TOMBERLIN

USA Repair Instructions

Edition December 2005

Tomberlin Outdoor

MadAss 50

PREFACE

This repair manual serves as guideline for professional repair activities.
See the illustrated spare-parts catalog for further assistance.

All figures, dimensions and descriptions correspond to the state of the version concerned. All changes are reserved in the interest of further development of the construction models.

See also the "technical information", which provides data about technical changes implemented after this repair manual was sent to the printer .

The technical information is intended for master mechanics, since its careful and constant observation is a requisite for preserving the operability of the individual assemblies of the motorcycle.

Apart from such information, the usual basic safety rules that apply to the repair of motorcycles must be observed.

Use the tools provided for in the "Motor" section.
The use of unsuitable tools may adversely affect engine operability.

Use only original MadAss spare parts.

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TECHNICAL DATA

Engine type	FY139FMB
Construction	One cylinder 4-stroke petrol engine
Valve steering	1 overhead cam with rocker arms
Valve	2 valve
Valve clearance, cold	intake + exhaust 0.05 mm - 0.08 mm
Pistion displacement	49,5 cm^3
Bore	ø 39 mm
Stroke	41,4 mm
Compression ratio	10:1
Lubrication system	forced oil lubrication
Cooling	air cooled
Maximum net power output	2,0 kW at 7.000 rpm
Maximum net torque	3,2 Nm at 4.300 rpm
Air-filter	paper air-filter
Type of starter	electric starter / kick starter
Ignition system	transistorized ignition system with electronic ignition control (CDI)
Ignition timing	15 ° before TDC at 2.000 rpm / 30 ° before TDC at 3.500 rpm
Pickup coil resistance	110-130 Ohm (bl/w-ground)
Ignition coils resistance	Primary 550-570 Ohm
Spark plug	NGK CR7 HSA electrode gap 0,6- 0,8 mm
Carburetor	Mikuni type VM 12 101 6
Main jet #	47,5
Idle jet	15
Jet needle setting groove	3 rd from top
Mixture regulation screw	Initial opening 2 turns out
Idle speed	1.800 +/- 200 rpm
Float level	13 mm - 1 mm
Throttle cable free play	1,0 - 2,0 mm
Power transmission	
Clutch	Wet multi-plate type
Gear box	4-seed constant mesh, foot operated
Gear ratios	1. gear = 36/11 (3,273)
	2. gear = 31/16 (1,938)
	3. gear = 27/20 (1,350)
	4. gear = 24/23 (1,044)
Primary transmission ratio	4,059
Chain pinion	11 teeth
Sprocket	53 teeth
Drive chain	420, 116 links

TECHNICAL DATA

Chassis	
Motorbike version:	Type 649
Frame:	Center-type frame made of tubular steel
Front suspension:	Telescopic fork ø 37 mm , hydraulic shock absorption, travel 100 mm
Rear suspension:	Mono shock absorber, travel 65 mm
Wheels:	Light metal (Alu) Front rim size: = 1,85 x 16" Rear rim size: = 2,50 x 16"
Tires:	Front = 90/90-16 48J Rear = 120/80-16 60J
Tire pressure solo driver Tire pressure with pillion driver	Front = 29 rear = 36 psi Front = 32 rear = 39 psi
Brakes, front Minumim lining thickness	Disc brake ø 260 mm, hydraulic two piston floating caliper 2,5 mm
Brakes, rear Minumim lining thickness	Disc brake ø 215 mm, mechanical two piston caliper 1,5 mm
Lubricants and operating fluids	
Fuel tank capacity	1,22 gal, including 0,09 gal reserve
Fuel	Unleaded fuel min. 91 octane
Telescopic-fork oil	Viscosity SAE 10 W
Filling quantity per fork tube	180 cm^3
Engine oil Filling quantity	SAE 15 W 40 mineral oil API (SG or higher) 0,8 litres
Brake fluid	DOT 4
Electrical Equipment	
Generator	12 V 120 W
Charging coil resistance	0,6-0,9 Ohm
Regulator voltage	13,0-14,0 V
Battery	12 V 6 Ah MF
Fuse:	15 A
Lights - Headlight - Position light - Instrument lights - Brake/rear light: - Turn signal light	 Low beam 2x 12V 55W 12 V 5W Direction-indicator 12V 3W Change over gear 12 V 3W Cockpit 12 V 3W 12 V 21/5W 12V 21W
Dimensions and weights	
Overall length:	1830 mm
Width across handlebars without rear view mirror	780 mm
Maximum height	1010 mm without rear view mirror
Wheel base	1235 mm
Seat height	865 mm
Weight empty	85 kg
Weight in running order	89,5 kg
Max. transport weight allowed	190,5 kg
Max. permitted total weight	280 kg

SERVICE DATA

Tightening torques for inspection plan	Nm
Engine	
Cylinder head nuts and bolts	10-12
Cam chain tension adjuster bolt	25–28
Crankcase cover bolts	10-12
Manifold bolts	10-12
Clutch lock nut	40-45
Generator rotor nut	40-45
Engine oil drain plug	22-25
Valve cover lock	10-12
Chassis	
Rear-wheel axle nut	50-60
Front-wheel axle nut	45-55
Swing axle nut	45-55
Disc brake screws	12-14
Front brake calliper bolts	60-65
Rear brake calliper bolts	30-35
Handle bar holder bolt upper	22-25
Rear shock mounting bolts	38-42
Exhaust pipe mounting nuts	10-12
Engine mounting bolt upper / below	33-35
Sprocket bolts	12-14
Headlight fastening	10-12

SERVICE DATA

Spare parts for inspection plan

part no	Description	Q'ty	1.000 km	4.000 km	8.000 km	12.000 km
43235-FYBQ-300	Brake pad (rear)	2		X	X	X
46630-FYBQ-000	Brake pad (front)	2		X	X	X
17220-FYBQ-000	Core cleaner	1		X	X	X
17223-FYBQ-000	Gasket air cleaner	1		X	X	X
90701-30003-002	O-gasket valve cover	2	X	X	X	X
90701-13002-000	O-gasket cover side hole upper	1	X	X	X	X
90701-27002-000	O-gasket cover side hole	1	X	X	X	X
30700-FYBF-000	Spark plug	1			X	
90301-12020-15AL0	Gasket drain plug	1	X	X	X	X
	Engine oil SAE 10W40	1	0,8 Liter	0,8 Liter	0,8 Liter	0,8 Liter
23682-FYBF-000	Sprocket 11 T	1	Replace if necessary			
GB894.1-86-17001	Spline gear driven	1	Replace if necessary			
41201-FYBQ-000	Sprocket 420/53 gear driven	1	Replace if necessary			
GB1243.1-83-06B112	Chain 420-112B	1	Replace if necessary			
42711-FYBQ-000	Tire 120/80-16 (rear)	1	Replace if necessary			
44711-FYBQ-000	Tire 90/90-16 (front)	1	Replace if necessary			
42712-FYBQ-000	Tube (rear)	1	Replace if necessary			
44712-FYBQ-000	Tube (front)	1	Replace if necessary			

SERVICE DATA

Inspection plan						
I = Inspection, retighten, adjust, replace if necessary, or grease **W = Change** **R = Clean** **S = Grease**						
	Maintenance Kilometers	**Delivery**	**1.000**	**4.000**	**8.000**	**12.000**
	Months	**NEW**	**1**	**4**	**8**	**12**
Component Assembly	**Servicing Tasks**					
Valves	Check and adjust valves if necessary	**I**	**I**	**I**	**I**	**I**
Spark plug	Check condition and accordingly clean or replace	**I**	**I**	**I**	**W**	**I**
Air filter	Clean filter and housing		**R**	**R**	**R**	**R**
	Replace paper filter		**I**	**W**	**W**	**W**
Carburetor	Check and adjust idle and cold start	**I**	**I**	**I**	**I**	**I**
	Throttle cable	**I**	**I**	**I**	**I**	**I**
Fuel filter	Clean (petcock)		**R**	**R**	**R**	**R**
Fuel hoses	change at least every 4 years		**I**	**I**	**I**	**I**
Engine oil	Change (operating temperature)	**I**	**W**	**W**	**W**	**W**
Exhaust system	Check for leads and repair if necessary	**I**	**I**	**I**	**I**	**I**
Brakes	Check brake function and brake fluid	**I**	**I**	**I**	**I**	**I**
	Check and replace brake pads	**I**	**I**	**W**	**W**	**W**
	Adjust rear brake	**I**	**I**	**I**	**I**	**I**
Brake fluid	Change	**change every 2 years**				
Brake hoses	Check and renew min. every 4 years	**I**	**I**	**I**	**I**	**I**
Clutch	Check and adjust	**I**	**I**	**I**	**I**	**I**
Rear suspension	Check, retighten, replace if necessary	**I**	**I**	**I**	**I**	**I**
Tires	Check general condition and profile depth and replace as necessary	**I**	**I**	**I**	**I**	**I**
	Check air pressure	**I**	**I**	**I**	**I**	**I**
Wheels	Check for damage, balance	**I**	**I**	**I**	**I**	**I**
Stearing and bearings	Check and adjust free play	**I**	**I**	**I**	**I**	**I**
Front forks	Check general condition as well as for leaks and repair if necessary	**I**	**I**	**I**	**I**	**I**
Chain	Check adjustment and condition and grease, adjust and renew if necessary	**I/S**	**I/S**	**I/S**	**I/S**	**I/S**
Side stand	Check, grease, repair if necessary	**I/S**	**I/S**	**I/S**	**I/S**	**I/S**
Nut and bolt tightness	Check tightened to the correct torque settings	**I**	**I**	**I**	**I**	**I**
Cables	Check for damage and smooth operation, if necessary replace	**I**	**I**	**I**	**I**	**I**
Headlight	Check and adjust	**I**	**I**	**I**	**I**	**I**
Battery	Check, recharge if necessary	**I**	**I**	**I**	**I**	**I**

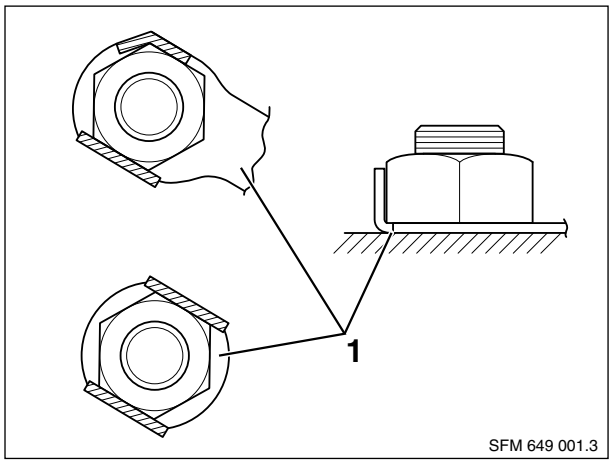
GENERAL NOTES

Gaskets, seal rings and O-rings

- Gaskets, seal rings and O-rings must generally be replaced when overhauling the engine. The sealing faces must be thoroughly cleaned.

Lock washers and split pins

- After removal replace all lock washers (1) and split pins. After tightening the nut, lock washer (1) must be bent up against the side of the nut.

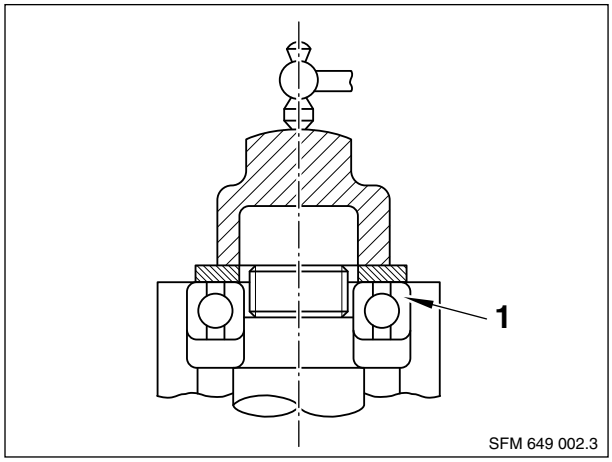


SFM 649 001.3

Bearings and radial seals

- When assembling bearings (1) make sure that manufacturer name or number point to the outside. Lubricate the bearings with oil.

ATTENTION
Do not use compressed air to dry the bearings since this could damage the surface of the bearings.

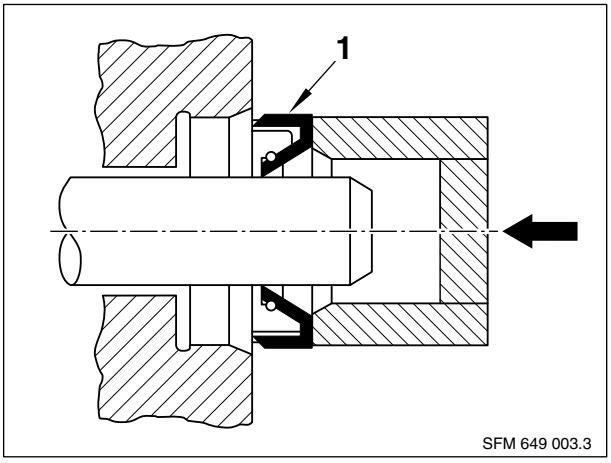


SFM 649 002.3

- When assembling radial seals (1) make sure that manufacturer name or number point to the outside. Apply a thin coat of light viscosity engine oil to the seal lips.

Circlips

- Circlips must be thoroughly inspected before installation.
- Piston pin circlips must not be assembled again.
- Warped circlips must be renewed.
- When assembling a circlip (1) make sure that the sharp edged side (2) is positioned opposite the side subjected to the force (3) applied to the circlip. See cross-sectional drawing (4 = shaft).



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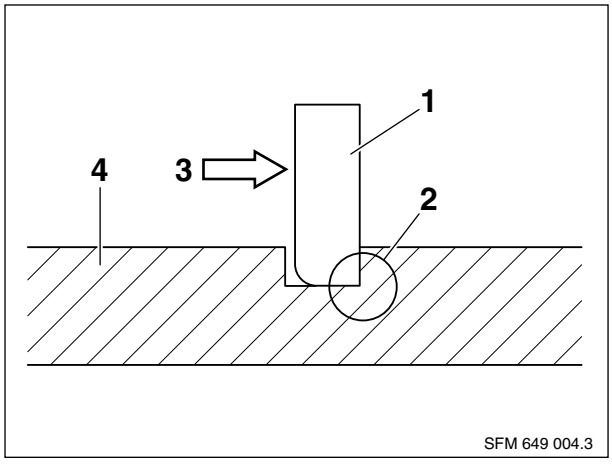

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TORQUE VALUES

TORQUE VALUES ENGINE			
Item	**Q'ty**	**Thread Dia mm**	**Nm**
Clutch lock nut	1	14	40-45
Flywheel nut	1	10	42
Cam sprocket bolt	3	5	9
Valve adjuster lock nut	2	5	9
Cylinder head nut	4	6	10-12
Cylinder head bolt	2	6	10-12
Cam chain guide roller pin bolt	1	6	10
Intake manifold bolt	2	6	10-12
Exhaust pipe joint nut	2	6	12
Shift drum stopper arm bolt	1	6	10
Shift drum stopper plate bolt	1	6	17
Shift spring pin bolt	1	8	30
Oil drain bolt	1	12	22-25
Cam chain tensioner sealing bolt	1	14	25-28
Cam chain tensioner pivot bolt	1	8	16
Shift drum bolt	1	6	12
Crankcase cover bolt	11	6	10-12
Drive sprocket bolt	2	6	12-14

TORQUE VALUES FRAME	
Connection	**Nm**
Handle bar holder	22-25
Fastening screws for upper fork bridge	25-28
Fastening screws for lower fork bridge	38-42
Screw plug for fork pipe	40
Closing nut of control-head bearing	40
Brake shoe, front	60-65
Brake shoe, rear	30-35
Brake disk on wheel hub, front	12-14
Brake disk on wheel hub, rear	12-14
Brake pipe connection	20-25
Ventilating valve on calliper	10-12
Screws for brake lining, rear	22-25
Footbrake lever on frame	25-28
Gear pedal	25-28
Footrest support, front	25
Footrest support, rear	25
Chain wheel to hub	10-12
Engine fastening	33-35
Exhaust pipe nuts	10-12
Front-wheel axle	45-55
Rear-wheel axle	50-60
Swing axle	45-55
Telescopic leg	38-42
Side standard	40

TORQUE VALUES

TOURQE VALUES FOR ENGINE/CLUTCH/GEARBOX/FRAME	
Tightening torques, gerneral	**Nm**
Srew connection M5	5-6
Srew connection M6	8-10
Srew connection M8	22-25
Srew connection M10	38-42
Tightening torques for plastic connections	Nm
Srew connection M5	3-5
Srew connection M6	5-7
Srew connection M8	13-15

MAINTENANCE

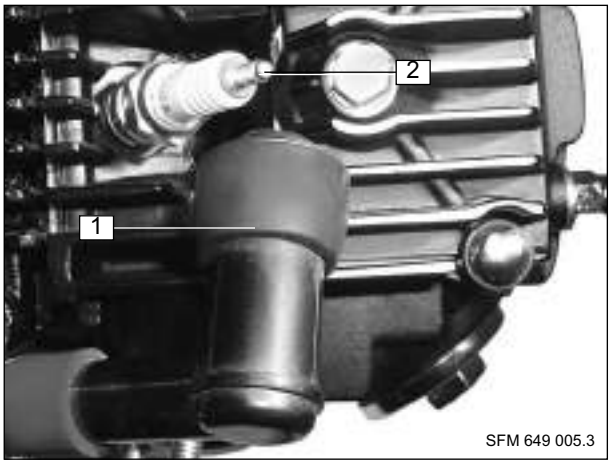
Spark plug

Recommended spark plug: NGK CR7 HSA

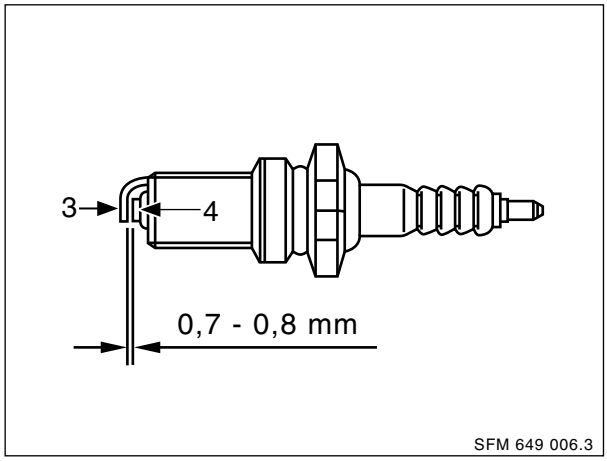
CAUTION
Check or change the spark plug only when the engine is cold.

Pull the spark plug connector (1).

Unscrew the spark plug (2).



Clean any dirt from around the spark plug base.
Visually inspect the spark plug electrodes for wear.
The center electrode (4) should have square edges and the side electrode (3) should have a constant thickness.
Discard the spark plug if there is apparent wear or if insulator is cracked or chipped.
Measure the spark plug gap using a wire-type feeler gauge.



Check the electrode gap (0,7-0,8 mm), replace the plug if it is severely burnt away.

Adjust the gap by bending the side electrode carefully. With the plug washer attached, thread the spark plug in by hand to prevent cross threading. Tighten the spark plug with a spark plug wrench to compress the plug washer.

Torque 20 Nm.

Plug in the connector (1).

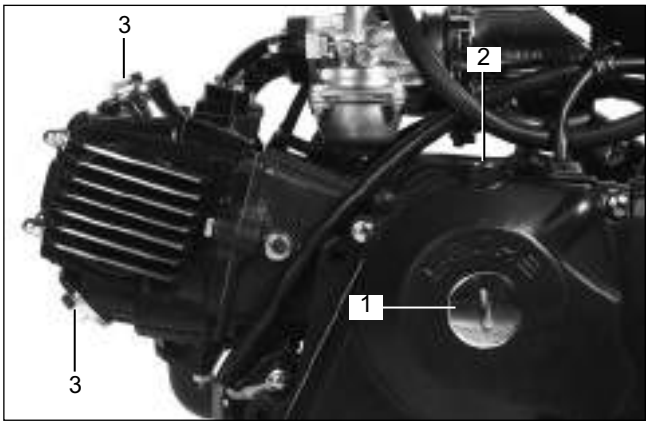
MAINTENANCE

VALVE CLEARANCE

NOTE
Adjust the valve clearance while the engine is cold (below 35°C)

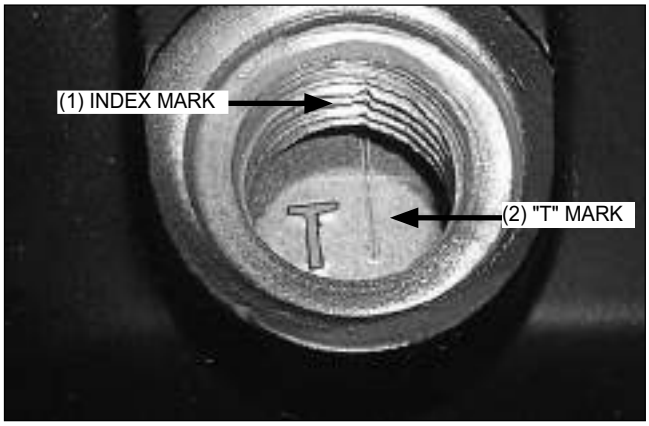
Remove inspection plugs (1 and 2) of the left side engine cover.

Remove the valve adjuster covers (3).



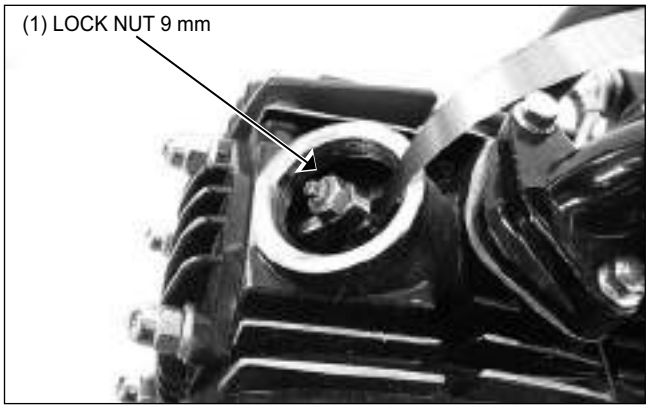
Rotate the crankshaft counterclockwise and align the "T" mark with index mark on the left crankcase.

Make sure the piston is at TDC on compression stroke.



Check the valve clearance by inserting a feeler gauge between the adjusting screw and valve stem.

VALVE CLEARANCES (Cold):
IN and EX: 0.05 ± 0.02 mm - 0.08 ± 0.02 mm

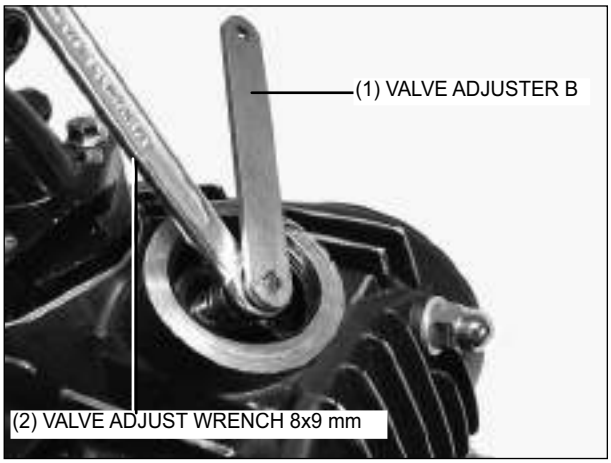


MAINTENANCE

Adjust by loosening the lock nut and turning the adjusting screw until there is slight drag on the feeler gauge. Hold the adjusting screw and tighten the lock nut. Recheck the valve clearances.

TOOLS:
Valve adjust wrench, 9 mm
Valve adjuster B

Install the valve adjuster covers and the inspection plugs.



CARBURETOR IDLE SPEED

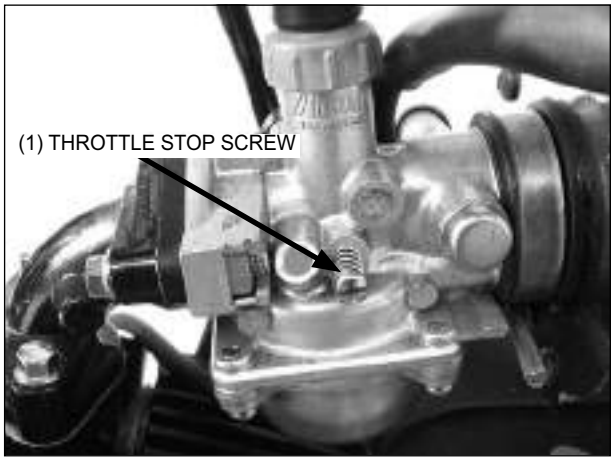
NOTE
Inspect and adjust the idle speed after all other engine maintenance items have been performed and are within specifications.
The engine must be warm for accurate idle speed inspection and adjustment.

Shift the transmission into neutral and place the motorcycle on its center stand on level ground.
Warm up the engine for about ten minutes and connect a tachometer.

WARNING
If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

Turn the throttle stop screw as required to obtain the specified idle speed.

IDLE SPEED: 1.800 +/- 200 rpm

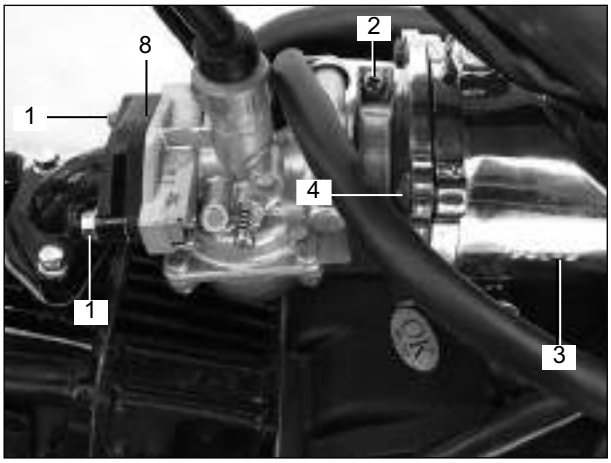


MAINTENANCE

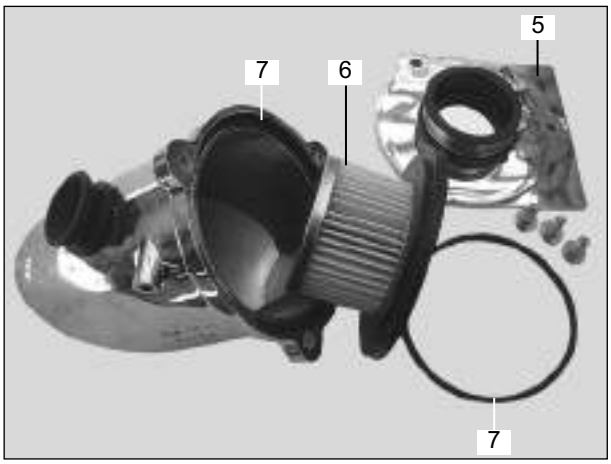
AIR CLEANER

Clean initally at	**1.000 km**
Replace every	**4.000 km**

Remove the air cleaner
- Unscrew the screws (1) of the manifold and take off the carburetor with the air cleaner.
- Unscrew the clamp (2) and remove the air cleaner (3) from the carburetor.



Opening the air filter
- Remove the three screws (4).
- Take off the cover (5).
- Clean the filter case and filter element (6) or replace if necessary.



NOTE
Before installation, check the O-rings (7) for damage and correct position.

Assembly of the cleaned or new filter element takes place in reverse order of removal.

Tightening torque
screw (1) 10-12 Nm
screw (4) 6 Nm

MAINTENANCE

Adjusting the clutch lever play

CAUTION
If you drive with no clutch lever play, the clutch will be damaged.

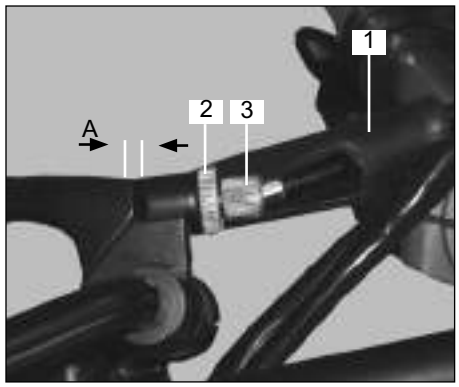
Check:
- Pull the lever until there is discernable resistance.
- Measure the play. Required value:
  Standard: A = min. 3-4 mm

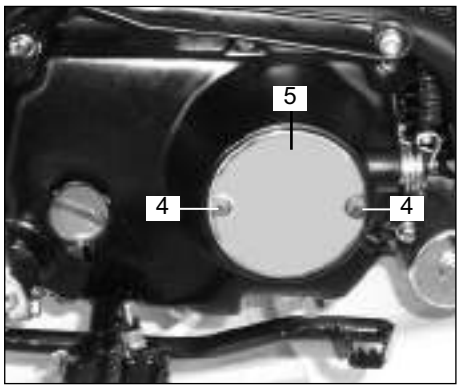
Adjustment:
- Push back protective cap (1).
- Release the lock nut (2).
- Turn setting screw (3) as required.
- Tighten the lock nut (2).
- Check the play.

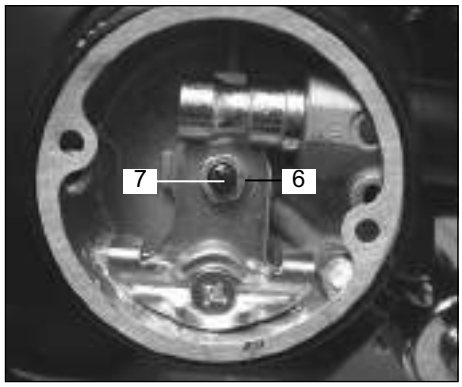
NOTE
If the clutch play cannot be corrected with this adjustment, the following adjustment must be made.

- Release the lock nut (2).
- Tighten setting screw (3) all the way, so that the clutch cable can be made as slack as possible.
- Tighten up the lock nut (2).

- Remove screws (4) and take off the clutch cover (5).
- Release the lock nut (6).
- Adjust the setting screw (7) until the desired clutch lever play (A = 3-4 mm) is reached.
- Tighten the lock nut (6).
- Reassemble the clutch cover (5) with gasket.

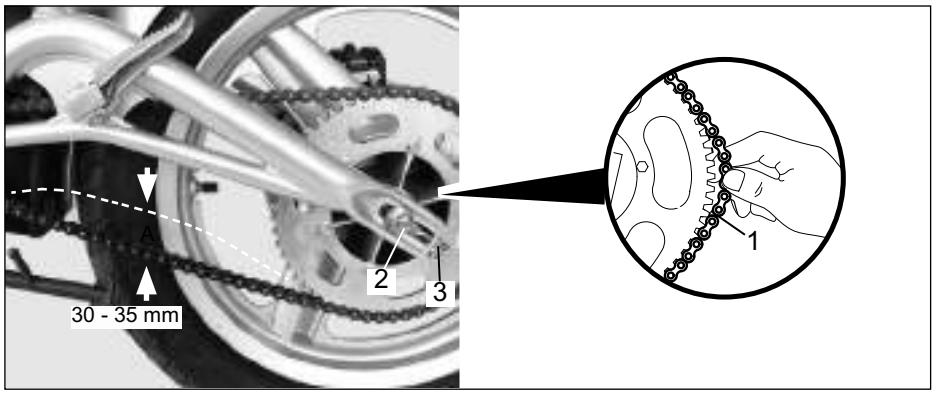






MAINTENANCE

Checking, adjusting the drive chain



Checking the chain for wear

CAUTION
The chain, sprocket and pinion must be changed as a single unit.

- Prop the motorbike up on the side stand.
- Hold the chain (1) at the furthest rear point of the sprocket and pull it
- With correct chain tension, it should not be possible to lift the chain higher than the teeth of the sprocket.
- If the chain can be pulled higher, chain, sprocket and pinion have to be replaced.

Adjusting the chain

CAUTION
The adjustment of the chain influences the wear of chain and sprocket.
Too tight off an adjustment of the chain will cause bearing damages on engine and rear wheel and result in excessive wear of the chain.

- Unscrew the axle (2).
- Adjust the setting nuts (3) evenly on both sides of the chain tensioner (rear wheel must be in line with the front wheel).
- Let rear end of the motorbike drop to the suspension limit.
- Push in the drive chain half way between sprocket and pinion. Measure the travel.

30

Required value: A =30-35 mm

- Tighten axle (2).
- Tighten lock nuts (3).

Torque
Axle nut: 50-60 Nm

MAINTENANCE

Brake system

Checking the brake system for leaks
- Check the brake lines for damage and correct position.
- Wipe off all screw connections of the brake lines.
- Firmly operate the front and rear brakes and shortly keep them operated.
- Check the brake lines for any leaks.
- Replace any faulty brake lines and seals/washers.

Checking/adjusting the front and rear brake-fluid level

CAUTION
Brake fluid damages paint and plastic parts! Before filling the tank with brake fluid, check the brake lining for wear and the brake system for leaks. Only use new brake fluid of specification DOT 4. Brake fluid is exposed to high temperatures and absorbs moisture from the ambient air.

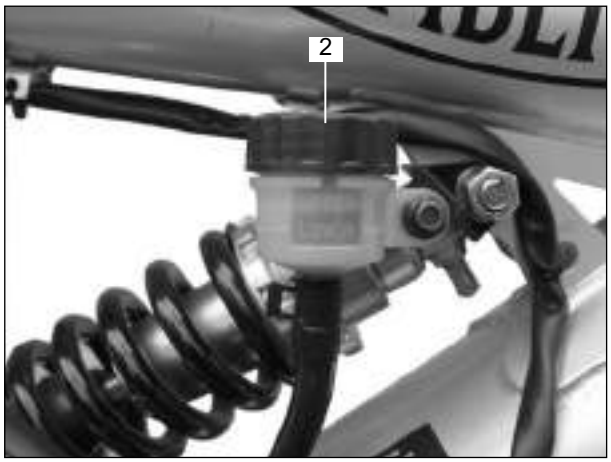
NOTE
Cover the painted parts to avoid damage.

Checking the front brake-fluid level:
- Turn the handlebar until the line near the "LOWER" mark on the brake-fluid tank is horizontal.
- The brake-fluid level must be between the "LOWER" and "UPPER" marks.
- If air bubbles are visible: check the brake lining for wear, if neseccary replenish the brake fluid.

Replenishing the brake fluid:
- Remove the cover (1) and the rubber gasket.
- Replenish the brake fluid up to the "UPPER" mark and reinsert the rubber gasket.
- Reinstall on the cover.

Checking the rear brake-fluid level:
- Park the motorbike on a flat surface.
- The brake-fluid level must be between the "LOWER" and "UPPER" marks.
- If air bubbles are visible: check the brake lining for wear, if neseccary replenish the brake fluid.

Replenishing the brake fluid:
- Remove the cover (2) and the rubber gasket.
- Replenish the brake fluid to the "UPPER" mark and reinsert the rubber gasket.
- Reinstall on the cover.



MAINTENANCE

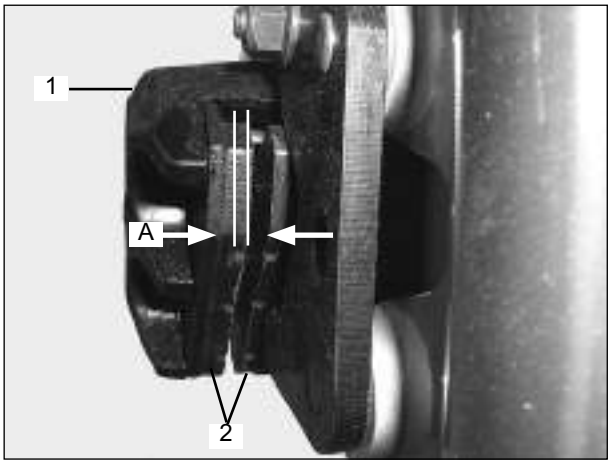
Checking/replacing the lining of the front brakeshoes

Checking the lining thickness

CAUTION
Make sure the minimum lining thickness is observed.
- Visually inspect the calliper (1).
- Check the minimum lining thickness.

  Minimum lining thickness (A): 2.5 mm

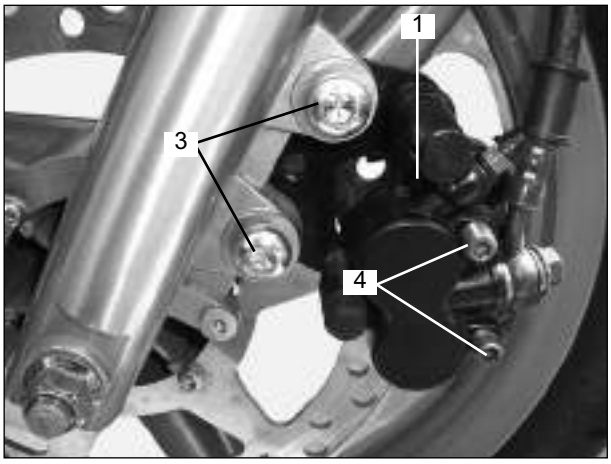
If the thickness is less than the minimum:
replace the brake lining (2).
- Check the brake disk for wear and wobble.



Replacing the brake linings:

NOTE
Brake linings may only be replaced in pairs.

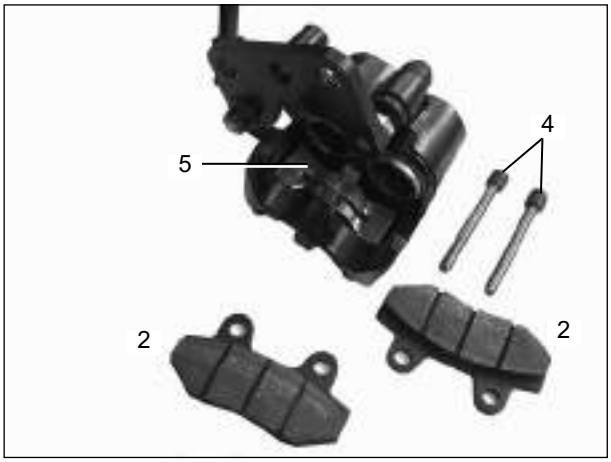
- Remove the screws (3).
- Remove the caliper.
- Remove the holder bolts (4) from the caliper (1).
- Remove the brake linings (2).
- Check the lock plate (5) for damage.
- Insert the new brake linings and fasten them with the holder bolts.
- Reassemble in reverse order.



Tightening torques
calliper screws (3): 35-38 Nm
Holder bolts (4): 25-28 Nm

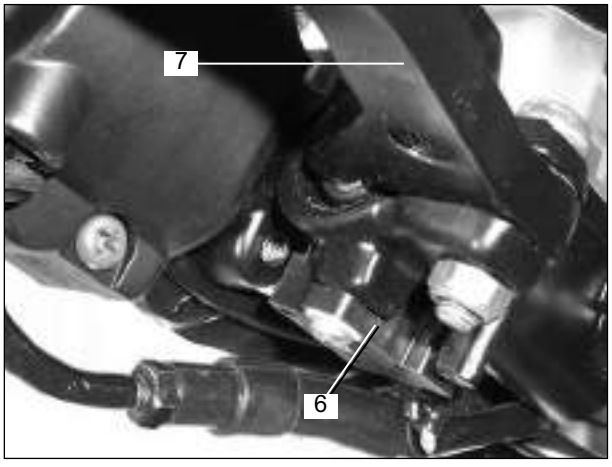
WARNING - RISK OF ON-ROAD ACCIDENT
Operate the brakes several times, until the brake linings make contact.

- Check the brake - fluid level and the handbrake play.
- Check the operation.



Brake light switch

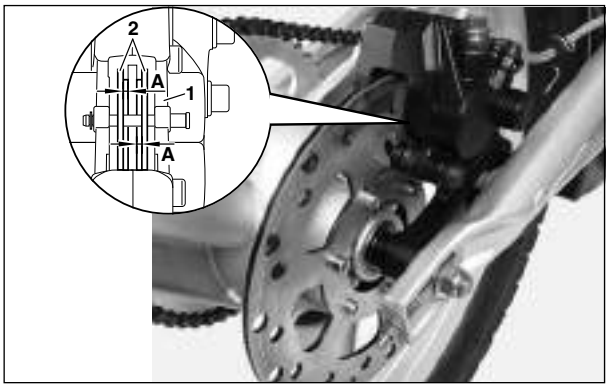
NOTE
The brake light switch (6) is placed in the hand brake lever.
By operating the front brake lever (7) the brake light must flash immediately.
An adjustment is not required.



MAINTENANCE

Checking/replacing the lining of the rear brake-shoes

Checking the lining thickness:

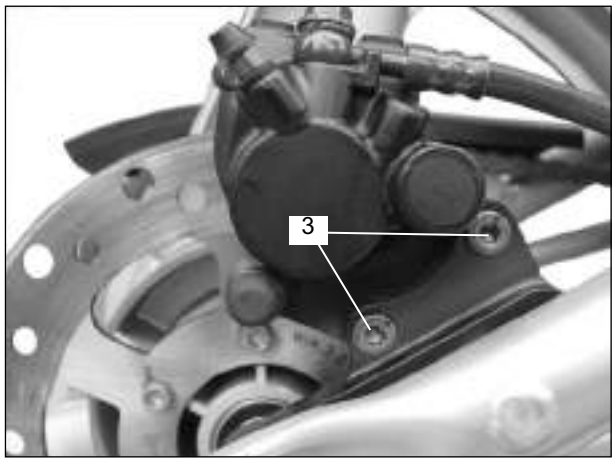


CAUTION

The minimum lining thickness must not be fallen short of.

- Visually inspect the brake calliper (1).
- Check the minimum lining thickness.
  Minimum lining thickness (A): 1.5 mm

  If the lining thickness is less than the minimum: replace the brake lining.
- Check the brake disk for wear and wobble.



Replacing the brake lining:

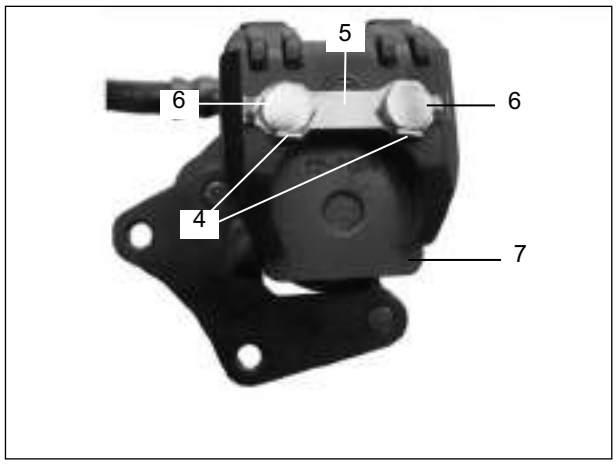
NOTE

The brake linings may only be replaced in pairs.

Use heatproof lubricant e.g. copper paste for mechanical movable parts.

Use screw-lock e.g. Loctite 242 for brake screws.

- Unscrew the bolts (3)and remove the brake calliper (1).
- Bend back the lugs (4) of the locking plate (5).
- Unscrew the bolts (6).
- Remove the brake linings (7).
- Insert the new brake linings (7) and screw the fixation bolts (6) in the brake capiller by using a new locking plate (5).
- Lock the bolts (6) by bending the lugs (4).



WARNING - RISK OF ON-ROAD ACCIDENT

Allways use a new locking plate (5). Make sure that the bolts (6) are locked fail-safe.

Tightening torques

Bolts (6): 25-28 Nm

- Reassemble in reverse order.

Tightening torques

Bolts (3): 30-35 Nm

WARNING - RISK OF ON-ROAD ACCIDENT

Operate the brakes several times, until the brake linings make contact.

- Check the operation.

MAINTENANCE

Setting the footbrake pedal position

NOTE
The footbrake pedal position can be adjusted with the setscrew (1).

WARNING
The adjustment measuremet A must not exceed 14 mm!

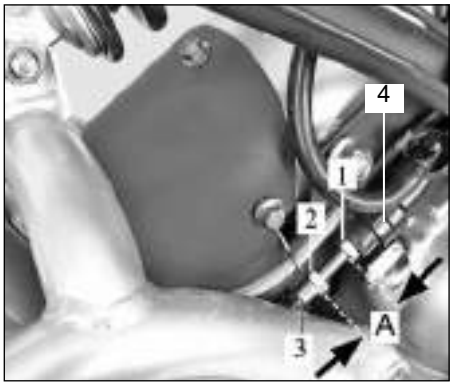
- Loosen lock nut (2) and adjust the foot brake pedal position (3) with the setscrew (1).

- Tighten lock nut (2).

CAUTION
A footbrake lever play that is too small will lock the rear wheel.

Brake light switch

NOTE
The brake light switch is placed in the rear brake pump (4).
By operating the rear brake lever the brake light must flash immediately.
An adjustment is not required.

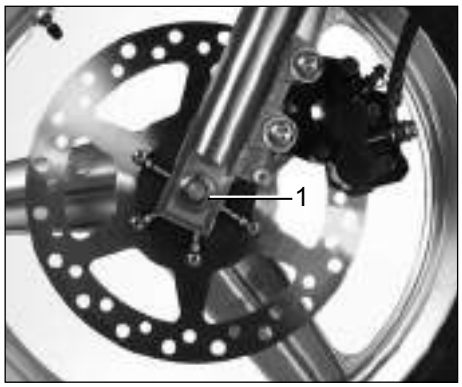


MAINTENANCE

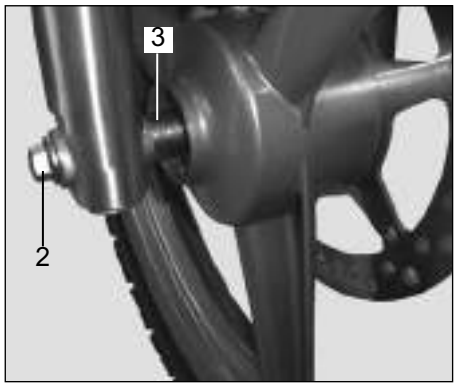
FRONT WHEEL

Removing the front wheel

CAUTION
Take care not to damage the brake discs and linings while removing them.
Do not operate the handbrake lever after the wheel has been removed.
Protect the wheel bearings from dirt and moisture.



- Support the motorcycle so that the front wheel can move freely and the motorcycle is standing securely.
- Loosen the axle nut (1).
- Lift the front wheel and pull out the full-floating axle (2) and remove the spacer bushing (3).
- Remove the front wheel by pulling it down.



Installing the front wheel

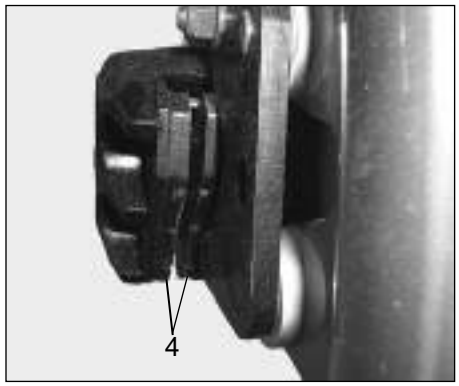
CAUTION
Take care not to damage the brake discs and linings (4) while installing them.

- Roll the front wheel in between the fork tubes and insert the spacer bushing (3) (on the right as seen from the riding direction).

- Grease the full floating axle (2) and push it in from the right as far as it will go.

- Attach the axle nut (1) and tighten.

- Before tightening the screws, stand the motorbike on its wheels and push the telescopic forks several times to prevent twisting of the fork struts.



Torque
Axle nut (1): 45-55 Nm

MAINTENANCE

REAR WHEEL

Removing the rear wheel

CAUTION
Do not damage brake disc and linings during disassembly!
Protect the wheel bearings from dirt and moisture!

- Support the motorbike so that the rear wheel can move freely.
- Counter the axle (4) and loosen the axle nut (1).
- Back the lock nuts on left and right-hand sides of the chain tensioner (2) completely off.
- Take off the drive chain (5).

NOTE
When taking off the rear wheel, make sure that the bush (3) to the left of the wheel hub is not lost.

- Lift up the rear wheel, remove axle (4) and brake counter bracket (6) with brake caliper and pull the rear wheel out towards the back.

Installing the rear wheel

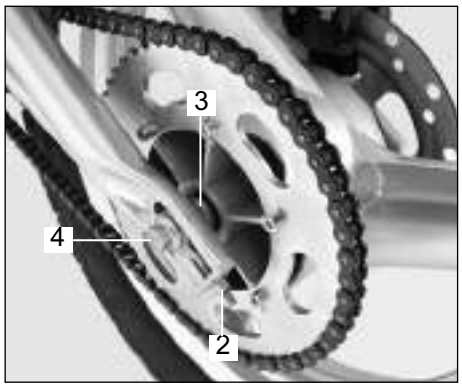
CAUTION
Do not damage brake disc and linings during installation!

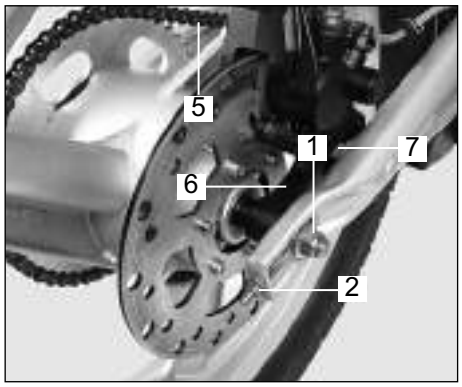
- Clean and grease the axle (4).
- Assemble axle (4), chain tensioner (2), brake caliper (6) into the swing arm.

NOTE
Insert the brake counter bracket into the receptacle (7) of the rear suspension.

- Assemble the drive chain (5).
- Assemble the rear wheel with spacer sleeve (3) and axle (4).
- Attach the right hand chain tensioner (2) and preassemble with axle nut (1).
- Tension the drive chain.
- Tighten axle nut (1).

Torque
Axle nut (1): 50-60 Nm





MAINTENANCE

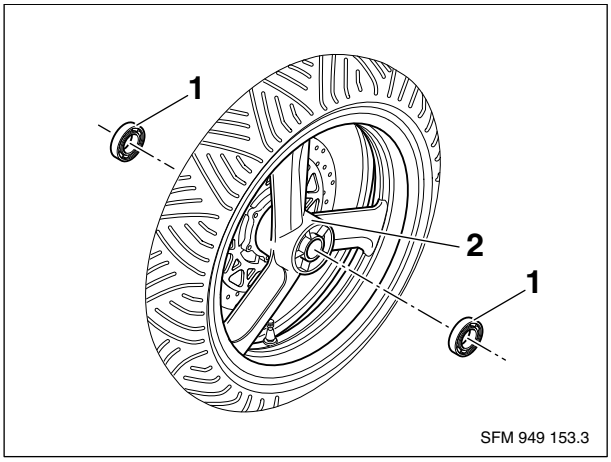
FRONT WHEEL / REAR WHEEL BEARINGS

Removing/installing the front-wheel bearing

NOTE
Heat the bearing seat to approx. 100 °C in order to facilitate removal/installation.

Removing the wheel bearing:
- Remove the front wheel.
- Use an internal extractor to pull the wheel bearing (1) out of the bearing seat of the wheel hub (2).

Installing the wheel bearing:
- Press the wheel bearing (1) into the bearing seat of the wheel hub (2).
- Install the front wheel.



SFM 949 153.3

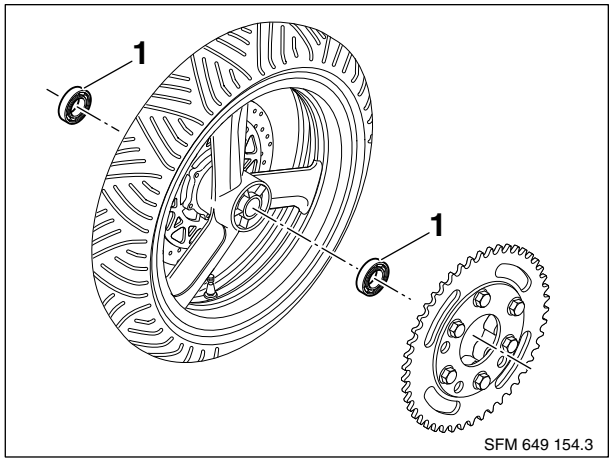
Removing/installing the rear-wheel bearing

NOTE

Heat the bearing seat to approx. 100 °C in order to facilitate its removal and installation.

Removing the wheel bearing:
- Remove the rear wheel.
- Remove the brake shoe support.
- Use an internal extractor to pull the wheel bearing (1) out of the bearing seat of the wheel hub (2).

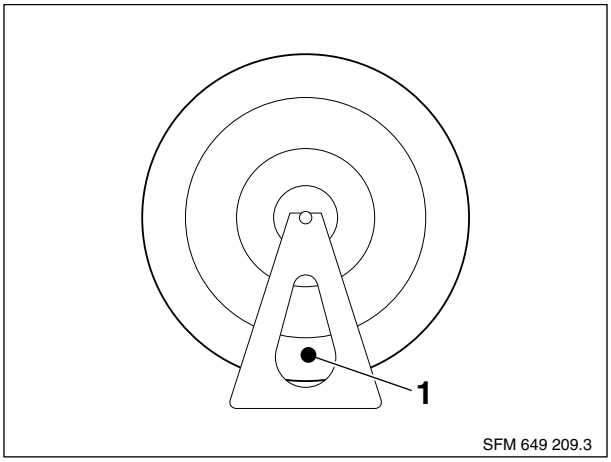
Installing the wheel bearing:
- Press the wheel bearing (1) into the bearing seat of the wheel hub (2).
- Install the front wheel.



SFM 649 154.3

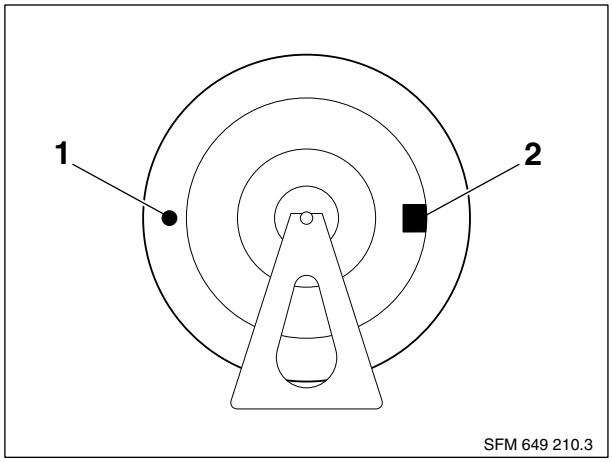
Statically aligning the wheels
- Clamp the relevant wheel in the aligning device.
- Rotate the wheel gently and wait until it comes to a standstill. Make a mark (1) at the low point of the tire.

NOTE
Always start with the smallest alignment weight.



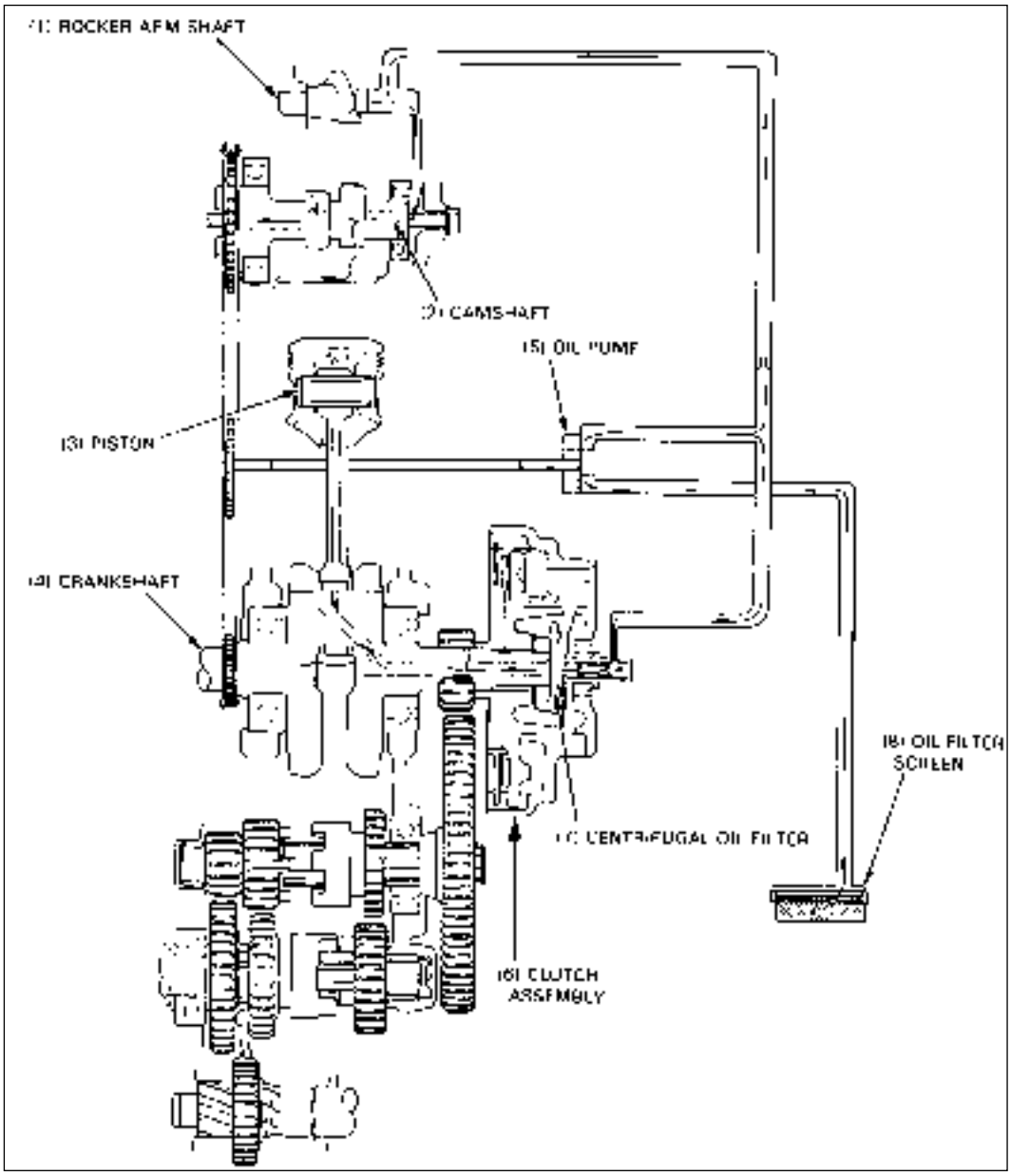
SFM 649 209.3

- Turn the wheel through 90°, stop it and let it find its own position. If the mark (1) again stops at the low point of the tire, this is the heavy point and an alignment weight (2) must be installed opposite it.
- Each time turn the wheel through 90° and stop it; the wheel must remain in position, otherwise repeat the alignment procedure.



SFM 649 210.3

LUBRICATION SYSTEM



LUBRICATION SYSTEM

SERVICE INFORMATION

GENERAL

WARNING

If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

CAUTION

Used motor oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

- The oil filter screen and oil filter rotor cleaning and oil pump servicing can be done with the engine in the frame.
- Perform these maintenance procedures with the engine oil drained after removing the right crankcase cover.
- When cleaning the oil filter rotor, do not use compressed air.

SPECIFICATION

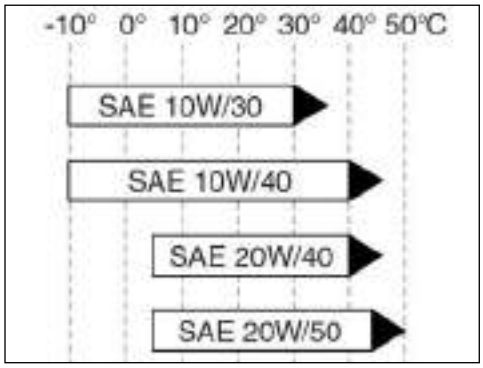
Engine oil capacity 1.0 litres at disassembly
0.8 litres at oil change

Engine oil:

Recommended grade:
Per API: SG or higher or also with additional release status: ACEA A3/96 (CCMC G5).

Recommended viscosity:
Viscosity depends on the outside temperature. For short while, the temperature may exceed or fall short of the limits of the SAE grades.

The recommended viscosity grade SAE 10W/40 covers the ambient temperature range –10 °C to +40 °C and therefore represents the optimum for our latitudes.



SERVICE DATA Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Oil pump	Rotor tip clearance	0.15 (0.006)	0.20 (0.008)
	Rotor-to-body clearance	0.03-0.08 (0.001-0.003)	0.12 (0.005)
	Pump end clearance	0.10-0.21 (0.004-0.008)	0.27 (0.011)

TORQUE VALUES

Oil drain bolt 25 Nm

TROUBLESHOOTING

Oil level too low

- External oil leak
- Worn valve guide or oil seal
- Worn piston ring
- High oil consumption

Oil contamination

- Oil not changed often
- Blown cylinder head gasket

Low oil pressure

- Oil level too low
- Plugged oil filter, screen, oil passage or orifice
- Faulty oil pump
- Incorrect oil used
- Damaged oil pump drive sprocket (cam chain guide sprocket)
- Misaligned oil pump/cam chain guide sprocket

LUBRICATION SYSTEM

ENGINE OIL

OIL LEVEL CHECK
Support the motorcycle upright on level ground.
Check the oil level with the filler cap/ dipstick (1).

CAUTION
For checking the oil level only insert the oil filler cap and don't screw in!
Otherwise there will be a wrong measurement.

If the level is below the lower level mark (4) on the dipstick, add the recommended oil to the upper level mark (3).

OIL CHANGE

NOTE
Change the engine oil with the engine warm to ensure complete and rapid draining.
Remove the oil filler cap/ dipstick.
Place an oil drain pan under the engine, and remove the drain bolt (2) and drain the engine oil.
Make sure that the sealing washer is in good condition and install the drain bolt.

TORQUE: 25 Nm

Fill the crankcase with the recommended oil.

CAPACITY: 0.8 litres at oil change

Install the oil filler cap/ dipstick. Start the engine and let it idle for 2-3 minutes.

WARNING
If the engine must be running to do some work, make sure the area is well-ventilated. Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

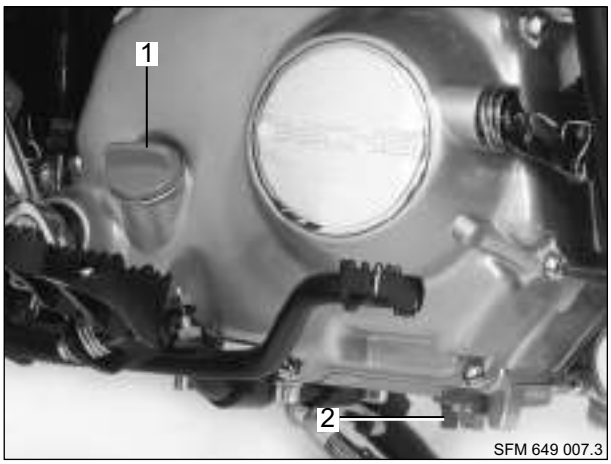
Stop the engine and check that the oil level is at the upper level mark on the dipstick with the motorcycle upright. Make sure there are no oil leaks.

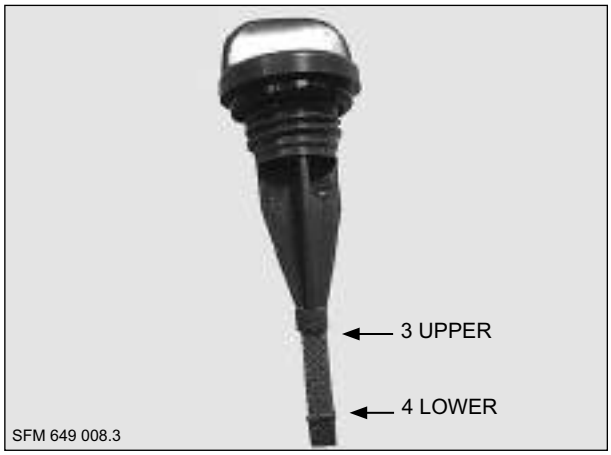
ENGINE OIL FILTER CLEANING

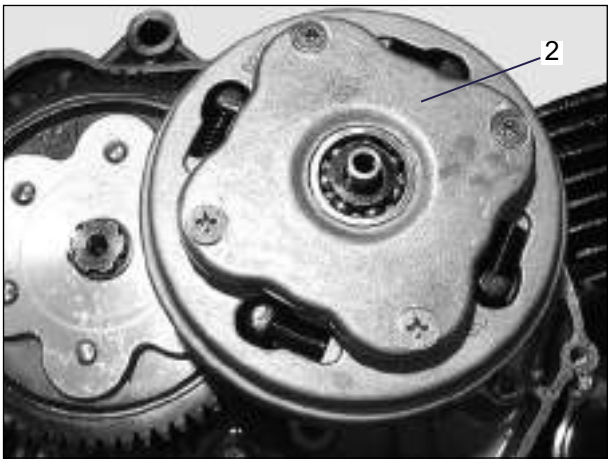
NOTE
Drain the engine oil before cleaning the filter.

Remove the right crankcase cover (1).
Remove the clutch outer cover (2).
Clean the clutch outer cover and inside of the clutch outer using a clean lint-free cloth.

NOTE
Do not allow dust and or dirt to enter the crankshaft oil passage.
Do not use compressed air.







LUBRICATION SYSTEM

Install a new gasket and the clutch outer cover.

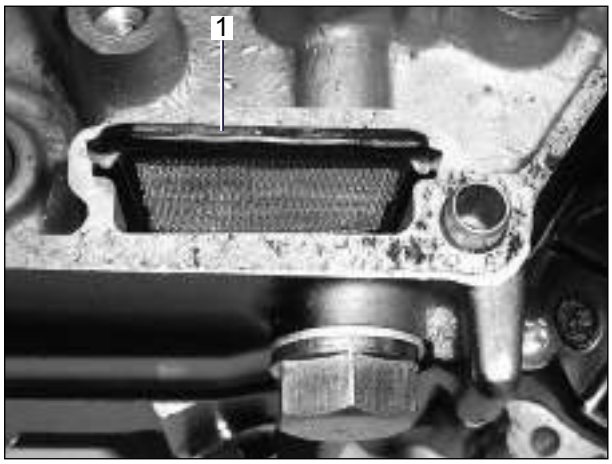
Remove the oil filter screen (1).

Clean the oil filter screen with solvent and blow it dry with compressed air.

Reinstall the oil filter screen into the right crankcase.

Install the removed parts in the reverse order of removal.

Fill the engine with recommended oil.

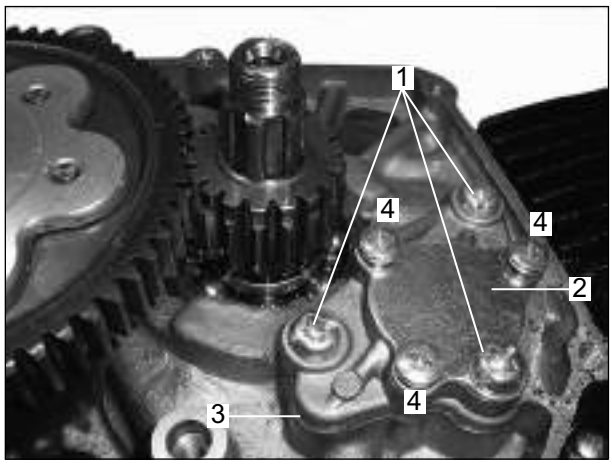


OIL PUMP REMOVAL

NOTE
The oil pump can be removed with the engine in the frame.

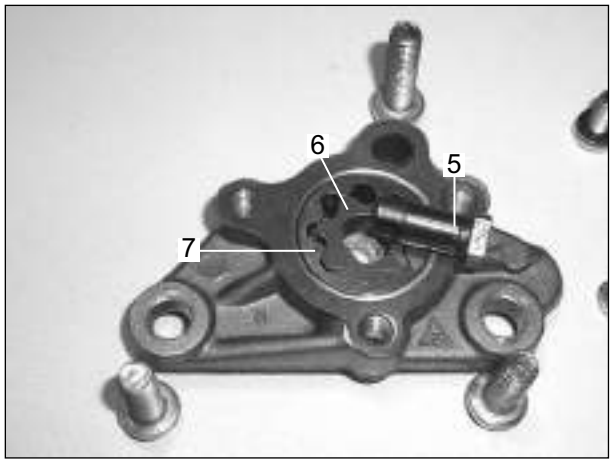
Drain the engine oil and remove the right crankcase cover.

Remove the clutch assembly.
Remove the three mounting screws (1), the oil pump (2), and the pump gasket (3).



DISASSEMBLY

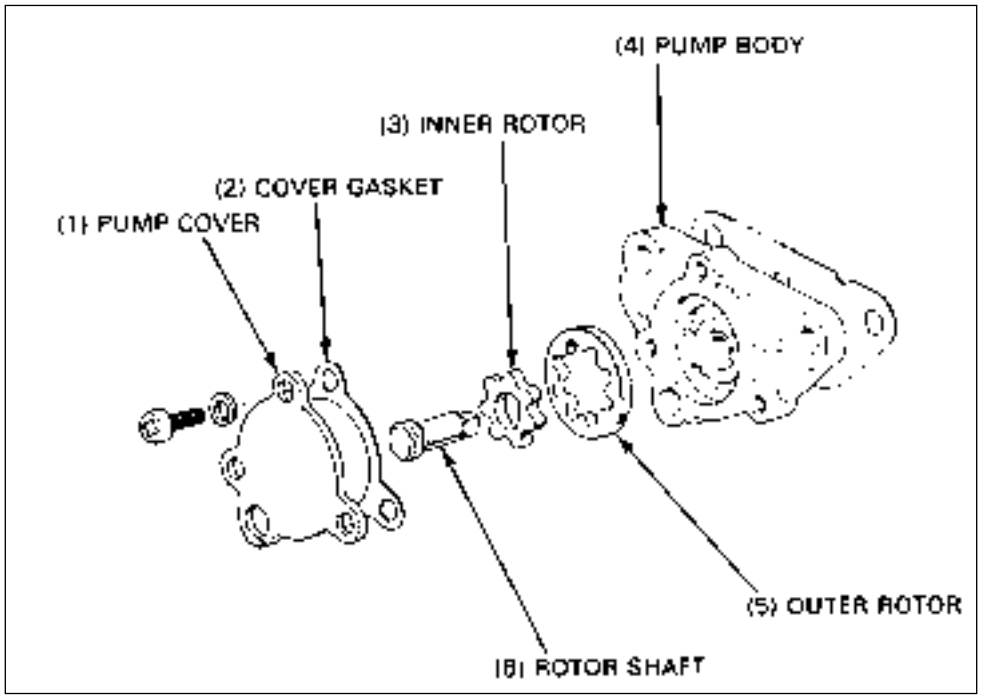
Remove the three cover screws (4), cover and gasket.



Remove the rotor shaft (5), inner rotor (6) and outer rotor (7).

LUBRICATION SYSTEM

Clean all disassembled parts in solvent and check for damage or abnormal wear.



INSPECTION
Install the rotor shaft and inner and outer rotors into the pump body.

Measure the rotor tip clearance.

SERVICE LIMIT: 0.20 mm (0.008 in)

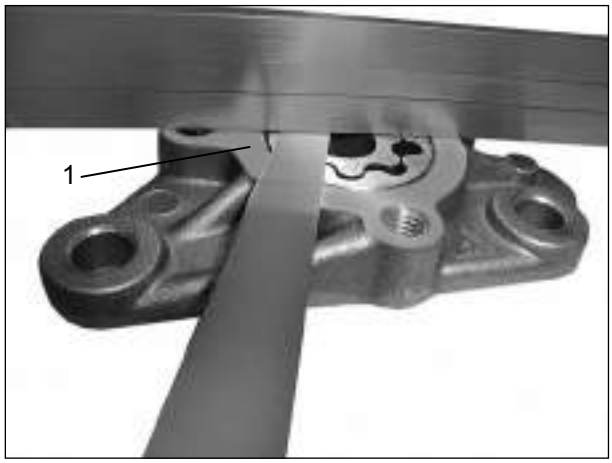
Measure the pump body clearance.

SERVICE LIMIT: 0.12 mm (0.005 in)

LUBRICATION SYSTEM

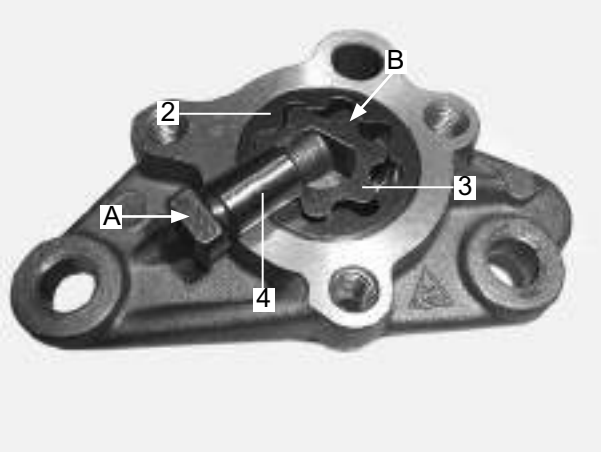
Install the pump cover gasket (1) and measure the pump end clearance.

SERVICE LIMIT: 0.27 mm (0.011 in)



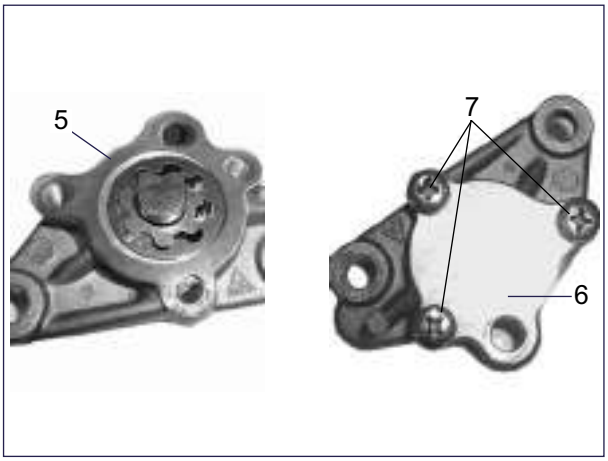
ASSEMBLY
Install the outer rotor (2) and inner rotor (3).

Install the pump shaft (4) by aligning the flat (A) on the shaft with the flat (B) on the inner rotor.



Install a new cover gasket (5) and the pump cover (6).

Secure the cover with the three screws (7) and make sure that the oil pump turns freely without binding.

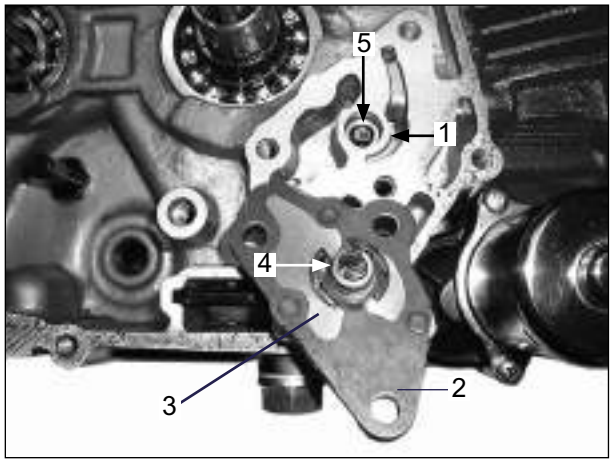


INSTALLATION
Set the shaft collar (1) into the right crankcase.
Install a new oil pump gasket (2) and set the oil pump (3) onto the right crankcase by aligning the groove of the rotor shaft (4) with the cam chain guide spindle (5).

Tighten the oil pump mounting screws securely. Check the cover screws for looseness, retighten them if necessary.

Install the clutch assembly.

Install the removed parts in the reverse order of removal. Fill the engine with recommended oil.



FUEL SYSTEM

SERVICE INFORMATION

GENERAL

WARNING
Gasoline is extremely flammable and is explosive under certain conditions. Work in a well ventilated area. Do not smoke or allow flames or sparks in the work area or where gasoline is stored.
If the engine must be running to do some work, make sure the area is well-ventilated.
Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

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

When disassembling the fuel System parts, note the locations of the O-rings. Replace them with new ones on reassembly.
Before disassembling the carburetor, drain the fuel in the float chamber by loosening the drain screw.

NOTE
If vehicle is to be stored for more than one month, drain the float bowls. Fuel left in the float bowls will cause clogged jets resulting in starting and driveability complaints.

SPECIFICATIONS

Fuel tank capacity	4.6 lit
Fuel reserve capacity	0.35 lit
Throttle grip free play	2-6 mm

TROUBLESHOOTING

Engine cranks but won't start
- No fuel in tank
- No fuel to carburetor
- Engine flooded with fuel
- Clogged air cleaner
- No spark at plug

Engine idles roughly or runs poorly
- Incorrect idle speed
- Rich mixture
- Lean mixture
- Clogged air cleaner
- Intake air leak
- Fuel contaminated

Lean mixture
- Clogged carburetor jets
- Blocked fuel tank breather hole
- Clogged fuel strainer screen
- Restricted fuel line
- Faulty float valve
- Float level low

Rich mixture
- Choke stuck closed
- Faulty float valve
- Float level too high
- Clogged air jets

Carburetor Specification

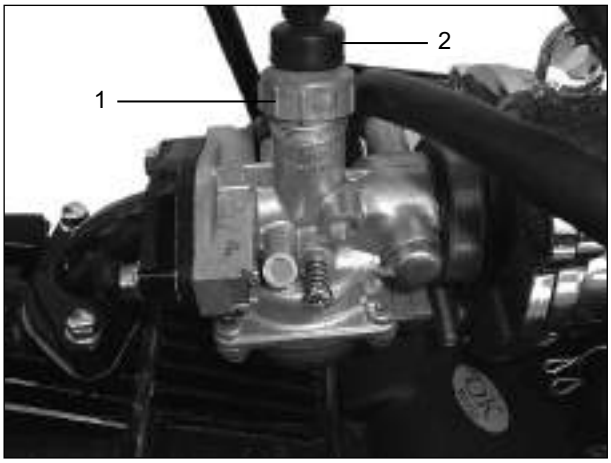
Identification number	Mikuni VM 12 101 6
Venturi diameter	13 mm
Float level	16.0 mm
Air screw opening	2,5 turns out
Idle speed	1.800 rpm +/- 200 rpm
Main jet	#47.5
Main air jet	#15
Jet needle	3N15
Needle jet	D-7 563
Jet needle setting groove	3 rd from top

FUEL SYSTEM

THROTTLE VALVE

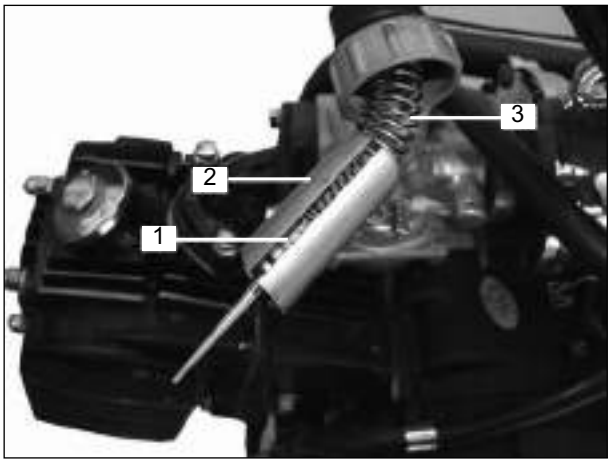
REMOVAL

Unscrew the carburetor (1) top and pull out the throttle valve (2).



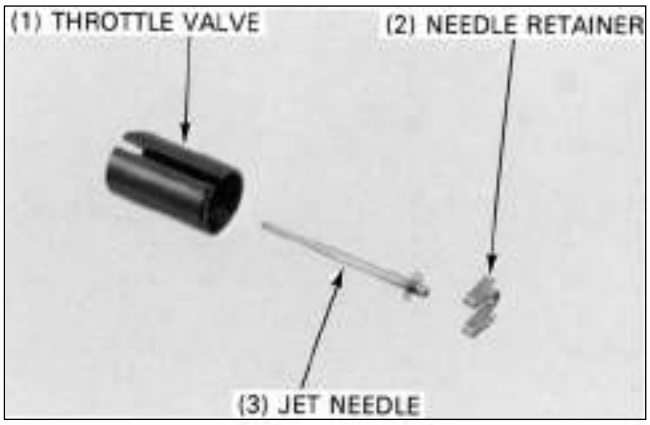
Compress the valve spring as shown and disconnect the throttle cable end (1) from the throttle valve through the groove while compressing the throttle valve spring as shown.

Remove the throttle valve (2), spring (3) and carburetor top.



Remove the needle retainer and take out the jet needle from the throttle valve.

Check the throttle valve and jet needle for scratches or wear.



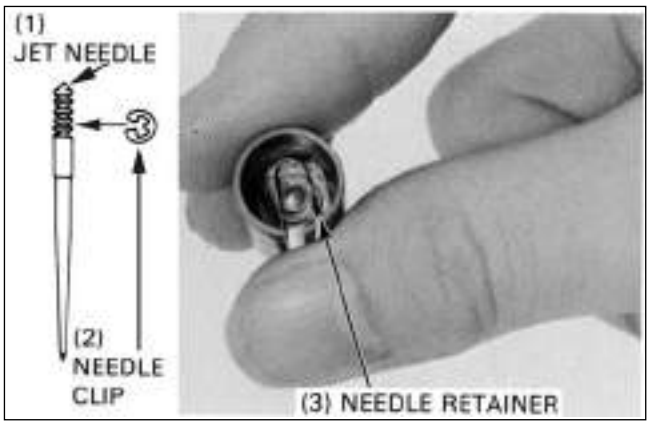
ASSEMBLY

Install the needle clip into the jet needle groove.

STANDARD SETTING: 3 rd GROOVE FROM TOP

Install the jet needle in the throttle valve.

Install the jet needle retainer.



FUEL SYSTEM

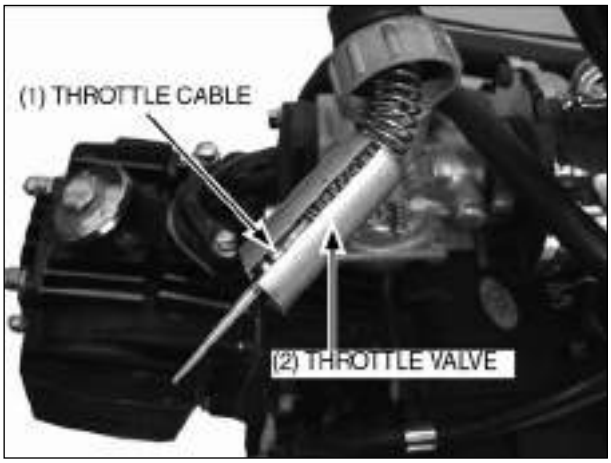
Route the throttle cable end through the carburetor top.

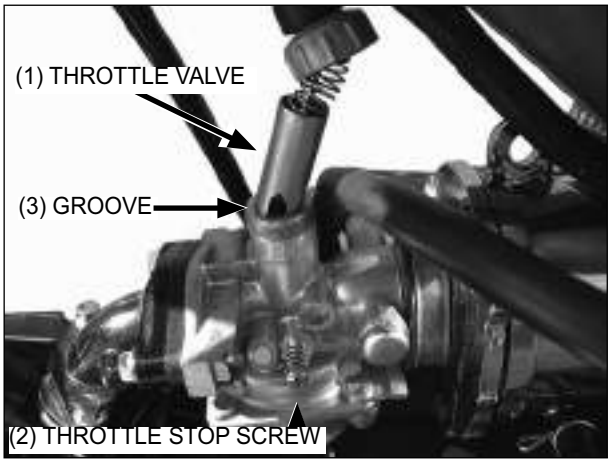
Install the throttle valve spring.

Connect the throttle cable to the throttle valve.

Install the throttle valve in the carburetor by aligning the throttle valve groove with the throttle stop screw.

Perform the following adjustments:
- Throttle grip free play
- Carburetor idle speed





CARBURETOR REMOVAL

WARNING
Gasoline is extremely flammable and is explosive under certain conditions. Work in a well ventilated area. Do not smoke or allow flames or sparks in the work area or where gasoline is stored.
Wipe up spilled gasoline at once.

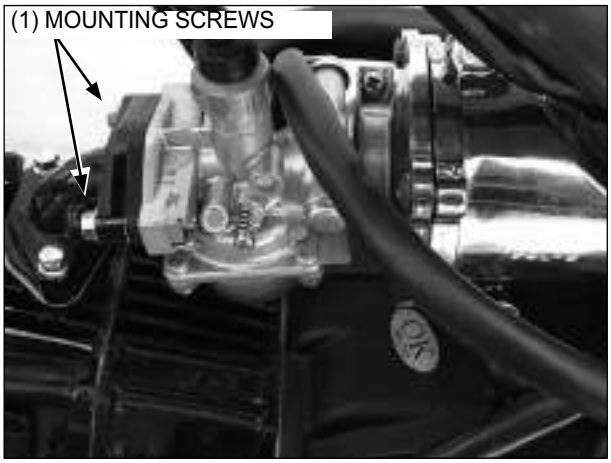
Turn the fuel petcock OFF and remove the hose.

Remove the carburetor top and throttle valve.

Loosen the drain screw to drain the fuel from the carburetor.

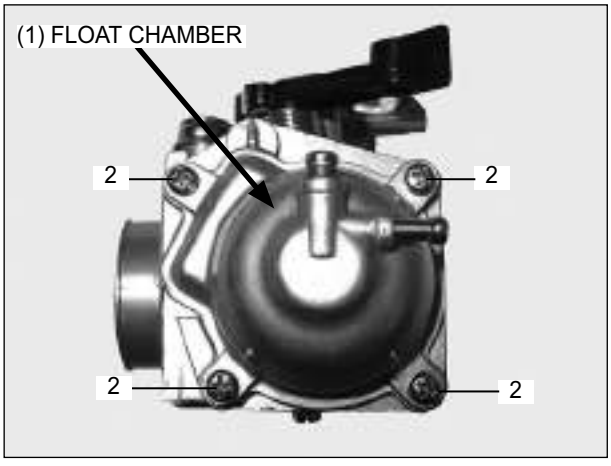
Loosen the air cleaner connecting tube band.

Remove the carburetor mounting bolts and carburetor.



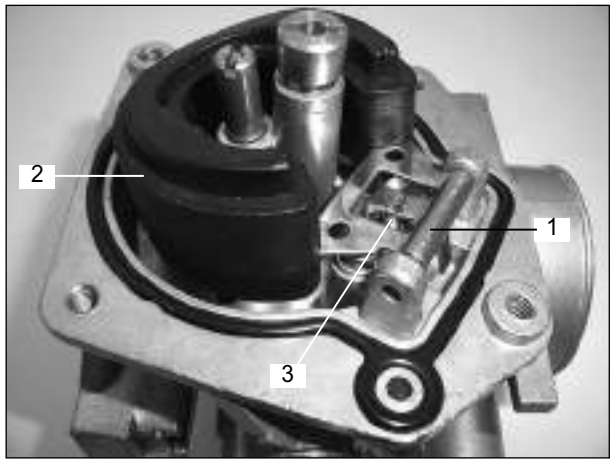
DISASSEMBLY

Remove the air vent and drain tubes.
Remove the float chamber by removing four screws (2).



FUEL SYSTEM

Pull out the float arm pin (1) and remove the float (2) and float valve (3).

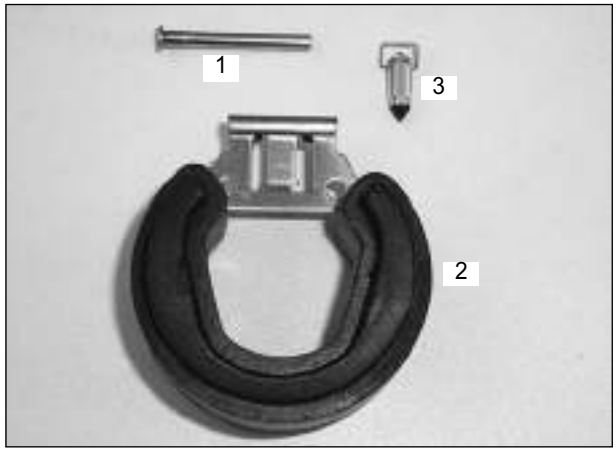


FLOAT VALVE/FLOAT INSPECTION
Inspect seating surface of the float valve (3) for wear or damage.

Inspect the float valve for grooves and nicks, and replace if necessary.

Check the Operation of the float valve.

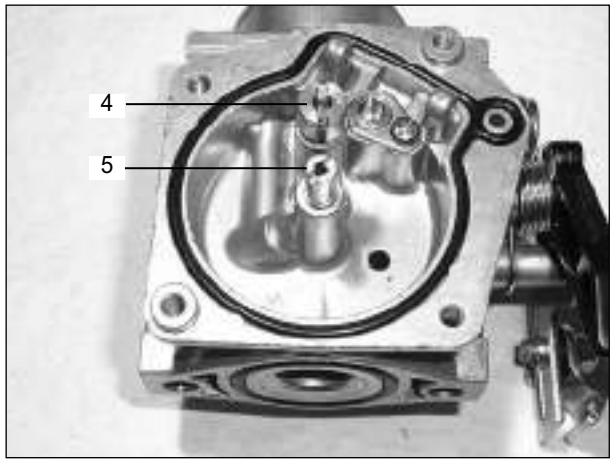
Check the float for damage and fuel in float.



Remove the main jet (4).

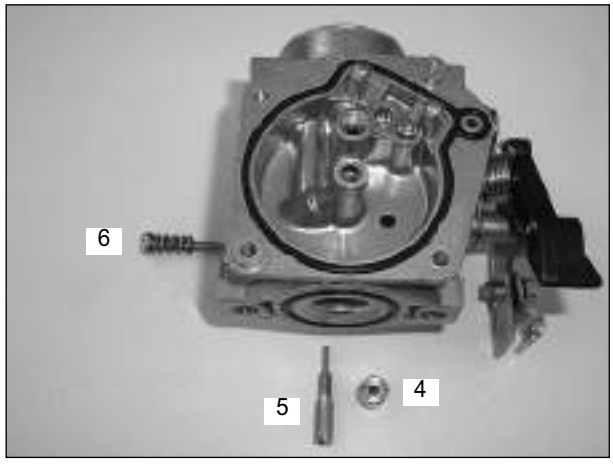
Remove the pilot jet (5).

Remove the throttle stop screw (6).



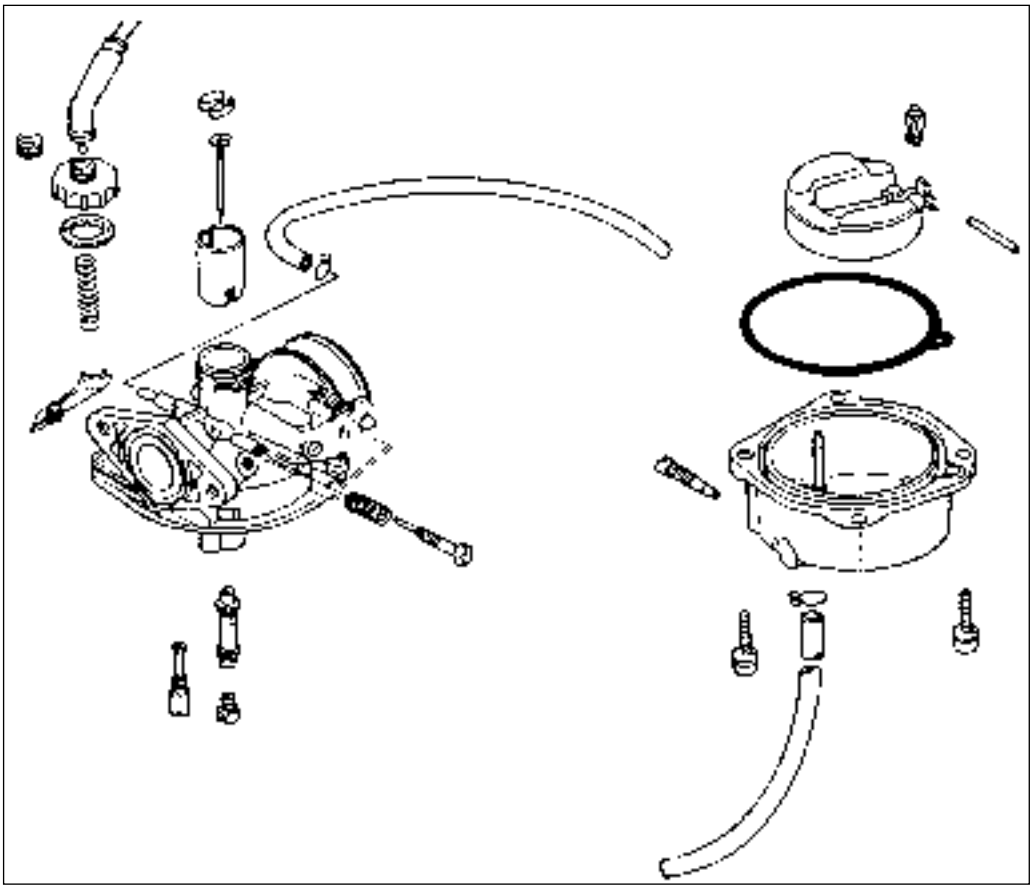
Clean all disassembled parts with solvent and dry them.

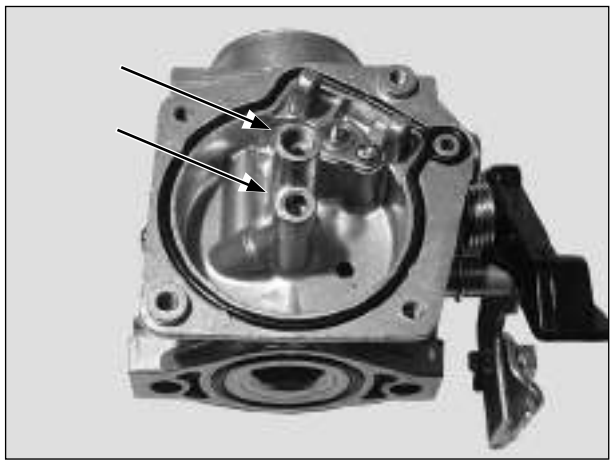
Inspect each jet and replace them if they are worn or damaged.



FUEL SYSTEM

ASSEMBLY

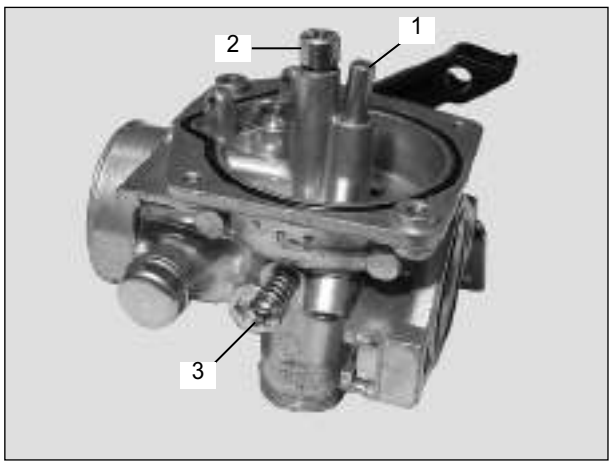




Clear all Jets and carburetor openings with compressed air.

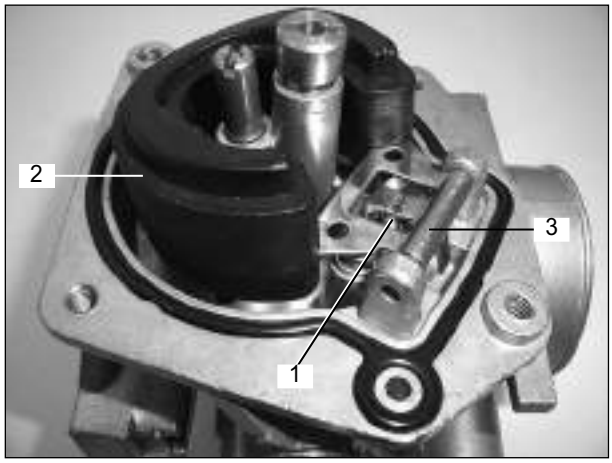
Install the needle jet (1) and main jet (2).

Install the throttle stop screw (3).



FUEL SYSTEM

Install the float valve (1), float (2) , and float arm pin (3).



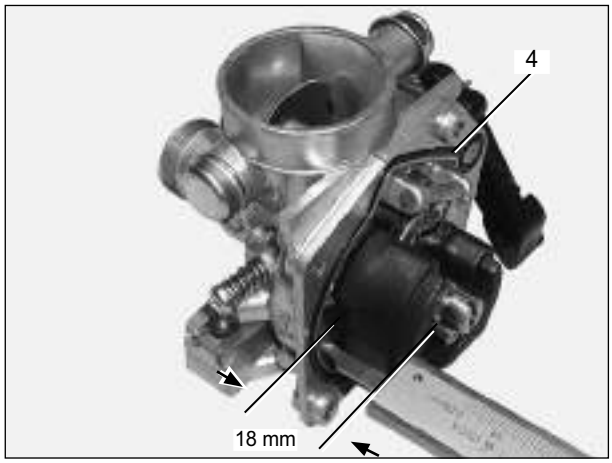
FLOAT LEVEL INSPECTION
Measure the float level with the carburetor inclined 15—45° from vertical so that the float tang just contacts the float valve.

FLOAT LEVEL: 18.0 mm

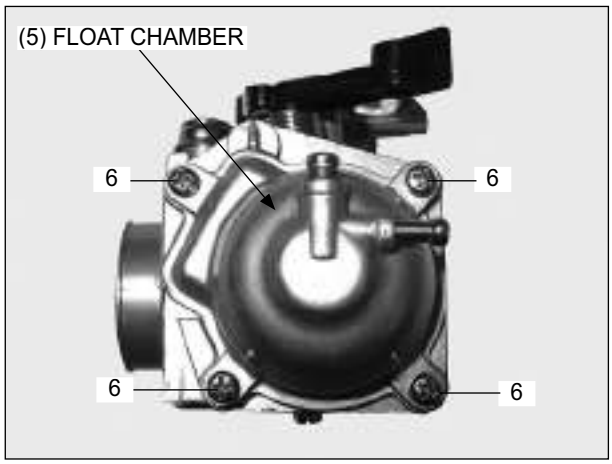
TOOL: VERNIER CALLIPER

Make sure the float moves smoothly.

Install a new O-ring (4) in the carburetor groove.



Install the float chamber (5) and tighten the screws (6).



FUEL SYSTEM

INSTALLATION

Install the carburetor in the reverse order of removal.

NOTE
Make sure that the O-rings on the intake pipe and insulator are installed properly.

Tighten the connecting tube band screw.

Install the air vent and drain tubes.

Install the throttle valve.

Warm up the engine to operating temperature.

WARNING
If the engine must be running to do some work, make sure the area is well-ventilated, Never run the engine in an enclosed area. The exhaust contains poisonous carbon monoxide gas that may cause loss of consciousness and lead to death.

Stop the engine and connect a tachometer.

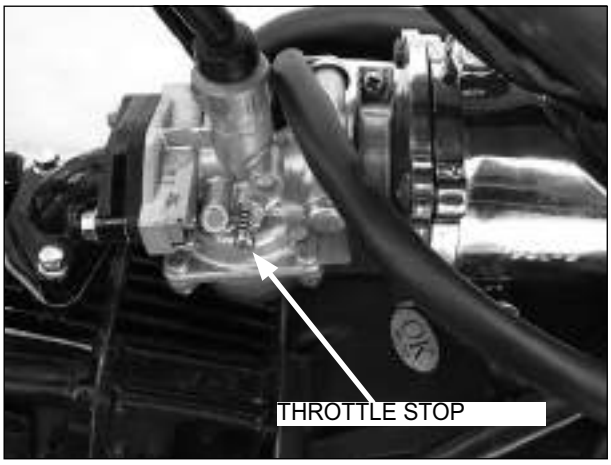
Start the engine and adjust the idle speed with the throttle stop screw.

IDLE SPEED: 1,800 +/- 200 rpm

Turn the air screw in or out to obtain the highest engine speed.

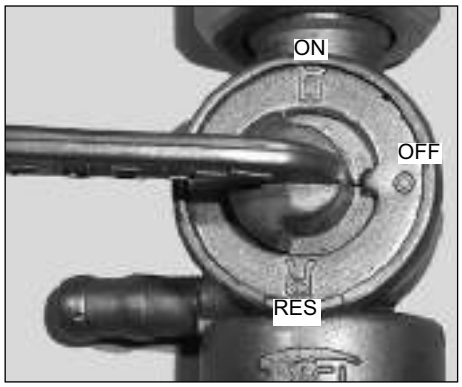
Readjust the idle speed to specified rpm with the throttle stop screw.

Make sure that the engine does not miss or run erratically.



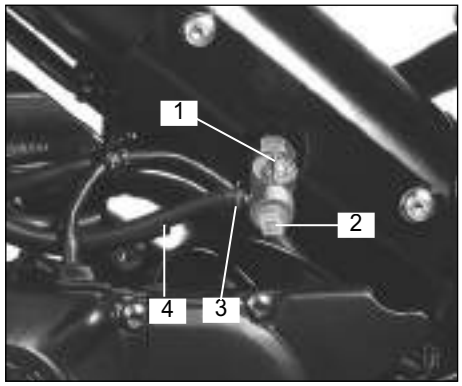
FUEL SYSTEM

Removing/installing the fuel petcock



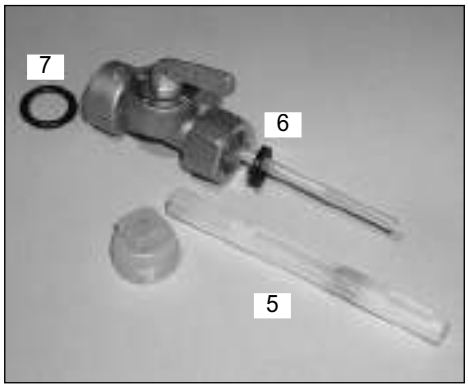
Removing the fuel petcock

- Turn the fuel petcock on position RES.
- Open the seal and drain the fuel tank completely.



- Loosen the hose clamps (3) and pull off the fuel hose (4).
- Remove the fuel petcock.
- Clean the sleeve (5).

Installing the fuel petcock



NOTE
Check the sealing rings (6 and 7) and replace if necessary.

- Reassemble in reverse order.

ENGINE DISASSEMBLY/ASSEMBLY

SERVICE INFORMATION

GENERAL

When removing the engine, support the motorcycle using safety stands.

Parts requiring engine removal for servicing:
Crankcase
Transmission
Shift drum and forks
Crankshaft
Kick starter spindle

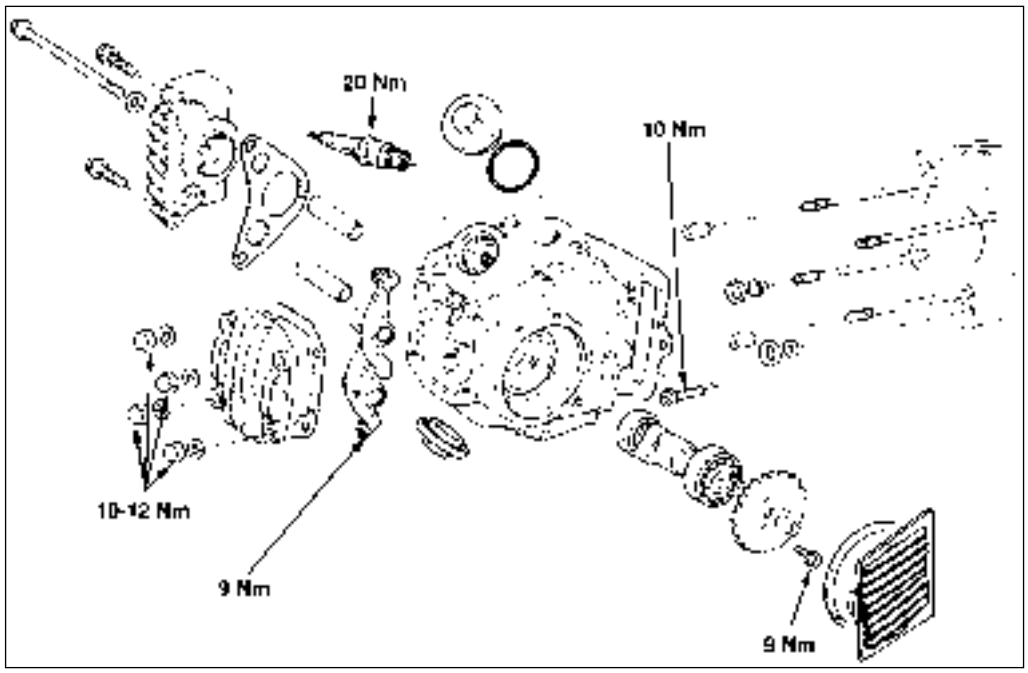
SPECIFICATION	
Engine oil capacity	0.8 lit after draining
	1.0 lit after disassembly
Engine dry weight	22 kg / 49 lbs
TORQUE VALUES	
Engine upper mounting bolt	33-35 Nm
Engine lower mounting bolt	33-35 Nm
Exhaust pipe joint nut	10-12 Nm
Intake manifold mounting bolt	10-12 Nm
Rear axle nut	50-60 Nm
Drive sprocket bolt	12-15 Nm

CYLINDER HEAD / VALVES

SERVICE INFORMATION

GENERAL

This section covers maintenance of the cylinder head, valves, camshaft and rocker arms.
Camshaft lubrication oil is fed to the cylinder head through an oil control orifice in the engine case.
Be sure this orifice is not clogged and that the O-ring and dowel pins are in place before installing the cylinder head.
Apply clean engine oil to the camshaft bearings to provide initial lubrication.



SERVICE DATA

Unit : mm

ITEM		STANDARD	SERVICE LIMIT
Cylinder head	Warpage	—	0.05
	Valve seat width	1.0	1.6
Cam height	IN	19.105	18.705
	EX	19.097	18.697
Rocker arm I.D.		10.000-10.015	10.10
Rocker arm shaft O.D.		9.978-9.987	9.91
Rocker arm-to-shaft clearance		0.013-0.037	0.05
Valve spring free length		33.34	32.0
Valve stem O.D.	IN	4.970-4.985	4.92
	EX	4.970-4.985	4.92
Valve guide I.D.	IN	5.000-5.012	5.03
	EX	5.000-5.012	5.03
Valve stem-to-guide clearance	IN	0.015-0.042	0.08
	EX	0.030-0.057	0.10

TORQUE VALUES

Cylinder head nut	10-12 Nm
Cylinder head bolt	10-12 Nm
Cam sprocket bolt	9 Nm
Cam chain tensioner sealing bolt	25 Nm

CYLINDER HEAD / VALVES

TROUBLESHOOTING

Engine top-end problems are usually performance-related and can be diagnosed by a compression test. Engine noises can usually be traced to the top-end with a sounding rod or stethoscope.

Uneven compression or low compression

- Valve troubles
  - Incorrect valve adjustment
  - Burnt or bent valves
  - Incorrect valve timing
  - Broken valve spring
  - Worn or damaged valve seat
- Cylinder head
  - Leaking or damaged head gasket
  - Warped or cracked cylinder head
- Faulty cylinder or piston

High compression

- Excessive carbon build-up on piston or combustion chamber

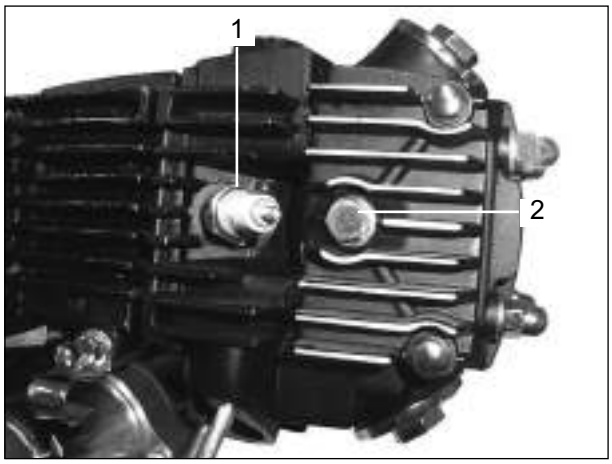
Excessive noise

- Incorrect valve adjustment
- Sticking valve or broken or weak valve spring
- Damaged or worn rocker arm or rocker arm shaft
- Damaged camshaft bearing

CYLINDER HEAD / VALVES

CAMSHAFT REMOVAL

Remove the spark plug (1).
Loosen the 6 mm bolt (2) and tap it to lift the left side cover.



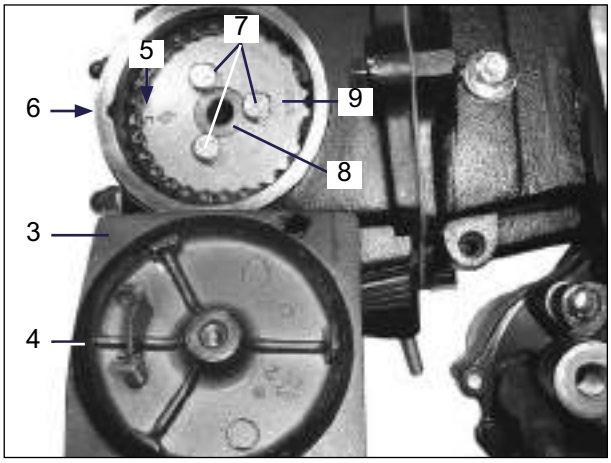
Remove the left side cover (3) and gasket (4).

Remove the left crankcase cover.

Remove the cam chain tensioner sealing bolt, spring and tensioner push rod.

Turn the flywheel counterclockwise until the "O" mark (5) on the cam sprocket aligns with cut-out (6) on the cylinder head.

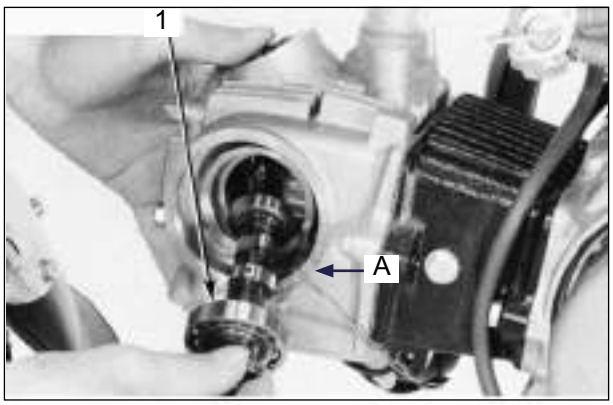
Remove the cam sprocket bolts (7) and dowel pin (8).
Remove the cam sprocket (9).



NOTE
Suspend the cam chain with a piece of wire (A) to prevent it from falling into the cylinder head.

Remove the valve adjuster covers and loosen the valve adjusters completely.

Screw the cam sprocket bolts into the camshaft and pull out the camshaft (1) while holding the rocker arms.



NOTE
Cylinder head can be removed with the camshaft installed on the cylinder head.

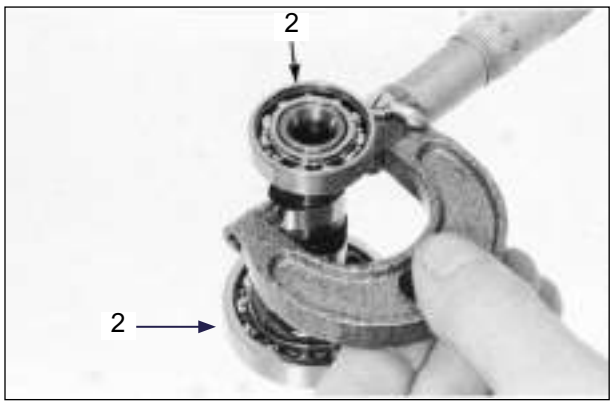
INSPECTION

Turn the outer race of the camshaft bearing (2) with finger.

The outer race should turn smoothly and quietly.

Also check that the bearing inner race fits tightly on the camshaft.

Replace the camshaft bearing if the outer race does not turn smoothly, quietly, or if it fits loosely on the camshaft.



Check each cam lobe for wear or damage.

Measure the cam lobe height.

SERVICE LIMITS:
IN: 18.705 mm
EX: 18.697 mm

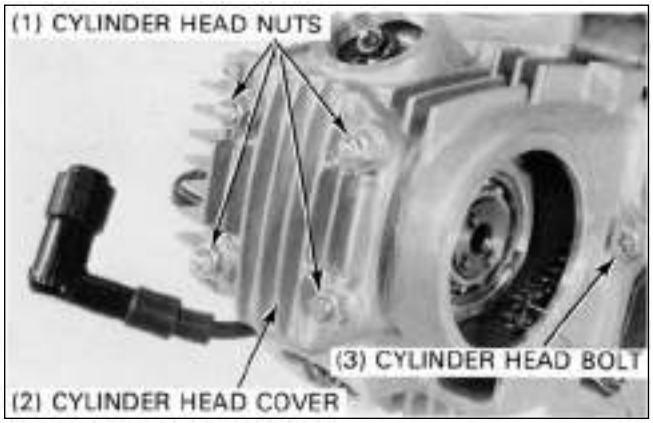
CYLINDER HEAD / VALVES

CYLINDER HEAD REMOVAL

Remove the muffler (1).

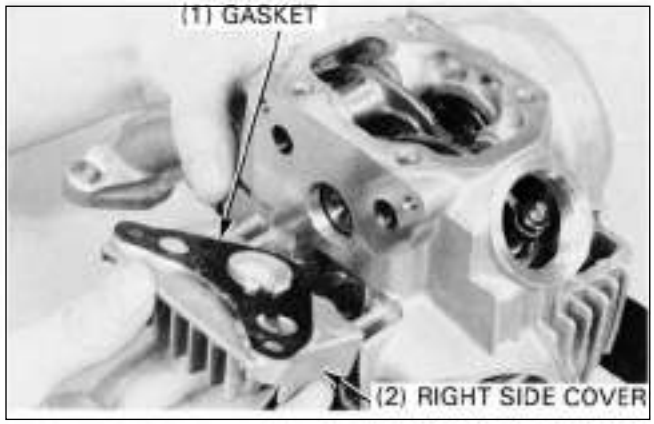
Remove the intake manifold bolts (2) from cylinder head.

Remove the following:
- cam sprocket
- cylinder head nuts and cylinder head bolt.
- cylinder head cover and gasket.
- cylinder head.



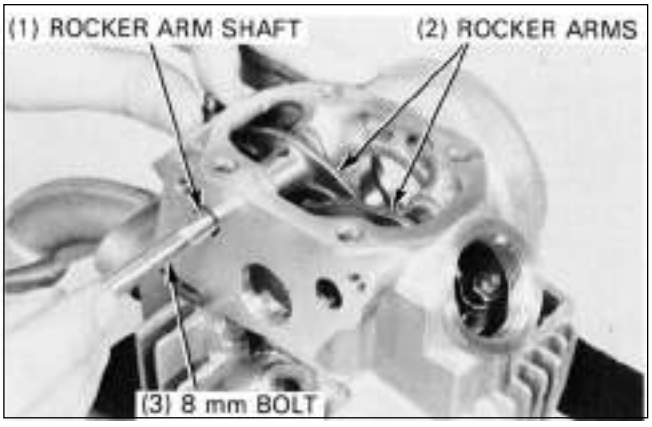
CYLINDER HEAD DISASSEMBLY

Remove the two bolts, right side cover and gasket.



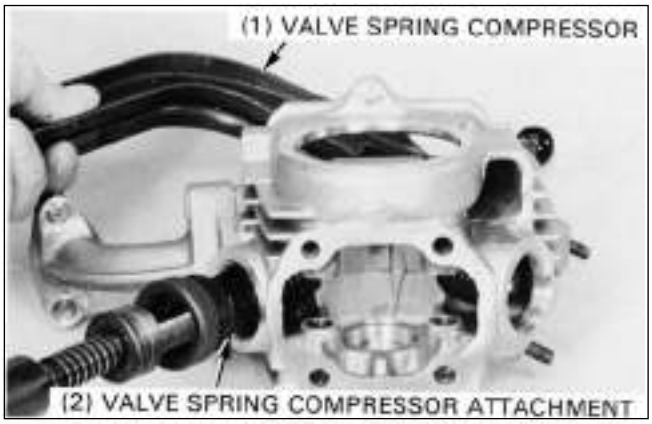
Screw an 8 mm bolt into the thread end of the rocker arm shaft and pull out the rocker arm shaft.

Remove the rocker arms.



CYLINDER HEAD / VALVES

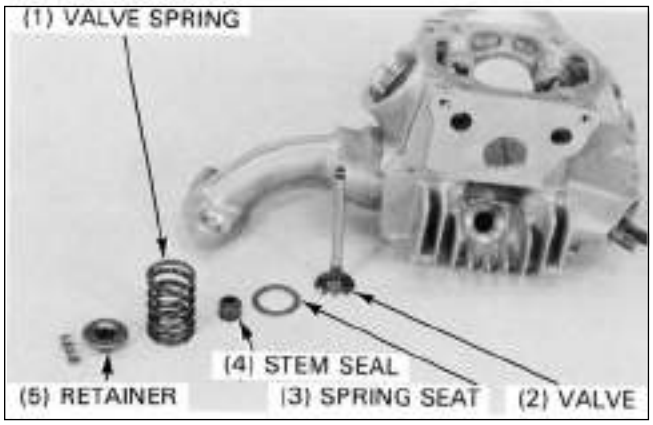
While compressing the valve spring with a valve spring compressor, remove the valve cotters.



CAUTION
To prevent loss of tension, do not compress the valve springs more than necessary to remove the cotters.

TOOLS:
Commercially available tools.

Loosen the valve spring compressor and remove the valve retainer, valve spring, spring seat and valve.

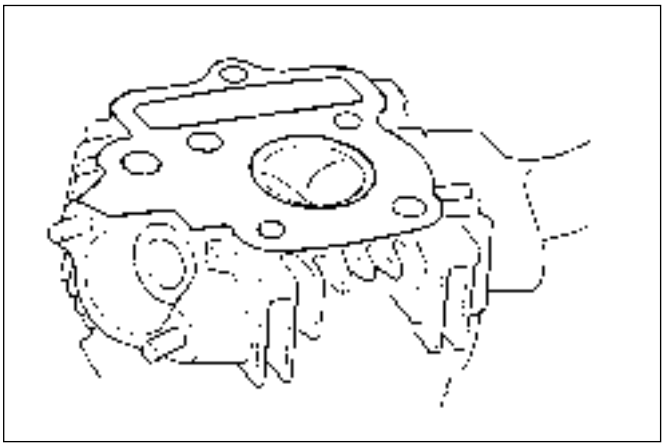


NOTE
Mark all disassembled parts to ensure correct reassembly.

Remove the stem seals, if necessary.

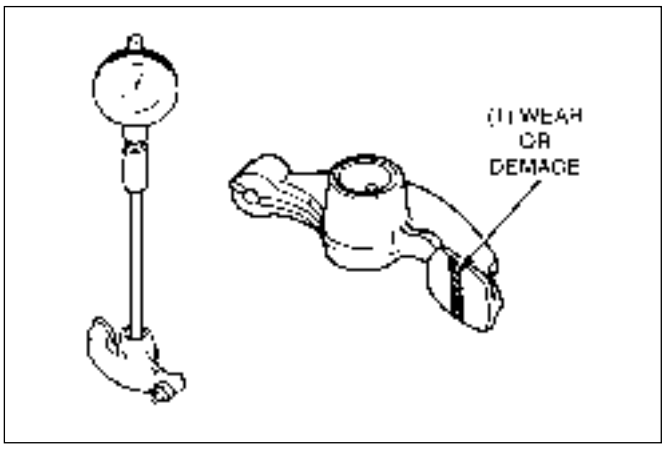
NOTE
Replace the stem seals with new ones whenever they are removed.

Remove the carbon deposits from the combustion chamber.
Clean off any gasket material from the cylinder head surface.



INSPECTION

Rocker arm
Inspect the rocker arm for wear, damage or clogged oil holes.



NOTE
If any rocker arm requires servicing or replacement, inspect the cam lobes for scoring, chipping or excessive wear.

Measure the rocker arm I.D.

SERVICE LIMIT: 10.10 mm

CYLINDER HEAD / VALVES

Rocker Arm Shaft
Inspect the rocker arm shaft for wear or damage.

Measure the rocker arm shaft O.D.

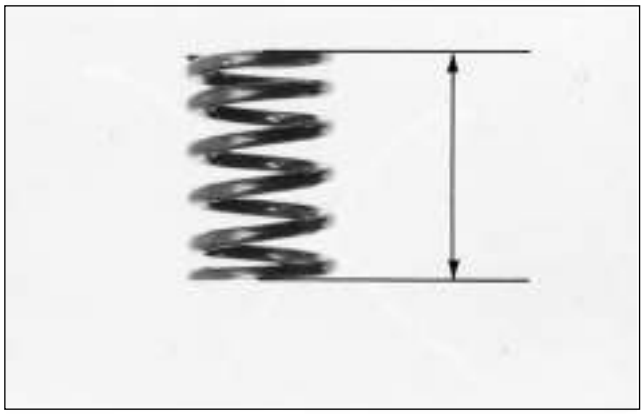
SERVICE LIMIT: 9.91 mm

Calculate the rocker arm-to-shaft clearance.

SERVICE LIMIT: 0.05 mm

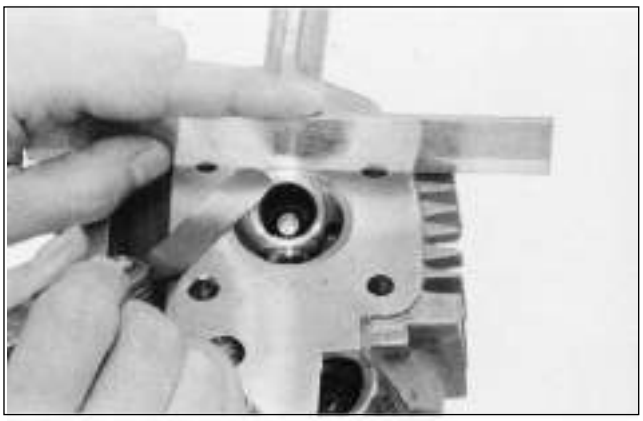
Valve Spring
Measure the free length of the valve spring.

SERVICE LIMIT: 32 mm



Cylinder Head
Check the spark plug hole and valve area for cracks.
Check the cylinder head for warping with a straight edge and a feeler gauge.

SERVICE LIMIT: 0.05 mm



Valve
Inspect each valve for trueness, burning, scratches or abnormal stem wear.
Measure the valve stem O.D.

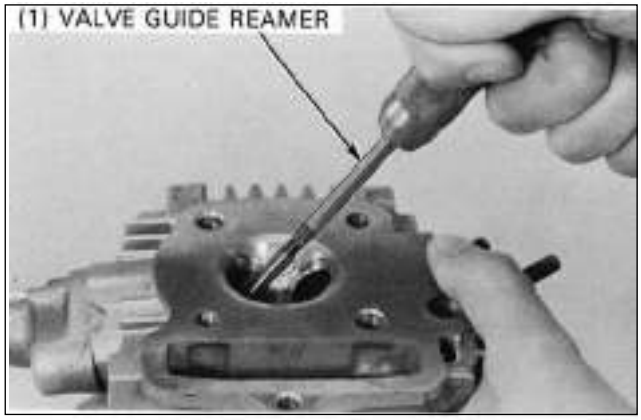
SERVICE LIMIT:
IN/EX: 4.92 mm

Insert each valve into the valve guide and check the valve movement in the guide.

CYLINDER HEAD / VALVES

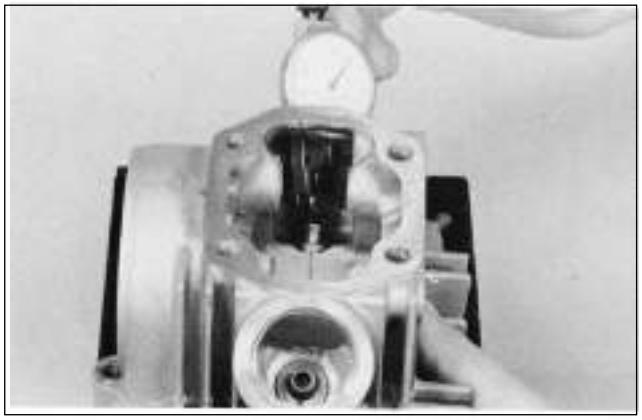
Valve guide

NOTE
Ream the valve guide to remove the carbon build-up before checking the valve guide.
Always rotate the reamer clockwise, never counterclockwise when installing, removing and reaming.



Measure and record each valve guide I.D. with a ball gauge or inside micrometer.

SERVICE LIMIT:
IN/EX: 5.03 mm



Calculate the stem-to-guide clearance.

SERVICE LIMIT:
IN 0.08 mm
EX: 0.10 mm

NOTE
If the stem-to-guide clearance exceeds the Service limit, determine if a new guide with Standard dimensions would bring the clearance within tolerance. If so, replace the guides as necessary and ream to fit.

If the stem-to-guide clearance still exceeds the service limit with new guides, replace the valves and guides.

Reface the valve seat whenever new valve guides are installed.

VALVE GUIDE REPLACEMENT
Chill the valve guides in the freezer section of a refrigerator for about an hour.
Heat the cylinder head to 100°C with a hot plate or oven.

WARNING
To avoid burns, wear heavy gloves when handing the heated cylinder head.

CAUTION
Do not use a torch to heat the cylinder head; the use of a heat torch may cause warping.

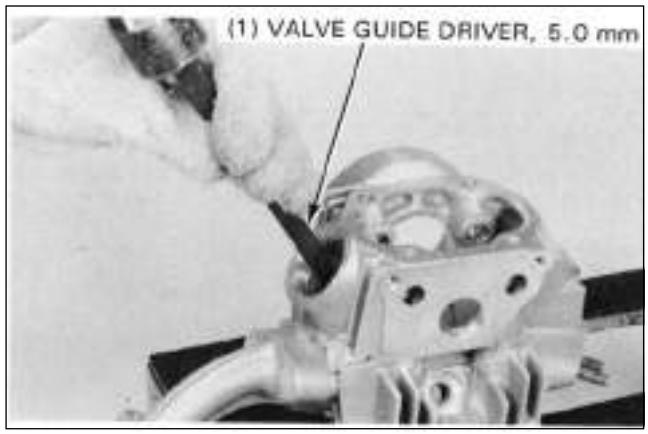
Support the cylinder head and drive out the valve guide from the valve port with a valve guide driver.

CAUTION
Avoid damaging the cylinder head.

CYLINDER HEAD / VALVES

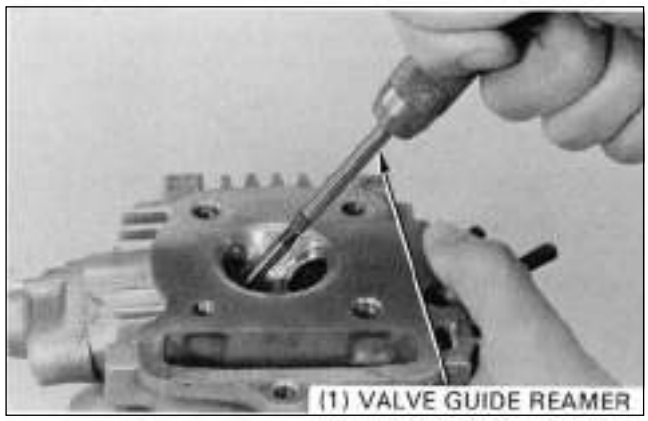
Install a new valve guide (oversize) from the top of the cylinder head.

CAUTION
When installing a valve guide take care not to damage the cylinder head.



After driving in the valve guide, ream it with a valve guide reamer.

NOTE
Use cutting oil on the reamer during this Operation.
Always rotate the reamer clockwise, never counterclockwise.



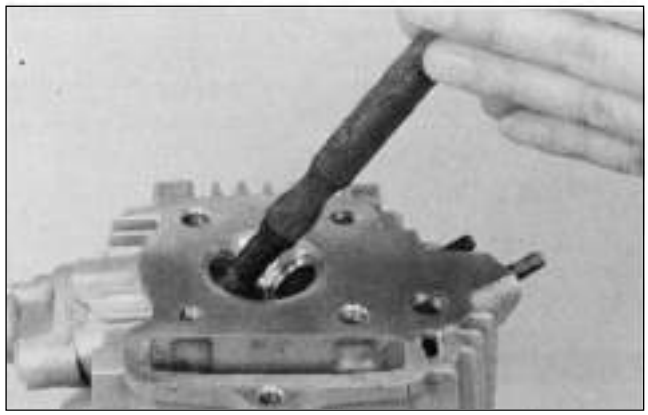
Clean the cylinder head thoroughly to remove any metal particles.

Reface the valve seat.

VALVE SEAT INSPECTION/REFACING

VALVE SEAT INSPECTION

Clean the intake and exhaust valves thoroughly to remove carbon deposits.

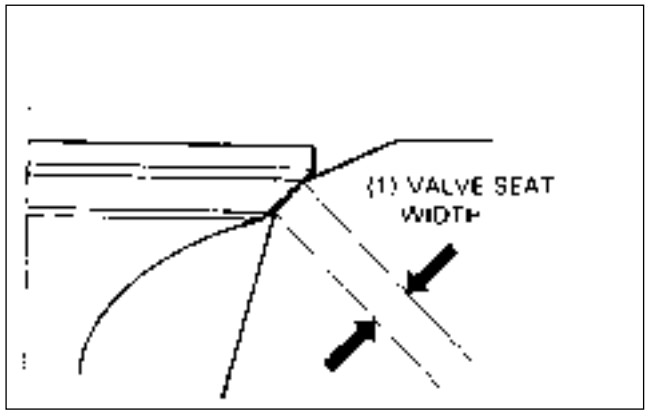


Apply a light coating of Prussian Blue to the valve seats. Lap the valves and seats using a rubber hose or other handlapping tool. Remove the tool and inspect the width of each valve seat.

STANDARD: **1.0 mm**
SERVICE LIMIT: **1.6 mm**

If the valve seat is too wide, too narrow or has low spots, the seat must be ground.

CAUTION
The valve cannot be ground. If a valve face is burned or badly worn or it contacts the seat unevenly, replace the valve.

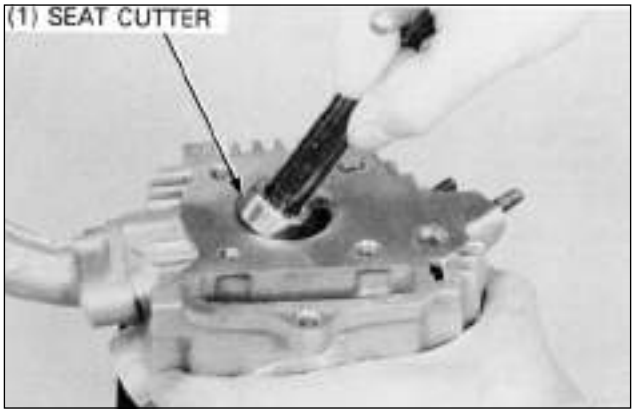


CYLINDER HEAD / VALVES

VALVE SEAT GRINDING

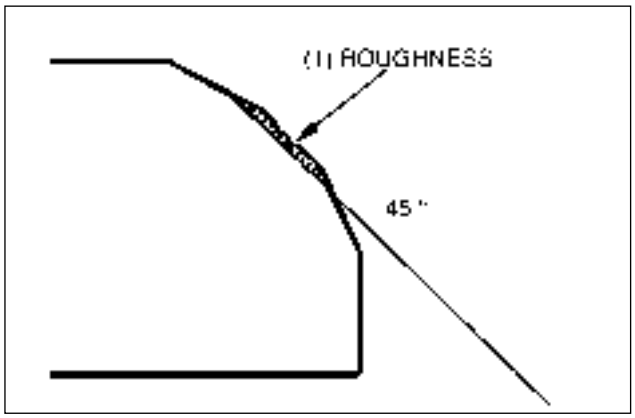
Valve Seat Cutters, a grinder or equivalent valve seat refacing equipment are recommended to correct a worn valve seat.

NOTE
Follow the refacer manufacturers operating instructions.

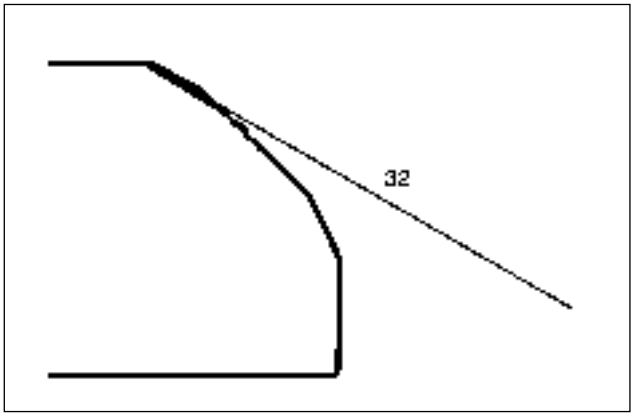


Use a 45 degree cutter to remove any roughness or irregularities from the seat.

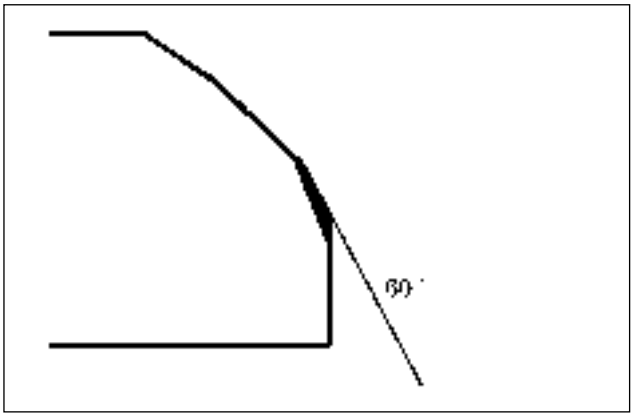
NOTE
Reface the valve seat with a 45 degree cutter when a valve guide is replaced.



Using 32 degree cutter, remove 1 /4 of the existing valve seat material.



Using 60 degree cutter, remove the bottom 1/4 of the old seat. Remove the cutter and inspect the area you have just removed.

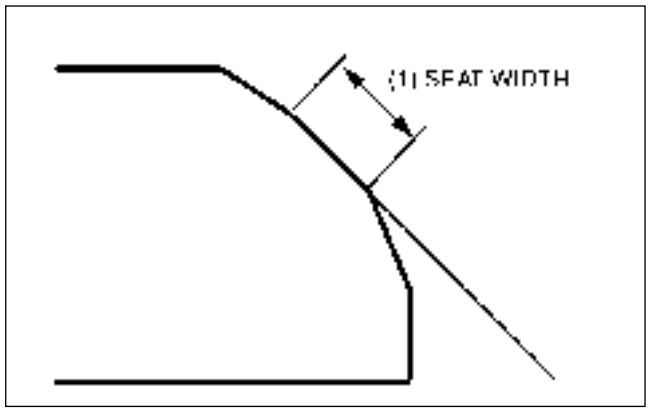


CYLINDER HEAD / VALVES

Install a 45 degree finish cutter and cut the seat to proper width. Make sure that all pitting and irregularities are removed.

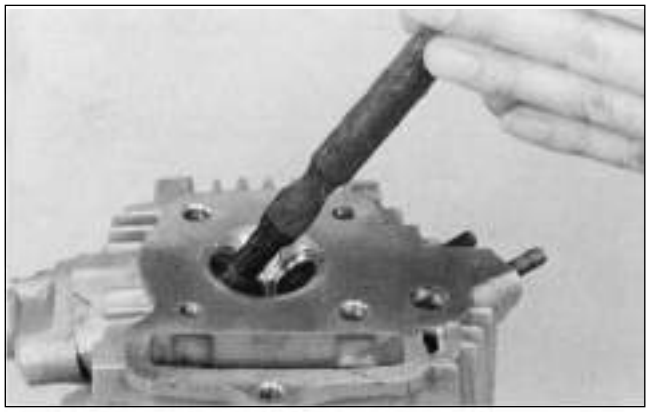
Refinish if necessary.

STANDARD SEAT WIDTH: 1.0 mm



Apply a thin coating of Prussian Blue to the valve seat. Press the valve through the valve guide and onto the seat to make a clear pattern.

NOTE
The location of the valve seat in relation to the valve face is very important for good sealing.



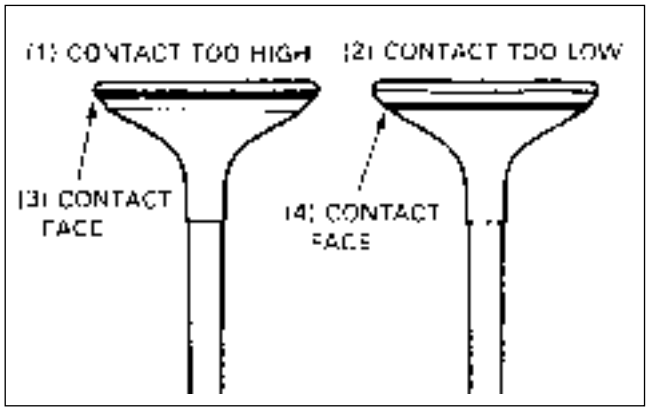
If the contact area is too high on the valve, the seat must be lowered using a 32 degree flat cutter.

If the contact area is too low on the valve, the seat must be raised using a 60 degree inner cutter.

Refinish the seat to specifications, using a 45 degree finish cutter.

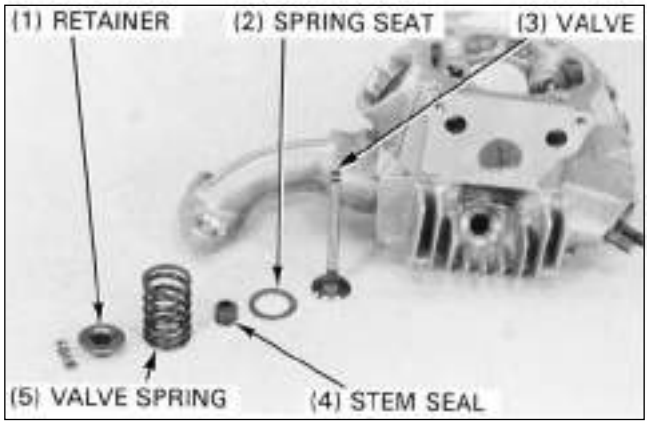
After cutting the seat, apply lapping compound to the valve face, and lap the valve using light pressure.

After lapping, wash all residual compound off the cylinder head and valves.



CYLINDER HEAD ASSEMBLY

Install new valve stem seals.
Lubricate each valve stem with the engine oil.
Insert the intake and exhaust valve into the valve guides.



CYLINDER HEAD / VALVES

Install the valve spring seats, springs and retainers.

NOTE
Install the valve springs with the narrow pitch end facing down.

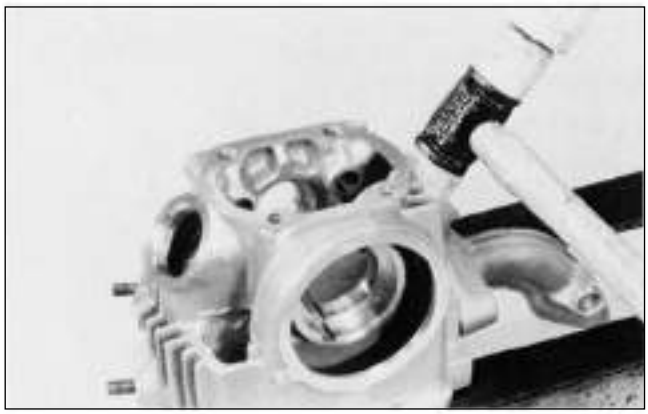
Compress the valve spring and install the valve cotters.

CAUTION
To prevent loss of tension, do not compress the valve spring more than necessary.

TOOLS:
Commercially available tools.

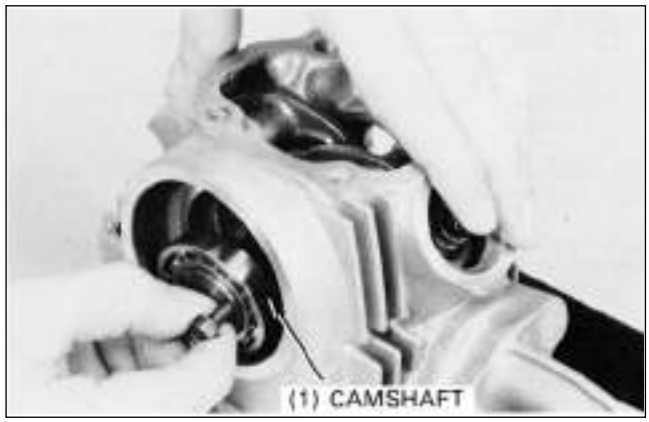
Tap the stems gently with a plastic hammer to firmly seat the cotters.

CAUTION
Support the cylinder head above the work bench surface to prevent valve damage.



Apply clean engine oil to the camshaft and camshaft bearings. Install the camshaft into the cylinder head with the cam lobes facing the combustion chamber.

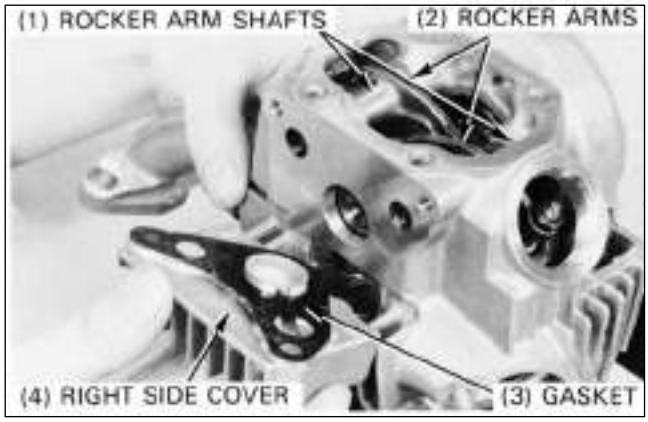
NOTE
The camshaft can be installed after the cylinder head has been installed.



Coat the rocker arm shafts with fresh engine oil. Install the rocker arm shafts and the rocker arms.

NOTE
Be sure the shaft threads are facing outward.

Install a new gasket onto the right side cover, then install the cover.



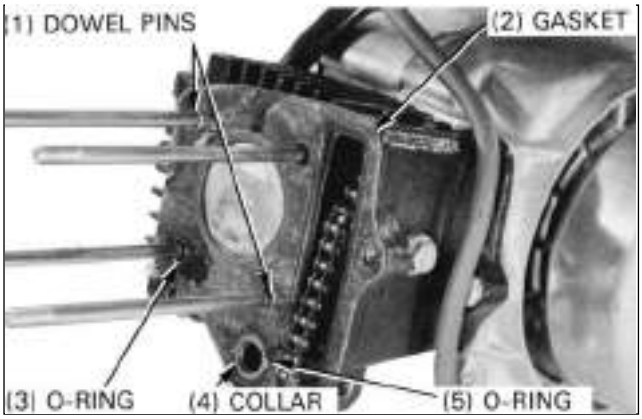
CYLINDER HEAD / VALVES

CYLINDER HEAD INSTALLATION

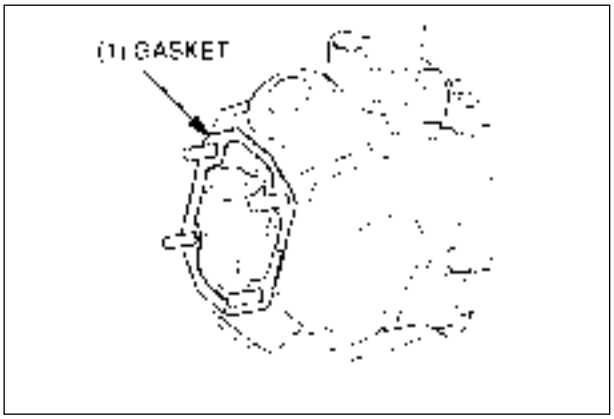
Clean the cylinder head gasket surface of any gasket material.

NOTE
Do not allow dust and dirt to enter the cylinder.

Install the dowel pins, a new cylinder head gasket, the 0-rings and collars.



Install the cylinder head and a new head cover gasket.

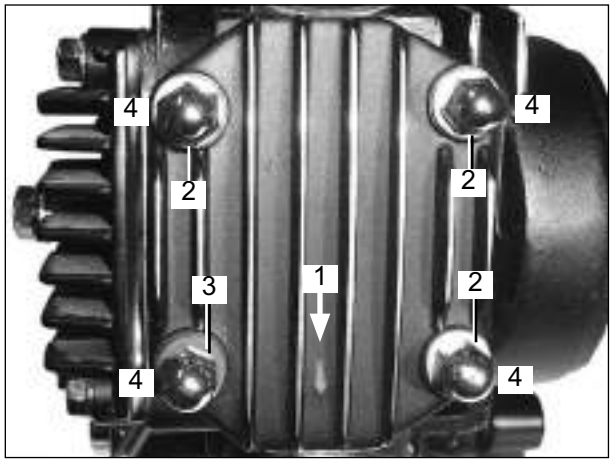


Position the cylinder head cover with its arrow (1) facing the exhaust side.

Install the sealing washer (2), copper washer (3) and nuts (4) in the proper locations.

Tighten the cap nuts to the specified torque.

TORQUE: 10-12 Nm



Install the muffler in the reverse order of removal.

TORQUE
Exhaust pipe joint nuts (1): 10-12 Nm

Tighten the intake manifold bolts (2).

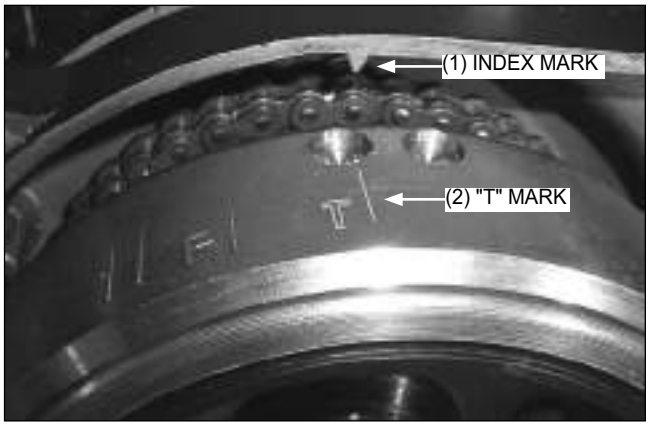
TORQUE: 10 Nm

NOTE
Make sure that the O-ring is positioned properly.

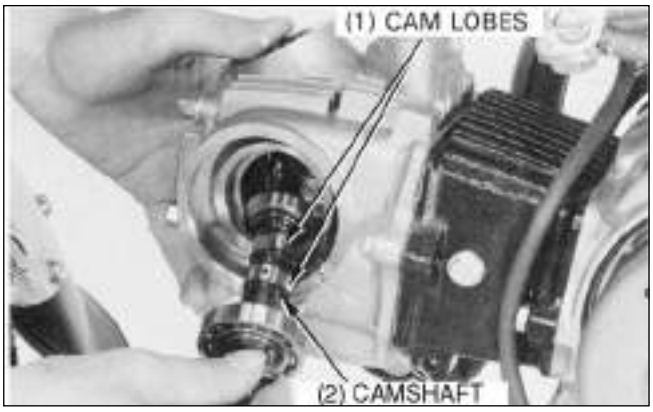
CYLINDER HEAD / VALVES

CAMSHAFT INSTALLATION

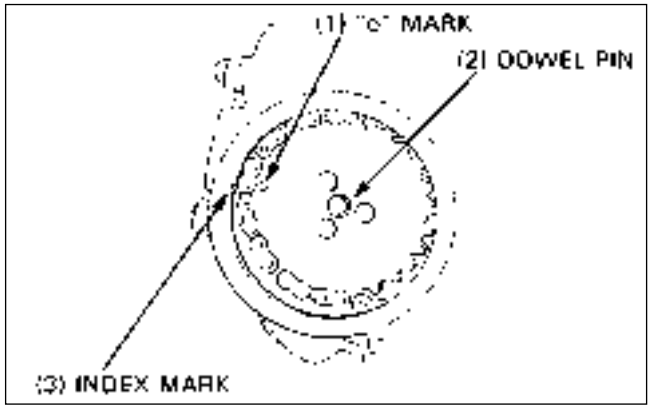
Rotate the flywheel counterclockwise and align the "T" mark with the index mark.



Coat the camshaft and camshaft bearings with clean engine oil.
While holding the rocker arms out of the way, install the camshaft into the cylinder head with the cam lobes facing the piston.

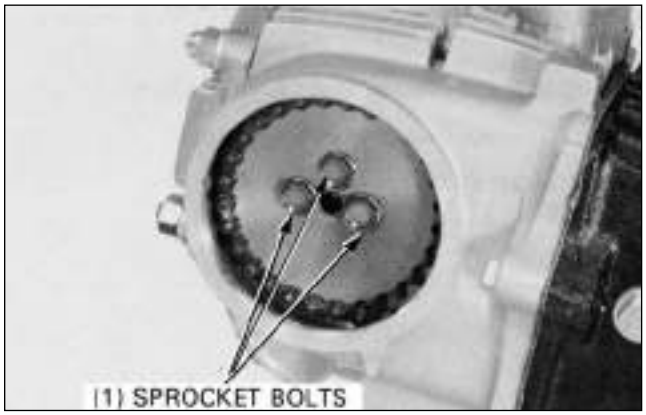


Install the dowel pin into the camshaft.
Align the "O" mark on the cam sprocket with the index mark on the cylinder head.
Install the cam chain over the sprocket.



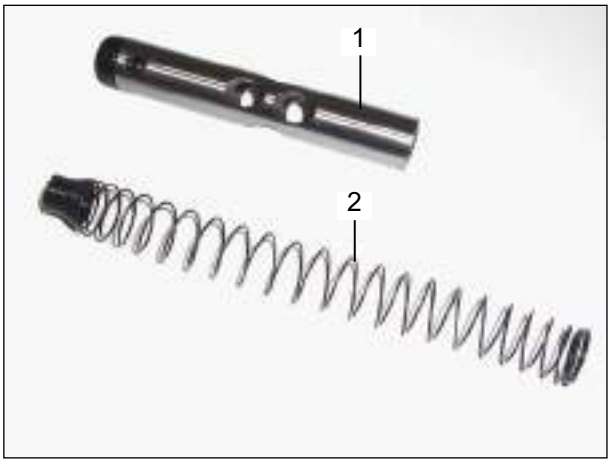
Tighten the cam sprocket bolts.

TORQUE: 9 Nm



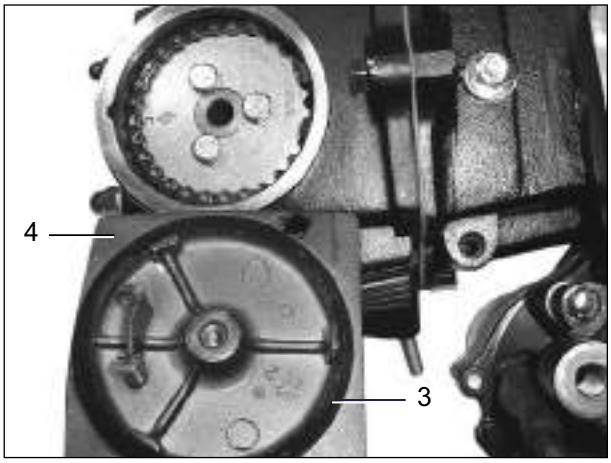
CYLINDER HEAD / VALVES

Install the cam chain tensioner push rod (1) and spring (2).



Install the left crankcase cover.

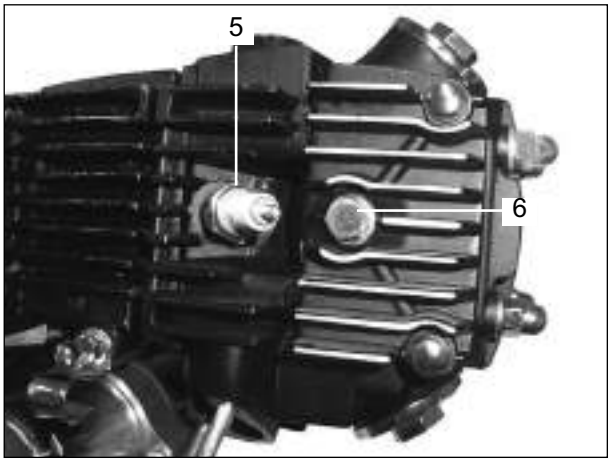
Install a new gasket (3) and the left side cover (4).



Adjust the valve clearance.

Install the spark plug (5).

Tighten the left side cover using the 6 mm bolt (6).



CYLINDER COMPRESSION

Warm up the engine.

Stop the engine and remove the spark plug (5).

Insert the compression gauge.

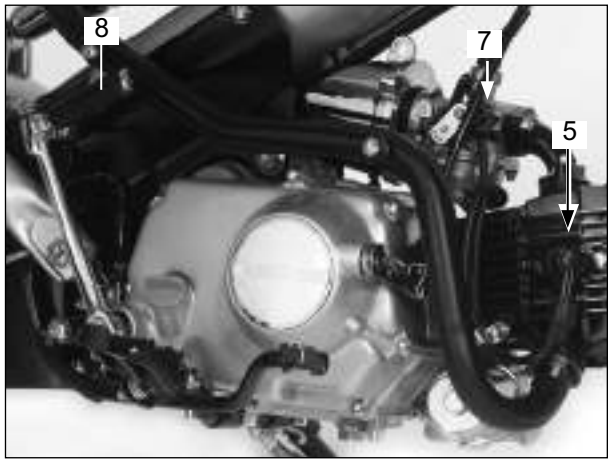
Move the choke lever (7) downward.

Open the throttle grip fully.

Crank the engine with the kick starter (8).

NOTE

Crank the engine until the gauge reading stops rising.



COMPRESSION PRESSURE: 10-12 kg/cm² (142-171 psi)

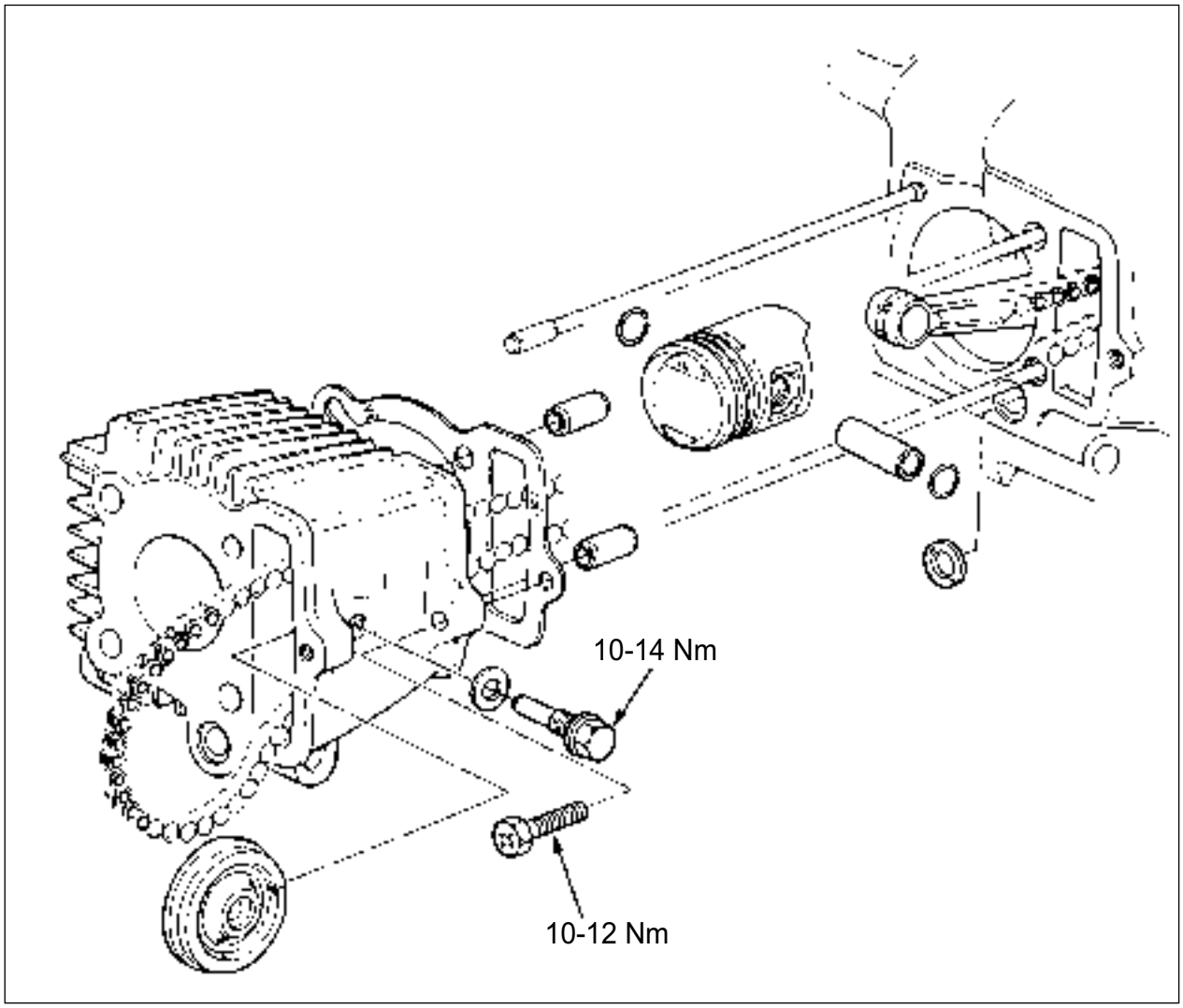
Low compression can be caused by:

- Improper valve adjustment
- Valve leakage
- Worn piston ring or cylinder

High compression can be caused by:

- Carbon deposits in combustion chamber or on the piston crown.

CYLINDER / PISTON



CYLINDER / PISTON

SERVICE INFORMATION

GENERAL

- This section covers the Service of the piston and cylinder. These Services are completed with the engine in the frame.
- The camshaft lubricating oil is fed to the cylinder head through an oil orifice in the right crankcase. Be sure this orifice is not clogged and that the O-ring and dowel pins are in place before installing the cylinder.

SERVICE DATA

Unit: mm

ITEM			STANDARD	SERVICE LIMIT
Cylinder		I.D.	39.005-39.01 5	39.05
		Warpage	—	0.05
		Out of round	—	0.10
		Taper	—	0.10
Piston		O.D.	38.975-38.995	38.90
		Piston pin bore	13.002-13.008	13.05
		Cylinder-to-piston clearance	0.010-0.045	0.15
Piston pin		O.D.	12.994-13.000	12.98
		Piston-to-pin clearance	0.002-0.014	0.08
Piston ring	End gap	Top/second	0.15-0.35	0.5
		Oil (side rail)	0.30-0.90	1.1
	Piston-to-ring groove clearance	Top	0.015-0.050	0.12
		Second	0.015-0.050	0.12
Connecting rod small end		I.D.	13.016-13.034	13.06
		Small end-to-piston pin clearance	0.016-0.040	0.08

TORQUE VALUES

Cylinder bolt	10-12 Nm
Cam chain guide roller pin bolt	10 Nm

TROUBLESHOOTING

Low or unstable compression
- Worn cylinder or piston rings

Excessive smoke
- Worn cylinder, piston or piston ring
- Improper Installation of piston rings
- Scored or scratched piston or cylinder wall

Overheating
- Excessive carbon build-up on piston or combustion chamber wall

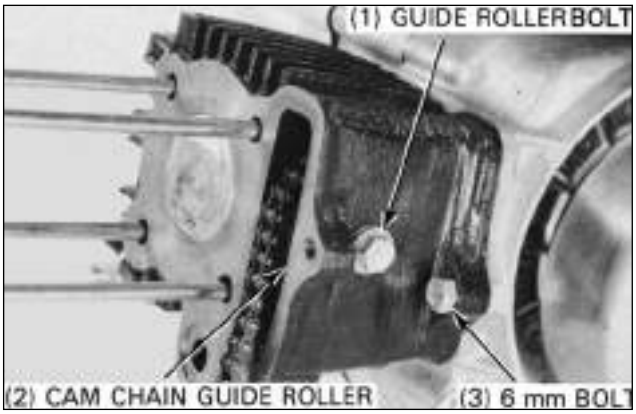
Knocking or abnormal noise
- Worn piston and cylinder
- Excessive carbon build-up

CYLINDER / PISTON

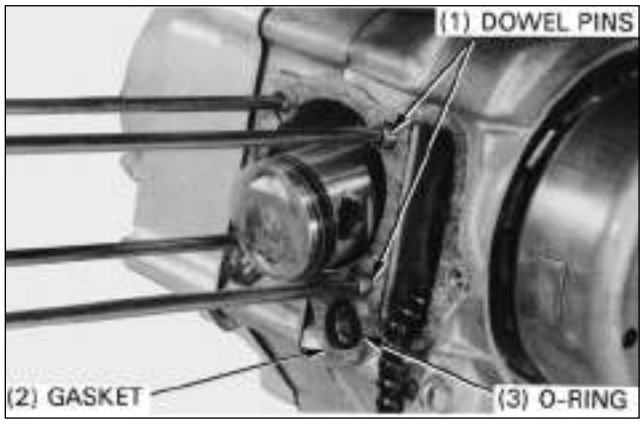
CYLINDER REMOVAL

Remove the cylinder head.
Remove the guide roller bolt and cam chain guide roller.

Remove the 6 mm bolt and cylinder.



Remove the O-ring, gasket and dowel pins.



CYLINDER INSPECTION

Inspect the cylinder bore for wear or damage.
Measure the cylinder I.D. at three places; the top, middle and bottom areas of piston travel, and in two directions at right angles to each other.

SERVICE LIMITS: 39.05 mm

Measure the piston O.D. and calculate the piston-to-cylinder clearance using the maximum cylinder I.D. measurement.

SERVICE LIMIT: 0.15 mm

Measure the cylinder for taper at three levels in an X and Y axis. Take the maximum reading to determine the taper.

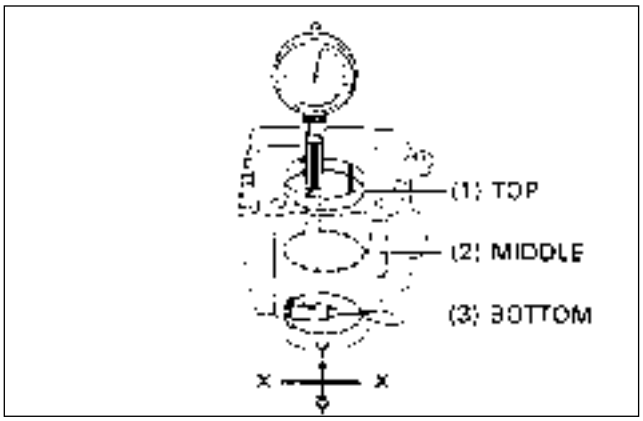
SERVICE LIMIT: 0.10 mm

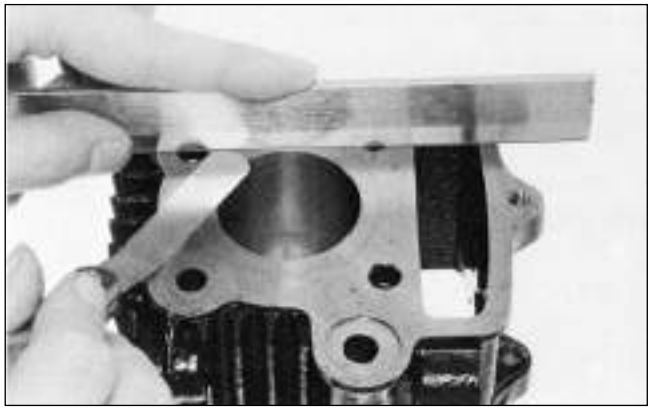
Measure the cylinder for out-of-round at three levels in an X and Y axis. Take the maximum reading to determine the out-of-round.

SERVICE LIMIT: 0.10 mm

Check the cylinder for warping with a straight edge and a feeler gauge.

SERVICE LIMIT: 0.05 mm





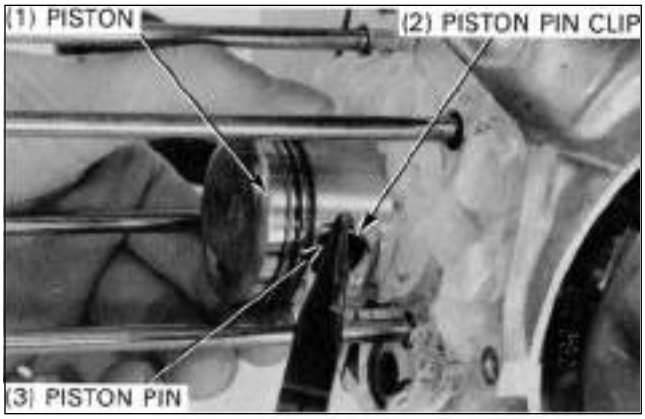
CYLINDER / PISTON

PISTON REMOVAL

Place clean shop towels in the crankcase to keep the piston pin clips or other parts from falling into the crankcase.

Remove the piston pin clip with pliers.
Press the piston pin out of the piston from the opposite side with your finger.

Remove the piston.



PISTON/PISTON RING INSPECTION

Measure the piston ring-to-groove clearance with a feeler gauge.

SERVICE LIMITS:
Top: 0.12 mm
Second: 0.12 mm

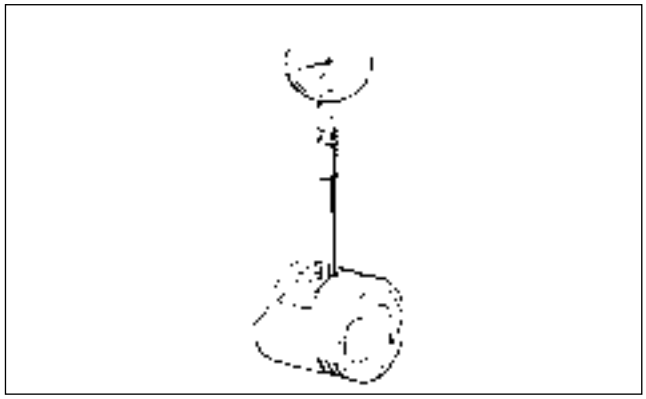
Measure the piston O.D. at the skirt.

SERVICE LIMIT: 38.90 mm

Compare this measurement against the service limit and use it to calculate piston-to-cylinder clearance.

Measure the piston pin bore I.D. in two directions at right angles to each other.

SERVICE LIMIT: 13.05 mm



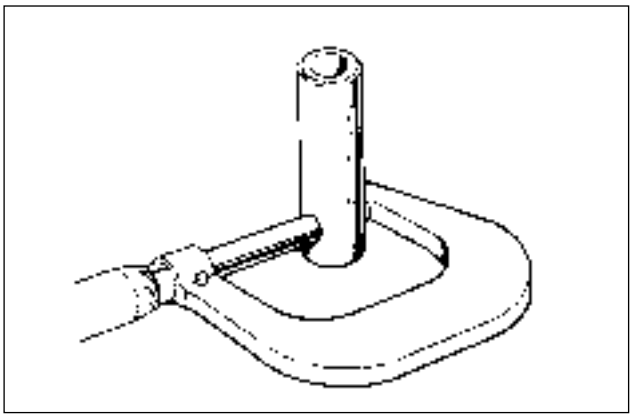
CYLINDER / PISTON

Measure the piston pin O.D. at the left, center and right in two directions at right angles to each other.

SERVICE LIMIT: 12.98 mm

Calculate the piston-to-piston pin clearance.

SERVICE LIMIT: 0.08 mm

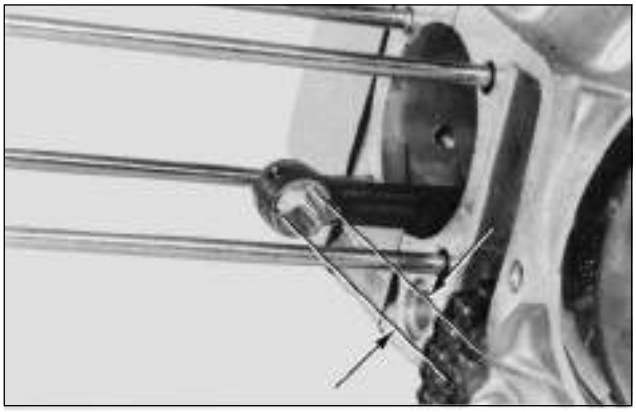


Measure the connecting rod small end I.D.

SERVICE LIMIT: 13.06 mm

Calculate the piston pin-to-connecting rod clearance.

SERVICE LIMIT: 0.03 mm



Remove the piston rings.

NOTE
Do not damage the rings during removal.

Inspect the piston ring for damage or cracks.
Inspect the piston groove for wear or damage.

Insert each piston ring into the cylinder with the piston and measure the ring end gap in the cylinder at a point 10 mm from the bottom.

SERVICE LIMITS:
Top/second: 0.5 mm
Oil (side rail): 1.1 mm

CYLINDER / PISTON

PISTON RING INSTALLATION

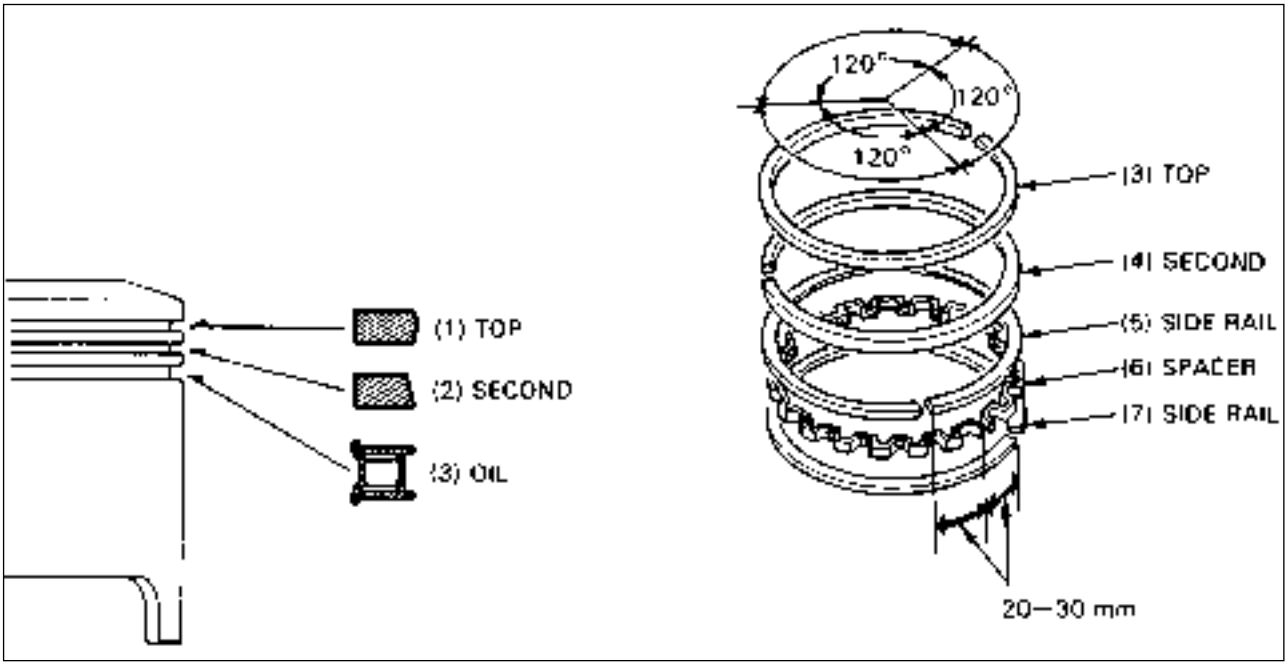
Clean the piston ring grooves thoroughly and install the piston rings with the markings facing up.

NOTE
When installing the oil ring, install the spacer first and then the side rails.

Be careful not to damage the piston or rings during installation.

After Installation, the piston rings should be free to rotate in the grooves.
Do not interchange the top ring with the second ring.

Space the piston ring end gaps 120 ^{0} apart.
Do not align the gaps of the oil ring side rails.

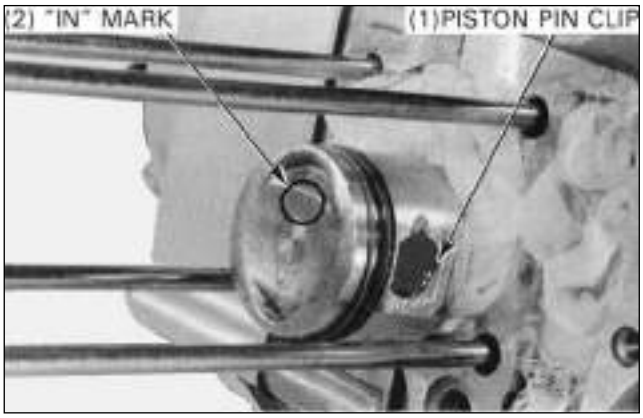


PISTON INSTALLATION

Install the piston with the "IN" mark facing the intake valve. Install the piston pin and new piston pin clips.

NOTE
Replace piston pin clips whenever they are removed.

Do not align the piston pin clip end gap with the piston cutout.



CYLINDER / PISTON

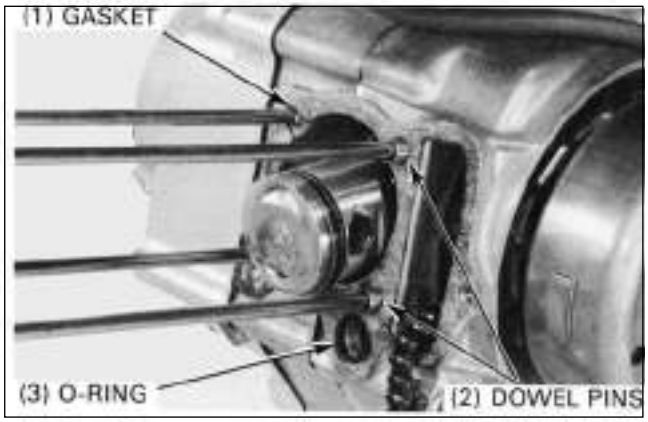
CYLINDER INSTALLATION

Remove any gasket material from the cylinder gasket surface on the crankcase.

NOTE
Do not damage the gasket surface.
Do not let any material fall into the crankcase.

Install a new cylinder gasket, O-ring and dowel pins.

NOTE
Make sure that the oil orifice is not clogged.

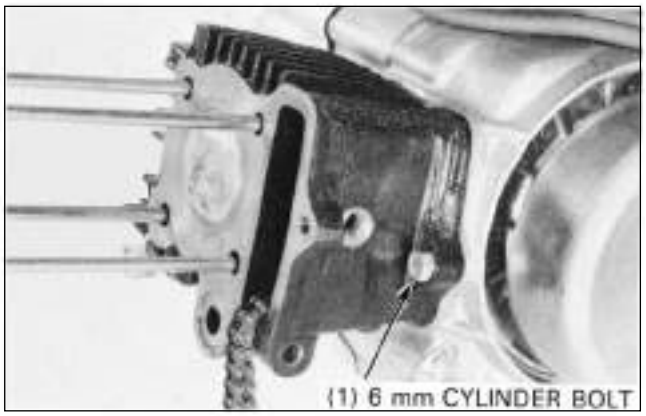


Coat the cylinder and piston rings with clean engine oil and install the cylinder.

NOTE
Be careful not to damage the piston rings during installation.

Tighten the 6 mm cylinder bolt.

TORQUE: 10-12 Nm

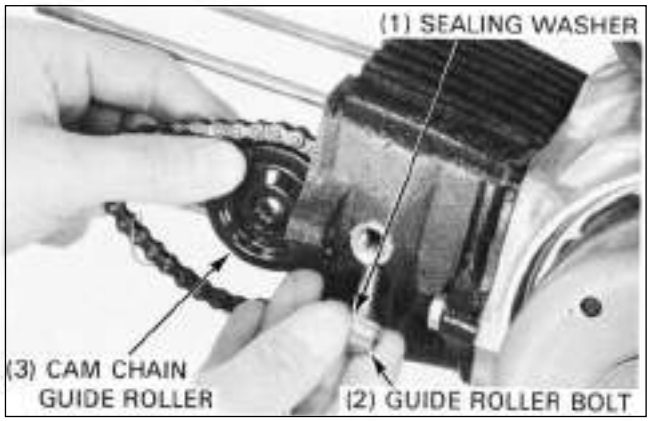


Install the cam chain guide roller and tighten the roller bolt.

TORQUE: 10 -14 Nm

Route the carburetor drain tube properly.

Install the cylinder head.



CLUTCH/GEARSHIFT LINKAGE

SERVICE INFORMATION

GENERAL

This section covers removal, installation and servicing of the clutch and gearshift linkage with the right crankcase cover removed.

All these operations can be accomplished with the engine in the frame. When the existing clutch discs are replaced, coat new discs with clean engine oil prior to assembly.

See section for oil pump Service.

SERVICE DATA Unit: mm

ITEM		STANDARD	SERVICE LIMIT
Clutch	Spring free length	19.8	17.5
	Plate warpage	—	0.2
	Disc thickness	2.52-2.68	2.3
	Clutch center guide O.D.	20.930-20.950	20.90
	Primary drive gear I.D.	21.000-21.021	21.05

TORQUE VALUES

Clutch lock nut	40-45 Nm
Shift drum stopper arm bolt	10 Nm
Shift drum stopper plate bolt	14-20 Nm
Crankcase cover bolt	8-12 Nm

TOOLS

Special

Clutch outer holder 07923-0340000

Common

Lock nut wrench, 20 x 24 mm

Extension bar

TROUBLESHOOTING

CLUTCH

Clutch slips when accelerating

- Incorrect clutch adjustment
- Discs worn
- Spring damaged

Motorcycle creeps with clutch disengaged

- Incorrect clutch adjustment
- Plate warped
- Faulty clutch lifter

GEARSHIFT LINKAGE

Hard to shift

- Damaged gearshift spindle
- Damaged stopper plate and pin
- Loose stopper plate bolt
- Incorrect clutch adjustment

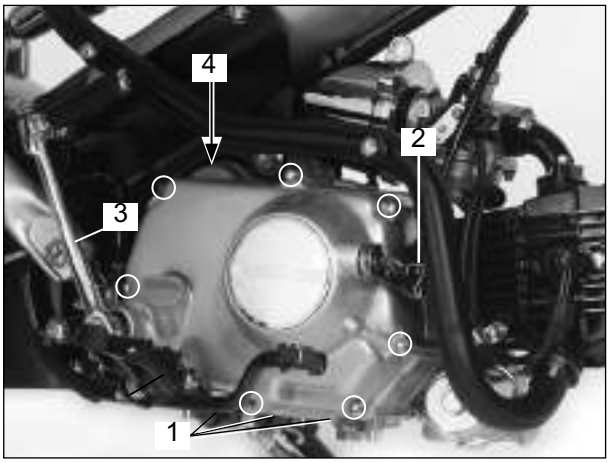
Transmission Jumps out of gear

- Damaged stopper arm
- Damaged stopper plate
- Loose stopper plate bolt

CLUTCH/GEARSHIFT LINKAGE

RIGHT CRANKCASE COVER REMOVAL

Drain the oil from the engine.
Support the motorcycle using a safety stands and remove the side stand with the footrest by removing the four bolts (1).

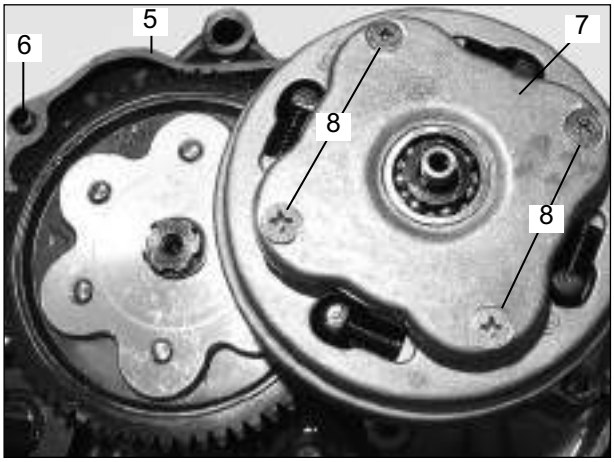


Disconnect the clutch pull cable (2).

Remove the kick starter pedal (3).

Remove eight screws and take off the right crankcase cover (4).

Remove the gasket (5) and two dowel pins (6).



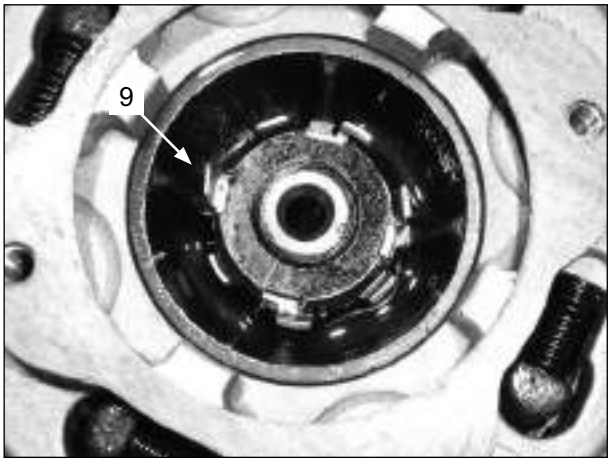
CLUTCH REMOVAL

Remove the clutch outer cover (7) by removing the four screws (8).

Straighten the lock washer tab (9).

Hold the clutch outer with a clutch holder.

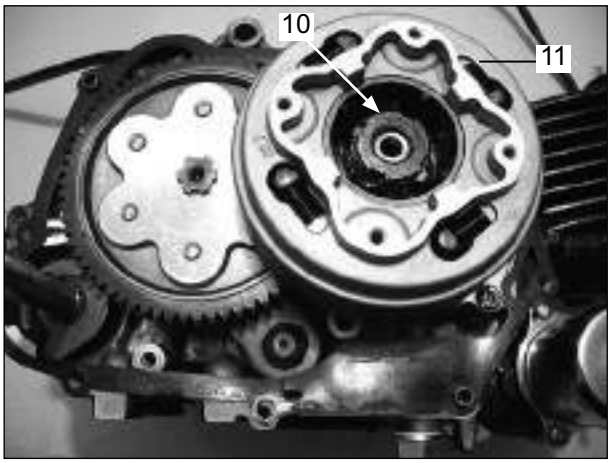
TOOL:
Crownnut wrench



Remove the lock nut (10) with a lock nut wrench and extension bar.

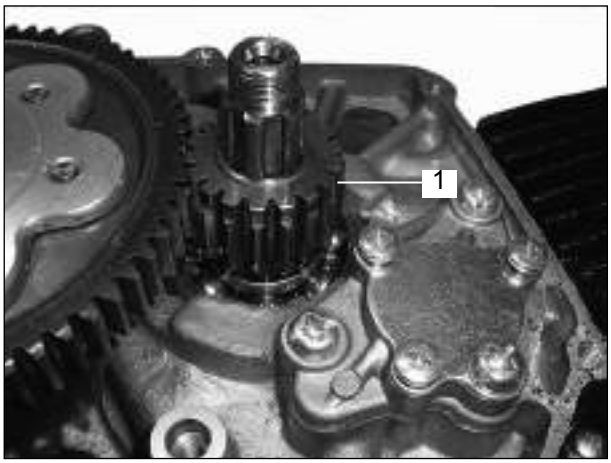
Remove the plain washer and lock washer.

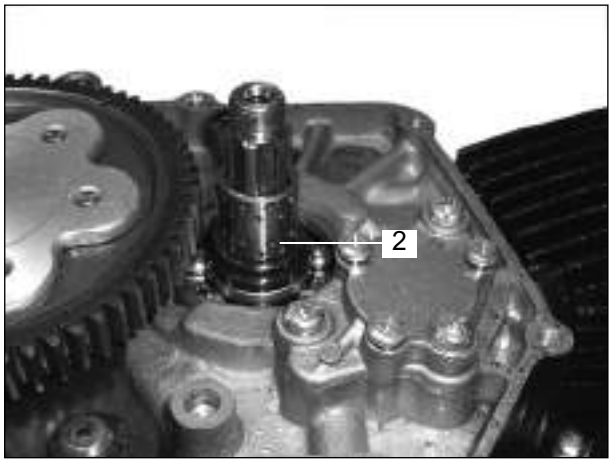
Remove the clutch assembly (11).



CLUTCH/GEARSHIFT LINKAGE

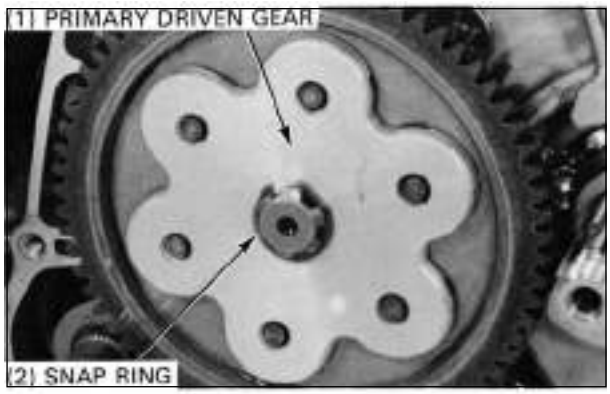
Remove the primary drive clutch (1) and clutch center guide (2).



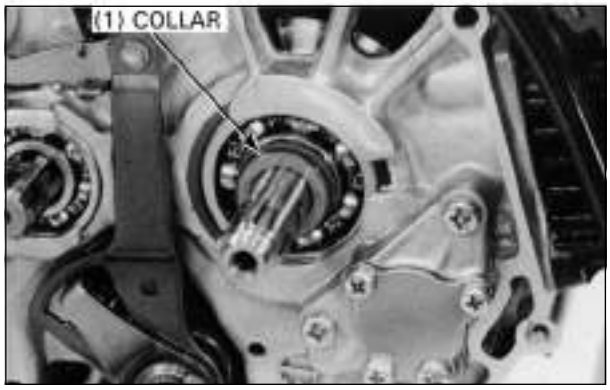


CLUTCH/GEARSHIFT LINKAGE

Remove the snap ring (2) and the primary driven gear (1).



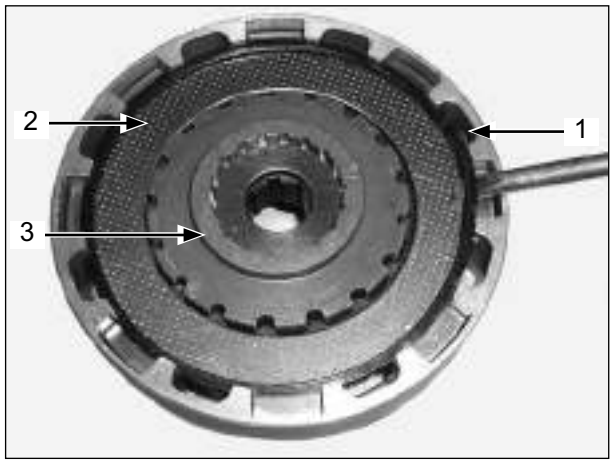
Remove the collar (3) from the crankshaft.



CLUTCH DISASSEMBLY

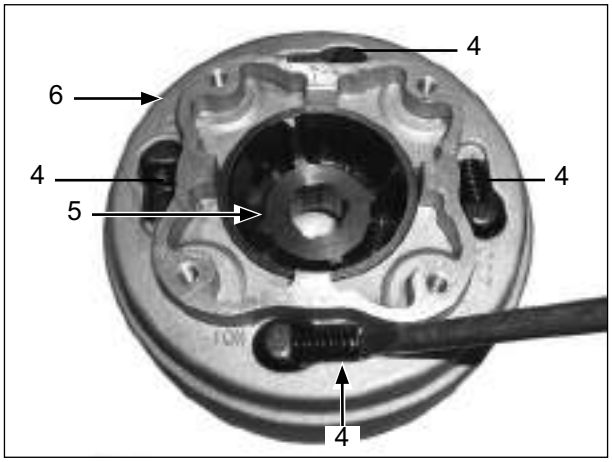
Remove the set ring (1).

Remove the clutch plates (2), friction discs and clutch center (3).



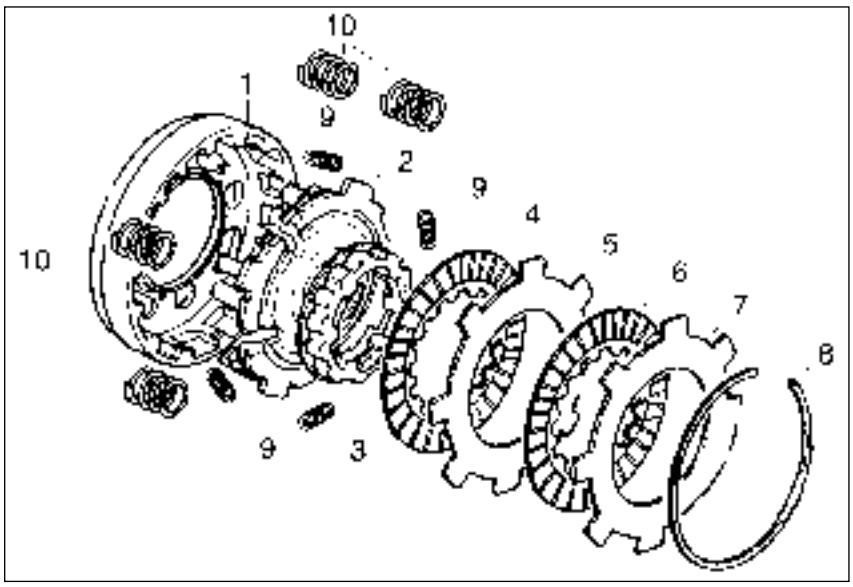
Remove the damper springs (4).

Separate the drive plate (5) and clutch springs from the clutch outer (6).



CLUTCH/GEARSHIFT LINKAGE

1	Clutch outer
2	Drive plate
3	Clutch center
4	Friction disc
5	Clutch plate
6	Friction disc
7	Clutch plate
8	Set spring
9	Damper spring
10	Clutch spring



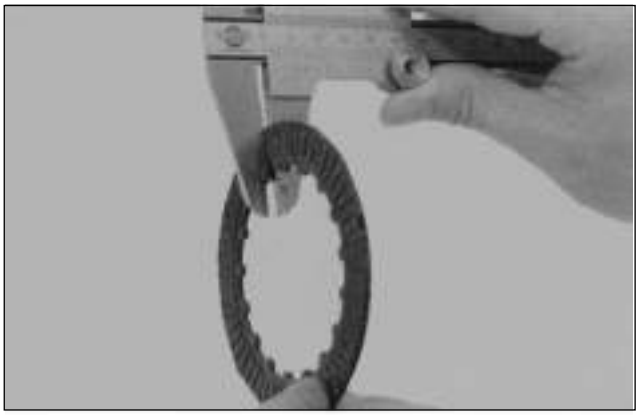
INSPECTION

Friction discs

Replace the friction discs if they show signs of scoring or discoloration.

Measure each friction disc thickness.

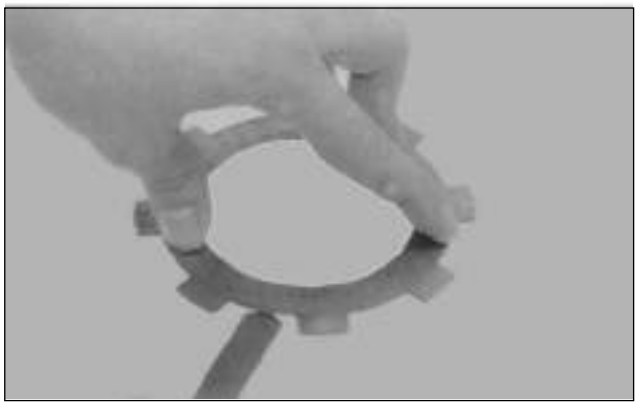
SERVICE LIMITS:
Discs 4 and 6: 2.3 mm



Clutch plates

Check the plates for warpage on a surface plate, using a feeler gauge.

SERVICE LIMIT:
Plate 5 and 7: 0.2 mm



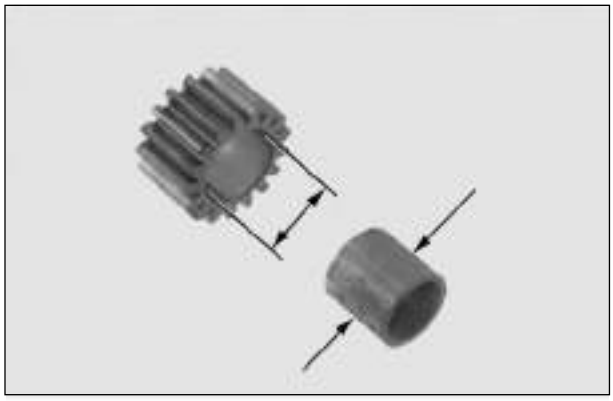
CLUTCH/GEARSHIFT LINKAGE

Primary Drive Gear/Center Guide

Check the primary drive gear and the center guide for wear or damage.

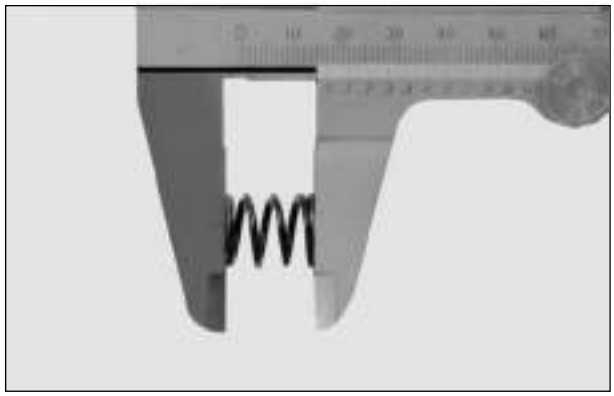
Inspect the primary drive gear I.D. and the center guide O.D.

SERVICE LIMITS:
Primary drive gear I.D.: 21.05 mm
Center guide O.D.: 20.90 mm



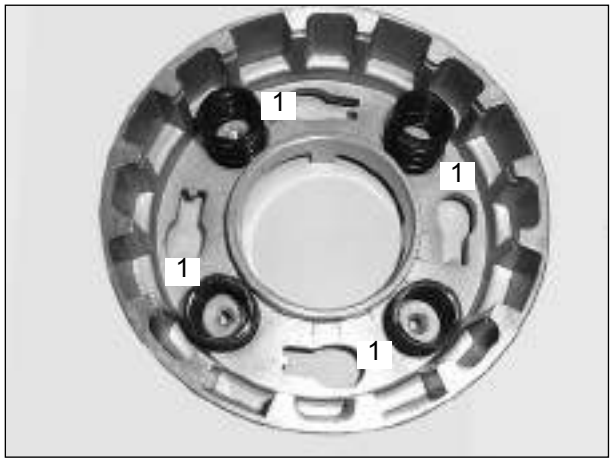
Clutch Spring
Measure each clutch spring free length.

SERVICE LIMIT: 17.5 mm



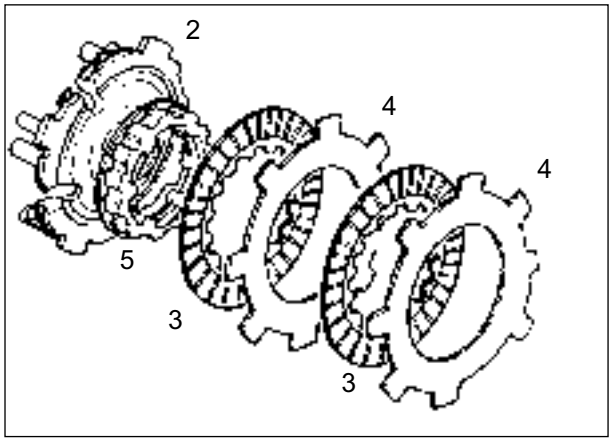
CLUTCH ASSEMBLY

Install the four clutch springs (1) on the clutch outer.



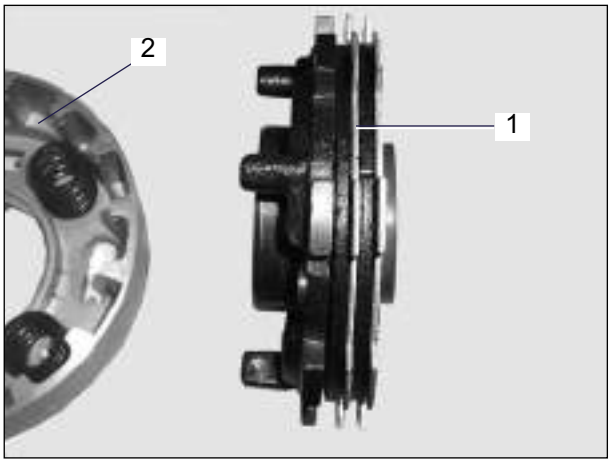
NOTE
Coat the clutch discs with lightweight engine oil before assembling.

Assemble the drive plate (2) with the friction discs (3), clutch plates (4) and the clutch center (5).

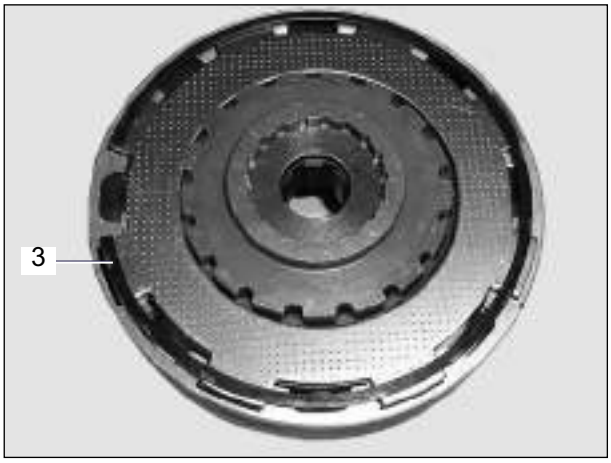


CLUTCH/GEARSHIFT LINKAGE

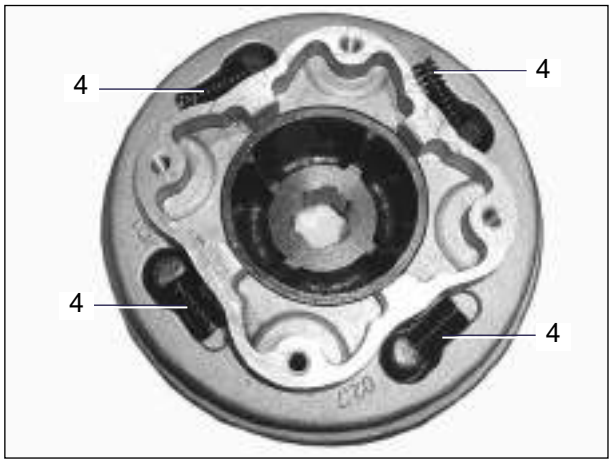
Install the assembly (1) into the clutch outer (2).



Install the set ring (3).



Install the clutch damper springs (4).

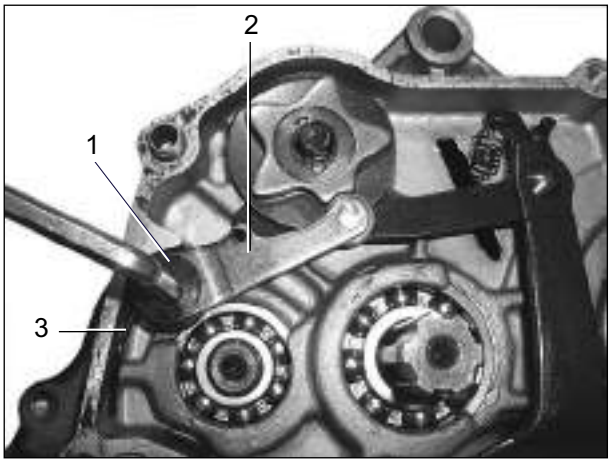


CLUTCH/GEARSHIFT LINKAGE

GEARSHIFT LINKAGE

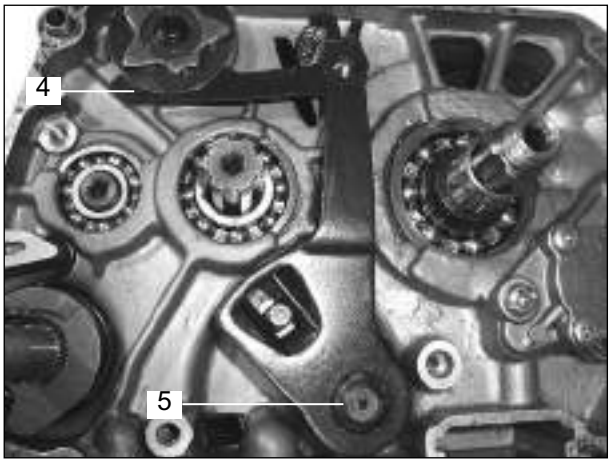
DISASSEMBLY

Remove the bolt (1), drum Stopper arm (2) and spring (3).

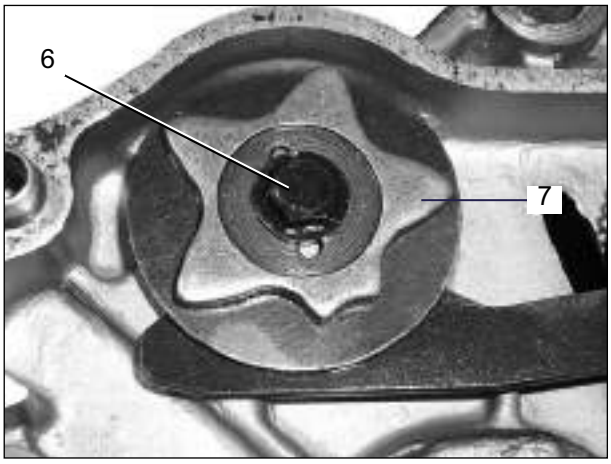


Remove the gearshift pedal.

Hold the gearshift spindle claw (4) down and pull out the gearshift spindle (5).



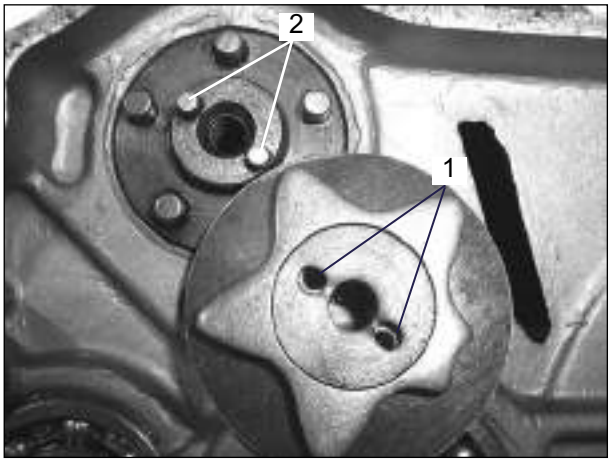
Remove the stopper plate bolt (6) and the plate (7).



ASSEMBLY

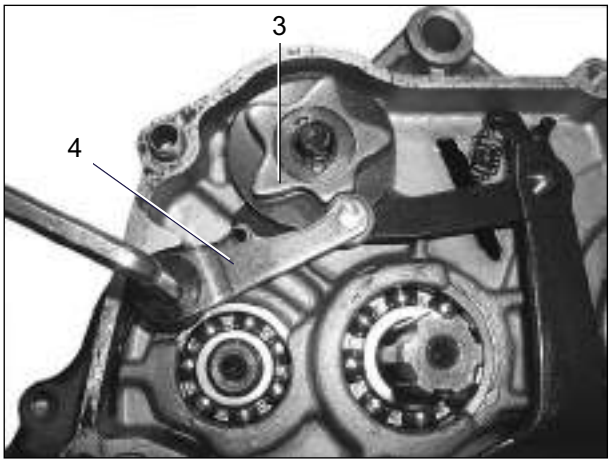
Install the gearshift linkage in the reverse order of removal.

NOTE
Align the holes (1) in the stopper plate with the dowel pins (2).



CLUTCH/GEARSHIFT LINKAGE

Install the gearshift spindle (3) and stopper arm (4).

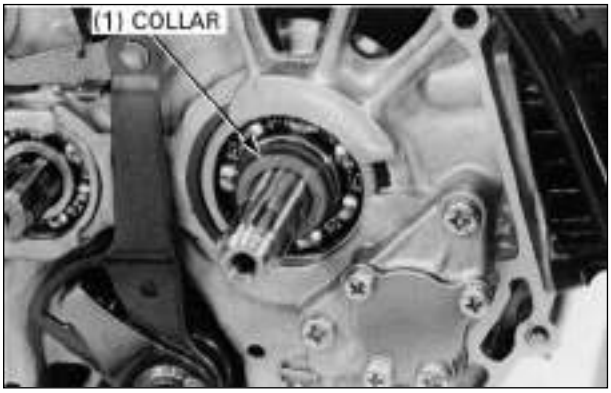


TORQUE:

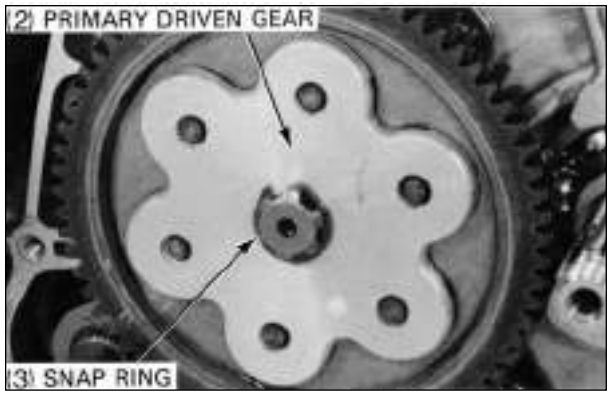
Stopper arm bolt	**10 Nm**
Stopper plate bolt	**17 Nm**

CLUTCH INSTALLATION

Install the collar (1) onto the crankshaft.

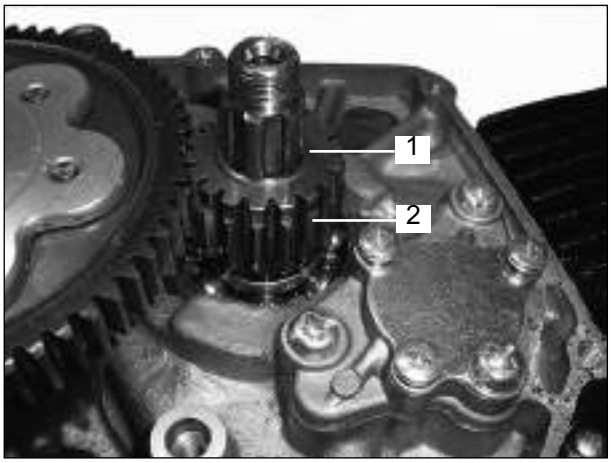


Install the primary driven gear (2) and secure it with the snap ring (3).

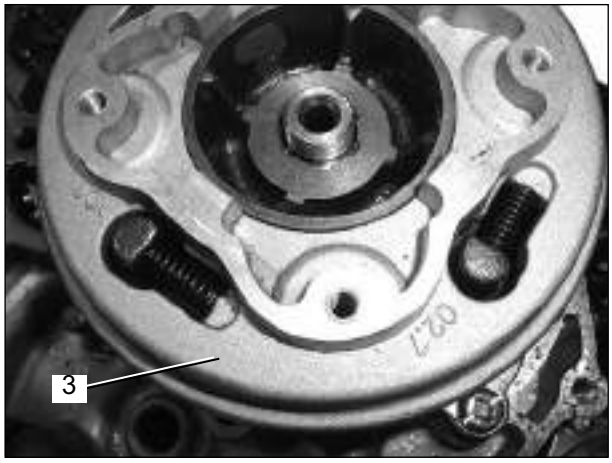


CLUTCH/GEARSHIFT LINKAGE

Install the clutch center guide (1) and primary drive gear (2) onto the crankshaft.

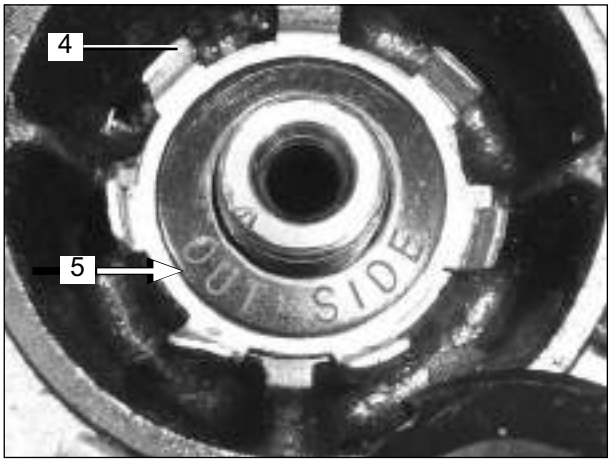


Install the clutch assembly (3).



NOTE
Install a new lock washer (4).

Install the plain washer (5) with the "OUTSIDE" mark facing out.



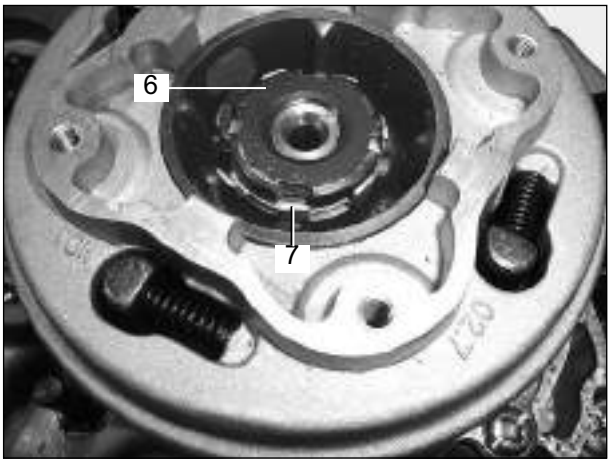
Hold the clutch outer with the clutch outer holder.

Tighten the lock nut (6) with the lock nut wrench and extension bar.

TOOL:
Crownnut wrench

TORQUE: 40-45 Nm

Bend the tab (7) of the lock washer up against the groove in the lock nut.

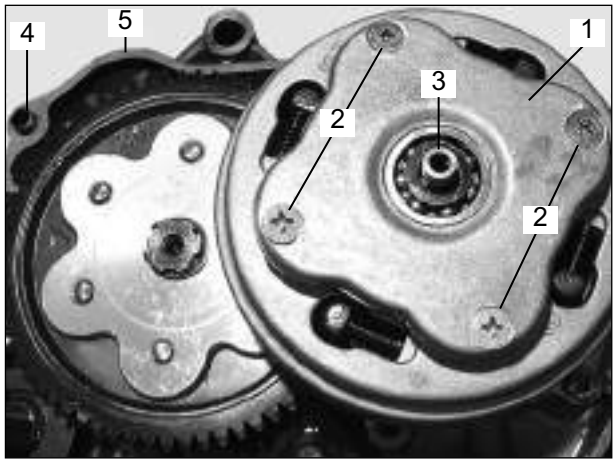


CLUTCH/GEARSHIFT LINKAGE

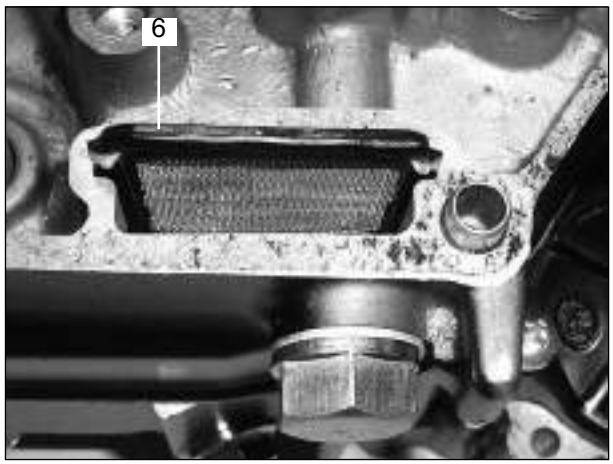
Install a new gasket for the clutch outer cover (1) and tighten them with four screws (2).

Install the bushing (3) with the spring.

Set in the two dowel pins (4) into the crankcase and use a new gasket (5).



Clean the oil filter screen (6) and install into the crankcase.

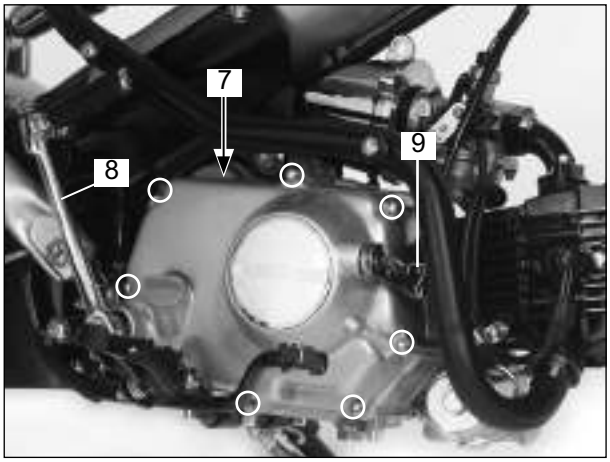


RIGHT CRANKCASE COVER INSTALLATION

Install the crankcase cover (7) using eight bolts.

Install the kick starter pedal (8) and connect the clutch pull cable (9).

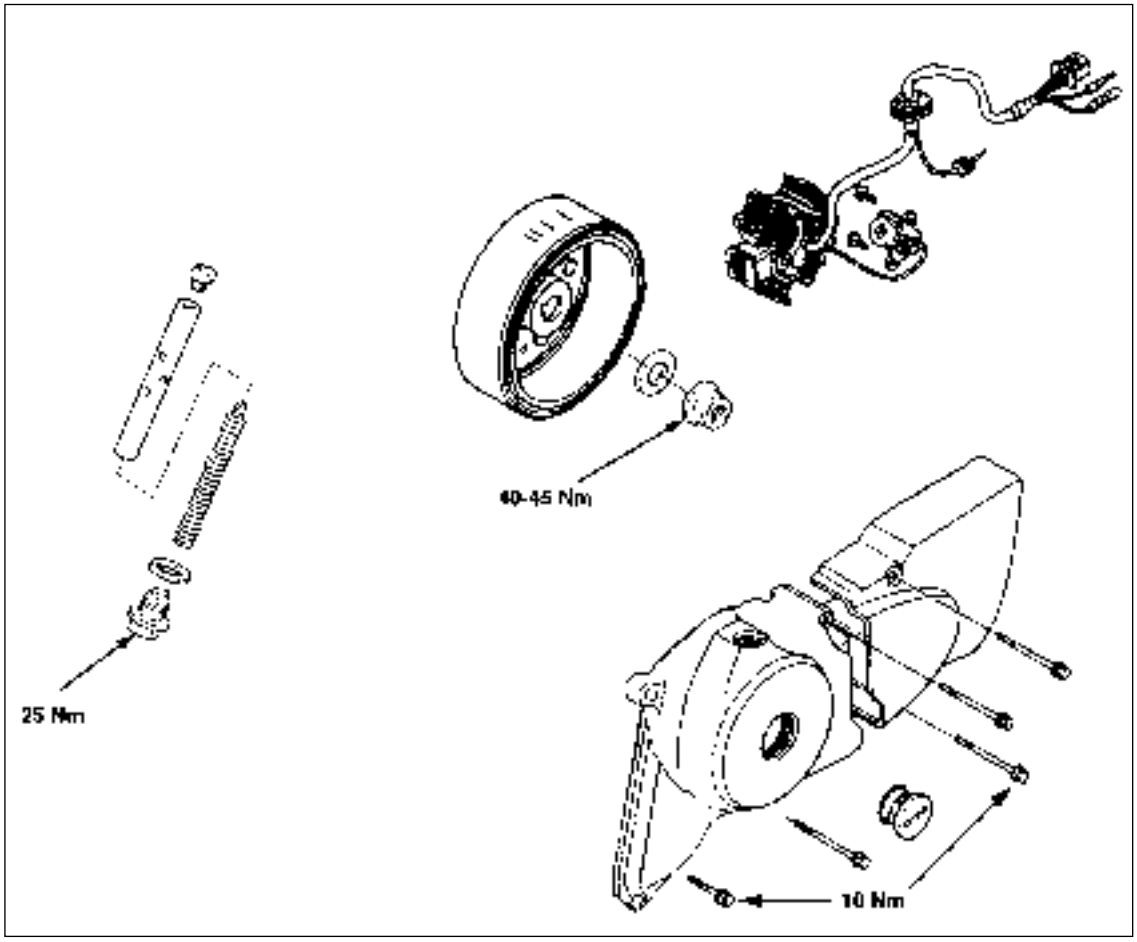
Adjust the clutch.



Fill up crankcase with engine oil.

SAE 15 W 40 engine oil API (SG or higher)
0.8 lit.

ALTERNATOR / CAM CHAIN TENSIONER



SERVICE INFORMATION

GENERAL

This section contains information for the removal and Installation of the alternator and cam chain tensioner.
These operations can be accomplished with the engine in the frame after removing the left crankcase cover.
For alternator inspection and troubleshooting, refer to sections 13 and 14.

SERVICE DATA Unit: mm

ITEM		STANDARD	SERVICE LIMIT
Cam chain tensioner	Tensioner spring free length	111.0	106.0
	Push rod 0. D.	11.985-12.000	11.94

TORQUE VALUES

Flywheel nut	40-45 Nm
Sealing bolt	25 Nm
Left crankcase cover bolt	10 Nm

TOOLS
Common
Universal holder
Flywheel puller

TROUBLESHOOTING

Excessive cam chain slack
Worn or damaged tensioner spring
Faulty push rod (clogged one-way valve)
Damaged cam chain tensioner

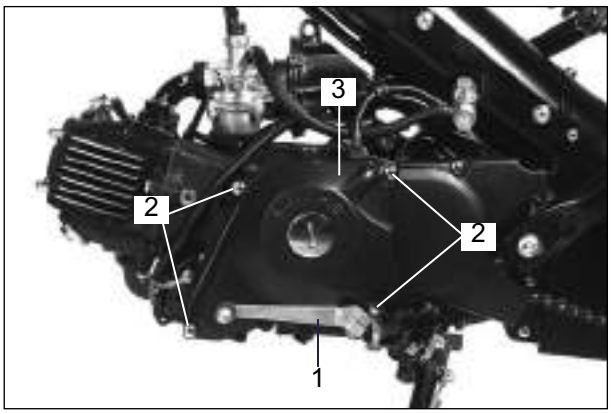
Cam chain noise
Worn or damaged tensioner spring
Faulty push rod (clogged one-way valve)
Damaged cam chain tensioner
Air in tensioner chamber
Sticking push rod

ALTERNATOR / CAM CHAIN TENSIONER

ALTERNATOR REMOVAL

Remove the gearshift pedal (1).

Reinstall four bolts (2) and remove the left crankcase cover (3).



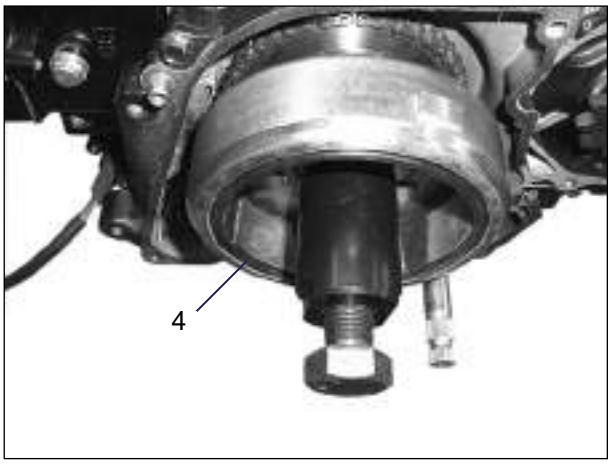
FLYWHEEL REMOVAL

Hold the flywheel (4) with the universal holder and remove the 10 mm nut.

TOOL:
Universal holder
Flywheel puller M28x1

Remove the flywheel using the flywheel puller.

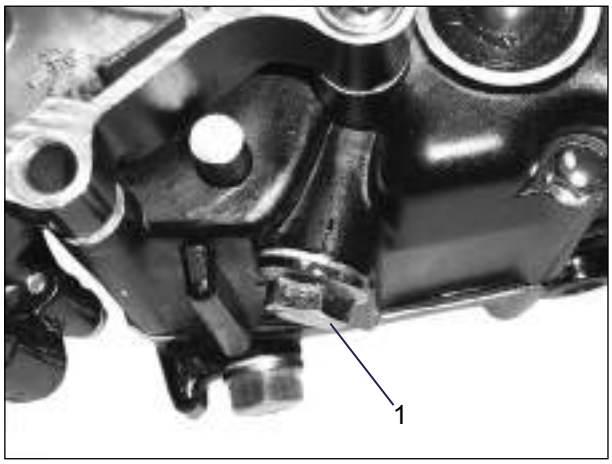
Remove the woodruff key from the crankshaft.



CAM CHAIN TENSIONER

INSPECTION

Remove bolt (1).



Measure the spring free length.

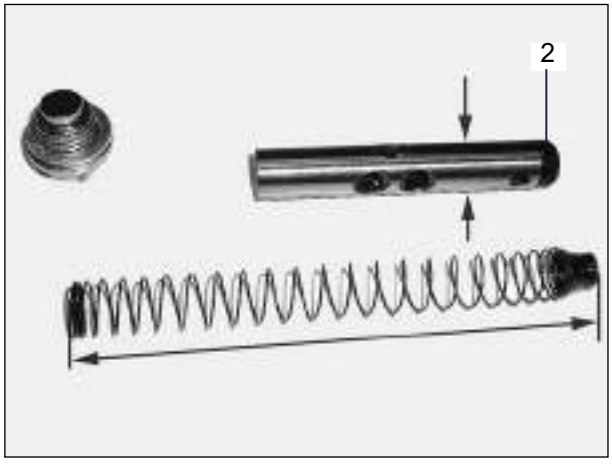
Service limit: 106 mm

Check the sealing washer (2) and replace if it appears worn.

Check the push rod for wear or scratches and the valve holes for clogging.

Measure the push rod O.D.

Service limit: 11.94 mm



INSTALLATION

Assembly takes place in reserve order of removal.

Torque bolt (1): 25 Nm

TRANSMISSION / CRANKSHAF T/ KICK STARTER

SERVICE INFORMATION

GENERAL
The crankcase must be separated to Service the components covered in this section.
The following parts/systems must be removed before the crankcase can be separated:

- Engine removal
- Cylinder head
- Cylinder/piston
- Clutch/gearshift linkage
- Alternator/cam chain tensioner
- Oil pump

SERVICE DATA Unit: mm

ITEM			STANDARD	SERVICE LIMIT
Crankshaft	Connecting rod small end I.D.		13.016-13.043	13.06
	Connecting rod big end clearance	Axial	0.100-0.350	0.60
		Radial	0-0.012	0.05
	Runout		—	0.10
Transmission	Mainshaft O.D.	M2	16.983-16.994	16.94
	Countershaft O.D.	C1	19.959-19.980	19.94
	Gearshift fork	I.D.	34.000 34.025	34.14
		Claw thickness	4.86-4.94	4.60
	Gearshift drum O.D.		33.950-33.975	33.93

TORQUE VALUE
Shift drum bolt 12 Nm

TOOLS
Special
Universal bearing puller

Common
Inner driver
Attachment, 20 mm
Driver
Attachment, 37 x 40 mm
Pilot, 17 mm

TROUBLESHOOTING

Hard to shift
- Incorrect clutch adjustment
- Bent gearshift fork
- Worn gear dogs
- Damaged gearshift drum groove
- Damaged guide pin

Transmission Jumps out of gear
- Worn gear dogs
- Bent gearshift fork
- Damaged gearshift drum stopper

Engine noise
- Worn main Journal bearing
- Worn crankpin bearing
- Worn piston pin
- Worn piston pin bore

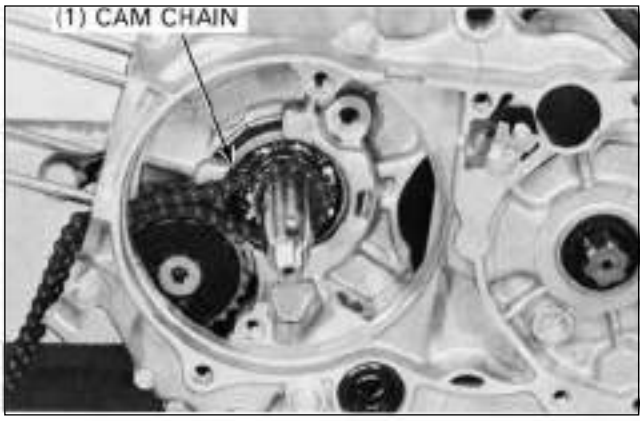
Transmission noise
- Worn gears
- Damaged or worn mainshaft and/or countershaft

TRANSMISSION / CRANKSHAFT / KICK STARTER

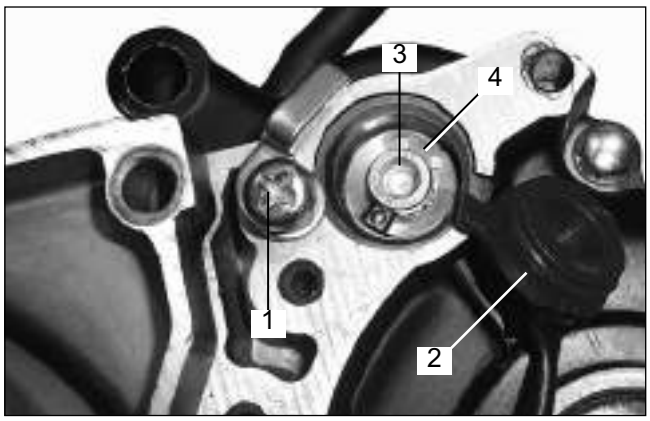
CRANKCASE SEPARATION

Remove the required parts.

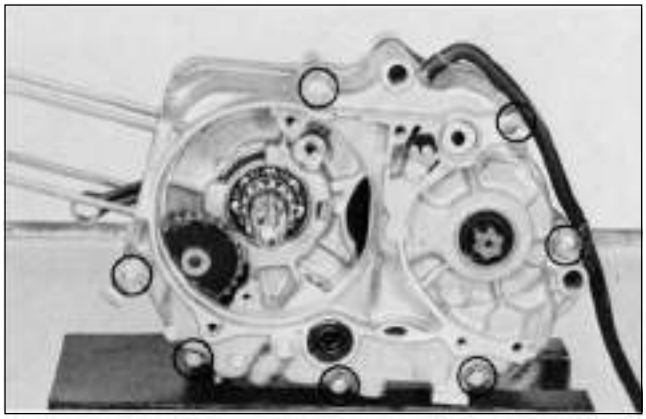
Remove the cam chain.



Loosen the screw (1), remove the rubber cap (2), gearshift drum bolt (3) and moving contact (4).



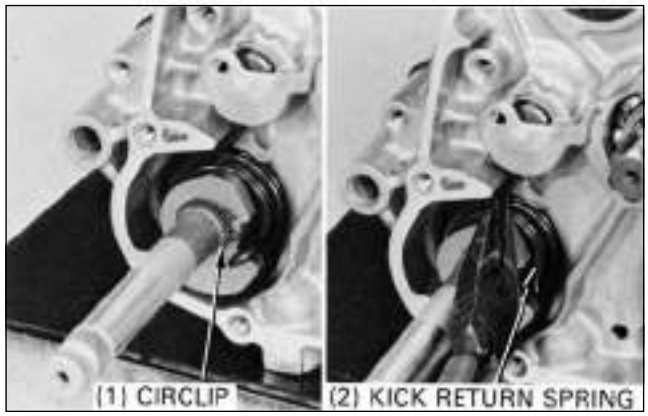
Remove the crankcase bolts.



Place the crankcase on the work bench.

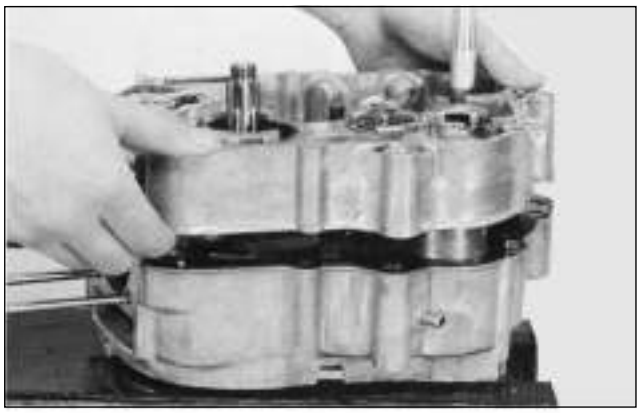
Pry out the circlip on the kick starter spindle.

Remove the kick return spring and spring retainer.

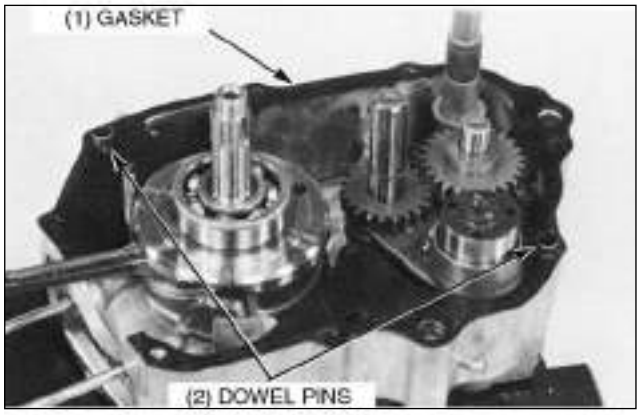


TRANSMISSION / CRANKSHAFT / KICK STARTER

Separate the right crankcase from the left crankcase.

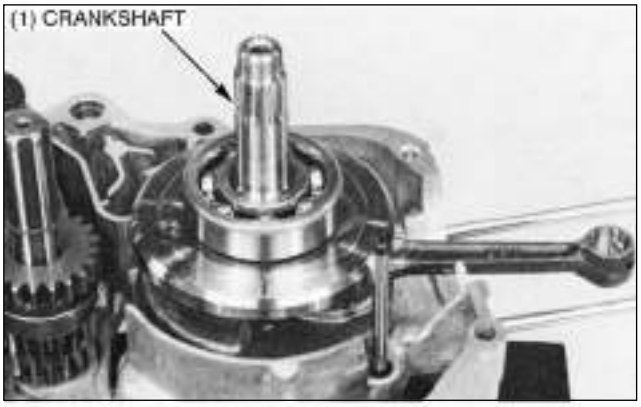


Remove the gasket and dowel pins.



CRANKSHAFT INSPECTION

Remove the crankshaft from the left crankcase.



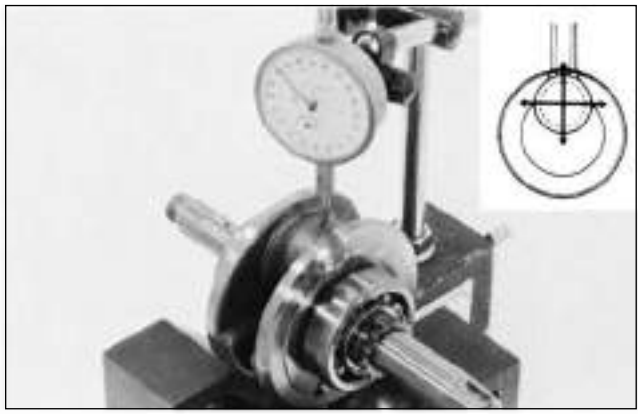
Measure the connecting rod big end side clearance.

SERVICE LIMIT: 0.60 mm (0.024 in)

TRANSMISSION / CRANKSHAF T/ KICK STARTER

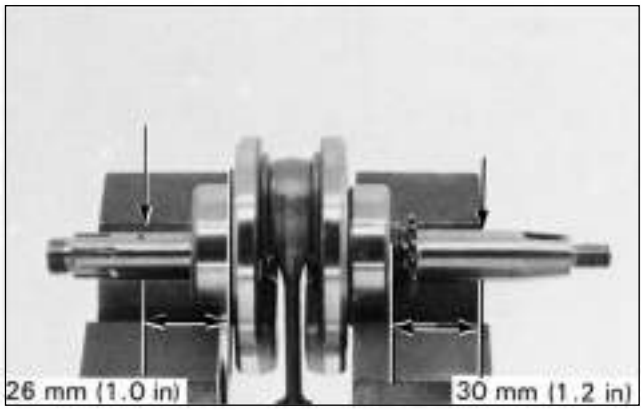
Measure the connecting rod big end radial clearance at two different points across from each other as shown.

SERVICE LIMIT: 0.05 mm (0.002 in)

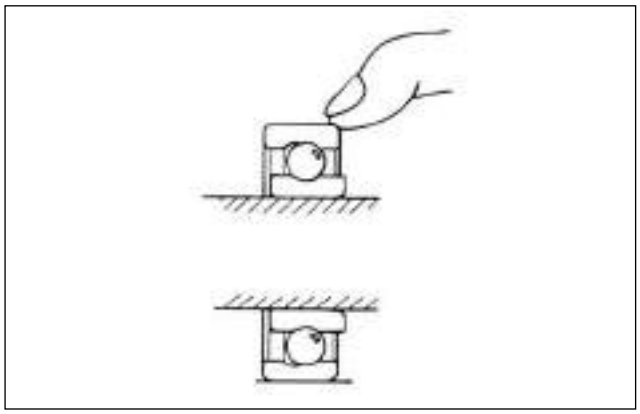


Place the crankshaft on a stand or V-blocks and measure the runout using a dial indicator.

SERVICE LIMIT: 0.10 mm (0.004 in)



Turn the outer race of the crankshaft bearing with finger.
The outer race should turn smoothly and quietly.
Also check that the bearing inner race fits tightly on the crankshaft.
Replace the crankshaft bearing if the outer race does not turn smoothly, quietly, or if it fits loosely on the crankshaft.

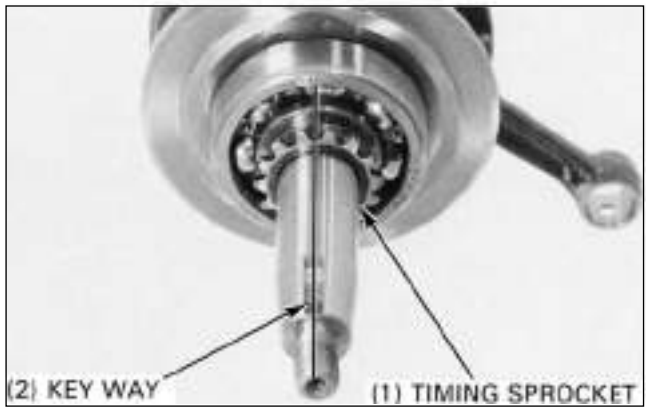


TIMING SPROCKET REPLACEMENT

Carefully inspect the timing sprocket teeth for wear or damage. If necessary, remove the damaged sprocket from the crankshaft.

Align any center between the teeth of a new sprocket with the key way on the crankshaft and drive the sprocket onto the shaft.

TOOLS:
Inner driver
Attachment, 20 mm

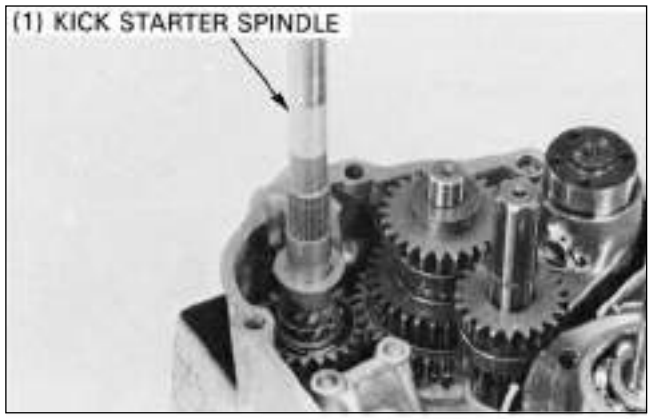


TRANSMISSION / CRANKSHAFT / KICK STARTER

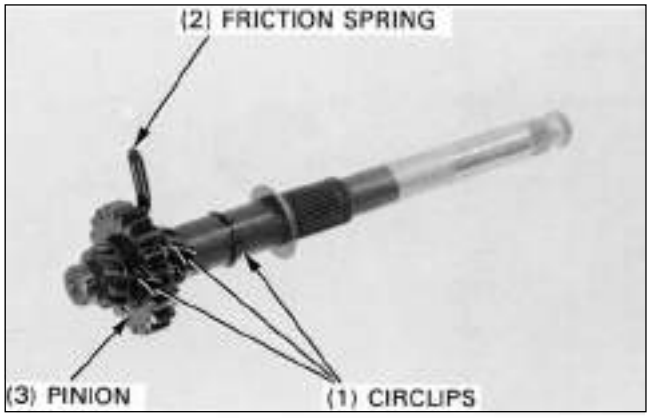
KICK STARTER

DISASSEMBLY/ REASSEMBLY

Remove the kick starter from the left crankcase.

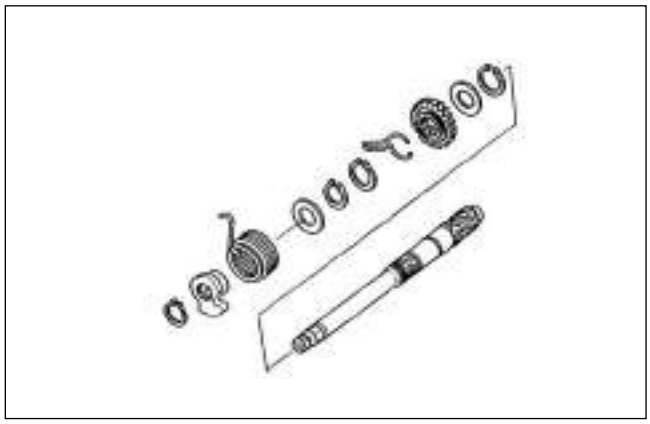


Remove the circlips and remove the kick starter pinion and friction spring.

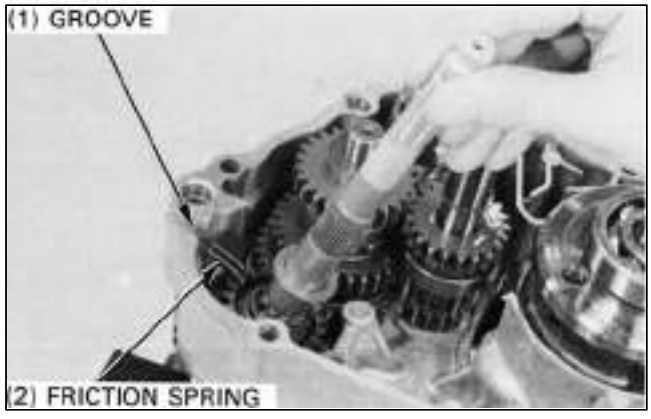


Check the disassembled parts for damage and excessive wear and replace them if necessary.

Assemble the kick starter as shown.



Install the kick starter assembly into the left crankcase by aligning the friction spring with the groove in the crankcase as shown.



TRANSMISSION / CRANKSHAFT / KICK STARTER

TRANSMISSION DISASSEMBLY

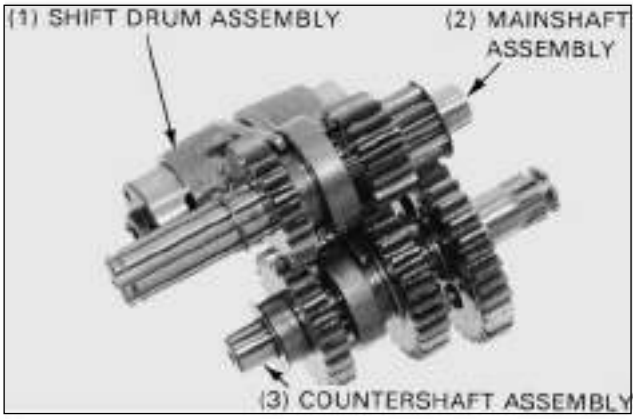
Separate crankcase.

Remove the kick starter.

Remove the transmission and shift drum as an assembly.

Separate the shift drum assembly from the transmission gears.

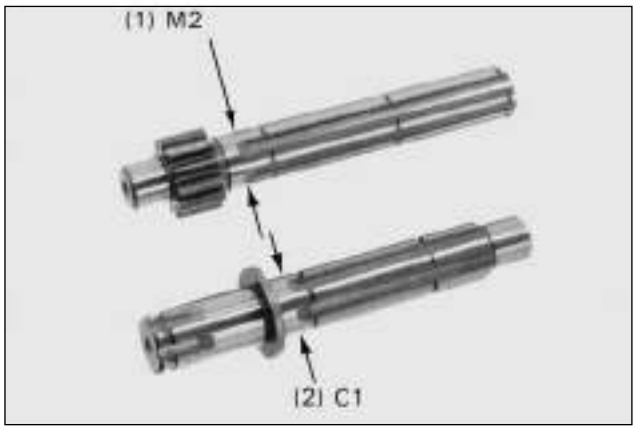
Remove the gears from the mainshaft and countershaft.



INSPECTION

Measure the mainshaft and countershaft O.D.

SERVICE LIMITS:
M2: 16.95 mm (0.667 in)
C1: 16.94 mm (0.667 in)



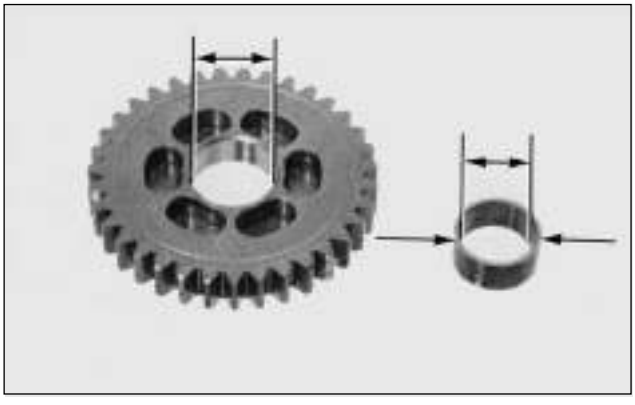
Check each gear for wear or damage.

Measure the gear I.D.

SERVICE LIMITS:
M2: 17.10 mm (0.673 in)
C1: 20.10 mm (0.791 in)
C3: 17.10 mm (0.673 in)

Measure the I.D. and O.D. of the C1 gear bushing.

SERVICE LIMITS:
I.D.: 17.08 mm (0.672 in)
O.D.: 19.93 mm (0.785 in)



TRANSMISSION / CRANKSHAFT / KICK STARTER

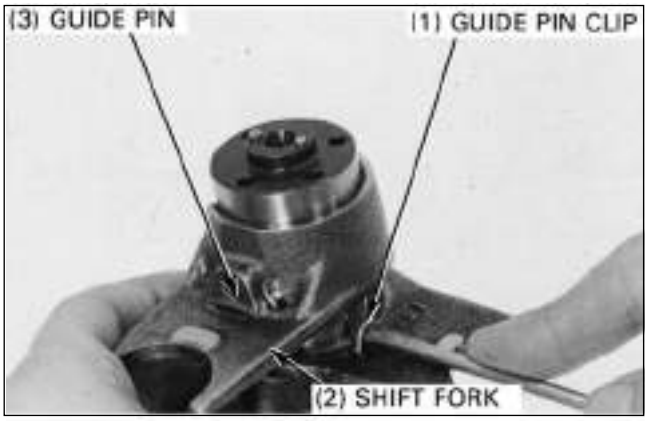
SHIFT DRUM/ FORK DISASSEMBLY

Pull out the guide pin clips and the shift fork guide pins.

Remove the shift forks from the shift drum.

NOTE
Mark the right and left shift forks to ensure correct assembly.

Straighten the tab and remove the neutral switch rotor.



INSPECTION

Check the gearshift drum for wear or damage.

Measure the gearshift drum O.D.

SERVICE LIMIT: 33.93 mm (1.336 in)

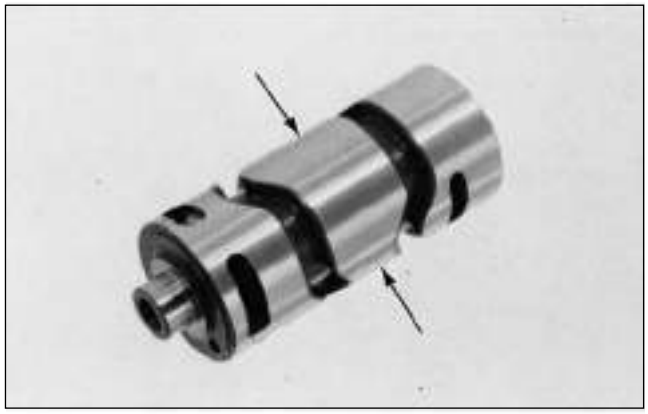
Check the guide pins and shift forks for wear or damage.

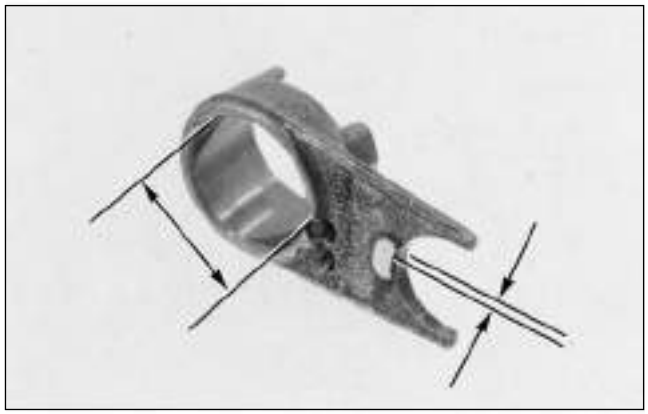
Measure the shift fork I.D.

SERVICE LIMIT: 34.14 mm (1.344 in)

Measure the shift fork claw thickness.

SERVICE LIMIT: 4.60 mm (0.181 in)

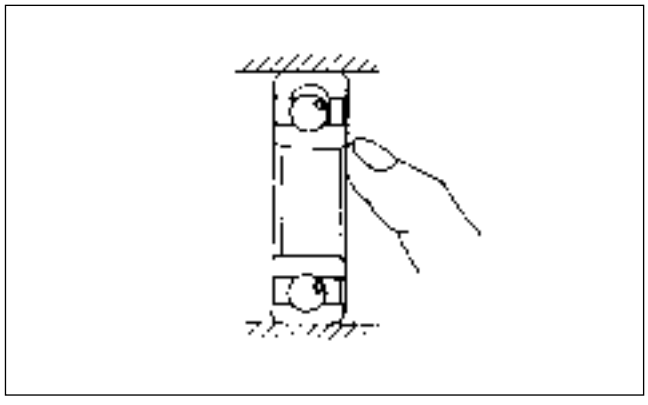




TRANSMISSION BEARING INSPECTION

Turn the races of each bearing with your finger.
The bearing should turn smoothly and quietly.
Also check that the bearing outer race fits tightly in the crankcase.

Remove and discard the bearing if the races do not turn smoothly, quietly, or if they fit loosely in the crankcase.



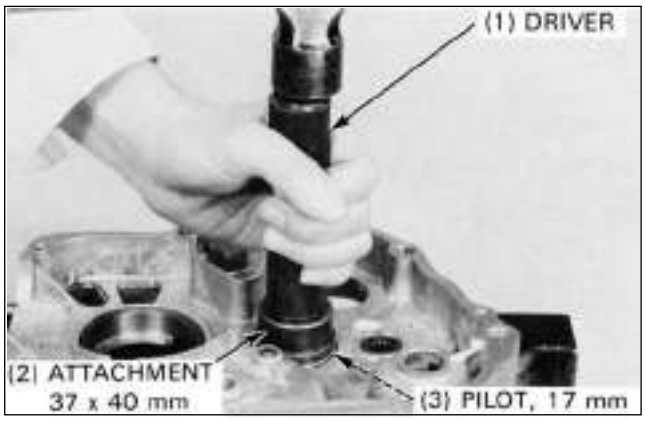
TRANSMISSION / CRANKSHAFT / KICK STARTER

CRANKCASE BEARING REPLACEMENT

Right Crankcase
Drive out the mainshaft bearing from the outside.

Drive a new bearing into the place.

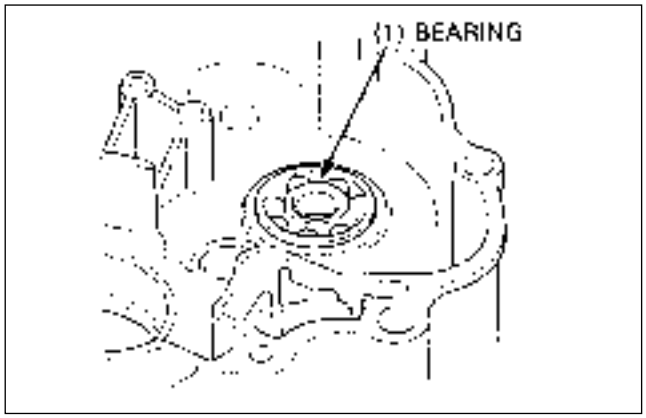
TOOLS:
Driver
Attachment, 37 x 40 mm
Pilot, 17 mm



Left Crankcase
Remove the oil seal and drive out the countershaft bearing.

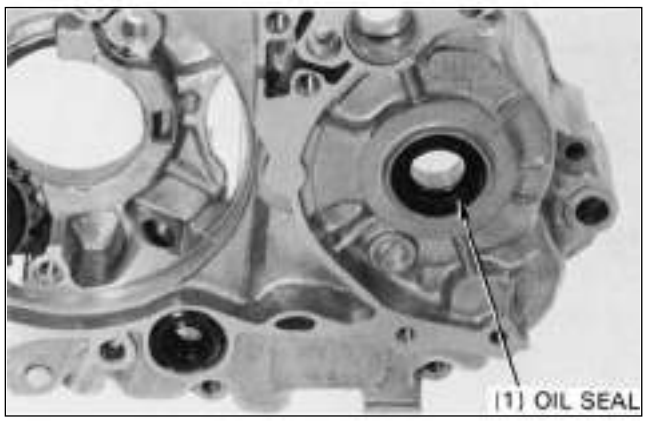
Drive a new bearing into the left crankcase.

TOOLS:
Driver
Attachment, 37 x 40 mm
Pilot, 17 mm



Apply grease to the lip of a new oil seal and install it in the crankcase.

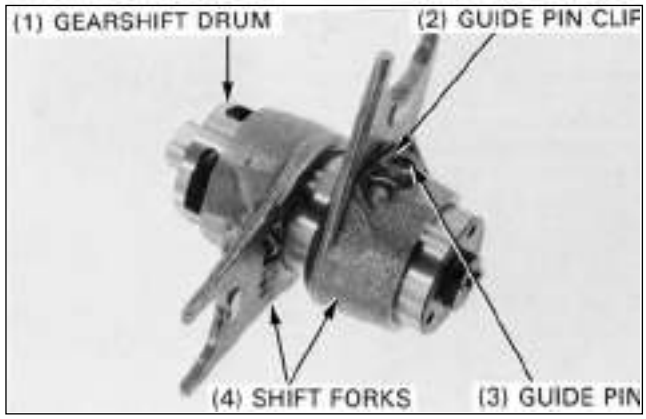
NOTE
Align the top of the oil seal with the crankcase. Do not allow the seal to contact the bearing.



TRANSMISSION ASSEMBLY

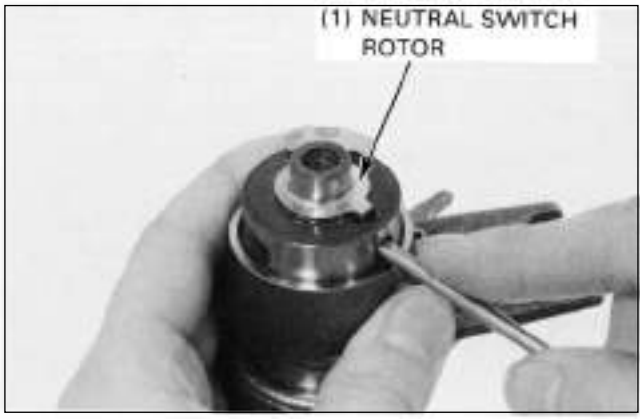
Install the right and left shift forks onto the gearshift drum.

Insert the guide pins and guide pin clips.



TRANSMISSION / CRANKSHAFT / KICK STARTER

Install the neutral switch rotor into the shift drum and bend the tab to lock the switch rotor.

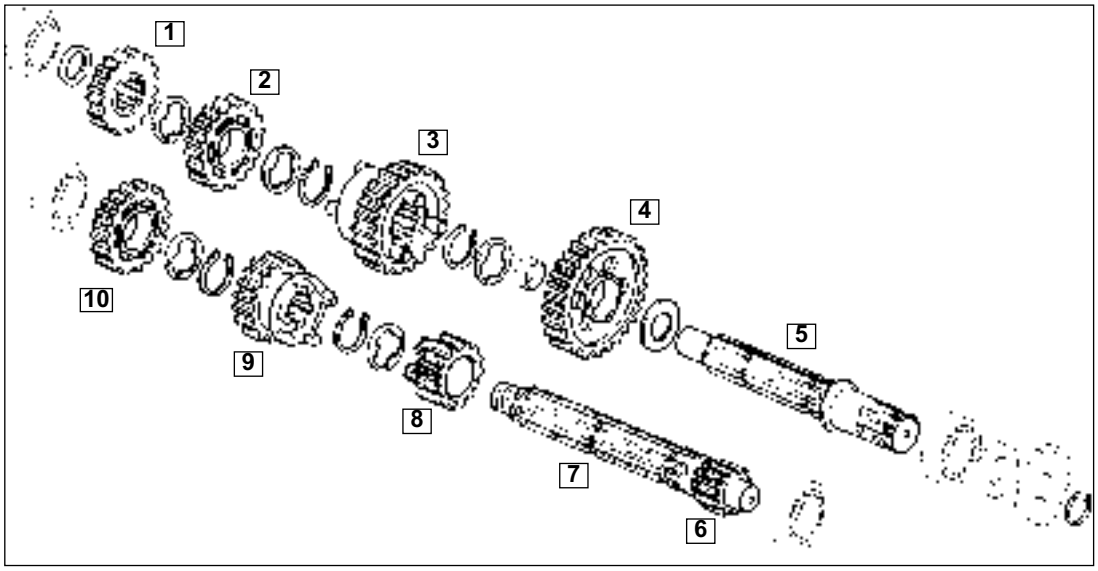


Coat the gears and shafts with clean engine oil.

Assemble the countershaft and mainshaft.

NOTE
Set the circlip in the groove properly.

1	24 Teeth
2	27 Teeth
3	31 Teeth
4	36 Teeth
5	Countershaft
6	11 Teeth
7	Mainschaft
8	16 Teeth
9	20 Teeth
10	23 Teeth



Assemble the shift drum, countershaft and mainshaft assemblies.

Install the transmission assembly in the left crankcase as a set.

Turn the mainshaft and make sure that the transmission works properly.

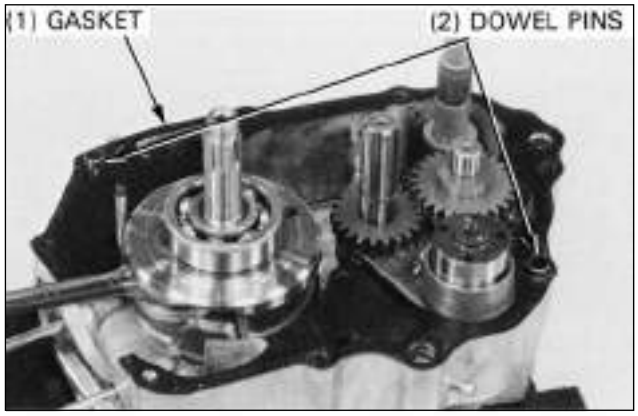
TRANSMISSION / CRANKSHAFT / KICK STARTER

CRANKCASE ASSEMBLY

Install the kick starter.

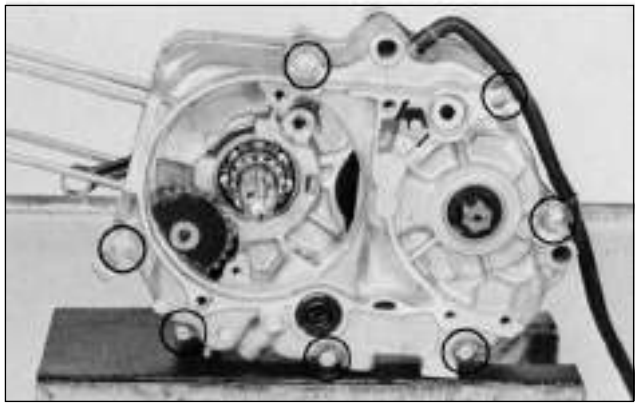
Install the crankshaft.

Install the dowel pins and a new gasket.



Install the right crankcase on the left crankcase.

Tighten the crankcase bolts securely in a crisscross pattern in two or more steps.



Install the moving contact (1) and shift drum bolt (2).

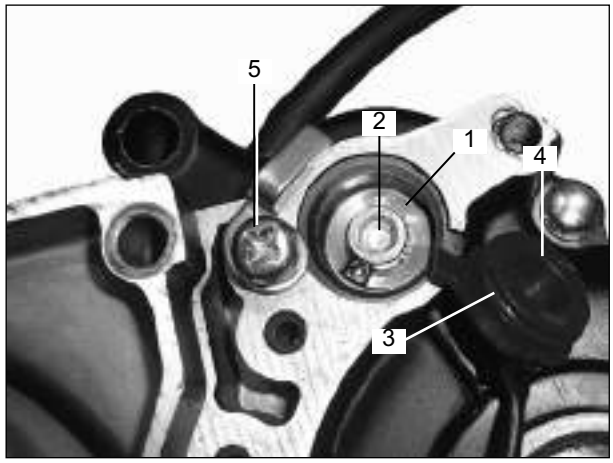
Tighten the bolt.

TORQUE: 12 Nm

Check the O-ring (3) and replace if necessary.

Install the neutral switch (4) carefully and fix with the plate and screw (5).

TORQUE: 10 Nm

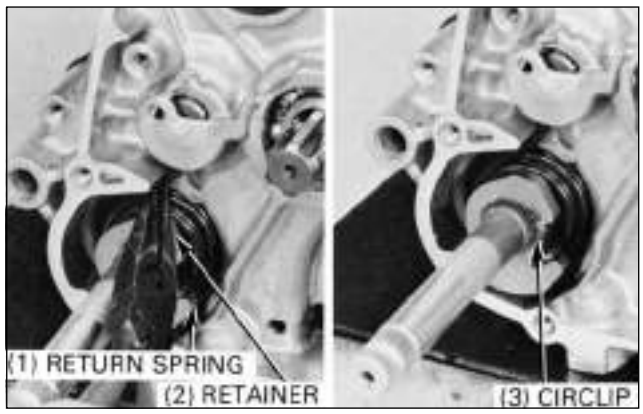


Install the kick starter spring and spring retainer onto the kick spindle.

Hook the return spring to the right crankcase as shown.

Install the circlip onto the kick spindle.

Reassemble the removed parts in the reverse order of removal.



ELECTRICAL SYSTEM

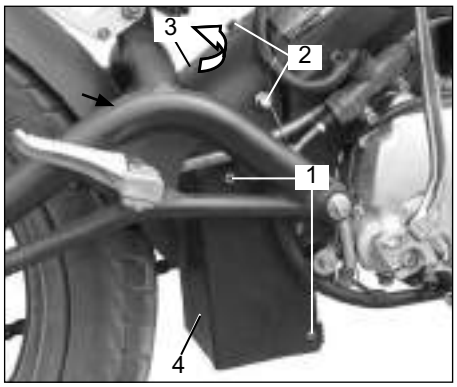
FUSE

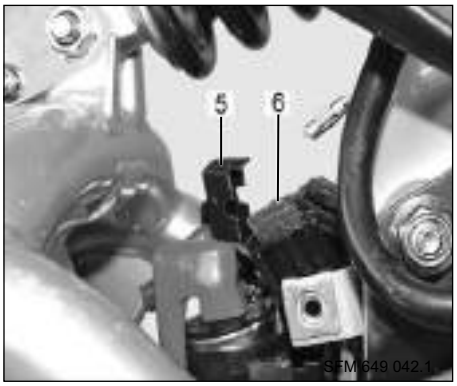
CAUTION
Never install a fuse with a larger rating, doing so could destroy the entire electrical system.

The fuse is located behind the battery upper cover (3).

Replace fuse

- Unscrew four screws (1) on the left and right side of the lower cover (4) and pull it off downward.
- Unscrew three screws (2) and lift off the upper cover (3) to the left side.
- Open the fuse case cap (5).
- A faulty or blown fuse (6) must be replaced by a new one with a rating of 15 A.
- Install to take place in reverce order.





ELECTRICAL SYSTEM

BATTERY

WARNING
Always wear safety glasses.
Keep children away from acids and batteries.

EXPLOSION DANGER
A battery being charged produces a highly explosive gas, which is why fire, sparks, naked flames and smoking are prohibited.

FIRE HAZARD
Avoid generating sparks and electrostatic discharges when handling cables and electrical devices.
Avoid short circuits.

DANGER - CAUSTIC ACTION
Battery acid is highly caustic, so always wear safety gloves and glasses.
Do not tilt the battery as acid can leak from the ventilation openings.

FIRST AID
If acid comes into contact with an eye, immediately flush the eye for several minutes with fresh water. Then immediately visit / call a doctor.
Acid on the skin or clothing must immediately be neutralised using acid converter or soap suds, and the spots must be flushed with plenty of water.
If acid is swallowed, immediately visit / call a doctor.

CAUTION
Do not expose batteries to direct sunlight. Discharged batteries can freeze, so they must be stored in a place where the temperature remains above 0 °C.
Professional maintenance, charging and storage will increase the lifespan of the battery and are a condition for the honouring of guarantee claims.

DISPOSAL
Take a dead battery to a collection point. Never dispose of one with household refuse.

Charging the battery

After a long lay-up (3-4 months), charge the battery. The charging current (in amperes) must not exceed 1/10th of the battery capacity (Ah). The battery must not be fast-charged. The battery may only be charged using a special charger approved for MF batteries.

Maintenance

Although the battery is maintenance-free. Never leave the battery discharged. Keep the battery clean and dry and make sure that the connection terminals are firmly seated.

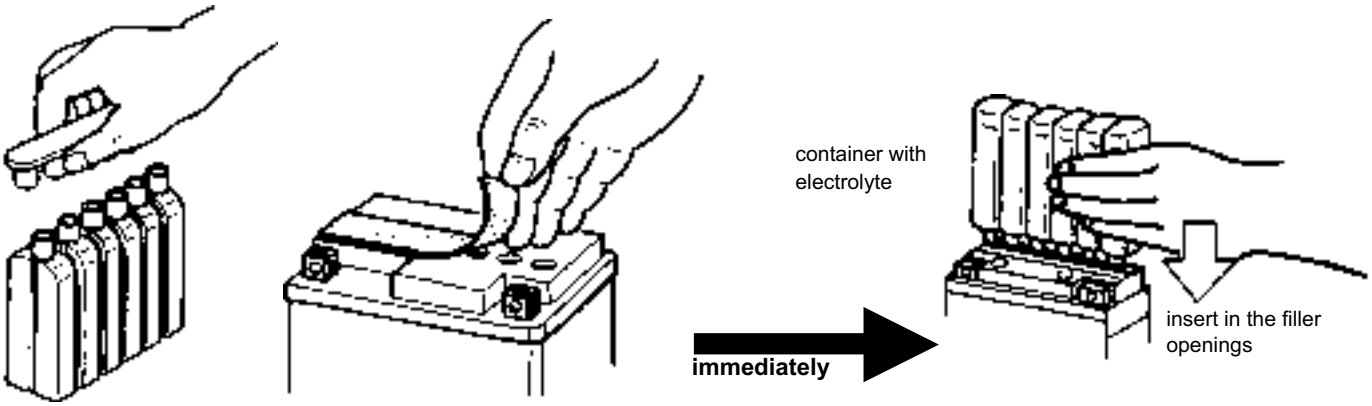
CAUTION
The battery may only be connected or disconnected while the ignition is inactive.
First disconnect the minus terminal (black cable). When installing the battery, first connect the plus terminal (red cable). The battery is maintenance-free. Do not try to open it.

ELECTRICAL SYSTEM

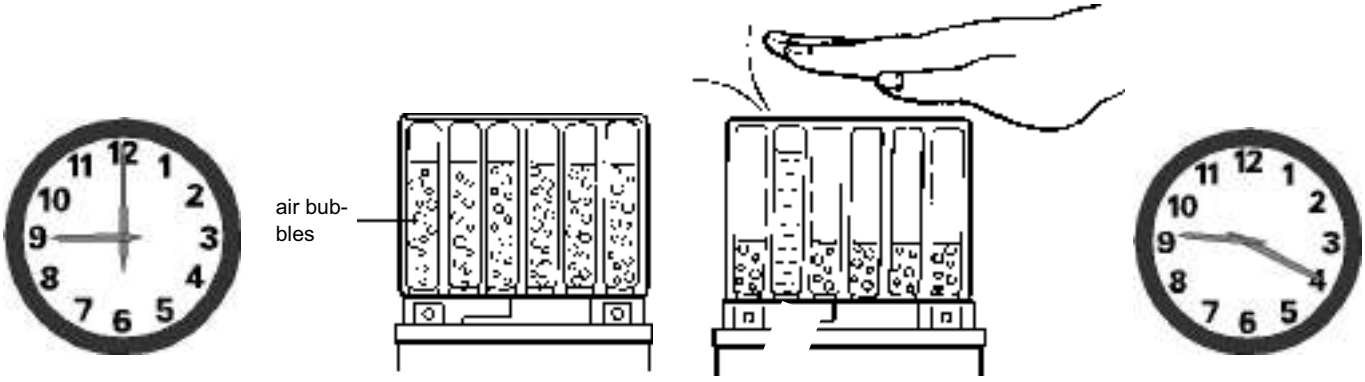
Commissioning maintenance-free batteries (MF)

The steps described below must be strictly observed in order to guarantee the long lifespan of the battery.

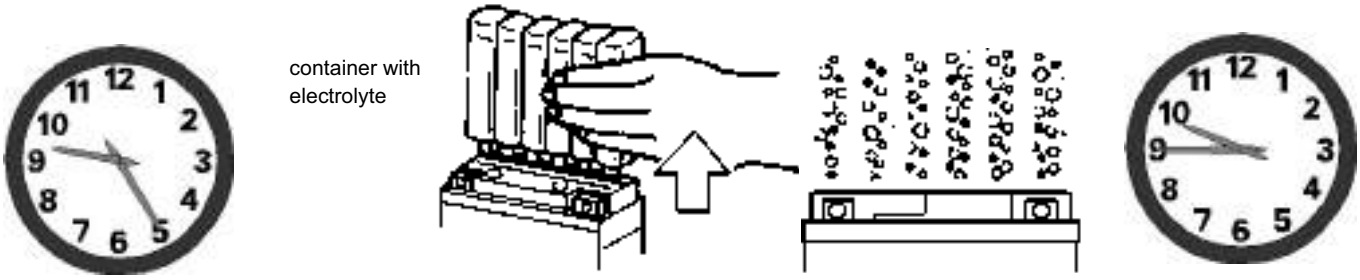
Work steps:



Pull the shut-off plug of the battery from the acid pack and remove the aluminium foil used to seal the battery (once the aluminium foil has been removed, the battery must be **filled immediately**!)



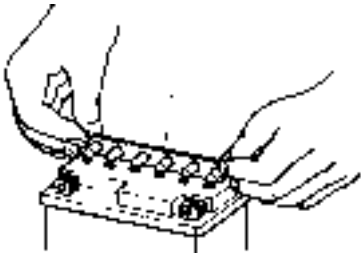
Insert the acid pack into the filler opening of the battery and allow the acid to run into the battery (keep the acid pack in this position for at least **20 minutes**).

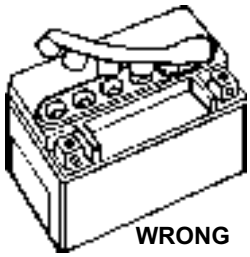


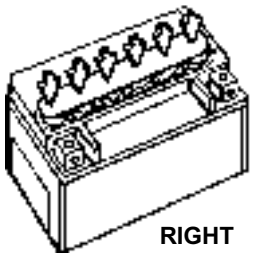
Remove the **acid pack from the battery** and allow the battery to de-gas for another 20 minutes.

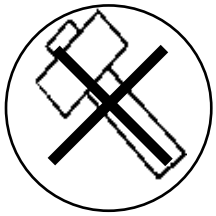
ELECTRICAL SYSTEM

Commissioning maintenance-free batteries (MF)

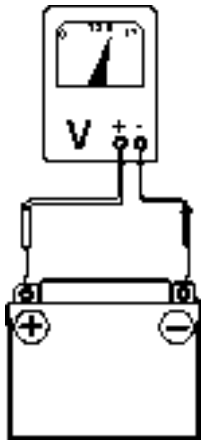




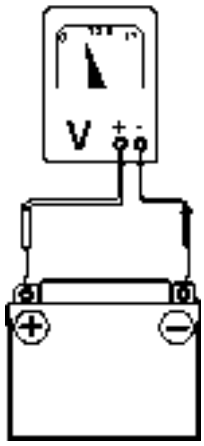




Close the battery using **only the fingers**, so that all plugs are **simultaneously** pressed into the battery.

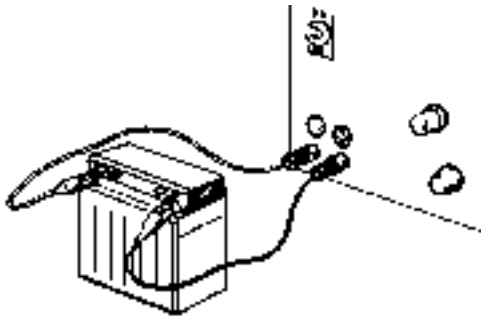


V ≥ 12.5 OK

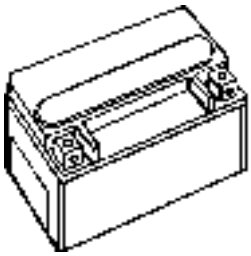


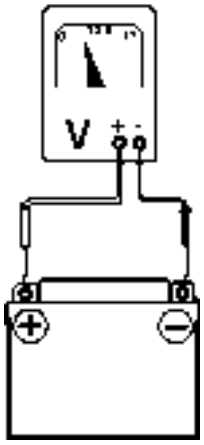
V < 12.5

MF-charger unit



Now check the battery voltage using a volt meter; if the voltage is **lower than 12.5 volt**, the battery must **be recharged** by means of an MF charger unit.





After charging, wait at least **30 minutes** and again check the battery using the volt meter. If the voltage is still **lower than 12.5 volt**, the battery must **be recharged**.

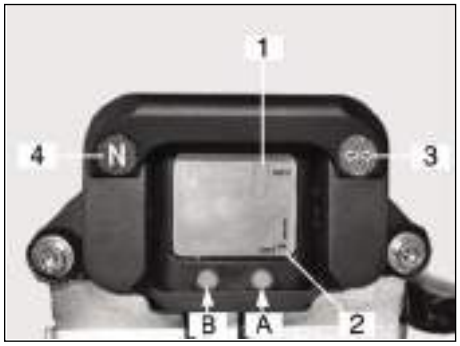
- If the battery voltage after the second charging cycle is still lower than 12.5 volt, the battery must be replaced.
- If the motorcycle remains unused for a longer period, the battery must be **checked or recharged every month.**
- To charge a maintenance-free battery you must use a suitable charger unit. The recharge may not exceed a **max. charging current of 1/10th** of the battery capacity.

ELECTRICAL SYSTEM

Cockpit

Speedometer
1 MPH - odometer
2 DST - total distance

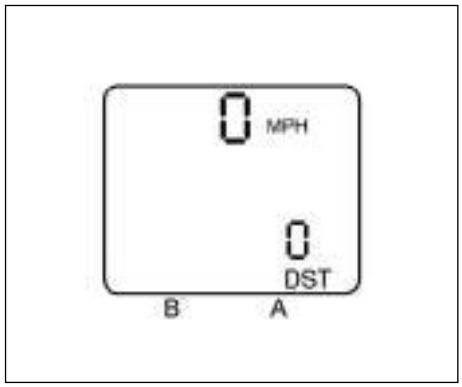
Instrument lights
3 Right and left direction indicator ⇦⇨ green
4 Change-over gear Neutral (N) N green

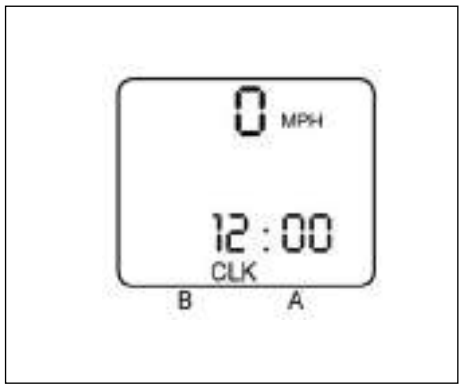


Speedometer set-up

Button A press once
set-up from odometer (DST) to clock (CLK)
or

Button A press once
set-up from clock (CLK) to odometer (DST)





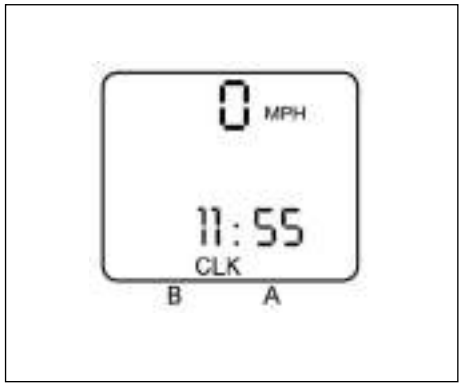
Speedometer time adjustment

Button B press once
the clock (CLK) appears the time can be set.

Button B press twice
the hour signal is flashing set the hours by pressing button A.

Button B press thrice
the minute signal is flashing set the minutes by pressing button A.

Button B press four times
the time is set and (:) is flashing.



ELECTRICAL SYSTEM

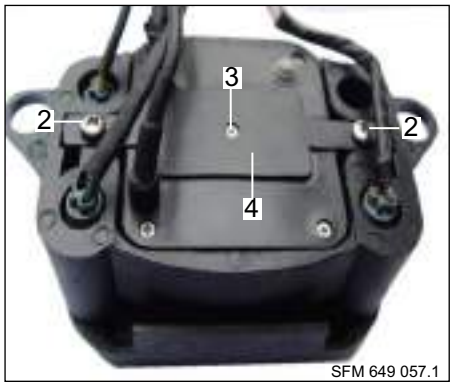
Speedometer battery change

NOTE
If there is no reading on the display or very poor visibility change the batteries. Always replace both batteries.

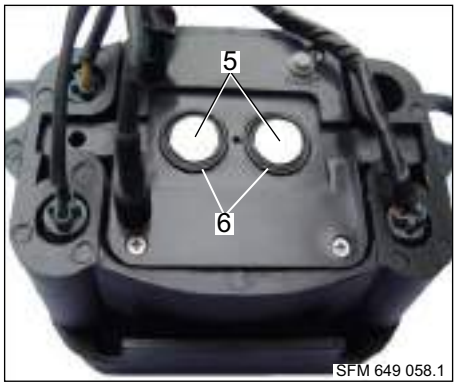
Remove the speedometer for battery change.

- Remove the screws (1) and take off the speedometer.

- Remove the screws (2) and (3) and take off the cover (4).



- Remove the batteries (5) and use new batteries, type AG 13.
- Set-in the batteries with the plus terminal showing upwards.
- Insert the O-rings (6) and close the cover (4) properly.



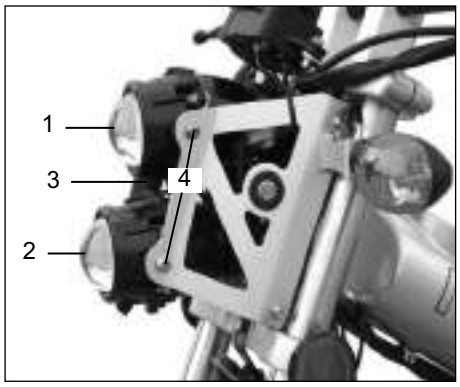
NOTE
After battery change set-up the time again. The total distance is set on zero.

DISPOSAL
Take a dead battery to a collection point. Never dispose of one with household refuse.

ELECTRICAL SYSTEM

Changing the bulbs

NOTE
Use only tested, incandescent bulbs with the identification (E). The use of out of specification light bulbs will cause the warranty to become invalid. Do not touch the bulbs with bare fingers. Use a clean, dry cloth for installing -and removal.



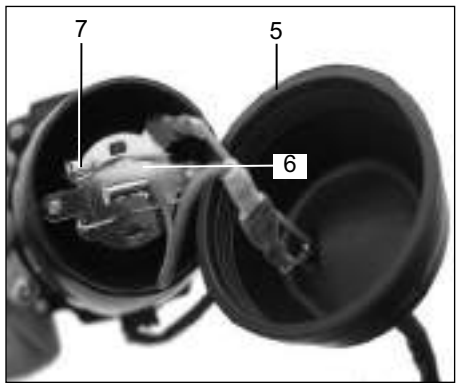
Headlight

1 = High beam bulb **H3 12V 55W PK22s**

2 = Low beam bulb **H3 12V 55W PK22s**

3 = Position light bulb **12V/5W**

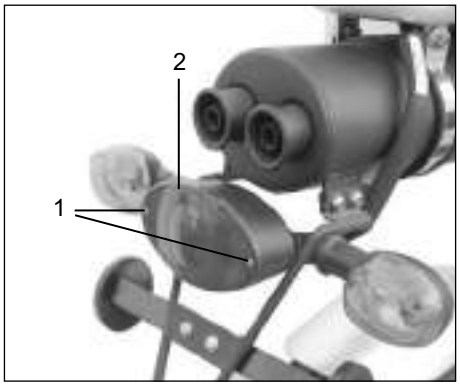
- Unscrew the screws (4) from both sides.
- Remove the rubber cover (5) from the headlight housing.



- Release the retaining clamp (7) and remove the bulb (6).
- Pull the position light (3) with the bulb holder carefully out of the headlight housing.
- Install to take place in reverse order.

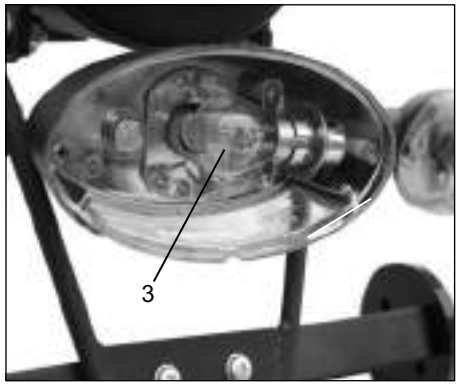
NOTE
For assembly it may be necessary to slightly bend the retaining clamp (7) to ensure reliable contact.

Tail / brake light



NOTE
The tail light glass (2) must be removed to replace the bulb.

Do not touch the bulb with bare fingers. Use a clean, dry cloth for installing and removal.
- Unscrew the screws (1).
- Remove the tail glass (2).
- Unlock and remove the tail / brake light bulb (3).



Installation to take place in reverse order.

Tail / brake light bulb: 12V 21/5W.

ELECTRICAL SYSTEM

Indicator

NOTE
The indicator glass (1) must be removed to replace the light bulb.

Do not touch the bulbs with bare fingers. Use a clean, dry cloth for installation and removal.

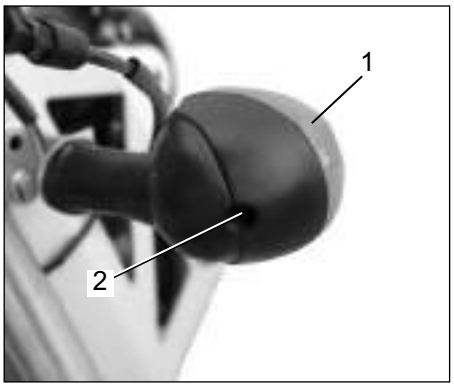
- Unscrew the scew (2)

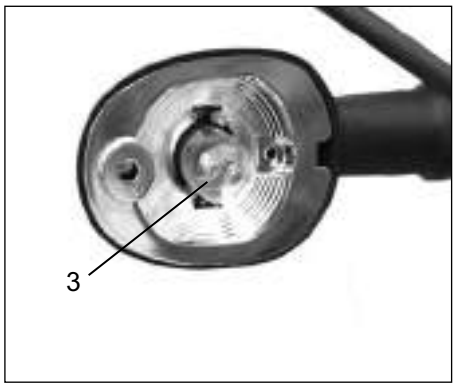
- Remove the glass (1).

- Unlock and remove the bulb (3).

- Installation to take place in reverse order.

Indicator bulbs: 12 V/21W



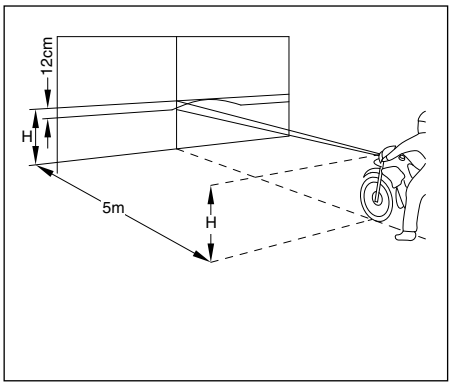


ELECTRICAL SYSTEM

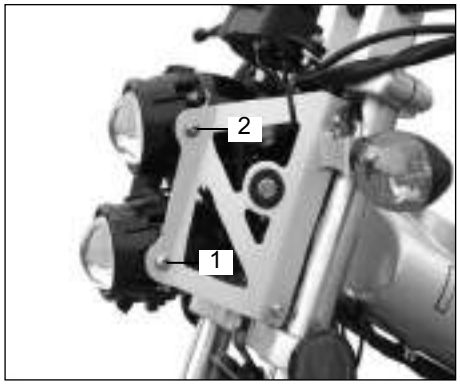
Adjusting the headlamps

WARNING
Do not run the engine in an enclosed space (risk of asphyxiation).

Position the motorcycle on a level floor 5 m (measured from the headlamp) from a light coloured wall with a rider seated on the motorcycle and the tires filled at the correct pressure.

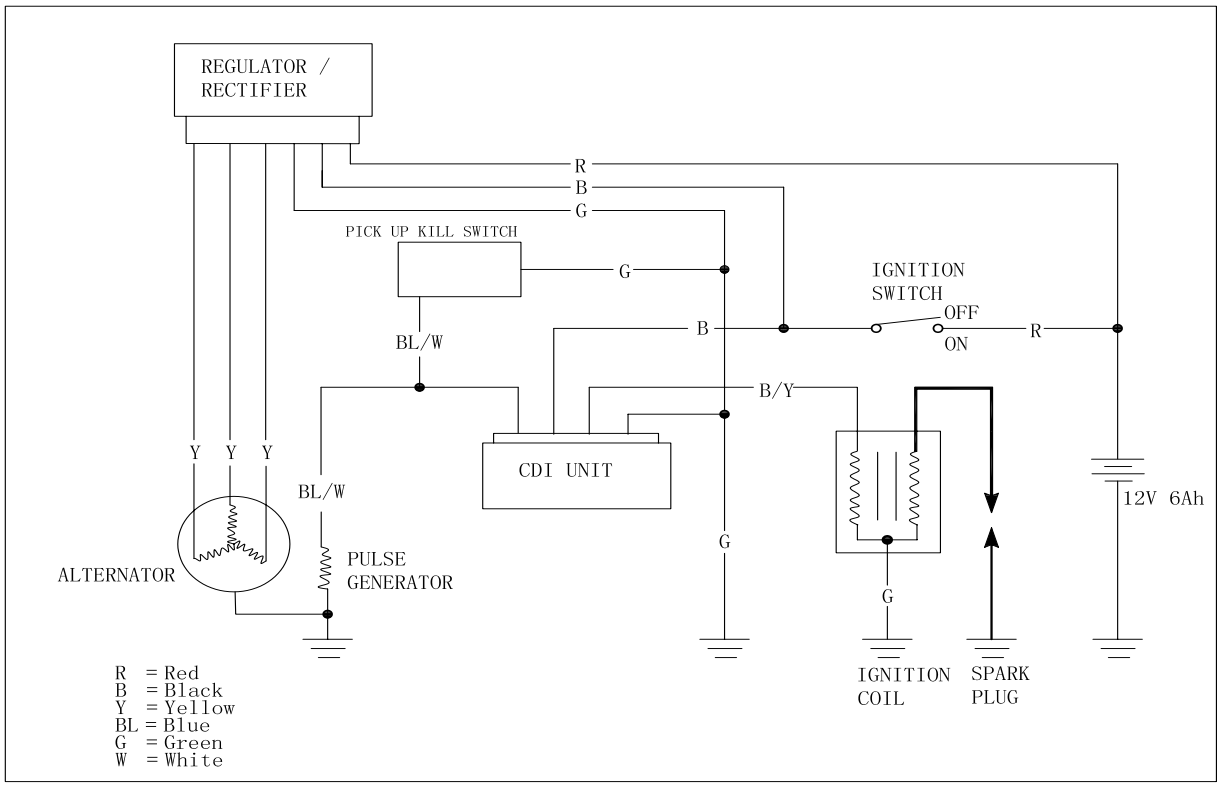


- Measure the distance from the floor to the centre of the headlamp and mark the height on the wall with a cross. Draw a second cross 12 cm beneath the first cross.
- Start the motorcycle and run the engine.
- Activate the dipped beam.
- Use the adjusting screw (1 and 2) on both sides to adjust the angle of the asymmetrically illuminated surface area of the road top.
- Release screws (1) and (2), adjust and tighten up.



IGNITION SYSTEM

SCHEMATIC



IGNITION SYSTEM

SERVICE INFORMATION

GENERAL
Ignition timing does not normally need to be adjusted since the CDI (Capacitive Discharge Ignition) unit is factory pre-set.
If the ignition timing is incorrect, check the CDI unit, pulse generator and alternator and replace the part(s) as required.

SPECIFICATIONS	
Ignition system	CDI unit
Ignition timing	15 ° before TDC at 2.000 rpm 30 ° before TDC at 3.500 rpm
Electrode gap	0,7 mm - 0,8 mm
Pulse generator resistance (pick-up)	circa 125 Ω (bl/w - ground)

TROUBLESHOOTING

No spark at plug			
1.Exchange the spark plug with known-good spark plug and try spark test.	GOOD SPARK	Faulty original spark plug	
→			
WEAK OR NO SPARK			
2. Check for loose CDI unit connector	ABNORMAL	Loose connector	
→			
NORMAL			
3. Disconnect the CDI unit connector from the CDI unit and test for system components at CDI unit 5P connector	ABNORMAL	3-1. Check the individual component(s)	
→			
NORMAL		NORMAL	ABNORMAL
		Open or short circuit in wire harness Loose connector(s)	Faulty ignition coil Faulty pulse generator Faulty exciter coil
4. Check the CDI unit itself using CDI unit tester	ABNORMAL	Faulty CDI unit	
→			
NORMAL			
5. Check the ignition coil using CDI unit tester	ABNORMAL	Faulty ignition coil	
→			
NORMAL		Faulty flywheel Stator and / or pulse generator not installed properly	
→			

Engine starts but runs poorly

1. Ignition primary circuit
   Faulty ignition coil
   Loose or bare wire or connector
   Faulty ignition switch connection
2. Ignition secondary circuit
   Faulty ignition coil
   Faulty spark plug
   Faulty spark plug wire
   Plug cap installed improperly
3. Improper ignition timing
   Faulty pulse generator
   Stator not installed properly
   Faulty CDI unit

IGNITION SYSTEM

CDI UNIT

Removal
Remove the battery cover and the battery.

Disconnect the connector and remove the CDI unit.

Inspection

System inspection

Disconnect the 4- pole connector from the CDI unit and test the wires at the harness- side connector according to the table below:

Item	Measure at:	Standard
Ignition coil (primary)	Black/Yellow - Green	circa 1 Ω
Signal generator coil (pick-up)	Blue/white - green	circa 125 Ω
Ignition switch	Black - green	circa 12V in ignition position ON and 0V in ignition position OFF.
Ground	Green - frame ground	There should be continuity.

If any one item does not meet the standard, test the individual component and replace it or repair open short circuit in wire or loose connector as required.

IGNITION SYSTEM

IGNITION COIL

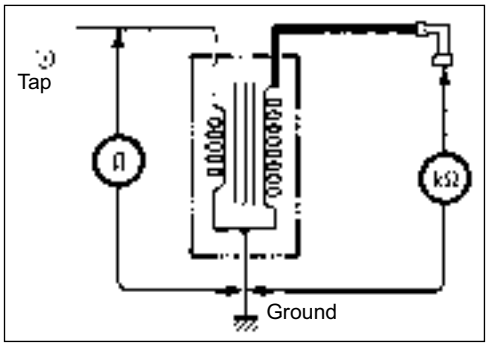
REMOVAL

Disconnect the spark plug cap from the spark plug.
Remove the mounting nuts and ignition coil.

IGNITION COIL (checking with the pocket tester)
A pocket tester or an ohm meter may be used, instead of the electro tester. In either case, the ignition coil is to be checked for continuity in both primary and secondary windings. Exact ohm readings are not necessary, but, if the windings are in sound condition, their continuity should be close to the specified values.

Tool: Pocket tester

Tester knob indication: x 1 Ω range



PRIMARY COIL INSPECTION

Measure the resistance between the terminals.

RESISTANCE: circa 1 Ω at 20°C

Replace the ignition coil if the resistance is out of specification.

SECONDARY COIL INSPECTION

Measure the secondary coil resistance with the cap installed.

RESISTANCE: circa 10 kΩ at 20°C

If the resistance is out of specification, remove the spark plug cap from the wire and remeasure.

RESISTANCE: circa 5 kΩ at 20°C

If the resistance is within the specified range, replace the spark plug cap.
If the resistance is out of specification, replace the ignition

IGNITION SYSTEM

ALTERNATOR

(Exciter coil)
Disconnect the alternator wire connector.
Measure the resistance between the three Yellow wires.

RESISTANCE: circa 1.3 Ω

If the resistance is out of specification replace the alternator.

PULSE GENERATOR (PICK-UP)
Remove the battery cover and the battery.
Disconnect the alternator pick-up connector and measure the resistance between the blue/white wire terminal and ground.

RESISTANCE: circa 125 Ω

If the resistance is out of the specification, replace the alternator.

IGNITION TIMING INSPECTION

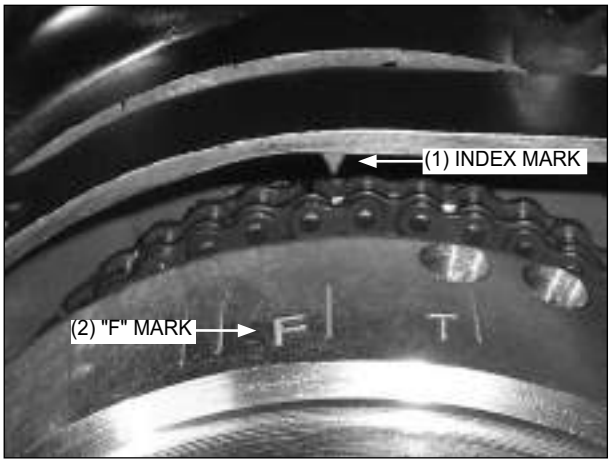
NOTE
The Capacitive Discharge Ignition (CDI) system is factory preset and does not require adjustment. To inspect the function of the CDI components, ignition timing inspection procedures are given here.

Remove the left crankcase cover.
Connect a tachometer and timing light.
Start the engine and allow it to idle.

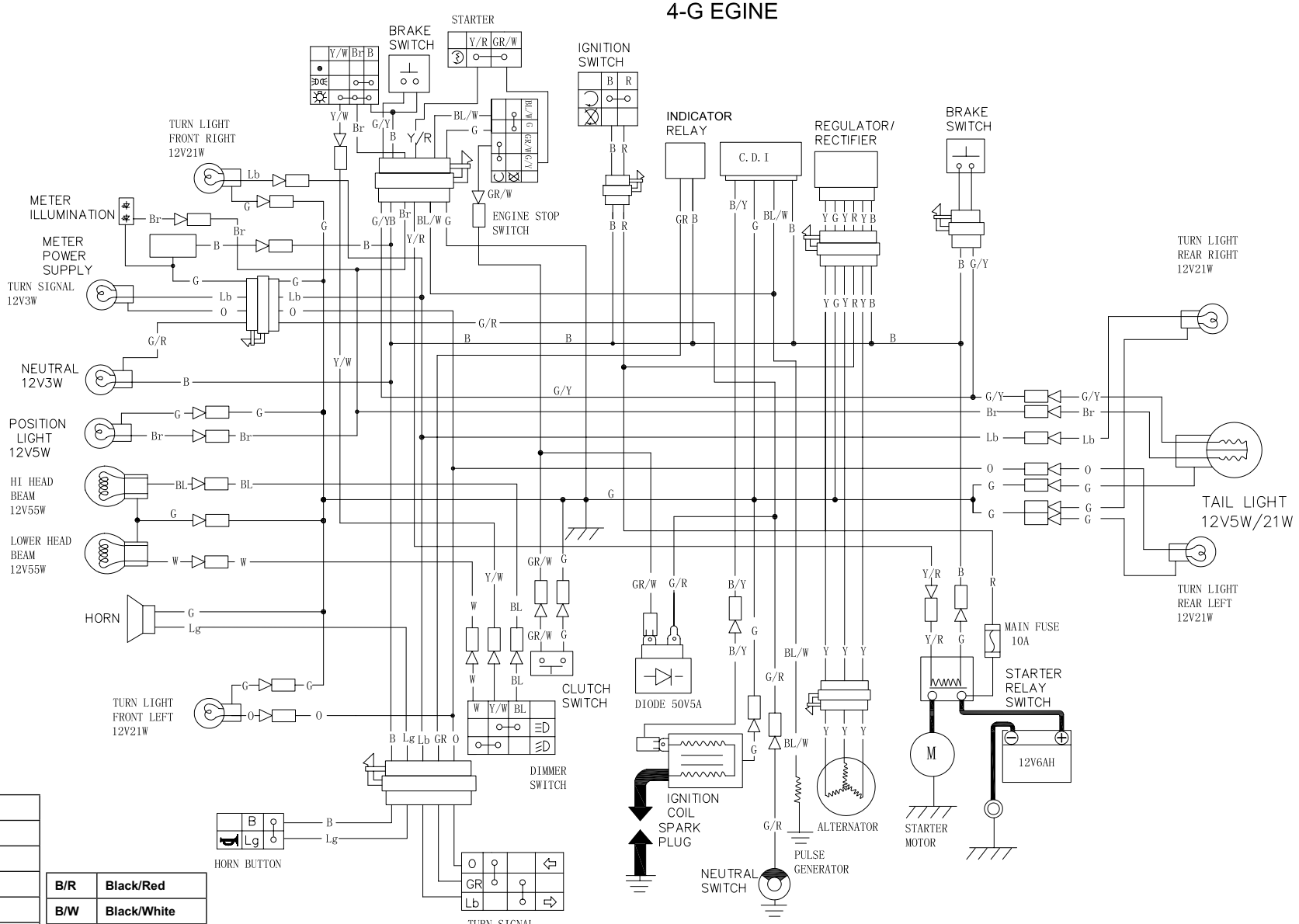
IDLE SPEED: 1,800 +/- 200 rpm

Inspect the ignition timing

Timing is correct, if the "F" mark on the flywheel is aligned with the index mark on the left crankcase at idle.



4-G EGINE



B	Black
Bl	Blue
Br	Brown
G	Green
Gr	Grey
LB	Light Blue
LG	Light Green
O	Orange
R	Red
Y	Yellow

B/R	Black/Red
B/W	Black/White
B/Y	Black/Yellow
Bl/W	Blue/White
G/R	Green/Red
G/Y	Green/Yellow
Y/W	Yellow/White

TROUBLESHOOTING

Engine		
Complaint	**Symptom and possible causes**	**Remedy**
Engine will not start or is hard to start.	**Compression too low**	
	Worn cylinder	Rebore or replace
	Worn piston ring	Replace.
	Worn valve guide or improper valve seating	Repair or replace
	Loose spark plug	Tighten.
	Broken, cracked or damaged piston	Replace
	Slow cranking starter motor	See electrical section
	Mistimed valves	Adjust
	Tappet clearance out of adjustment	Adjust
	Spark plug not sparking	
	Damaged spark plug	Replace
	Damaged spark plug cap	Replace
	Fouled spark plug	Clean or replace
	Wet spark plug	Clean and dry or replace
	Defective ignition coil	Replace
	Open or short in high-tension cord	Replace
	Defective pick-up coil or CDI unit	Replace
	No fuel reaching a carburetor	
	Clogged or defective fuel valve	Clean or replace
	Defective carburetor needle valve	Replace with cauburetor needle valve seat
	Clogged fuel hose	Clean or replace
	Clogged fuel filter	Clean or replace
Engine stalls easily	Fouled spark plug	Clean or replace
	Defective pick-up coil or CDI unit	Replace
	Clogged fuel hose	Clean
	Clogged carburetor jet	Clean
	Tappet clearance out of adjustment	Adjust
Engine is noisy	**Excessive valve chatter**	
	Excessive tappet clearance	Adjust
	Weak or broken valve spring	Replace
	Worn cam surface	Replace
	Worn or burnt camshaft journal	Replace camshaft

TROUBLESHOOTING

Engine		
Complaint	**Symptom and possible causes**	**Remedy**
Engine is noisy	**Noise seems to come from the piston**	
	Worn piston	Replace
	Worn cylinder	Rebore or replace
	Carbon build-up in combustion chamber	Clean
	Worn piston pin or piston pin bore	Replace
	Worn piston ring or ring groove	Replace
	Noise seems to come from the cam chain	
	Stretched cam chain	Replace cam chain and sprockets
	Worn cam chain sprocket	Replace cam chain and sprockets
	Improperly working cam chain tension adjuster	Repair or replace
	Noise seems to come from the clutch	
	Worn countershaft spline	Replace countershaft
	Worn clutch hub spline	Replace clutch hub
	Worn clutch plate teeth	Replace clutch plate
	Distorted clutch plate	Replace
	Worn clutch release bearing	Replace
	Weak clutch damper	Replace primary driven gear
	Weak clutch spring	Replace
	Noise seems to come from the crankshaft	
	Rattling bearing	Replace
	Worn or burnt crank pin bearing	Replace
	Worn or burnt ball bearing	Replace
	Noise seems to come from the transmission	
	Worn or rubbing gear	Replace
	Worn countershaft spline	Replace countershaft
	Worn driveshaft spline	Replace driveshaft
	Worn or rubbing primary gear	Replace
	Worn bearing	Replace
Clutch slips	Clutch cable out of adjustment	Adjust
	Weak or broken clutch spring	Replace
	Worn or distorted clutch pressure plate	Replace
	Distorted clutch plate	Replace
Clutch drags	Clutch out of adjustment	Adjust
	Some clutch springs are weak, while others are not	Replace
	Worn or distorted clutch pressure plate	Replace
	Distorted clutch plate	Replace
Transmission will not shift	Broken gearshift cam	Replace
	Distorted gearshift fork	Replace
	Worn gearshift fork pawl	Replace gearshift fork
Transmission will not shift back	Broken gearshift shaft return spring	Replace
	Rubbing or stuck gearshift shaft	Repair or replace
	Worn or distorted gearshift fork	Replace

TROUBLESHOOTING

Engine		
Complaint	**Symptom and possible causes**	**Remedy**
Transmission jumps out of gear	Worn gear	Replace
	Worn or distorted gearshift fork	Replace
	Weakened gearshift stopper spring	Replace
	Worn gearshift fork pawl	Replace gearshift fork
Engine idles poorly	Tappet clearance out of adjustment	Adjust
	Improper valve seating	Repair or replace
	Worn valve guide	Replace
	Worn cam surface	Replace
	Excessive spark plug gap	Adjust or replace
	Defective ignition coil	Replace
	Defective pick-up coil or CDI unit	Replace
	Spark plug too cold	Replace by hot type plug
	Incorrect float Chamber fuel level	Adjust float height
	Clogged carburetor jet	Clean
	Defective generator	Replace
Engine runs poorly in high-speed range	Weak valve spring	Replace
	Worn camshaft	Replace
	Insufficient spark plug gap	Regap or replace
	Ignition not advanced sufficiently due to poorly working timing advance circuit	Replace CDI unit
	Defective ignition coil	Replace
	Defective pick-up coil or CDI unit	Replace
	Low float chamber fuel level	Adjust float height
	Dirty air cleaner element	Clean or replace
	Clogged fuel hose, resulting in inadequate fuel	Clean and prime
	supply to carburetor	
Exhaust smoke is dirty or thick	Excessive amount of engine oil	Check level and drain
	Worn cylinder	Rebore or replace
	Worn piston ring	Replace
	Worn valve guide	Replace
	Scored or scuffed cylinder wall	Rebore or replace
	Worn valve stem	Replace valve
	Defective valve stem oil seal	Replace
	Worn oil ring side rail	Replace oil ring

TROUBLESHOOTING

Engine		
Complaint	**Symptom and possible causes**	**Remedy**
Engine lacks power	Insufficient tappet clearance	Adjust
	Weak valve spring	Replace
	Mistimed valves	Adjust
	Worn cylinder	Rebore or replace
	Worn piston ring	Replace
	Improper valve seating	Repair or replace
	Fouled spark plug	Clean or replace
	Incorrect spark plug	Replace
	Clogged carburetor jet	Clean
	Incorrect float chamber fuel level	Adjust float height
	Dirty air cleaner element	Clean or replace
	Worn camshaft	Replace
	Air leakage from intake pipe	Tighten or replace
	Excessive amount of engine oil	Check level and drain
Engine overheats	Carbon build-up on piston crown	Clean
	Insufficient amount of engine oil	Check level an add
	Defective oil pump	Replace
	Clogged oil circuit	Clean
	Float chamber fuel level too low	Adjust float height
	Air leakage from intake pipe	Tighten or replace
	Incorrect engine oil	Change
Carburetor		
Starting difficulty	Clogged starter jet	Clean
	Clogged starter jet passage	Clean
	Air leaking from joint between starter body and carburetor	Tighten, adjust or replace gasket
	Air leaking from carburetor joint or vacuum hose joint	Tighten or replace defective part
	Improperly working starter plunger	Adjust
Idling or low-speed trouble	Clogged or loose pilot jet	Clean or tighten
	Clogged or loose pilot air jet	Clean or tighten
	Air leaking from carburetor joint or vacuum pipe joint, or starter	Tighten or replace defective part
	Clogged pilot outlet port	Clean
	Clogged bypass port	Clean
	Starter plunger not fully closed	Adjust
Medium-or high speed trouble	Clogged main jet	Clean
	Clogged main air jet	Clean
	Clogged needle jet	Clean
	Improperly working throttle valve	Adjust
	Clogged fuel filter	Clean or replace
Overflow and fuel level fluctuations	Worn or damaged needle valve	Replace
	Broken needle valve spring	Replace
	Improperly working float	Adjust or replace
	Foreign matter an the needle valve	Clean or replace with needle valve seat
	Incorrect float chamber fuel level	Adjust float height

TROUBLESHOOTING

Electric		
Complaint	**Symptom and possible causes**	**Remedy**
No sparking or poor sparking	Defective ignition coil	Replace
	Defective spark plug	Replace
	Defective pick-up coil	Replace
	Defective CDI unit	Replace
Spark plug is wet or quickly becomes fouled with carbon	Excessively rich air/fuel mixture	adjust carburetor
	Excessively high idling speed	Adjust carburetor
	Incorrect gasoline	Change
	Dirty air cleaner element	clean or replace
	Incorrect spark plug (cold type)	Change to hot type spark plug
Spark plug quickly becomes fouled with oil or carbon	Worn piston ring	Replace
	Worn piston	Replace
	Worn cylinder	Rebore or replace
	Excessive valve-stem-to-valve-guide clearance	Replace
	Worn valve stem oil seal	Replace
Spark plug electrodes overheat or burn	Incorrect spark plug (hot type)	Change to cold type spark plug
	Overheated engine	Tune-up
	Loose spark plug	Tighten
	Excessively lean air/fuel mixture	Adjust carburertor
Generator does not charge	Open or short in lead wires, or loose lead connections	Repair, replace or connect properly
	Shorted, grounded or open stator coil	Replace
	Shorted or punctured regulator/rectifier	Replace
Generator charges but charging rate is below the specifications	Lead wires tend to get shorted or open-circuited or loosely connected at terminal	Repair or tighten
	Grounded or open-circuited stator coils or generator	Replace
	Defective regulator/rectifier	Replace
	Defective battery cell plates	Replace battery
Generator overcharges	Internal short-circuit in the battery	Replace battery
	Damaged or defective regulatror/rectifier	Replace
	Poorly grounded regulator/rectifier	Clean and tighten ground connection
Unstable charging	Lead wire insulation frayed due to vibration resulting in intermittent shorting	Repair or replace
	Internally shorted generator	Replace
	defective regulator/rectifier	Replace
Starter button does not work	Run down battery	Recharge or replace
	Defective switch contact	Replace
	Brushes do not seat properly on the commutator in the starter motor.	Repair or replace
	Defective starter relay	Replace

TROUBLESHOOTING

Electric		
Complaint	**Symptom and possible causes**	**Remedy**
Some electric components are without function, for instance indicator lamps, horn, starter	Faulty connection at the round plugs	Secure a correct contact by straighten the plugs
	Cold soldered points at the handlebar switch	Exchange the handlebar switches or solder the contacts again
	Faulty plugs at the ignition switch	Secure a correct contact
Rear indicator wire blown. Might concern the first series production	Pole at the indicator wire mix up	Exchange indicator lamps and connect correctly
Fuse blown	Short- circuit at the cable	Search for short- circuit and repair
Failure of the complete electric system	Battery to frame body without ground contact	Repair ground contact to the frame body
	Fuse blown or without contact	Change fuse and find out the reason
Indicator and rear light indicate with interplay	Battery is not charged, voltage below 10 V	Charge battery
	Indicator wire with low ground	Secure the isolation
Light gets darker if the turn light is active	A certain voltage is normal and can not be repaired	
	Battery voltage below 12 V	Recharge battery. Check if the battery will be charged by running engine
Head light bulbs blown all the time. Only for vehicles without clutch switch!	Diode defect or without contact	Remove the diode and connect the contacts so that the regulator can adjust the voltage
Light power too low	After all remedies the standard bulb is still too weak	Install a high beam bulb Order no. P4064905001001405 Caution! Not licensed for use on normal traffic conditions
Starter motor without function	Starter relay defect	Change starter relay
Speedometer without function	Batteries run down	Change batteries (AG 13)
	Batteries run down (about two weeks)	Change speedometer
	Moisture gets in the speedometer	Change speedometer
Rear light without function	Several LED with poor soldered points	Change complete LED rear light

TROUBLESHOOTING

Battery		
Complaint	**Symptom and possible causes**	**Remedy**
Sulfation or spots on surfaces of cell plates	Cracked battery case	Replace the battery
	Battery has been left in an run-down condition for a long time	Replace
Battery runs down permanent	Contact to the regulator are loose	Secure a correct contact
	Diode blown or without contact Only for vehicles without clutch switch!	Remove diode and combine contacts so that the regulator can regulate the voltage
	Regulator defect	Check, if the board voltage increases during running engine. Replace regulator if necessary
	Battery defect	Replace the battery if it can not be charged
Battery runs down quickly	Incorrect charging method	Check generator, IC regulator, or rectifier circuit, connections, and make necessary adjustment to obtain specified charging operation
	Battery cell plates have lost much of their active material as a result of overcharging	Replace battery and correct charing system
	Internally shorted battery	Replace
	Excessively low battery voltage	Recharge
	Battery is too old	Replace
Battery sulfation	Incorrect charging rate (When not in use, the battery should be checked at least once a month and properly charged if necessary, to avoid sulfation.)	Replace battery
	The battery was left unused in a cold climate for too long	Replace the battery if badly sulfated