to stipulated torque.

Tool(s):

[2] Cap shaped wrench for oil filter

Fastening torque: 12 N • m

Fill up the crankcase by stipulated oil.



Engine idling

Note:

- When finish all the maintenance items and confirmed they meet demands, then adjust the idling.
- Check the items before inspecting the idling:
  - The malfunction indicating light didn't flash
  - The normal performance of spark plug
  - The normal work of element of air filter
  - The free travel of throttle switch and throttle lever
- The idling could be checked and adjusted when the engine is hot only.

Start the engine to let it get to normal working temperature, then make it idly run. Check the idling.

Idling speed: 1500±100

In case the idling speed is out of limited range, please check the parts below:

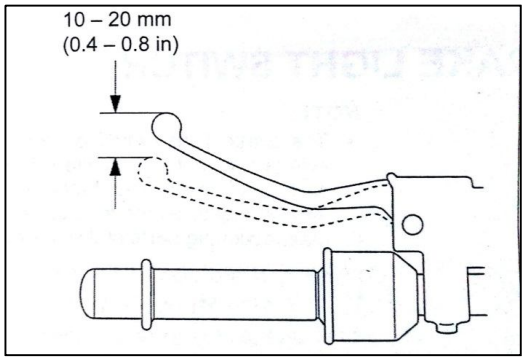
- The problem of air inlet amount and engine's end
- Operation of controlling valve for idling speed

Clutch

Check the distortion or damage or clutch cable, then lubricate the clutch cable when it is necessary.

Check the free travel of clutch lever at its end part.

Free travel: 10～20mm

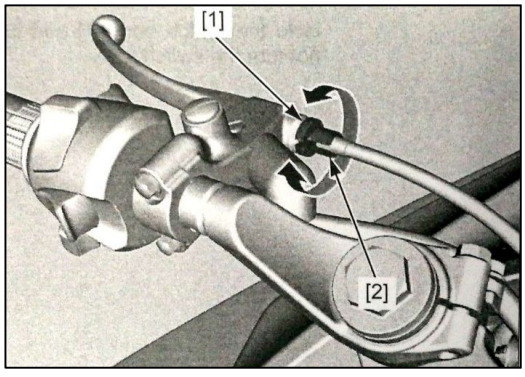


Adjustment in a small range could be done by the adjustor on clutch lever.

Loosen the locking nut [1], turn the adjustor according to your demand.

Hold the adjustor, meanwhile fasten the locking nut.

When you passed the wire limit of adjustor, the precise free travel could not be got, at this moment, we need the main adjustor.

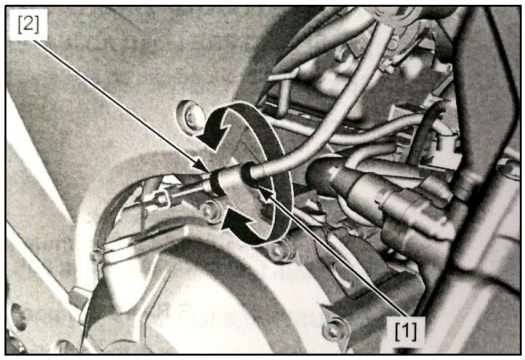


Adjust the main adjustor by turn its nut [1] on operation arm of clutch.

Loosen the locking nut [1], turn the adjustor according to your demand.

Hold the adjustor meanwhile fasten the locking nut.

In case the correct clutch travel failed to be got, or it gets skidding when making trial driving, please break down and check the clutch.



3 Cooling system

Maintenance information

Summary

⚠Warning
Please don’t remove the cover of heat radiator when the engine and radiator completely cooled down, otherwise the coolant may inject or splash out and get your injured.

Caution:

The coolant with silicate solvent of anti-corrosion may accelerate the wear-out of seal ring on water pump and block up the passage of heat radiator.

Use the running water may damage the engine

- Fill up the sub tank with coolant, except filling up of draining off, please don’t remove the cover of heat radiator.
- The engine needn’t be removed from frame when maintaining the cooling system.
- The coolant touches the painting surface is not allowed.
- Check the leakage when the cooling system was maintained by the tester of cooling system.
- Check by coolant temperature indicator/Water temperature sensor.
- Check the relay of cooling fan’s controller.

Specification of cooling system

Items		Specification
Coolant capacity	Heat radiator and engine	1.4L
	Tank	0.12L
Releasing pressure for heat radiator’s cover		108～137kPa
Thermostat	Initial opening temperature	80～84℃
	Completely opened temperature	95℃
	Rising of valve	No less than 8mm
The coolant we suggest		With ethanol but without silicate
Standard coolant density		Mixture with distilled water in ratio of 1:1

Troubleshooting

Too high the engine temperature

- Malfunction in coolant temperature indicator/Water temperature sensor
- The thermal valve failed to be opened
- Malfunction on heat radiator’s cover
- Coolant is not enough
- Passage, soft hose and water tube of heat radiator blocked up
- Air got into circulation system
- Malfunction in motor of cooling fan
- Malfunction in relay of cooling fan’s controller
- Malfunction in water pump

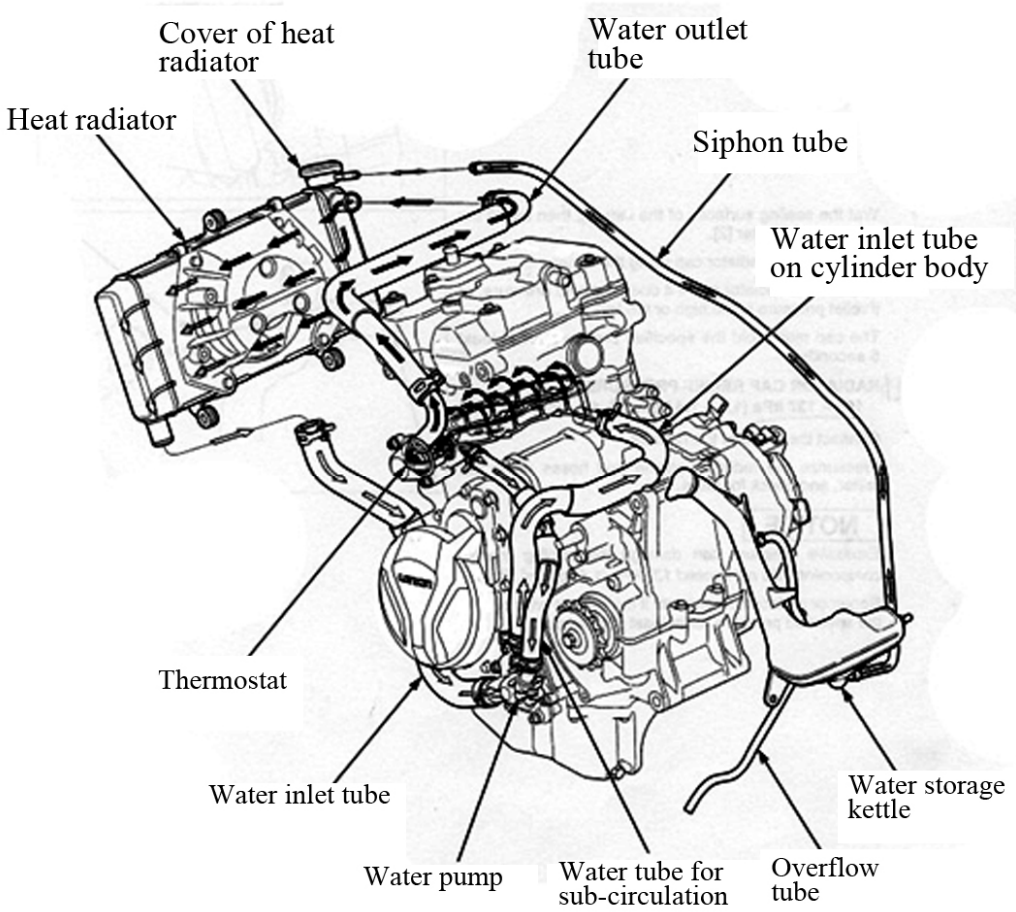
Too low the engine temperature

- Malfunction in coolant temperature indicator/Water temperature sensor
- The thermal valve was opened
- Malfunction in relay of cooling fan’s controller

Coolant leakage

- Defect on machinery structure of water pump
- O-ring gets aged
- Malfunction on cover of heat radiator
- Gasket of cylinder head gets damaged or aged
- The joint of soft hose or tube clamp get loose
- Soft hose gets damaged or aged
- Heat radiator is broken
- The cover of thermostat or tube joint of water pump’s cover is flexible.

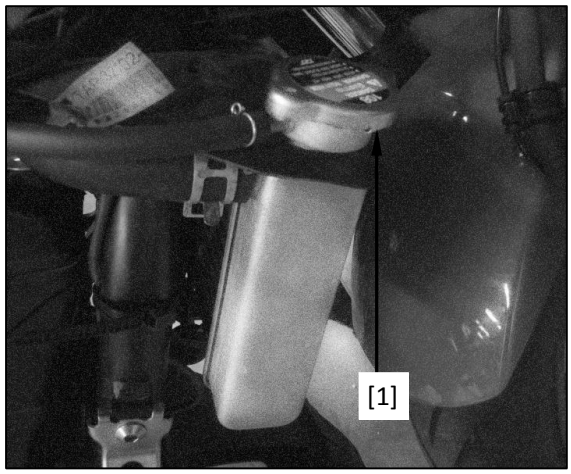
System procedure mode



System test

Pressure test for cover of heat radiator/System

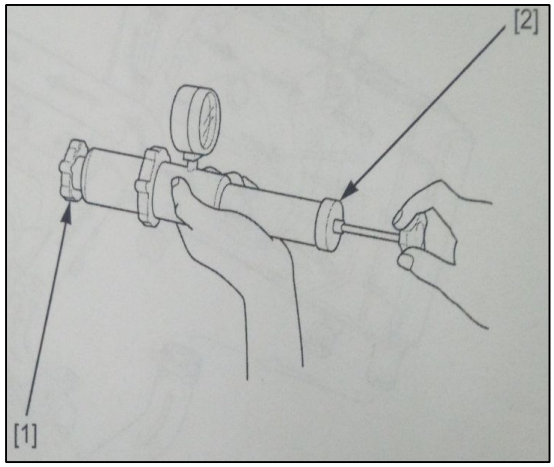
Remove the fairing of right middle impeller
Remove the cover [1] of heat radiator



Get the gasket of cover of heat radiator wet, then install the cover into tester [2].
Lay the pressure on the cover by tester.
In case the cover failed to keep pressure or too high or low the releasing pressure, the cover need be replaced.
The cover must bear the stipulated pressure at least by 6 seconds.
The pressure on heat radiator's cover:

108～137 KPa

Connect the tester to heat radiator.
Lay the pressure on heat radiator, engine and their soft hose by tester to check their air tightness.



Caution

Overpressure may damage the cooling system or its components. The pressure must not be higher than 137 KPa.
In case the system failed to bear the pressure at least by 6 seconds, please repair or replace the components.

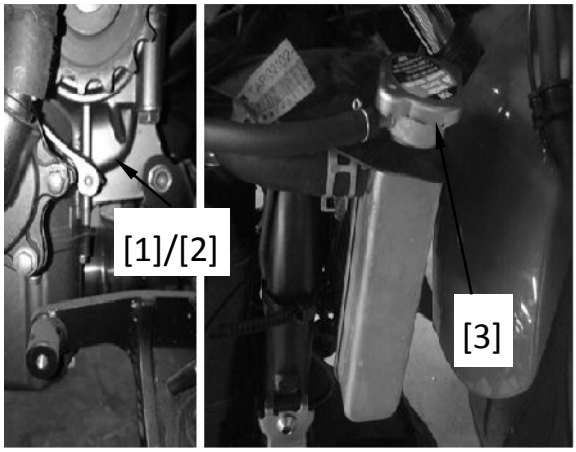
Coolant replacement

Coolant replacement/Air exhaust

Note: When filling up coolant into sub tank, system, or check the coolant level, please lay the motorcycle on horizontal ground and stay it upright.

Remove the fairing of cooling fan

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

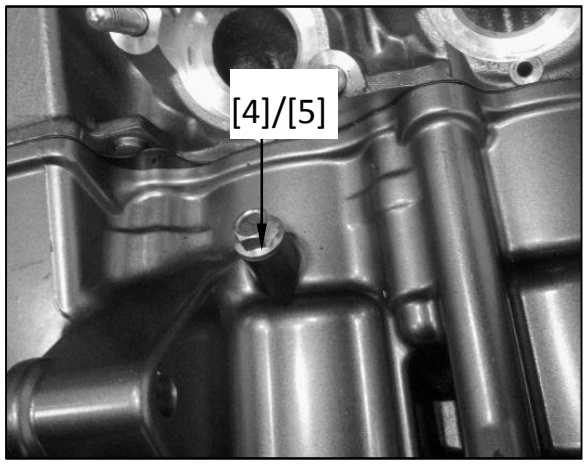


Remove the cover [3] of heat radiator and drain off the coolant.

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

When replaced the flat washer for a new one, put the water drainage bolt on.

Fasten the water drainage bolt to correct torque.



Fastening torque:

Water drainage bolt on water pump:

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

Water drainage bolt on cylinder head:

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

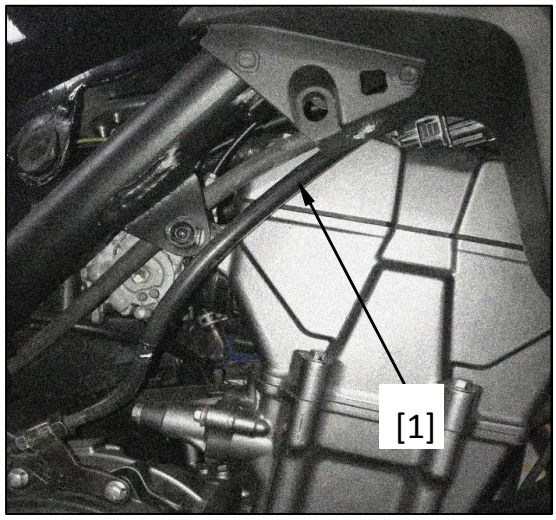
Cut off the siphon tube [1] from heat radiator.

Pull out the siphon tube from its clamp.

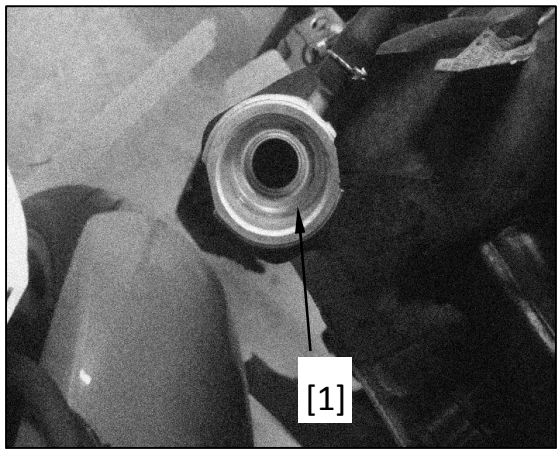
Put the soft hose at lower position out of engine frame, then drain off the coolant in storage case.

Drain off the coolant, then wash up the inside of storage case by water.

Install the soft hose into its clamp and install onto radiator.



Fill up the system with the recommended coolant through the filling port until reached its neck [1].



Recommended coolant:

With ethanol but without silicate

Standard concentration:

1:1 mixture ratio with distilled water

Exhaust the air in system by steps below:

1. Shift the engine to neutral gear.
   Start the engine and let it idly run for 2-3 minutes.
2. Open and stop the throttle by 3-4 times to exhaust the air in system.
3. Stop the engine, fill up the coolant if it is necessary.
4. Install the cover of heat radiator.

Fill up the storage case by recommended coolant.

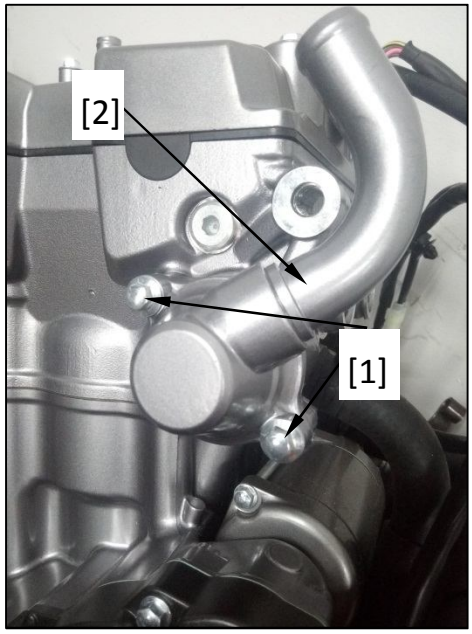
Re-assemble the fairing cover.

Thermostat

Disassembly/Re-assembly

Drain off the coolant.

Remove the bolt [1] and thermostat’s cover [2].



Remove the thermal valve from cylinder head.

The re-assembly is precisely opposite to disassembly.

Fastening torque:

Bolt on thermostat’s cover:

12N·m (1.2kgf·m, 9lbf·ft)

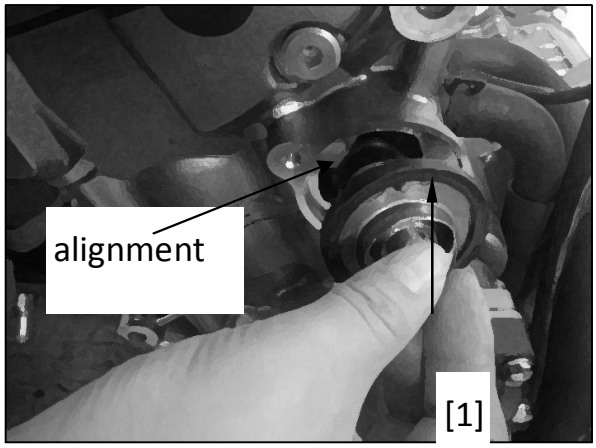
Note:

- When installing the thermostat, please align it with air exhaust hole [2] by adjusting convex pin on groove of cylinder cover. Fill up and drain off coolant in system.

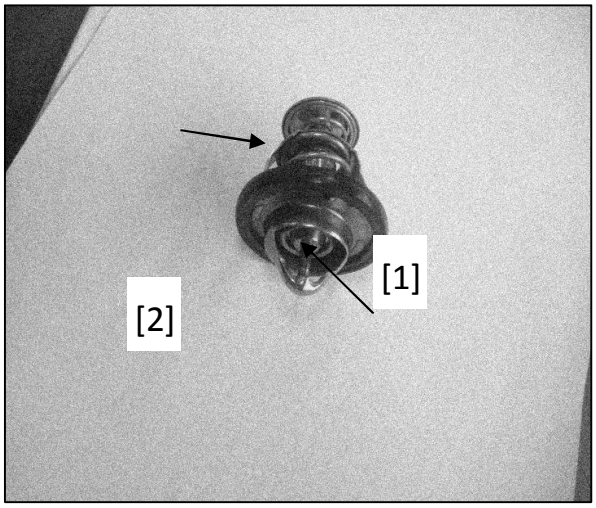
[1]

Check/Test

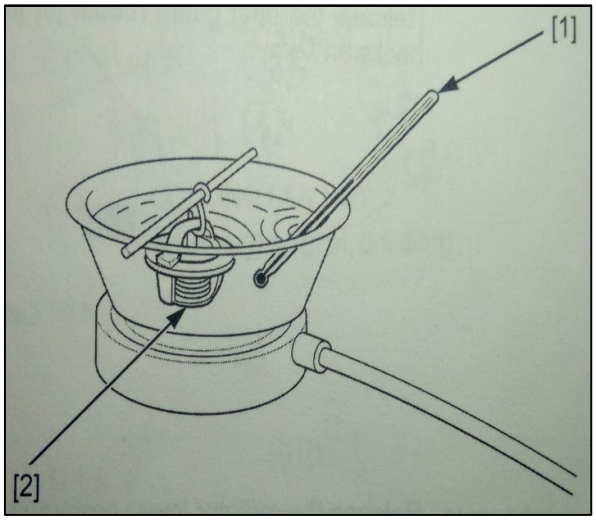
Check if there is damage on the surface of thermostat [1].
In case the thermal valve was open under room temperature, which means it need be replaced.
Check the damage on seal ring [2], replace if it is necessary.



Note:
Wear the oven gloves and suitably protect your eyes.
Keep the combustible materials far away from electrical parts.
Don't let the thermostat and thermometer [1] touch the bottom plate, otherwise the data you got may be wrong.
Heat the water to working temperature by electrothermal furnace and keep it for 5 minutes.
Suspend the thermostat [2] in hot water to check and confirm its normal performance.



Initial opening temperature of thermostat:
80～84℃（176～183℉）
Height when the valve completely opened:
Under 95℃（203℉）no less than 8mm(0.3 in)
In case the thermostat gets opened when the temperature is out of stipulation, please replace it.



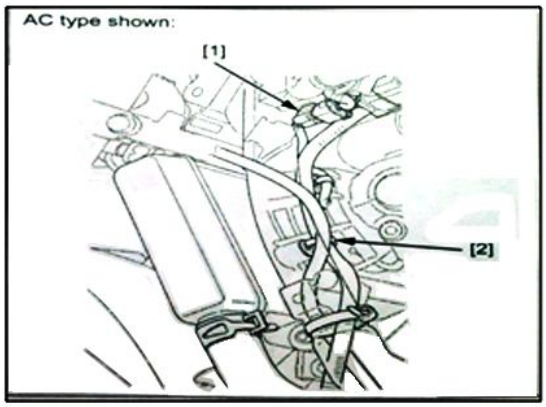
Heat radiator/Cooling fan

Disassembly/Re-assembly

Drain off the coolant.

Cut off the connector [1] for motor 2P (Black) of cooling fan.

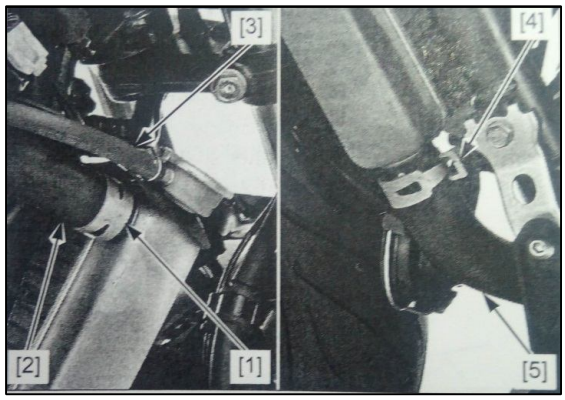
Remove the wire clip [2] on shield cover of cooling fan.



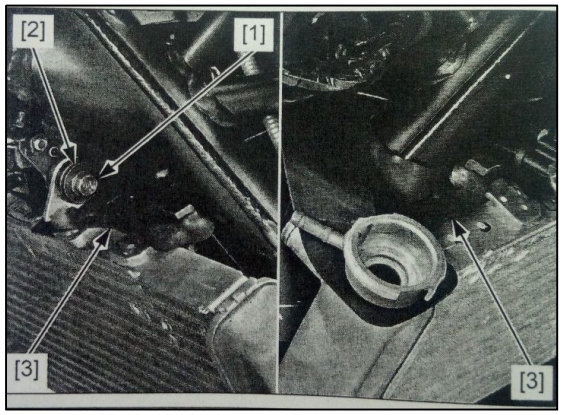
Loosen the tube clamp [1], loosen the soft hose [2] on heat radiator.

Loosen the siphon tube [3].

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



Remove the installation bolt [1] and shim [2] on it. Loosen the hot-proof rubber on filling-up tube, elbow pipe and traction cable.

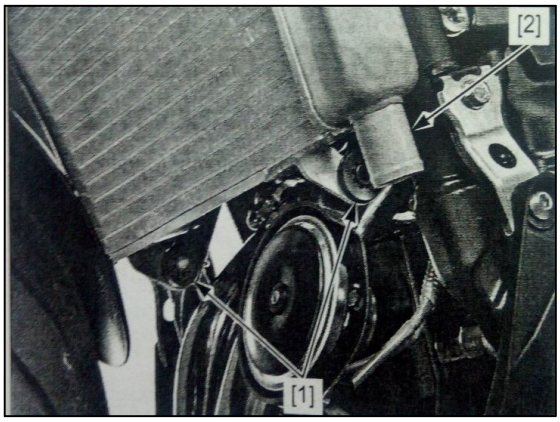


Please don’ t damage the heat radiating piece.

Move the radiator left and loosen the liner ring [1] on the convex column, then remove the radiator [2] itself.

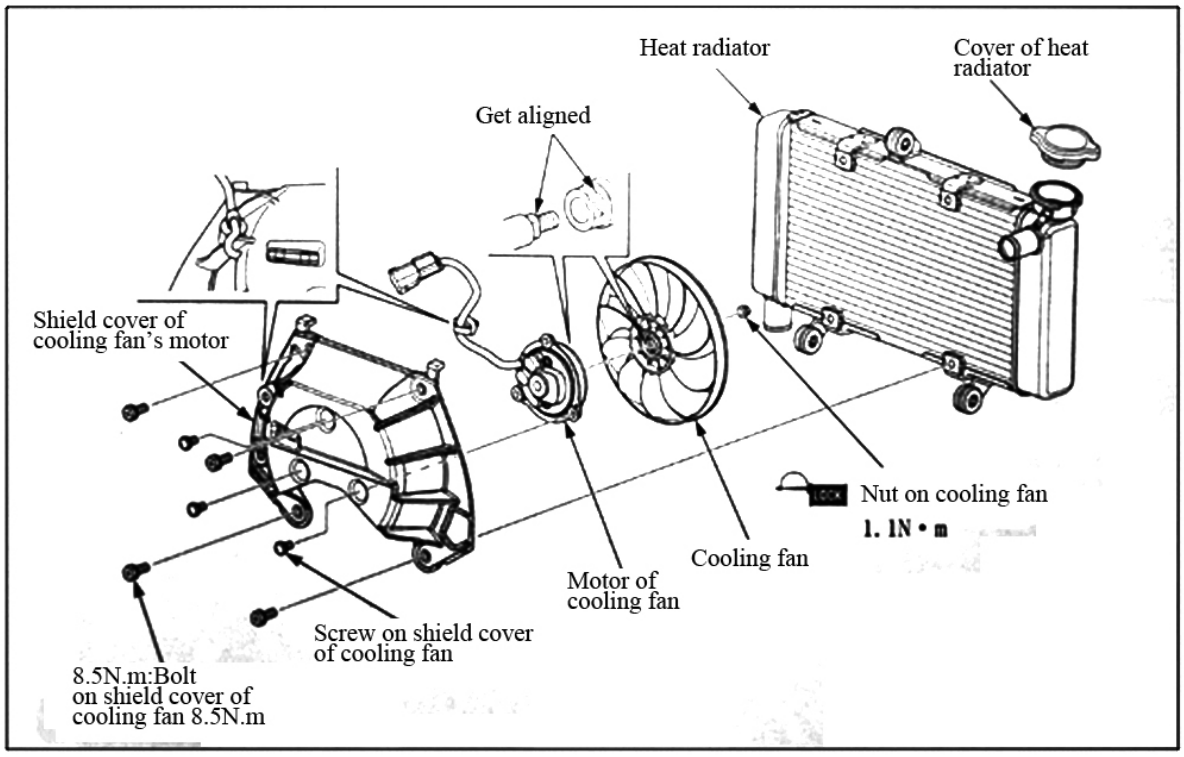
The re-assembly is precisely opposite to disassembly.

Fill up and drain off the coolant in system.



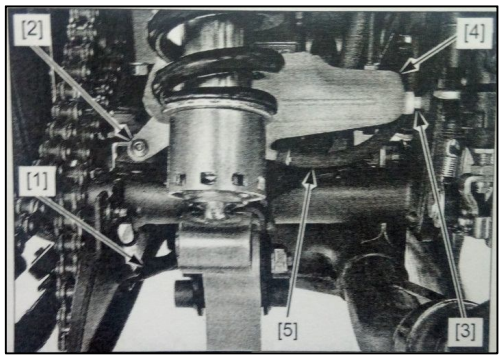
Disassembly/Re-assembly

Disassemble and re-assemble the heat radiator as picture below.



Tank of heat radiator

Disassembly/Re-assembly



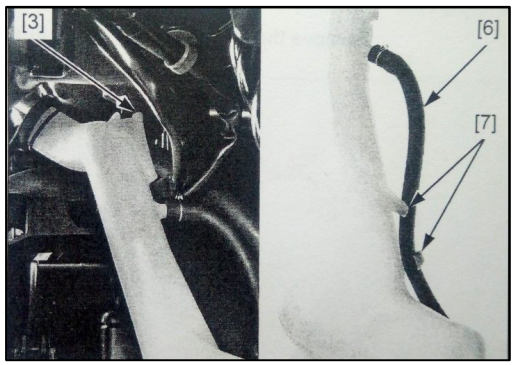
The disassembly is as below:

- Shield cover of motor of cooling fan
- Cooling fan and its motor.

Remove the overflow tube [1] from breathing cap under it.

Remove the bolt [2], then remove the tank [4] and lug [3] from the rim.

Loosen the soft hose [5] of siphon, drain off the coolant, then remove the tank of heat radiator.



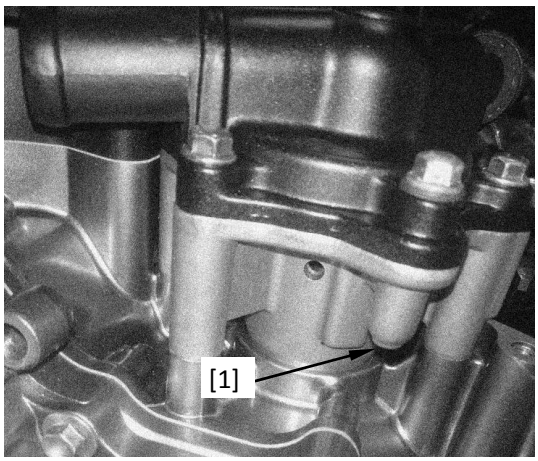
Cut off the overflow tube [6], then remove it from the guiding plate [7].

The re-assembly is precisely opposite to disassembly.

Fill up the tank with recommended coolant.

Water pump

Check the sealing of end surface



Check the coolant leakage from overflow hole [1] on water pump.

- Just a few coolant overflow means it is normal.
- Make sure there is not coolant keeps overflowing when engine started.

In case there is, please replace the water pump set.

Disassembly/Re-assembly

Note:

- Lay a clean oil tray under engine, when removing the water pump body, there may have oil flow out. When re-assembled, fill up with recommended oil to stipulated position (By referring the Maintenance Guidance).

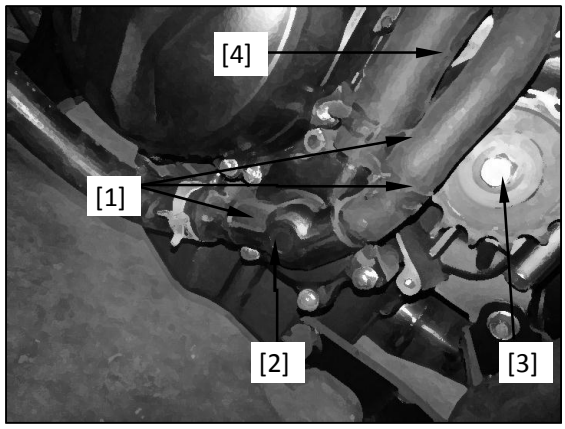
Drain off the coolant

Remove the shield cover of driving sprocket wheel

Lay the motorcycle on a horizontal ground and make it upright.

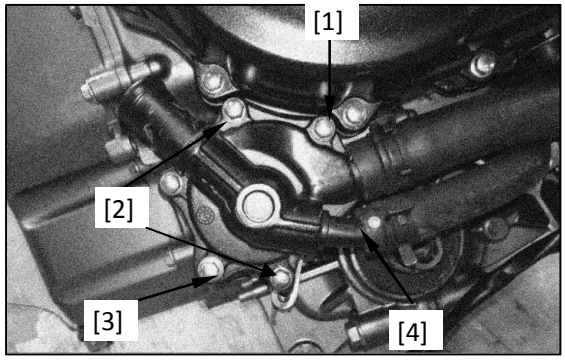
Loosen the tube clamp [1], then loosen parts from water pump as below:

- Tube [2] of radiator under it
- Water tube [3] for sub circulation
- Water inlet tube [4]



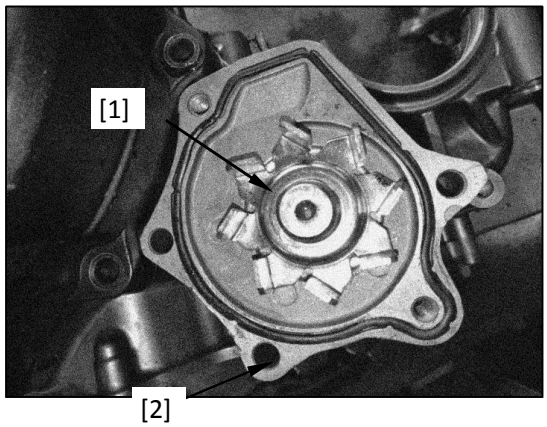
Remove the parts below:

- Bolt [1] on water pump’s cover
- 3 pieces of installation bolt [2]
- Water drainage bolt [3]
- Water pump’s cover [4]



Remove the o-ring [1] on water pump’ s cover on the pump.

Remove the water pump [2] from crankcase.



Remove the o-ring [1] on water pump.

The re-assembly is precisely opposite to disassembly.

Fastening torque:

Installation bolt for water pump:

12N•M(1.2kgf•m,9lbf•ft)

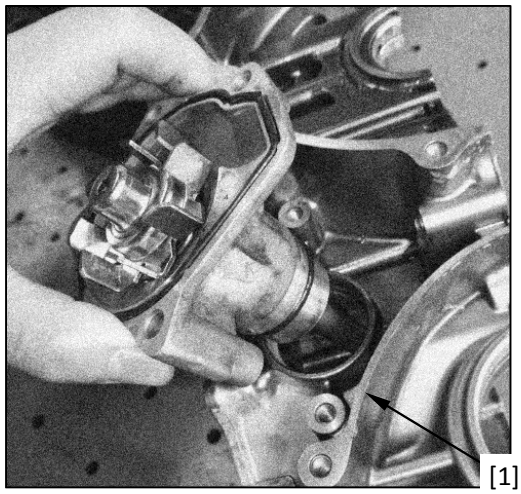
Bolt on cover of water pump:

10N • M （1.0kgf • m，10lbf•ft）

Note:

- Please don’ t break down the water pump body.
- Replace the o-ring.
- Coat the o-ring on water pump body with oil.
- The o-ring on water pump’ s cover needn’ t coat with oil.
- Align the groove on water pump’ s shaft with the tail end of oil pump’ s shaft by turning the impeller of water pump.

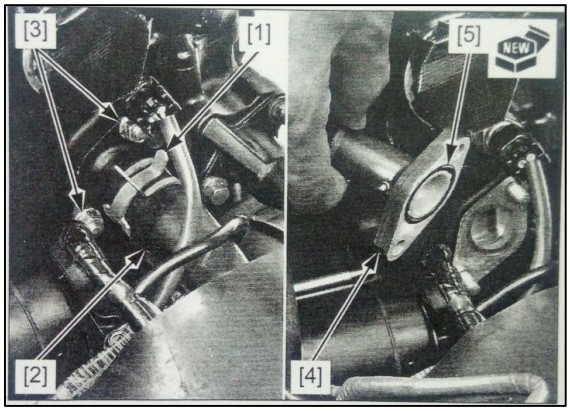
Check the oil level.



Fill up and drain off the coolant in system.

Tube joint

Disassembly/Re-assembly



Drain off the coolant.

Remove the throttle valve/Air filter set.

Loosen the tube clamp [1], then remove the water inlet tube [2].

Remove the nut [3], tube joint [4] and o-ring [5].

The re-assembly is precisely opposite to disassembly.

Note:

- Replace the o-ring.

Fill up the system with coolant and drain off

Stud replacement

Remove the joint of soft water hose.

Screw up the two bolts with nut, then fasten, and screw off the stud by wrench.

Lock up the device by new stud.

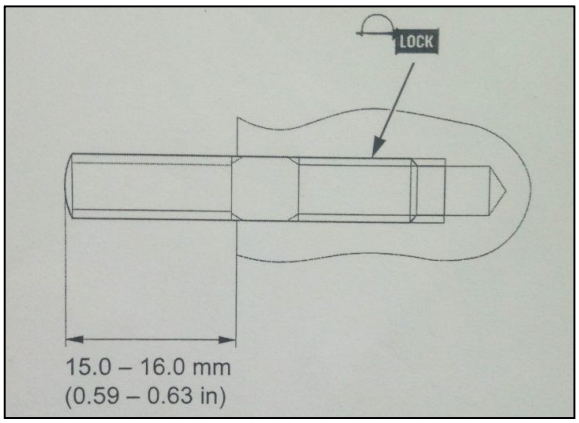
Install the stud into cylinder body as picture shows.

When the stud assembled, please check the length from its head to cylinder surface is within stipulation.

。

Stipulated length: 15.0～16.0mm

Re-assemble the tube joint



4 Lubrication system

Maintenance information

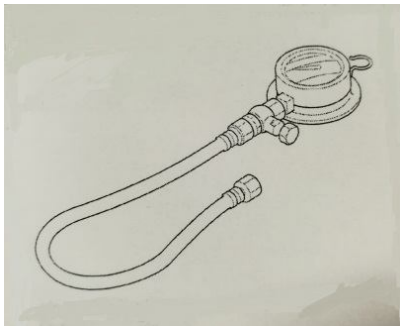
Summary

⚠Warning
Repeatedly touch the engine oil in long time may get skin cancer, but this kind of situation is rarely to be seen, unless your skin touches the engine oil every day, but we still you suggest you wash up your hands by soap and clean water.

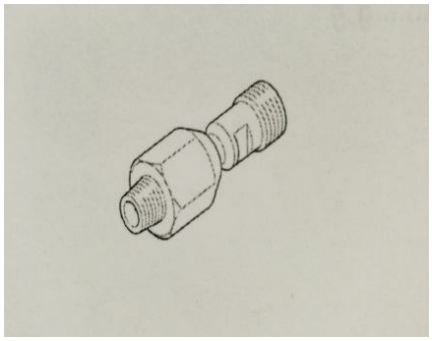
- When repairing the oil pump, we needn't remove the engine from frame.
- The pre-condition for all maintenance steps in this Chapter is drain off the oil in engine.
- When disassembling and re-assembling the oil pump, please don't let dust or dirt get into engine.
- Any part in oil pump passed the limit for maintenance, please replace the oil pump as a complete set.
- When the oil pump re-assembled, please check the oil leakage and correct oil pressure.
- Check the oil pressure indicator for engine and the EOP switch.
- Maintenance for injecting stream of piston.

Tools

Oil pressure gauge



Accessory for oil pressure gauge



Specification for lubrication system

Unit: mm

Items			Standard	Limit
Oil capacity	After oil replaced		2.5L	—
	When oil filter removed		2.7L	—
	When engine removed		3.2L	—
Recommended oil			Recommended oil: SG10W～40 API quality grade: SG or higher (Don't adopt the one with round label of API service for energy saving) JASO T903 标准: MA Viscosity: SAE10W～40	—
Opening pressure for oil pressure sensor			Under 1200rpm/80℃: 93kpa	—
Rotor of oil pump		Clearance between tip of impeller	0.15	0.20
		Middle clearance	0.15～0.21	0.35
		Sides clearance	0.02～0.09	0.12

Troubleshooting

Too low the oil level

- Too heavy the oil consumption
- Oil leakage on external components
- Piston ring worn out or without assembling in place
- Cylinder worn out
- The seal of core shaft worn out
- Valve guiding tube worn out

Too low the oil pressure

- Too low the oil level
- Oil filtering screen was blocked up
- Oil leakage on internal components
- Incorrect use of oil

0 oil pressure

- Too low the oil level
- Safety valve for oil pressure is seized up when getting open
- Transmission chain of oil pump broke up
- Teeth of driving and driven gear of oil pump broke up
- Oil pump damaged
- Oil leakage on internal components

Too high the oil pressure

- Safety valve of oil pressure gets closed
- Oil filtering screen, oil returning hole and jet hole are blocked up
- Incorrect use of oil

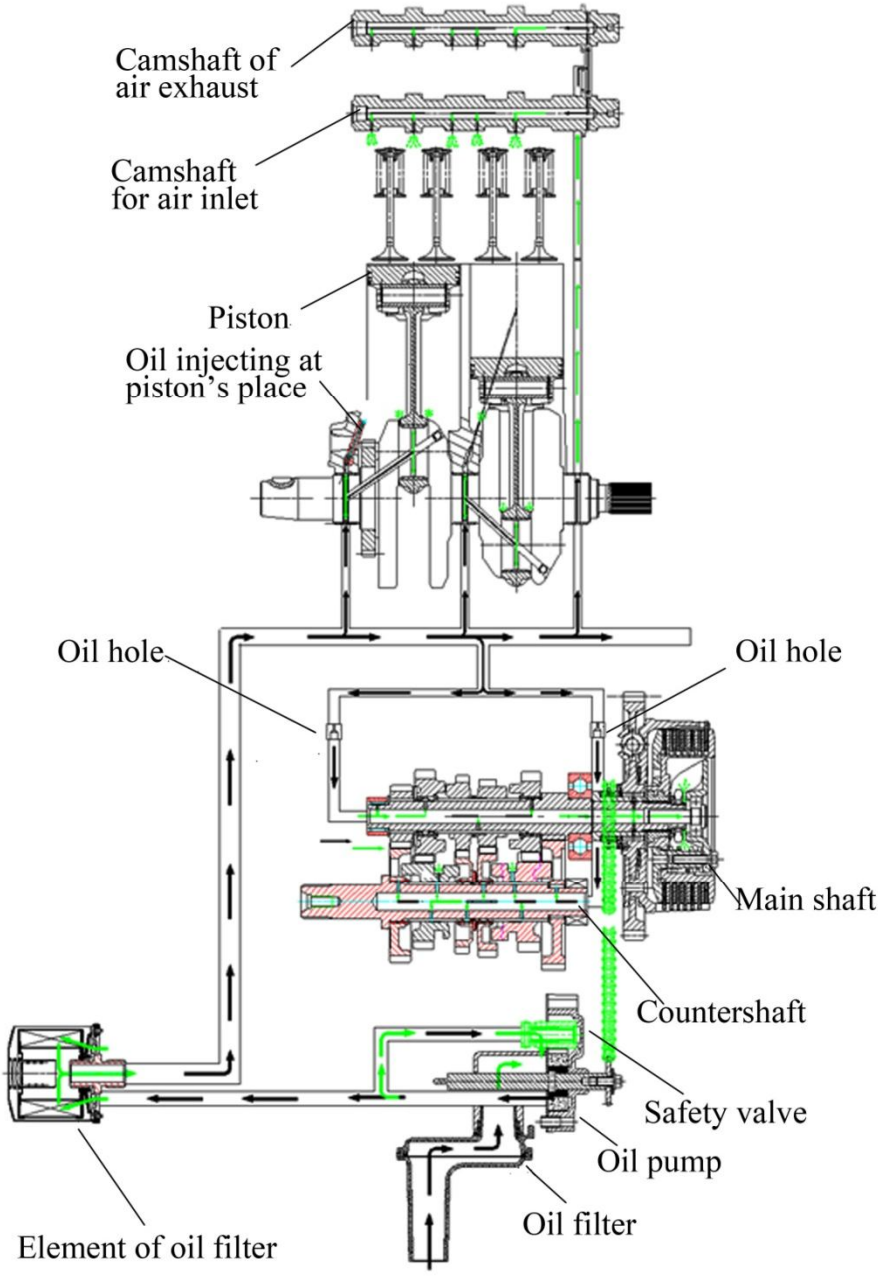
Oil gets dirty

- Didn’t replace oil and filtering screen periodically
- Piston ring gets damaged

Oil emulsified

- Cylinder head cover gets expanded and cracked
- Leakage on coolant passage
- Water gets into engine

Diagram for lubrication system

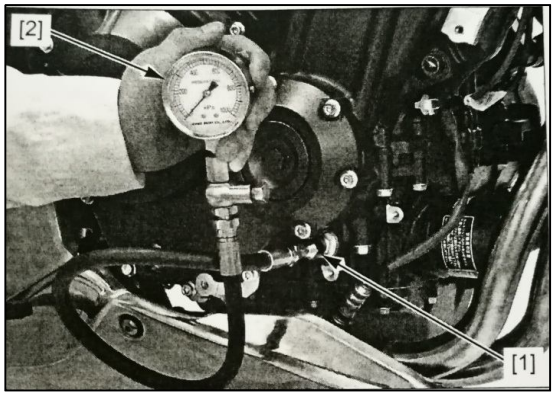


Oil pressure checking

Note:

- When the engine is working, in case the oil pressure gauge keeps moving on, check the oil pressure gauge itself and its system before checking the oil pressure.

Remove the oil pressure sensor.
Install the accessory [1] of oil pressure gauge into switch base.
Connect the oil pressure gauge [2] to its accessory.



Tool(s):
Oil pressure gauge
Accessory for oil pressure gauge

Check the oil level, fill up if it is necessary.
Start the engine and heat it to working temperature (About 80℃/176℉), then speed up the engine rotation to 1200r/min, read the oil pressure from the gauge.

Standard:

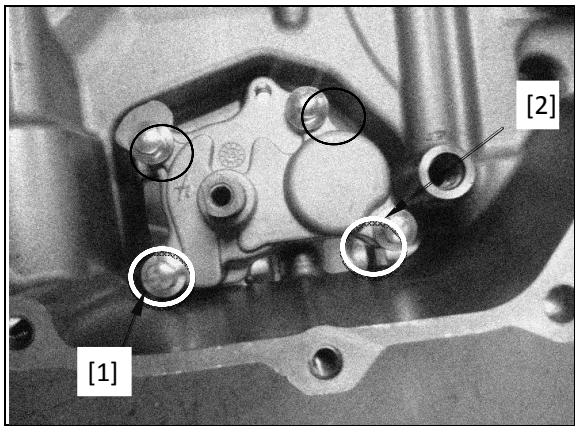
1200rpm/80℃, pressure: 93kPa (0.9kgf/cm2,13psi)

Stop the engine, remove the tools.
Re-assemble the oil pressure sensor.

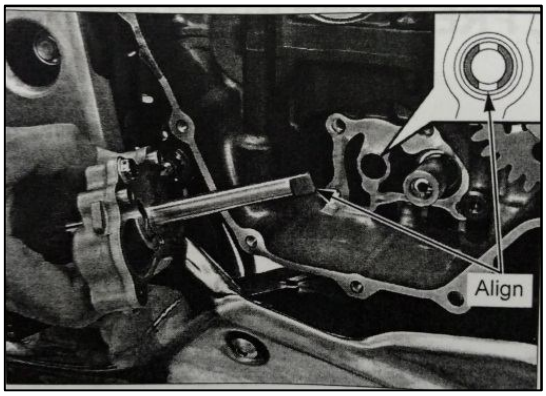
Oil pump

Disassembly/Re-assembly

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



The re-assembly is precisely opposite to disassembly.

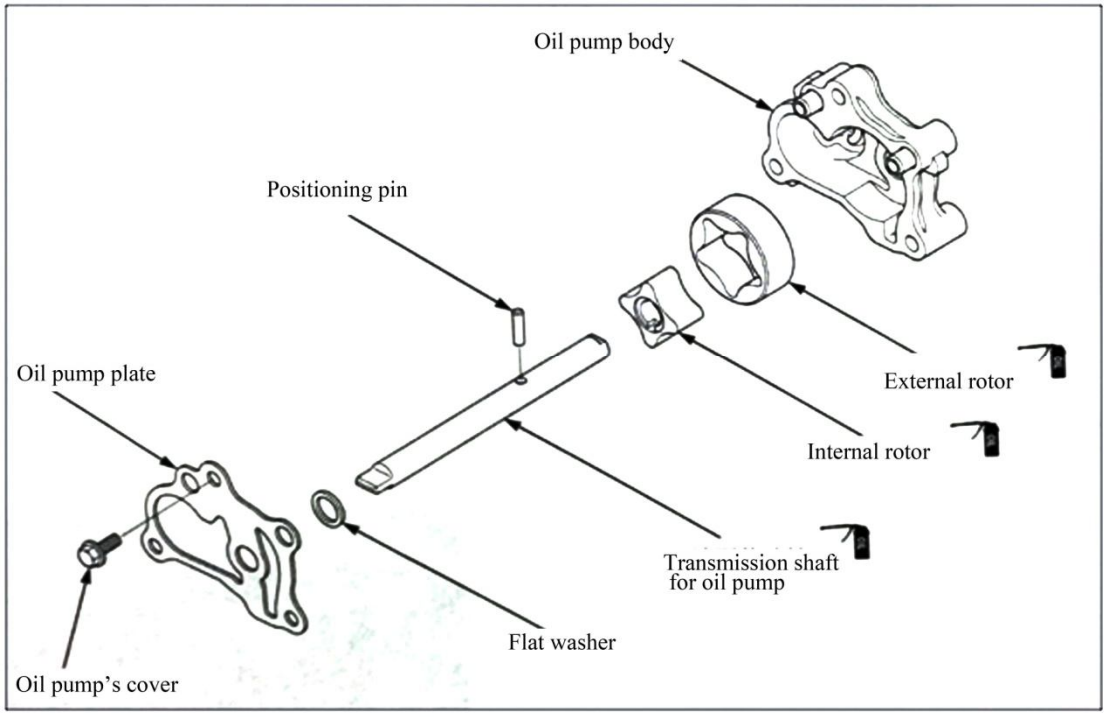


Note:

- Align the oil pump’s shaft with the groove on water pump’s shaft.

Disassembly/Re-assembly

The disassembly and re-assembly for oil pump is shown as below:



Check:

- Check the driving, driven gear of oil pump, and the driving chain.

Check the damage, abnormal wear-out, distortion and burn out on parts below.

- Oil pump’s shaft
- Positioning pin
- Internal rotor
- External rotor
- Oil pump base’s body

Measure the clearance of oil pump according to specification of lubrication system.

Any measured results passed the limit of maintenance, please replace the oil pump as a complete set.

Pressure relief valve

Disassembly/Re-assembly

Remove the oil pump (P6)。

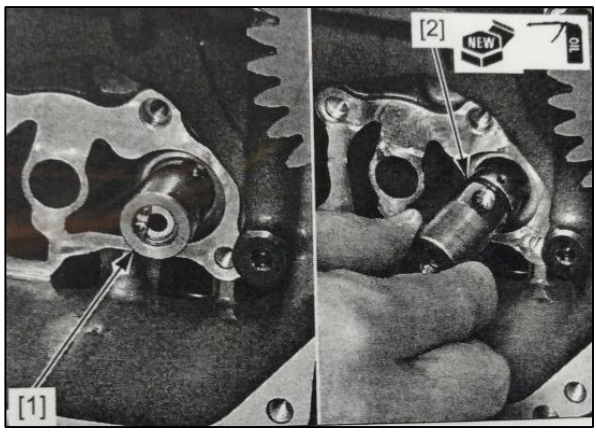
Remove the pressure relief valve [1] and o-ring [2].

Replace the o-ring for a new one.

Install the o-ring into groove on pressure relief valve.

Install the pressure relief valve into groove on crankcase body.

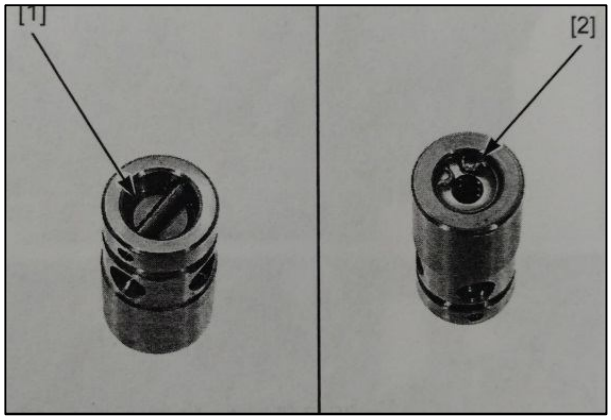
Re-assemble the oil pump (P6)。



Check

Push and press the pushing rod [1] of controlling valve to confirm the normal work of pressure relief valve.

Remove the elastic circlip [2] to break up the pressure relief valve.



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

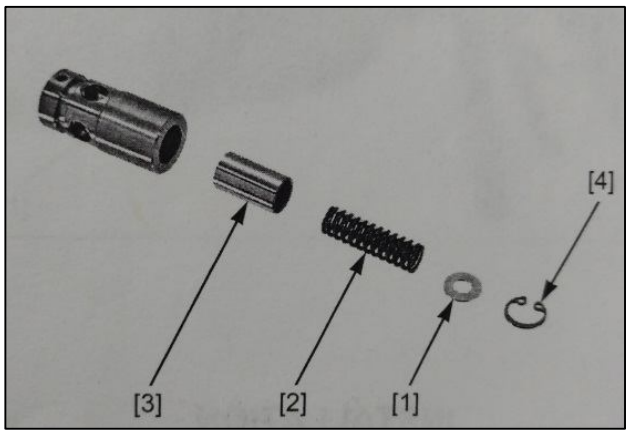
Check the abrasion, scratch or damage on pushing rod of controlling valve.

Check the fatigue and damage on spring.

The re-assembly of pressure relief valve is opposite to its disassembly.

Note:

- When re-assembling the elastic circlip, its chamfer faces outwards.
- Make sure re-assemble the elastic circlip into the groove



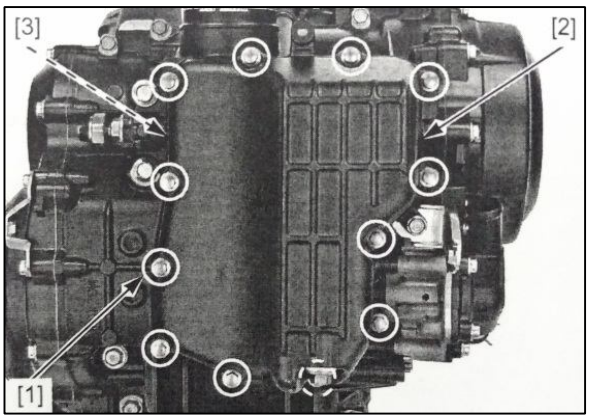
Oil filter

Disassembly

Drain off the oil.

Remove the air exhaust pipe.

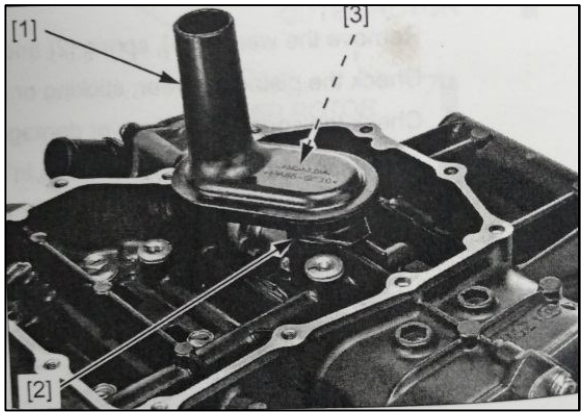
AC products family: Remove the clamp [1] on water drainage tube from oil pan.



Remove the bolts [1] on oil pan by alternative angle sequence, then remove the oil pan [2] and its gasket [3].

Remove the oil filter [1] and its seal ring [2].

Clean up the oil filtering screen [3] and check if it is damaged.

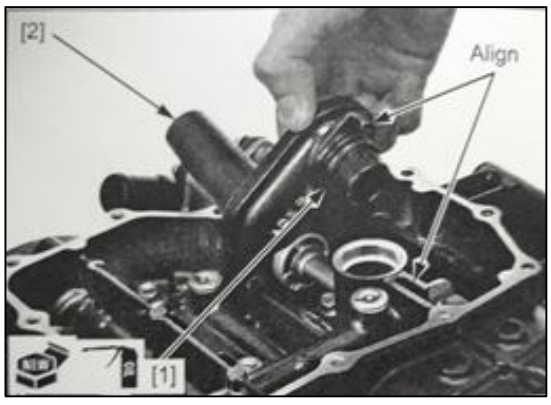


Re-assembly

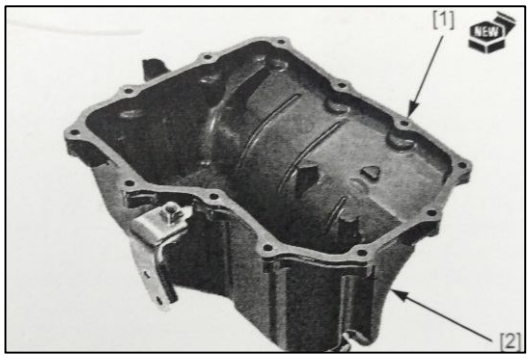
Note: Please don't damage the assembling surface.

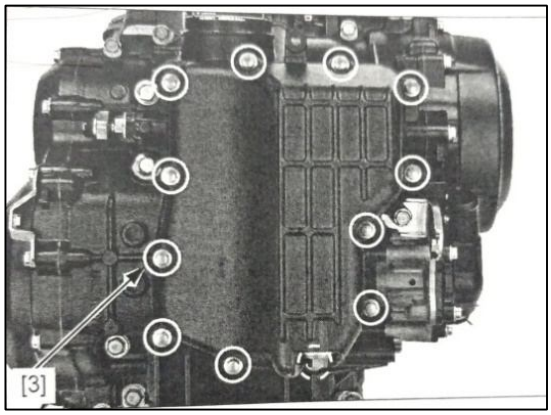
Clean up the residual gasket on the assembling surface of oil pan, replace the seal ring [1] for a new one, then install it on oil filter [2].

Install the oil filter into crankcase, and align the convex shaft on filter with groove on crankcase

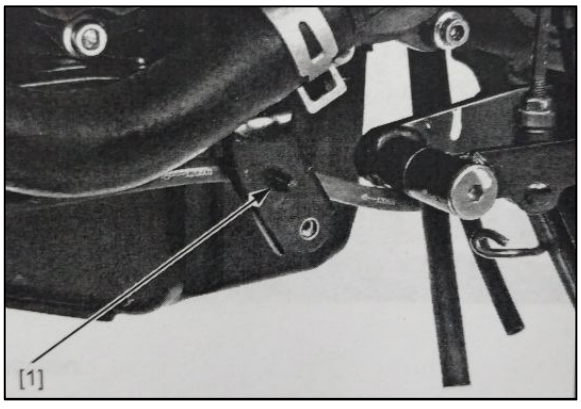


Replace the gasket [1] for a new one, and install the oil pan [2].
Install the oil pan and bolt [3] into crankcase body.
Fasten the bolts in alternative angle sequence.





AC products family: Install the bracket [1] of water drainage tube.
Install the water drainage tube.
Fill the engine with recommended oil and confirm the oil leakage.



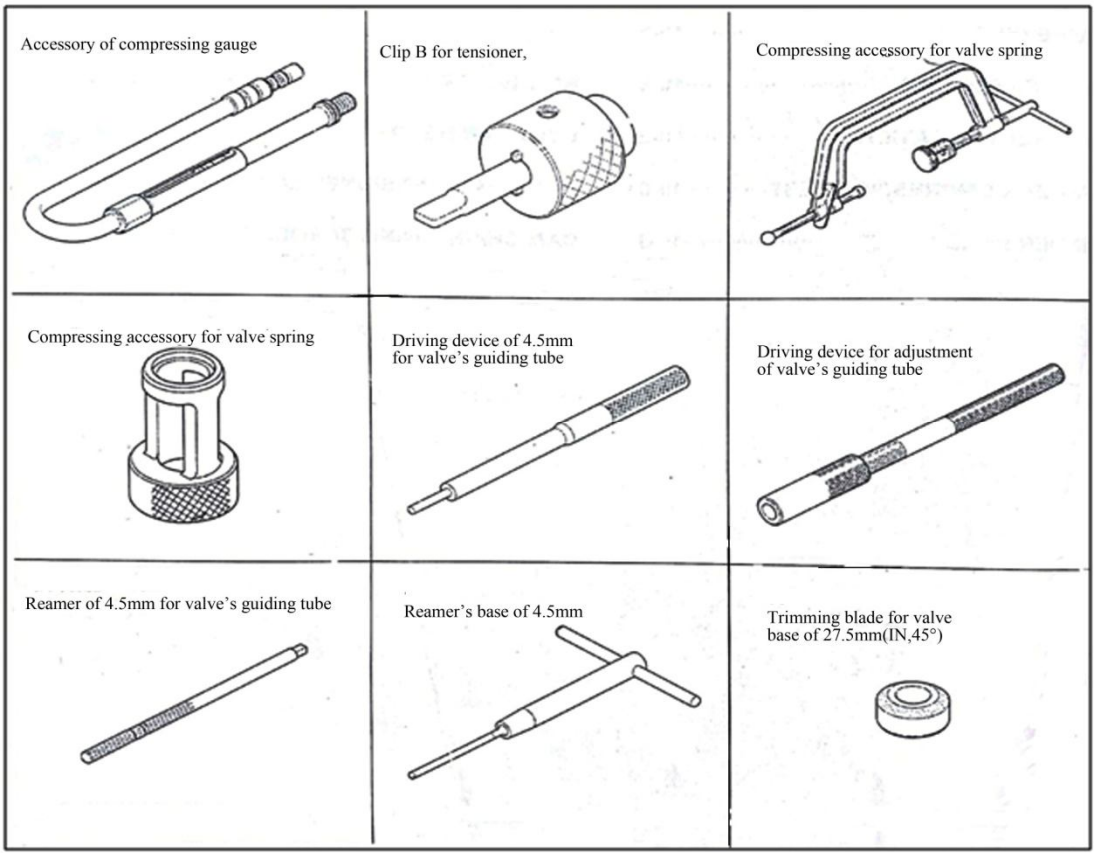
5 Cylinder head and valve

Maintenance information

Summary

- This chapter includes the inspection and maintenance for cylinder head, camshaft and swinging arm.
- When repairing the camshaft, swinging arm and adjusting stud of tensioner, we needn't remove the engine from frame; But when repairing the cylinder head and valves, we need remove the engine from frame.
- When disassembling the components, mark up the removed parts for a correct re-assembly.
- Before checking, wash up all the removed parts by cleanser, then dry them up by compressed air.
- The lubricant on camshaft is got through the oil passage in cylinder head and its cover, in this case, before re-assembling the cylinder head and its cover, wash up their oil passage first.
- Please don't damage the contact surface when disassembling the cylinder head and its cover.

Tool(s)



Trimming tools of 24mm （EX,45°）for valve seat 	End mill of 28mm(IN,32°) 	End mill of 24mm(IN,32°) 
Internal milling cutter of 26mm(IN,60°) 	Internal milling cutter 32mm(EX,60°) 	

Cylinder head/Specification of valves

Unit: mm

Items			Standard	Limit
Cylinder pressure under electrical starting			1372kPa	—
Valve clearance		Air inlet	0.13～0.2	—
		Air exhaust	0.25～0.3	—
Swinging arm and its shaft	Internal diameter of swing arm	Inlet/Exhaust	10.000～10.015	10.10
	External diameter of swinging arm	Inlet/Exhaust	9.972～9.967	9.75
	Clearance between swinging arm and its shaft	Inlet/Exhaust	0.013～0.043	0.10
Camshaft	Protrusion height of cam	Air inlet	31.2123～31.3123	31.1923
		Air exhaust	31.2407～31.3407	31.2207
	Clearance between journal and hole		0.02～0.062	0.10
	Runout		—	0.04
Valve, guiding tube of valve	Valve rod’s diameter	Air inlet	4.475～4.490	4.465
		Air exhaust	4.465～4.480	4.455
	Internal diameter of valve’s guiding tube	Inlet/Exhaust	4.500～4.512	4.54
	Clearance between valve rod and its guiding tube	Air inlet	0.005～0.042	0.07
		Air exhaust	0.015～0.052	0.08
	Guiding tube’s height	Inlet/Exhaust	14.10～14.30	—
	Valve base’s width	Inlet/Exhaust	0.90～1.10	1.5
Free length of valve spring		Spring inside	31.5	30.3
		Spring outside	41.5	40.3
Flatness of cylinder head		—		0.10

Troubleshooting

- Malfunction at the top place of engine is usually bad for engine performance. We can find out these malfunctions by compression test, also we can find them by detective rod or stethoscope to know where the engine noise comes from, even can reach the top part of engine.
- In case the power output of engine is weak when it under low speed, please check if there is white smoke in beathing tube of crankcase. In case the soft hose is smoky, please check the jamming on piston ring.

When engine is working under low speed, too low the compressing pressure, difficult starting or poor performance

- Valve
  - Incorrect adjustment for valve clearance
  - Valve burned out or got bent
  - Wrong valve timing
  - The valve spring got cracked
- Cylinder head
  - The gasket of cylinder head with leakage or damage
  - Cylinder head gets bow, twist or crack
  - Spark plug is flexible
- Cylinder, piston or piston ring worn out

Compressing overpressure, overheat or cylinder knock

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

Smoky

- Cylinder head
  - Valve rod or guiding tube worn out
  - Sealing piece for valve rod damaged
- Cylinder, piston, or piston ring worn out

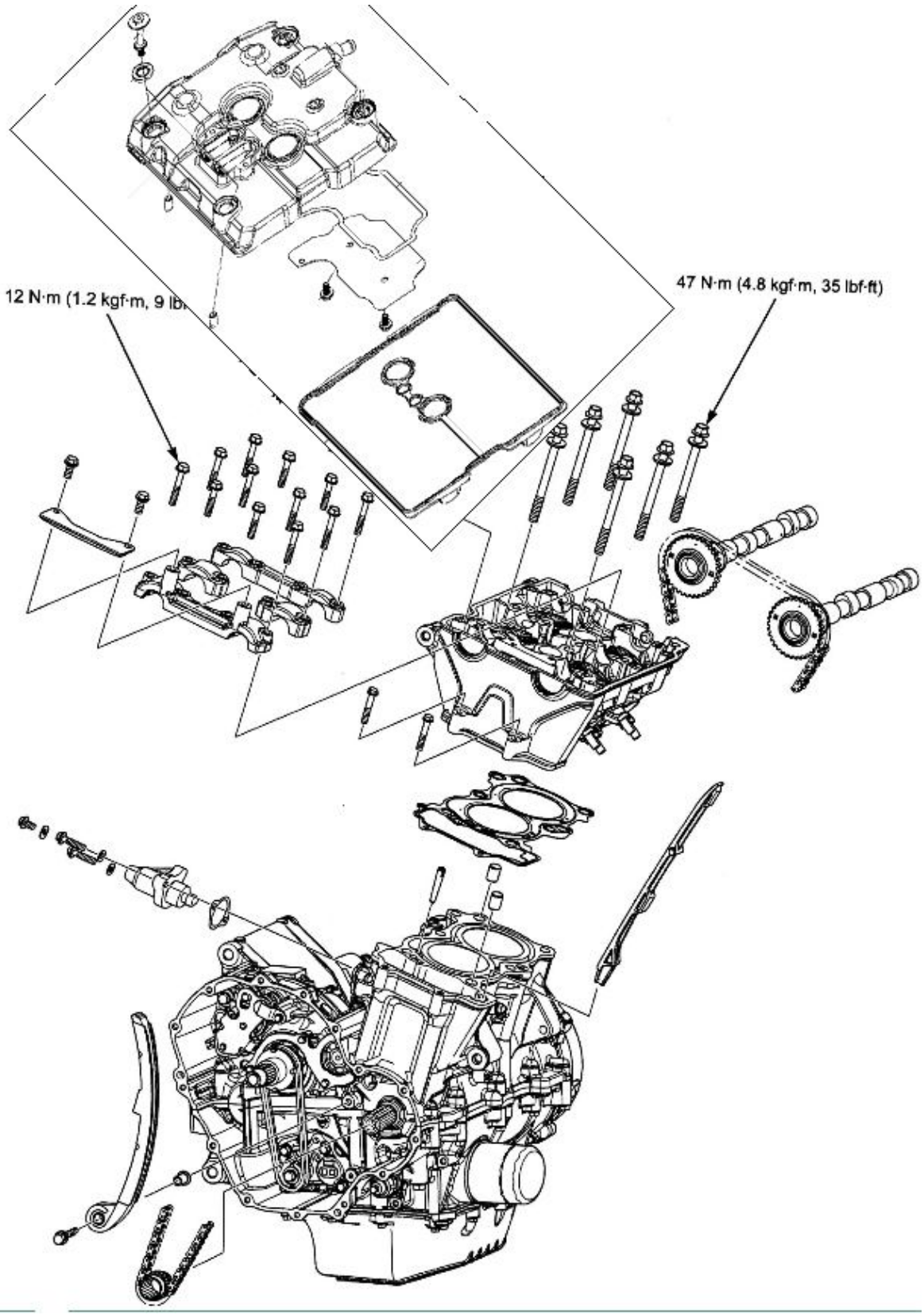
Noisy

- Cylinder head
  - Incorrect adjustment for valve clearance
  - Valve gets jammed or its spring cracked
  - Camshaft worn out or damaged
  - Swinging arm and its shaft worn out
  - Swinging arm and valve rod's end worn out
  - Chain of cam gets flexible or worn out
  - Timing chain worn out
  - Teeth of cam's sprocket wheel worn out
- Cylinder, piston and piton ring worn out

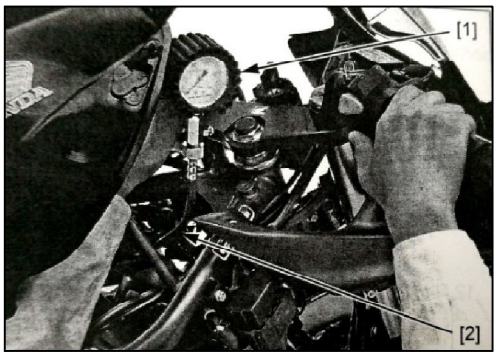
Poor idling

- Too low the compressing pressure in cylinder

Position for components



Cylinder compression test



Heat the engine to its normal working temperature.
Stop engine and remove spark plug.
Install the connector with wire 33 (Black) of ECM by temporary.
Install the threaded end of cylinder pressure gauge [1] into the hole for spark plug.

Tool(s):

[2]Accessory for cylinder pressure gauge

Turn ignition switch to ON, then turn the engine switch to "∩".
Turn to neutral gear.
Turn on the throttle to its maximum limit, start engine until the data in pressure gauge stopped rising.
The maximum data may usually keep for 4～7 seconds.

The compressed pressure:

When rotation is 450rpm, the pressure is 1372kPa

Analysis for low pressure:

- Leakage at cylinder head's gasket
- Incorrect adjustment for valve clearance
- Valve leakage
- Piston ring or cylinder worn out

Analysis for high pressure:

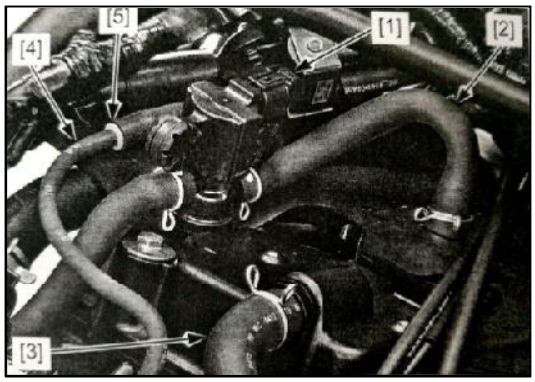
- Carbon buildup in combustion chamber or on piston's top

Cylinder head cover

Disassembly/Re-assembly

Note:

- The maintenance for cylinder head cover needn't remove the engine from frame.

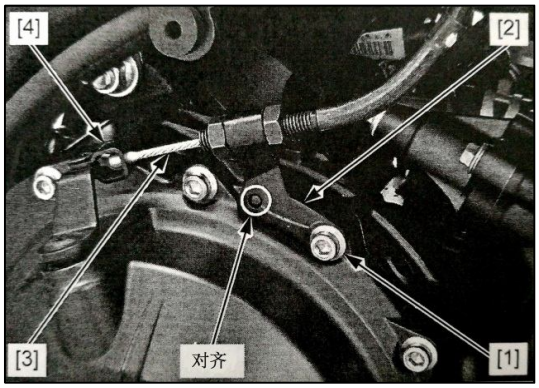


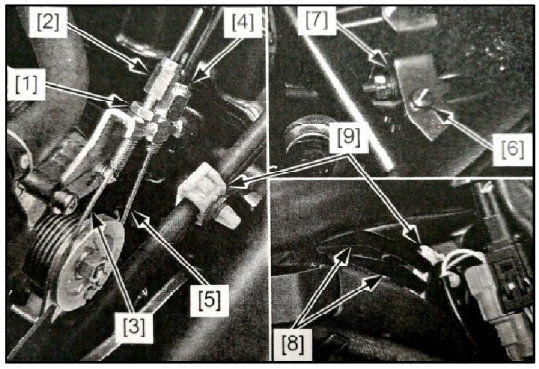
Remove the bolt [1], locating plate of clutch cable, and remove the Loosen the locking nut A[1] of adjustor for throttle cable, then loosen and remove the throttle cable A[3] from throttle drum and cable's bracket.
Loosen the adjustor B[4] of throttle cable, then loosen and remove the throttle cable B[5] from throttle drum and cable's bracket.
Move the throttle cable out of frame.
Remove the installation bolt on heat radiator.
CBR500RA/CB500FA/XA: Remove the bolt [6] and joint [7] of brake line.
Remove the brake hose [9] from two wire clips [8], then remove the wire clips.

Fuel evaporation system: Remove the installation bolt [1] and washer [2], then the carbon canister [3].
Remove bolt [4] and connecting cable [5].
Fuel evaporation system: Remove the controlling solenoid valve for

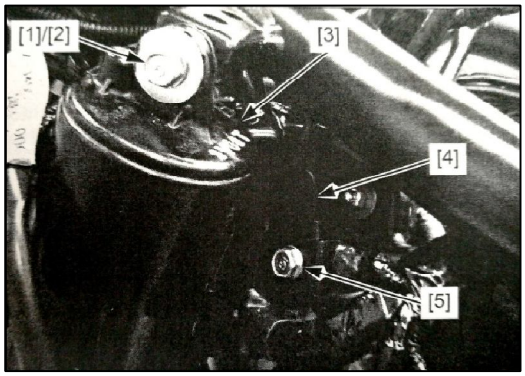
Remove the fuel tank under pallet.
Remove the parts below:
- Remove the socket plug [1] for secondary air supplementary valve.
- Remove the air inlet tube [2] of secondary air supplement
- Remove the breathing tube [3].
- Fuel evaporation system [4] [5]

clutch cable [4] from its lug [3].
Move the clutch cable out of frame.

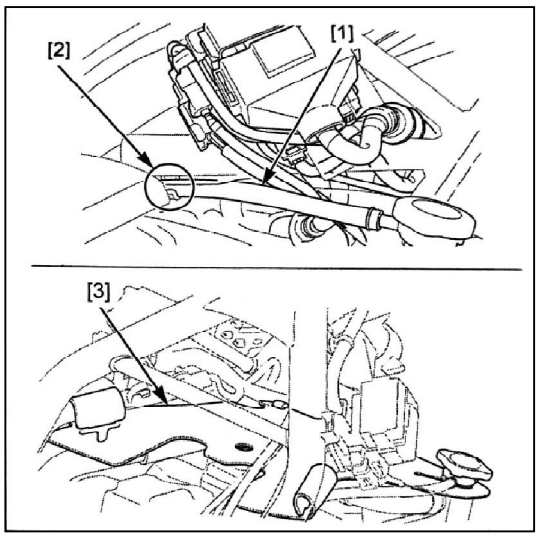




fuel evaporation from frame.



Loosen the overflow tube [2] from its clip [1].
Remove the rubber thermal shield plate [3] at overflow tube's plate, then put it on the right side of frame.

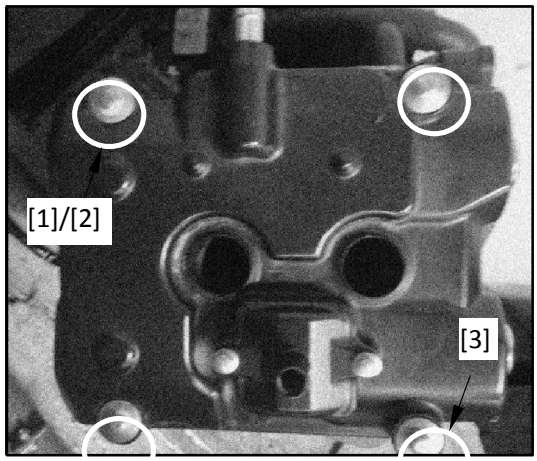


Note:

To avoid the runout of cylinder cover, please fix its by adhesive tape.

Remove the bolt [1] on cylinder head cover and rubber base [2].
Remove the cylinder head cover [3] from the head itself.
Note:

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



Remove the seal ring [1] from cylinder head cover.
The re-assembly is precisely opposite to disassembly.

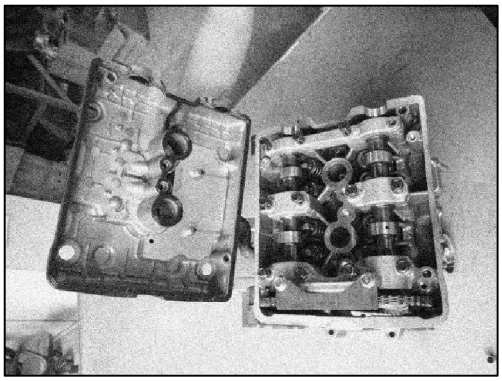
Fastening torque:

Bolt of cylinder head cover:10N•m

Bolt on right crankcase: 10N•m

Note:

- Replace the seal ring on cylinder head cover for a new one.
- Please assemble the seal ring for cylinder head cover to its corresponding groove.
- Align the locating hole on clutch cable with the convex column on crankcase.



Make adjustment for parts below:

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

Camshaft

Note:

- When repairing the camshaft, we needn't remove engine from frame.

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

Note:

Be careful, don't let the bolt of chain's limit plate drop into crankcase.

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

Caution:

From outside to inside, alternatively loosen the bracket's bolts, otherwise the camshaft's bracket may damage.

Be careful. don't let the bolt on camshaft's bracket drop into crankcase.

Remove the seal bolt [1] and washer [2].
Completely move the adjusting stud of adjuster [1] backwards by special tools (Clockwise).

Tool(s):

[3] Fixture B for tensioning device

Alternatively loosen the bolts [1] of camshaft's bracket by 2 to 3 times.
Remove the camshaft's bracket [2] and positioning pin from cylinder body.

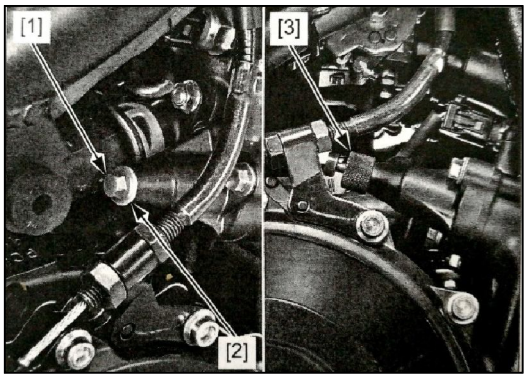
Note:

- Forced removal for positioning pin from camshaft's bracket is

not allowed.

Suspend the cam's chain by line to avoid dropping into crankcase.

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

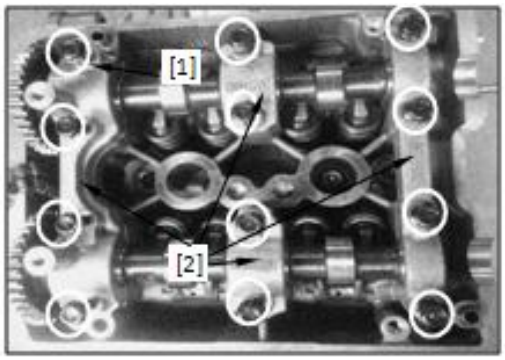


Lift up the swinging arm [1].

Remove the valve adjustment shim [2]

Note:

- Don't let the adjusting shim of valve drop into crankcase.
- Mark up the shim to make sure correct re-assembly.
- Remove by tweezers or magnet may make your work easier.



Check

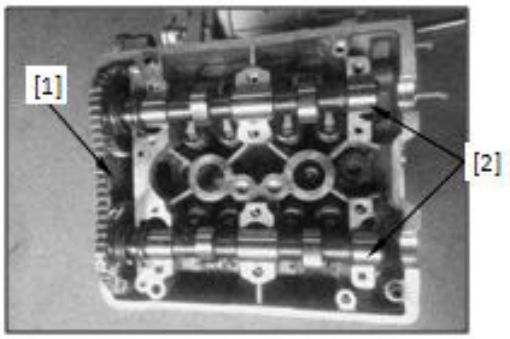
Check the damage, wear-out, distortion, burn-out or block in oil passage for parts below:

- Cam's sprocket chain/Camshaft
- Camshaft's bracket/Positioning pin
- Pressing plate for cam's sprocket wheel

Measure each part according to specification of cylinder head/valves

Runout of camshaft

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

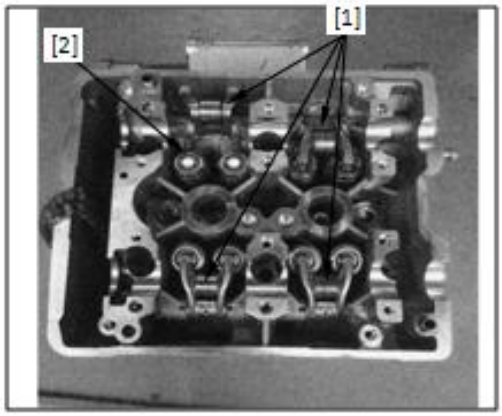


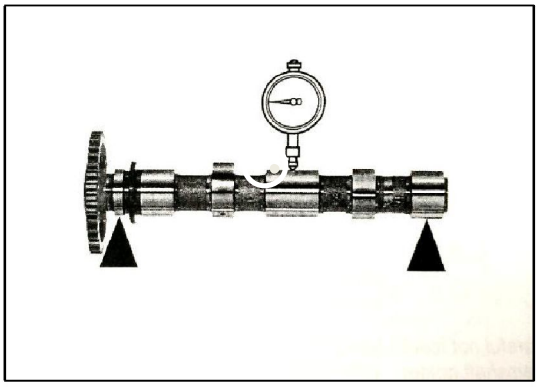
Limit for maintenance: 0.04mm

Oil gap of camshaft

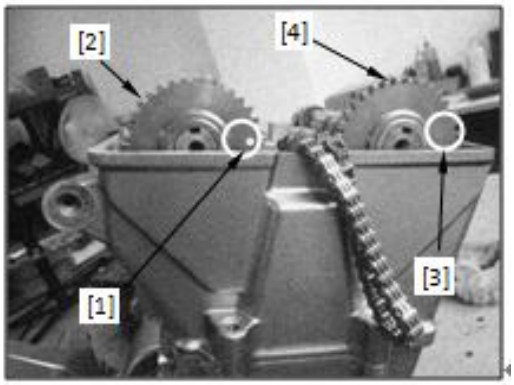
Wipe up the oil on camshaft, cylinder head and camshaft's bracket.
Assemble the camshaft on cylinder head.

- Get the machining mark [2] on cam's sprocket wheel [1] of air inlet aligned with upper surface of cylinder as picture shows.
- Get the lower scale line on mark EX [4] of camshaft [3] aligned with upper surface of cylinder head as picture shows.





Lay a plastic line gap gauge [1] vertically from the top of camshaft., avoid the oil hole.
Note:



- Don't turn the camshaft during checking.

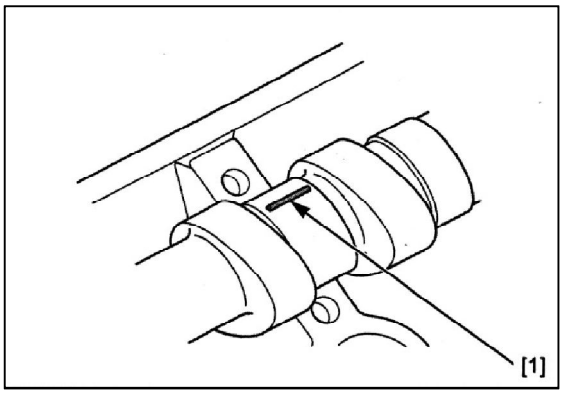
Make sure the positioning pin on camshaft's bracket align with the pin's hole on cylinder head.
Install each camshaft's bracket in corresponding plate and make sure the arrow [1] point at the side of air inlet as picture shows.

- Camshaft's bracket A[2]
- Camshaft's bracket B[3]("IN" means: Bracket at air inlet side)
- Camshaft's bracket C[4]("EX" means: Bracket at air exhaust side)
- Camshaft's bracket D[5]

Coat the thread of bolt on each camshaft’s bracket and sealing surface with oil.

Bolt on camshaft's bracket：

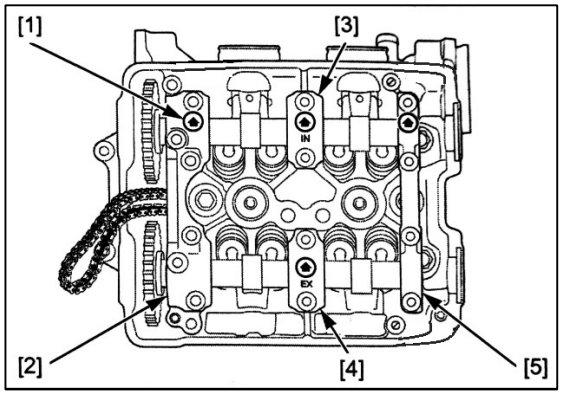
- 6×39.5mm bolt[1]
- 6×32mm bolt[2]



Caution

From inside to outside, alternatively fasten the bolts on camshaft’s bracket, otherwise the bracket may damage.

From inside to outside, alternatively fasten the bolts on camshaft’s bracket until the bracket installed in place.



Alternatively fasten the bolts on bracket by 2～3 times until reached the stipulated torque.

Fastening torque: 12N・m

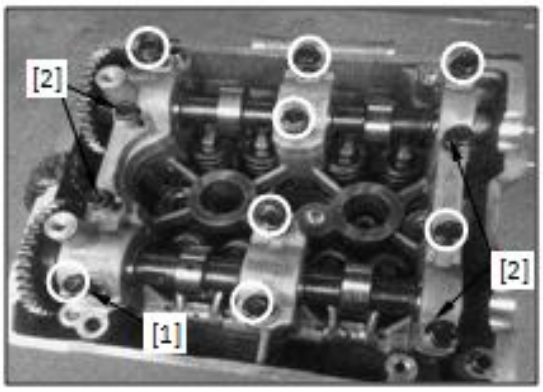
Remove the bracket of camshaft, measure width of every plastic line gap gauge.

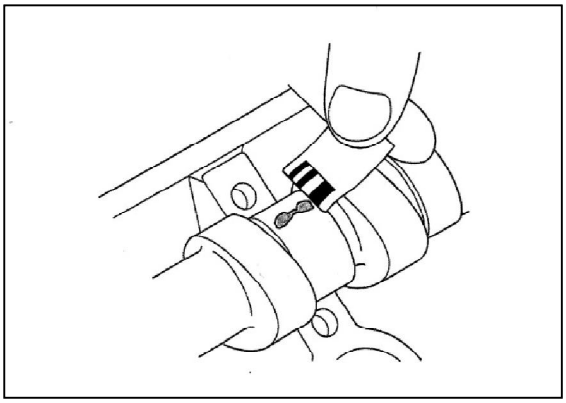
The maximum width is the one for oil gap.

Limit for maintenance: 0.10mm

When it passed the limit for maintenance, please replace the camshaft and check the oil gap once again.

In case the oil gap still passed the limit for maintenance, please replace the camshaft’s bracket and cylinder head together as a complete set.

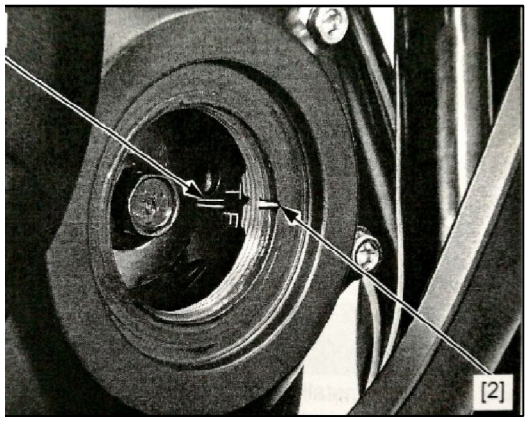




Re-assembly

Note: When turning the crankshaft, please don't forcedly press-fit the chain of cam into timing sprocket wheel.

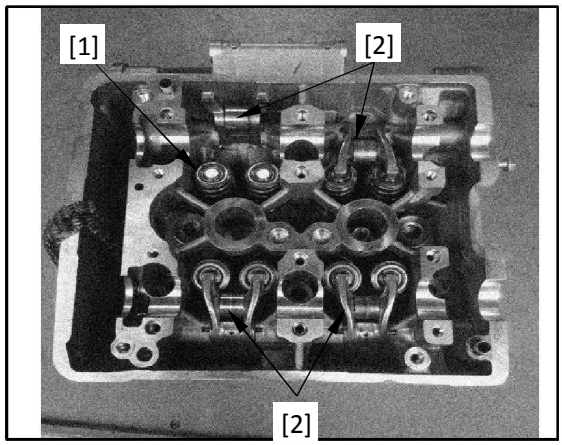
Turn the crankshaft clockwise, get the mark T [1] on primary driving gear aligned with the index mark [2] on right crankcase.



Note: Please don't let the valve adjusting shim drop into crankcase.

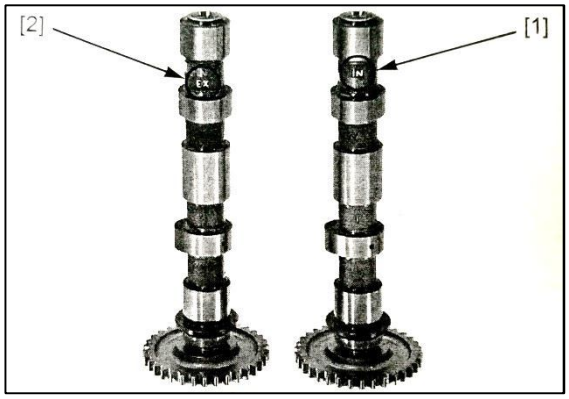
Re-assemble the valve adjusting shim [1] back to their position in turn.

Lay down the swinging arm's shaft [2].



Every camshaft has its own mark for identification:

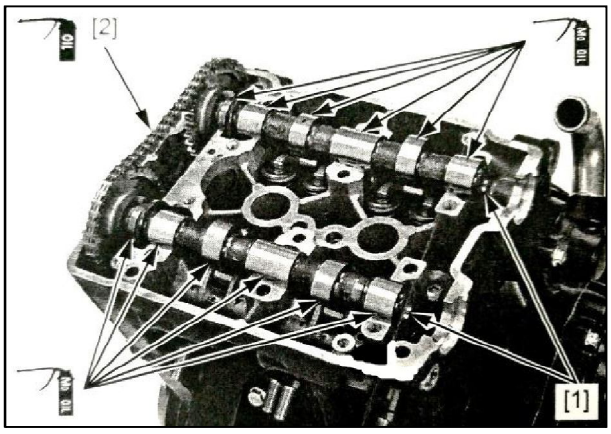
- “IN” Mark [1]: Camshaft of air inlet
- “EX”Mark [2]：Camshaft for air exhaust

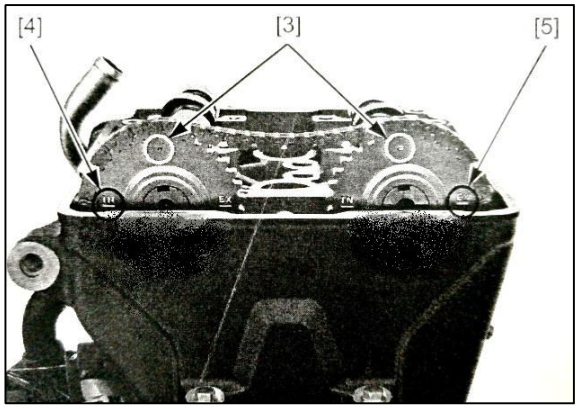


Coat the cam [1] of camshaft, journal, and force bearing surface with solution of molybdenum disulfide

Coat the complete surface of cam’s chain [2] with oil.

Match and assemble the chain and sprocket wheel of cam, then install the camshaft on the cylinder head. The mark [3] of punching hole on sprocket wheel of cam face upwards, and get the mark IN [4] and lower scale line of mark EX [5] with upper surface of cylinder head as picture shows.



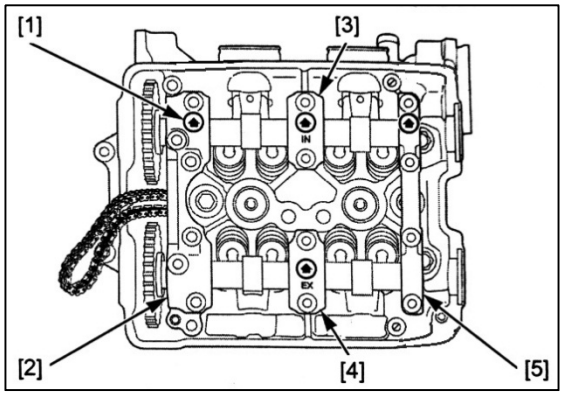


Make sure the positioning pin on camshaft’s bracket align with the pin’s hole on cylinder head. Make sure all the arrows on camshaft’s bracket point at the side of air inlet.

Please install every camshaft’s bracket in corresponding plate and make sure the arrow [1] point at the side of air inlet as picture shows.

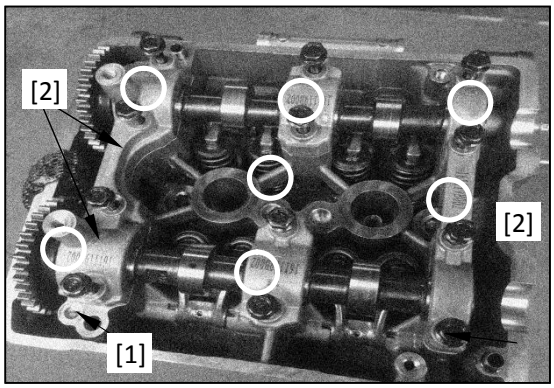
- Camshaft’s bracket A[2]
- Camshaft’s bracket B[3] (“IN”

Mark: Bracket at air inlet side)
- Camshaft’s bracket C[4](“EX” Mark: Bracket at air exhaust side)
- Camshaft’s bracket D[5]



Please coat the threaded part and sealing surface of camshaft’s bracket with oil.

Bolt on camshaft’s bracket
- 6×39.5mm bolt [1]
- 6×32mm bolt [2]



Caution

From inside to outside, alternatively fasten the bolts on camshaft’s bracket, otherwise the bracket may damage.

From inside to outside, alternatively fasten the bolts on camshaft’s bracket, until the bracket installed in place.

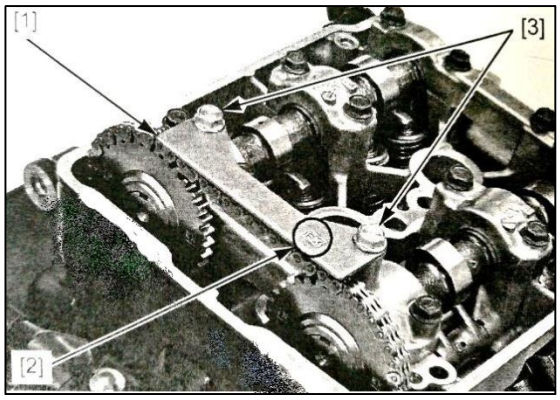
Alternatively fasten the bolts of camshaft’s bracket to stipulated torque by 2～3 times.

Assemble the pressing plate [1] of cam’s chain, the mark EX [2] faces to air exhaust side.

Note: Don’t let the bolt of pressing plate for cam’s chain drop into crankcase.

Assemble and fasten the bolt [3] for pressing plate of cam’s chain.

Fastening torque: 12N·m



Remove the tensioner [1] from its adjusting stud.

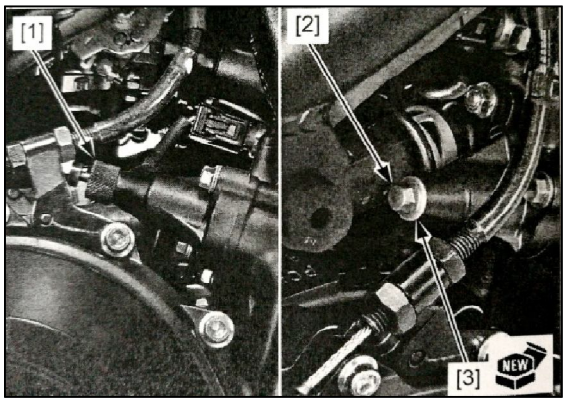
Turn the crankshaft clockwise several times, then get the mark T on primary driving gear aligned with the index mark on right crankcase

Check once again the valve timing.

Check the valve clearance

Assemble the seal bolt [1], and

replace the gasket [2] for a new one.
Re-assemble the cylinder head cover.



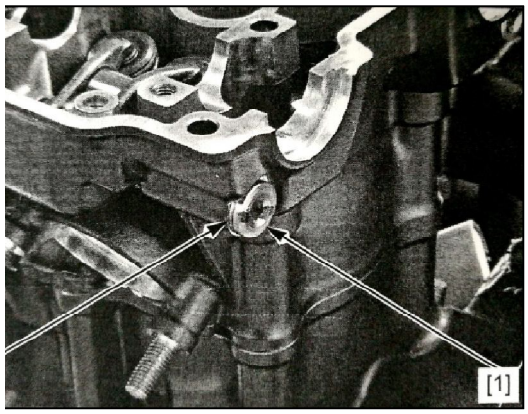
Swinging arm

Disassembly/Re-assembly

Note:

- When repairing the swinging arm's shaft, we needn't remove the engine from frame.
- The steps for repairing swinging arm's shaft on air inlet valve and exhaust valve are the same.

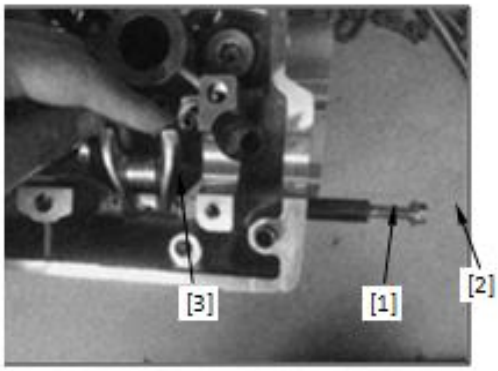
Remove the camshaft.
Remove the bolt [1] on pin of swinging arm's shaft and gasket [2].



Fix the swinging arm [1], and remove its shaft [3] by the bolt [2] in size of 6mm.
Remove the swinging arm.
Coat the sliding area, force bearing surface, external surface of swinging arm's shaft with solution of molybdenum disulfide
Assemble the swinging arm and its shaft.
Note:

- The swinging arm could be identified by its mark:

- "I" mark [4]: Swinging arm at air inlet side
- "E" mark [5]: Swinging arm at air exhaust side

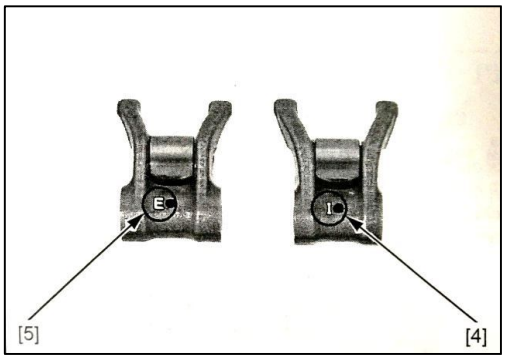


Install the bolt [1] for inserting pin, coat the threaded part with oil, replace the gasket [2] for a new one, get the impeller aligned with groove.

Fasten the inserting pin to stipulated torque.

Fastening torque: 15N•m

Re-assemble the camshaft.



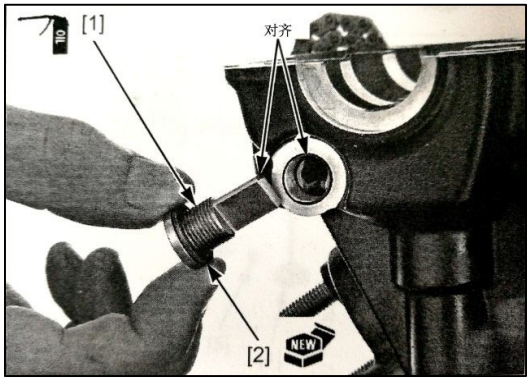
Check

Check the damage, wear-out, distortion, burn-out or block in oil passage for parts below:

- Swinging arm
- Swinging arm’s shaft

Measure clearance for each part according to specification for cylinder head/valves.

Any part passed the limit of maintenance, please replace.



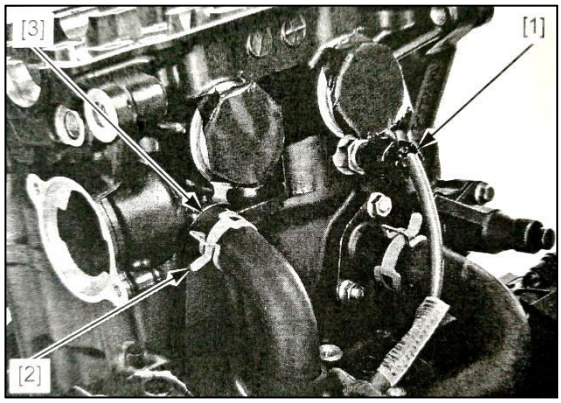
Cylinder head

Disassembly:

Disassemble the parts below in turn:

- Engine
- Swinging arm
- Heat radiator

Loosen the tube clamp [2] and water tube [3] for sub circulation,



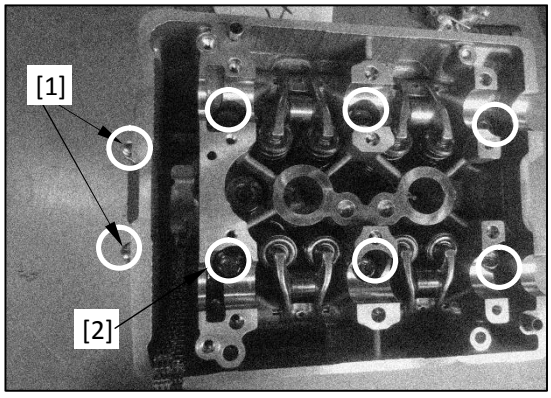
Remove the bolt [1] in size of 6mm. *Before removing bolt, sucking off the oil in cylinder head's bolt groove of 9mm.*

Alternatively loosen the cylinder head bolt [2] of 9mm by 2～3 times, then remove the bolt.

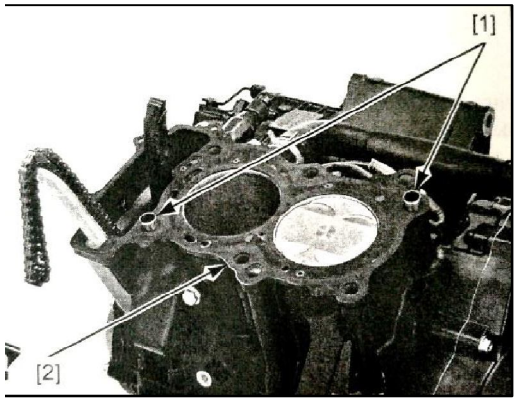
Remove the cylinder head [3].

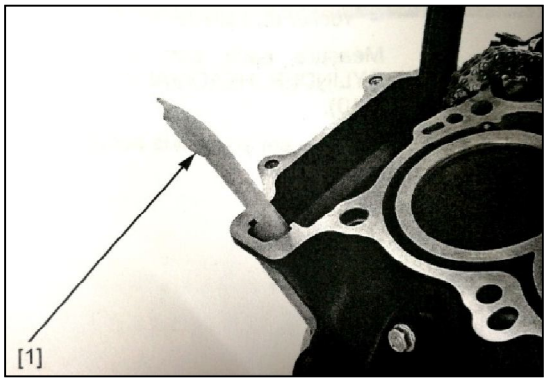
Note:

- Suspend the cam's chain by line to avoid dropping into crankcase
- Don't heavily knock the cylinder head, don't take any tool as lever and damage the contact surface.



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



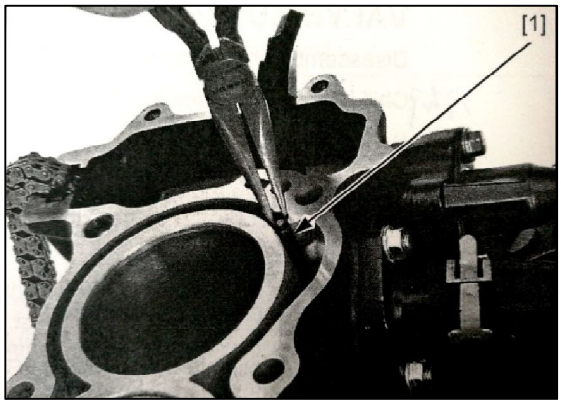


Break down

Remove the parts below:

- Spark plug
- Water temperature sensor

Note: To avoid the permanent distortion on spring, don't Mark up every removed part for a



easy re-assembly.

Remove the compressing tools for valve and parts below:

- Upper valve spring base ring [1]

Check

Check the damage, wear-out, distortion, burn-out and block in oil passage for parts below.

- Cylinder head

Remove the guiding plate [1] for chain.

Remove the rubber rod [1] of water proof.

Check if the rubber rod [1] for water proof gets bad or damaged.

heavily press the valve spring when removing it.

Remove valve locking clip [1] by tools for it only.

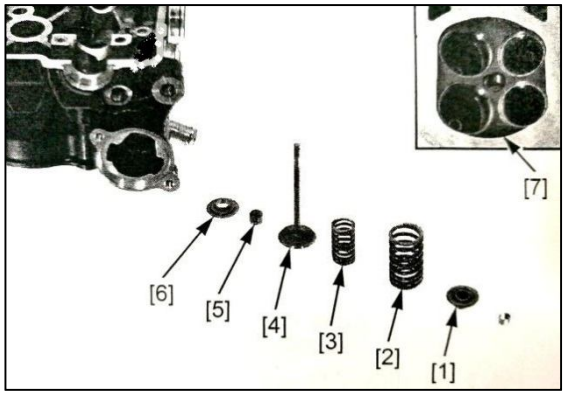
Tool(s):

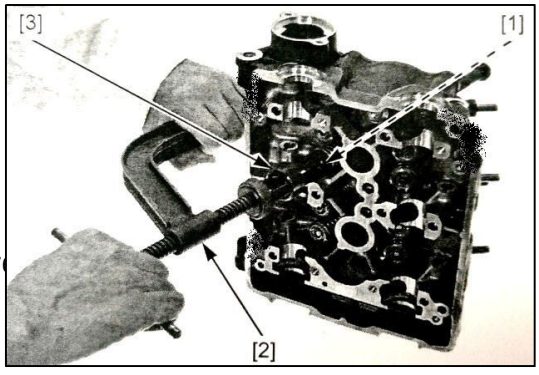
[2]Compressing tool for valve spring

[3]Compressing accessories for valve spring

- External valve spring [2]
- Internal valve spring [3]
- Valve [4]
- Oil shield cover [5]
- Lower valve spring base [6]

Please don't damage the combination surface. Please clean up the carbon buildup in combustion chamber and gasket on the surface of cylinder head.





- Internal/External spring
- Valve
- Valve’s guiding tube
- Chain’s guiding plate

Measure clearance for each part according to specification of cylinder head/valves.

Any part passed the limit for maintenance, please replace.

- Clean up the carbon buildup in valve’s guiding tube by reamer before measuring.
- Please refer to the Checking for valve seat.

Replacement for valve’s guiding tube

Disassemble the cylinder head.

Put the new guiding tube in freezer for cooling down by a hour.

Note:

- Please wear the oven gloves when operate the hot cylinder head to avoid scald.
- Heat the cylinder head by fire may get it bow and twist.

Heat the cylinder head to 130～140℃ by hot plate or baking oven.

The welding tools could be bought in shop.

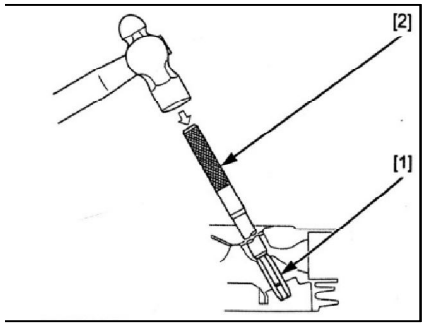
Support the cylinder head, push out the guiding rube and its clamp from cylinder head from the side of combustion chamber.

Take out the new valve’s guiding tube [1] from freezer, when the cylinder head is still hot, install the new tube from camshaft, until its exposed length reached the stipulation. Slide the main shaft on upper crankcase body and remove its bearing on the right.

[2]Adjusting driver for valve’s guiding tube

Stipulation: In/Ex:14.10～14.30mm

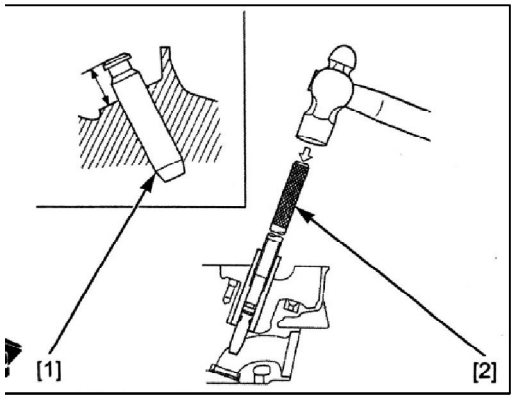
We can ensure the suitable temperature by temperature indicating bar.



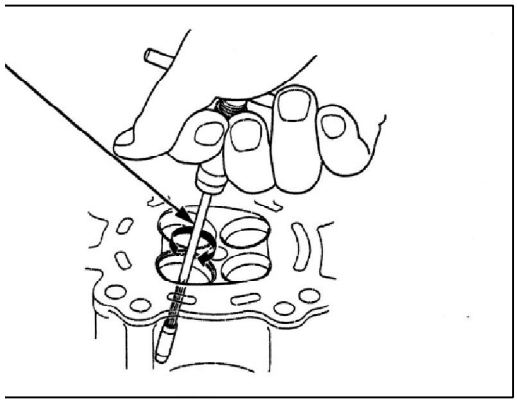
Tool(s):

Driver for valve guiding tube, 4.5mm

Tool(s)



Note:



Requirement for re-assembly:

Mark up the depth of valve’s guiding tube by mark pen.

Adjust to correct depth by driver for valve’s guiding tube.

Let the cylinder cool down to room temperature.

When re-assembled, adjust the guiding tube by reamer once gain.

When cleaning up, please don’t let the reamer pry up or get inclining in the guiding tube.

During this operation, please adopt the lubricant for cutting only.

Insert the reamer in from the side of combustion chamber in cylinder head, turn the reamer clockwise in the all process.

Tool(s)

Reamer for valve’s guiding tube, 4.5mm

Completely clean up the cylinder head to remove all metallic chips produced by reamer, finally trim the valve.

Checking and trimming for valve base

Check

Disassemble the cylinder head cover.

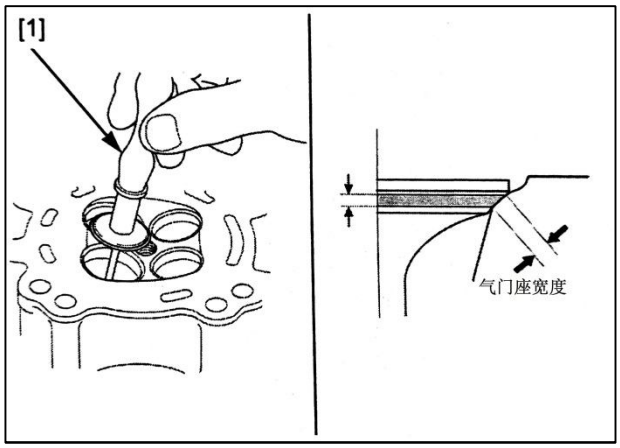
Totally clean up the carbon buildup in air inlet/exhaust valve.

Coat a thin layer of iron blue to every valve.

Slightly knock the valve to its base’s side by hand grinding tool, don’t make the valve turn, then check the contact of valve base.

Standard：0.90～1.10mm

Limit for maintenance：1.5mm



Remove the valve, check the width for each base surface of valve.

The width for contact surface of valve base shall be within stipulation, whose surrounding shall be smooth and flat, in case not, please trim the valve base.

The valve could not be grinded. In case the contact surface of valve is burned out or badly worn out, or the valve base is not smooth or flat, please replace.

Check and confirm if the valve is in conditions below：

- The contact surface of valve base is not smooth and flat
  - The valve rod folded or bent, please replace the valve and trim the valve base.
- Base’s surface worn out.
  - Replace the valve and trim its base
- Contact area (Too high or too low)
  - Replace the valve base.

Trimming

The trimming for valve base needs the tools below:

Tool(s):

Tool holder ,4.5mm 07781～0010600

Trimming cutter for valve base,27.5mm (IN, 45°) 07780～0010200

Trimming cutter for valve base,24mm (EX, 45°) 07780～0010600

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

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

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

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

Width of valve base:0.90～1.10mm

Note:

- Please comply with the User manual for surface grinding suppliers.
- Don’t grind too much for valve

1、Adopt the trimming cutter of 45 ° first, cut off the rough or unregular part of valve base.

2、Cut off 1/4 of the ring belt area on working surface of valve base by flat milling cutter of 32 °.

3、Cut off 1/4 of the ring belt area on bottom of valve base by internal milling cutter of 60 °.

4、Grind the valve base to suitable width by trimming cutter of 45 °.

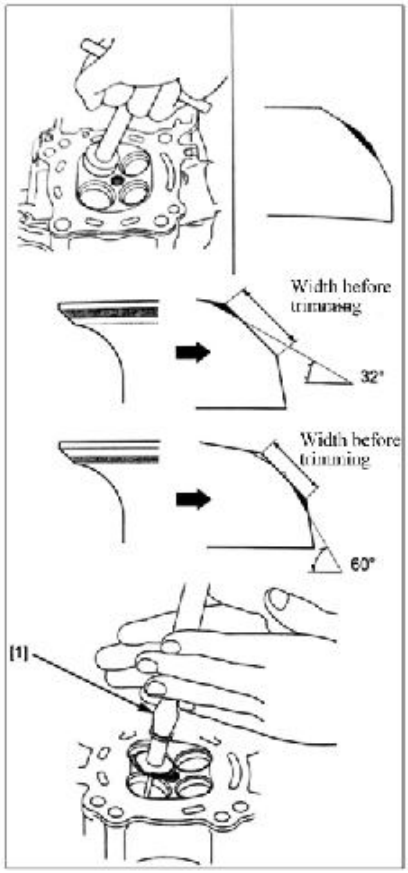
Make sure already got rid of all the rough and unregular surface on valve base.

5、When the griding for valve base finished, coat the surface of valve with abrasive, and slightly grind the valve.

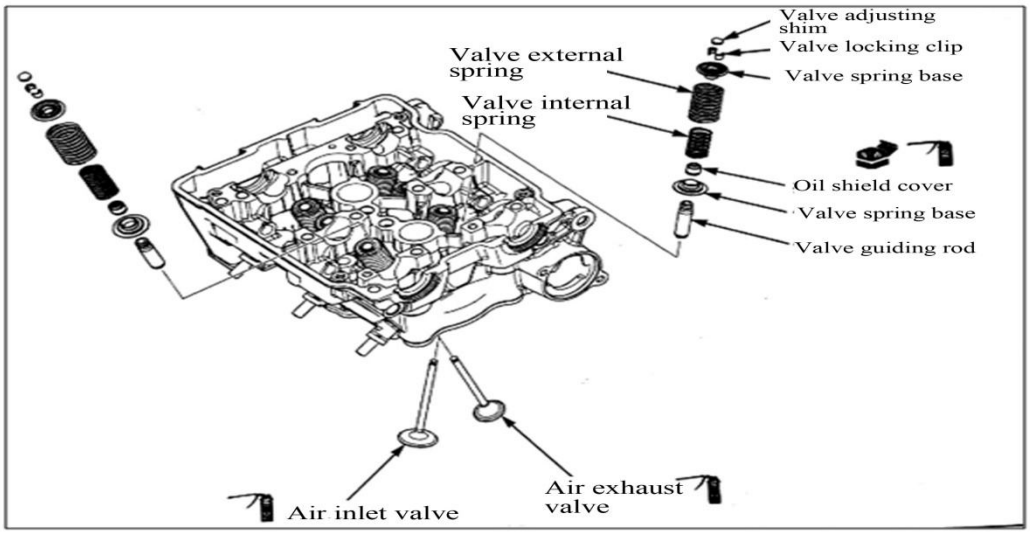
Note:

- Too heavy the force of grinding may get valve base distorted or damaged.
- Frequently change the angle of grinding tool to avoid uneven grinding on valve base.
- Don’t let the abrasive get into valve rod and guiding tube.

When the grinding finished, wash and wipe up the abrasive on cylinder head and valve, and check contact surface of valve base once again. Re-assemble the cylinder head.



Re-ass embly



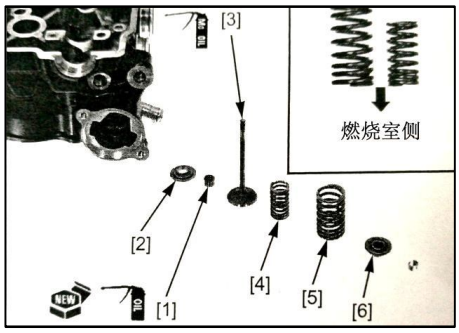
Wash up the cylinder head by solvent, blow and wash all the oil passage by compressed air.
Lubricate the new oil shield cover [1] by oil.
Re-assemble the lower valve spring’s base [2] and oil shield cover.
Lubricate sliding surface and rod’s end on each valve by solution of molybdenum disulfide.
Insert the valve [3] into its guiding tube, meanwhile slowly turning the valve to avoid damage on oil shield cover. Re-assemble
Assemble the locking clip [1] of valve by the tools for it only.
Lubricate the split pin to reduce the resistance in re-assembly, don’t heavily press the spring to avoid its performance loss.

Tool(s):

[2] Compressing tool for valve spring

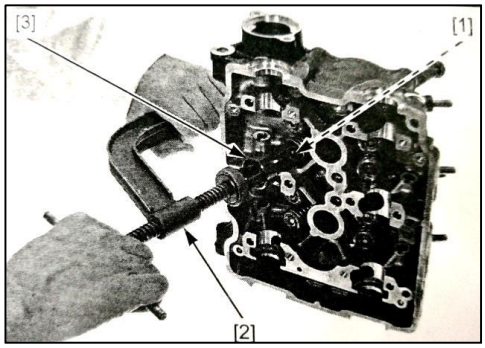
07757～0010000

[3] Accessories for compressing the internal valve spring [4] and external valve spring [5], let the side of coil with higher concentration face to the combustion chamber.
Re-assemble the ring [6] for spring base of valve.



tool for valve spring

07959～KM30101

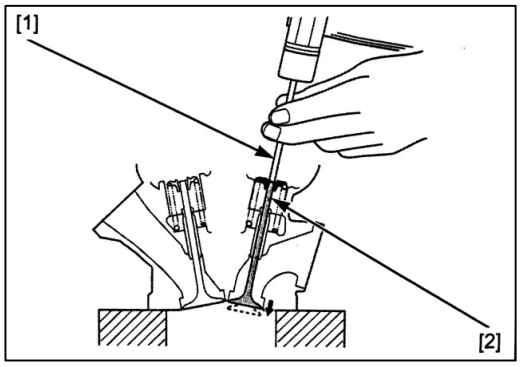


Support the cylinder head up on the working bench to avoid damage on valve

Put the suitable tool [1] into valve guiding tube [2]. Slightly knock the tool to stably install the locking clip.

Re-assemble the parts below:

- Water temperature sensor
- Spark plug

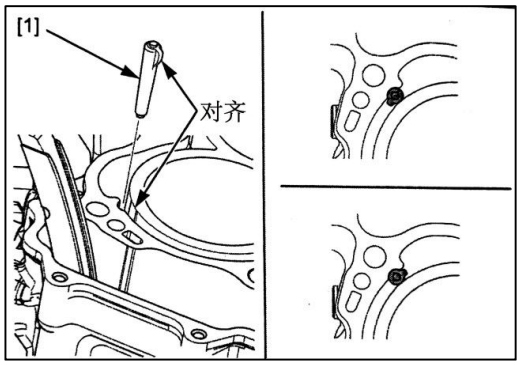


Install the positioning pin [1] and new gasket [2].

Re-assembly

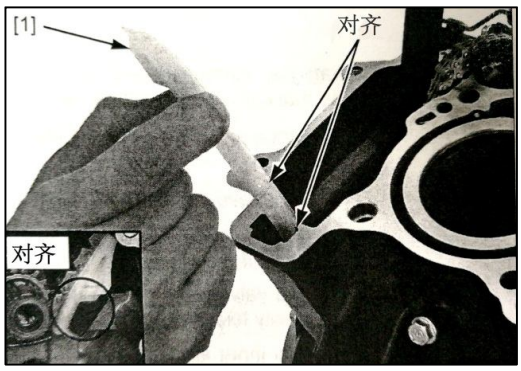
Clean up the residual old gasket on the combination surface of cylinder.

Note: Don't let the dust and dirt get into cylinder.

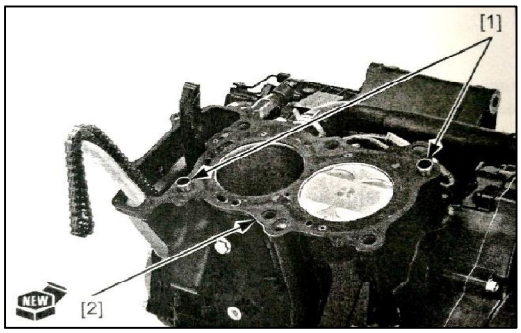


Install the rubber bar [1] for water proof into the right side, the so called air inlet side on cylinder head, whose taper face downward, and get is protrusion edge aligned with the water jacket of cylinder.

Note: The protrusion edge on the left or right are both for sure.

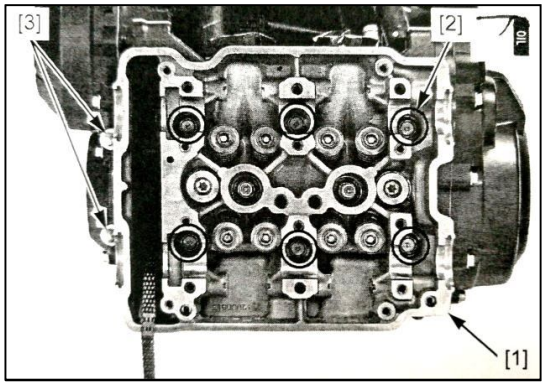


Re-assemble the guiding plate [1] for chain, and get its protrusion aligned with the groove on cylinder, make its bottom part in the groove of crankcase.



Get the timing chain through cylinder head, install the cylinder head on cylinder [1].
Totally clean up the threaded part and base surface of seal bolt (9mm) for cylinder head, then wipe it up.
Spread the engine oil on threaded part and base surface of seal bolt (9mm) for cylinder head.
Alternatively fasten the seal bolt (9mm) [2] for cylinder head by 2～3 times and fasten to stipulated torque.
Fastening torque: 47N·m
Install and fasten the bolt (6mm) [3] for cylinder head.

Install the components below:
- Thermostat
- Swinging arm
- Engine

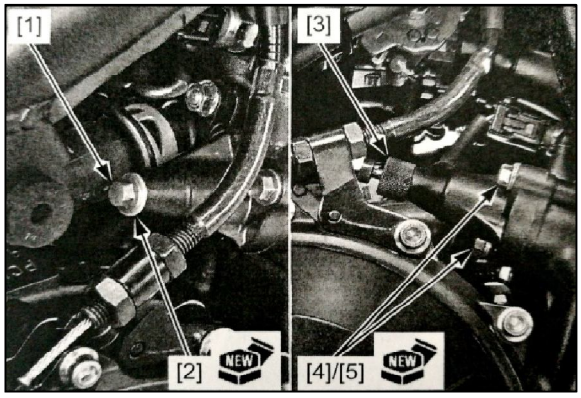


Adjusting stud for tensioner

Disassembly/Re-assembly

Note:
- The maintenance for adjusting stud of tensioner needn't remove the engine from frame.

Remove the seal bolt [1] and seal ring [2].
Turn the adjusting stud of tensioner clockwise by tool for it only to ensure its tension.
Tool(3):
[3]Fixture for tensioner

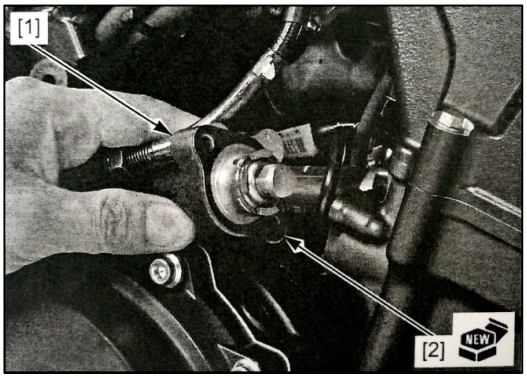


Remove the installation bolt [4] and seal ring [5].
Remove the adjusting stud [1] of tensioner and seal ring [2].
The re-assembly is precisely opposite to disassembly.
Note:
- Replace the seal ring and gasket for a new one.

Check

Check the operational performance for adjusting rod [1] of tensioner.

- The adjusting stud could not press into the adjustor when pressing on it.
- When turning the adjusting stud clockwise by cross shaped blade or screwdriver [2], the adjusting stud shall be able to press into the adjustor; When the tools removed, the adjusting stud should eject out immediately from the adjustor.



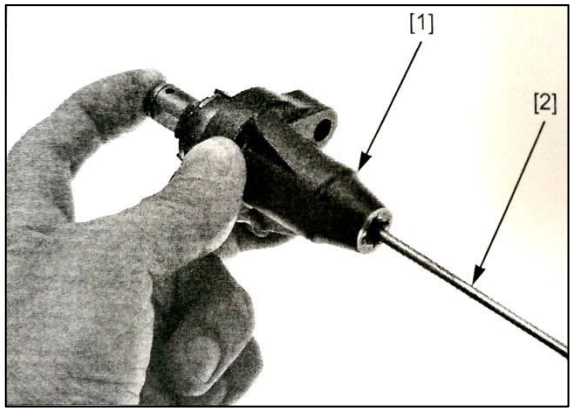
Timing chain/Sprocket wheel

Removal

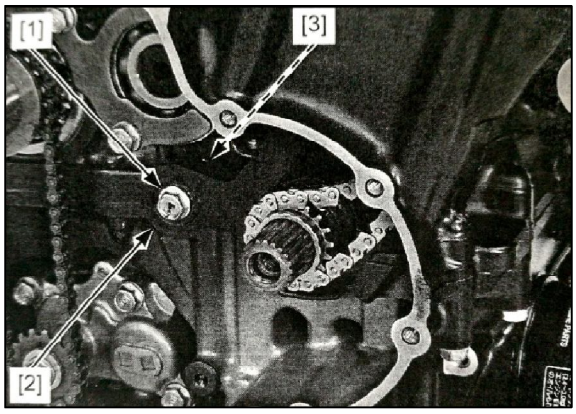
Remove the parts below:

- Cylinder head
- Primary driving gear set
- Clutch outer case

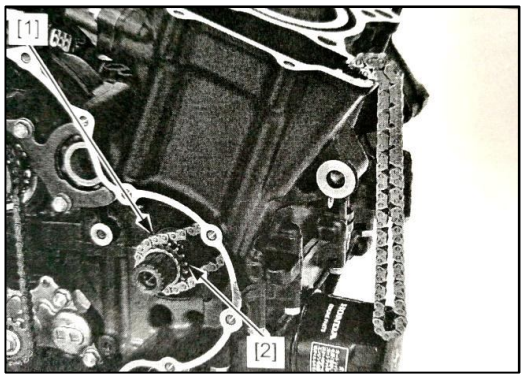
Remove the bolt [1], tensioning plate [2] for chain and collar [3].



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



Check

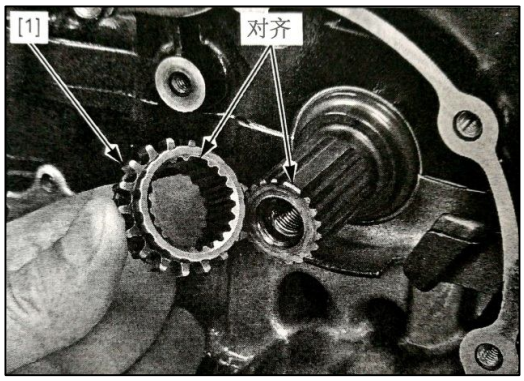


Check the damage, scratch, wear-out and distortion on parts below, in case it is, please replace.

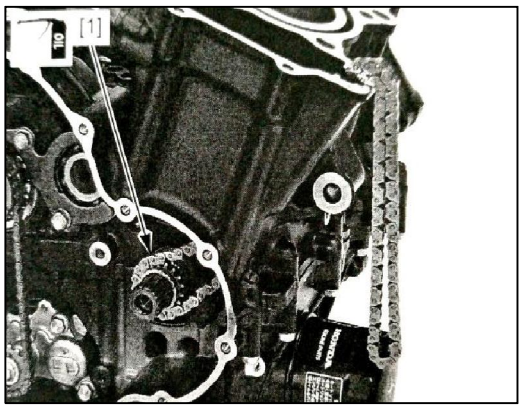
- Timing chain
- Tensioning plate for chain
- Timing sprocket wheel

Re-assembly

Re-assemble the timing sprocket wheel [1], get its wide tooth of internal spline on sprocket wheel aligned with the wide key’s groove on crankshaft.



Coat the all surface of timing chain [1] with oil, then match and install with the timing sprocket wheel.



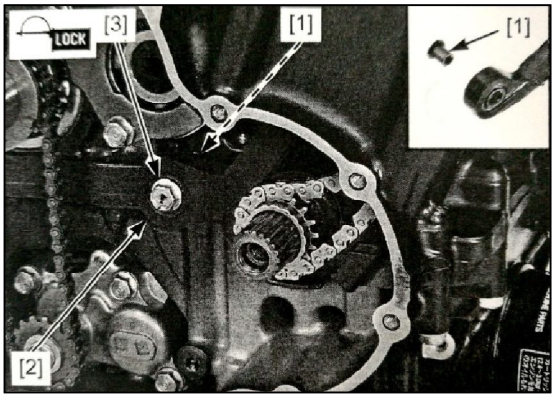
Coat the thread of installation bolt for tensioning plate with Loctite.
Re-assemble the collar [1], tensioning plate [2] and bolt [3]. The installation direction for collar is shown as picture.

Fasten the installation bolt of tensioning plate for chain to stipulated torque.

Fastening torque:12N·m

Re-assemble the parts below:

- Outer case of clutch
- Primary driving gear set
- Cylinder head



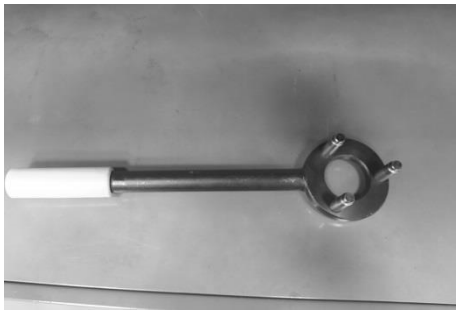
6 Clutch and gearshift

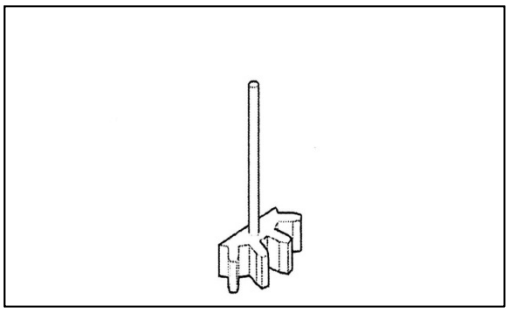
Maintenance

Summary

- The maintenance for clutch and gearshift device in this chapter needn’t remove the engine from frame.
- The oil level and viscosity has influence on separation of clutch. When the clutch failed to separate or the motorcycle is still in low speed when clutch separated, please check the oil level before clutch maintenance.

Tool(s)





Specification for clutch and gearshift device

Unit：mm

Items		Standard	Limit
Free travel for clutch lever		10～20	—
Clutch	Free length for spring	41.5	40.5
	Thickness of friction plate	2.9～3.1	2.7
	Flatness for driven plate	—	0.30
Collar of cltuch	Internal diameter	22.000～22.021	22.031
	External diameter	27.987～28.000	27.977
External diameter for main shaft at clutch’s collar		21.967～21.980	21.95

Troubleshooting

Difficult to hold clutch lever tightly

- The clutch cable damaged, twisted or too dirty
- Wrong wiring for clutch cable
- The thrust mechanism of clutch got damaged
- Malfunction in bearing of clutch' s pushing rod
- Incorrect installation for operational rod of clutch

Clutch skidding in acceleration

- Jamming on clutch' s pushing rod
- Driving friction plate worn out
- Poor performance for clutch spring
- Not any free travel on clutch lever
- Molybdenum disulfide or graphite additive gets into oil

When clutch separated or failed to separate, the motorcycle is still under low speed

- Too wide the free travel of clutch lever
- The friction plate of clutch gets warped
- Too high the oil level, wrong viscosity or incorrect additive
- The locking nut on clutch center case gets loosened
- Thrust mechanism of clutch gets damaged
- Incorrect installation for clutch' s operational rod
- The inserting groove on clutch outer case and clutch gear worn out
- Wrong operation for clutch

Difficult gearshift

- Incorrect adjustment for clutch cable
- Wrong operation on clutch
- Wrong viscosity of oil
- The gearshift fork gets damaged or bent
- The shaft of gearshift fork gets bent
- The claw of gearshift fork gets bent
- The bolt on five-star shaped plate gets loosened
- The five-star shaped turning plate gets damaged
- The guiding groove on gearshift drum gets damaged
- Five-star shaped turning plate gets worn out or damaged

Gear jump in transmission system

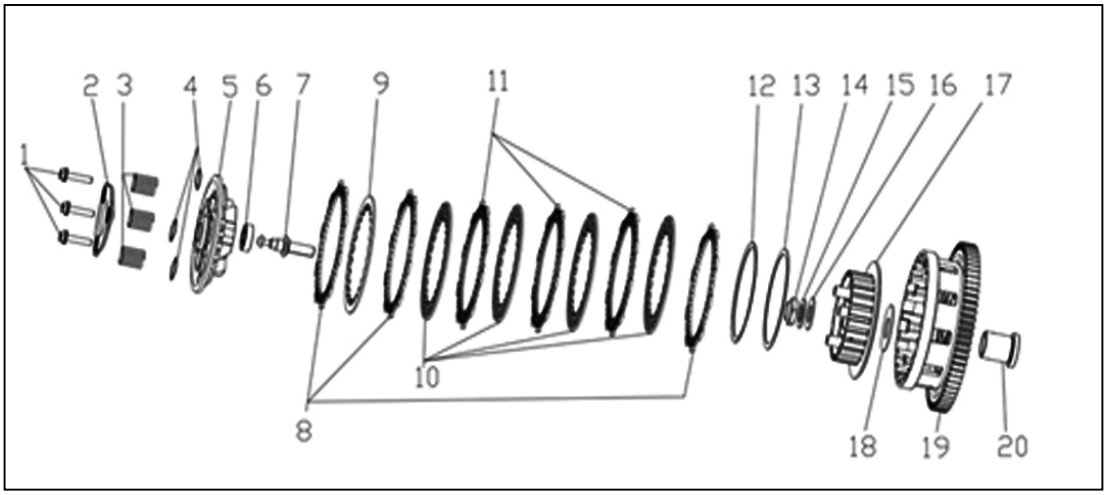
- Check plate gets worn out
- Poor performance even damage on returning spring of check plate
- The bolt on five-star shaped turning plate gets loosened
- Five-star shaped turning plate gets damaged
- Shaft of gearshift fork gets bent

- Gearshift fork gets bent or damaged
- The meshing surface or teeth groove gets damaged

Gearshift plate fail to return

- The poor elasticity of returning spring of gearshift spindle or gets cracked
- Gearshift spindle gets bent or damaged

Layout for components

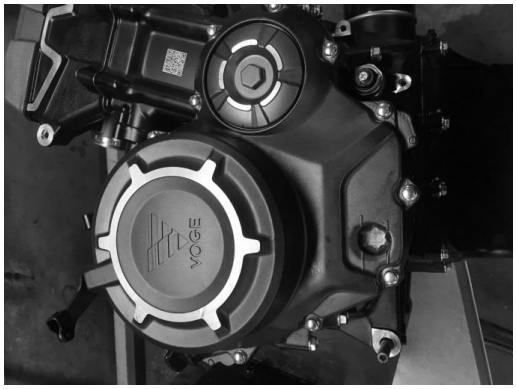


S/N	Name	Condition	Quantity
1	BOLT,HEXAGON FLANGE	Grade M6_L=30_10.9	3
2	PLATE,CLUTCH LIFTER		1
3	SPRING,CLUTCH		3
4	SEAT,CLUTCH BUFFER SPRING		3
5	PLATE,CLUTCH PRESSURE		1
6	BEARING	GB/T 276_6001	1
7	PUSH ROD		1
8	PLATE, CLUTCH DRIVING	Thickness 3.0, Internal diameter 108	3
9	PLATE, CLUTCH DRIVEN		1
10	PLATE, CLUTCH DRIVEN	Internal spline teeth 24, moulds 4	4
11	PLATE, CLUTCH DRIVING		3
12	DISC SPRING		1
13	WASHER,PLAIN		1
14	NUT,ROUND	M18*1	1
15	WASHER,SAUCER	d=18_D=30_h=2.3	1
16	WASHER,PLAIN	Internal diameter 18_ External diameter 34_Thickness 1.6	1
17	BODY,CLUTCH CENTER COMP.		1
18	WASHER,PLAIN	Internal diameter 22_ External diameter 49_Thickness 1.6	1
19	OUTER COMP.,CLUTCH		1
20	COLLAR	Internal diameter 28_ External diameter 22_Thickness 38.2	1

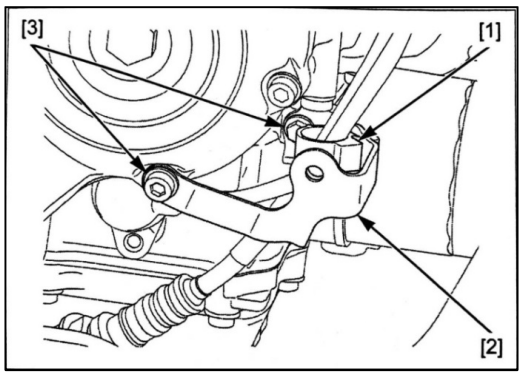
Right crankcase cover

Disassembly/Re-assembly

Remove the windshield cover under motorcycle
Drain off the oil in engine.
Remove the bolt and locating plate of clutch cable, then remove the clutch cable from the operational arm of clutch.



Remove the wire clip [2] from supporting plate [1] of windshield cover under motorcycle.
Remove the bolt [3] and supporting plate [4].



Alternatively loosen the bolts on right crankcase cover by 2～3 times.
Remove the parts below:
- Bolt
- Right crankcase cover

Remove the positioning pin and gasket.
Clean up the residual gasket on combination surface between crankcase and its cover and don't damage the combination surface.
The re-assembly is precisely opposite to disassembly.

Fastening torque:

Bolt on right crankcase cover:

Note:

- Coat the combination surface of

crankcase with sealing glue for end surface as picture shows.

- Replace the gasket for right crankcase for a new one.

Adjust the free travel for clutch lever.

Fill up the crankcase with recommended oil and check the leakage.

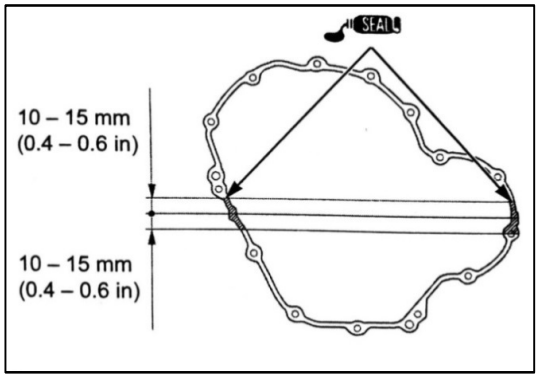
Disassembly/Re-assembly

Remove the returning spring and clutch operational arm from right crankcase cover

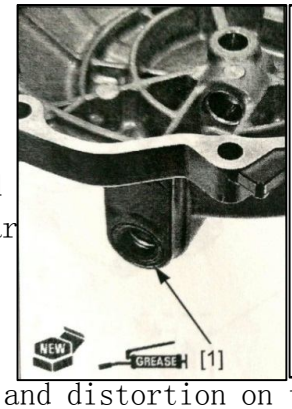
Note:

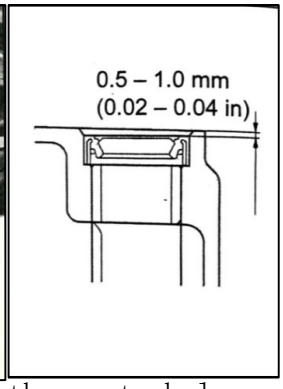
Remove the oil seal [1] from right crankcase cover.

The re-assembly is precisely opposite to disassembly.



- Coat the new oil seal with grease.
- Install the oil seal to stipulated depth as picture shows.
- Get the hook of returning Spring aligned with the gap on right crankcase.
- Get the returning spring aligned with the groove on operational ar





Check

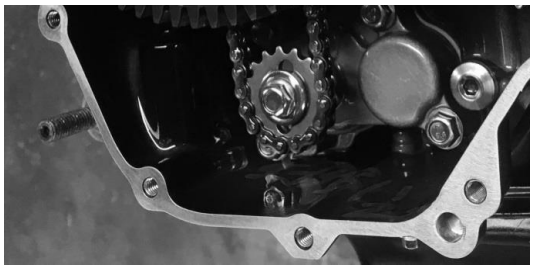
Check the scratch, damage, wear-out and distortion on the parts below.

- Shaft jacket for operational arm of clutch
- Clutch’ s operational arm
- Returning spring

- Smaller pushing rod

Clutch

Disassembly



Remove the right crankcase cover. If you need to remove the clutch's collar, please remove the seal bolt for oil pump's driven gear first, when the clutch is without removing.

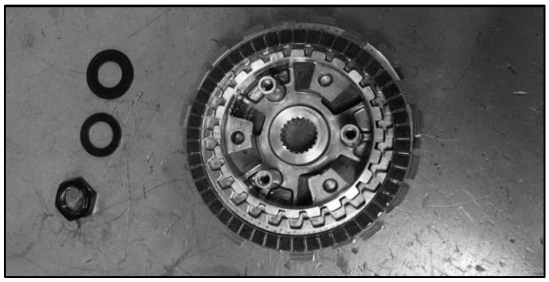
Loosen the bolt on lifting plate of clutch by 2～3 times, remove the bolt first, then remove the lifting plate, drawing rod, pressure plate and springs of clutch.

Break up the locking curling on locking nut on clutch's central case. Note: Please don't damage the thread of main shaft.

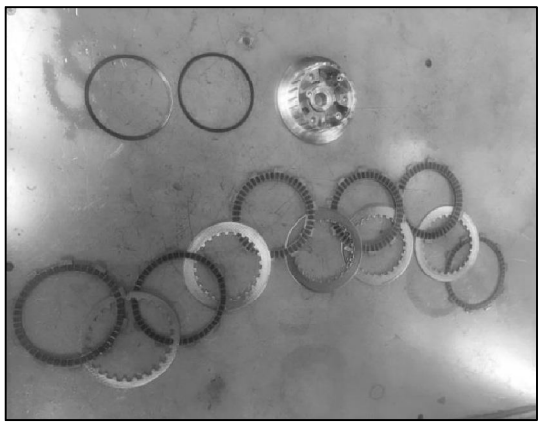
Fix the pressing plate of clutch and loosen its locking nut by tools.

Tool(s):
Locating plate for central case
Remove the locking nut.

Remove the locking washer and locking shim.

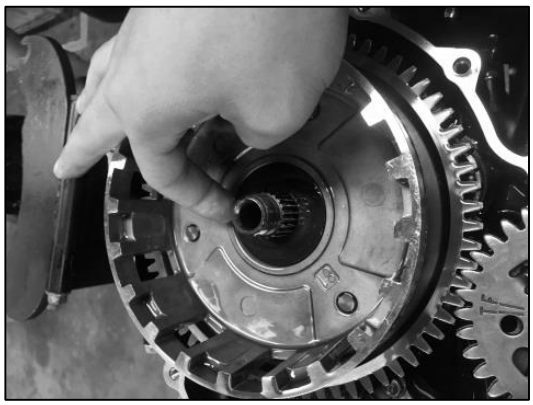


Remove the central case of clutch.



Remove the parts below:

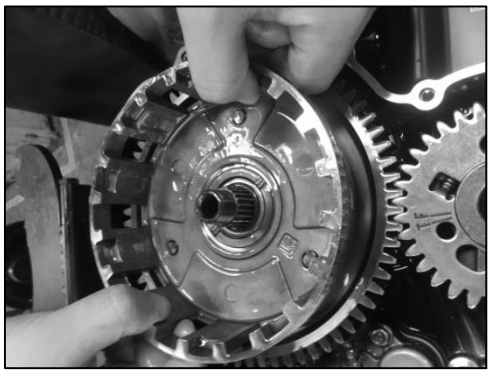
- Central case
- Driving plate
- Driven plate
- Flat washer
- Butterfly spring
- Pressing plate



Remove the thrust washer.

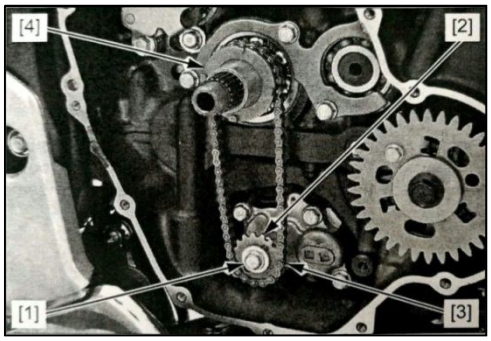
Insert the screwdriver into groove [1] on driving gear, then move it, let the driving and driven gears aligned, then install a bolt of 6 ×14mm at locating hole of primary driving gear.

Remove the outer case of clutch.

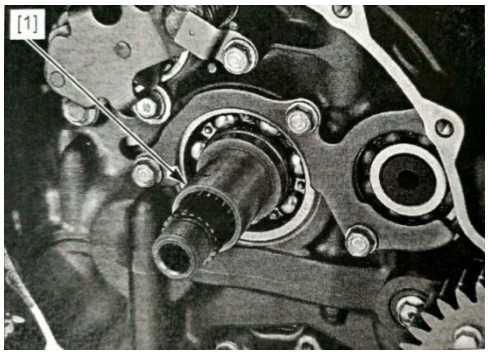


Remove the parts below:

- Fastening bolt [1] on driven sprocket wheel of oil pump.
- Driven sprocket wheel [2] of oil pump.
- Chain [3] of oil pump
- Driving sprocket wheel [4] on oil pump.



Remove the collar [1] on clutch.



Check

Check the scratch, damage, wear-out or distortion on parts below, in case it is, please replace.

- Pushing rod of clutch
- Bearing for lifting plate of clutch
- Lifting plate of clutch
- Spring
- Central case
- Flat washer
- Butterfly spring
- Driving and driven plate
- Outer case/Primary driven gear/Needle bearing
- Collar on clutch

- Driving and driven sprocket wheel for oil pump
- Chain of oil pump
- Mainshaft

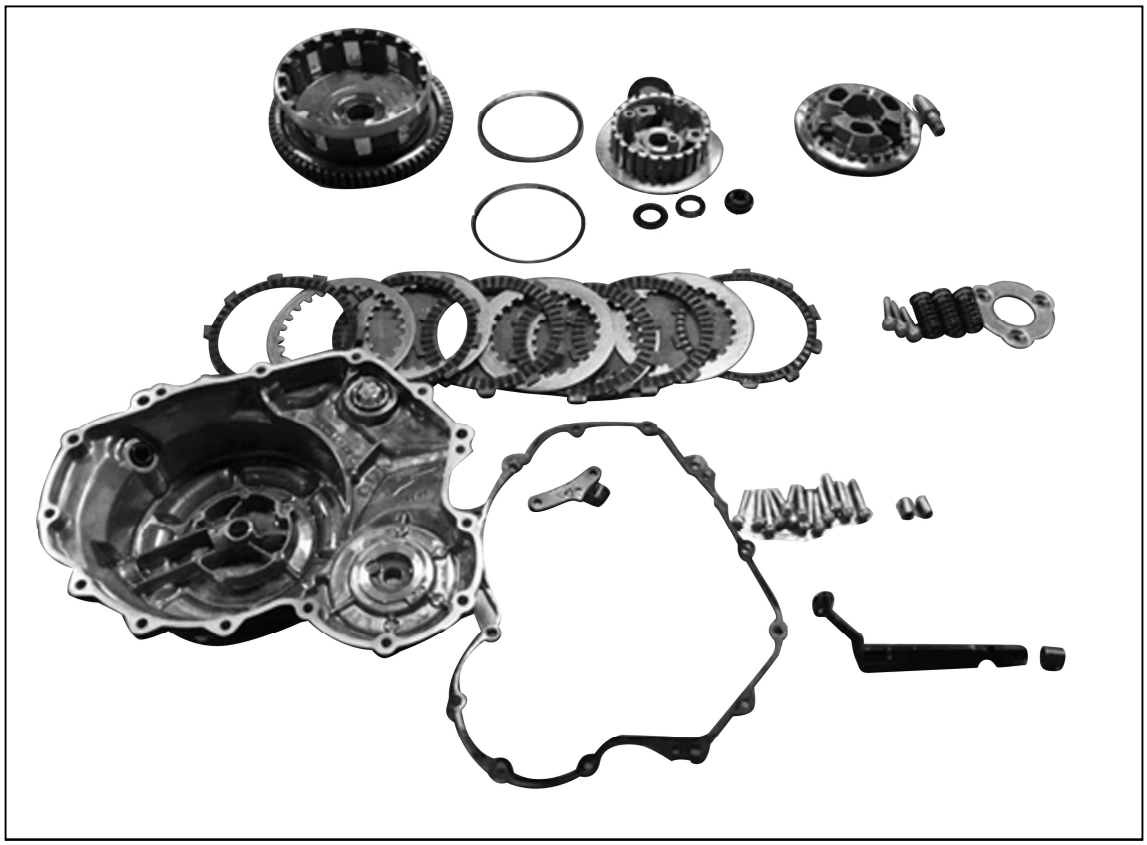
Measure each part according to specification for clutch and gearshift device.

In case any part passed the limit, please replace.

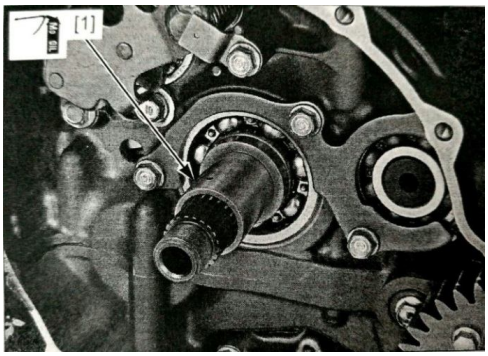
Note:

- Replace the springs on clutch as a complete set.
- Replace the driving and driven plate of clutch as a pair or complete set.

Re-assembly



Coat the outer surface [1] of clutch's collar with solution of molybdenum, then install it onto main shaft.



Coat the driven gear and driving chain of oil pump with clean engine oil,

Install the driving gear [1] and driving chain [2] for oil pump, please make the mark [3] MGZ on driving gear face upwards.

When installing the driven gear [4], please let the mark OUT [5] face upwards, gets aligned horizontally.

Coat the thread of seal bolt for driven gear of oil pump with sealing glue.

Coat the internal and external hole of needle bearing on clutch outer case with clean engine oil, the primary driving and driven gear's face with teeth face upwards.

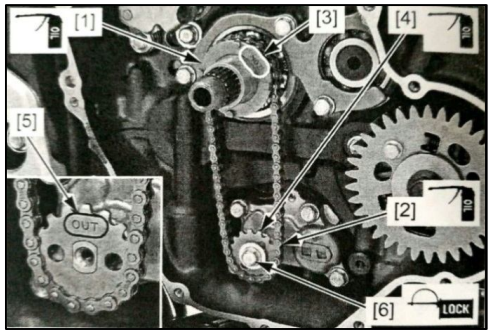
Install the outer case [1] of clutch, gets the hole on the outer case aligned with the convex column on driving gear of oil pump.

When installing the outer case, turn the driven gear of oil pump.

Note:

- Make sure the correct meshing between primary driving and driven gear.
- Make sure the surface of driving and driven gear are basically aligned, whose difference of height is not more than 2mm.

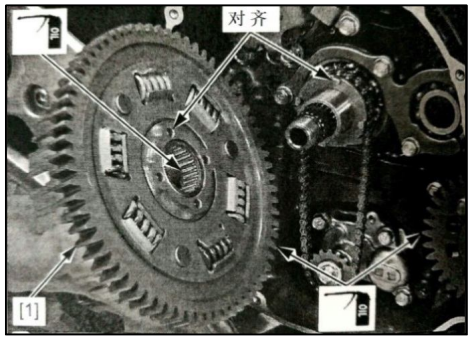
Remove the bolt of 6×14mm from

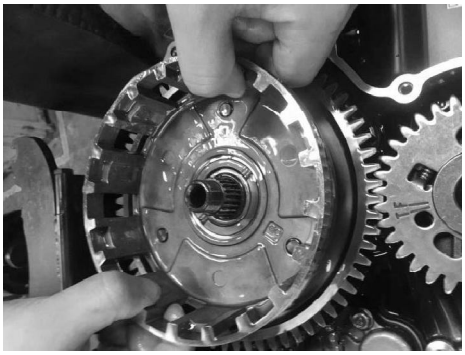


primary driving gear.

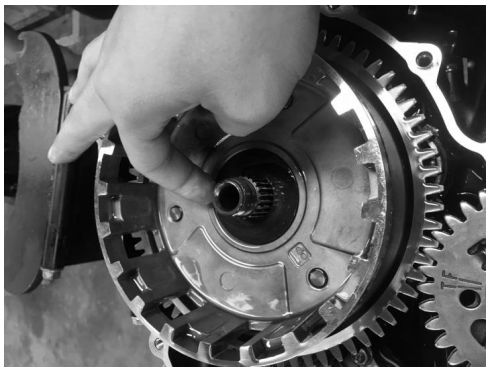
Note:

- Please don't forget remove the bolt when clutch's outer case re-assembled.



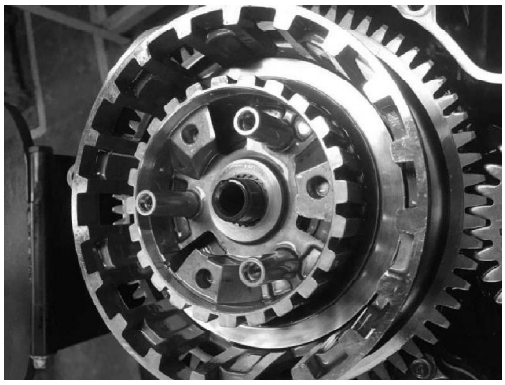


Install the thrust washer.

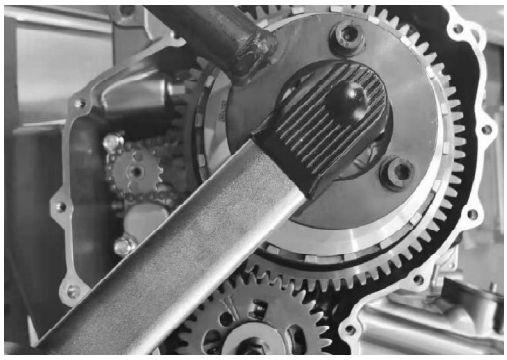


Re-assemble the central case body.
Install the flat washer
Install the butterfly washer.
Note:

- The bigger end of butterfly washer face upwards.



Install the washer
Install the lock washer
Note: The mark “OUTSIDE” face Outwards.



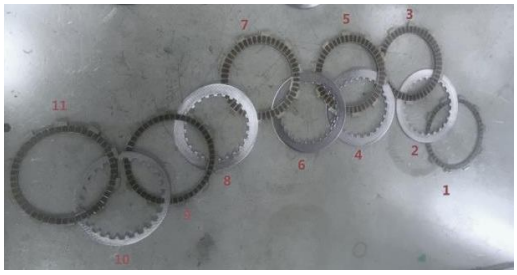
Coat the thread and base surface of locking nut of clutch with clean engine oil.
Install the locking nut on main shaft.
Press fit the pressing plate by tools, then lock it up.
Turn the nut to stipulated torque.
Install the convex column on locking nut into the groove on main shaft.

Please don’t damage the thread of main shaft.

Coat the friction plate with clean oil.

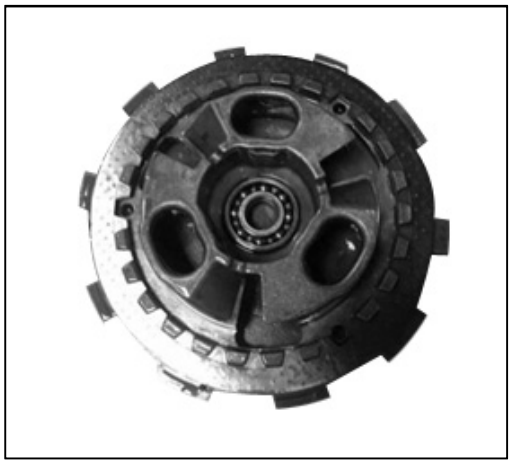
Install the driving and driven friction plate into central case according to sequence number 1-9.

Note: The plate with number 1, 9, 11 are the same specification (Internal diameter of 108); 3, 5, 7 are the same (Internal diameter of 108); 2, 4, 6, 8 are in same specification, and the number 10 is another single specification.



Coat the pushing rod with oil and install into the hole on main shaft.

Install the friction plate 11 and 10 on pressing plate as picture shows on the right.



Install the assembled pressing plate into central case.

Note:

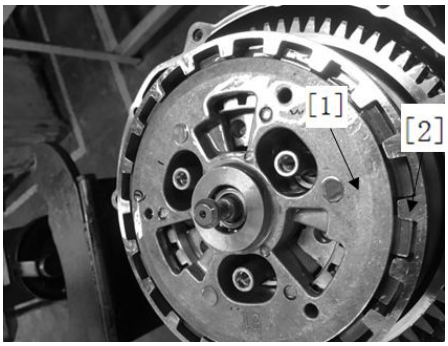
- The groove on the friction plate on the top is different with others.

Make sure the pressing plate is installed in place, in the picture the surface [1] of pressing plate

is the end surface [2] of outer case are basically even, with height difference is not more than 2mm.

Note:

- In case the height difference failed to meet demand is due to the driven friction plate on the top didn’ t fall into the groove, sudden force into it is not allowed, please assemble once again.

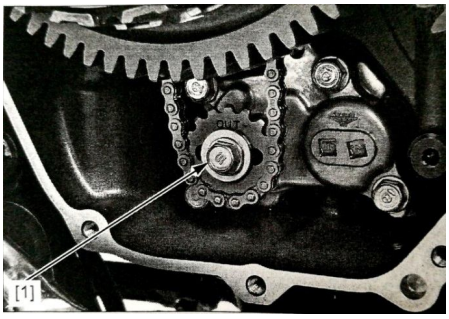


Install the main spring, lifting plate and its bolt.

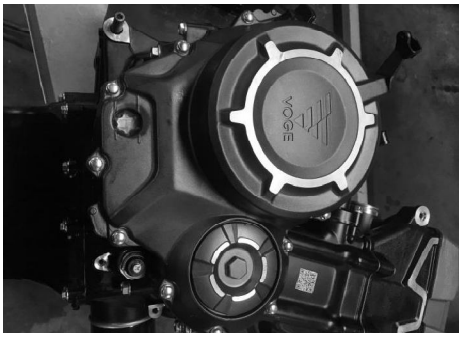
Fasten the bolts on lifting plate alternatively by 2～3 times to stipulated torque.

Turn the locking bolt [1] on driven sprocket wheel of oil pump to stipulated torque,

Fastening torque: 12N·m



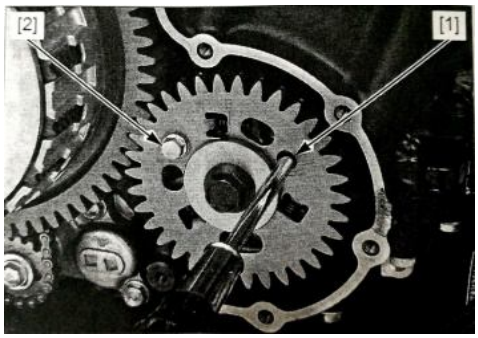
Install the right crankcase cover.



Primary driving gear

Disassembly

Remove the right crankcase cover.
Insert the screwdriver into gear’s groove [1] on primary driving gear, move the gear to get its teeth aligned with the one on driven gear, and install a bolt [2] of 6×14mm on the locating hole on primary driving gear.



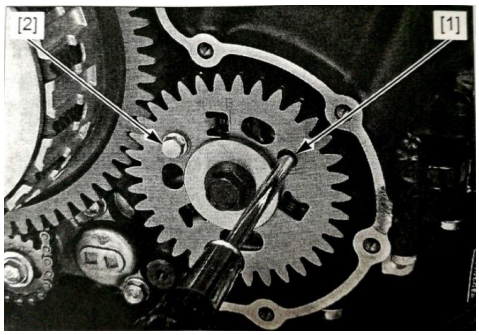
Fix the primary driving gear [1] by tools, remove the bolt [2] on driving gear and washer [3].

Tool(s):

[4]Gear stopper, 2.5

Remove the Gear stopper and primary driving gear.

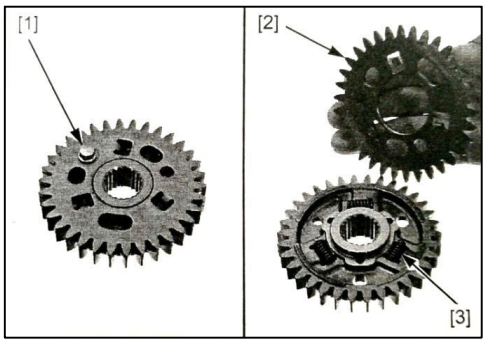
Remove the bolt [1] of 6×14mm and the sub gear [2] of primary driving gear.
Remove the spring [3] on the gear’s groove of sub gear.



Check

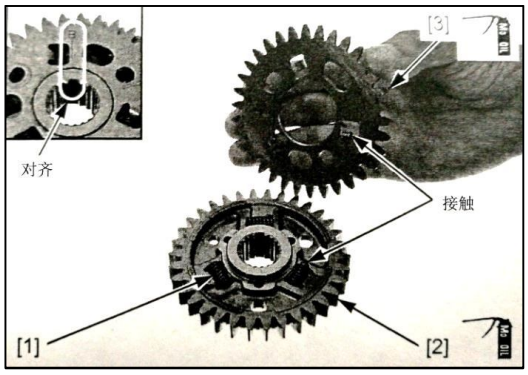
Check the scratch, damage, wear-out and distortion on parts below, replace if it is necessary.

- Main gear of primary driving gear
- Sub gear
- Spring

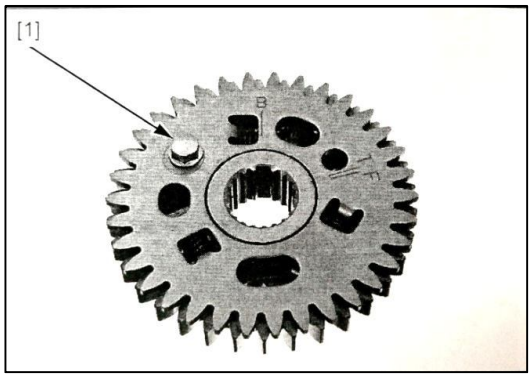


Re-assembly

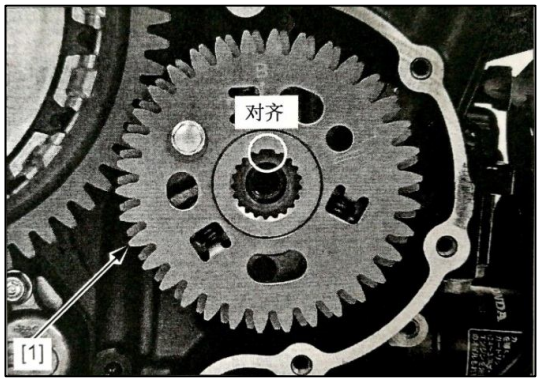
Coat the sliding surface of main and sub gear of primary driving gear with solution of molybdenum.
Install the spring [1] into groove of primary driving gear [2].
Install the sub gear [3] onto primary driving gear, and make its mark at the bottom plate of spring, and get the index ling of mark B aligned with wide tooth as picture shows.



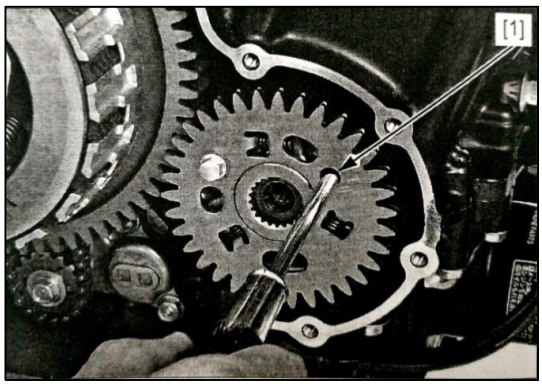
Install a bolt [1] of 6×14mm very loose to avoid the gear dropping off.



Install the primary driving gear [1] onto crankshaft.



Insert the screwdriver into groove [1] of primary driving gear, and move the gear, to let the sub gear coincide with primary driven gear.



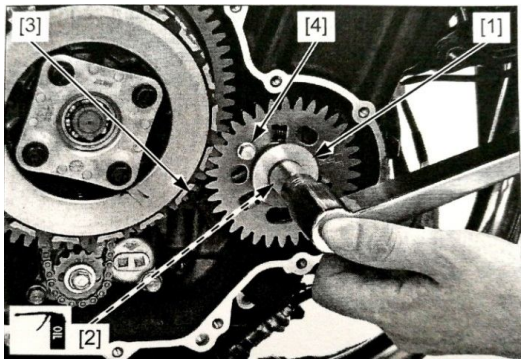
Coat the cutting surface of combination and threaded part of bolt on primary driving gear with clean engine oil.
Install the washer [1] and bolt [2] for primary driving gear.

Fix the primary driving gear by tools, turn the bolt on it to stipulated torque.
Tool(s):
[3] Gear stopper, 2.5
07724～0010100/07724～001A100

Fastening torque: 95N·m

Remove the gear stopper.

Remove the bolt of 6×14mm from primary driving gear.



Note:

- When the primary driving gear installed, don't forget remove the bolt of 6×14mm. Install the right crankcase cover.

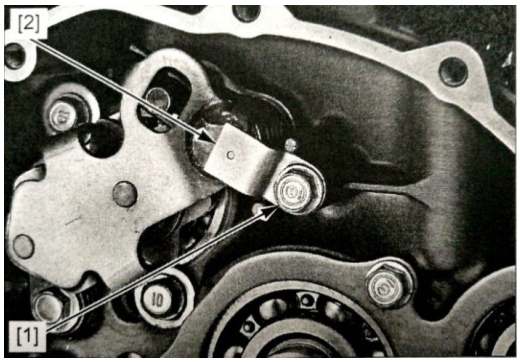
Gearshift system

Disassembly

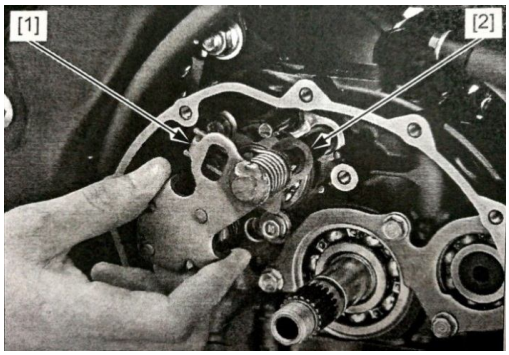
Remove the parts below:

- Clutch
- Gearshift arm

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

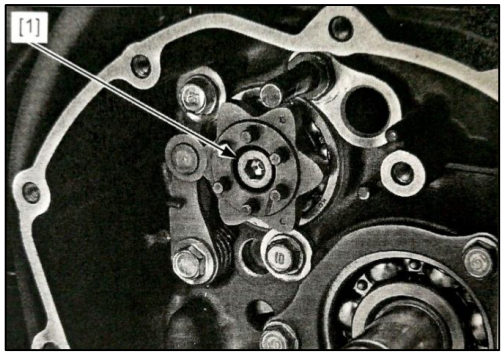


Pull out the gearshift spindle set [1] and thrust washer [2] from crankcase.



Remove the socket hex. bolt [1] on five-star shaped turning plate.

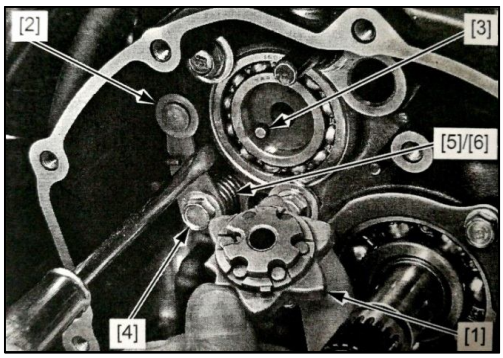
Fix the check plate [1] by screwdriver and remove the five-star plate [2] as picture shows.



Remove the parts below:

- Positioning pin [3]
- Locating bolt [4] for check plate
- Check plate
- Washer [5]
- Return spring [6]

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



Check

Check damage, wear-out or distortion on parts below, in case it is, please replace.

- Five-star plate
- Check plate
- Return spring for check plate
- Needle bearing for gearshift spindle

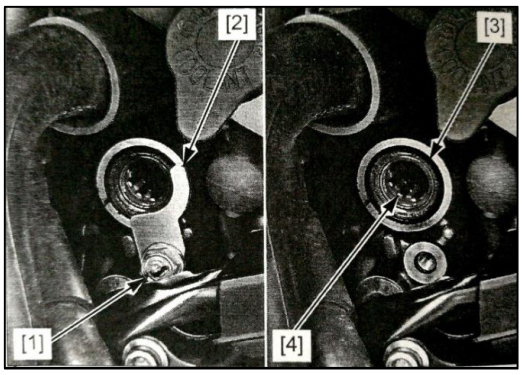
Gearshift arm

Check the wear-out or fatigue on twist spring [1] on gearshift spindle and twist spring [2] on gearshift plate, please replace if it is necessary.

Check if the gearshift spindle [1] got bent or damaged.

Check of the gearshift check plate [2] got worn out, damaged, or distorted.

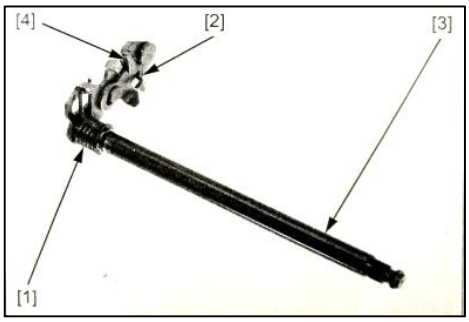
Replace the gearshift spindle if it is necessary.



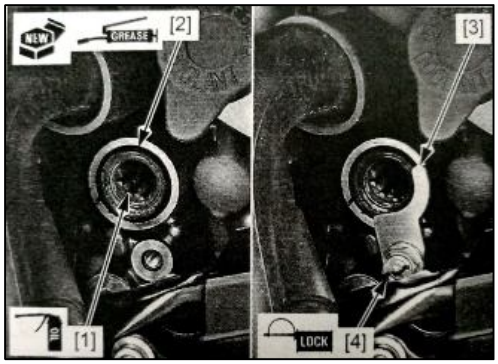
Re-assembly

Coat the needle bearing [1] of gearshift spindle with clean engine oil, then install it on the crankcase. Coat the edge of new oil seal [2] with grease, then install into crankcase, make sure its

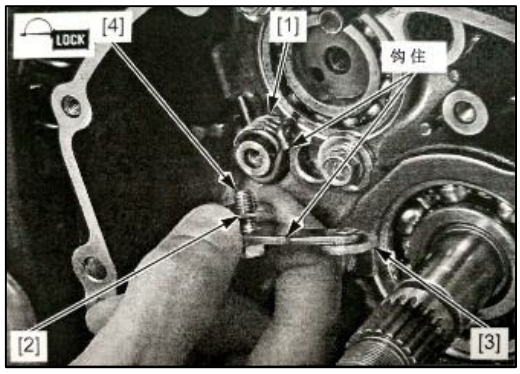
surface get even with the root part of crankcase’s chamfer.
Coat the thread of bolt on pressing plate of gearshift’s oil seal with Loctite.
Fastening torque: 12N•m



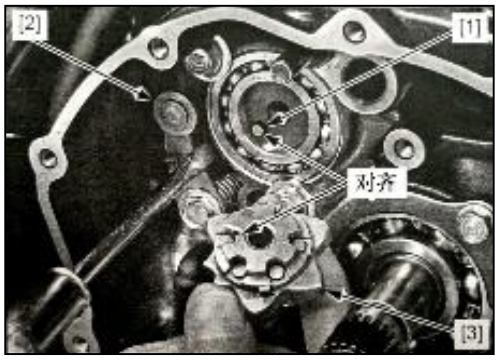
Install the pressing plate [3] on oil seal of gearshift spindle as picture shows, then fasten the bolt [4] to stipulated torque.
Coat the thread of bolt on check plate with Loctite.
Fastening toque: 12N•m
Check the normal work of check plate.



Install the return spring [1], shim [2] and check plate [3], then grasp the groove of check plate by return spring. Install and turn the bolt [4] on check plate to stipulated torque, then coat the thread of bolt on five-star plate wth Loctite.

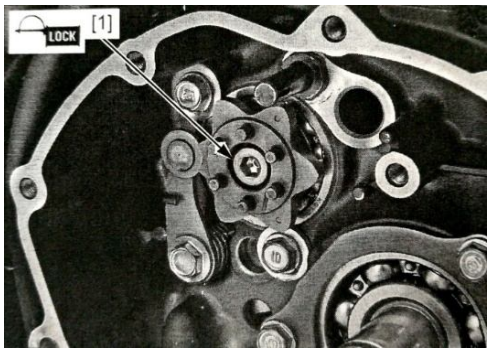


Install the positioning pin [1] into its hole on gearshift drum.
Fix the check plate [2] by screwdriver as picture shows.
Install the five-star plate [3], then get its narrow groove with positioning pin.

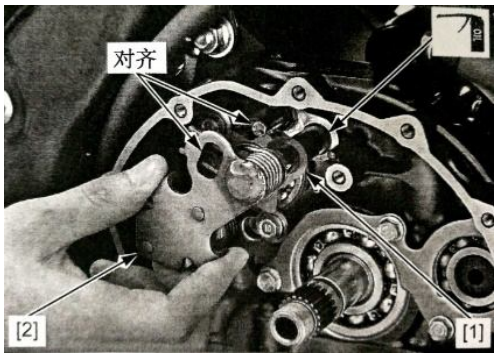


Install the locating bolt [1] for five-star plate and turn to stipulated torque.

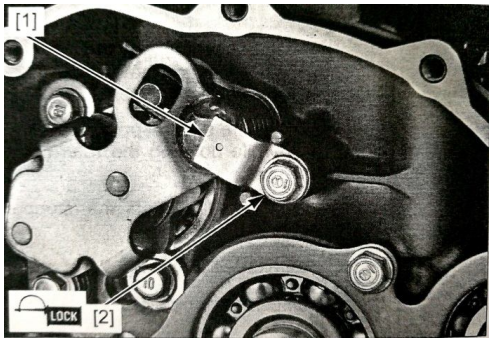
Torque: 23N • m



Coat the outer surface of gearshift spindle with clean engine oil.
Install the thrust washer [1] and gearshift spindle set [2] into crankcase, then get it aligned with the end of return spring and pin of the spring.



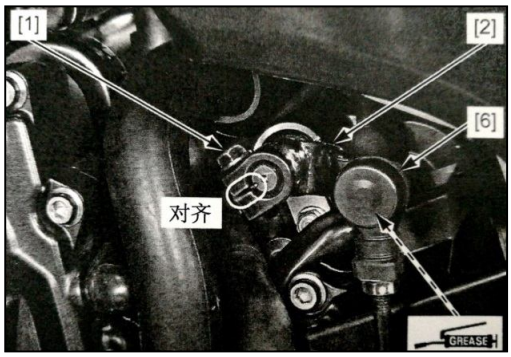
Coat the thread of bolt for pressing plate with Loctite.
Install the pressing plate [1], bolt [2] and fasten to stipulated torque.
Fastening torque: 12N • m
Install the parts below:
- Gearshift rod
- Clutch



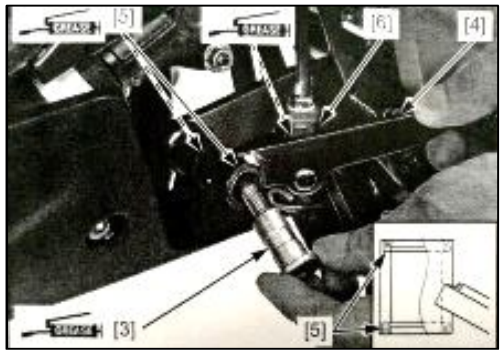
Disassembly/Re-assembly for gearshift pedal

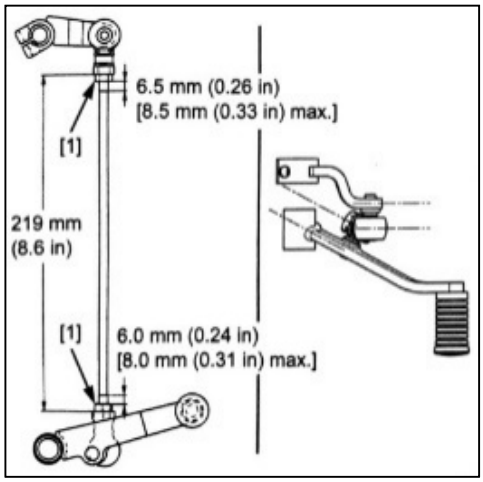
Remove the locking bolt [1] and gearshift rod [2] from gearshift spindle.
Remove the locating bolt [3] and gearshift pedal [4].
Remove the dust-proof ring [5].
Check if the dust proof ring or dust shield on ball shaped joint of rod were got bad or worn out, replace if it is necessary.
The re-assembly is precisely opposite to disassembly.
Torque:
Locating bolt for gearshift pedal: 27N·m
Note:

- Coat the edge of dust proof ring with Loctite.
- When installing the dust proof ring, let its edge side face outwards.
- 。Coat the bolt of shaft of sliding area on gearshift pedal with Loctite.
- Coat the ball shaped joint of gearshift pedal’s drawing rod with Loctite.



Align the slit on gearshift arm with machining hole on the shaft.





Adjust the height for gearshift pedal by loosening the locking nut,

- Make sure the thread length of locking nut is shorter than stipulation.
  - End of gearshift arm: 8.5mm
  - End of gearshift pedal：8.0mm
  - Fasten the nut to let the ball shaped joint is parallel with gearshift arm and gearshift pedal.

7 Magneto and starting clutch

Maintenance information

Summary

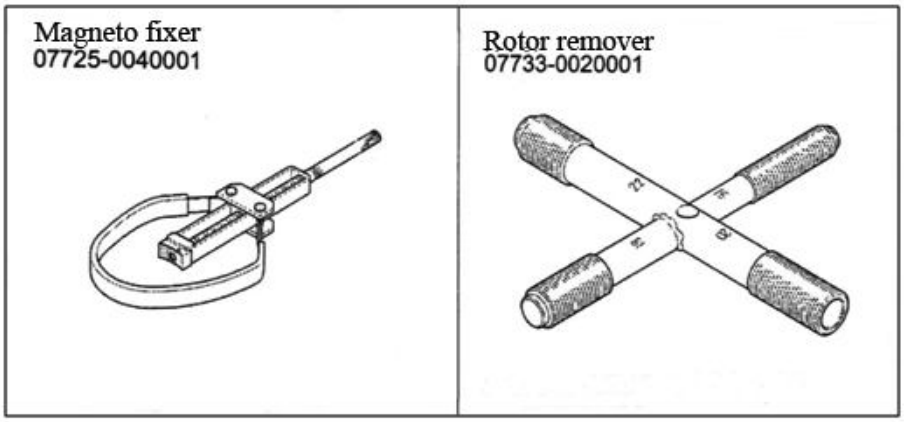
- The maintenance for stator and rotor of magneto needn't remove the engine from frame.
- Check about the charging coil of alternative power generator.
- Check about the trigger.
- Maintenance about starting clutch.

Specification for magneto and starting clutch

Unit: mm

Items	Standard	Limit
External diameter for shaft jacket of starting plate shaped gear	51.705～51.718	51.685
Internal diameter for outer case of starting clutch	68.362～68.392	68.402

Tool(s)

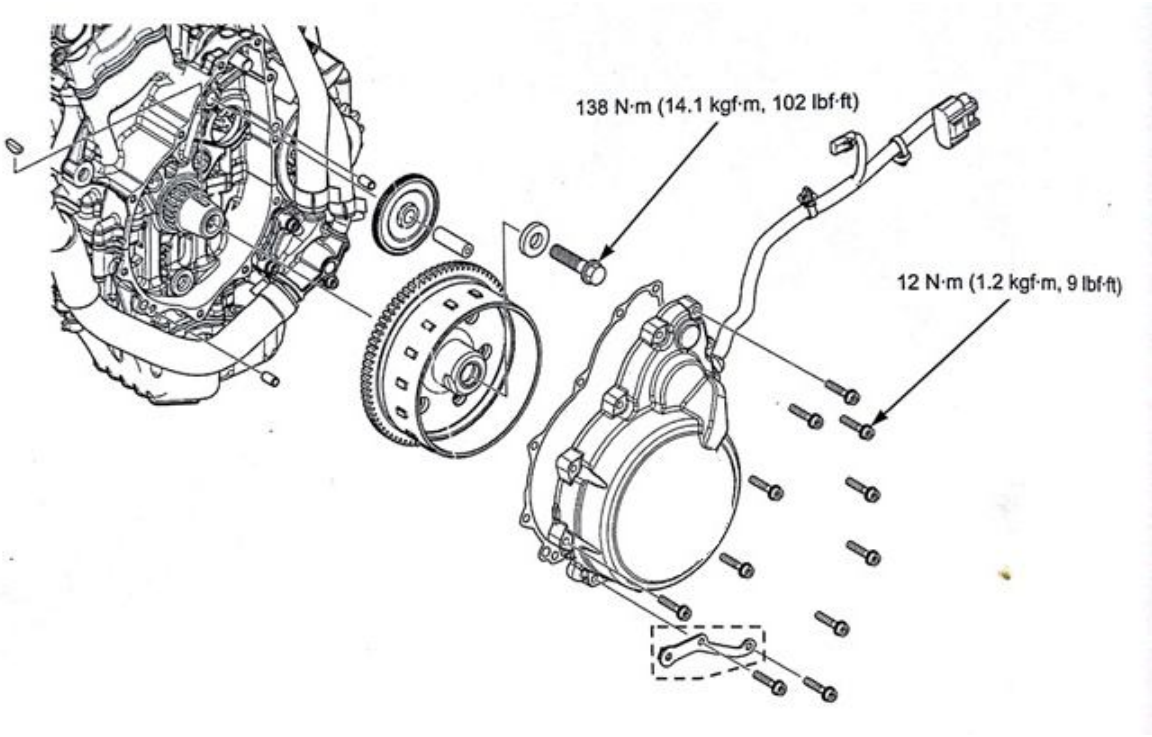


Troubleshooting

Starting motor is run, while engine failed starting

- Malfunction in starting clutch
- Malfunction in double gear or its shaft of starting motor
- Smaller gear of starting motor in malfunction or worn out
- Malfunction in driving gear of starter

Position’s relation of components



Left crankcase cover

Disassembly/Re-assembly

Note:

- When removing the left crankcase cover, lay a clean oil tray under engine to avoid oil outflow. When re-assembled, fill up with recommended oil to stipulated amount.

Lay the motorcycle on a horizontal ground and keep it upright.

Remove the parts below:

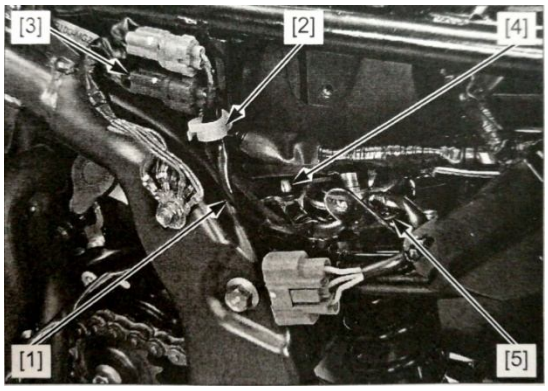
- Shield cover for motorcycle bottom
- Cover for driving sprocket

Remove the wire [2] of trigger from its clip [1].

Cut off the red joint [3] of trigger.

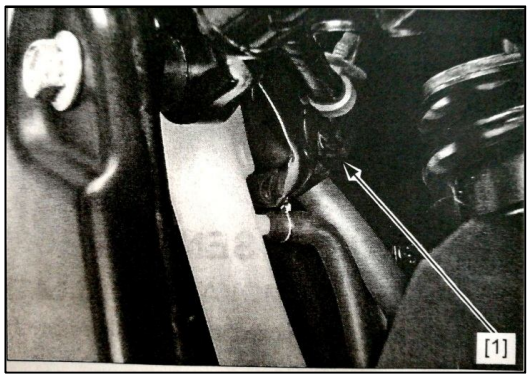
Remove the stator of magneto and wheel

- Rectifier regulator



wire band’s clamp (Brown [4], black [5]) from frame.

Remove the stator of magneto and wire [1] of trigger in workshop.



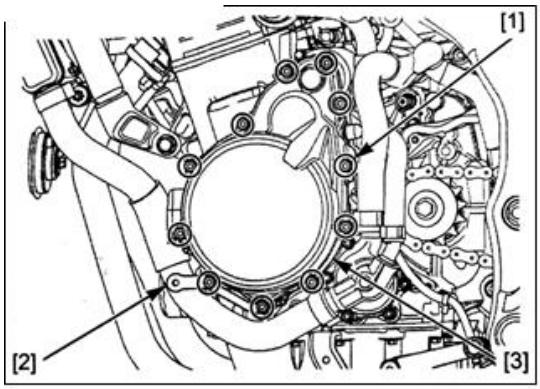
Loosen the bolts [1] on left crankcase cover by turns of alternative angle for several times.

Remove the parts below:

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

Note:

- The left crankcase (Stator) bears the magnetic attraction of rotor, be careful when disassembling and re-assembling.



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

Clean up the residual gasket on combination surface between left crankcase and its cover.

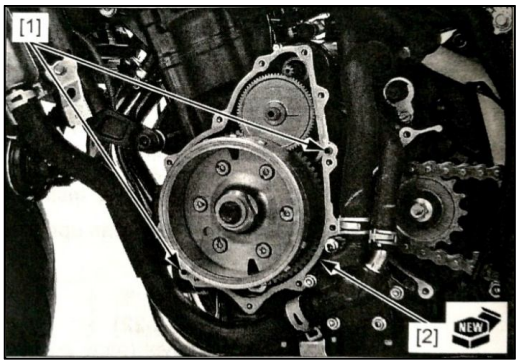
The re-assembly is precisely opposite to disassembly.

Fastening torque:

Bolt on left crankcase cover:12N•m

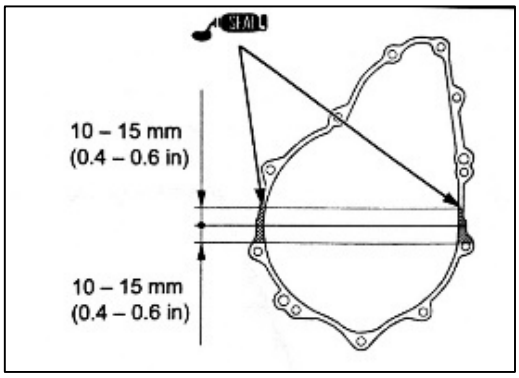
Note:

- Coat the combination area of crankcase with end surface's sealing glue as picture shows.
- Replace the gasket of left crankcase cover for a new one.



Check the oil level.

Make sure there is not any oil leakage.



Stator of magneto and trigger

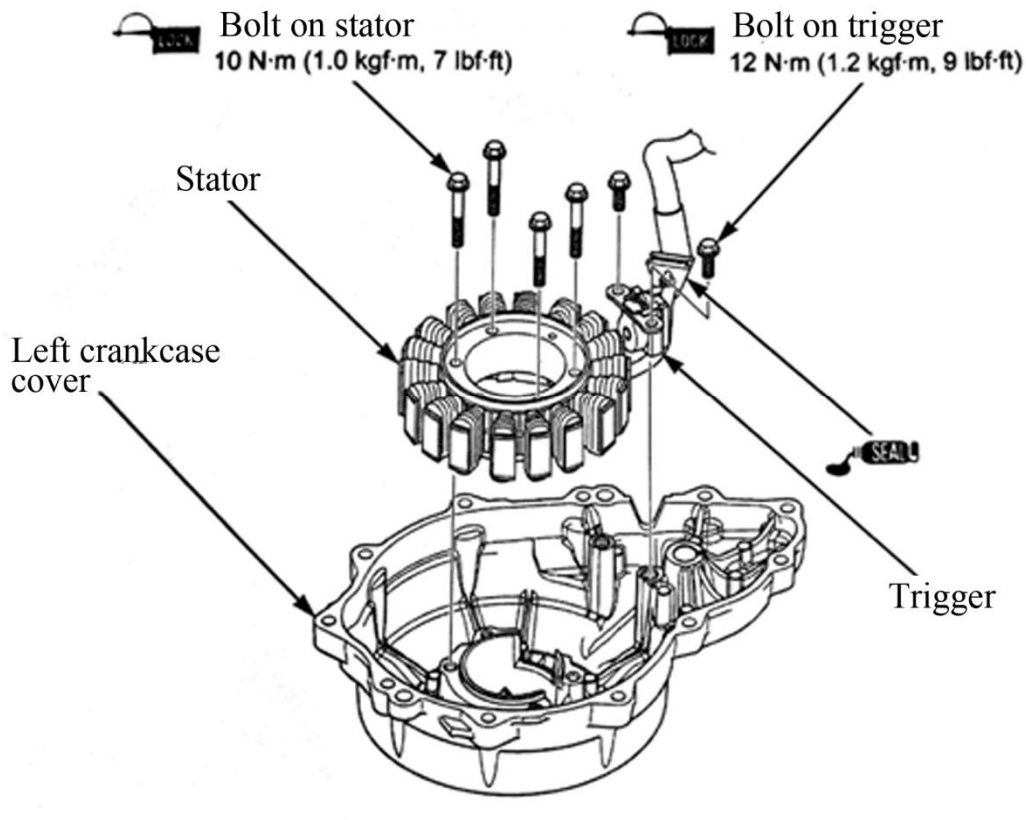
Disassembly/Re-assembly

Remove the left crankcase cover.

Disassembly and re-assembly for stator/trigger is shown as picture below.

- Coat the thread of stator and bolt of trigger with Loctite.
- Coat the sealing surface of ring jacket for wire joint of magneto/trigger with sealing glue for end surface.

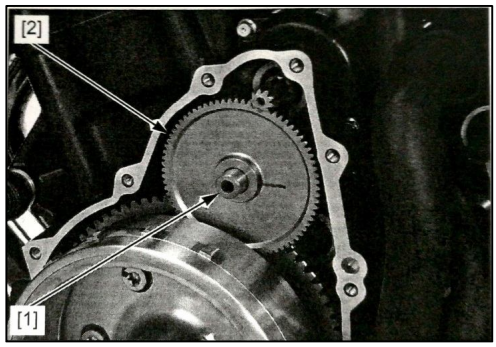
The re-assembly is precisely opposite to disassembly.



Rotor of magneto

Removal

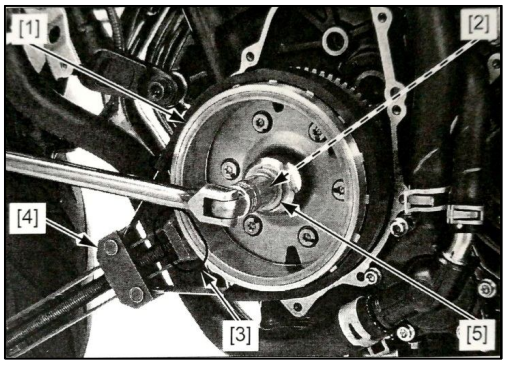
Remove the left crankcase cover.
Remove the double gear [2] and its shaft [1].



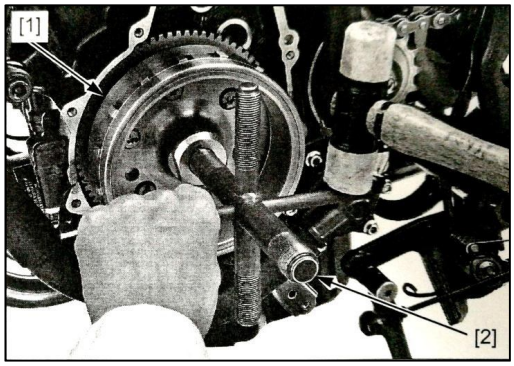
Fix the rotor [1] of magneto by its fixer and remove bolt [2].
Note:

- Installer a rotor fixing piece of the fixer to prevent rotor turning.

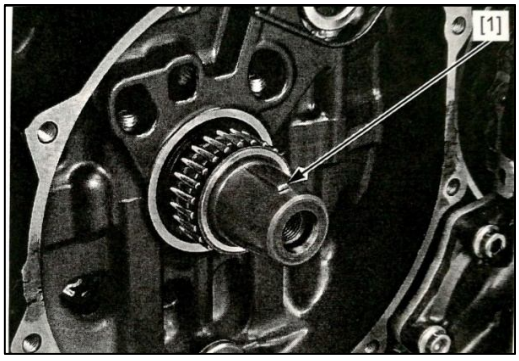
Remove the bolt on rotor and washer [5].



Remove the rotor [1] by tools.
Tool(s):
[2] Rotor remover
07733～0020001/07933～3950000



Remove the semicircular key [1].
Please don’t damage the groove for semicircular key and crankshaft.



Check

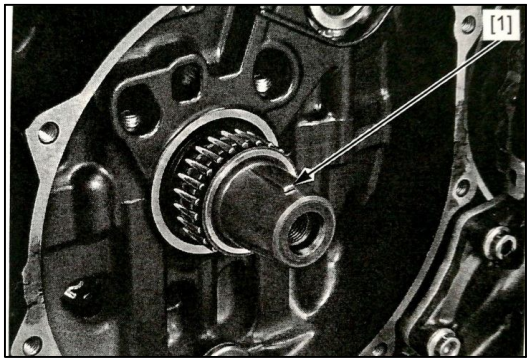
Check the scratch, damage, wear-out and distortion on parts below, replace if it is necessary.

- Shaft for double gear
- Double gear

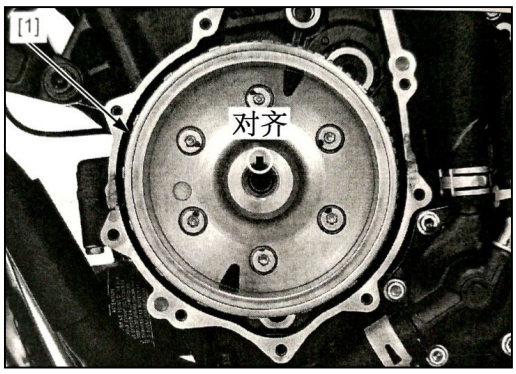
- Semicircular key
- Needle bearing

Re-assembly

Re-assemble the semicircular key [1].
Coat the rolling area of needle bearing [2] with engine oil.
Please don't damage the semicircular key and crankshaft.



Totally clean up the oil in internal hole of rotor and taper surface of crankshaft. Re-assemble rotor [1], get the semicircular key on crankshaft aligned with its groove on rotor.



Coat the thread and installation surface of bolt on rotor with clean engine oil.
Re-assemble the shim [1] and bolt [2] for rotor.
Fix the rotor [1] of magneto by its fixer, then fasten the bolt to its shaft [2].
Re-assemble the left crankcase cover.

Coat the external surface of double gear shaft with solution of molybdenum disulfide.
Re-assemble the double gear [1] and

stipulated torque.
Note:

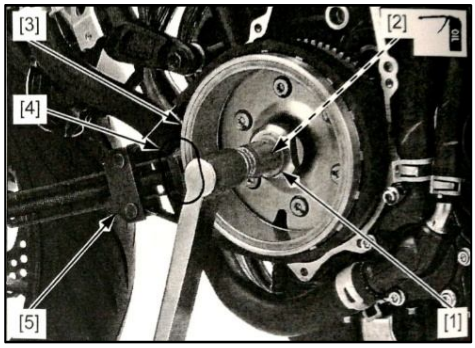
- Install a fixing piece of fixer for magneto rotor to prevent rotor turning.

Fastening torque: 138N·m

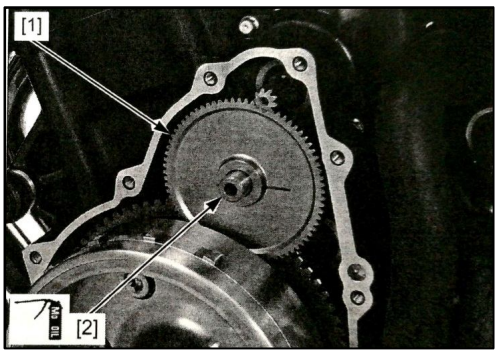
Starting clutch

Check the starting clutch

Remove the rotor.
Check the operation performance for starting clutch by turning its plate shaped gear [1].



Check if the anticlockwise turning of plate shaped gear is smooth and without clockwise turning.



turning.

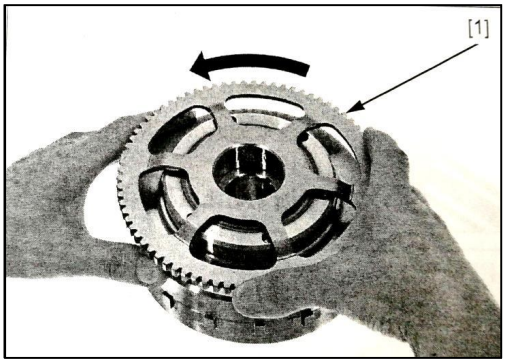
Removal

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

Fix the rotor [1] of magneto by its fixer and remove the fastening bolt [2] on starting clutch.
Note:

- Install a fixing piece [4] of fixer [3] to prevent rotor

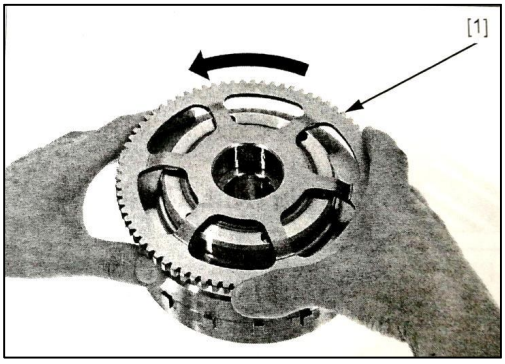
Remove the starting clutch set.
Remove the starting clutch [2] from its outer case [1].



Check

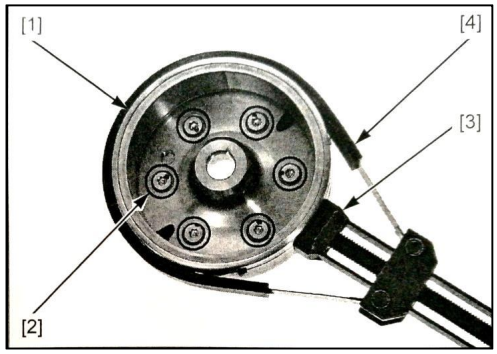
Check the scratch, damage, wear-out or distortion on parts below. In case it is, please replace.

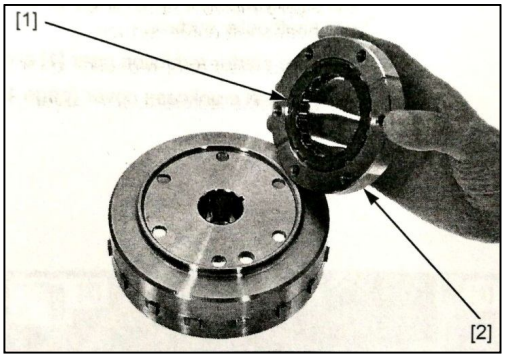
- Plate shaped gear



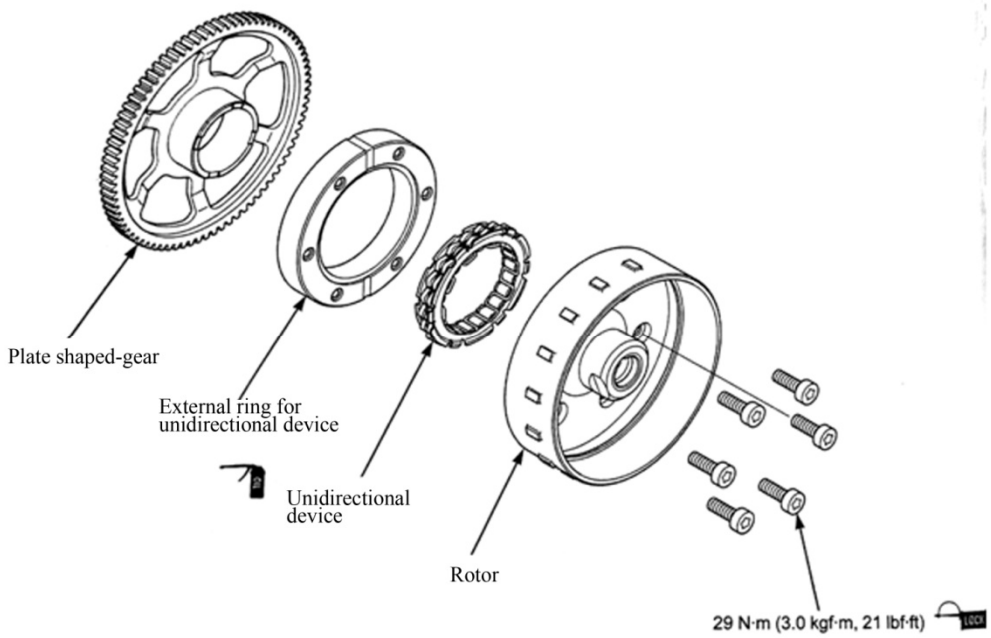
- Clutch’s outer case
- Starting clutch

Make sure every part meets the specification for magneto/starting clutch.
In case any part passed the limit for maintenance, please replace.

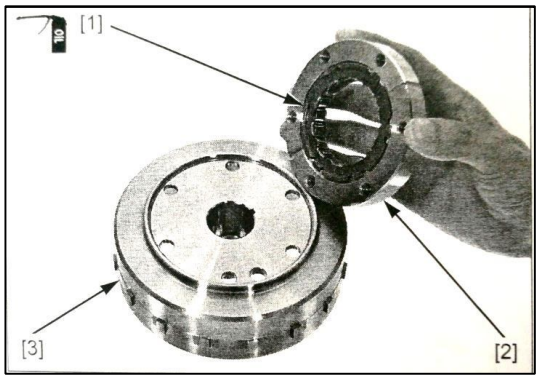




Re-assembly



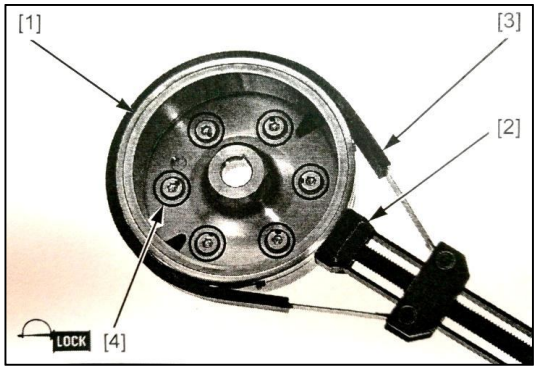
Coat the contact surface of starting clutch with clean engine oil.
Install the starting clutch [1] onto its outer case [2].
Assemble the starting clutch set to rotor [3].



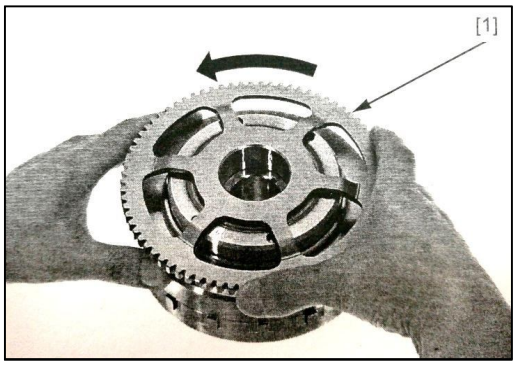
Fix the rotor [1] by its fixer.
Note:

- Install a fixing piece [3] of fixer to prevent rotor turning.

Coat the thread of fastening bolt on clutch with Loctite.
Install and turn the fastening bolt [4] to stipulated torque.
Fastening torque: 29N·m



Turn the plate shaped gear [1] anti-clockwise, then install the plate shaped gear into outer case of starting clutch.



Check the operation performance for starting clutch.
Re-assemble the rotor.

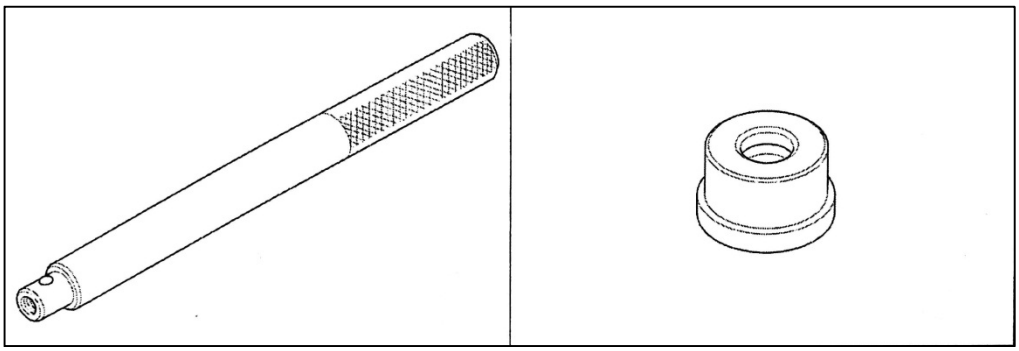
8 Case body and transmission system

Maintenance information

Summary

- Break up the crankcase for the maintenance below:
  1. Transmission system
  2. Crankshaft
  3. Balancing shaft
  4. Piston, connecting rod and cylinder body
- Remove the parts below before breaking up crankcase:
  1. Engine
  2. Gearshift system
  3. Magneto set
  4. Cylinder head set
  5. Tensioner
  6. Tensioning plate and guiding plate
  7. Primary oil filter
  8. Pressure relief valve
  9. Secondary oil filter
  10. Water pump
  11. Water tube
  12. Oil pressure sensor
  13. Speed sensor
  14. Gear indicator set
- Please don’t damage the combination surface of crankcase when repairing.
- Wash and clean the oil passage before re-assembling the crankcase.
- Before combining the case, coat the combination surface with sealing glue for end surface evenly, the surplus sealing glue must be clean up.
- Mark up the pad on bigger end of connecting rod and that on main shaft with suitable color, select the shaft pad according to the requirement in its <Selection Table>, check the oil gap when shaft pads re-assembled, wrong oil gap may heavily damage the engine.

Tool(s)



Specification for case body and transmission system

Unit: mm

Items			Standard	Limit
Transmission system	Diameter of gear's internal hole	M5	28.000～28.021	28.04
		C1	24.007～24.028	24.04
		C2	31.000～31.025	31.04
	External diameter of shaft's jacket	M5, M6	27.959～27.980	27.94
		C2	30.970～30.995	30.94
		C3, C4	30.950～30.975	30.93
	Clearance between gear and shaft's jacket	M5	0.020～0.062	0.10
		C2	0.005～0.055	0.07
	Internal diameter of shaft's jacket	M5	25.000～25.021	25.04
		C2	28.000～28.021	28.04
	Diameter for main shaft	Matching with shaft' jacket of M5	24.967～24.980	24.96
		Matching with shaft's jacket of C2	27.967～27.980	27.95
	Clearance between shaft and its jacket	M5, C2	0.020～0.054	0.07
Gearshift fork and its shaft	Diameter for gearshift fork's shaft		11.957～11.968	11.95
	Internal diameter of gearshift fork		12.000～12.018	12.03
	Thickness of gearshift fork's tip		5.93～6.00	5.9

Troubleshooting

Difficult gearshift

- Wrong operation on clutch
- Wrong viscosity of oil
- Gearshift fork got distorted
- Gearshift's shaft got distorted
- Ratchet of gearshift's fork got distorted
- Guiding groove on gearshift drum got damaged
- Gearshift arm got distorted

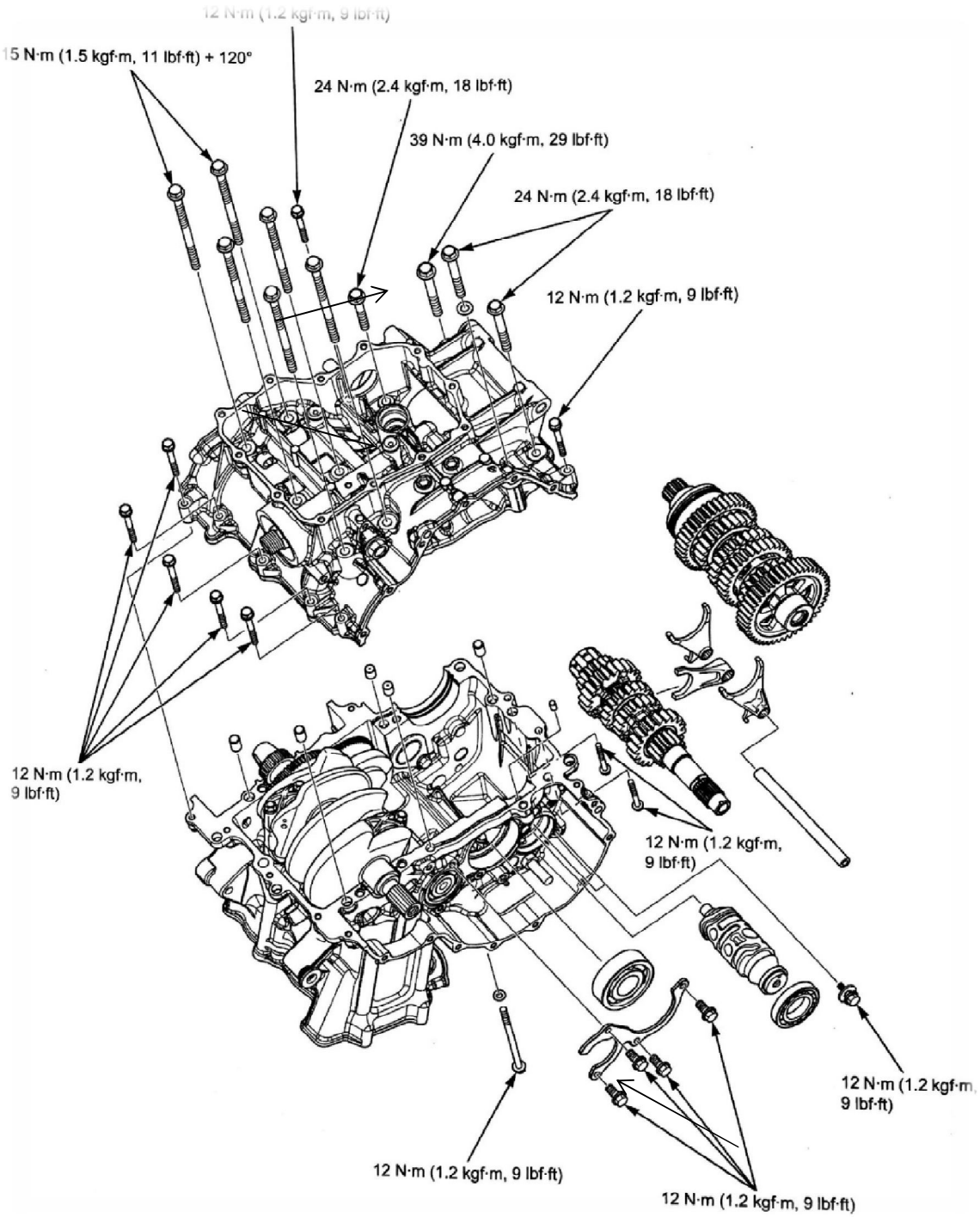
Gear jump in transmission system

- Gear got worn out
- Guiding groove of gearshift drum got worn out
- Gearshift fork's shaft got distorted
- Gearshift drum got damaged
- Twist spring of locating plate got damaged
- Gearshift fork got worn out or distorted
- Gearshift arm got damaged

Noisy engine

- Transmission gear got worn out or damaged
- Transmission bearing got worn out or damaged

Components layout

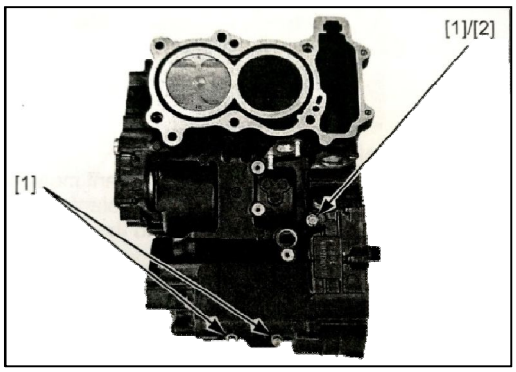


Transmission system

Disassembly and re-assembly

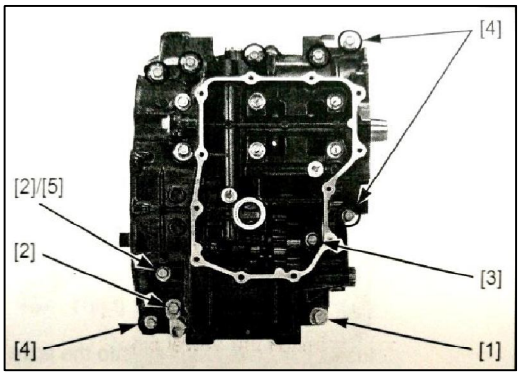
Remove the crankcase body（13～5）。

Get the scale line on driving gear of balancing aligned with the combination surface of case body.



Oppositely put the engine.

Loosen the bolt [1] of M10, M8X75 [2], M8X55 [3] and bolt [4] of M6 by 2 or 3 times, then remove all the bolts and flat washer [5].



Loosen the bolts [1] of main shaft on case body by 2 or 3 times, then remove the bolts.

Remove the lower case body [2] from the upper one. (Note: Prying up the combination surface of crankcase by screwdriver is not allowed.)

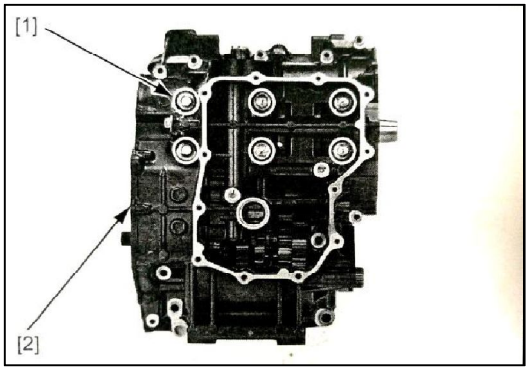
Remove the positioning pin [1] and plug [2] for oil passage.

Re-assembly

Wash and clean the combination surface between upper and lower case body and don’t damage it.

Check if the oil passage in case body is blocked up, clean up the oil passage if it is necessary.

Evenly coat the combination surface of lower case body with sealing glue for end surface as right picture shows.

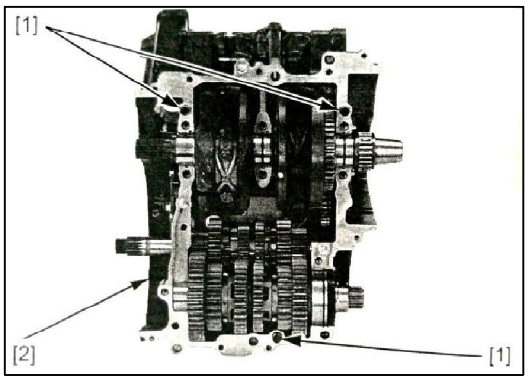


Note:

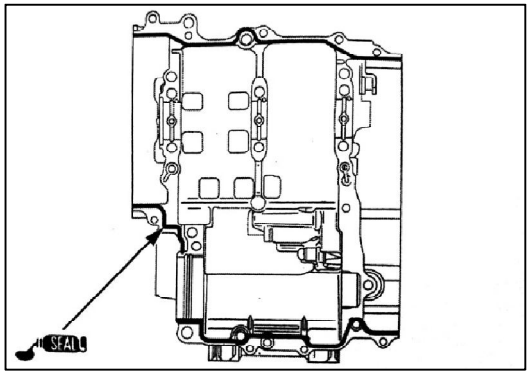
- Over-coat the sealing glue for end surface is not allowed.
- Don’t coat the bolt on journal of main shaft and the hole of oil passage with sealing glue for end surface.

Clean and wash the plug of oil passage.

Check if the plug of oil passage is blocked up, replace if it is necessary.
Install the plug [1] of oil passage onto crankcase body [2], put whose end with bigger hole diameter into upper crankcase body.

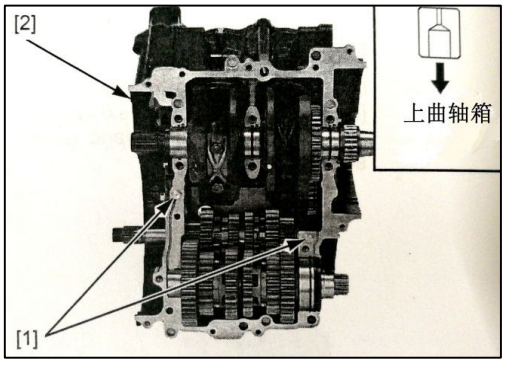


Install the positioning pin [1] into upper crankcase body [2].
Coat the journal and pad [1] of main shaft in upper and lower crankcase body with oil.



Install the lower crankcase body [1] onto the upper one.
Install a new bolt [2] for journal of main shaft.
Note:

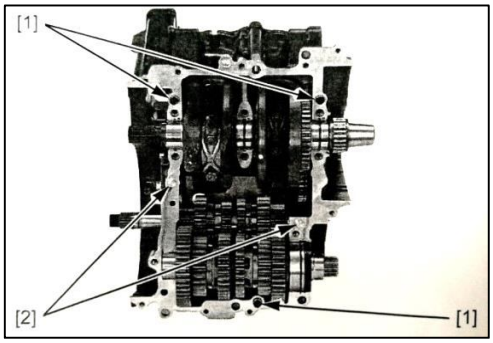
- Fasten the bolts on journal of main shaft by alternative way.
- Don’t adopt the bolt for journal already used, because its axial tension force is incorrect.
- Coat the bolt of journal with oil before re-assembling to increase its stability in axial stretching force, don’t wipe up the oil when re-assembling.



Confirm the upper and lower crankcase body are firmly re-assembled.
Fasten the bolt of journal on main shaft to stipulated torque by 2~3 times as picture shows.
Turn the bolt on journal of main shaft by 120° for further fastening.
Fastening torque: 15N.m+120°

stipulated torque by 2~3 times.
Note:

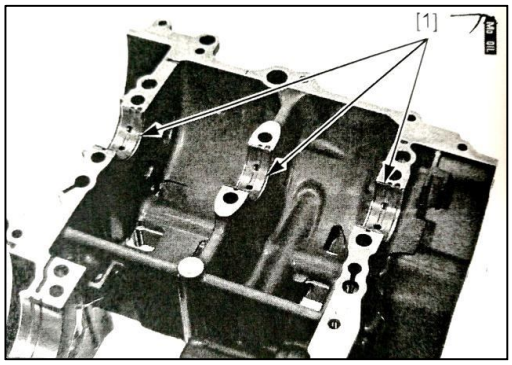
- Install the flat washer at the



Replace the flat washer and case combination bolt for a new one.
Fasten the case combination bolts to

position in picture [1] on the right.

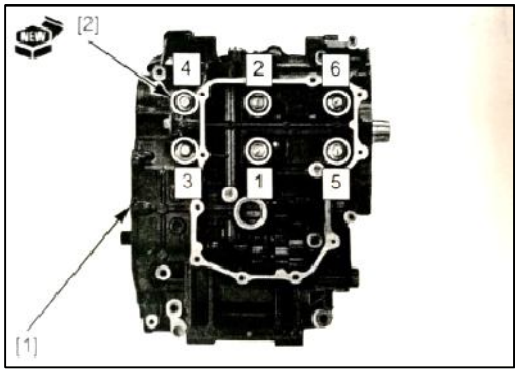
Fastening torque:
M10 Bolt [2]：39 N.m
M8×75 Bolt [3]：24 N.m
M8×55 Bolt [4]：24 N.m
M6 Bolt [5]：12 N.m



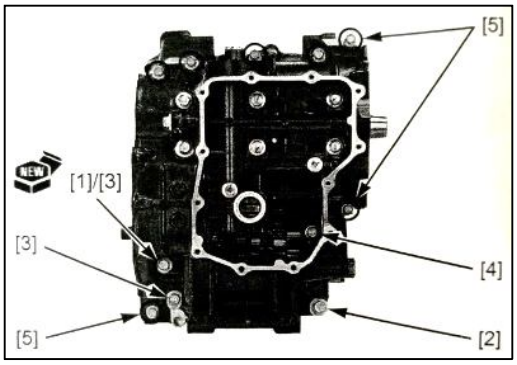
Turnover the engine to let its bottom face downwards.
Install new flat washer and case combination bolts of M6.
Note:

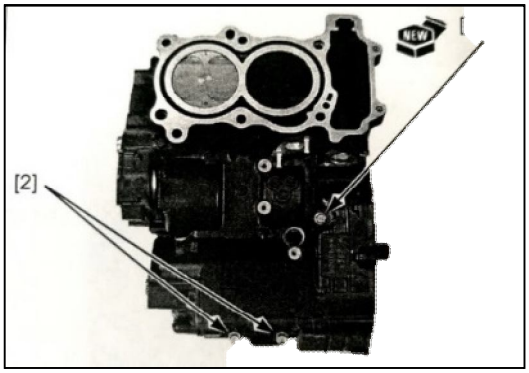
- Install the flat washer at position in picture [1] on the right.

Fasten the bolt of M6 to stipulated torque.
Fastening torque: 12 N.m



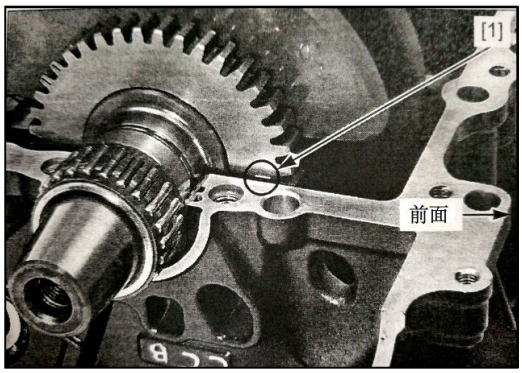
The re-assembly is precisely opposite to disassembly.





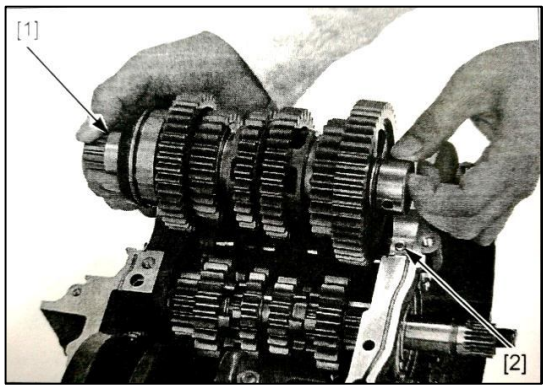
Case body

Disassembly and re-assembly
Break up the upper and lower crankcase body.

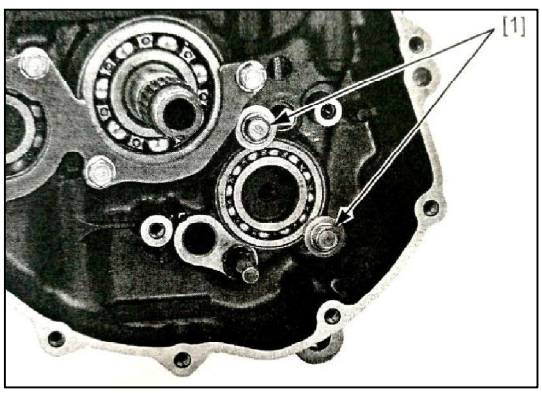


Get the scale line [1] on balancing gear aligned with the combination surface of upper crankcase body and face forward.

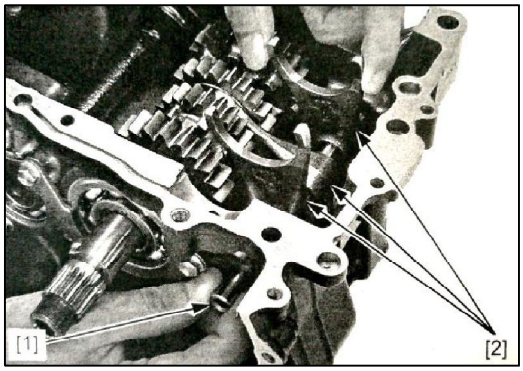
Remove the countershaft set [1] and pin axis [2].



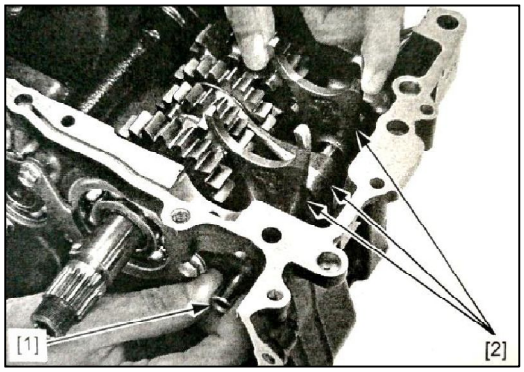
Remove limit bolt [1] for gearshift drum’s bearing.



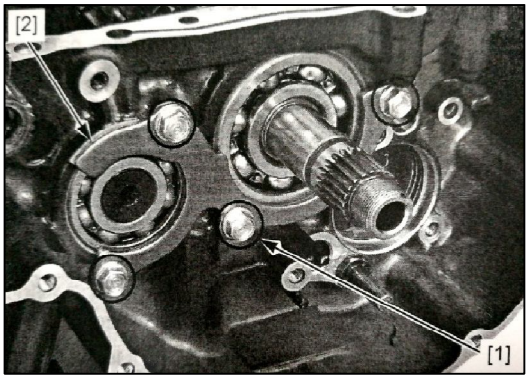
Remove the gearshift fork [1] and fork [2].



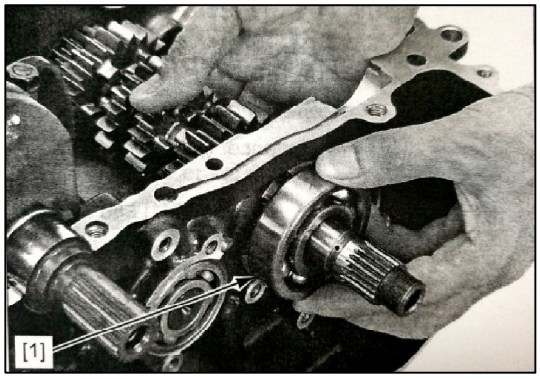
Remove the gearshift drum [1] and its bearing [2]



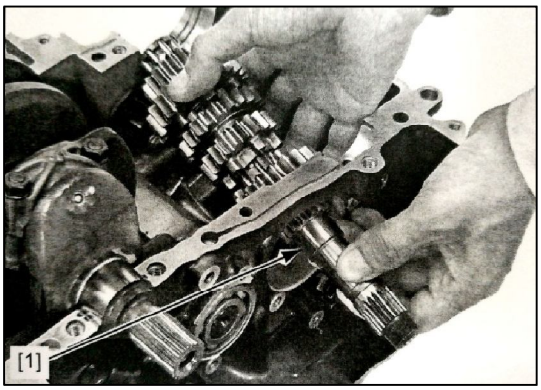
Remove the bolt [1] and pressing plate [2] on main shaft's bearing.



Slid the main shaft on upper crankcase body and remove the bearing on the right of main shaft.



Remove the main shaft set.



Break down the main shaft and countershaft.

Note:

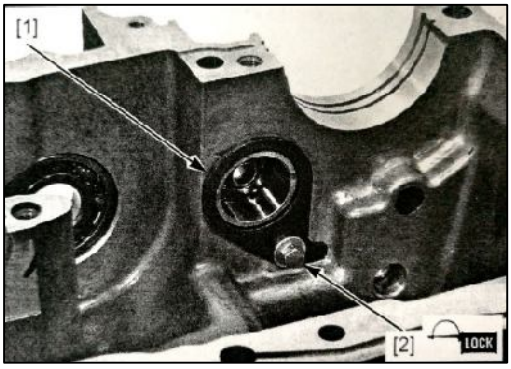
- Put the removed gears, collars, washers, and circlip rings in a line in a special container.
- Don't expand the circlip ring passed its limit, when removing it, expand it first, then push it out by the gear behind it.

Check

Check the scratch, damage, wear-out and distortion for parts below, replace if it is necessary.

- Transmission gear
- Transmission shaft's jacket
- Transmission bearing
- Gearshift drum and its bearing
- Gearshift fork
- Gearshift fork's shaft

Measure sieze for every part and calculate their matching clearance according to standard. In case any part's matching clearance passed the standard limit, please replace it for a new one.



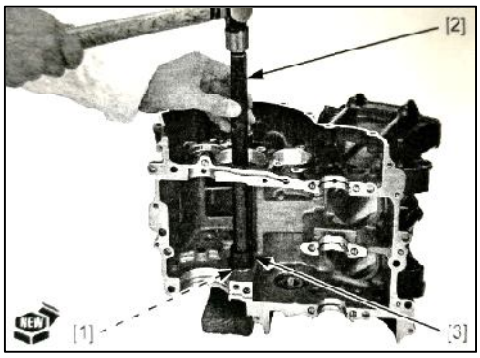
Replace the outer ring of left bearing on main shaft

Remove the parts below:

- Balancing shaft
- Piston

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

Remove the outer ring [3] of left bearing on main shaft by specialized tools.



Knock the new outer ring of left bearing on main shaft by specialized tools from the right above into lower crankcase body until it is completely in place.

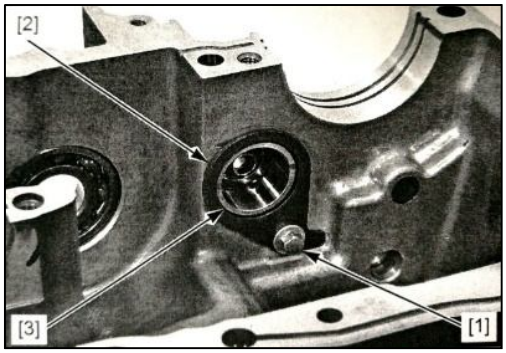
Tools:
Extension rod
Collar

Coat the thread of bolt on check plate of outer ring of bearing base with Loctite.

Install the check plate of outer ring on bearing base and install the bolt, then fasten the bolt to stipulated torque.

Fastening torque: 12N.m

The re-assembly is precisely opposite to disassembly.



Re-assembly

Wash and clean all the parts by solvent and make them totally dry up.

Coat the surface of teeth, turning area and bearing of gears with oil.

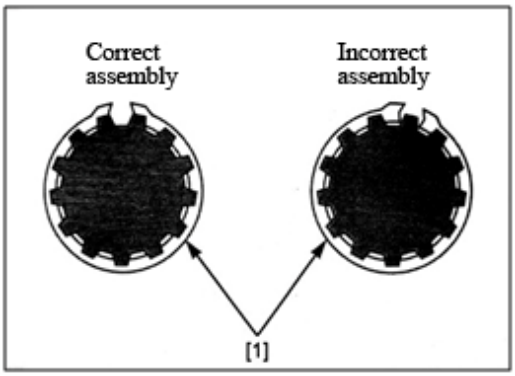
Coat the outer surface of gear's spline jacket, collar, turning area of needle bearing and groove of gear changer with oil.

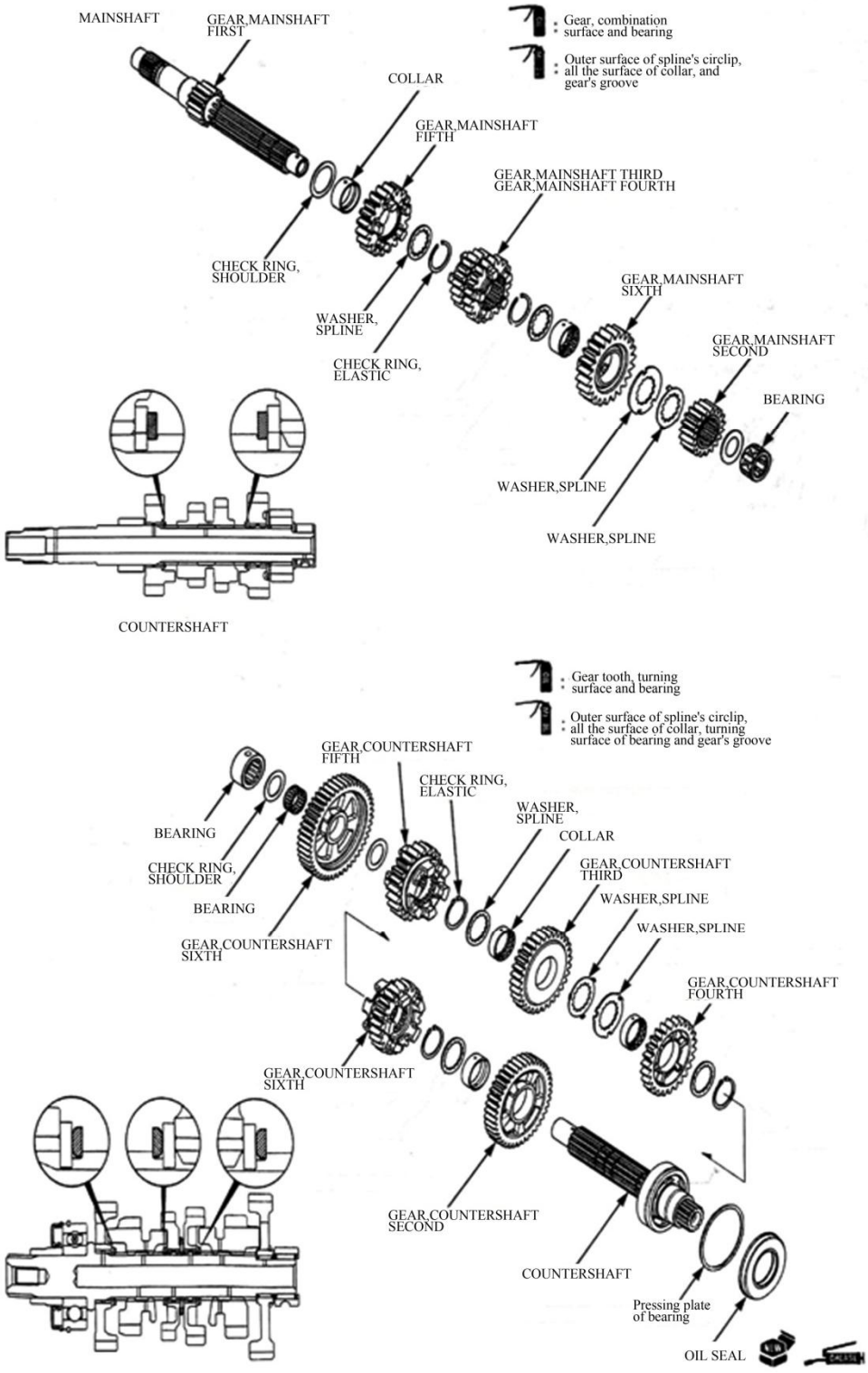
Re-assemble the main shaft and counter shaft.

Note:

- Coat every gear with oil and check its smooth and stable turning.
- Get the inner spline of spline washer aligned with its groove.
- Re-assemble the thrust washer always along the axial thrust surface of gear.

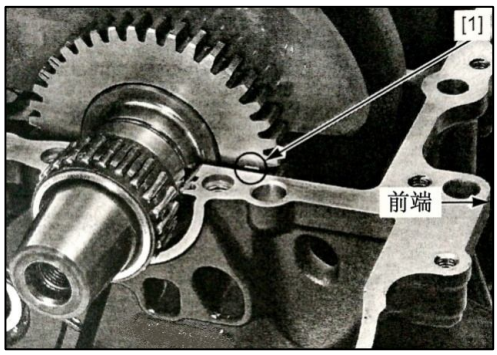
- When re-assembling the circlip ring, get its opening gap aligned with spline groove [1].
- Make sure the circlip is completely in the shaft’s groove when re-assembled.



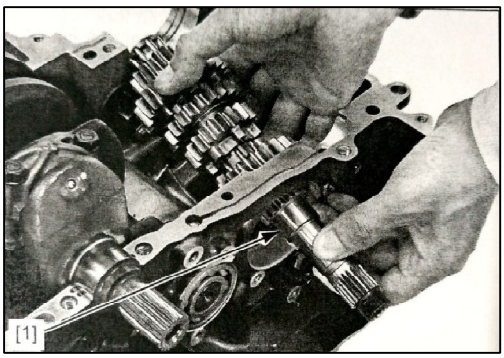

MAINSHAFT
GEAR,MAINSHAFT FIRST
COLLAR
GEAR,MAINSHAFT FIFTH
GEAR,MAINSHAFT THIRD
GEAR,MAINSHAFT FOURTH
CHECK RING, SHOULDER
WASHER, SPLINE
CHECK RING, ELASTIC
GEAR,MAINSHAFT SIXTH
GEAR,MAINSHAFT SECOND
BEARING
WASHER,SPLINE
WASHER,SPLINE
COUNTERSHAFT
* Gear, combination surface and bearing
* Outer surface of spline's circlip, all the surface of collar, and gear's groove
* Gear tooth, turning surface and bearing
* Outer surface of spline's circlip, all the surface of collar, turning surface of bearing and gear's groove
GEAR,COUNTERSHAFT FIFTH
CHECK RING, ELASTIC
WASHER, SPLINE
COLLAR
BEARING
CHECK RING, SHOULDER
BEARING
GEAR,COUNTERSHAFT SIXTH
GEAR,COUNTERSHAFT THIRD
WASHER,SPLINE
WASHER,SPLINE
GEAR,COUNTERSHAFT FOURTH
GEAR,COUNTERSHAFT SIXTH
GEAR,COUNTERSHAFT SECOND
COUNTERSHAFT
Pressing plate of bearing
OIL SEAL

Re-assembly

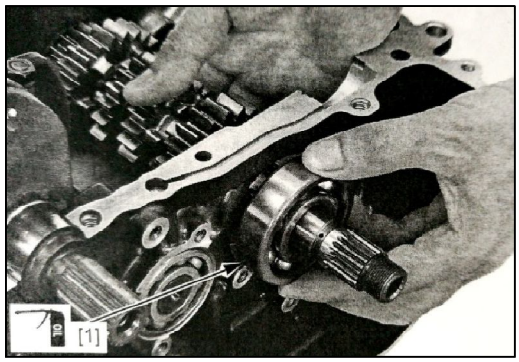
Get the scale line [1] on driving gear of balancing on crankshaft aligned with the combination surface of case body by turning the crankshaft and face forward.



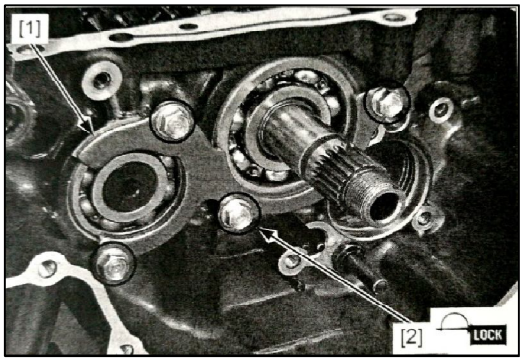
Install the main shaft set [1] into upper crankcase body.



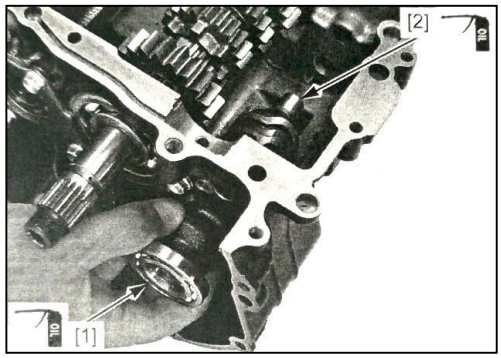
Coat the bearing on the right side of main shaft with oil, and install the right bearing [1] of main shaft into upper crankcase body. When re-assembling, the bearing's side with mark face outwards.



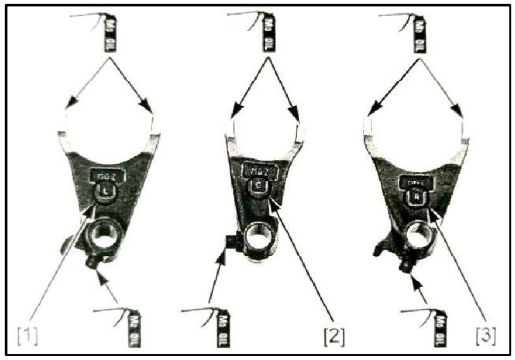
Install the pressing plate [1] for bearing of main shaft and bolt [2], before installation, coat thread of bolt with Loctite.
Fasten the bolt to stipulated torque.
Fastening torque: 12N.m



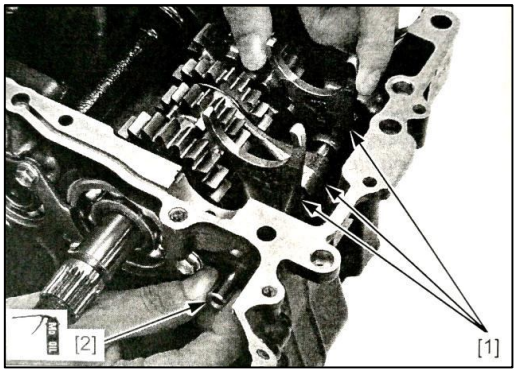
Coat the outer surface of gearshift drum and its bearing with oil.
Install the bearing [1] of gearshift drum on the drum itself [2]. When re-assembling, the side of gearshift drum with mark face outwards.
Install the gearshift drum set (With its bearing) into upper crankcase body.



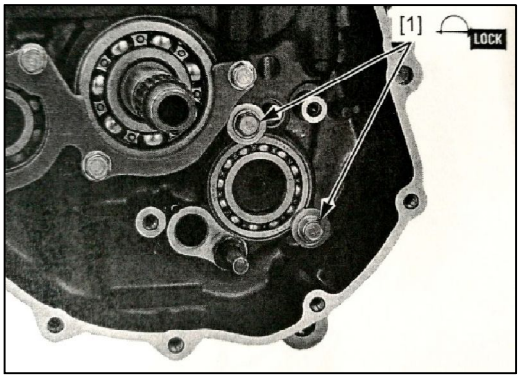
The mark on gearshift forks:
"L" [1]: Left fork
"C" [2]: Middle fork
"R" [3]: Right fork
Coat the guiding area of gearshift fork and guiding pin with oil.



Coat the surface of gearshift fork's shaft with oil.
Install the fork [1] into the guiding groove on gearshift drum and the groove of middle fork, then let the identification mark face to the right side of engine, then insert the fork shaft [2] in place.



Coat the thread of bolt on bearing of gearshift drum and the washer with Loctite.
Install the bolt and washer on bearing of gearshift drum in place and fasten the bolt to stipulated torque.
Fastening torque: 12N.m

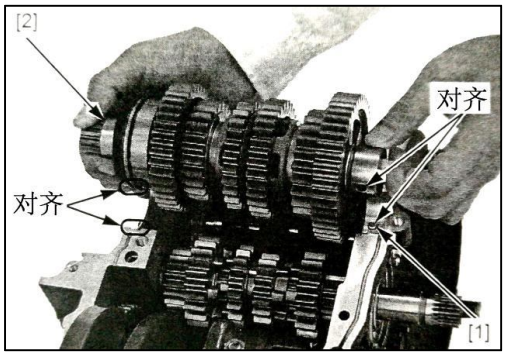


Install the cylindrical pin into upper crankcase body.

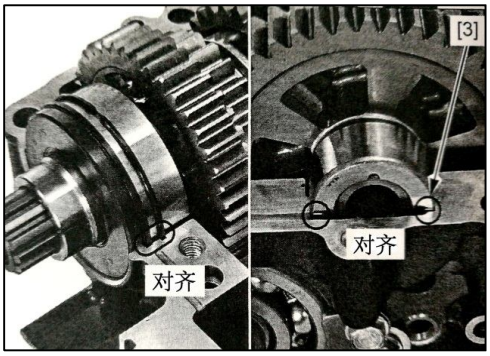
Install the countershaft into upper crankcase body, install the oil seal and stopping ring into the groove in case body when re-assembling, then get the outer ring of needle bearing aligned with cylindrical pin.

Note:

- Make sure the scale mark on the cover of needle bearing align with combination surface of case body.



Re-assemble the crankcase body.



9 Crankshaft, piston, cylinder and balancing shaft

Maintenance information

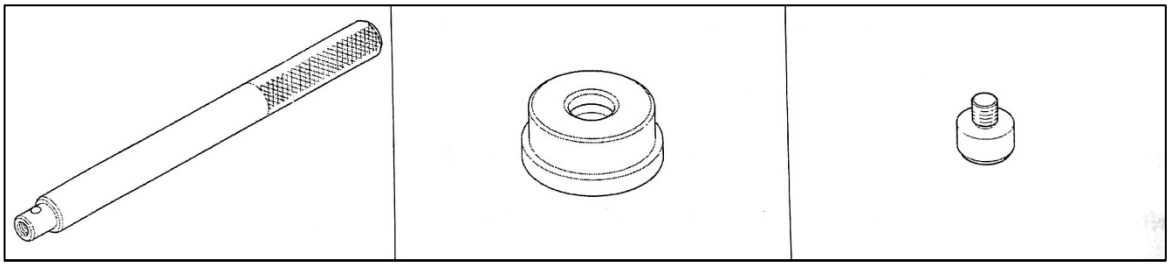
Summary

When maintaining the crankshaft, balancing shaft, cylinder body, piston/connecting rod and nozzle, the crankcase must break up. How to break up the crankcase refer to its corresponding chapter.

Mark up the bigger end of connecting rod, cover of the rod and crankshaft pads and well put aside to make sure the correct re-assembly.

The crankshaft's pin and pad of main shaft's journal gets matched according to their color, select the crankshaft's pad according to its color. When the new pad selected, confirm the clearance of oil film by plastic feeler gauge, the wrong clearance of oil film may heavily damage the engine.

Tool(s):



Specification for crankshaft, piston, cylinder body and balancing shaft

Unit：mm

Items			Standard	Limit
Crankshaft	Clearance in bigger end of connecting rod		0.05～0.20	0.25
	Clearance between pad at bigger end of connecting rod and crankshaft’s pin		0.030～0.052	0.06
	Clearance between journal of crankshaft and crankshaft’s pad		0.017～0.035	0.05
	Runout		—	0.05
Cylinder	Cylinder bore		68.000～68.015	68.10
	Roundness loss		—	0.10
	Taper		—	0.10
	Flatness		—	0.10
Piston, piston pin and piston ring	Diameter of base circle for piston		67.970～67.990	67.905
	Diameter for pin’s hole		16.002～16.008	16.02
	Diameter for piston pin		15.994～16.000	15.98
	Clearance between piston and its pin		0.002～0.014	0.04
	Closing clearance for piston ring	1st ring	0.10～0.20	0.4
		2nd ring	0.21～0.31	0.5
		Oil ring	0.20～0.70	1.0
	Clearance between piston ring and its groove	Clearance between 1st ring and its groove	0.030～0.060	0.10
		Clearance between 2nd ring and its groove	0.015～0.050	0.08
Cylinder matching clearance			0.010～0.045	0.10
Internal diameter of smaller end of connecting rod			16.030～16.044	16.05
Matching clearance between connecting rod and crankshaft pin			0.03～0.05	0.07

Troubleshooting

Too low the cylinder pressure, difficult starting or poor performance under low speed

- Air leakage of cylinder head's gasket
- Wear-out, jamming or damage on piston ring
- Cylinder head/Piston worn out or damaged

Too high the pressure in cylinder, cylinder body overheat or cylinder knocking

- Too much the carbon buildup on the top of piston

Too much waste gas

- Cylinder body, piston or its ring got worn out
- Wrong assembly for piston ring
- Scratch on piston or cylinder wall

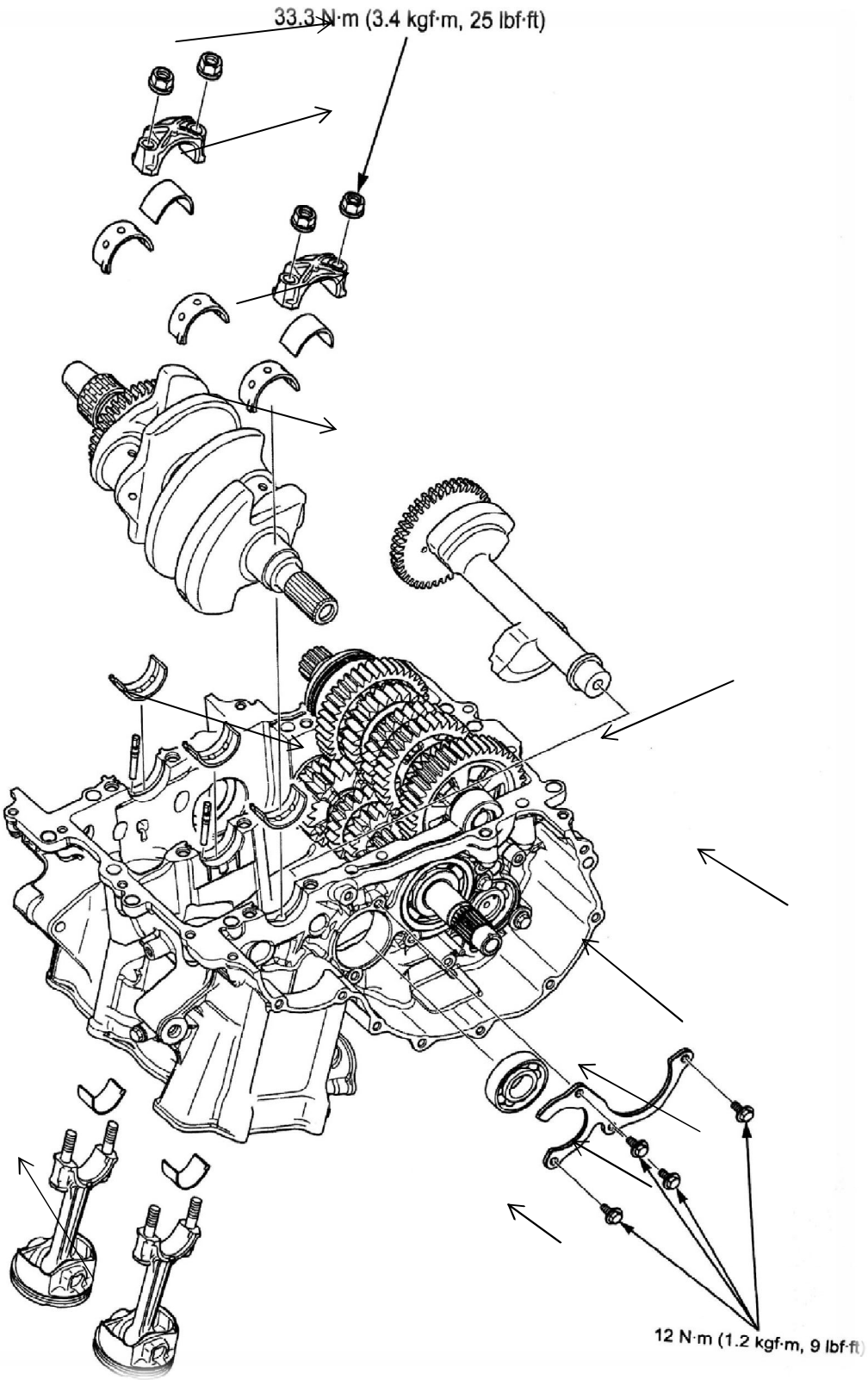
Engine noisy

- Piston pin or the hole for pin got worn out
- Smaller end of connecting rod got worn out
- Cylinder body, piston or its ring got worn out
- Crankshaft pin's pad got worn out

Engine vibration

- Too strong the runout of crankshaft

Components layout



Crankshaft

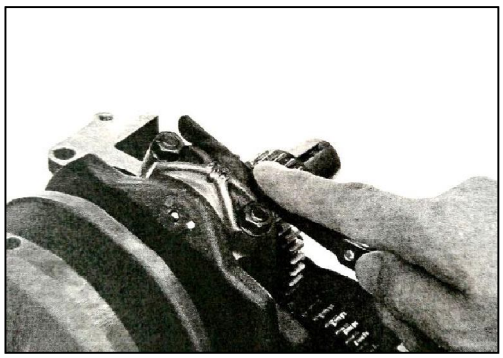
Check side clearance

Break up the upper and lower crankcase body.

Measure the side clearance of connecting rod.

Limit for maintenance: 0.25mm。

In case the clearance passed the limit for maintenance, replace the connecting rod. Confirm once again the side clearance, in case still passed the limit, replace the crankshaft.



Removal

Note:

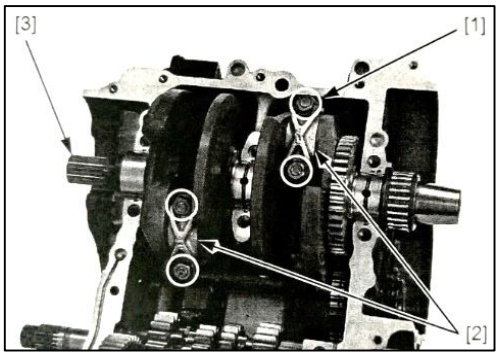
Don't change the position of shaft pads. The pads must be installed at their initial position, otherwise it may break the gap for oil film and get engine damaged.

Break up the upper and lower case body.

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

Remove the nut [1] for connecting rod's cover and the cover [2] itself. Don't damage the crankshaft pin, journal for main shaft and the pads.

In case the cover of connecting rod is difficult to be removed, slightly knock the side of connecting rod. Remove the crankshaft [3].

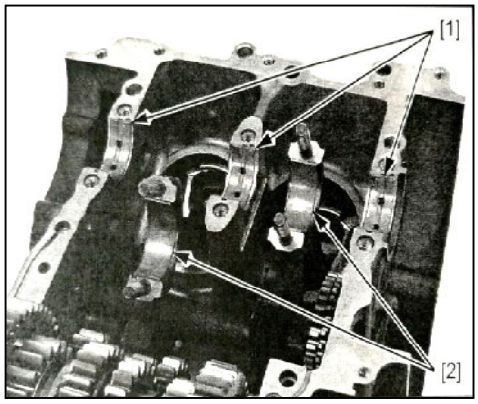


Note:

Push the piston to the upper stopping point before remove the crankshaft to avoid damage on crankshaft pin.

Remove the pad [1] of journal on main shaft from upper and lower crankcase body.

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

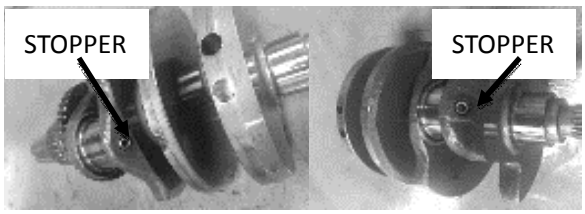


Note:

Don't change the position of shaft pads. The pads must be installed at their initial position, otherwise it may break the gap for oil film

and get engine damaged.

Remove the 2 pieces of plug in oil passage



Check

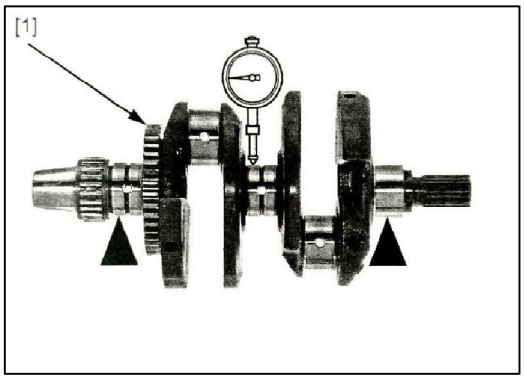
Support and journal on the both ends of crankshaft.

Lay a micrometer above the middle journal and avoid the oil groove and oil hole.

Turn the crankshaft by 2 rounds （720°），then read its runout.

Limit for maintenance：0.05 mm

Check the wear-out or damage on driving gear [1] on balancing shaft.



Check if there is foreign material in oil passage, in case it is, please clean up.

Re-assembly

Re-assemble the 2 pieces of plug for oil passage back to crankshaft.

Coat with suitable Loctite and avoid it getting into oil passage.

Fastening torque: 8**N • m**

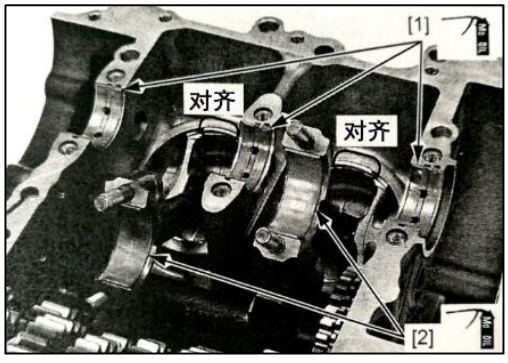
their original place.

Pad of crankshaft's pin

- Pad for journal of main shaft

Note:

- *Don't change the position of shaft pads. The pads must be installed at their initial position, otherwise it may break the gap for oil film and get engine damaged.* Install the pad [1] of journal on main shaft and pad [2] of crankshaft's pin to

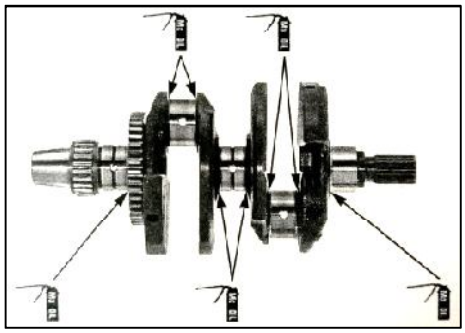


Coat the internal surface of pad of journal on main shaft in upper crankcase and the crankshaft pin's pad in bigger end of connecting rod with oil,

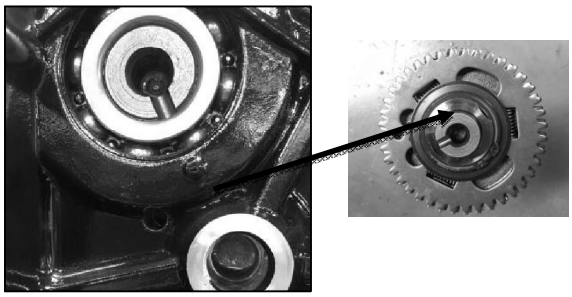
Get the end of skirt part on piston

aligned with cylinder edge

Coat the thrust surface of crankshaft with oil as picture shows.



Install the balancing shaft in, and get the circular hole on balancing shaft aligned with that on crankcase.



Insert the tool of round bar Φ5 to fix the balancing shaft.

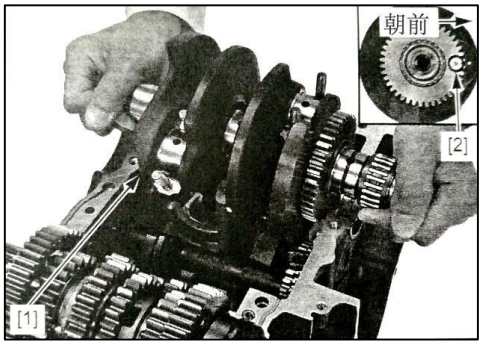
Slightly shake the balancing shaft to confirm the round bar already inserted in it and fixed.

Safely put the crankshaft [1] above crankcase, the mark △ [2] on driving gear of balancing shaft face to the front of engine, then put the crankshaft's pin into bigger end of connecting rod (Don't damage the crankshaft's pin, journal of main shaft and their pads).

Install the crankshaft into crankcase, when re-assembling, make sure the round point on crankshaft aligned with

that on crankcase body as picture shows.

Remove the round bar of locating fixture for balancing shaft.



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

Clean up the combination surface between bigger end of connecting rod and its cover, then dry it up by compressed air.

Coat the internal surface of crankshaft pin's pad on cover of connecting rod with oil.

Install the connecting rod's cover [1] by matching the letter mark (Indicating their internal diameter) on the cover and bigger end of connecting rod

Note:

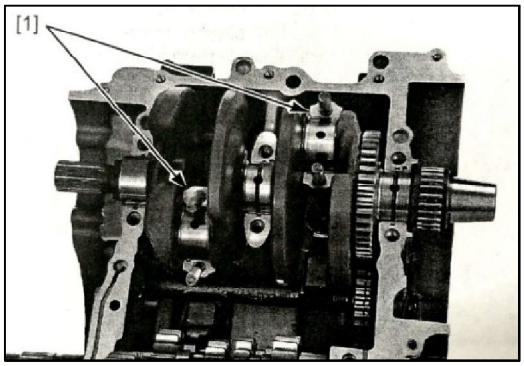
Make sure every part is re-assembled back to their initial position as the marks when removing them.

Coat the thread of cap-shaped nut on connecting rod's cover and its base with oil.

Install and fasten the nuts [1] of connecting rod's cover by 2 to 3 times in alternative turn.

Fastening torque: 46N • m

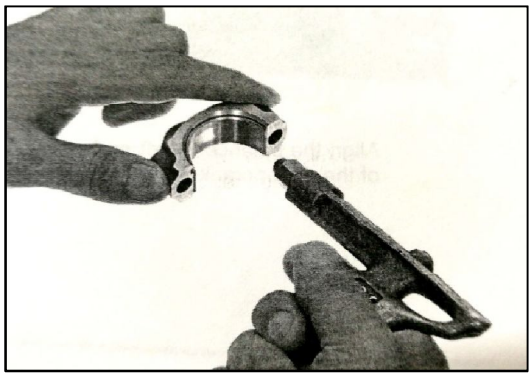
Re-assembly for upper and lower crankcase（13～6）。



Pad of journal on main shaft

Note:

Don't change the position of shaft pads. The pads must be installed at their initial position, otherwise it may break the gap for oil film and get engine damaged.



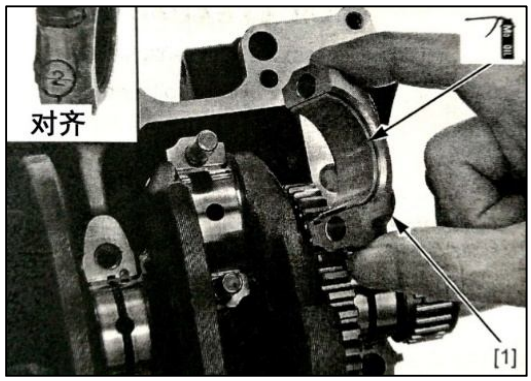
Check the shaft pads

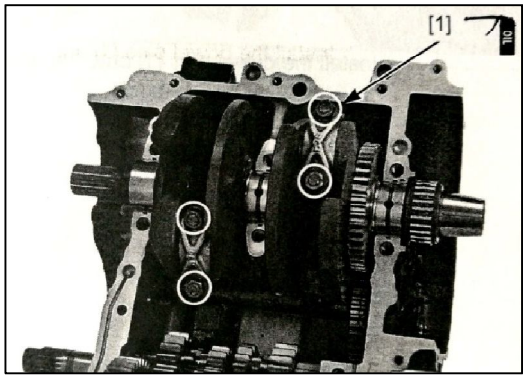
Remove the crankshaft.

Check if there is wear-out of dropping off from the pad [1] on journal of main shaft

Check the damage on protrusion [2] of shaft pad.

In case the pad of journal on main shaft damaged, select a correct pad for replacement.





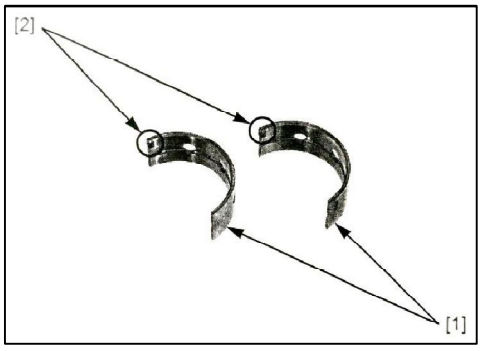
Check the oil gap

Remove the crankshaft.

Wipe up the oil on journal of main shaft and its pads.

Install the crankshaft into upper crankcase.

On every journal of main shaft, avoid oil hole and vertically lay a plastic gap gauge [1]. (Don't turn the crankshaft when checking the oil gap).



。

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

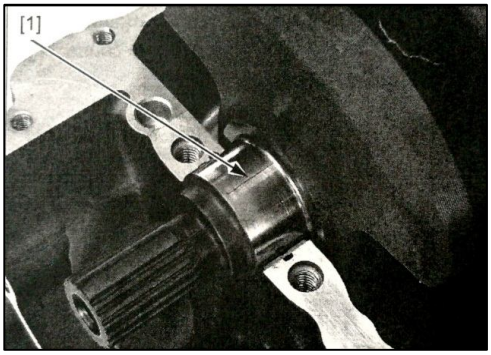
Install the lower crankcase [1] above the upper one.

Clean up the case combination bolt by solution (Repeatedly use), then totally dry them up by blowing.

Coat the thread and its base surface of combination bolt on journal of main shaft with oil,

Install the case combination bolt [2] for journal of main shaft.

Make sure the upper and lower crankcase are firmly re-assembled.



According to the numbers in picture, fasten the case combination bolt to stipulated torque by 2 or 3 times in alternative turn.

Make a further turning by 120 ° to fasten the combination bolt for case.

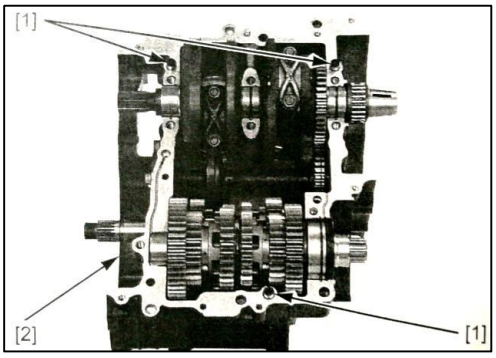
Fastening torque: 15N.m+120°

Remove the case combination bolts and lower crankcase.

Measure every plastic gap gauge on journal of main shaft after extrusion to confirm the oil gap by maximum width.

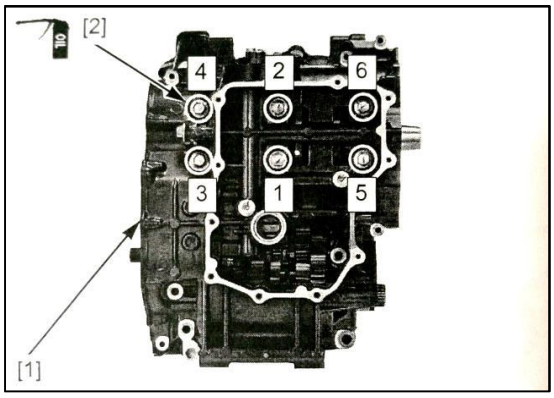
Limit for maintenance:0.05 mm

In case the oil gap passed the limit for maintenance, select a correct shaft pad for replacement.



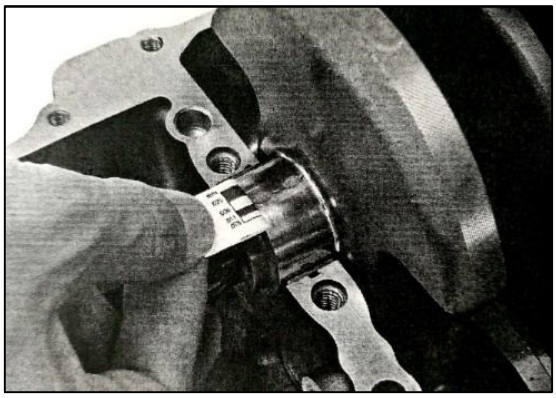
Select the correct pad

Take a record for letter number [1] for internal diameter of installation hole on shaft pad on the left of upper crankcase as picture shows (The letter A, B, or C means the number order for internal diameter of installation hole on shaft pad gets from left to right).



diameter's number order for journal of main shaft gets from left to right.

n case the crankshaft needs be replaced, take record for corresponding number [1] on weight piece of crankshaft (1, 2, or 3), which means the external In case the crankshaft need be replaced, take record the corresponding number [1] on its weight piece, select the pad's color [1] by mutually refer the number for installation hole of journal and pad for main shaft.



Thickness for pad of journal for main shaft:

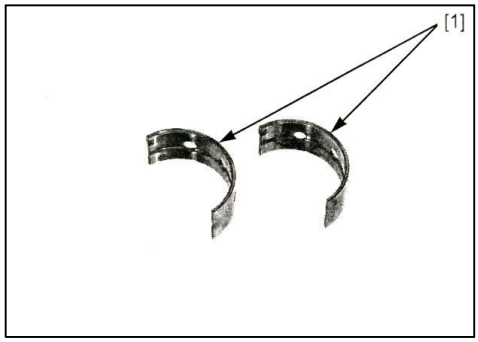
A：Black： Thick

B Brown：

C：Green：

D:Yellow：

E：Pink： Thin



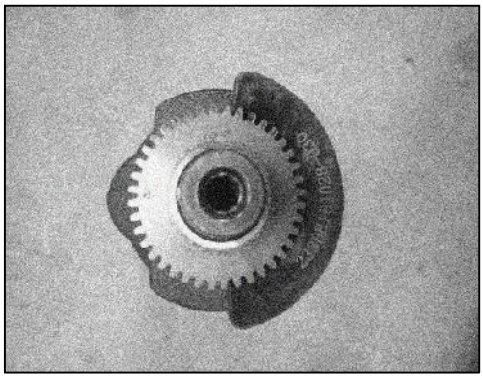


Table for matching journal and pad of main shaft:

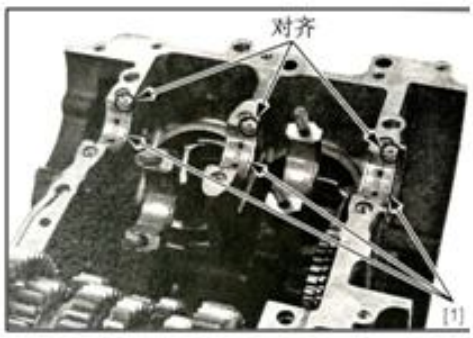
			Number for internal diameter of installation hole for main shaft's pads		
			A	B	C
			37.000～37.006 mm (1.4567～1.4569 in)	37.006～37.012 mm (1.4569～1.4572 in)	37.012～37.018 mm (1.4572～1.4574 in)
Number for external diameter of journal for main shaft	1	34.000～34.006 mm (1.3386～1.3388 in)	E (Pink)	D (Yellow)	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)

Note: *When new shaft pad was selected, measure its clearance by plastic gap gauge once again.*

Re-assembly for shaft pad

Clean up the external surface of shaft pad and its installation hole on crankcase.

Install the shaft pad [1] into its installation hole on crankcase, get every protrusion aligned with groove.



Crankshaft pin’s pad

Note:

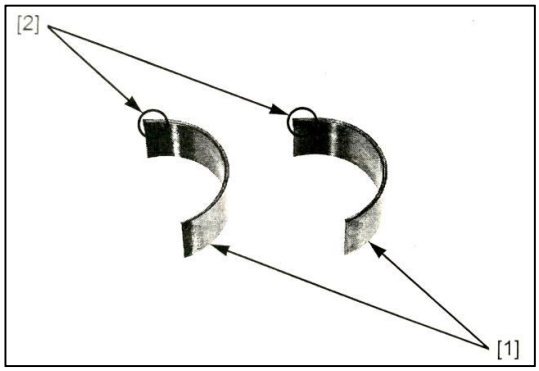
Don’t change the position of shaft pads. The pads must be installed at their initial position, otherwise it may break the gap for oil film and get engine damaged.

Remove the crankshaft.

Check if there is wear-out or peel off on crankshaft pin’s pad [1]

Check the damage on protrusion [2] of shaft pad.

In case the crankshaft pin’s pad got damaged, select a correct one for replacement.



Check the oil gap

Remove the crankshaft（Page 14～4）。

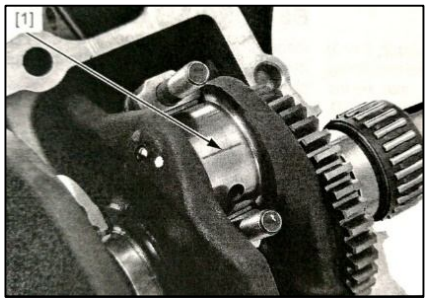
Clean up the combination surface between bigger end of connecting rod and its cover by solution, then dry it up by compressed air.

Wipe up all the oil on shaft pads and crankshaft’s pin.

Install the crankshaft into upper crankcase (Page 14~5)

Install the bigger end of connecting rod into crankshaft's pin.

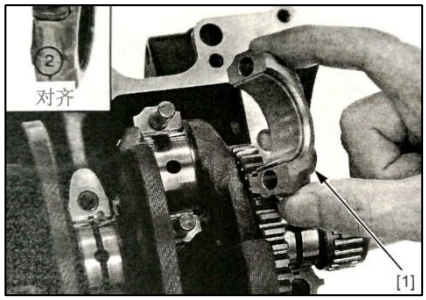
Lay a plastic gap gauge [1] on every journal of main shaft vertically while avoiding oil hole (Don't turn the crankshaft during checking)



Install the cover [1] of connecting rod by matching the letter number for internal diameter on bigger end of connecting rod and its cover.

Note:

Make sure every part is re-assembled back to initial position as the mark when removing.

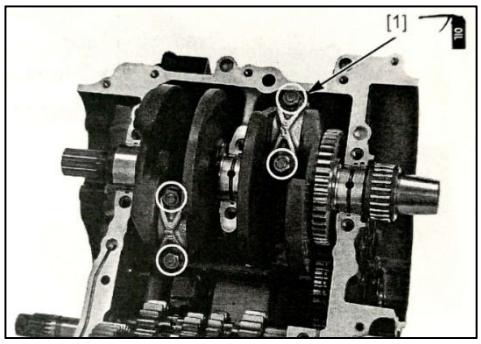


Coat the thread of nut on connecting rod's cover and nut's base with oil.

Install the nut [1] for connecting rod's cover and fasten to stipulated torque by 2 or 3 times in alternative turn.

Fastening torque: 33N.m

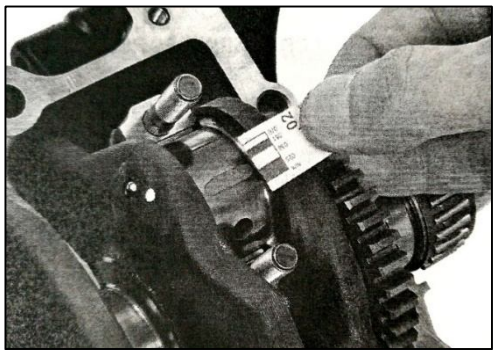
Remove the cover of connecting rod.



Measure every maximum width of plastic gap gauge to confirm the oil gap after extrusion.

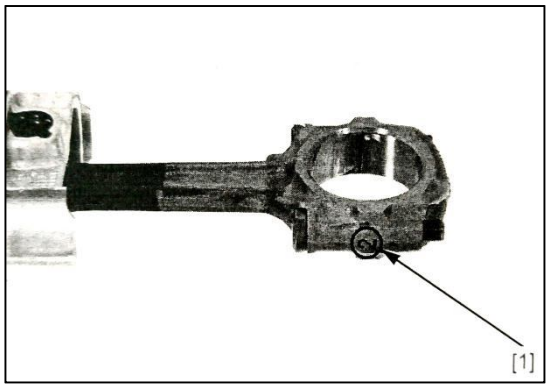
Limit for maintenance: 0.06mm

In case the oil gap got passed the limit of maintenance, select a correct pad for replacement.



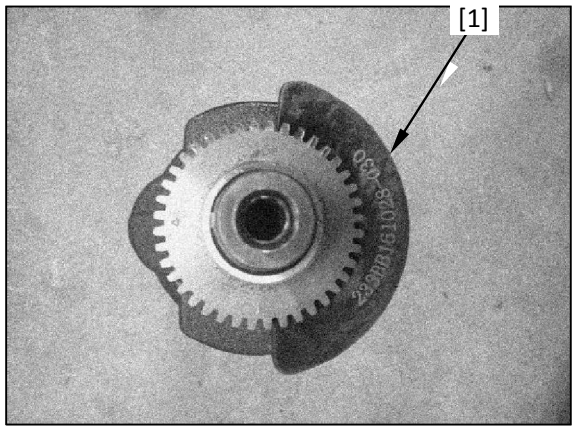
Select the shaft pad

Take record for the letter number [1] for internal diameter of bigger end of connecting rod (The number 1, 2, or 3 on the bigger end of connecting rod stands for the internal diameter of the bigger end), or install the cover on connecting rod, measure its internal diameter without shaft pad.



In case the crankshaft needs be replaced, take record for the corresponding number [1] on crankshaft's weight piece (The number A, B, or C on weight piece of crankshaft means the number order for crankshaft pin's external diameter gets from left to right).

In case repeatedly use the crankshaft, measure the external diameter of crankshaft's pin by micrometer.



Select the replaceable color [1] of shaft pad by mutual reference of number between bigger end of connecting rod and crankshaft's pin.

Thickness for crankshaft pin's pad:

A：Blue： Thick

B：Black：

C: Brown：

D：Green：

E：Yellow： Thin

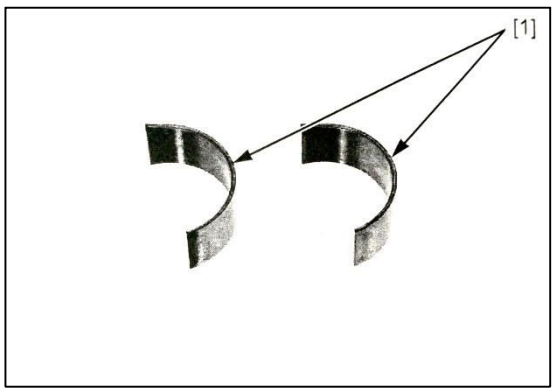


Table for matching between crankshaft's pin and pad:

	Number for internal diameter for bigger end of connecting rod		
	1	2	3

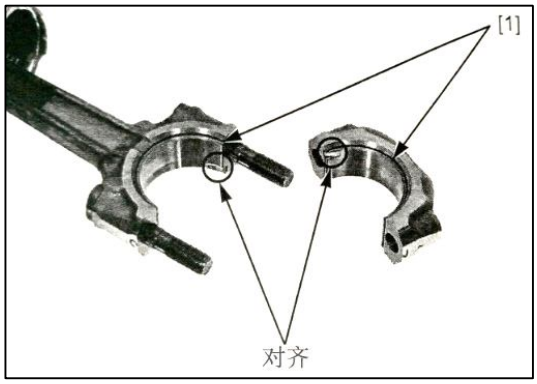
			39.000～39.006 mm (1.5354～1.5357 in)	39.006～39.012 mm (1.5357～1.5359 in)	39.012～39.018 mm (1.5359～1.5361 in)
Number for external diameter of crankshaft’s pin	A	35.994～36.000 mm (1.4171～1.4173 in)	E (Yellow)	D (Green)	C (Brown)
	B	35.988～35.994 mm (1.4168～1.4171 in)	D (Green)	C (Brown)	B (Black)
	C	35.982～35.988 mm (1.4166～1.4168 in)	C (Brown)	B (Black)	A (Blue)

Note: *When new shaft pad was selected, measure the clearance by plastic gap gauge once again.*

Re-assembly for shaft pad

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

Install the pad [1] of crankshaft’s pin into the cover and bigger end of connecting rod, then get every protrusion aligned with groove.



Piston/Cylinder

Remove the piston/connecting rod set

Note:

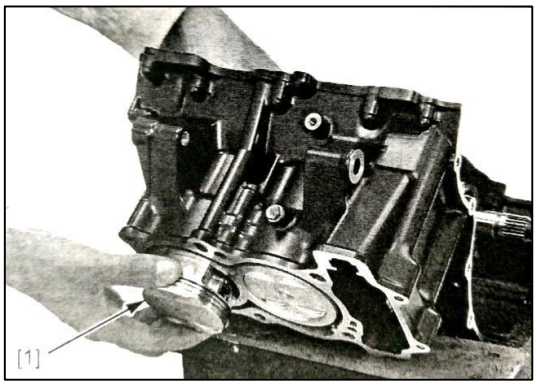
- Don’t remove the piston/connecting rod set from the bottom of cylinder, because they may be seized up at joint between cylinder sleeve and upper crankcase body.
- Pack the bigger end of connecting rod by a clean non fiber cloth before removing the piston to avoid damage on cylinder sleeve.
- *Don’t change the position of shaft pads. The pads must be*

installed at their initial position, otherwise it may break the gap for oil film and get engine damaged.

Remove the parts below:

- Balancing shaft
- Crankshaft

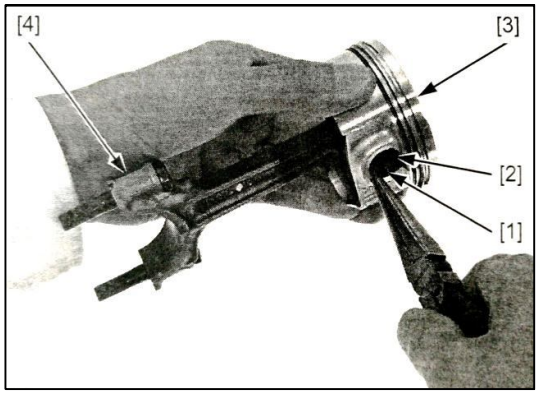
Remove the piston/connecting rod set [1] from the top of cylinder body.



Remove the piston

Remove the circlip [1] of steel wire by tweezers.

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



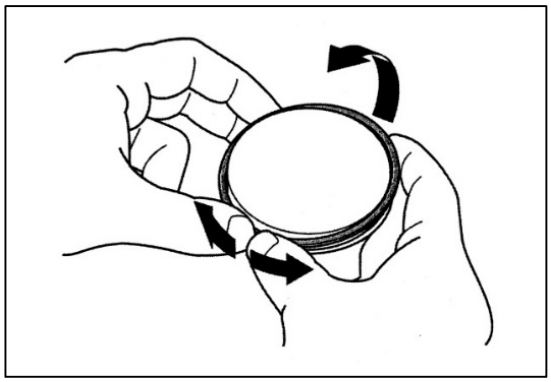
piston when removing its rings.

Removal for piston ring

Get every opening of piston ring breaking apart, then remove the ring upwards along the opposite position of its opening.

Note:

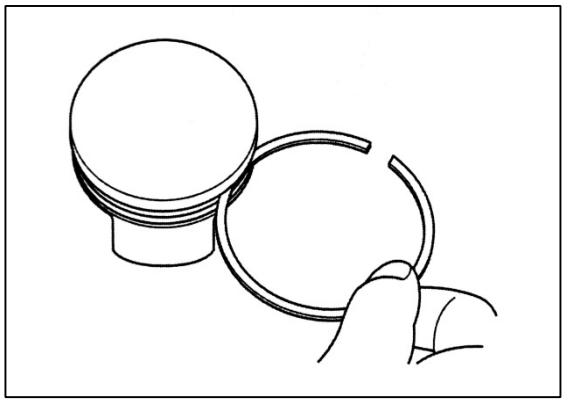
- Don't break apart the two ends of opening too far to avoid damage on piston ring.
- Please don't leave scratch on



Clean up the carbon buildup in groove of piston ring by replaced ring who is about to throw away.

Note:

- Don't use the steel brush to avoid leaving scratch on piston ring.



Check

Check the scratch, damage, wear-out, distortion, burn-out or block in oil

passage for parts below.

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

Measure every part according to specification for crankshaft/piston/cylinder/balancing shaft, then calculate their clearance.

Any part got passed the limit for maintenance needs be replaced.

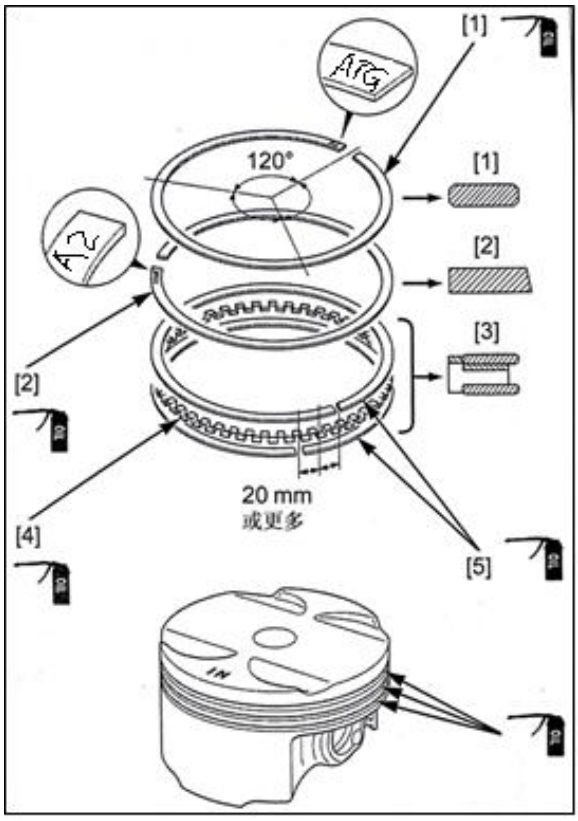
Re-assembly for piston ring

Totally clean up the groove of piston ring and install the rings.

- Coat the surface of piston rings and their grooves with oil.
- Don't damage the piston and its rings when re-assembling.
- The side of piston ring with mark face upwards when re-assembling.
  - Mark "ATG": 1st ring[1]。
  - Mark "A2": 2nd ring[2]。
- When re-assembling the oil ring set [3], install the liner ring [4] first, then the scratching ring [5].

Get the opening on piston rings mutually cross by 120 °.

The staggering position for openings on scratching ring is shown as picture.



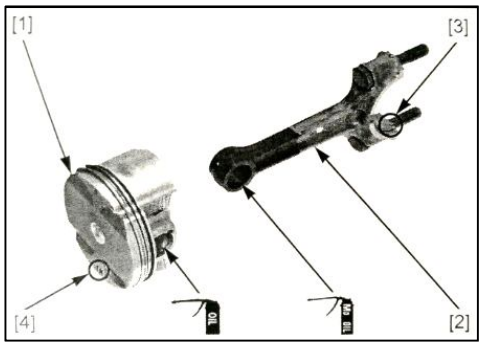
Re-assembly for piston

Install the crankshaft pin's pad to its initial position (Page 14~13).

Coat the internal surface of piston pin's hole with oil.

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

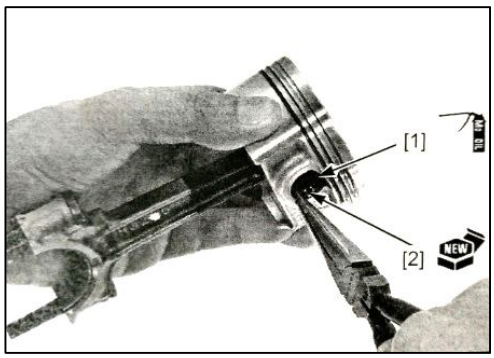
When matching the piston [1] and connecting rod [2] set, get the protrusion [3] of crankshaft pin's pad facing to mark IN [4] on piston.



Coat the external surface of crankshaft's pin and piston pin with oil. Re-assemble the piston pin [1], then fix it by a new circlip [2] of steel wire.

Note:

- Make sure the circlip of steel wire installed in place.
- Don't align the opening on circlip of steel wire with the gap on piston.



Coat the cylinder wall and thrust surface of piston with oil.

Install the piston/connecting rod set [1] into cylinder body by tools could be bought on market (When re-assembling the set, the mark IN on piston face to the side of air inlet).

When re-assembling the repeatedly using connecting rod, they must be re-assembled back to their initial position.

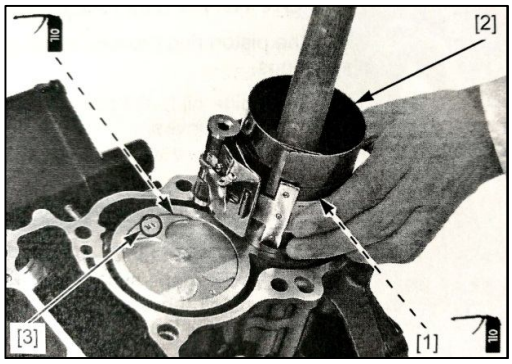
Note:

- When re-assembling the piston, don't damage the upper surface of piston, especially the matching part on hole of cylinder.
- Don't damage the cylinder sleeve and crankshaft's pin by connecting rod.

Slightly knock the piston into cylinder body by tools such as plastic hammer (Make sure the pressing tool for piston ring is horizontally put on the upper surface of cylinder body).

Re-assemble the parts below:

- Crankshaft
- Balancing shaft



Nozzle on piston

Removal/Re-assembly

Remove the piston/connecting rod set.

Push the nozzle outwards from cylinder' side to journal of main shaft (Don't damage the jet hole on nozzle).

Remove the o-ring on nozzle.

Totally clean up the nozzle by solvent.

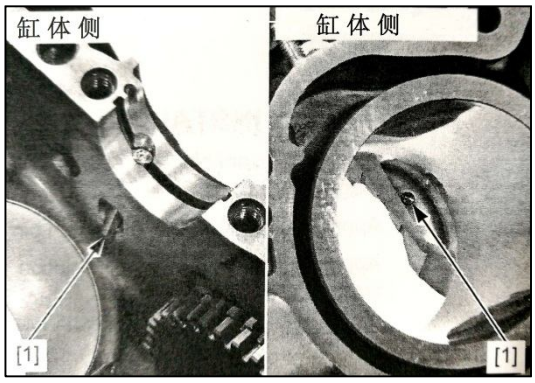
Check if the nozzle is blocked up, replace if it is necessary.

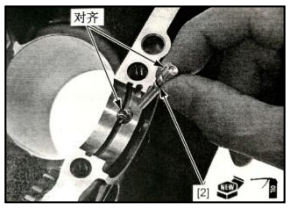
Clean up the oil passage in crankshaft and nozzle by blowing of compressed air.

Install a new o-ring at the groove of nozzle, coat it with oil before installation.

Re-assemble the nozzle into crankcase until it totally in place. Get the protrusion on nozzle aligned with groove on crankcase when re-assembling.

The re-assembly is precisely opposite to disassembly.



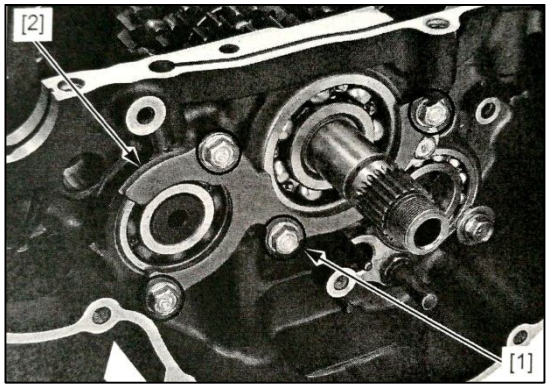


Balancing shaft

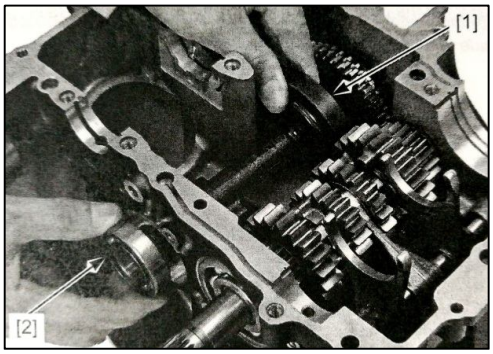
Removal

Remove the piston/connecting rod set.

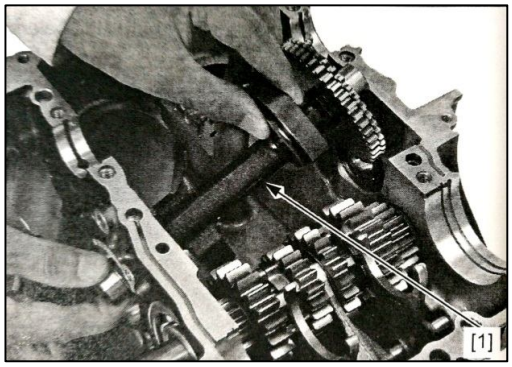
Remove the bolt [1] and pressing plate [2] of balancing shaft/right bearing of main shaft.



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



Remove the balancing shaft [1].



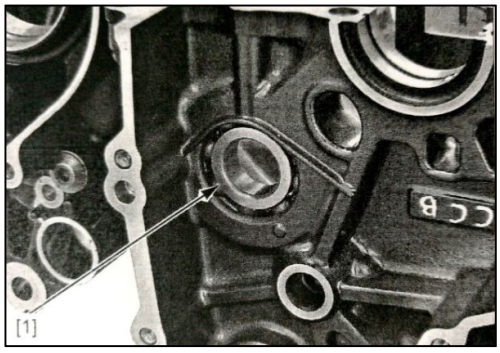
Check

Check the scratch, damage, wear-out and distortion on parts below, replace if it is necessary.

- Driven gear of balancing shaft
- Sub gear on driven gear of balancing shaft
- Pressing spring of driven gear
- Balancing shaft
- Bearing of balancing shaft

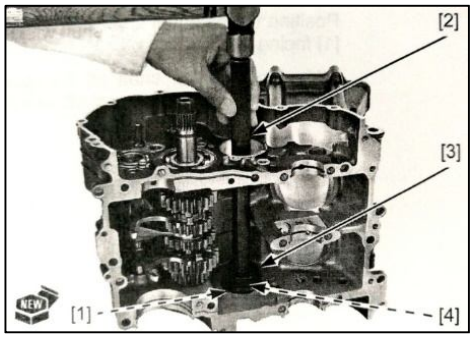
Replace the left bearing of balancing shaft

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



Install a new left bearing [1] for balancing shaft into upper crankcase by specialized tools, slightly knock it until completely in place (Knock it in a right angle, the side with mark on bearing face upwards).

Tool(s):



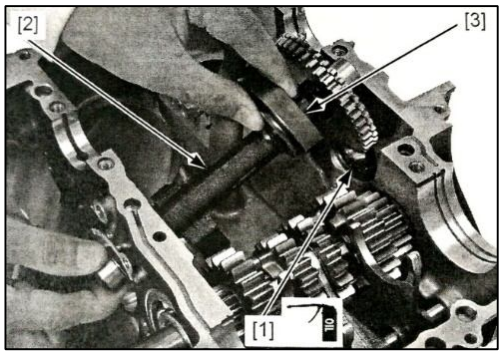
[2] Driving bar [3] Damper piece
[4] Guiding piece

re-assembling.

Re-assembly

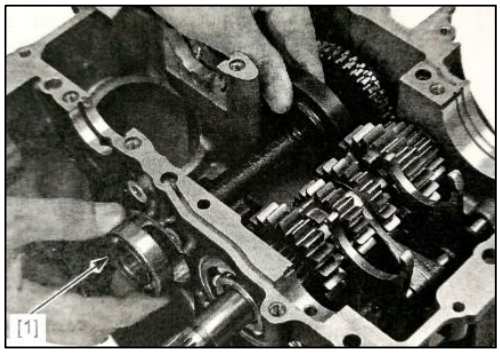
Coat the left bearing [1] of balancing shaft with oil.

Re-assemble the balancing shaft [2] into upper crankcase, the left balancing piece [3] face upwards when



Coat the right bearing of balancing shaft with oil.

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



Coat the thread of bolt on balancing shaft/pressing plate of right bearing on main shaft with Loctite.

Re-assemble the balancing shaft/pressing plate [1] for right bearing of main shaft and bolt [2] of pressing plate.

Fasten the bolt of pressing plate to stipulated torque.

Fastening torque: 12N.m

Re-assemble piston/connecting rod set.