

# **SERVICE MANUAL**

ATV-300XS

*2002/24*



JULY 31, 2007

High Power Engine

**HER CHEE INDUSTRIAL CO., LTD.**

## Foreword

This service manual contains information on servicing ATV-300XS

This manual is written for use as a guideline only. It is recommended that any mechanic, with or without sufficient experience, thoroughly read through the manual and only attempt to service those areas that are fully understood in accordance with the guidelines provided by this manual. For fully qualified mechanics, this manual supplies service data necessary for repairs and maintenance. It is highly recommended that a qualified mechanic, regardless of technical level, should study the service manual in full before attempting service on ATV-300XS

All the data and diagrams provided in this service manual are valid at the time of publication. Information may be updated without notice due to improvements or upgrades.

No quotation, reproduction, or reprint of the service manual, as a whole or in part, will be permitted without the express written consent from **ADLY** Motor sports.

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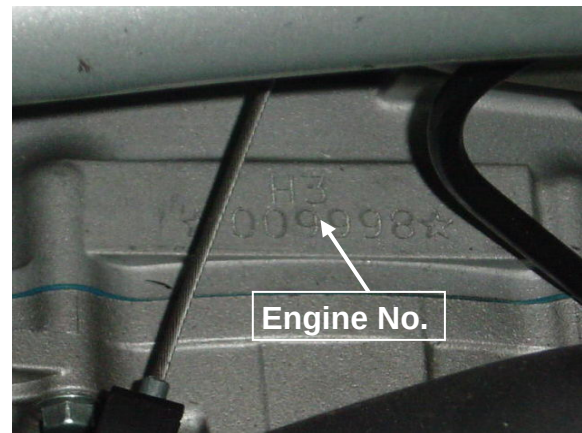
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## General Information

### MODEL IDENTIFICATION



The frame serial number is stamped on the lower front right side of frame.



The engine serial number is stamped on the upper rear right crankcase.



The VIN (Vehicle Identification Number) is attached to the lower front right side of frame behind the frame number.

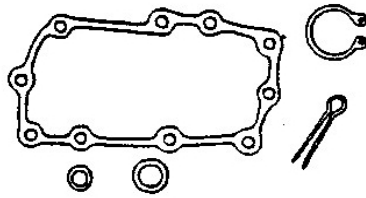


The carburetor identification number is stamped on the right side of the carburetor.

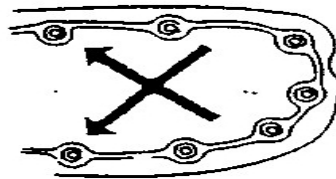
## Information for Preparation

### ATTENTION ON OPERATION

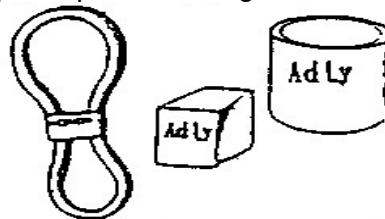
- All washers, oil rings, clamp rings, opening pins shall be duly replaced by a new item when dismantled.



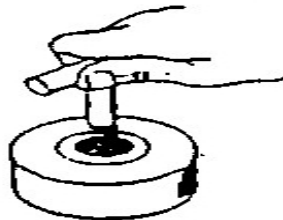
- Locking of all screws, nuts, cross screws shall be performed in the order of first the large screws and then the small ones and from inside to outside in opposite angles by tightening the torque locks.



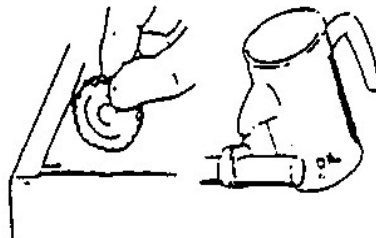
- All items must use original parts, pure oil and greases.



- All service shall use special tools and general tools to repair.



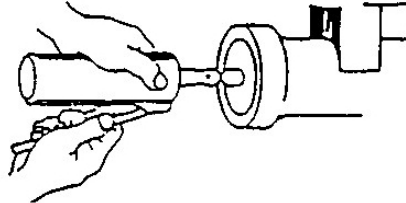
- All dismantled items requiring for checks shall be duly cleaned and for assembly, all items shall be duly lubricated.



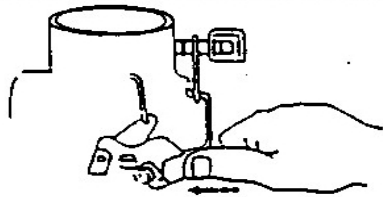
## Information for Preparation

### ATTENTION ON OPERATION

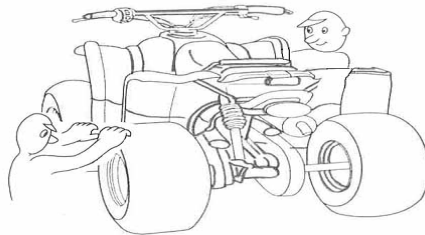
- Certified lubricants in cans shall be used on all the elements to be lubricated.



- After assembly, performance of all elements shall be duly checked and the locking shall be duly verified.



- In case of an operation is performed by over 2 people, the assignment shall be conducted in coordination and safety shall be the first priority.



- Definition of signs:

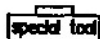
The sign given in the Service Manual shall refer to the operation methods and observation.



**OIL:** Lubrication by designated lubricant.



**GREASE:** Lubrication by grease



**Special Tool:** Parts on which special tools shall be used



**General Tool:** General tools shall be used



**New:** Replace by new items after dismounting



**Attention**



## Dangerous and important operations

### Information for Preparation

#### SPECIFICATION

| TYPE                 | ATV-300XS                                                                                                                                   |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| LENGTH               | 1830 mm                                                                                                                                     |
| WIDTH                | 1160 mm                                                                                                                                     |
| HEIGHT               | 1180 mm                                                                                                                                     |
| SEAT HEIGHT          | 830 mm                                                                                                                                      |
| WHEEL BASE           | 1250 mm                                                                                                                                     |
| NET WEIGHT           | 215 kg                                                                                                                                      |
| ENGINE TYPE          | 4-STROKE, Single Cylinder                                                                                                                   |
| COOLING              | AIR COOLED                                                                                                                                  |
| DISPLACEMENT         | 282 c.c.                                                                                                                                    |
| BORE×STROKE          | Ø 74 × 65.5 mm                                                                                                                              |
| TRANSMISSION         | Manuel , 5 speed<br>First gear 0.095<br>Second gear 0.139<br>Third gear 0.190<br>Forth gear 0.242<br>Fifth gear 0.299<br>Reverse gear 0.065 |
| CLUTCH TYPE          | Wet, Multi-disc                                                                                                                             |
| ENGINE OIL (CHANGE)  | 10W/40 (Standard), 2.0 Lit                                                                                                                  |
| ENGINE IDLE SPEED    | 1400±100 rpm                                                                                                                                |
| VALVE CLEARANCE      | 0.08~0.12 mm                                                                                                                                |
| STARTING             | Electric starter and pull start                                                                                                             |
| SPARK PLUG           | NGK DR8EA                                                                                                                                   |
| SPARK PLUS GAP       | 0.6~0.7 mm                                                                                                                                  |
| IGNITION             | C.D.I                                                                                                                                       |
| SUSPENSION           | Front : Double A-Arm with preload adjustable shock<br>Rear : Swing arm with preload adjustable shock                                        |
| BRAKE                | Front : Double Disc , Rear: Disc                                                                                                            |
| BATTERY              | 9 A/h, Maintenances Free                                                                                                                    |
| FINAL DRIVE          | Chain                                                                                                                                       |
| FRONT TIRE           | 21×7-10 (Optional 22×8-10)                                                                                                                  |
| REAR TIRE            | 20×11-9 (Optional 22×11-10)                                                                                                                 |
| FRONT BUMPER (LOAD)) | 30kg                                                                                                                                        |
| REAR BUMPER (LOAD))  | 45kg                                                                                                                                        |

## Information for Preparation

### LOCKING TORQUE

The standard locking torque shall apply in case of no specification.

### STANDARD TORQUE :

| Type           | Torque (kg-m) | Type                   | Torque (kg-m) |
|----------------|---------------|------------------------|---------------|
| 5mm Bolt, Nut  | 0.5           | 5 mm Screw             | 0.4           |
| 6mm Bolt, Nut  | 1.0           | 6 mm Screw             | 0.9           |
| 8mm Bolt, Nut  | 2.2           | 6 mm Flange Bolt, Nut  | 1.2           |
| 10mm Bolt, Nut | 3.5           | 7 mm Flange Bolt, Nut  | 2.1           |
| 12mm Bolt, Nut | 5.5           | 8 mm Flange Bolt, Nut  | 2.7           |
| 18mm Bolt, Nut | 15.0          | 10 mm Flange Bolt, Nut | 4.0           |
| 18mm Lock nut  | 11.0          |                        |               |

### CHASSIS :

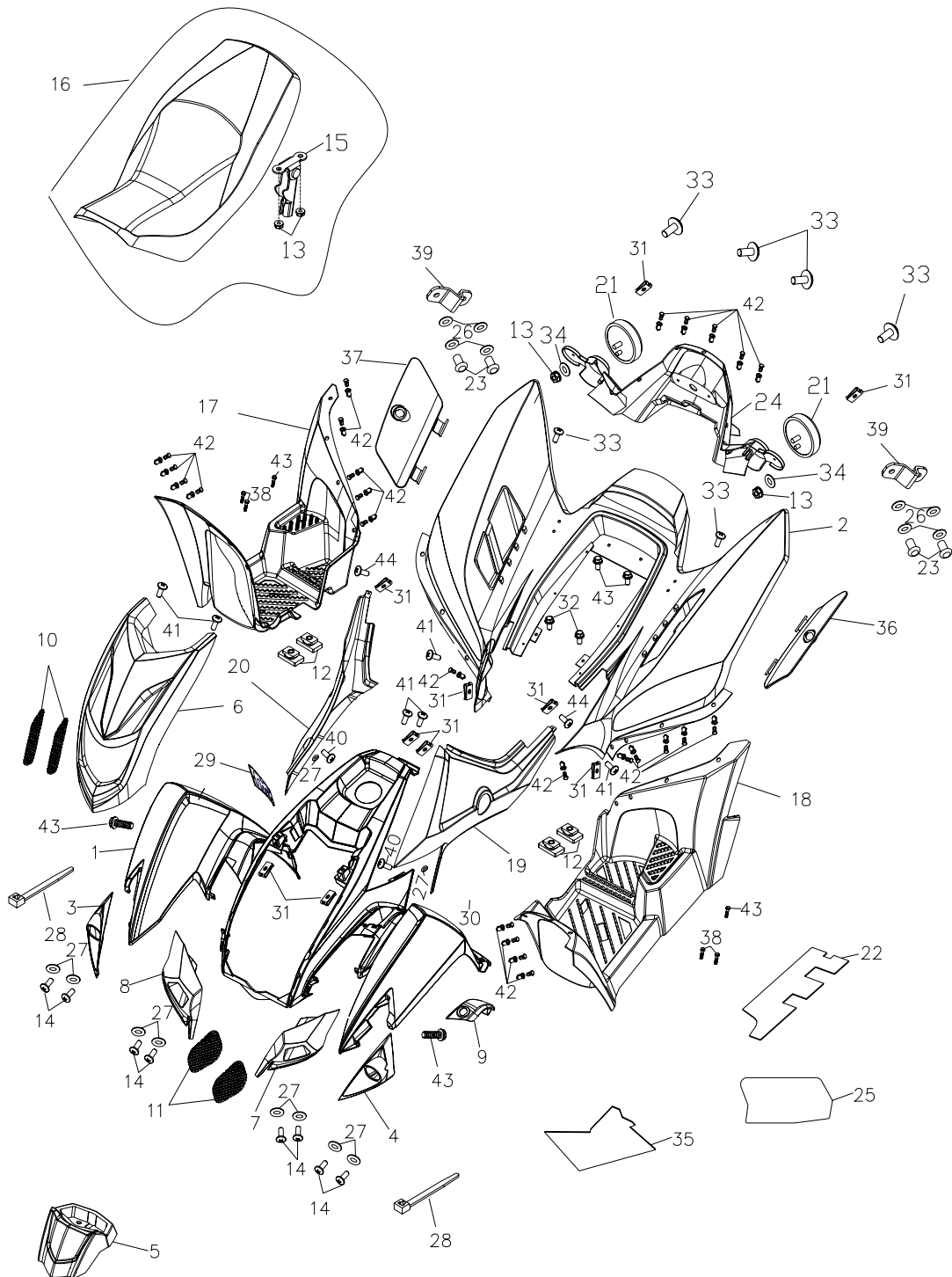
| Locking Place                | Qty | Dia. (mm) | Torque (kg-m) | Remark            |
|------------------------------|-----|-----------|---------------|-------------------|
| Handle bar bottom flange nut | 2   | 10        | 4.0           | Nylon insert type |
| Ball joint fixed nut         | 4   | 10        | 4.0           | Nylon insert type |
| Engine mounting flange nut   | 4   | 8         | 3.5           |                   |
| Engine mounting bracket bolt | 2   | 10        | 4.0           |                   |
| Foot rest flange bolt        | 6   | 8         | 4.0           |                   |
| Rear swing arm fixed nut     | 1   | 14        | 9             | Nylon insert type |
| Rear brake panel flange bolt | 4   | 12        | 7             |                   |
| Front suspension fixed nut   | 4   | 10        | 4.0           | Nylon insert type |
| Rear suspension flange bolt  | 2   | 10        | 4.0           |                   |
| Front rim nut                | 2   | 18        | 15            |                   |
| Rear rim nut                 | 2   | 18        | 15            |                   |

### ENGINE :

| Locking Place                     | Qty | Dia. (mm) | Torque (kg-m) | Remark                    |
|-----------------------------------|-----|-----------|---------------|---------------------------|
| Breather separator Allen bolt     | 1   | 6         | 1.2           | Hex socket flange bolt    |
| Cam chain tensioner mounting bolt | 2   | 6         | 1.2           | Hex flange bolt           |
| Cam sprocket bolts                | 2   | 7         | 2.1           | Hex flange bolt           |
| Clutch center locknut             | 1   | 18        | 11.0          | Locknut                   |
| Clutch lifter plate bolts         | 4   | 6         | 1.2           | Hex bolt                  |
| Crankcase cover bolts (L/R)       | 24  | 6         | 1.0           |                           |
| Crankcase bolts                   | 14  | 6         | 1.2           | Hex flange Bolt           |
| Cylinder base bolts               | 2   | 6         | 1.0           |                           |
| Cylinder head cover flange bolts  | 13  | 6         | 1.2           | Hex flange Bolt           |
| Cylinder head cap nuts            | 4   | 10        | 4.0           | Hex acorn washer face nut |
| Oil pipe bolts                    | 1   | 6         | 1.0           |                           |
|                                   | 1   | 7         | 1.2           |                           |
| Gearshift return spring pin       | 1   | 8         | 2.2           |                           |
| Gearshift drum shifter pin        | 2   | 8         | 2.2           |                           |

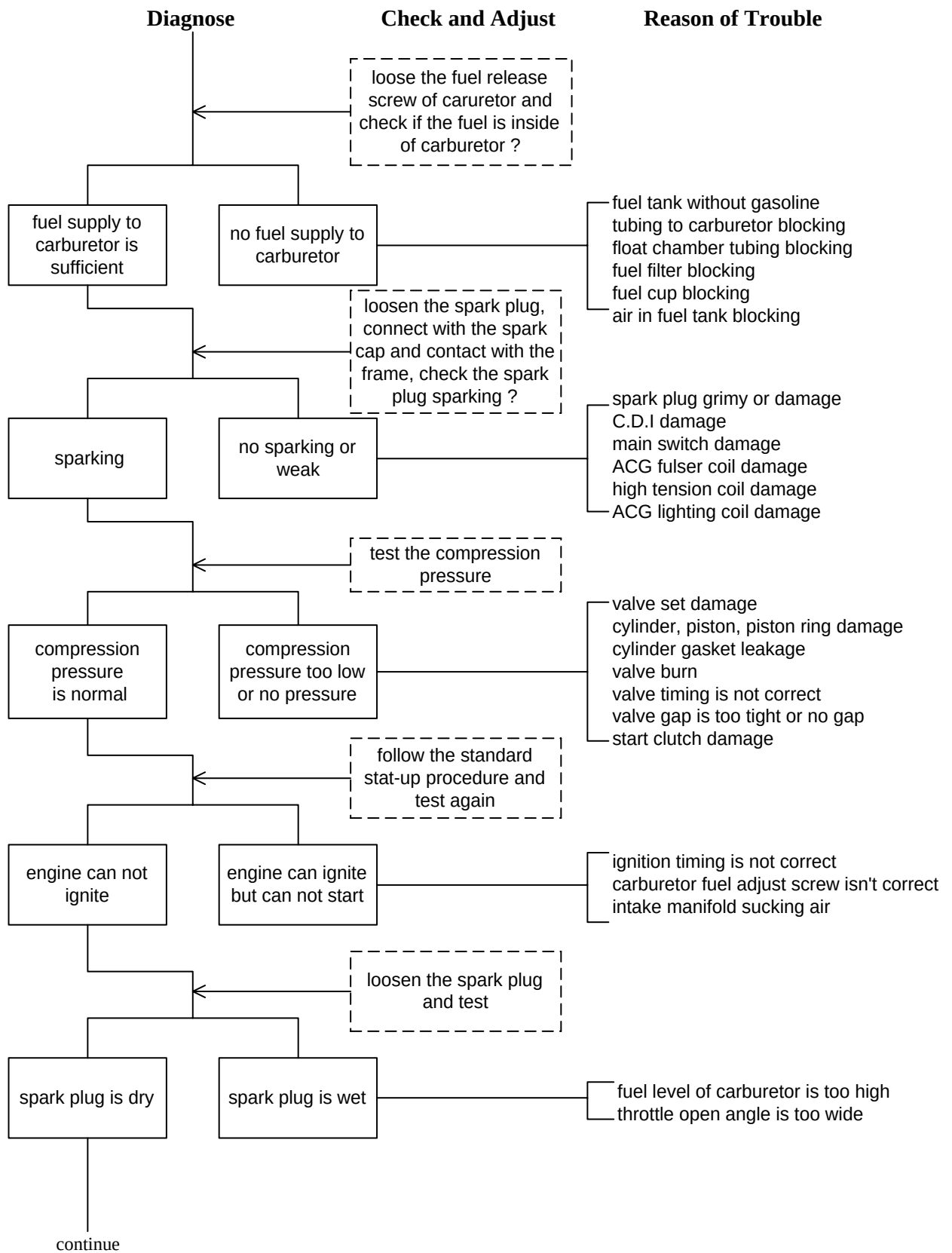
## Information for Preparation

The following drawing that shows the disassembling situation of the cover parts for ATV-300XS



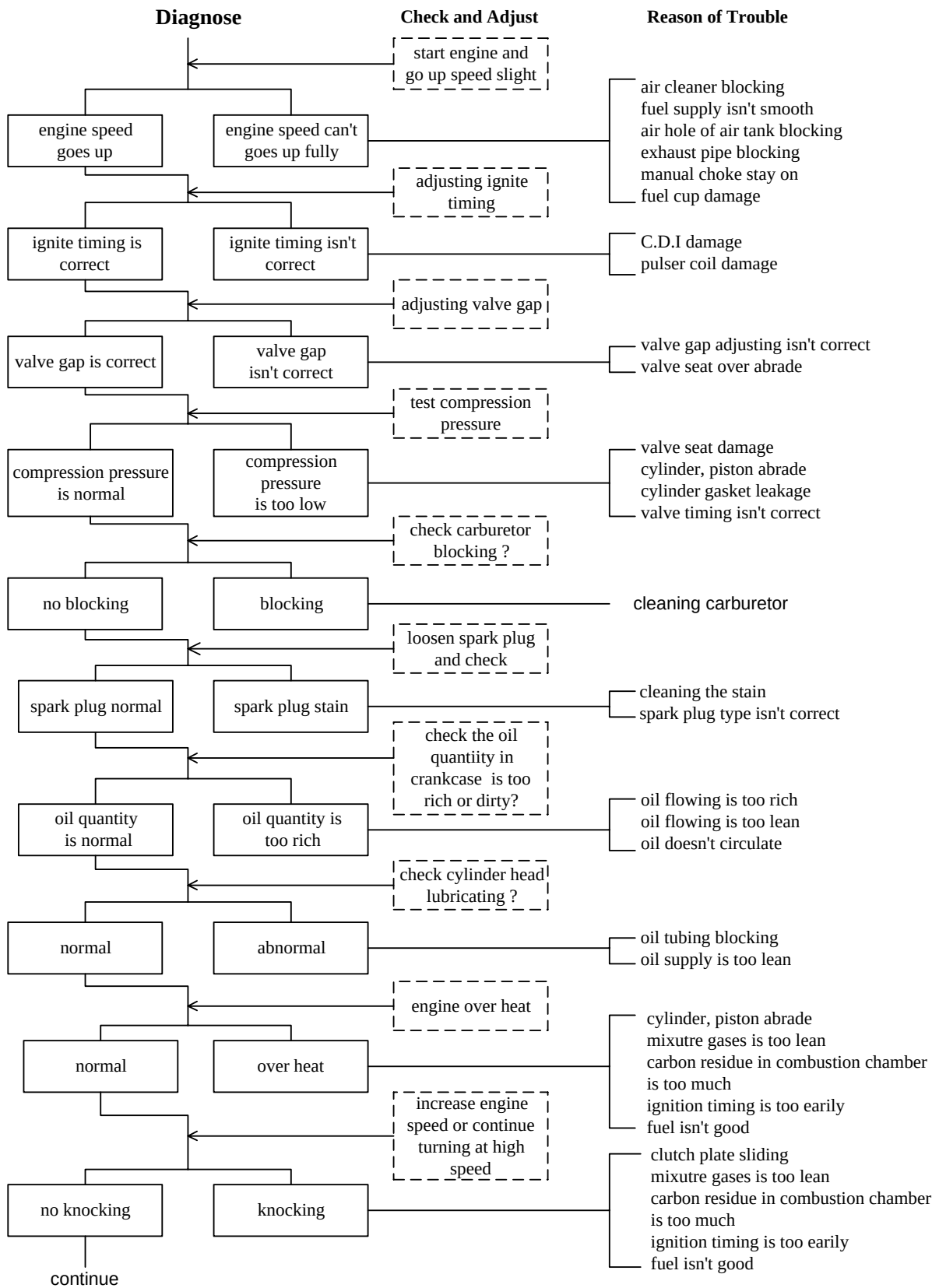
# INFORMATION FOR PERPARATION

## DIFFICULT START OR CANN'T START



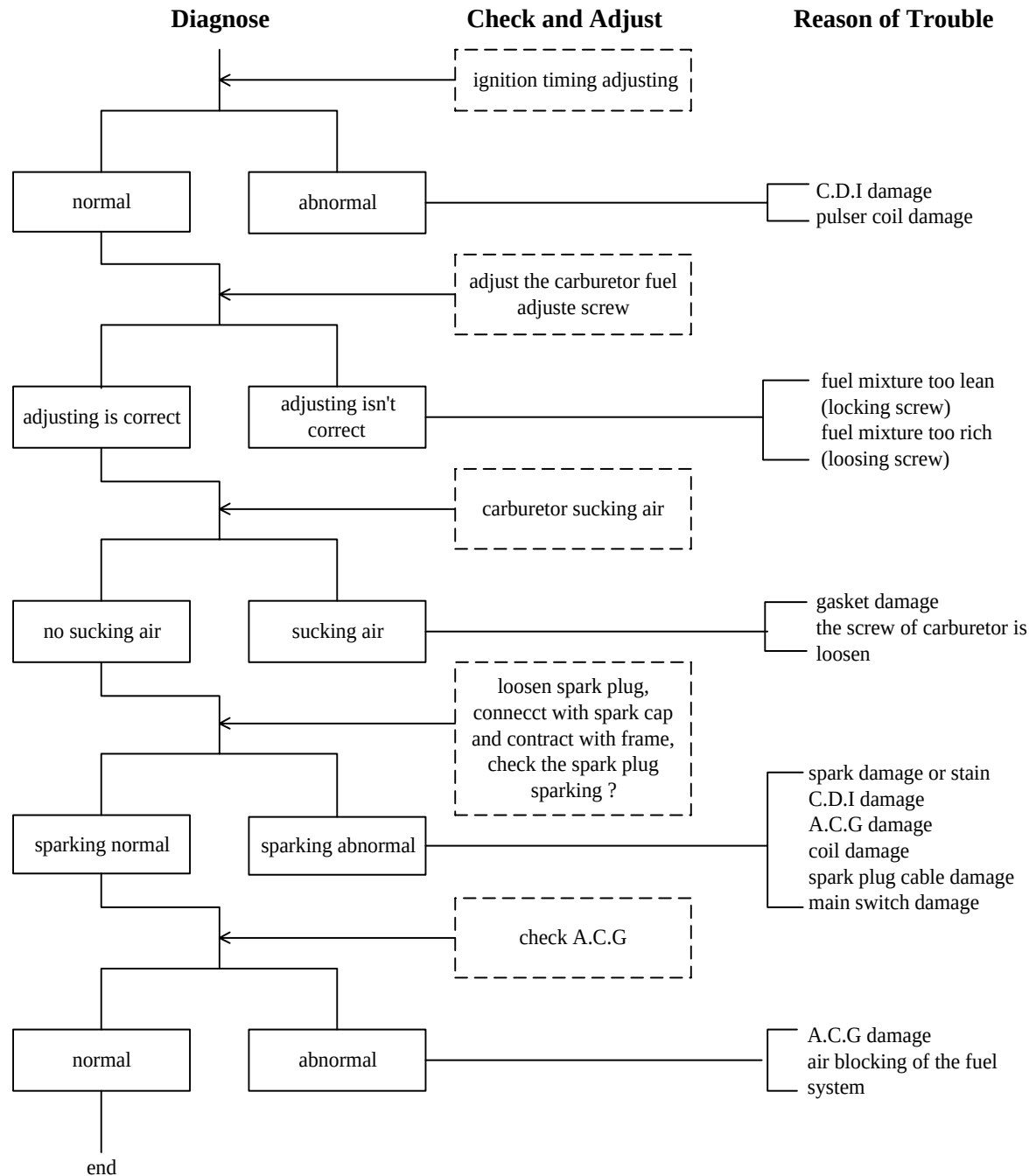
## INFORMATION FOR PREPARATION

### REVOLUTION NOT SMOOTH , LOST POWER

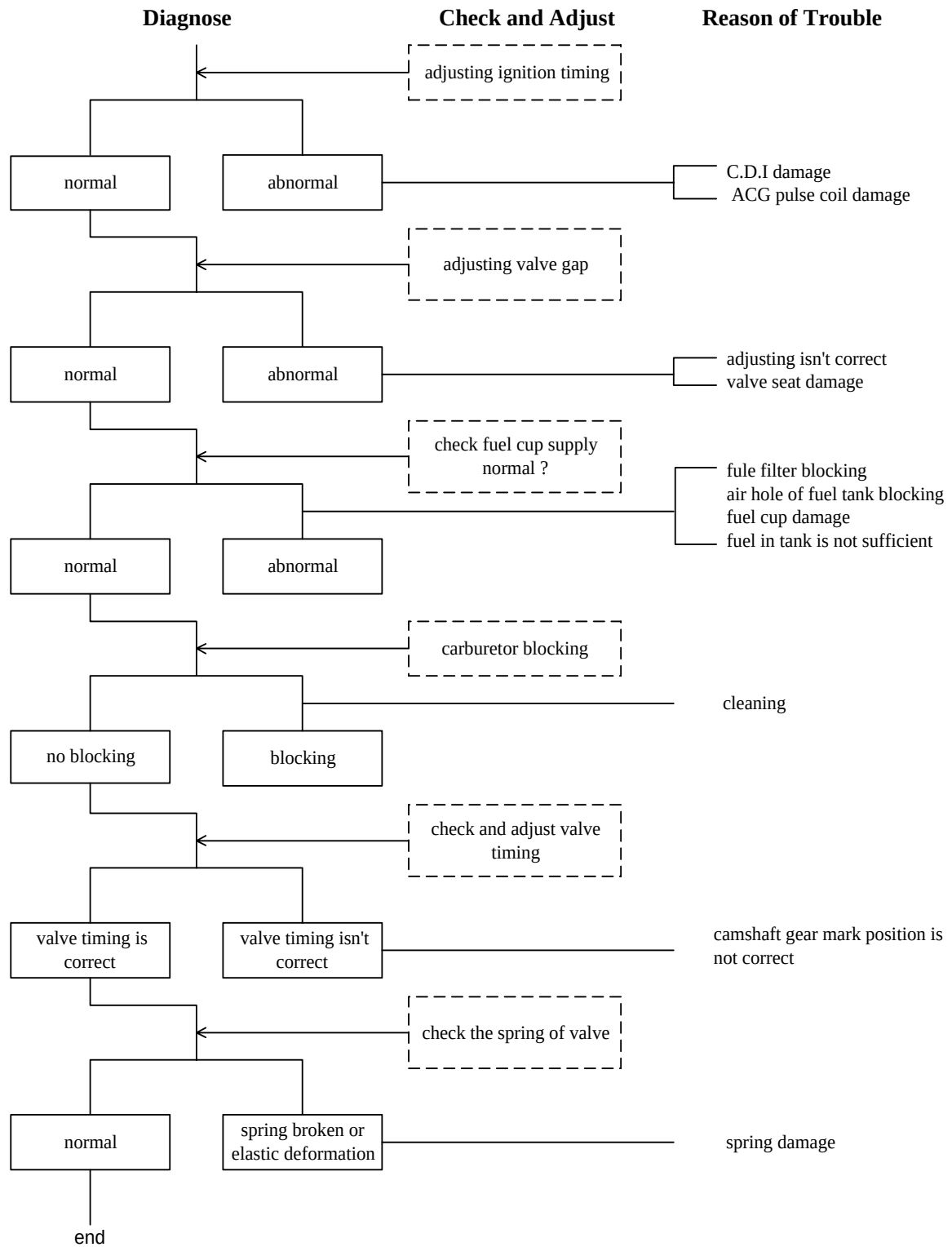


# INFORMATION FOR PREPARATION

## REVOLUTION NOT STABLE (LOW R.P.M.)

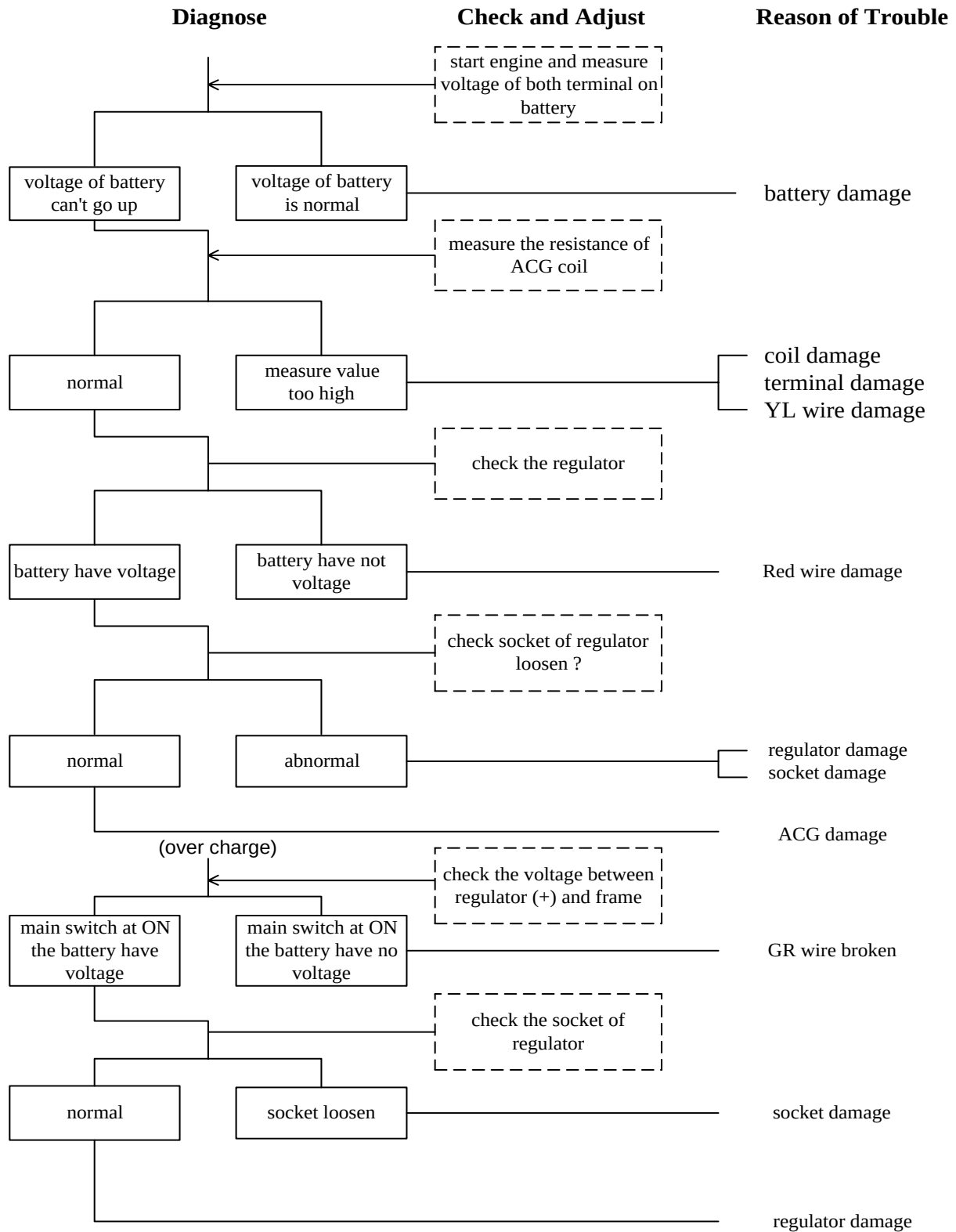


# **INFORMATION FOR PREPARATION** **REVOLUTION NOT SMOOTH(HIGH SPEED)**

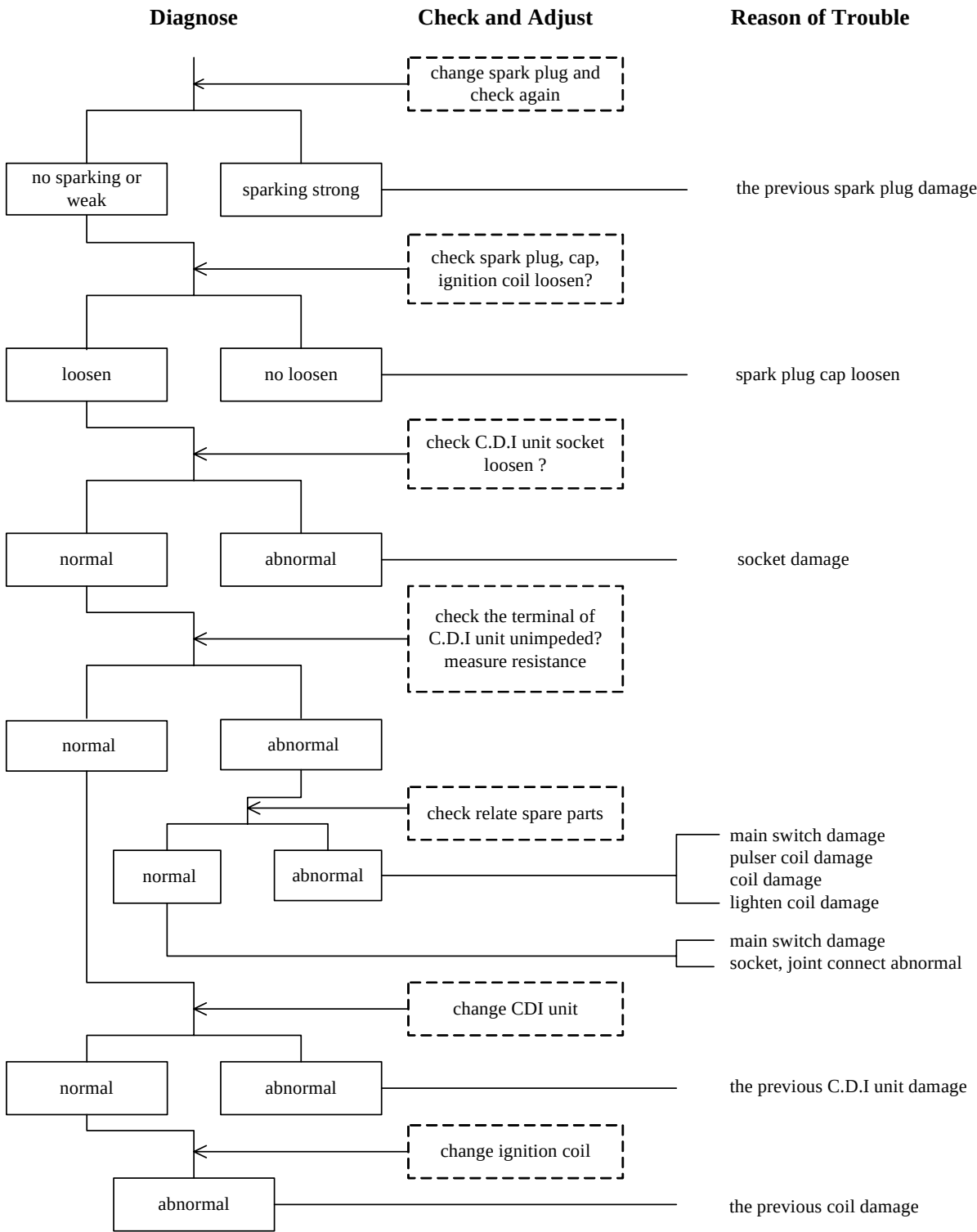


## INFORMATION FOR PREPARATION

### CHARGE ABNORMAL



INFORMATION FOR PREPARATION  
SPARK PLUG NO SPARKING



## CHECK AND ADJUST

### INFORMATION

#### WARNING

Do not start the engine at a close zone, because the exhaust gases from the engine including some noxious emission such as CO, HC, NOx... etc. that can result serious damage for health.

Strictly prohibit using any flammable thing in the working zone, because that can rise fire easily.

#### ENGINE :

| ITEM                  | SPECIFICATION         | REMARK                |
|-----------------------|-----------------------|-----------------------|
| Spark Plug Gap        | 0.6~0.7 mm            |                       |
| Spark Plug Type       | DR8EA                 | without resistance    |
| Valve Gap             | 0.08mm                | intake valve          |
|                       | 0.12mm                | exhaust valve         |
| Idle Speed            | 1400±100 rpm          |                       |
| Engine oil type       | SAE 10W/40            | Synthetic             |
| Engine Oil Capability | 1.6 L                 | At oil change         |
|                       | 2.0 L                 | After engine overhaul |
| Compression Pressure  | 13 kg/cm <sup>2</sup> | 1400 rpm              |
| Ignite Timing         | 17° BTDC              | 1400±100 rpm          |

#### CHASSIS :

| ITEM                          | SPECIFICATION | REMARK                 |
|-------------------------------|---------------|------------------------|
| Parking brake lever free play | 10~20 mm      |                        |
| Left lever free play          | 5~10 mm       |                        |
| Throttle free play            | 2~6 mm        |                        |
| Front Tire Pressure           | 10 psi        | Check the mark on tire |
| Rear Tire Pressure            | 10 psi        | Check the mark on tire |
| Torque of Front Rim Nut       | 14 kg-m       |                        |
| Torque of Rear Rim Nut        | 14 kg-m       |                        |

Detailed tire pressure specification please check the marking on tires.

## CHECK AND ADJUST

### MAINTENANCE SCHEDULE

Please follow the maintenance schedule to do the routine maintenance.

#### Service Interval

C : Clean up

L : Lubricate or Grease

R : Replace

I : Inspection, check, adjust and replace if necessary

D : Need some special tools or techniques, suggest to be serviced on dealers site.

| Inspection parts / System         | (1) | (2) | (3)         | Ref.       |
|-----------------------------------|-----|-----|-------------|------------|
| Air cleaner element               |     | C   | C           | (Note 1)   |
| Spark plug                        |     | I   | I           |            |
| Petrol filter/Fuel tube           | I   |     | I           | D          |
| Valve clearance                   | I   | I   | I           | D          |
| Engine oil                        | R   | R   | R           |            |
| Eng. oil filter screen            |     |     | C           | D          |
| Engine idle speed                 | I   | I   | I           |            |
| Drive chain                       | I,L |     | I,L(Note 3) | (Note 1,2) |
| Brake shoe wear / Brake system    |     | I   | I           | (Note 2)   |
| Clutch system                     | I   | I   | I,D         |            |
| Suspension                        |     | I   | I           |            |
| Re-tighten up bolts and nuts      | I   |     | I           |            |
| Tire and Wheel                    | I   | I   | I           |            |
| Steering system and shaft bearing |     |     | I           |            |

#### Service Interval

(1) Initial Service...20 hours or 150km either earlier time for new vehicle

(2) Regular Check...Every 100 hours or 1000km, earlier time

(3) Regular Check...Every 200 hours or 2000km, earlier time

Note 1 : Used in dusty, sandy, snow area need to be inspected.

Note 2 : Used in rainy, muddy condition need to be inspected.

Note 3 : Used after 50 hours or 500km need to be inspected.

#### Note :

(1) If the ATV is new then the motor oil have to replace at the first initial service.

(2) For safety reason, we suggest the maintenance should be done at local service center.

(3) If the driving condition is very abominable such as rainy, dust zone or heavy load...that we suggest operating maintenance more frequency.

## CHECK AND ADJUST PARKING BRAKE LEVER

Pull the right brake lever will perform brake function.

Push the locking will lock the brake.

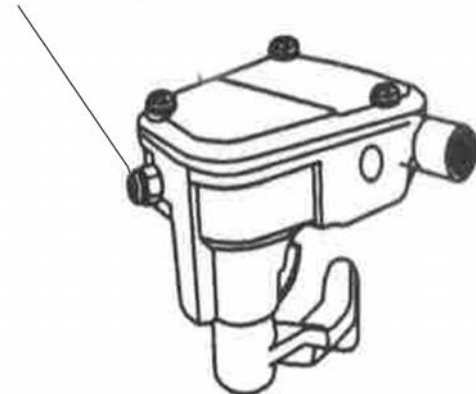


The main adjusting nut for throttle play is located under the handle bar  
Loose the fixed nut and adjust the play nut to proper position.



throttle adjust bolt

The throttle lever control bolt is located the throttle base.  
Loose the fixed nut and adjust the screw to  
The throttle lever free play : 2~6 mm  
get proper position.



## CHECK AND ADJUST

### SPARK PLUG

Pull to remove the spark plug cap.

Use tools come with the vehicle to remove the spark plug.

If the spark plug grimy or with carbon residue then using the copper brush to clean it.

Spark plug specification

DR8EA : Resistance

Check the gap of spark plug

Gap : 0.6~0.7 mm



### AIR CLEANER

Remove the seat.

Pull to open 4 clips on air cleaner cover and remove the cover.

Take-out the air filter.

Check the filter whether is dirty or damaged. If it's dirty or damaged then clean it or change a new one.

#### **Attention :**

Clean the element and frame in a high flash point solvent , squeeze the solvent out of the foam and let the guide and element dry completely.

#### **Check period :**

If the ATV often driving at the rainy or abominable surroundings, please check the filter more frequently.

## CHECK AND ADJUST

### VALVE ADJUSTING

**Attention :**

When you check or adjust the valve, do it when the engine temperature is low (below 35°C)

Remove the timing hole plug and the crankshaft hole plug with screwdriver. Rotate the flywheel and keep the "T" line aim at the centerline of the inspection hole.

Measure valve clearance with a feeler gauge of the specified thickness.

To adjust the valve clearance, loosen the locknut and turn the adjuster.

**Attention :**

※ When you adjusting the valve, don't invert the crankshaft, otherwise cannot adjust the exhaust valve.

Valve gap check and adjust

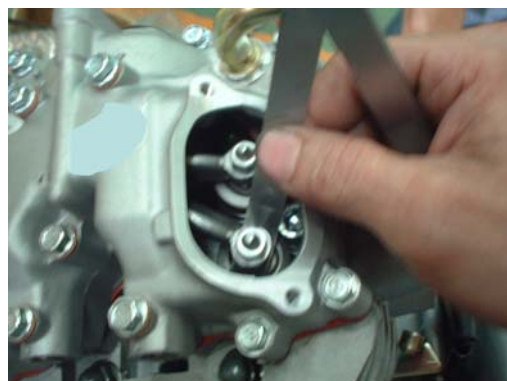
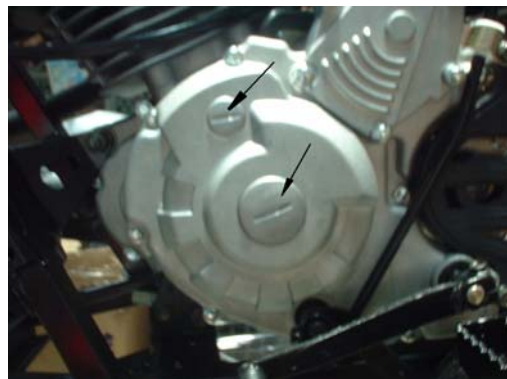
Valve gap : IN. : 0.08 mm

EX. : 0.12 mm

Loose the fixed nut and rotating the adjusting nut reach to the proper gap.

Tie up the fixing nut and check the gap again.

Using the valve gap tool to adjust the valve gap.



## CHECK AND ADJUST

### ADJUSTING IDLE SPEED

Engine idle speed adjustment has to do it when the engine is warm.

Connect with the rpm meter then starting the engine.

Before adjusting the idle speed, make sure the spark plug gap is correct. Also, turn the handlebars from left to right and note whether the idle speed changes. If it does, the throttle cable may be incorrectly routed. Be sure to correct this problem before proceeding.

#### **Warning :**

Use screw driver to adjust the idle speed to avoid injury.

Adjust the idle speed adjust screw reach to the normal idle speed.

The idle speed is about  
 $1400 \pm 100$  rpm.

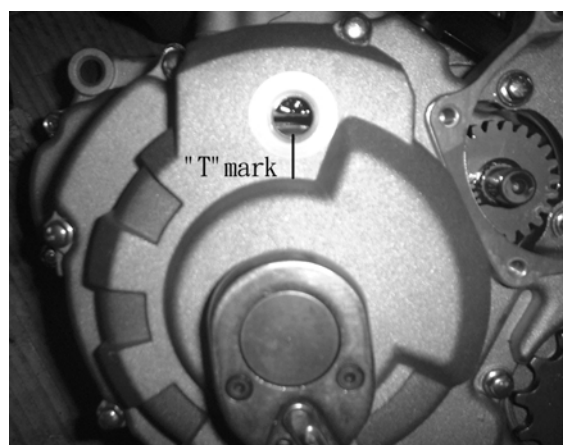


## IGNITION TIMING

The ignition system of this ATV is controlled by C.D.I unit, thus don't need to adjust anything. If the ignition timing isn't correct then checking the ignition system whether normally.

Remove the 14 mm A.C.G. cap.

Using the timing light to check the ignition timing. When the engine speed running at idle, the "F" mark of flywheel should aim at the inspection hole.

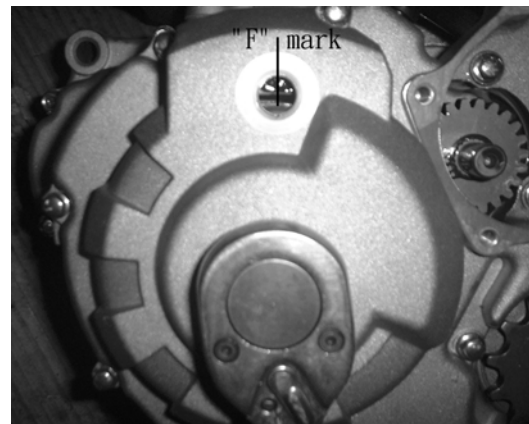


## CHECK AND ADJUST

### IGNITION TIMING

Using the timing light to check the ignition timing.

Keep the engine speed about 4000 rpm, if 2 mark-lines on flywheel aim at center of inspection hole then the ignition timing is correct.



### CYLINDER PRESSURE

Remove the spark plug cap and spark plug.  
Install the pressure gauge.

Rotate the throttle and press the electric start button.

The normal cylinder pressure is 12~14 kg/cm<sup>2</sup>.

If the cylinder pressure is too low then check the following items :

- Valve leakage?
- Valve gap is too tie?
- Cylinder head gasket is damage?
- Piston ring wear-out?
- Piston, cylinder wear-out?

If the cylinder pressure is too high then check the combustion chamber and the top face of piston whether with too much carbon residue.



## CHECK AND ADJUST ENGINE OIL

When you check the quantity of oil, the vehicle has to stay at the ground (flat) level.

Stop the engine and remove the oil level gauge.

Unscrew the engine oil filler cap from the right front corner of the engine and pull out the dipstick.

If the oil level is stay within bottom mark of the gauge, then the oil quantity is enough.

Refill the engine oil if it's too less.

The standard oil type is SAE 10W/40

Re-install the oil level gauge.

### **Change the engine oil :**

Take out the oil level gauge.

Remove the oil-release bolt underneath the engine and release the oil.

Install the oil-release bolt.

Fill the engine oil.

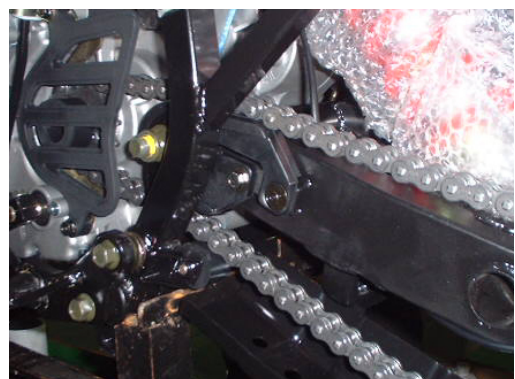
Confirm the washer of the bolt whether damaged.

### **Engine oil quantity :**

disassemble : 2.0 Lit

change : 1.6 Lit

Check all parts whether leaking, after assembly.



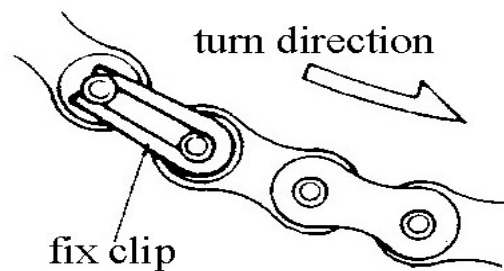
## DRIVE CHAIN

### Check the drive chain condition.

The drive chain should be checked, adjusted, and lubricated regularly.

Inspect the drive chain at a point on the lower run about halfway between the sprockets.

The free play of the drive chain should be between 20~30mm up and down.



### CHECK AND ADJUST

Inspect the front sprocket teeth for excessive wear; make sure there's no play in the sprocket.

When installing the chain clip, beware of the clip direction.

## BRAKE SYSTEM

### Parking brake and rear brake

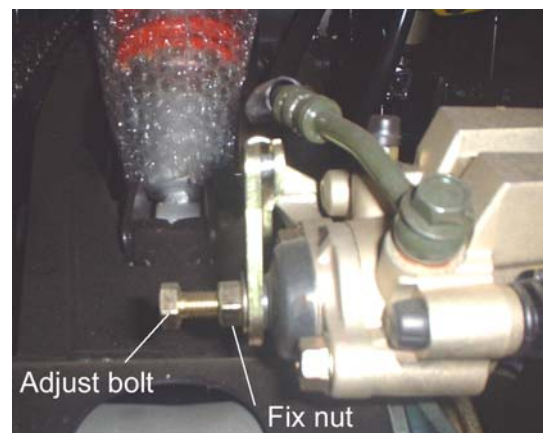
Check all the brake shoes. If the brake shoes have any dent or are wearing very seriously, then change them.

### Check the play of brake lever

Normal play : 10~20 mm

If the brake lever play is too much, adjust the fix bolts on the right brake lever.

If the play of the rear brake is over the normal value, then adjust the adjusting nut of the rear brake caliper on the swing arm.



Adjusting nut must be aligned with pin, any slight deviation may result in braking play change, causing danger as the brake is applied.

## **STEERING**

Turn the steering handlebar from right side to left side to check the steering operation.  
Be sure the wiring and cable does not affect the steering handle.

## **CHECK AND ADJUST**

### **FIXING OF NUTS AND BOLTS**

Check the fixing nuts, bolts on all parts to see if the nuts, bolts loosen then tie-up with certain locking torque.



## **SUSPENSION**

### **Front**

Hold the brake lever and push the handlebar.  
Check the fork movement and other parts if is loose or oil leaking.

### **Rear**

Check the damping of rear suspension  
Check the suspension bush function normally.

|                                                 |
|-------------------------------------------------|
| Inspect all suspension fasteners before riding. |
|-------------------------------------------------|

## **TIRE, RIM**

Check the tires whether have any nail, broken...etc.

Check tire pressure with a gauge that will read accurately at the low pressure used in ATV tires.

The tire pressure can be very depends on different operation condition. Please check the mark on tire for operation pressure tolerance.



## **CHECK AND ADJUST**

Check the shaft and nut of front wheel whether loosen.

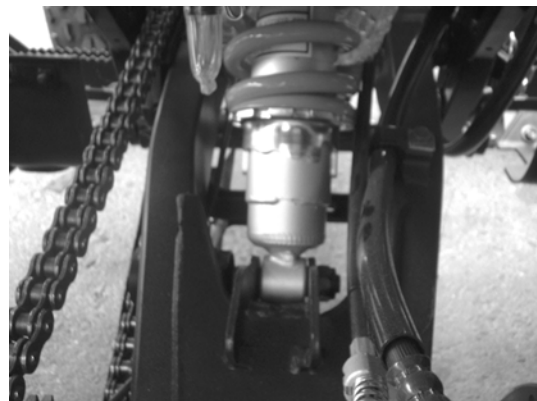
Check the nut of rear wheel whether loosen.



## **Locking Torque:**

Front wheel 18mm nut : 14 kg-m

Rear wheel 18mm nut : 14 kg-m



# Chapter I Engine

---

## ENGINE REMOVE AND INSTALLATION

### ENGINE REMOVAL

- Drain the engine oil.
- Remove the seat and the left/right footpad assembly.
- Remove the body front fender assembly.
- Disconnect the negative battery cable.
- Disconnect the crankcase breather tube from cylinder head cover and on cylinder.
- Remove the carburetor.
- Remove the exhaust system.



- Label and disconnect the following wires:
  - Spark plug wire
  - Alternator (there-pin connector)
  - Reverse and neutral switches
  - Starter cable
- Disconnect the reverse cable.
- Disconnect the clutch cable from the lifter arm and detach the cable from the bracket.
- Remove the drive sprocket cover, remove the drive sprocket and pull the drive chain back so that it doesn't interfere with engine removal.



- Remove the engine mounting bolts, nuts and brackets at the lower front and lower rear.
- Have an assistant help you lift the engine and remove it from the left side.
- Slowly lower the engine to a suitable working area.



### NOTE

Remove the external oil pipe on cylinder head cover for bigger clearance to remove the engine.

---

# Chapter I Engine

---

## Engine Remove and Installation

### INSTALLATION

- Mounting the engine and tie-up fixed nuts with standard locking torque.

Locking torque :

Fixed M10 nuts on bracket : 4.0 kg-m

- Place a floor jack under the engine. Again, be sure to protect the engine from the jack head with a block of wood. Lift the engine to align the mounting bolt holes, then install the brackets, bolts and nuts.
- The remainder of installation is the reverse of the removal steps, with the following additions:
  - a) Use new gaskets at all exhaust pipe connections.
  - b) Adjust the clutch cable and the throttle cable.
  - c) Fill the engine with oil. Run the engine and check for leaks.
- Finish mounting the engine; be sure to check the throttle cable tolerance.

Use reversed procedure to setup the parts that has been removed.

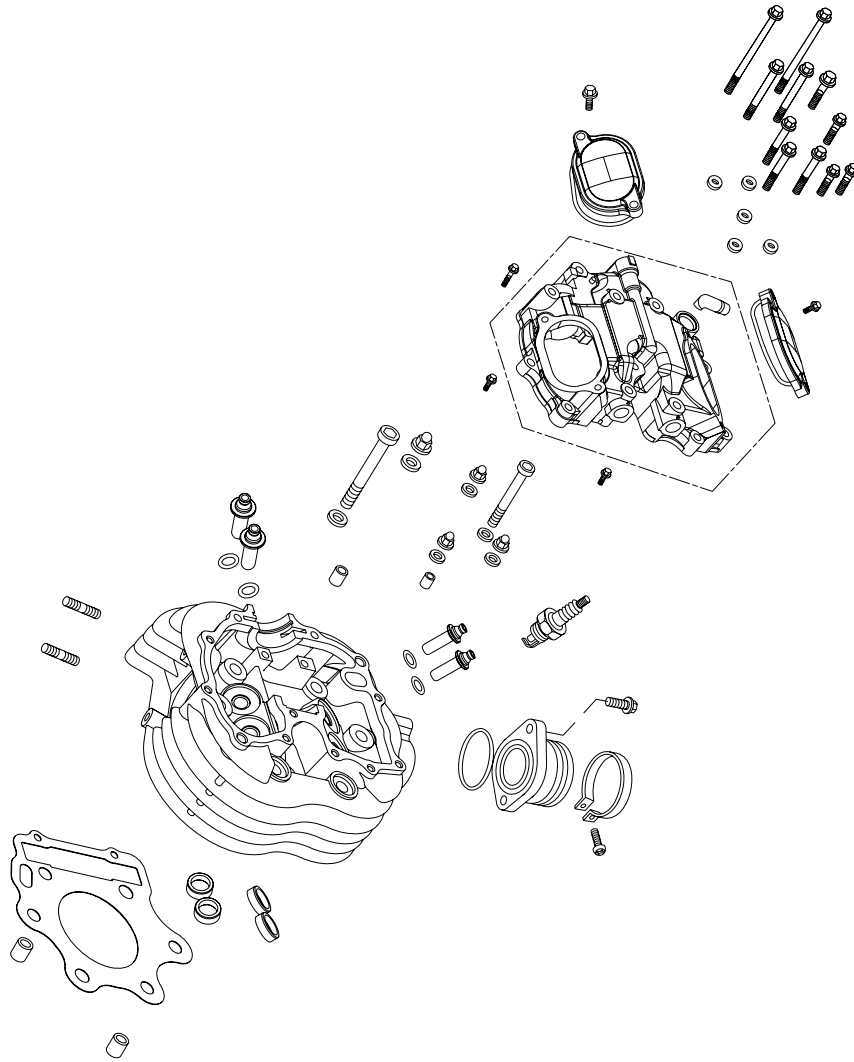
**NOTE :**

※ All cables and wiring has to be set into correct position

# Chapter I Engine

---

## CYLINDER HEAD, VALVE



## TROUBLE DIAGNOSE

### Idle Speed not Stable

- Compression pressure too low
- Bad adjustment of valve clearance
- Valves banded or burn
- Valve timing not correct
- Damage of valve spring
- Sealing of valves and seats abnormal
- Leaking of cylinder head gasket
- Bottom of cylinder head damaged
- Wrong installation of spark plug

**Valve gap adjustment 0.08 mm**

### Compression Pressure too high

- Too much carbon-residue inside combustion chamber.

### Emission with White Smoke

- Valves or valve guide attrition
- Oil seal on valve attrition
- Piston ring attrition

### Noise

- Bad adjustment of valve gap
- Valve burn or spring damaged
- Camshaft or rock arm attrition
- Attrition of cam-chain guide comp.

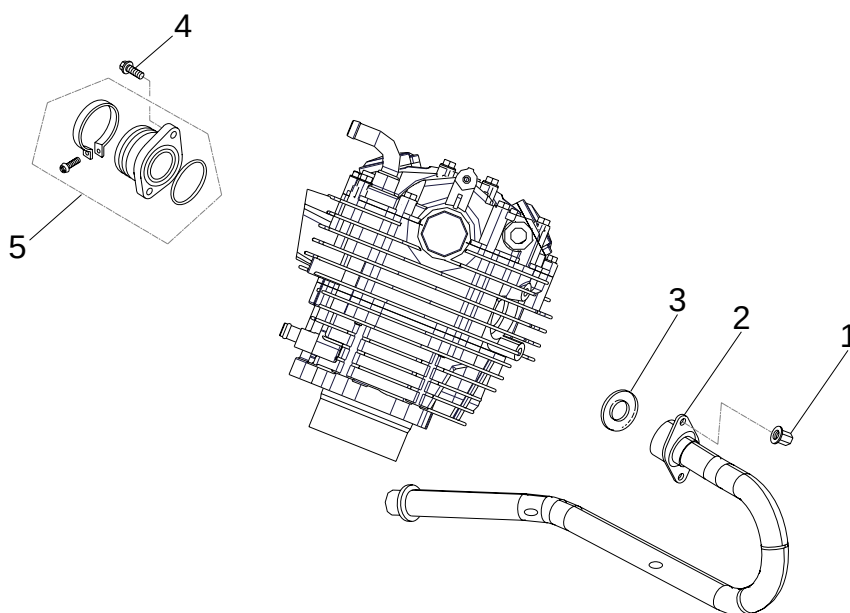
# Chapter I Engine

## CYLINDER HEAD, VALVE

### Attention of Operation

- Can be operated when engine installed on vehicle.
- Must cleaning before operating, avoiding dust enter the engine.
- Remove the gasket dust stay on joint face.
- Avoid to use screwdriver harm the joint face when remove the cylinder & cylinder head.
- Cleaning before check parts, and smear motor oil appointed in sliding face before installing.

### Remove Cylinder Head

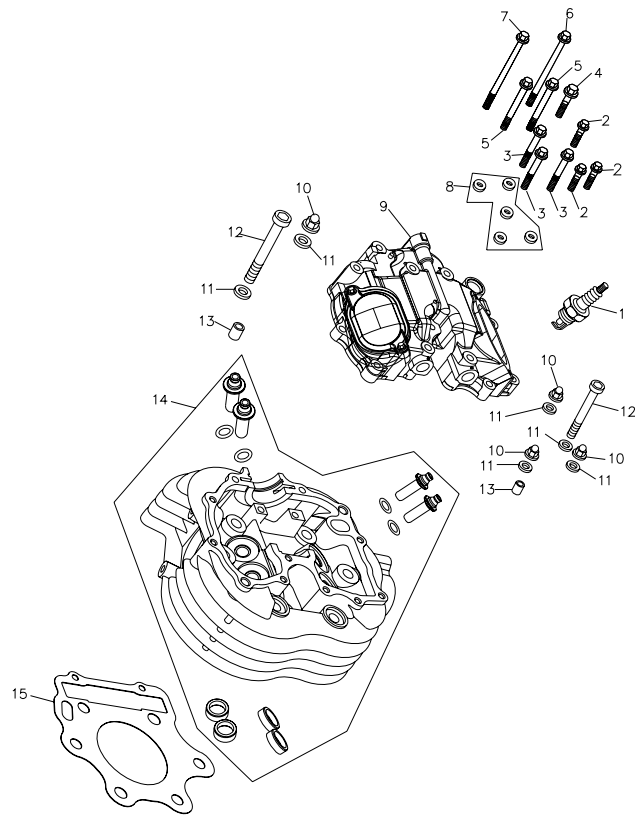


| SEQ | Operation / Parts Name          | Q'ty | Remarks                                                                                                 |
|-----|---------------------------------|------|---------------------------------------------------------------------------------------------------------|
|     | <b>Disassembly</b>              |      |                                                                                                         |
| 1   | Cap nut of exhaust pipe ( 8mm ) | 2    | ※ Unscrew the bolts cross-wise for 2~3 times.<br><br>※ <b>WARNING:</b> Don't knock cooling fin.         |
| 2   | Exhaust pipe of front section   | 1    |                                                                                                         |
| 3   | Exhaust pipe gasket             | 1    |                                                                                                         |
| 4   | Exhaust pipe gasket             | 2    |                                                                                                         |
| 5   | Hex flange bolt                 | 1    |                                                                                                         |
|     | Intake manifold assembly        |      |                                                                                                         |
|     | <b>Assembly</b>                 |      |                                                                                                         |
|     | 5→1                             |      | ※ Operation with sequence in reverse of disassembly.<br>※ Tie-up nuts on cylinder head cover 2~3 times. |

# Chapter I Engine

## CYLINDER HEAD, VALVE

### Disassembly the cylinder head

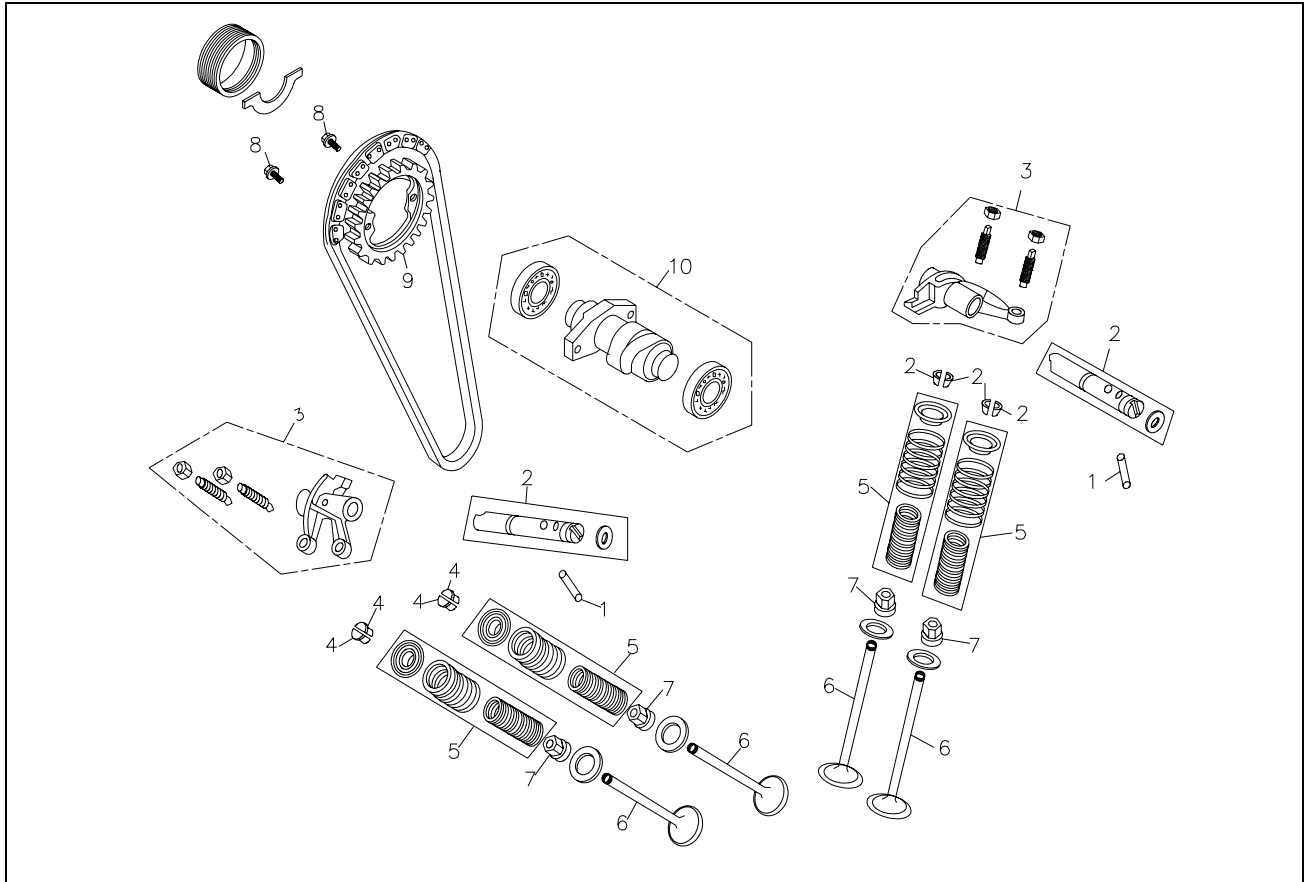


| SEQ. | Operation / Parts Name       | Q'ty | Remarks                                              |
|------|------------------------------|------|------------------------------------------------------|
|      | <b>Disassembly</b>           |      |                                                      |
| 1    | Spark plug                   | 1    |                                                      |
| 2    | Hex flange bolt              | 3    | ※ 6×28                                               |
| 3    | Hex flange bolt              | 3    | ※ 6×52                                               |
| 4    | Hex flange bolt              | 1    | ※ 6×35                                               |
| 5    | Hex flange bolt              | 2    | ※ 6×80                                               |
| 6    | Hex flange bolt              | 1    | ※ 6×115                                              |
| 7    | Hex flange bolt              | 1    | ※ 6×136                                              |
| 8    | Plain washer                 | 5    | ※ 6.5×14×1.6                                         |
| 9    | Cylinder head cover assembly | 1    |                                                      |
| 10   | Hex acorn washer face nut    | 4    |                                                      |
| 11   | Plain washer                 | 6    | ※ M10×P1.5                                           |
| 12   | Hex socket bolt              | 2    | ※ 10×20×2                                            |
| 13   | Dowel pin                    | 2    | ※ 10×105×P1.25                                       |
| 14   | Cylinder head                | 1    | ※ 8×12                                               |
| 15   | Cylinder head gasket         | 1    | ※ Check the gasket if wear out or damaged            |
|      | <b>Assembly</b>              |      |                                                      |
|      | 15→1                         |      | ※ Operation with sequence in reverse of disassembly. |

# Chapter I Engine

## CYLINDER HEAD, VALVE

### Remove the camshaft and valve



| SEQ. | Operation / Parts Name    | Q'ty | Remarks                                                          |
|------|---------------------------|------|------------------------------------------------------------------|
|      | <b>Disassembly</b>        |      |                                                                  |
| 1    | Dowel pin                 | 2    | ※ The dowel pins are located underneath the cylinder head cover. |
| 2    | Rocker arm shaft comp.    | 2    |                                                                  |
| 3    | Valve arm rocket assembly | 2    | ※ Using 8mm bolt to pull out the shaft from R side.              |
| 4    | Valve cotter              | 8    |                                                                  |
| 5    | Valve spring assembly     | 4    |                                                                  |
| 6    | Inlet/Exhaust valve       | 4    |                                                                  |
| 7    | Valve stem seal           | 4    |                                                                  |
| 8    | Hex flange bolt           | 2    |                                                                  |
| 9    | Camshaft sprocket         | 1    | ※ 38T                                                            |
| 10   | Camshaft comp             | 1    |                                                                  |
|      | <b>Assembly</b>           |      |                                                                  |
|      | 10→1                      |      | ※ Operation with sequence in reverse of disassembly.             |

# Chapter I Engine

## CYLINDER HEAD, VALVE

- Check the cam surface to see if it's wear out or damaged?

### Working limit:

Replace if **IN. cam under 35.57 mm**  
**EX. cam under 35.58 mm**

- Check the camshaft bearings to see if it's wear out or loose.  
If it's loose or wear out, change whole set of camshaft.

- Check the rock arm and shaft
- Check rock arm inside diameter

### Working Limit:

Replace if over 12.04mm

- Check the rock arm shaft outside diameter.

### Working Limit:

Replace if under 11.92mm

### Note :

※ If the sliding face of rock arm wear out then check the cam surface of the cam shaft

- Check the gap between rock arm and shaft.

### Working Limit:

Replace if over 0.07 mm

### Remove valves

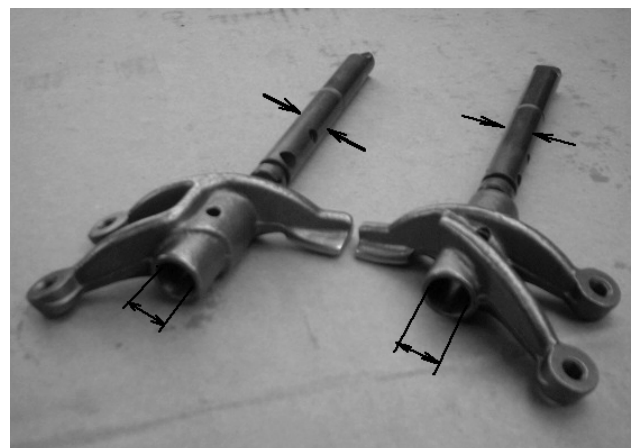
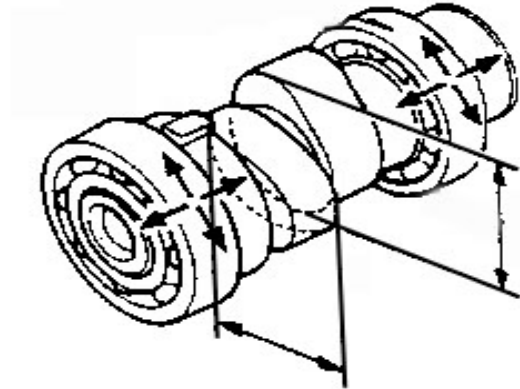
Use valve spring holder tool to remove the spring holder, cotter, spring, valve, and seal.

### Note :

- ※ Valve spring must use special tool to disassembly.
- ※ Parts removed have to place in certain order, assembly in opposite order.

↑  
specia

Valve spring holder tool : TLH3-03



# Chapter I Engine

## CYLINDER HEAD, VALVE

### Check cylinder head

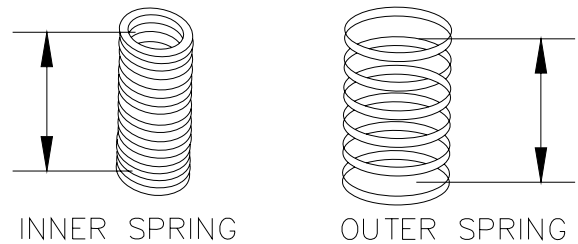
- Check the hole of spark plug and valve guide to see if it's damaged.

### Check valve spring free length

#### Working limit:

Outer spring: Replace under 39.8 mm

Inner spring: Replace under 37.8 mm



### Check valve and valve guide

- Check valve to see if it's burned or banded.
- Check the movement between valve and guide is smooth or not.

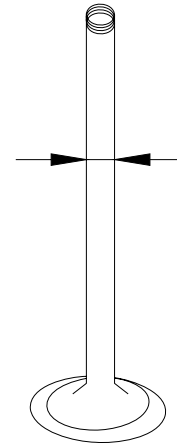
Valve outside diameter working limit:

Replace under 5.45 mm

### Valve guide inside cylinder head

#### working limit:

Replace if over 5.53 mm



### Cylinder head assembly

- Install valve seal, spring seat

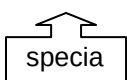
#### Note :

- ※ Install new valve seal after removed.

- Install valve into cylinder head with some lubrication oil on seal and spring seat
- Install springs, spring holder, cotter and use special tool to assembly.

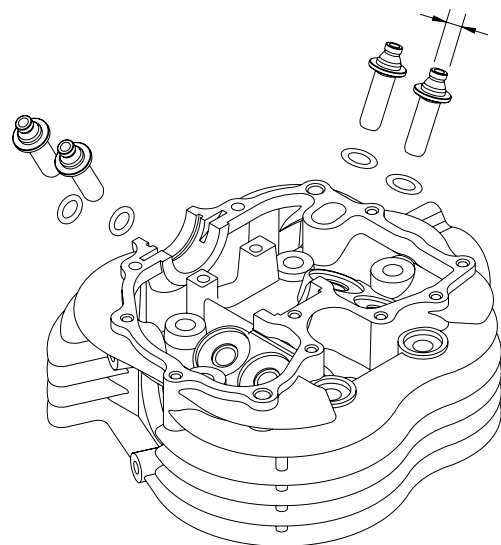
#### Note :

- ※ Must use the special tool.
- ※ Valve cotter sharp edge face toward cylinder head bottom.



Valve spring holder tool : TLH3-03

- Use rubber hammer hit the valve top for 2 ~ 3 times to have better contact between valve and cotter.



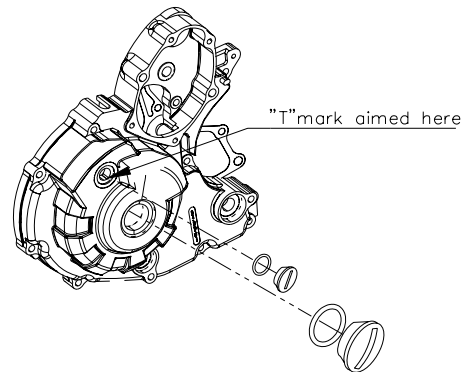
# Chapter I Engine

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## CYLINDER HEAD, VALVE

### Camshaft adjustment

- After install the cylinder head, it's necessary to setup the camshaft timing.
- Before put the timing chain on cam sprocket, turn the "T" mark on ACG flywheel aim at the crankcase sign.



## MEMO

# Chapter I Engine

## CYLINDER, PISTON

### TROUBLE DIAGNOSE

#### Low compression pressure

- Piston ring wear-out, burn, or broken
- Cylinder, piston wear out or damaged.

#### Compression pressure too high

- Piston or combustion chamber stocks with carbon material.
- Avoid to harm the cylinder inner surface and piston face.

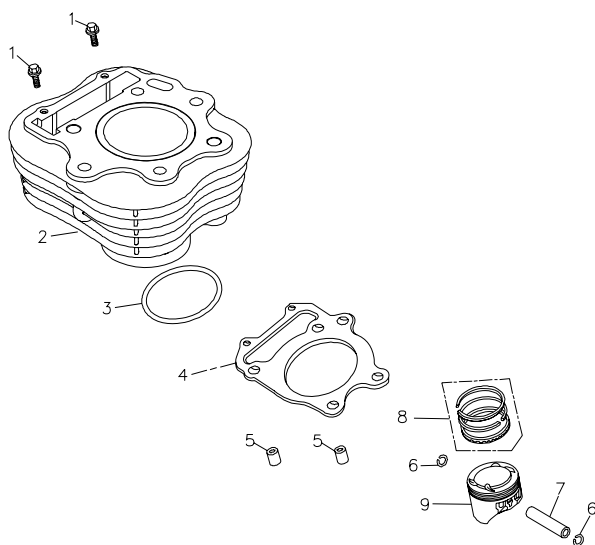
#### Exhaust with white smoke

- Piston ring wear-out, burn, or broken
- Cylinder, piston wear out or damaged.

#### Piston noise

- Piston, cylinder, or piston ring damaged.
- Piston pin and piston wear out

### Disassembly of Cylinder / Piston



| SEQ | Operation / Parts Name      | Q'ty | Remarks                                                  |
|-----|-----------------------------|------|----------------------------------------------------------|
|     | <b>Disassembly Cylinder</b> |      | <b>WARNING:</b>                                          |
| 1   | Cylinder and gasket         |      | ※ Don't knock the cooling fin.                           |
| 1   | Hex flange bolt             | 2    | ※ Clean the gasket stick on crank case.                  |
| 2   | Cylinder                    | 1    | ※ Replace if necessary                                   |
| 3   | Oil ring                    | 1    | ※ Replace if deformed                                    |
| 4   | Cylinder gasket             | 1    |                                                          |
| 5   | Dowel pin                   | 2    |                                                          |
|     | <b>Disassembly Piston</b>   |      | <b>WARNING:</b>                                          |
| 6   | Piston pin clip             | 2    | ※ Don't knock the piston when remove the pin.            |
| 7   | Piston pin                  | 1    | ※ Check the piston, piston pin, and piston rings.        |
| 8   | Piston ring set             | 1    | ※ Clean the carbon residual on ring and ditch on piston. |
| 9   | Piston                      | 1    | ※ Beware not to break or damage the piston rings.        |
|     | <b>Assembly</b>             |      |                                                          |
| 9→1 |                             |      | ※ Operation with sequence in reverse of disassembly.     |

# Chapter I Engine

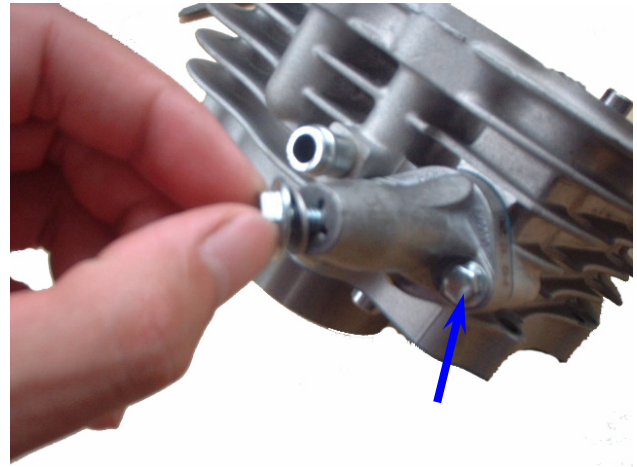
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## CYLINDER, PISTON

### Cam chain tensioner

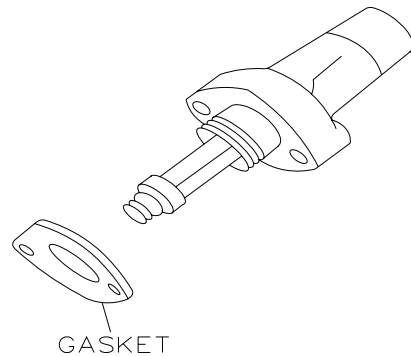
#### **Removal**

- Loosen the cam chain tensioner sealing bolt and washer.
- The cam chain tensioner lifter shaft must be retracted and locked into place before removing the tensioner.
- Remove the tensioner mounting bolts and detach the tensioner from the cylinder block.
- Clean all old gasket material from the tensioner body and from its mating surface on the cylinder block.



#### **Installation**

- Lubricate the friction surfaces of the components with moly-based grease.
- Install a new tensioner gasket on the cylinder.
- Cut the cable tie and remove the coat hanger wire.
- Install the tensioner sealing bolt and a new sealing washer and tighten the sealing bolt to torque.



### Disassembly of Piston

- The piston should have an IN mark on its crown that goes toward the intake side of the engine.



# Chapter I Engine

---

## CYLINDER, PISTON

- Wear eye protection and pry the cir-clip out of its groove with a pointed tool.
- Push the piston pin part-way out, then pull it the rest of the way.



### Inspection of Piston

- Remove the top and second piston rings.



- Remove the upper oil ring side rail and expander, then remove the lower side rail.

### \*Warning :

Be-ware not to scratch the piston during ring removal.



# Chapter I Engine

---

## CYLINDER, PISTON

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

### Working limit:

Top ring: replace above 0.11mm  
2<sup>nd</sup> ring: replace above 0.09 mm

- Take-off piston rings and put into the bottom of cylinder.

### Note :

\* Use piston to press the ring into cylinder.

- Measure the opening gap of the piston ring when pressed into cylinder.

### Working limit:

Top ring: replace above 0.5mm  
2<sup>nd</sup> ring: replace above 0.5mm

- Measure the hole of the piston pin.

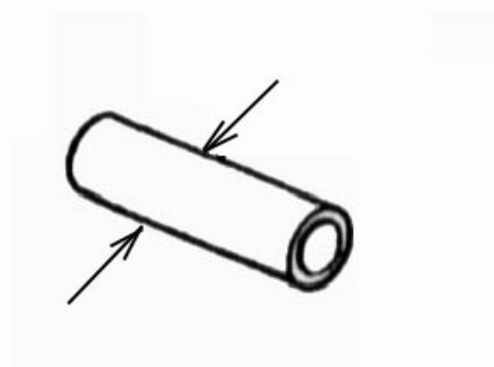
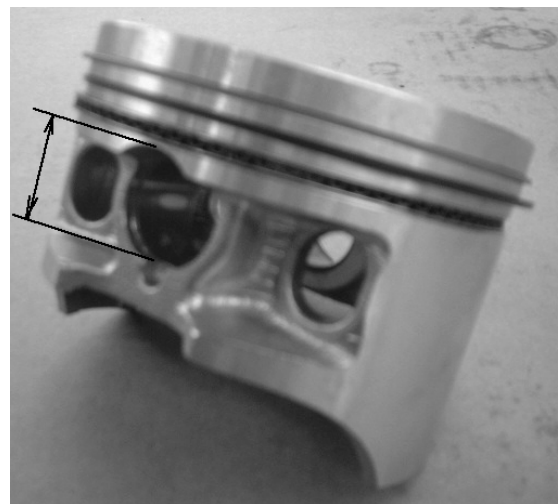
### Working limit:

Replace if inside diameter is over 17.04 mm

- Measure outside diameter of piston pin.

### Working limit:

Replace if under 16.96 mm



# Chapter I Engine

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## CYLINDER, PISTON

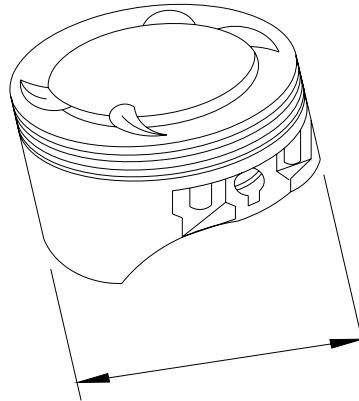
- Measure outside diameter of piston.

### Note :

- \* It's important to measure the outside diameter with vertical position. The measure point is about 5mm away from the bottom.

### Working limit:

Replace if under 73.9 mm

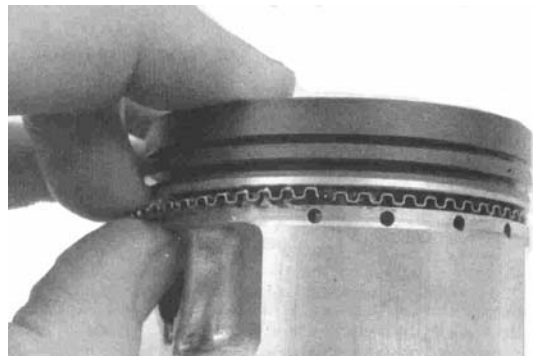


### Piston rings installation

- Each ring should be greased with oil.

### Warning :

- \* Do not scratch piston and do not band piston rings.
- \* The mark on piston ring must face up.
- \* Be sure the rings rotate freely after install into piston.



### Piston installation

- Clean the gasket stick on top of crankcase.
- Install piston, piston pin, and clips.

### Warning :

- \* The "IN" mark on top of cylinder must aim at the intake valve direction.
- \* Piston pin clip must not drop into crankcase. Use cloth to seal the crankcase.
- \* Check the piston clips is located in fix position.

# Chapter I Engine

## CYLINDER, PISTON

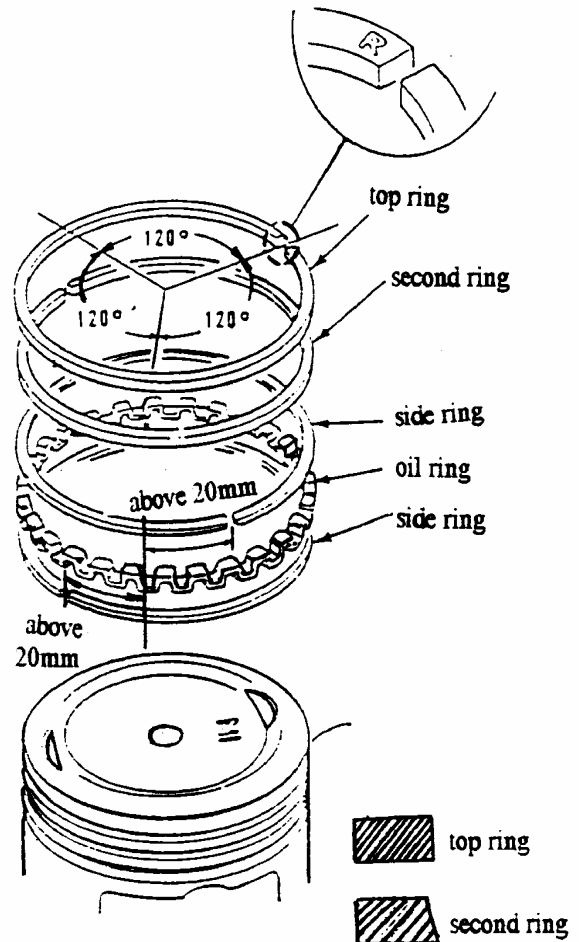
### Cylinder Installation

- Put the dowel pins and gasket on top of crankcase.
- Cylinder inside surface, piston, and piston rings must be greased with oil.
- Beware of the pressure from piston ring when install into cylinder.

#### Warning :

- \* Be careful not to damage or bend the piston ring.
- \* The opening section of piston rings should not be the same with piston pin and set into  $120^\circ$  to each other.

- Fit the cylinder into correct position.



# Chapter I Engine

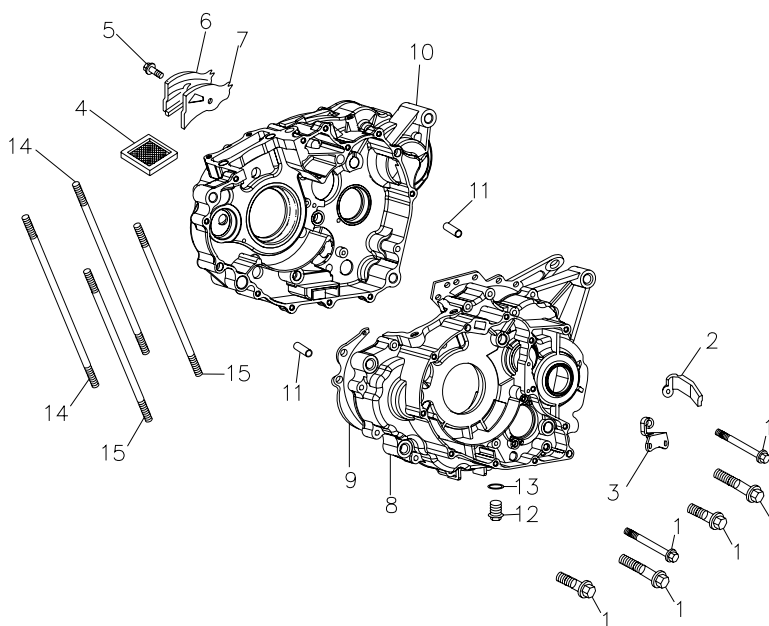
## CRANKCASE, CRANKSHAFT

### TROUBLE DIAGNOSE

#### Engine noise

- Loose of crankshaft bearings.
- Loose of bearings inside crankshaft connecting rod.

### Disassembly of the crankcase

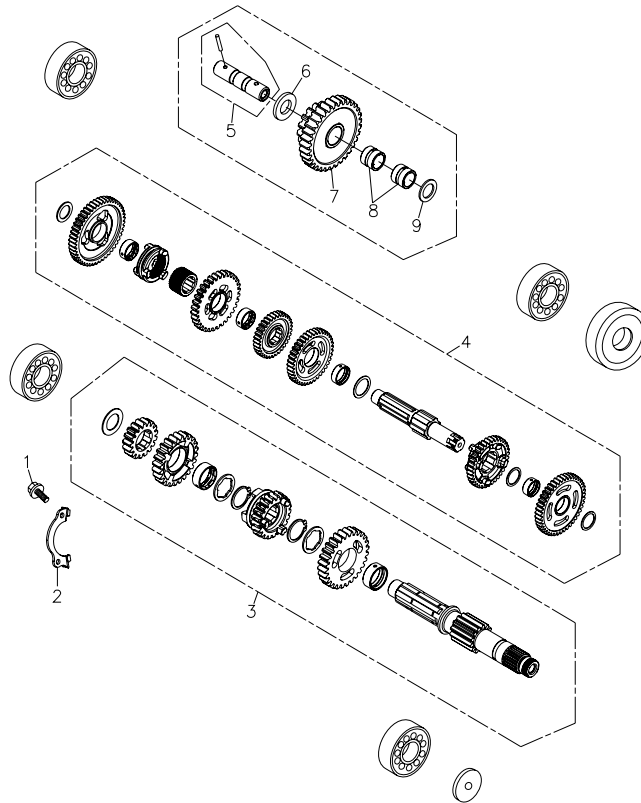


| SEQ  | Parts Name             | Q'ty | Remarks                                                                                 |
|------|------------------------|------|-----------------------------------------------------------------------------------------|
|      | Disassembly            |      |                                                                                         |
| 1    | Hex flange bolt        | 14   | ※ M6×35, M6×45, M6×65                                                                   |
| 2    | Breather tube clamp    | 1    |                                                                                         |
| 3    | Clutch wire receiver   | 1    |                                                                                         |
| 4    | Oil filter screen      | 1    |                                                                                         |
| 5    | Hex socket flange bolt | 1    | ※ M6×12                                                                                 |
| 6    | Breather plate         | 1    |                                                                                         |
| 7    | Breather plate gasket  | 1    | ※ Use rubber hammer slightly hit the gear to remove the crankcase.                      |
| 8    | Left crankcase         | 1    |                                                                                         |
| 9    | Crankcase gasket       | 1    | ※ Scratch off the gasket which between crankcases and use new gasket after disassembly. |
| 10   | Right crankcase        | 1    |                                                                                         |
| 11   | Dowel pin              | 2    | ※ Do not damage the crankcase surrounding edge.                                         |
| 12   | Hex flange bolt        | 1    |                                                                                         |
| 13   | Plain washer           | 1    | ※ Check the oil seal is attrition or not.                                               |
| 14   | Stud bolt              | 2    | ※ M12×15                                                                                |
| 15   | Stud bolt              | 2    | ※ 12.5×20×2                                                                             |
|      |                        |      | ※ The stud bolts are not necessary to remove unless it's banded or defect               |
|      | Assembly               |      |                                                                                         |
| 15→1 |                        |      | ※ Operation with sequence in reverse of disassembly.                                    |

# Chapter I Engine

## CRANKCASE, CRANKSHAFT

### Disassembly of the transmission gear

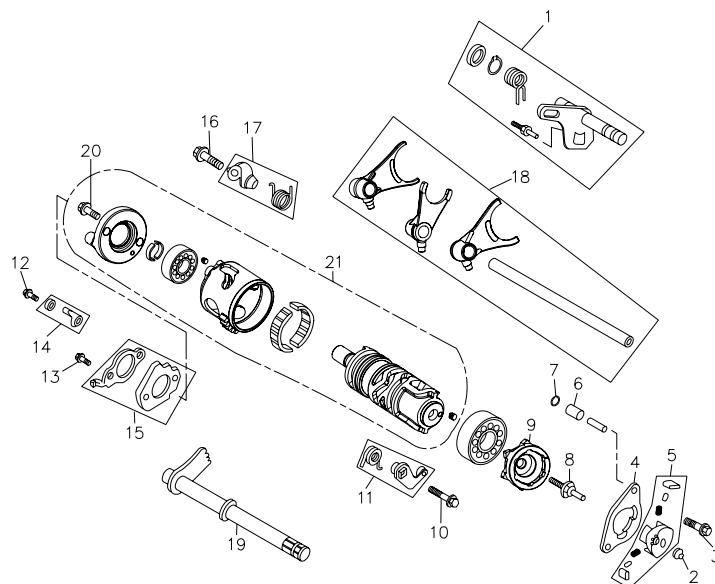


| SEQ | Parts Name              | Q'ty | Remarks                                                                                                                                                                                                                                                                                                                                                                                |
|-----|-------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | <i>Disassembly</i>      |      |                                                                                                                                                                                                                                                                                                                                                                                        |
| 1   | Hex socket bolt         | 1    | <ul style="list-style-type: none"> <li>※ The gear assembly should pull out at the same time with drum shaft assembly.</li> <li>※ Beware keep the washer and cir-clip in original order.</li> <li>※ The ball and needle bearings are located on crankcase. Check the bearing is functioning well or not.</li> <li>※ Be-ware of the gear set sequence and assembly direction.</li> </ul> |
| 2   | Bearing setting plate   | 1    |                                                                                                                                                                                                                                                                                                                                                                                        |
| 3   | Main shaft assembly     | 1    |                                                                                                                                                                                                                                                                                                                                                                                        |
| 4   | Counter shaft assembly  | 2    |                                                                                                                                                                                                                                                                                                                                                                                        |
| 5   | Reverse idle gear shaft | 1    |                                                                                                                                                                                                                                                                                                                                                                                        |
| 6   | Thrust washer           | 2    |                                                                                                                                                                                                                                                                                                                                                                                        |
| 7   | Reverse idle gear       | 1    |                                                                                                                                                                                                                                                                                                                                                                                        |
| 8   | Reverse idle gear bush  | 1    |                                                                                                                                                                                                                                                                                                                                                                                        |
| 9   | Thrust washer           | 1    |                                                                                                                                                                                                                                                                                                                                                                                        |
|     | <i>Assembly</i>         |      |                                                                                                                                                                                                                                                                                                                                                                                        |
| 9→1 |                         |      | <ul style="list-style-type: none"> <li>※ Operation with sequence in reverse of disassembly.</li> </ul>                                                                                                                                                                                                                                                                                 |

# Chapter I Engine

## CRANKCASE, CRANKSHAFT

### Disassembly of the gear shaft mechanism



| SEQ  | Parts Name                       | Q'ty | Remarks                                                                                                                                                                   |
|------|----------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | <i>Disassembly</i>               |      |                                                                                                                                                                           |
| 1    | Gear shift arm assembly          | 1    | ※ Parts from sequence 1 to 11 are removed during previous L crankcase disassembly.<br>※ Parts from sequence 12 to 17 are removed during previous R crankcase disassembly. |
| 2    | Shifter collar                   | 1    |                                                                                                                                                                           |
| 3    | Hex flange bolt                  | 1    |                                                                                                                                                                           |
| 4    | Guide plate                      | 1    |                                                                                                                                                                           |
| 5    | Rotor assembly                   | 1    |                                                                                                                                                                           |
| 6    | Bushing                          | 1    |                                                                                                                                                                           |
| 7    | Bearing holder plate             | 2    |                                                                                                                                                                           |
| 8    | Shift pin                        | 1    |                                                                                                                                                                           |
| 9    | Shift drum center                | 1    |                                                                                                                                                                           |
| 10   | Hex flange bolt                  | 1    |                                                                                                                                                                           |
| 11   | Gear shift drum stopper assembly | 1    |                                                                                                                                                                           |
| 12   | Hex socket bolt                  | 2    | ※ Check the tolerance between the forks and drum.                                                                                                                         |
| 13   | Hex washer face bolt             | 1    |                                                                                                                                                                           |
| 14   | Neutral switch rotor comp.       | 1    |                                                                                                                                                                           |
| 15   | Reverse stopper cam comp.        | 1    |                                                                                                                                                                           |
| 16   | Hex flange bolt                  | 2    |                                                                                                                                                                           |
| 17   | Reverse shift stopper comp.      | 1    |                                                                                                                                                                           |
| 18   | Gear shift fork assembly         | 2    |                                                                                                                                                                           |
| 19   | Gear shift spindle comp          | 1    |                                                                                                                                                                           |
| 20   | Hex socket bolt                  | 1    |                                                                                                                                                                           |
| 21   | Gear shift drum assembly         | 1    |                                                                                                                                                                           |
|      | <i>Assembly</i>                  |      |                                                                                                                                                                           |
| 21→1 |                                  |      | ※ Operation with sequence in reverse of disassembly.<br>※ Apply oil during assembly.                                                                                      |

# Chapter I Engine

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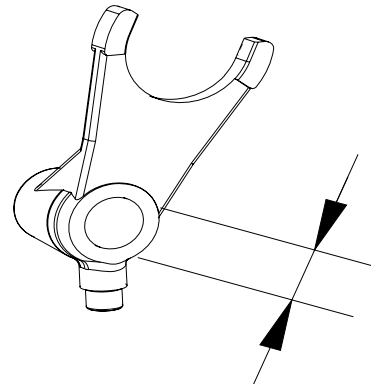
## CRANKCASE DISASSEMBLY

### GEAR SHIFT MECHANISM

- Check the small spring locates on the gearshift arm to see if it's too loose or not.
- Check the stopper plate is loose or not.
- Check the roller guide.

#### Working diameter limit:

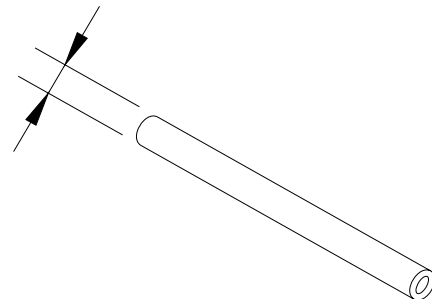
Replace if under 5.7mm



- Check the inside diameter of the forks.

#### Working diameter limit:

Replace if over 13.04mm



- Check the outside diameter of the forks.

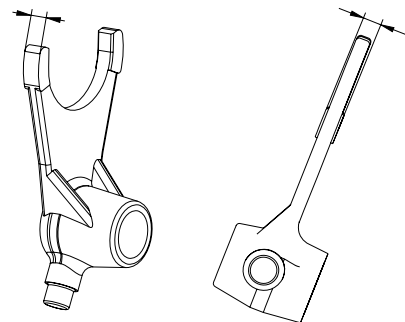
#### Working diameter limit:

Replace if over 12.96mm

- Check the fork ear thickness applied to gear shaft area.

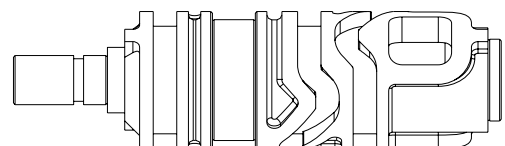
#### Working diameter limit:

Replace if under 4.50mm



Center gear shift fork      R/L gear shift fork

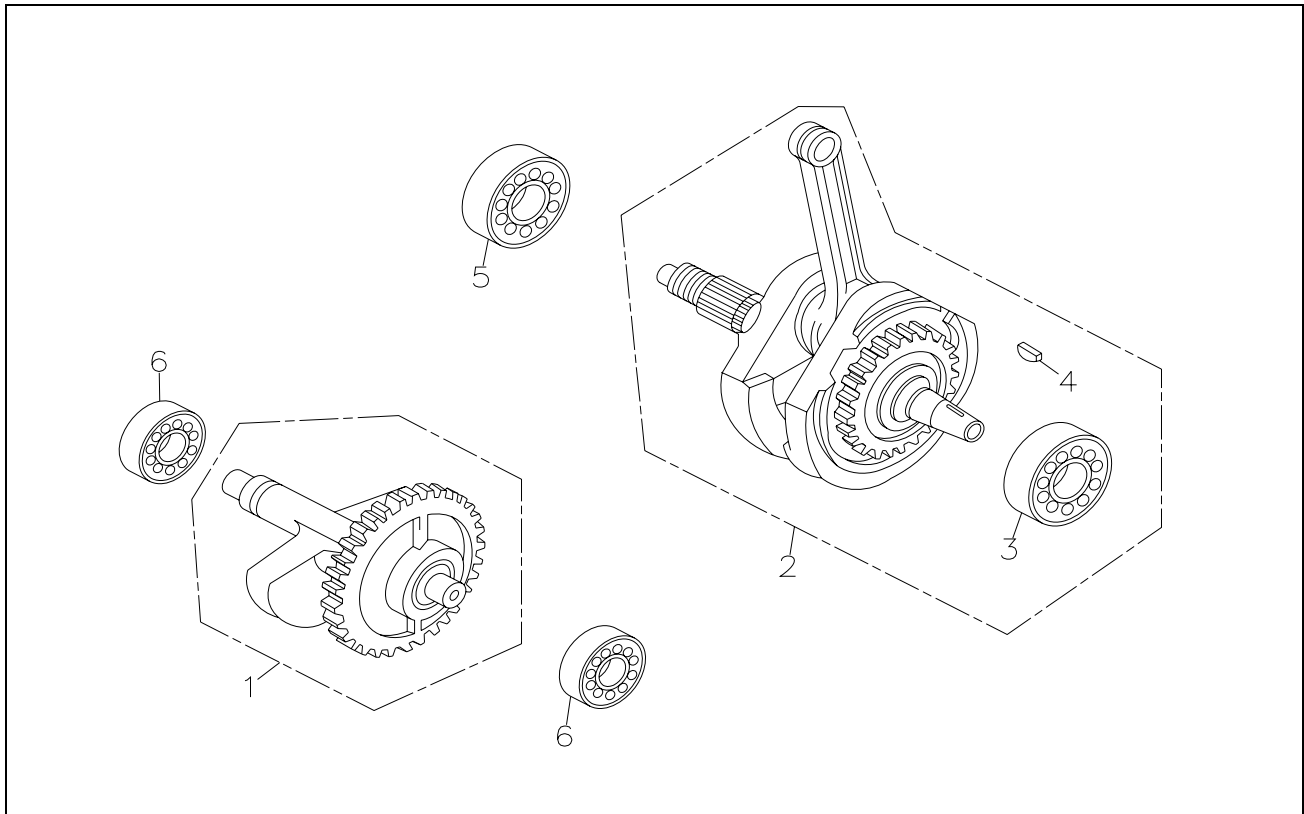
- Check the shift drum grooves for wear, especially at the points.



# Chapter I Engine

## CRANKCASE, CRANKSHAFT

### Remove of the crank shaft



| SEQ | Parts Name           | Q'ty | Remarks                                                                                                                                                                                                                                                       |
|-----|----------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | <i>Disassembly</i>   |      |                                                                                                                                                                                                                                                               |
| 1   | Shaft comp assembly  | 1    | ※ The crankshaft assembly normally is not for disassembly. It will generate more problems if the L/R cranks are disassembled.<br><br>※ The semi-cycle key normally was took out when disassembly the flywheel. Beware keep it in certain place to avoid lost. |
| 2   | Crank shaft assembly | 1    |                                                                                                                                                                                                                                                               |
| 3   | Radial ball bearing  | 1    |                                                                                                                                                                                                                                                               |
| 4   | Semi-cycle key       | 1    |                                                                                                                                                                                                                                                               |
| 5   | Radial ball bearing  | 1    |                                                                                                                                                                                                                                                               |
| 6   | Radial ball bearing  | 1    |                                                                                                                                                                                                                                                               |
|     | <i>Assembly</i>      |      |                                                                                                                                                                                                                                                               |
| 6→1 |                      |      | ※ Operation with sequence in reverse of disassembly.                                                                                                                                                                                                          |

# Chapter I Engine

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## CRANKCASE, CRANKSHAFT

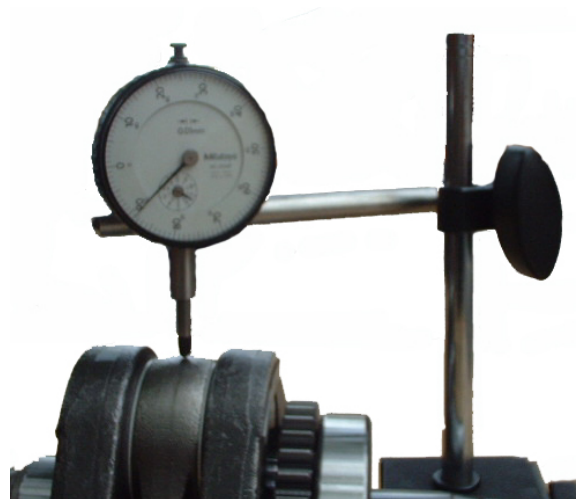
- Check the connecting rod side clearance with a feeler gauge.

**The connecting rod side clearance limit is 0.80mm**

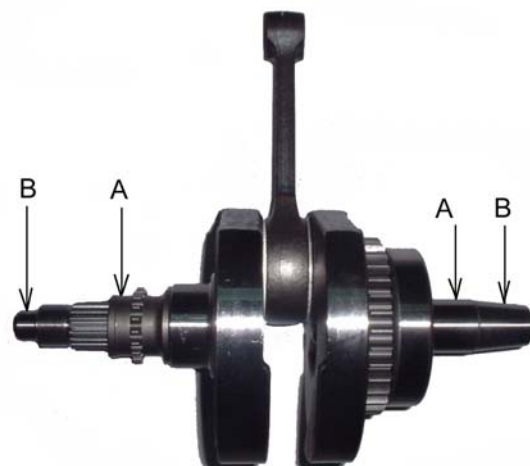


- Check the connecting rod radial clearance with a dial indicator.

**The connecting rod big end radial clearance limit is 0.05mm**



- Place a V-block on each side of the crankshaft (A) and measure run-out at the ends (B)



# Chapter I Engine

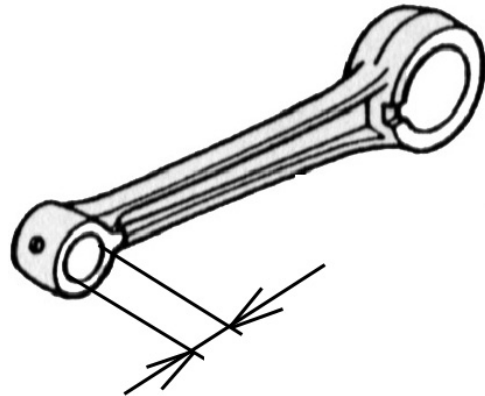
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## CRANKCASE, CRANKSHAFT

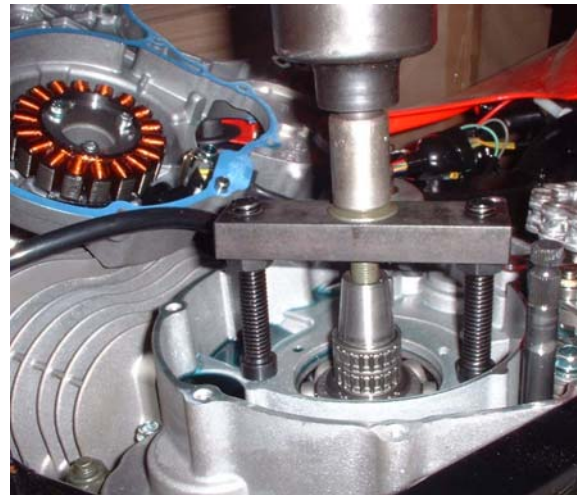
- Check the connecting rod.

### Working diameter limit:

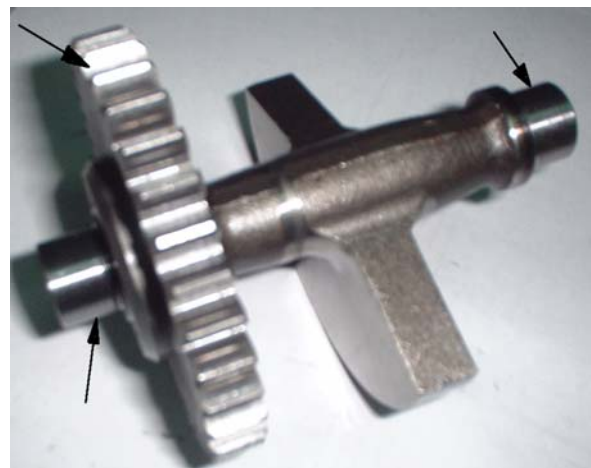
Replace if over 17.10mm



- Check the balancer gear and bearing journals for wear or damage.



- Use a special tool (TLH3-01) to pull the crankshaft and push the left crankcase onto the crankshaft.



# LUBRICATION SYSTEM

## TROUBLE DIAGNOSE

### Oil quantity reduced

- Normal consumption
- Oil leaking
- Piston ring wear-out or installed wrong
- Valve seal wear-out

### Engine burn

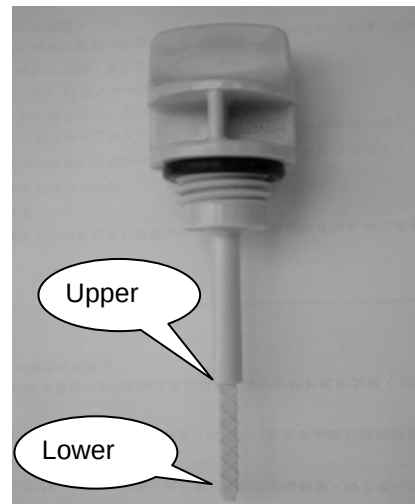
- No oil pressure or pressure too low
- Oil thoroughfare blocking
- Oil type incorrect

## ENGINE OIL & FILTER

### Oil quantity

- \* When you check the oil quantity, the vehicle has to stand on flat ground.
- \* Starting the engine about 2~3 min. then stop it. After 2~3 min. check the oil quantity.

Remove the oil level gauge and check if the oil level under the lower limit then adds the standard oil to upper limit of gauge.



### Oil Exchange

- \* The motor oil will flow more easily if the engine is warm.
- \* The oil release bolt is under crankcase.

Locking torque : 1.5 kg-m

Remove the right crankcase cover to check and clean the oil filter. Replace new filter if it's damaged.

Adding the proper oil quantity  
Engine disassembly : 2.0L.  
Oil change : 1.6L

Check the engine oil whether leaking. If not then starting the engine at idle speed for few minutes and checking the oil level again.



## LUBRICATION SYSTEM

### CLUTCH

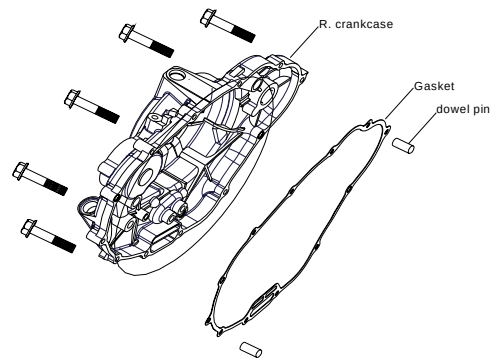
#### Remove

Remove the seat and body cover. ( see 3-1, 3-2 )

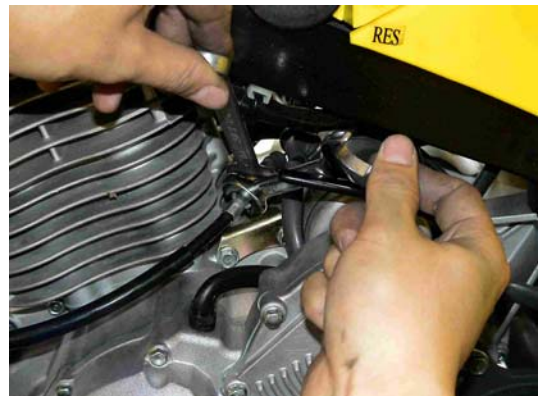
Remove 2×10mm Hex-flange bolts on left step bar (foot peg) and 2 Pan-Philips bolts on the rear foot fender. Remove foot peg and fender together.



Take-off 12 bolts on R. crankcase cover and remove the cover.  
Remove the gasket and 2 dowel pins.



Release the clutch cable fix nut from the left side of the engine. Pull out the cable from the clutch lever on top of right crankcase cover.



## LUBRICATION SYSTEM

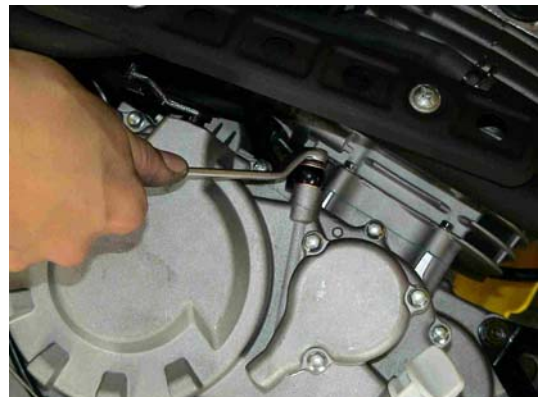
Remove 2×M8-25mm hex-flange bolts on master cylinder assembly. This is to lower down the brake pedal for easier disassembly.

Release brake pedal reset spring.



Lift the vehicle from right side and flip over to left side. Then remove the oil tube fix bolt on top of right crankcase cover.

※ Beware not to lost the copper washers.



Remove the nylon insert bolt on reverse stopper lever.



## LUBRICATION SYSTEM

Remove 2×M6-12mm hex-flange bolts together with the switch cover.



Un-plug the contact switch connectors.

**Attention :**

\* Beware the light green wire is for the neutral signal, the gray wire is for the reverse signal.



Remove 10×M6-32mm, 1×M6-40mm and 1×M6-50mm hex-flange bolts.



Put away all wires, cables. Slightly hit the right crankcase cover from side way and pull out to remove the cover.



## LUBRICATION SYSTEM

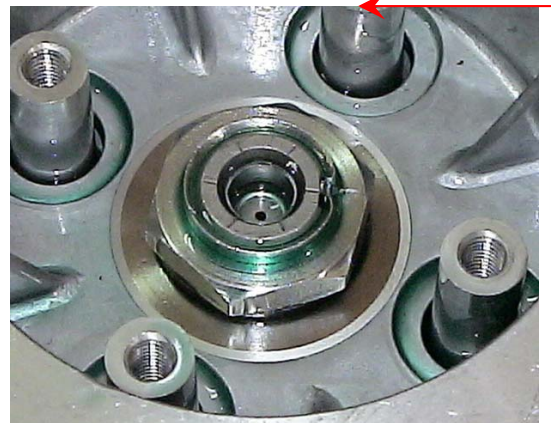
Remove the right crankcase cover gasket and beware not to lost the dowel pins.



Remove 4×M6-28mm hex bolts and 4 springs under the clutch lifter plate. Hold the lifter plate together with the needle roller bearing.



Before remove the locknut, punch out the lock section on the nut.



Remove the locknut and clutch center.



## LUBRICATION SYSTEM

Take off the clutch center.

Use reversed procedure to setup the parts that has been removed.

### Attention :

- \* Beware all dowel pins are located into the crankcase.
- \* Replace new gasket of the right crankcase cover after disassembly.



## OIL PUMP

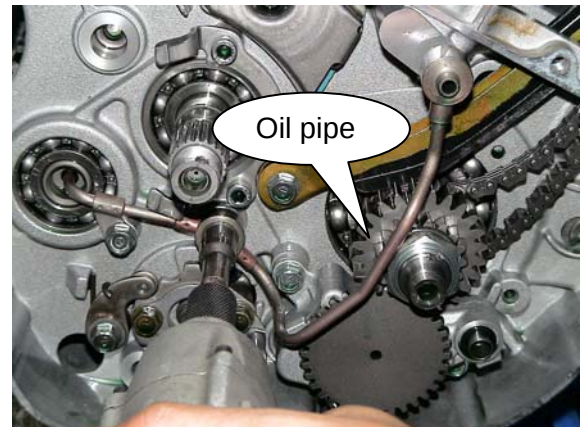
### Remove

Remove the O-ring from the oil pipe.

To detach the oil pipe from the crankcase, remove these 2 bolts.

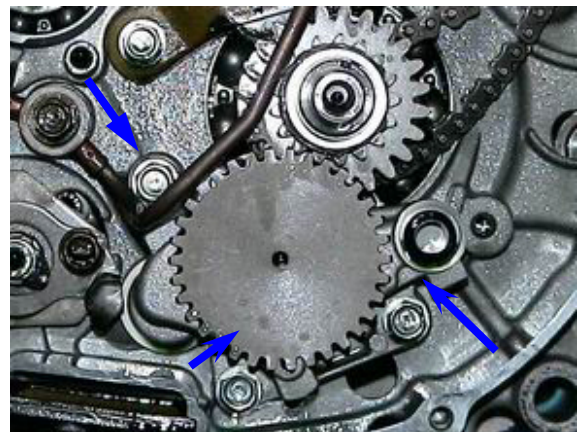
Carefully pull the oil pipe off the crankcase.

Remove this dowel pin and O-ring from the oil pipe.



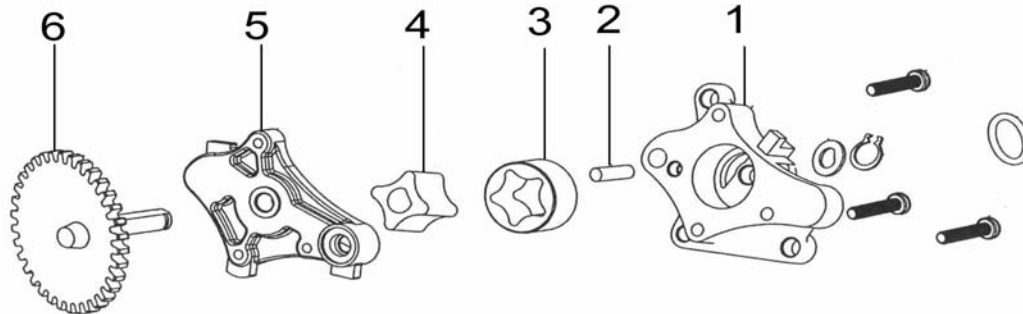
Remove the oil pump mounting bolts.

Use reversed procedure to setup the parts that has been removed.



## LUBRICATION SYSTEM

### oil pump assembly



1.oil pump body

2.crank shaft pin

3.oil pump outer rotor

4.oil pump inner rotor

5.oil pump cover

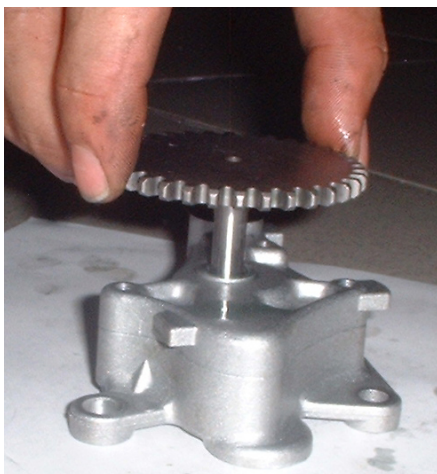
6.driven gear

#### Oil Pump Disassembling:

- Remove the snap-ring and washer.



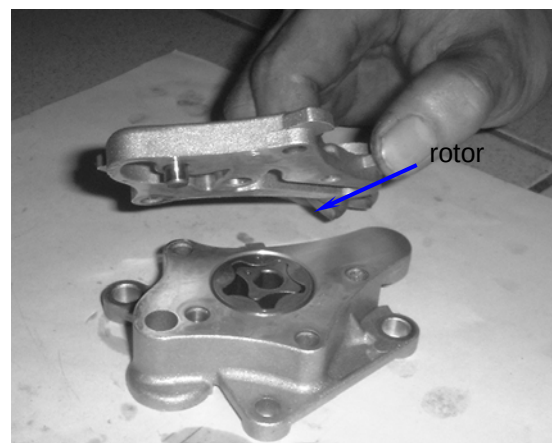
- Remove the pump driven gear and shaft.



- Remove the pump cover bolts and separate the cover from the pump body.



- Remove the rotors , wash all the components in solvent.



## LUBRICATION SYSTEM

### Check:

- Check the gap between the pump body and outer rotor.

The gap limit is 0.25 mm.



- Check the gap between inner and outer rotor.

The gap limit is 0.2 mm.



- Check the gap between the rotors and a straightedge laid across the pump body. The gap limit is 0.1 mm

