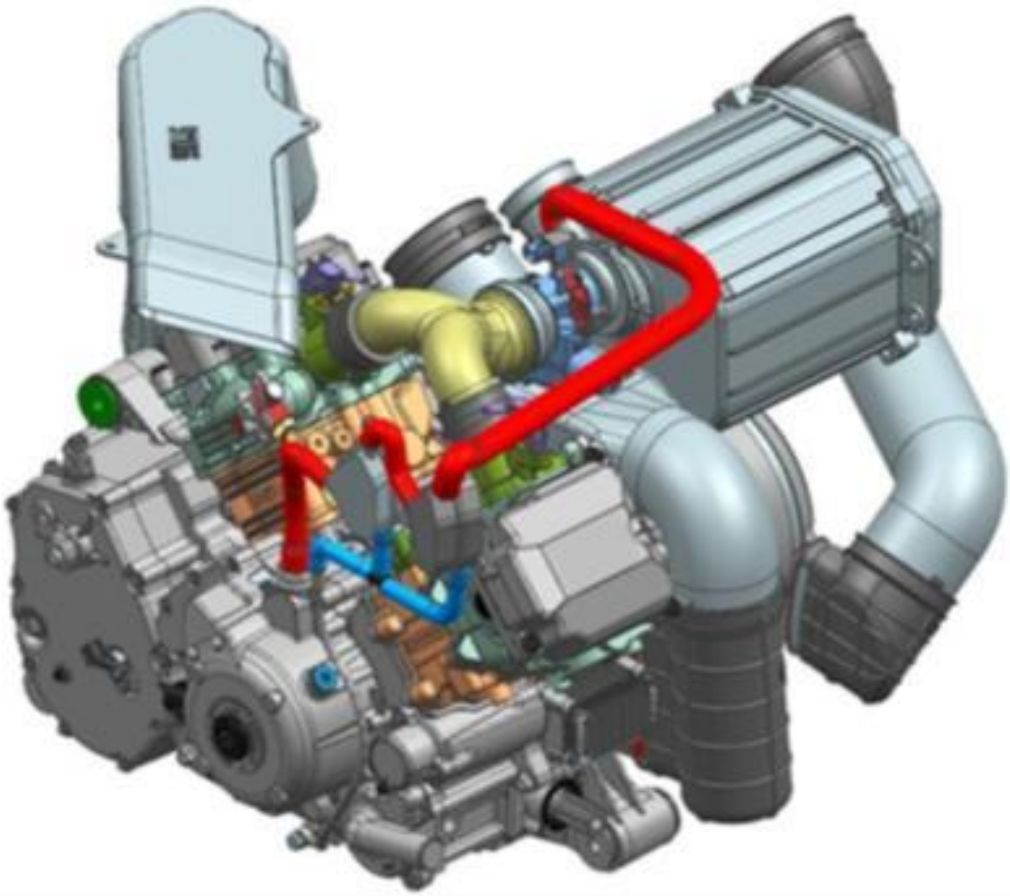
1000 ENGINE

SERVICE MANUAL



CONTENT

Symbols and Marks

Symbols and marks are used in this manual to indicate what and where the special service are needed, in case supplemental information is procedures needed for these symbols and marks, explanations will be added to the text instead of using the symbols or marks.

	Warning	Means that serious injury or even death may result if procedures are not followed.
	Caution	Means that equipment damages may result if procedures are not followed.
	Engine oil	Limits to use SAE 15W-40 API SG class oil.Warranty will not cover the damage that caused by not apply with the limited engine oil.
	Grease	King Mate G-3 is recommended.
	Oil seal	Apply with lubricant.
	Renew	Replace with a new part before installation.
	Brake fluid	Use recommended brake fluid DOT4 or WELLRUN brake fluid.
	Special tools	Special tools
	Indication	Indication of components.
	Directions	Indicates position and operation directions

General Safety

Carbon monoxide

If you must run your engine, ensure the place is well ventilated. Never run your engine in a closed area. Run your engine in an open area, if you have to run your engine in a closed area, be sure to use an extractor.

Caution

Exhaust contains toxic gas, which may cause one to lose consciousness and even result in death.

Gasoline

Gasoline is a low ignition point and explosive material. Work in a well-ventilated place, no flame or spark should be allowed in the work place or where gasoline is being stored.

Caution

Gasoline is highly flammable, and may explode under some conditions, keep it away from children.

Used engine oil

Caution

Prolonged contact with used engine oil (or transmission oil) may cause skin cancer although it might not be verified.
We recommend that you wash your hands with soap and water right after contacting. Keep the used oil beyond reach of children.

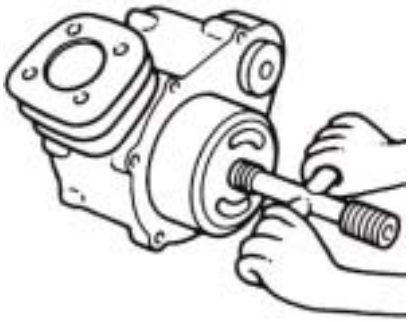
Hot components

Caution

Components of the engine and exhaust system can become extremely hot after engine running. They remain very hot even after the engine has been stopped for some time. When performing service work on these parts, wear insulated gloves and wait until cooling off.

SERVICE PRECAUTION

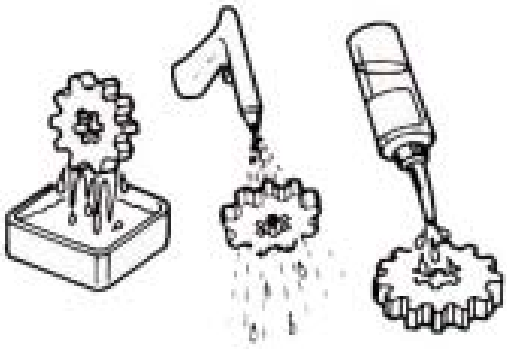
● Special tools are designed for remove and install of components without damaging the parts being worked on. Using wrong tools may result in parts damaged.



● When servicing this engine, use only metric tools. Metric bolts, nuts, and screws are not interchangeable with the English system, using wrong tools and fasteners may damage this vehicle.

● Clean the outside of the parts or the cover before removing it from the ATV. Otherwise, dirt and deposit accumulated on the part's surface may fall into the engine, chassis, or brake system to cause damage.

● Wash and clean parts with high ignition point solvent, and blow-dry with compressed air. Pay special attention to O-rings or oil seals because most cleaning agents have an adverse effect on them.

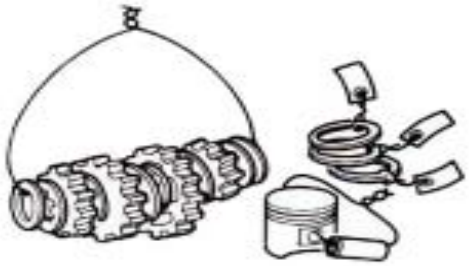


● Never bend or twist a control cable to prevent unsmooth control and premature worn out.

● Rubber parts may become deteriorated when old, and prone to be damaged by solvent and oil. Check these parts before installation to make sure that they are in good condition, replace if necessary.

● When loosening a component, which has different sized fasteners, operate with a diagonal pattern and work from inside out. Loosen the small fasteners first. If the bigger ones are loosen first, small fasteners may receive too much stress.

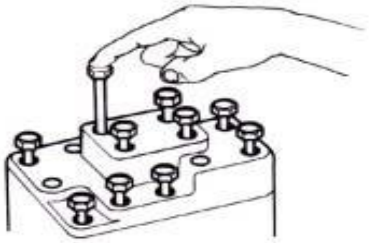
● Store complex components such as transmission parts in the proper assemble order and tie them together with a wire for ease of installation later.



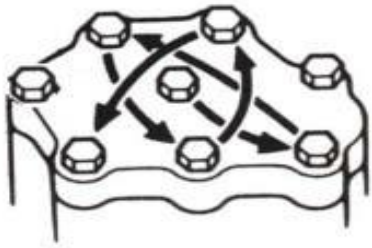
● Note the reassemble position of the important components before disassembling them to ensure they will be reassembled in correct dimensions (depth, distance or position).

● Components not to be reused should be replaced when disassembled including gaskets metal seal rings, O-rings, oil seals, snap rings, and split pins.

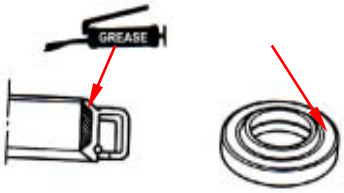
- The length of bolts and screws for assemblies, cover plates or boxes is different from one another, be sure they are correctly installed. In case of confusion, Insert the bolt into the hole to compare its length with other bolts, if its length outside the hole is the same with other bolts, it is a correct bolt. Bolts for the same assembly should have the same length.



- Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then tighten the big ones with special tool first diagonally from inside toward outside, important components should be tightened 2 to 3 times with appropriate increments to avoid warp unless otherwise indicated. Bolts and fasteners should be kept clean and dry. Do not apply oil to the threads.

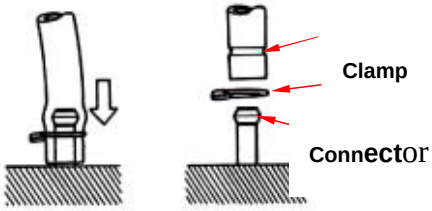


- When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.

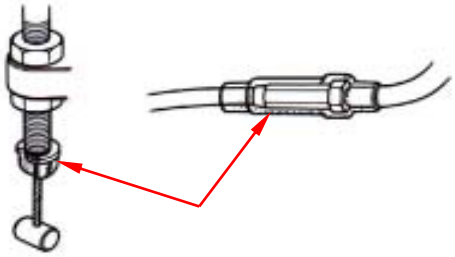


- Remove residues of the old gasket or sealant before re-installation grind with a grindstone if the contact surface has any damage.

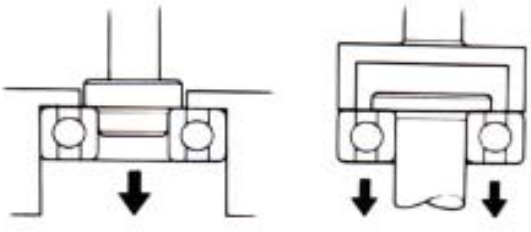
- The ends of rubber hoses (for fuel, vacuum, or coolant) should be pushed as far as they can go to their connections so that there is enough room below the enlarged ends for tightening the clamps.



- Rubber and plastic boots should be properly reinstalled to the original correct positions as designed.

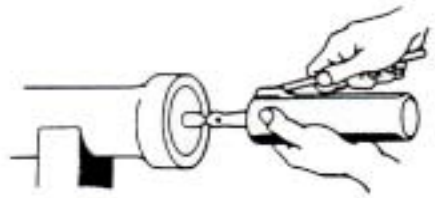


- The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both races.

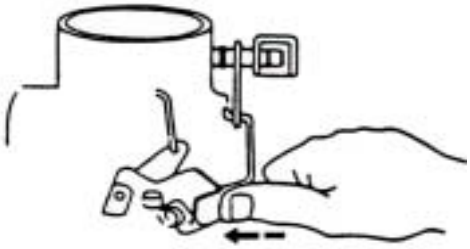


Both of these examples can result in bearing

● Lubricate the rotation face with specified lubricant on the lubrication points before assembling.



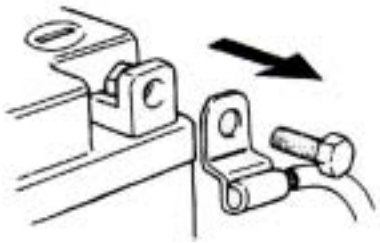
● Check if positions and operation for installed parts is in correct and properly.



● Make sure service safety each other when conducting by two persons.

● Note that do not let parts fall down.

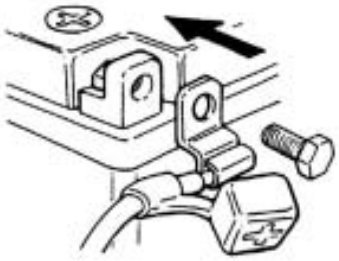
● Before battery removal operation, it has to remove the battery negative (-) cable firstly. Notre tools like open-end wrench do not contact with body to prevent from circuit short and create spark.



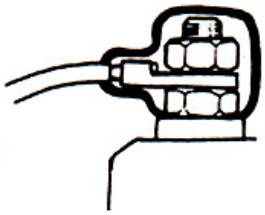
● After service completed, make sure all connection points is secured.

Battery positive (+) cable should be connected firstly.

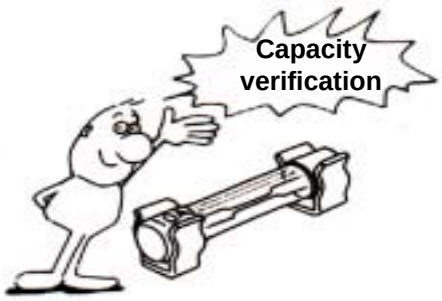
● And the two posts of battery have to be greased after connected the cables.



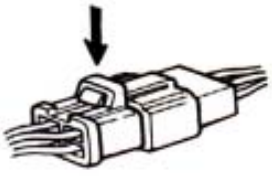
● Make sure that the battery post caps are located in properly after the battery posts had been serviced.



● If fuse burned, it has to find out the cause and solved it.And then replace with specified capacity fuse.

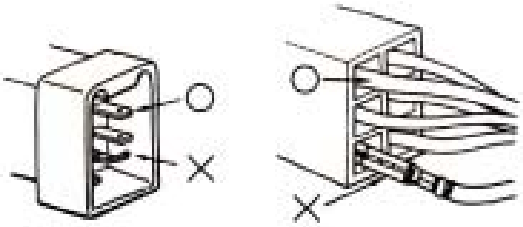


● When separating a connector, it locker has to be unlocked firstly. Then, conduct the service operation

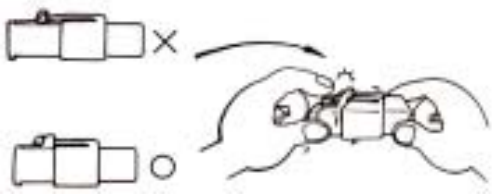


- Do not pull the wires as removing a connector or wires. Hold the connector body.

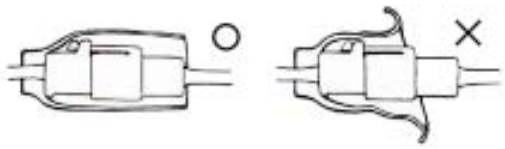
- Make sure if the connector pins are bent, extruded or loosen.



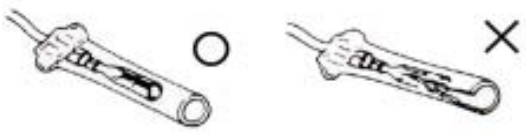
- Insert the connector completely. If there are two lockers on two connector sides, make sure the lockers are locked in properly. Check if any wire loose.



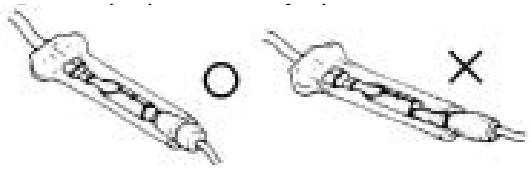
- Check if the connector is covered by the twin connector boot completely and secured properly.



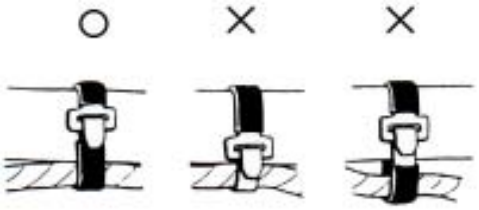
- Before terminal connection, check if the boot is crack or the terminal is loose.



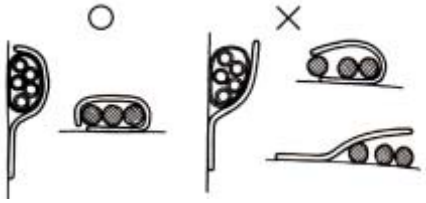
- Insert the terminal completely.
  Check if the terminal is covered by the boot.



- Secure wires and wire harnesses to the frame with respective wire bands at the designated locations. Tighten the bands so that only the insulated surfaces contact the wires or wire harnesses.

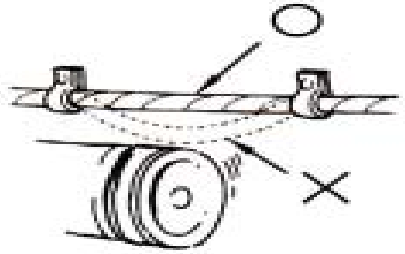


- Wire band and wire harness have to be clamped secured properly.

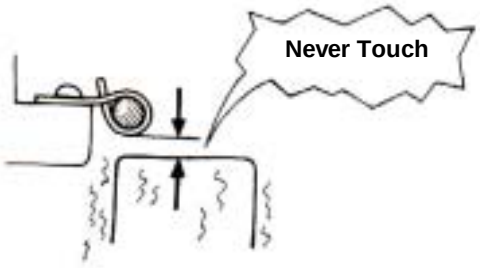


- Do not squeeze wires against the weld or its clamp.

- Do not let the wire harness contact with rotating, moving or vibrating components as routing the harness.

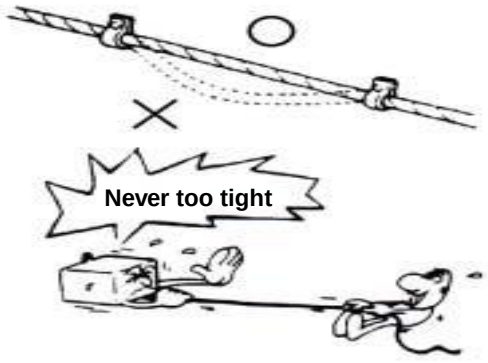


- Keep wire harnesses far away from the hot parts.

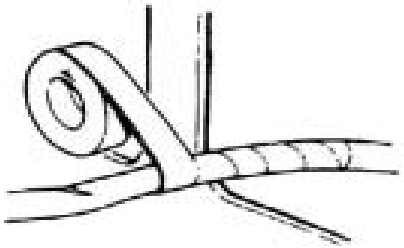


- Route wire harnesses to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.

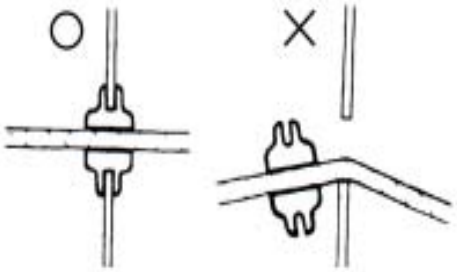
- Route harnesses so that they neither pull too tight nor have excessive slack.



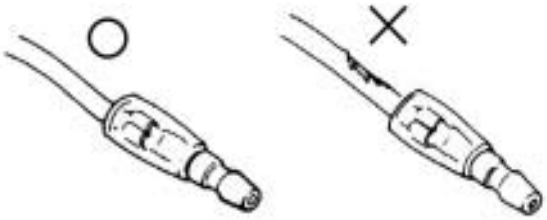
- Protect wires or wire harnesses with electrical tape or tube if they contact a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.



- Secure the rubber boot firmly as applying it on wire harness.

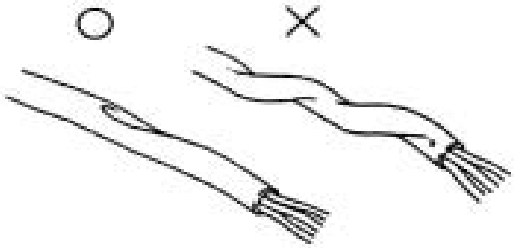


- Never use wires or harnesses which insulation has been broken.Wrap electrical tape around the damaged parts or replace them.

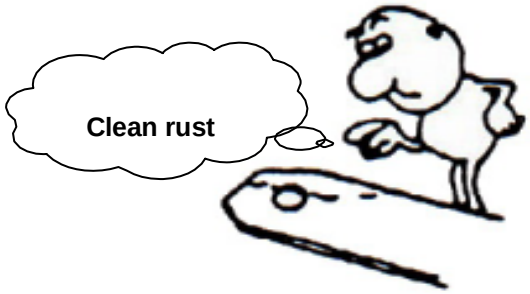


- Never clamp or squeeze the wire harness as installing other components.

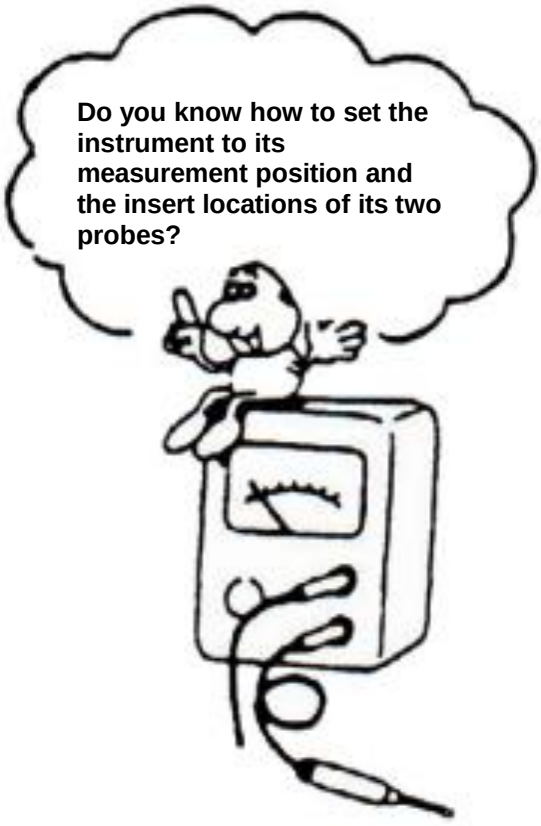
Do not let the wire harness been twisted as installation.



● With sand paper to clean rust on connector pins/terminals if found and then conduct connection operation later.



● Before operating a test instrument, operator



Torque Values

The torque values listed in above table are for more important tighten torque values. Please see standard values for not listed in the table.

Standard Torque Values for Reference

Type	Tighten	Type	Tighten
5 mm bolt、nut	0.45~0.6kgf-m	5 mm screw	0.35~0.5kgf-m
6 mm bolt、nut	0.8~1.2kgf-m	6 mm screw、SH nut	0.7~ 1.1kgf-m
8 mm bolt、nut	1.8~2.5kgf-m	6 mm bolt、nut	1.0 ~1.4kgf-m
10 mm bolt、nut	3.0~4.0kgf-m	8 mm bolt、nut	2.4 ~3.0kgf-m
12 mm bolt、nut	5.0~6.0kgf-m	10 mm bolt、nut	3.5~4.5kgf-m

Engine Torque Values

Item	Q'ty	Thread Dia. (mm)	Torque Values (kgf-m)	Remarks
Cylinder stud nut	4	6	1.0~1.2	
Cylinder head bolt	8	10	2.0 & 180°+/-5°	
Cylinder head cover bolt	8	7	1.0~1.2	
Intake inject pipe bolt	4	8	1.6~1.8	
Intake inject bolt	2	6	0.9~1.0	
Tappet adjustment screw nut	8	6	1.0~1.2	Apply oil to thread
Spark plug	1	12	1.8~2.2	
Tensioner lifter bolt	2	6	1.0~1.2	
Oil pump bolt	3	6	1.0~1.2	
Water pump impeller	1	8	2.2~2.5	
Oil radiator bolt	2	8	2.4~2.6	
ACG. Flywheel nut	1	18	16~18	
Crankcase bolts	7	6	0.8~1.2	
Mission case bolt	7	8	2.6~3.0	

SPECIFICATION

Engine Oil	Oil & Filter Change	2000 c.c.
	Oil change	1800 c.c.
	New Engine	2300 c.c.
Transmission Gear oil	Capacity	750 cc
Clearance of throttle valve		1~3 mm
Spark Plug	Type	NGK DCPR8E
	Gap	0.7~0.8 mm
Idling speed		1250±100 rpm
Cylinder compression pressure		9 ± 2 bar
Valve clearance		IN:0.10 ± 0.02 mm EX:0.15 ± 0.02 mm

PERIODICAL MAINTENANCE SCHEDULE

INTERVAL / ITEM	MONTHS	1	3	6	12
	Kms	INITIAL 200	EVERY 1000	EVERY 2000	EVERY 4000
	MILES	INITIAL 120	EVERY 600	EVERY 1200	EVERY 2400
Muffler & Exhaust Pipe Bolt, Nuts		T	T	T	T
Valve Clearance		I	-	I	I
Air Cleaner		-	C	C	R
Air Cleaner Vent Tube			I	I	I
Engine Idle RPM		I	I	I	I
Spark Plug		-	-	I	I
		Replace Every 6000KM (4000 MILES)			
Engine Oil		R	-	R	R
Oil Filter		R	-	R	R
C.V.T Belt		Inspection Every 1000KM (replaced if necessary)			
Fuel Tube		-	I	I	I
		Replace Every 4 Years			
Throttle Cable Play		I	I	I	I
Bolts and Nuts		T	T	T	T
General Lubrications		-	L	L	L
Muffler Plumbago		Visual Inspection Every 2000KM (replaced or tighten if necessary)			

Code: C ~ Cleaning (replaced if necessary) I ~ Inspection, cleaning, and adjustment
L ~ Lubrication R ~ Replacement T ~ Tighten

The above maintenance schedule is established by taking the monthly 1000 kilometers as a reference whichever comes first.

Remarks:

1. Clean or replace the air cleaner element more often when the engine is operated on dusty roads or in the Heavily- polluted environment.
2. Maintenance should be performed more often if the engine is frequently operated in high speed and after the engine has accumulated a higher mileage.
3. Preventive maintenance
   a. Ignition system – Perform maintenance and check when continuous abnormal ignition, misfire, after-burn, overheating occur.
   b. Carbon deposit removal – Remove carbon deposits in cylinder head, piston heads, exhaust system when power is obviously lower than normal.
4. Inspection CVT belt every 1000 KM, replace if crack or abnormal on the surface.

Fuel Lines

Check all lines, and replace it when they are deterioration, damage or leaking.
For removal, refer to chapter 4 Fuel Pump.

Warning

Gasoline is a low ignition material so any kin fire is strictly prohibited as dealing it.

Air Cleaner

Open access cover.
Counterclockwise turn the lid and pull out the element
Loosen the screw and separate the element.
Clean the sponge with non-flammable or high-flash point solvent and then squeeze it for dry.

Caution

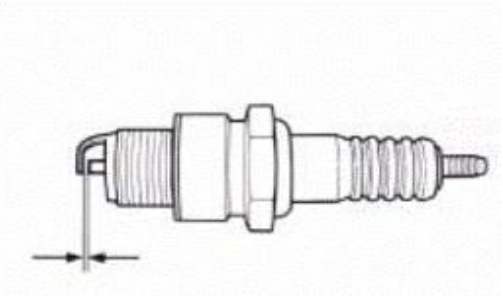
Never use gasoline or acid organized solven clean the element.

For installation, reverse the removal procedure.

Spark Plug

Recommended spark plug: NGK / DCPR8E

Remove spark plug cap.
Clean dirt around the spark plug hole.
Remove spark plug.
Measure spark plug gap.
Spark plug gap：**0.7~0.8 mm**



Carefully bend ground electrode of the plug to adjust the gap if necessary.
Hold spark plug washer and install the spark plug by screwing it.
Tighten the plug by turning 1/2 turn more with plug socket after installed.

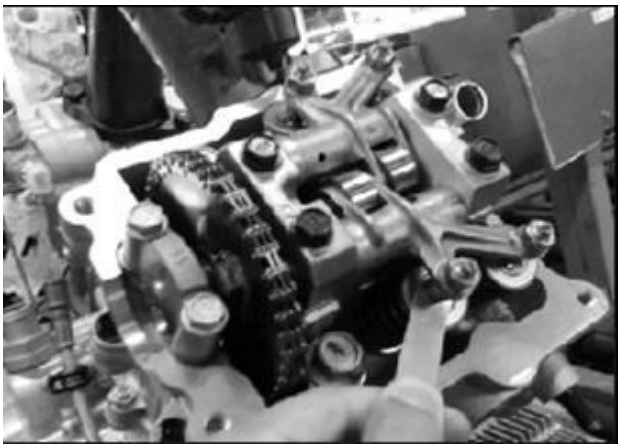
Tighten torque: 2.0 +/- 0.2kgf-m

Valve Clearance

Caution

Checks and adjustment must be performed v
the engine temperature is below 35℃.

Remove front fender, top cover and air cleaner.
Remove cylinder head cover.
Turn camshaft bolt in C.W. direction and let the Printing mark on the camshaft sprocket align with cylinder head mark so that piston is placed at TDC position in compression stroke.



Caution

Do not turn the bolt in C.C.W. direction to pr
from camshaft bolt looseness.

Valve clearance inspection and adjustment.
Check & adjust valve clearance with feeler gauge.

Standard Value: IN 0.10 ± 0.02 mm
EX 0.15 ± 0.02 mm

Loosen fixing nut and turn the adjustment nut for adjustment.

Caution

Re-check the valve clearance after tightene
fixing nut.

Cylinder Compression Pressure

Warm up engine.

Turn off the engine.

Remove the top cover.

Remove the side cover.

Remove any one of the spark plug cap and spark plug.

Install compression gauge.

Full open the throttle valve, and rotate the engine by means of starter motor.

Caution

- Rotate the engine until the reading in the ga no more increasing.
- Usually, the highest pressure reading will be obtained in 4~7 seconds.

Compression pressure: 9.0 ± 2 bar

Check following items if the pressure is too low:

- Incorrect valve clearance.
- Valve leaking.
- Cylinder head leaking, piston, piston ring and cylinder worn out.

If the pressure is too high, it means carbon deposits in combustion chamber or piston head.

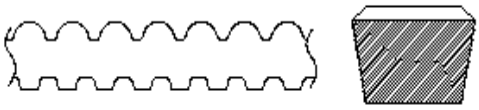
Drive Belt

- Remove CVT ventilation inlet and outlet hoses.

- Remove bolts of the clutch cover.

- Check if the belt is crack or worn out.
- Replace the belt if necessary or in accord with the periodical maintenance schedule to replace it.

Width limit: 31.0 mm or above



Nuts, Bolts Tightness

- Perform periodical maintenance in accord with the Periodical Maintenance Schedule
- Check if all bolts and nuts on the frame are tightened securely.
- Check all fixing pins, snap rings, hose clamp, and wire holders for security.

Special Tools List

PARTS NO. : 440649

PARTS NAME : EXTENSION PULLER / REMOVER

PARTS NO. : 440650

PARTS NAME : BUSHING(924739) REMOVER

PARTS NO. : 440651

PARTS NAME : 7777777777777777777777777777

BEARING(924384) REMOVER ϕ15

PARTS NO. : 440652

PARTS NAME : BEARING(924384) REMOVER ϕ20

PARTS NO. : 440653

PARTS NAME : BEARING(924384) REMOVER ϕ45

PARTS NO. : 440656

PARTS NAME : L CRANK CASE OIL SEAL REMOVER

PARTS NO. : 440667

PARTS NAME : CYLINDER HEAD VALVE AND

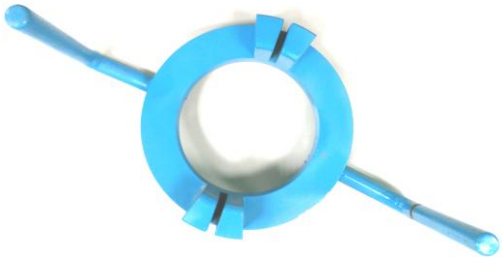
SPRING INSTALLER/REMOVER

PARTS NC
PARTS NAME : FLYWHEELREMOVER

PARTS NO. : 560002
PARTS NAME : FLYWHEEL INSTALLER

PARTS NO. : [illegible]
PARTS NAME : RIGHT CRANKCASE MECHNICAL SEAL INSTALLER

PARTS NO. : 560004
PARTS NAME : DRIVE PULLEY FIXING ROD



PARTS NO. : 560005
PARTS NAME : DRIVEN PULLEY FIXING TOOL

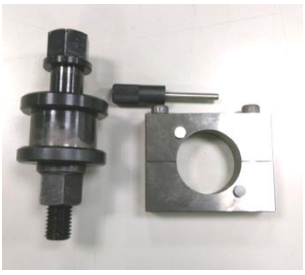
PARTS NO. : 560006
PARTS NAME : DRIVE PULLEY REMOVER

PARTS NO. : 560007
PARTS NAME : DRIVEN PULLEY EXTEND TOOL FOR REMOVE BELT

PARTS NO. : 560008
PARTS NAME : BEARING REMOVER (W/ 440649 Ø20 mm)

PARTS NO. : 560009
PARTS NAME : DEAR DIFF. NEEDLE BEARING REMOVER (W/ 440649 Ø20 mm)

PARTS NO. : 560010
PARTS NAME : REAR DIFF. BEARING SPACER INSTALLER



PARTS NO. : 560011
PARTS NAME : PLAIN BEARING INSTALLER (LEFT CRANKCASE)

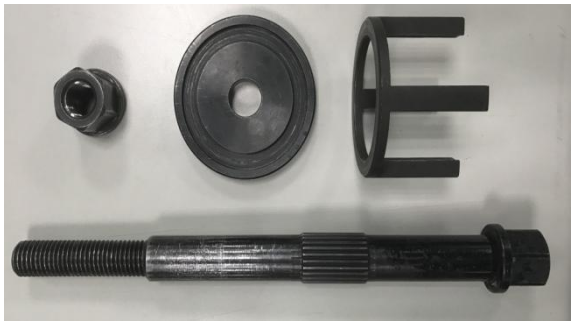
PARTS NO. : 560012
PARTS NAME : PLAIN BEARING REMOVER (LEFT CRANKCASE

PARTS NO. : 560013
PARTS NAME : PLAIN BEARING INSTALLER (RIGHT CRANKCASE)

PARTS NO. : 560014
PARTS NAME : PLAIN BEARING REMOVER (RIGHT CRANKCASE

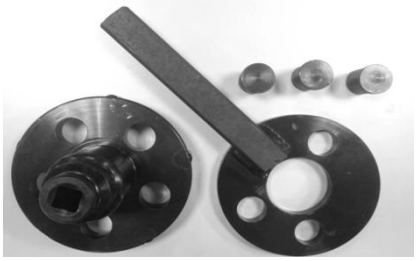
PARTS NO. : 560015
PARTS NAME : CRANKCASE COVER LH PLAIN BEARING INSTALLER (LEFT CRANKCASE)

PARTS NO. : 560016
PARTS NAME : CRANKCASE COVER LH PLAIN BEARING REMOVER (LEFT CRANKCASE



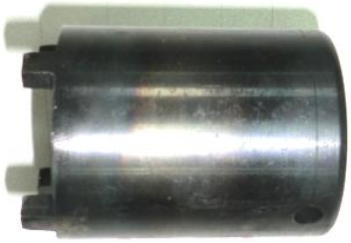
PARTS NO. : 560017
PARTS NAME : DRIVEN PULLEY REMOVER/ INSTALLER

PARTS NO. : 560018
PARTS NAME : TRANSMISSION BEARING INSTALLER



PARTS NO. : 560019
PARTS NAME : GOVERNOR CUP INSTALLER/REMOVER KIT (DRIVE PULLEY)

PARTS NO. : 560020A
PARTS NAME : DRIVE PULLEY FIXING SEAT FOR INSTALL AND REMOVE



PARTS NO. : 552312
PARTS NAME : EPS STEERING BEARING SEAT SOCKET

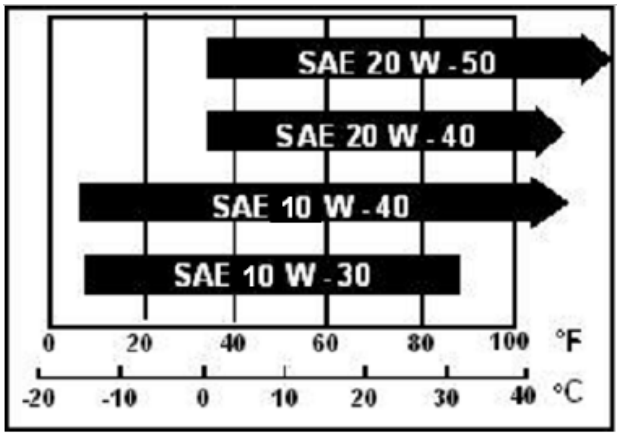
PARTS NO. : 560024
PARTS NAME : RIGHT CRANKCASE MECHNICAL SEAL REMOVER

PARTS NO. : 552303
PARTS NAME : PISTON & ROD CONNECTING HOLDER

Precautions in Operation

General Information

This chapter contains maintenance operation for the engine oil pump and gear oil replacement.



Specifications

Engine oil quantity

Overhaul: 2300 c.c.

Filter change: 2000 c.c.

Change: 1800 c.c.

Oil viscosity SAE 10W-40

Items		Standard (mm)	Limit (mm)
Oil pump	Inner rotor clearance	0.15	0.20
	Clearance between outer rotor and body	0.15~0.20	0.25
	Clearance between rotor side and body	0.04~0.09	0.12

Torque value

Torque value oil filter cover 1.2 kgf-m

Engine oil drain bolt 2.4 kgf-m

Troubleshooting

Low engine oil level

- Oil leaking
- Valve guide or seat worn out
- Piston ring worn out
- Camshaft worn out
- Camshaft main bearing worn out

Low oil pressure

- Low engine oil level
- Clogged in oil strainer, circuits or pipe, oil radiator gasket
- Oil pump damage
- Oil pressure valve, oil filter

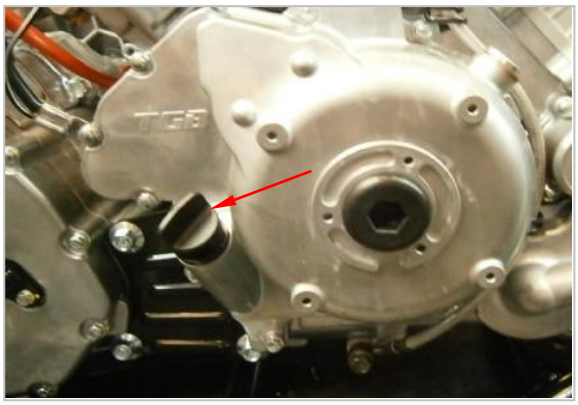
Dirty oil

- No oil change in periodical
- Cylinder head gasket damage
- Piston ring worn out
- Camshaft worn out
- Camshaft main bearing worn out

Oil Level Verification

NOTE: *Strictly follow this procedure, otherwise wrong oil level may be indicated.*

- Ensure vehicle is on a level surface.
- Start engine and let idle for a few minutes.
- Stop engine, wait a few minutes to allow oil to flow down to crankcase then check oil level.
- Fully screw in dipstick to check oil level.
- Remove dipstick and read the oil level.
- Oil level must be between minimum and maximum marks on dipstick.
- Refill oil as necessary. Do not overfill.
- Reinstall dipstick.



Oil Filter Change

- Ensure the vehicle is on a level surface.
- Oil and oil filter must be replaced at the same time. Oil change and oil filter replacement should be done with a warm engine.

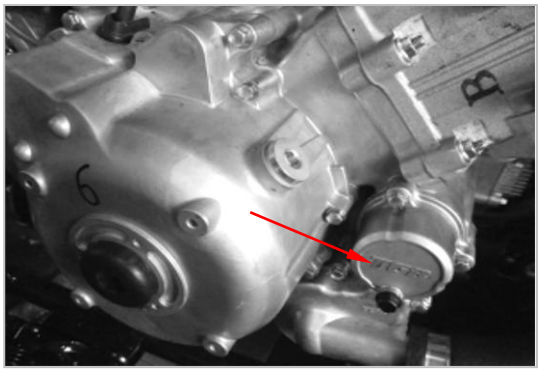
WARNING

Engine oil can be very hot. Wait until engine oil is warm

- Place a drain pan under the engine drain plug area.
- Clean the drain plug area.
- Unscrew drain plug and discard the gasket ring.
- Remove dipstick.
- Allow oil to drain completely from crankcase.

NOTE: *Oil condition gives information about the engine condition.*

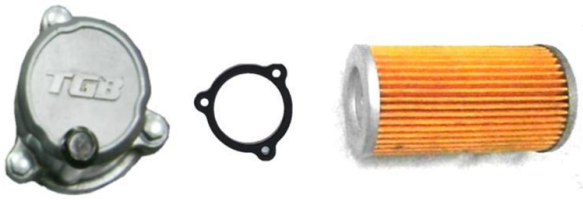
- clean the magnetic drain plug from metal shavings and residue. Presence of debris gives an indication of failure inside the engine. Check engine to correct the problem.
- Install a NEW gasket ring on drain plug.



TORQUE: 2.4 kgf-m

CAUTION

Never use the gasket a second time. Always replace by a new one.



- Replace oil filter.
- Refill engine with recommended engine oil.
- Oil change capacity with filter: 2.0 L.
- After filling, check the oil level with dipstick.
- Run engine to ensure oil filter and drain plug areas are not leaking.
- Dispose oil and filter as per your local environmental regulation.

INSPECTION

ENGINE OIL PRESSURE

NOTE: *The engine oil pressure test should be done with a warm engine 90℃ and the recommended oil.*

- Remove the oil pressure switch.
- Install *PRESSURE GAUGE* and *ADAPTER HOSE*.

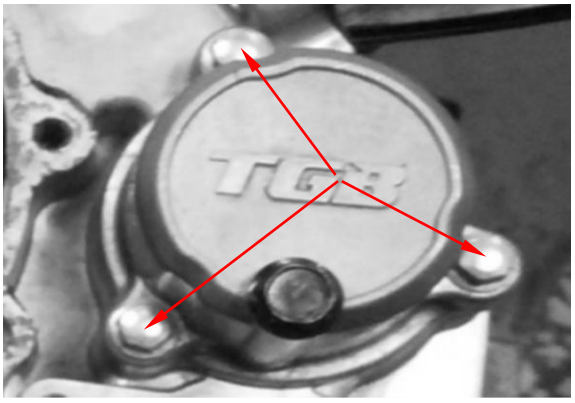
The engine oil pressure should be within the following values.

OIL PRESSURE	1250 RPM	6000 RPM
MINIMAL	10 psi	39 psi
NOR AL	22 psi	46 psi
MAXIMAL	36 psi	70 psi

- If the engine oil pressure is out of specifications, check the points described in troubleshooting section.
- Removal oil pressure gauge and adapter hose.

NOTE: *To remove adapter hose from oil pressure gauge, use the disconnect tool.*

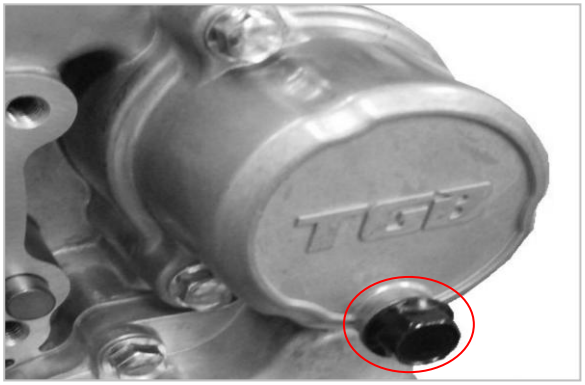
- Reinstall the oil pressure switch.



OIL FILTER

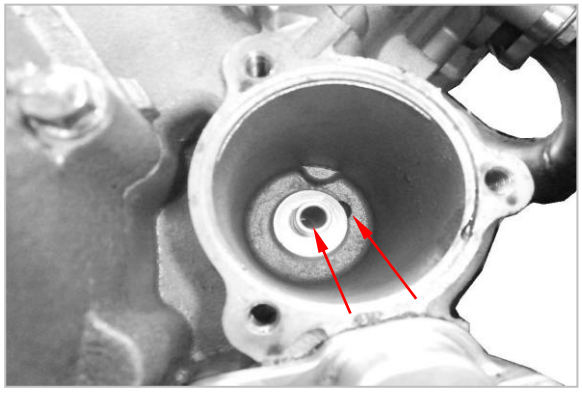
Oil Filter Removal

- Remove oil filter drain screw and washer.
- Drain out the oil inside the filter housing
- Remove three retaining screws and cover.
- Remove oil filter.



Oil Filter Inspection

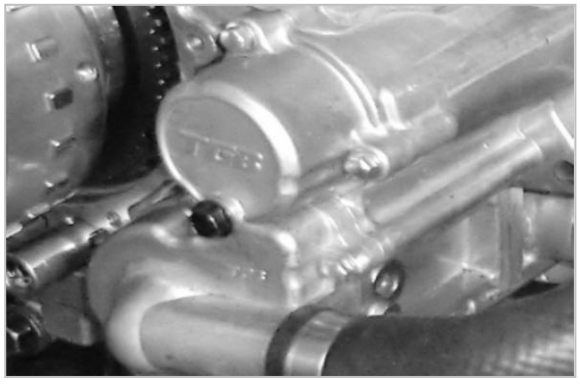
Check and clean the oil filter inlet and outlet area for dirt and other contaminations.



Oil Filter Installation

- Install a new gasket.
- Install the filter into the cover.
- Install the cover on the engine.

TORQUE: 1.2 kgf-m



OIL PRESSURE SWITCH

Oil Pressure Switch Activation

- Oil pressure switch works when engine oil pressure is between 20 and 40 kPa.
- To check the function of the oil pressure switch, an oil pressure test has to be performed. If the engine oil pressure is good, check the resistance of the oil pressure switch while engine is off and while engine is running.

Oil Pressure Switch Test

- Disconnect the connector from oil pressure switch.
- Use multimeter to check the continuity.
- Replace the oil pressure switch if necessary.
- If OK, check the continuity of the wiring harness.

Oil Pressure Switch Removal

Unplug then unscrew the oil pressure switch.

Oil Pressure Switch Installation

NOTE: *Install oil pressure switch with LOCTITE 243.*

TORQUE: 1.7 kgf-m.

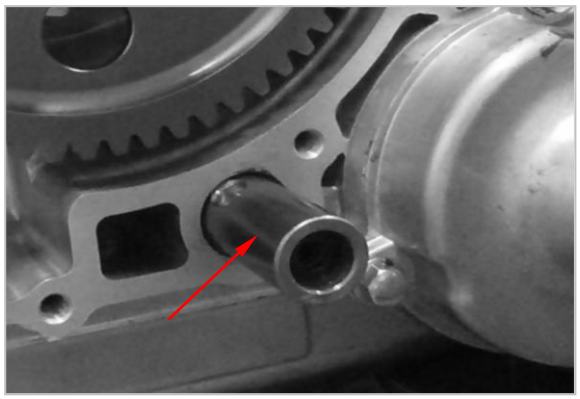
ENGINE OIL PRESSURE VALVE

The oil pressure valve is located on the engine magneto side (inside magneto cover).

NOTE: *The oil pressure valve system works when oil pressure exceeds 70 psi.*

Removal

- Remove the bolts and the ACG cover.
- Pull out the oil pressure valve and washer.



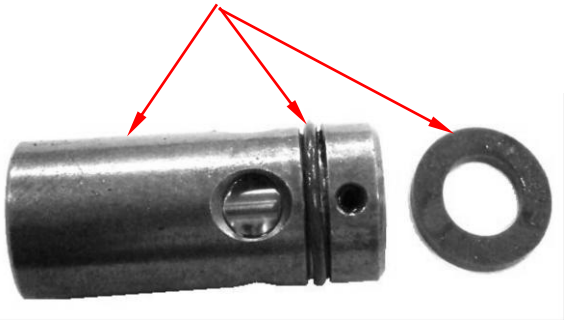
Inspection

- Inspect pressure valve housing, O-ring and valve for scoring or other damages.
- Clean bore and thread in the magneto housing from metal shavings and other contamination.

Installation

For installation, reverse the removal procedure.

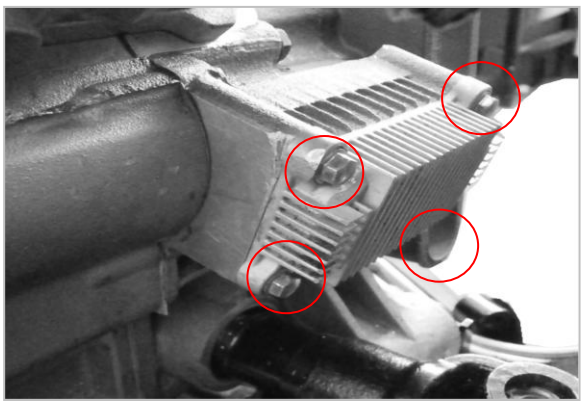
NOTE: *At installation, always replace the gasket ring.*



OIL RADIATOR

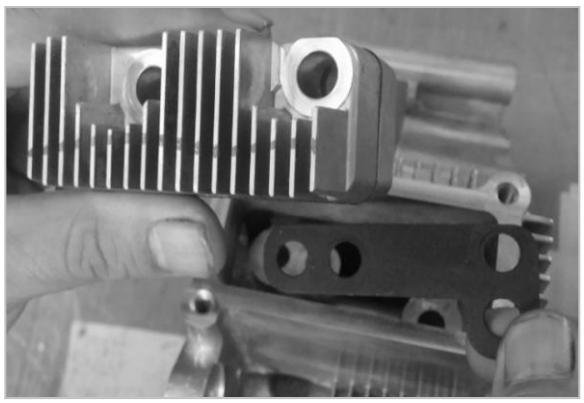
Oil Radiator Removal

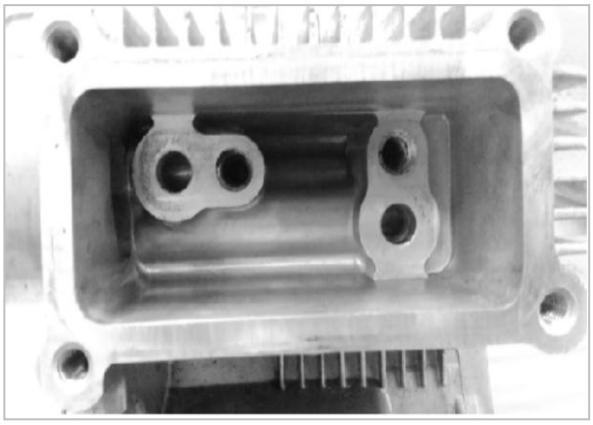
- Drain engine oil.
- Drain coolant.
- Remove oil radiator cap retaining bolts.
- Place rags or towels under oil cooler to catch remaining oil and coolant.
- Remove oil radiator and discard gasket.



Oil Radiator Inspection

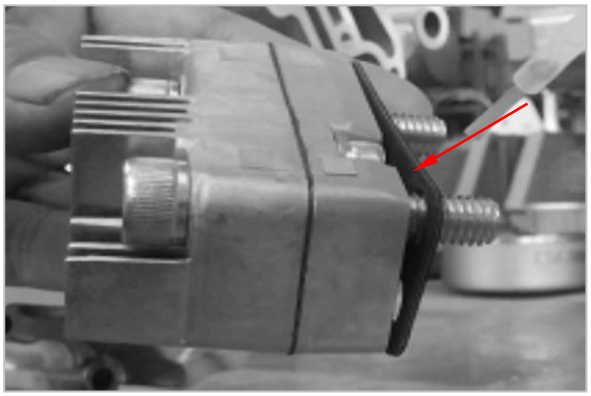
- Check oil radiator for cracks or other damage.
- Replace if necessary.





Oil Radiator Installation

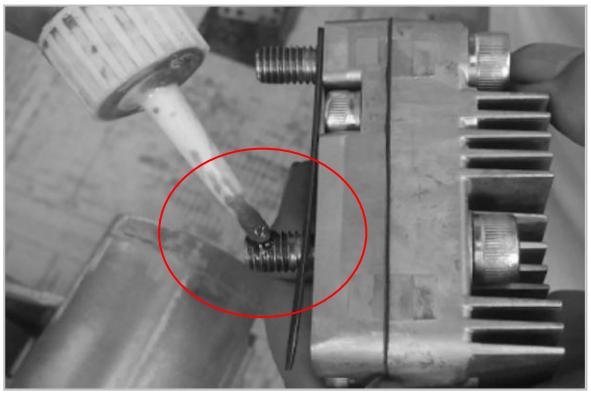
- For installation, reverse the removal procedure.
- Wipe off any oil and coolant spillage.
- Install a **new gasket** as shown.



NOTE：Apply LOCTITE 263 on the thread.

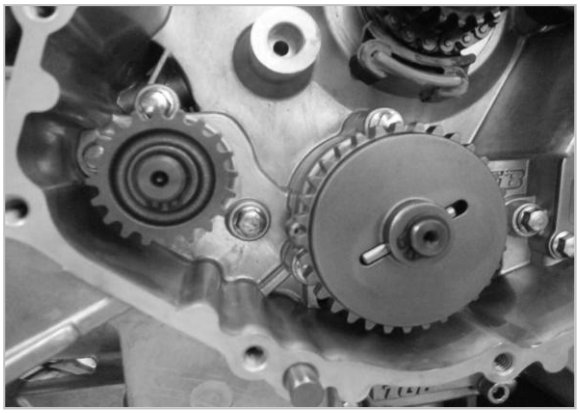
- Refill engine oil with recommended oil and at the proper oil level.
- Refill and bleeding cooling system.

TORQUE: 2.4~2.5 kgf-m.



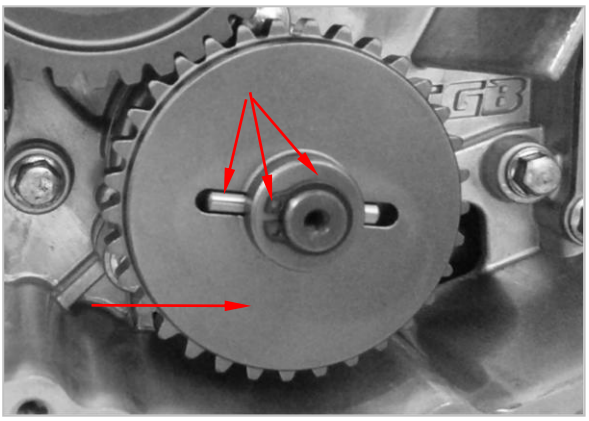
OIL PUMP

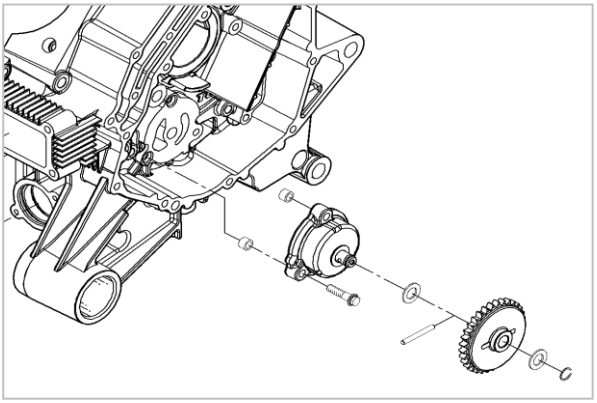
The oil pump is located on the engine CVT side (behind cover).



Removal

- Drain engine oil.
- Remove parts to access the CVT cover.
- Remove the CVT cover.
- Remove CVT assembly.
- Remove crankcase cover LH.
- Remove:
  - retaining ring.
  - oil pump gear.
  - needle pin
  - thrust washer.
  - oil pump flange bolts.
  - oil pump cover screws and pull oil pump cover.
  - oil pump shaft with inner rotor and outer rotor.





Inspection

- Inspect oil pump for marks or other damages.
- Check for scratches din crankcase between outer rotor and oil pump bore. If so, replace damaged parts.
- Check inner rotor for corrosion pinholes or other damages. If so, replace oil pump shaft assembly.

- Using a feeler gauge, measure the clearance of inner and outer rotors as shown.
- If clearance of inner and outer rotors exceeds the tolerance, replace oil pump shaft assembly. Ensure to also check oil pump cover. If damaged, replace the complete oil pump assembly.
- If clearance between outer rotor and its bore in crankcase exceeds the tolerance, replace the complete oil pump assembly and/or the crankcase.
- Using a depth gauge, measure the axial clearance of the oil pump as shown.
- Difference between measurements should not exceed 0.2 mm. If so, replace the complete oil pump assembly.

NOTE: *When the axial clearance of the oil pump shaft assembly increases, the oil pressure decreases.*

Installation

For installation, reverse the removal procedure.

NOTE：Apply LOCTITE 263 on the thread.

TORQUE: 1.0~1.2 kgf-m.

NOTE: *The outer rotor and inner rotor are marked. When installing, make sure both markings are on the upper side.*

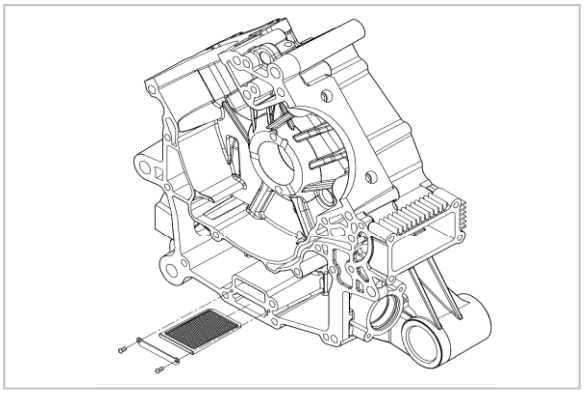
After reinstallation of remaining parts, check for smooth operation of the oil pump assembly.

Oil Pump Final Test

After engine is completely reassembled, start engine and make sure oil pressure is within specifications.

ENGINE OIL STRAINER

- The engine oil strainer is located between both crankcase halves.
- Usually the strainer no needs to clean.
- During engine over hall, it will clean after separate the crankcase half.
- Remove the retaining bolts and pull the oil strainer out.



Cleaning and Inspection

- Clean engine oil strainer with a part cleaner then use airgun to dry it.

WARNING

Always wear eye protector. Chemicals can cause a rash break out and injure your eyes.

- Check engine oil strainer for cracks or other damage. Replace if damaged.

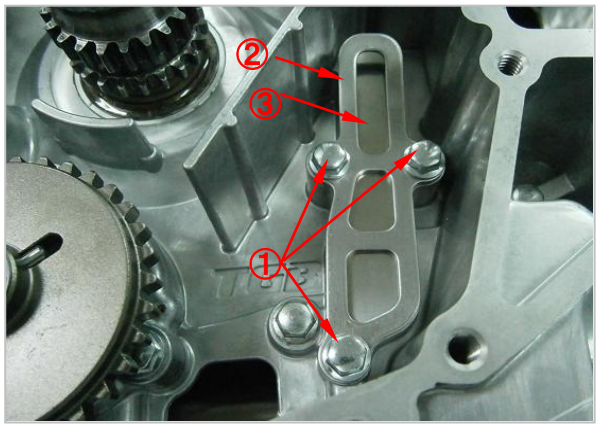
TORQUE:0.15~0.20 kgf-m.

Installation

For installation, reverse the removal procedure.

REED VALVE

The engine is equipped with reed valve, which prevents accumulation of large oil quantities in the crankcase. The reed valve is fitted into the crankcase.



Valve Removal

Remove

- Reed valve three retaining bolts.
- Stopper plate.
- Reed valve.

Valve Inspection

Check reed valve for cracks or other damage.

NOTE: *Replace reed valve if damaged.*

Valve installation

For installation, reverse the removal procedure.

TORQUE:1.0~1.2 kgf-m.

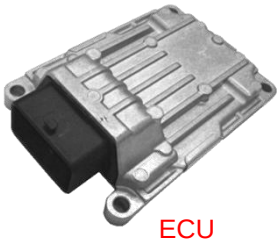
FUEL INJECTION SYSTEM COMPONENTS

O2 sensor

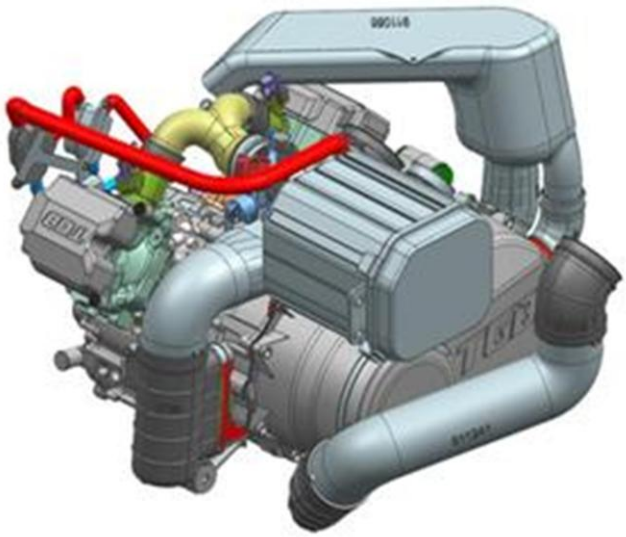
Throttle Body

Idle Speed Controller

Temperature Manifold Air Pressure



ECU



Throttle Position Sensor

Injector

Ignition Coil

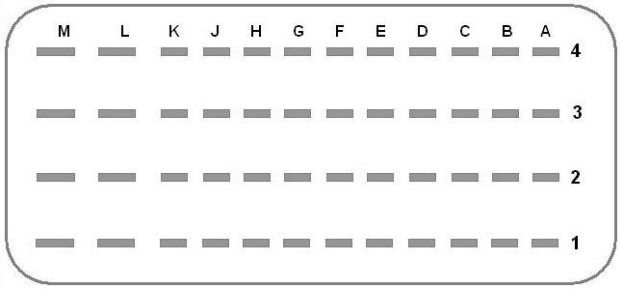
Crank Position Sensor

Roll Over Switch

Engine Coolant Temperature Sensor

ECU TERMINAL

HARNESS

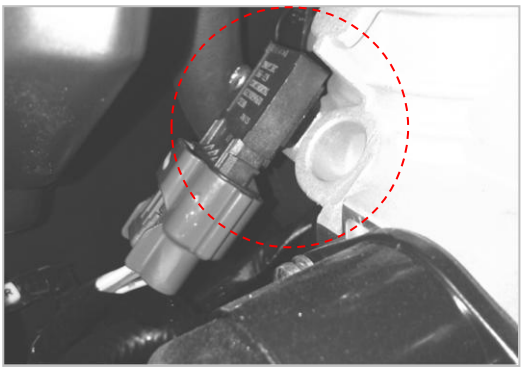


ECU PLUG

Pin No.	Pin Code	Wire Color	Circuit	Note	Pin No.	Pin Code	Wire Color	Circuit	Note
A1	1	Y/B	VSENS	Sensor voltage	G1	7	Br/W	Blank	Stop SW
A2	13	-	Blank		G2	19	Gr/R	SGND2	Signal ground
A3	25	-	Blank		G3	31	W/Br	TPS	Throttle position sensor
A4	37	Br/L	VBK	Key SW voltage	G4	43	W	Blank	O2 sensor
B1	2	P/W	CAN_H	Diagnosis Tool	H1	8	-	Blank	
B2	14	W/G	Blank	RPM Limit	H2	20	W	Gear B	H/L signal
B3	26	Y/G	MIL	Engine Check	H3	32	Pu	VEH	Speed sensor
B4	38	R/W	VBD	Battery Voltage	H4	44	L	Gear C	Neutral signal
C1	3	P/G	CAN_L	Diagnosis Tool	J1	9	B	Blank	Fuel Pump relay
C2	15	B/Y	Temp.	Temperature LED	J2	21	Gr/R	Blank	Front DiffLock SW
C3	27	Gr/R	SGND1	Signal Ground	J3	33	R	Gear A	Reverse signal
C4	39	Br/B	Stepper B	stepper /B	J4	45	R/Gr	Blank	Override switch
D1	4	LG/R	CPS-	Crank position sensor (-)	K1	10	O/W	Blank	Main relay
D2	16	Pu/B	Blank	TILT SW	K2	22	B/W	Blank	Fan relay
D3	28	G/B	Stepper D	stepper /D	K3	34	Blank	Blank	4WD SW
D4	40	L/B	Stepper A	stepper /A	K4	46	L/W	INJ2	Injector#2
E1	5	L/Y	CPS+	Crank position sensor (+)	L1	11	R	VBR	Start relay voltage
E2	17	Gr/L	Blank	Rear DiffLock SW	L2	23	W	Blank	O2 heater
E3	29	-	Blank		L3	35	B/W	Blank	Starter
E4	41	B/Y	Stepper C	stepper /C	L4	47	L/G	INJ1	Injector#1
F1	6	G/Y	Blank	Brake SW	M1	12	B/Y	IGN1	Ignition#1
F2	18	W/Y	MAP	Manifold Air Pressure	M2	24	B/L	IGN2	Ignition#2
F3	30	G/Br	TIA	Temperature Intake Air	M3	36	Gr	PGND	Ground
F4	42	Y/R	ECT	E/G Temperature sensor	M4	48	Gr	PGND	Ground

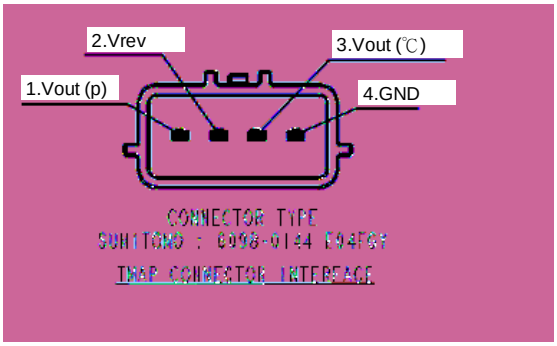
EFI SYSTEM COMPONENTS INSPECTION

T-MAP SENSOR



- Turn the ignition OFF.
- Disconnect the T-MAP sensor 4P connector.
- Check for loose or poor contact on the MAP sensor connector.

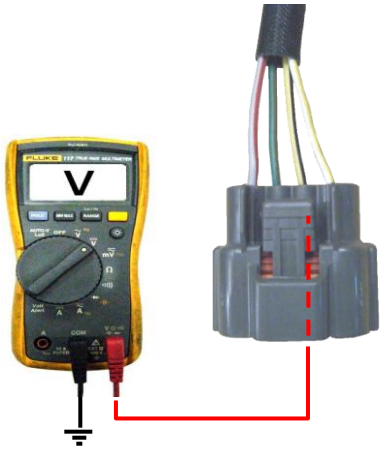
- Connect the T-MAP sensor connector.
- Start the engine and check that the MIL light.



- Turn the ignition switch OFF.
- Disconnect the MAP sensor 4P connector.
- Turn the ignition switch ON.
- Measure the voltage at the wire harness side connector.

Connection: Yellow/Black (+)－Ground(-)

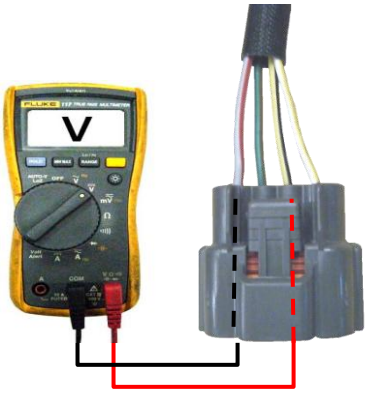
Standard: 5.0 +/- 0.1V



- Measure the voltage between the connector terminals of wire harness side.

Connection: Yellow/Black (+)－Gray/Red(-)

Standard: 5.0 +/- 0.1V

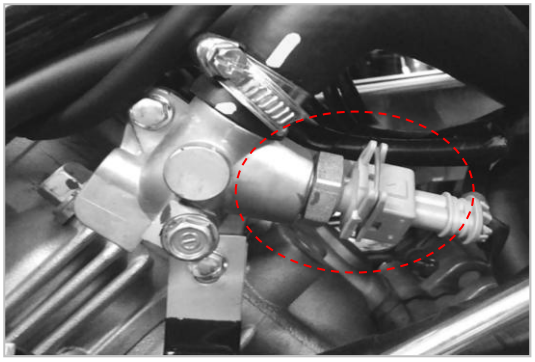


- Turn the ignition switch OFF.
- Connect the TMAP sensor 4P connector.

ECT SENSOR

INSPECTION

• Turn the ignition switch OFF.
• Disconnect ECT sensor 2P connector.
• Check for loose or poor contact on the ECT sensor connector.

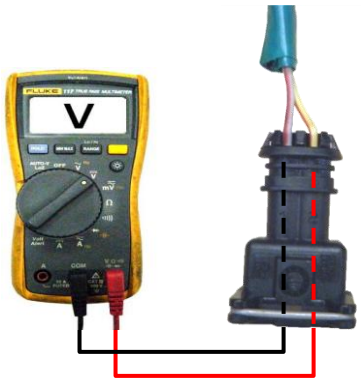


• Connect the ECT sensor connector.
• Turn the ignition switch ON.
• Check the MIL light.

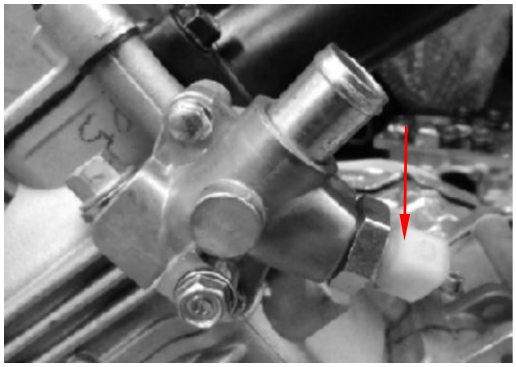
• Turn the ignition switch OFF.
• Disconnect the ECT sensor connector.
• Measure the resistance at ECT sensor terminals.
Connection:
Standard:2.3~2.6 kΩ (at 20℃)

• Turn the ignition switch ON.
• Measure the voltage between the ECT sensor connector terminal of the wire harness side and ground.
Connection: Yellow/Red (+)－Ground(-)
Standard: 5.0 +/- 0.1V

• Measure the voltage at ECT sensor connector of the wire harness side.
Connection: Yellow/Red (+)－Gray/Red(-)
Standard: 5.0 +/- 0.1V



REMOVAL / INSTALLATION



- Disconnect the ECT sensor 2P connector from the sensor
- Remove the ECT sensor.
- Install the new ECT sensor.

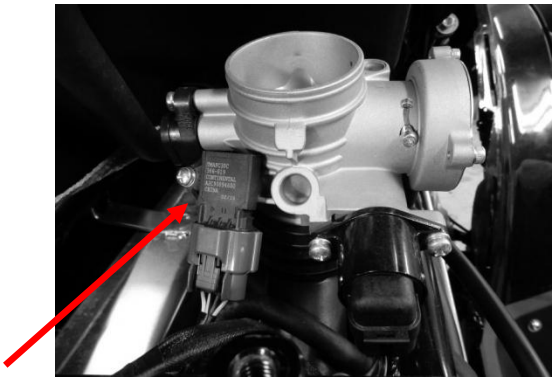
TORQUE: 1.6~1.8 kgf/m

- Connect the ECT sensor 2P connector.

Standard:

TEMPERATURE(℃)	RESISTANCE VALUES(OHM)	TOL. (OHM)
20	3500	±250
60	704	±45
90	260	±20

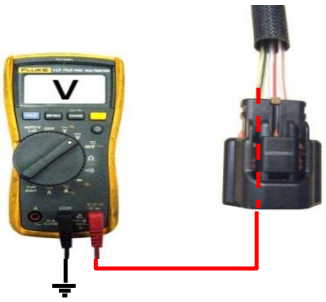
TP SENSOR



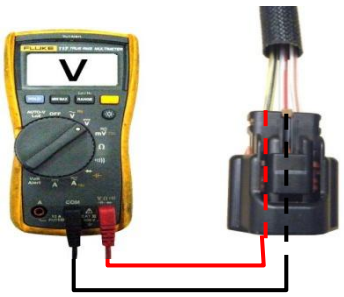
INSPECTION

- Turn the ignition switch OFF.
- Disconnect the TP sensor 3P connector.
- Check for loose or poor contact on the TP sensor connector.

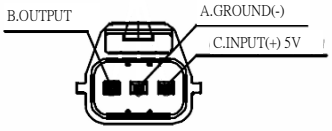
- Connect the TP sensor connector.
- Start the engine and check the MIL light.



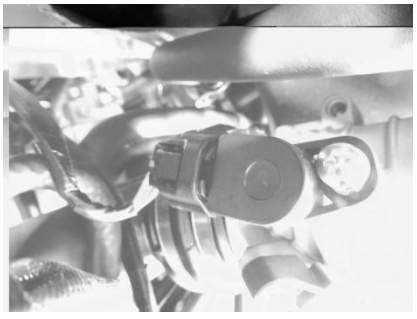
- Turn the ignition switch OFF.
- Disconnect the TP sensor 3P connector.
- Turn the ignition switch ON.
- Measure the voltage between the wire harness side connector terminal and ground.
  Connection: Yellow/Black (+)—Ground(-)
  Standard: 5.0 +/- 0.1V



- Measure the voltage at TP sensor terminals of the wire harness side.
  Connection: Yellow/Black (+)—Gray/Red(-)
  Standard: 5.0 +/- 0.1V
- Working voltage value: 5.0±0.1V
- Full throttle open voltage: **3.9±0.2V**
- Full throttle closed voltage: **0.5±0.05V**
- WARNING!
  Never loosen the screw of TPS, result the unsteady idle.

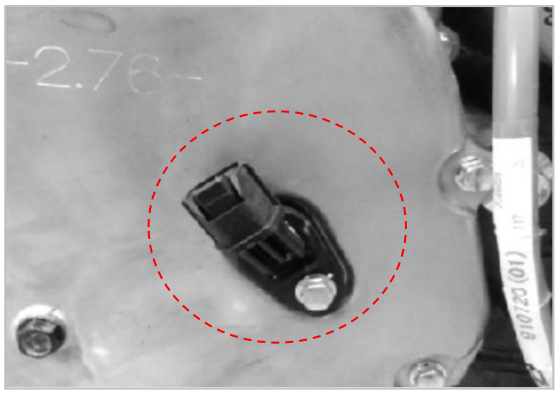


- Using diagnosis tool to confirm the throttle output signal.
  1. Connected to the "diagnosis tool", and open the main switch, but not to start engine.
  2. "Diagnosis tool" selects to a "Live Data" screen.
  3. Rotations throttle and check voltages.

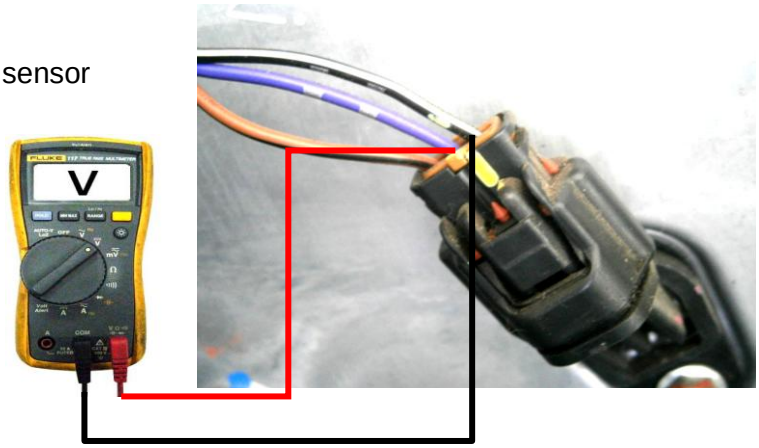


VEHICLE SPEED SENSOR

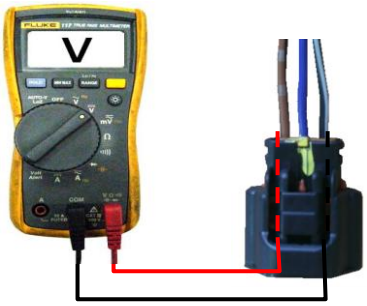
- Turn the ignition switch OFF.
- Disconnect the vehicle speed sensor 3P connector.
- Check for loose or poor contact on the vehicle speed sensor connector.



- Raise the rear wheel of the vehicle and supported by jack.
- Measure the voltage at the vehicle speed sensor connector as shown.
- Turn the rear wheel.
- Check the output voltage:
  High：>10 V.
  Low：>0 V.

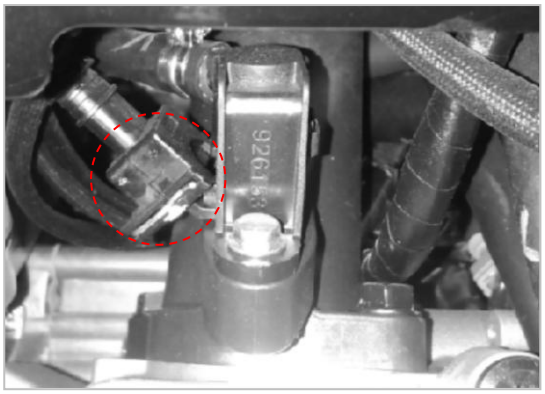


- Turn the ignition switch OFF.
- Disconnect the vehicle speed sensor 3P connector.
- Turn the ignition switch ON.
- Measure the voltage at the wire harness side connector.
  Connection: Red (+)－Black/White(-)
  Standard: 12 V



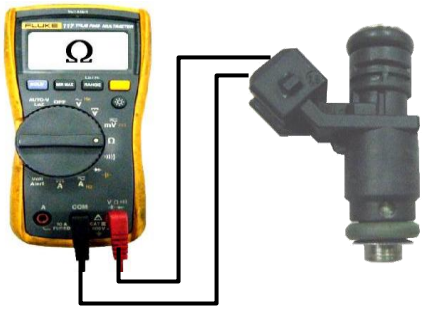
INJECTOR

• Turn the ignition switch OFF.
• Disconnect the injector 2P connector.
• Check for loose or poor contact on the injector 2P connector.

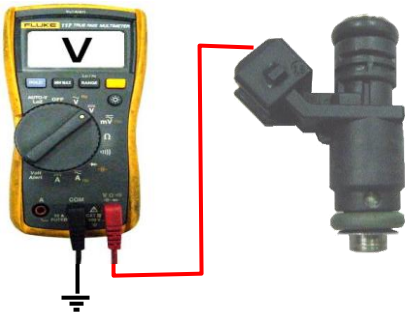


• Connect the injector 2P connector.
• Turn the ignition switch ON.
• Check the MIL light.

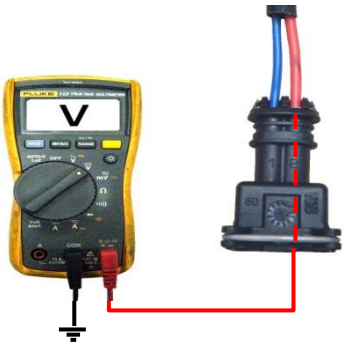
• Turn the ignition switch OFF.
• Disconnect the injector 2P connector and measure the resistance of the injector.
Connection: Red (+) — Blue/Green(-)
Standard:12.0+/-0.6Ω



• Check for continuity between the injector and ground.
Connection: Red (+) — Ground(-)
Standard: continuity

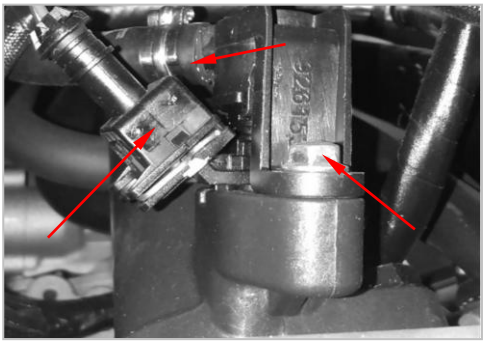


• Turn the ignition switch ON.
• Measure the voltage between the injector connector of the wire harness side and ground.
Connection: Red (+) — Ground(-)
Standard: battery voltage



INSPECTION

- Start the engine and let it idle.
- Confirm the injector operating sounds with a sounding rod or stethoscope.
- If the injector does not operate, replace the injector.



REMOVAL

- Disconnect the injector 2P connector.
- Remove the bolts and fuel rail assembly.
- Remove the injector from the intake pipe.

INSTALLATION

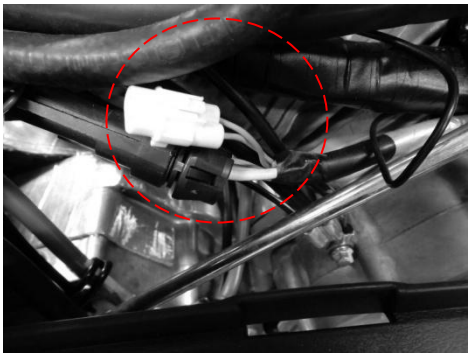
- Install injector on the intake pipe.
- Being careful not to damage the O-ring of injector.
- Install fuel rail assembly and tighten the bolt.

TORQUE: 0.9~1.0 kgf-m

- Connect the injector 2P connector.

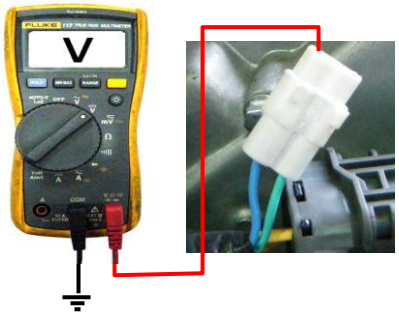
CRANK POSITION SENSOR

- Turn the ignition switch OFF.
- Disconnect the crank position sensor 2P connector.
- Check for loose or poor contact on the crank position sensor 2P connector.

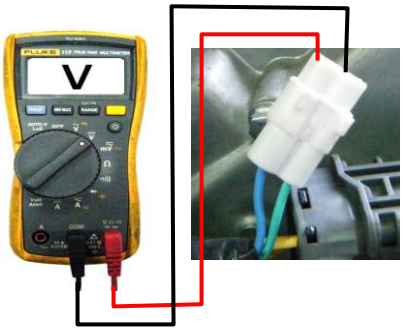


- Connect the crank position sensor 2P connector.
- Turn the starter motor more than 10 seconds and then check that the MIL light.

• Turn the ignition switch OFF.
• Disconnect the crank position sensor 2P connector.
• Check for continuity between the crank position sensor connector terminal and ground.
Connection: Blue (+) — Ground(-)
Standard: No continuity

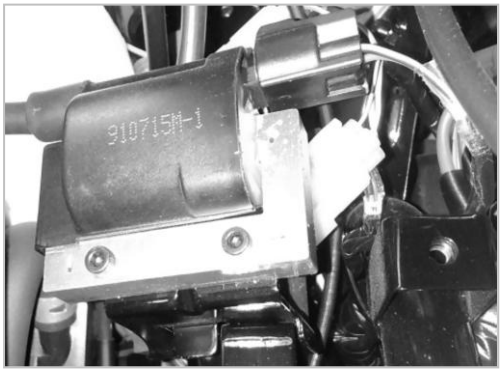


• Crank the engine with the starter motor, and measure the crank position sensor peak voltage at the crank position sensor 2P connector.
Connection: Blue (+) — Sky Blue(-)
Standard: **1.6~2.2V (AC)**



IGNITION COIL

• Turn the ignition switch OFF.
• Disconnect the ignition coil 2P connector.
• Check for loose or poor contact on the ignition coil 2P connector.



• Connect the ignition coil 2P connector.
• Turn the starter motor more than 10 seconds and then check that the MIL light.

• Turn the ignition switch OFF.
• Disconnect the ignition coil 2P connector.
• Check for continuity between the ignition coil connector terminal and ground.
Connection: Red (+) — Ground(-)
Standard: No continuity

• Check for resistance between the ignition coil connector terminal and ground.
Standard: 0.6±0.05Ω

THROTTLE BODY

REMOVAL

NOTE:

- *Before disconnecting the fuel hose, release the fuel pressure by loosening the clamp.*
- *Always replace the clamp when the fuel hose is removed or loosened.*

DISASSEMBLY

- Disconnect the TP sensor, T-MAP sensor and ISC sensor connector from the throttle
- Disconnect intake pipe rubber tube from the throttle body.
- Disconnect the throttle body from the air cleaner case.

NOTE:

- *Do not damage the throttle body. It may cause incorrect throttle and idle valve.*
- ***The throttle body is factory pre-set. Do not disassemble in a way other than shown in this manual.***
- ***Do not loosen or tighten the white painted bolts and screws of the throttle body. Loosening or tightening them can cause throttle and idle valve failure.***

- Disconnect the throttle cable end from the throttle drum.

ASSEMBLY

- Connect the throttle cable end to the throttle drum.
- Connect the TP, T-MAP and ISC sensor connector on the throttle body.
- Install and tighten the intake pipe rubber tube on the throttle body.
- Install the throttle body to the air cleaner case.

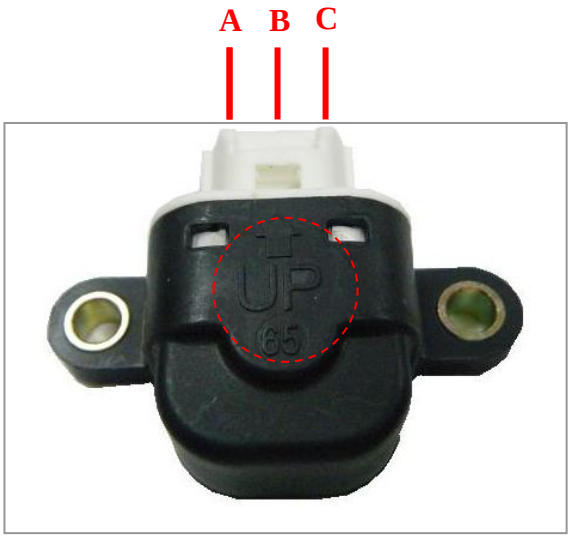
ROLL OVER SENSOR

INSPECTION

- Remove the seat set.
- Turn the ignition switch ON and measure the voltage between the following terminals of the Roll Over sensor connector with the connector connected.

TERMINAL	STANDARD
A-C	4~5V
B-C	1~1.5V
B-C (65°)	3.9V~4.3V

- Turn the ignition switch OFF.
- Remove the screws, washers, nuts and roll over sensor.
- Place roll over sensor horizontal as shown and turn the ignition switch ON.
- The roll over sensor is normal if the power supply is closed.
- Incline the roll over sensor approximately 65 degrees to the left or right with the ignition switch ON.
- The roll over sensor is normal if the power supply is open.
- If you repeat this test, first turn the ignition switch OFF then turn the ignition switch ON.



REMOVAL / INSTALLATION

- Disconnect the roll over sensor 2P connector.
- Remove the two screws, nuts and roll over sensor.
- Installation is in the reverse order of removal.
- Tighten the mounting screws securely.

NOTE: ***Install the roll over sensor with its "UP" mark facing up.***

ECU

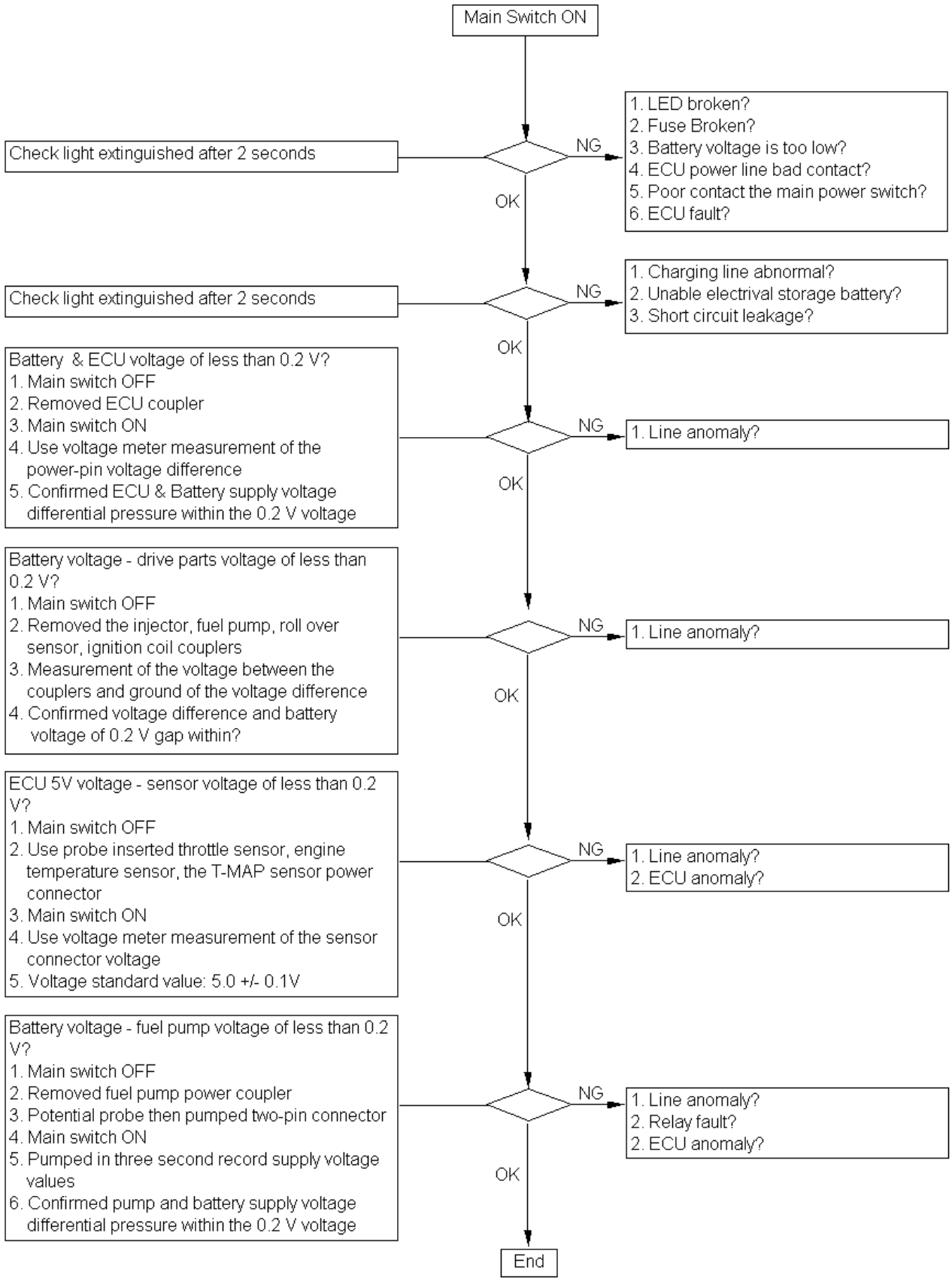
REMOVAL / INSTALLATION

- Remove the seat set.
- Disconnect the ECU 48P connectors.

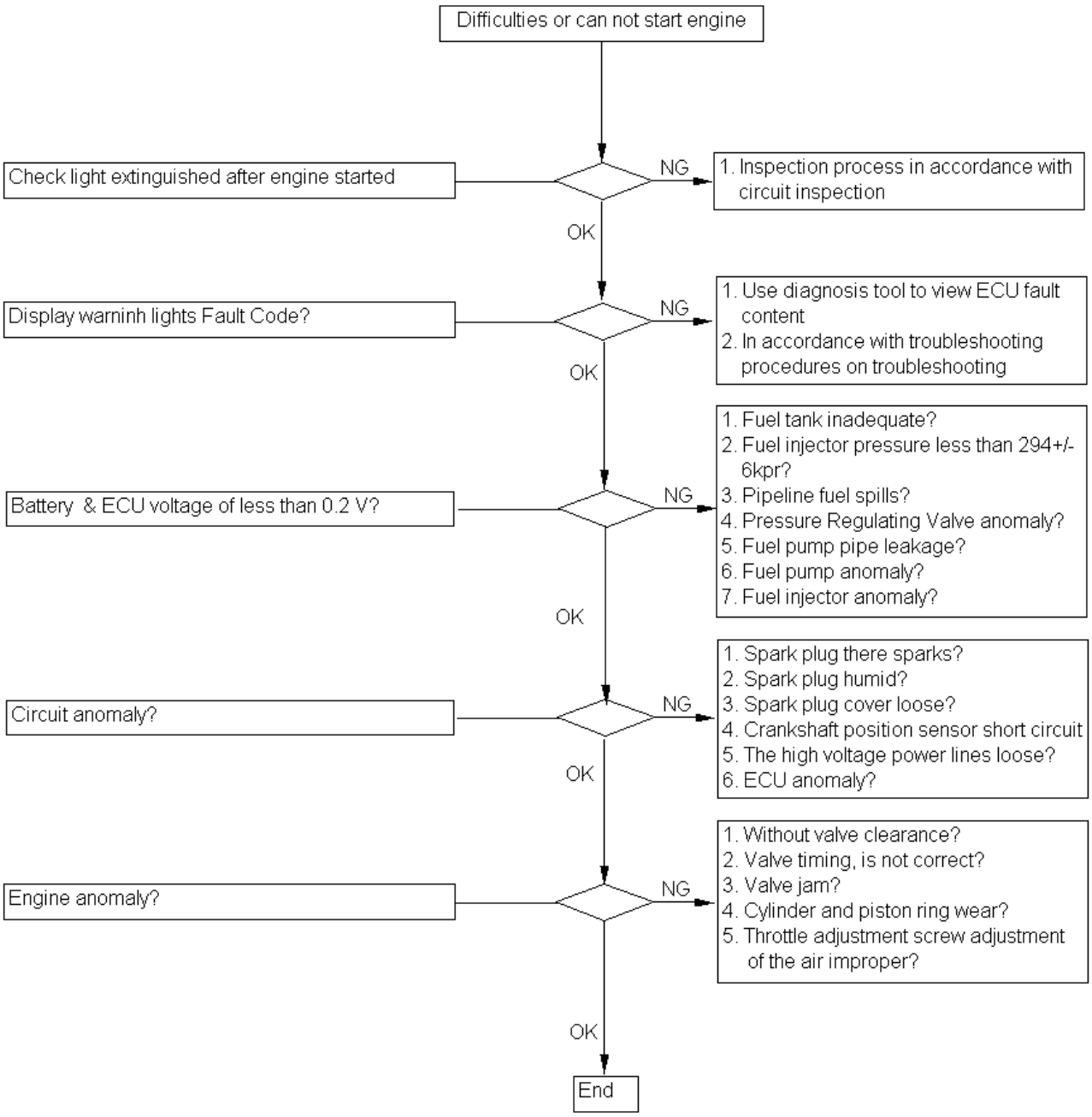
POWER INPUT LINE

- Turn the ignition switch ON.
- Measure the voltage between the ECU and ground.
- There should be battery voltage.
- If there is no voltage, check for an open circuit in Black/White wire between the ECU and roll over sensor/relay.
- If the wire is OK, check for the roll over sensor/relay.

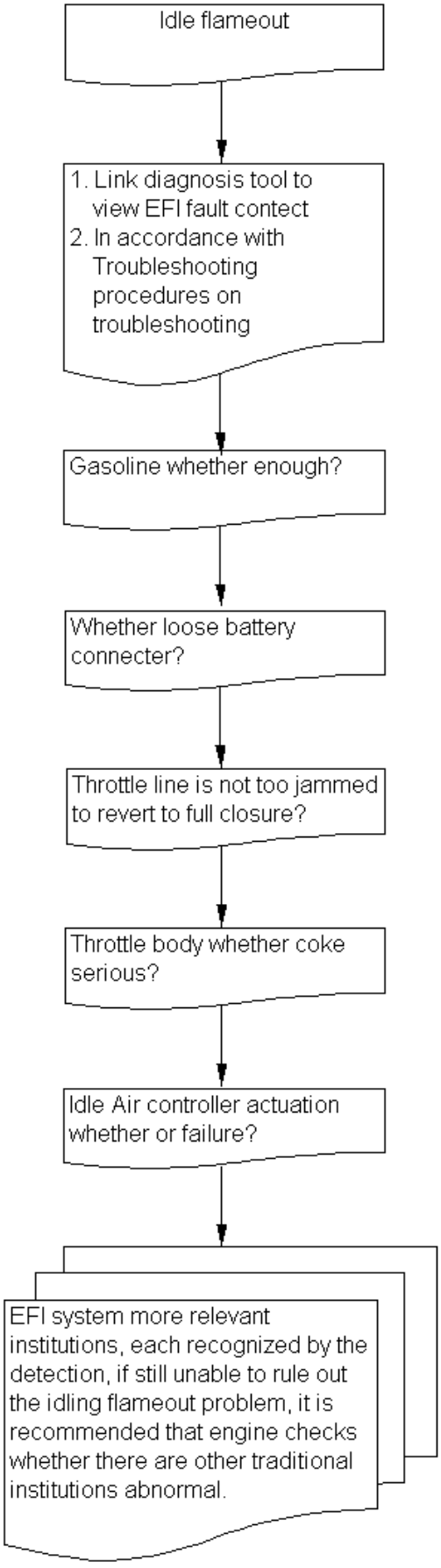
Fault Diagnosis
EFI Circuit inspection



Can not Start the engine or difficult to start inspection



Idle flameout diagnosis



Integrated Fault Diagnosis Program

Checking adjusting project	Detection of maintenance projects and steps	Fault status determination		Fault reasons	Parts specifications
Battery Voltage	· Use meter direct measurement battery voltage · Use diagnosis tool detection battery voltage	· Battery voltage is 10 V above? · Diagnosis tool show whether the voltage of 10 V above?	NO	· Battery electricity · Battery connector loose · Harness circuit opening · ECU coupler not connected properly	· Diagnosis tool display voltage required to achieve more than 10 V
		YES			
Diagnosis fault code inspection	· Use of the diagnosis tool detection fault code · Elimination of fault codes and then start engine	· Diagnostic tool show whether or not a fault code? · Fault Code cleared after show again?	YES	· TPS fault · ETS fault · CPS fault · T-MAP fault · Tilt fault · ECU fault	· The sensor detection methods and specifications, please refer to repair manual
		NO			
Fuel quantity and fuel pressure	· Removed the injector on the intake manifold but not removal of harness coupler. (Injector and cap tightly by hands, fuel spills should not be the case) · Start the engine · Examine whether injector fuel injection · Between the tank and injector, Installation the pressure gauge · Check fuel pressure adequancy	· Injector whether injection? · Injector spray angle is normal? · Fuel pressure enough?	NO	· Less than fuel tank · Injector fault · Fuel pump relay fault · Fuel pump fault · ECU fault · Fuel pump filter obstructive	· Pressure fuel specifications: Open the main switch ten seconds after but not start engine->more than 250 kPa Idle->294+/- 6kPa · Injecetor resistance specifications: 11.7+/- 0.6Ω
		YES			
Ignition situation	· Removed the spark plug from the cylinder head, but then power lines still ring · Start the engine · Check spark plug sparks	· Examine whether the spark plug ignition? · Check spark plug sparks strength is normal?	NO	· Spark plug fault · Roll over sensor fault · ECU fault · Ignition coil fault · Crankshaft position sensor fault	· Dspark plug specifications: NGK-CR7E
		YES			
Engine Vaccum	· Use diagnosis tool to detect of the manifold pressure	· Diagnosis tool manifold pressure for compliance with specifications?	NO	· Valve clearance is not normal · Intake system leak	· Manifold pressure Specifications: 32~38 kPa

YES

Normal starting → Finish

Can not starting or starting difficulties → In traditional engine overhaul way to maintenance

Fault Diagnosis Note

When the motorcycle injection system in the wrong signal, causing abnormal functioning of the engine or can not start engine, MIL light at the dashboard will be lighting, to inform drivers to carry out maintenance.

Overhaul, the diagnosis tool can be used for troubleshooting. If the fault has been ruled out or repair after the MIL light will be extinguished, but ECU fault code will be recorded, so the need to get rid of fault codes.

Diagnosis tool for overhaul

Diagnosis tool will connect to the motorcycle for coupler diagnosis, according to the use of diagnostic tool testing methods, when belong fuel injection system fault or parts fault, according to the diagnosis tool of the fault code display messages do describe parts of the inspection testing maintenance and replacement parts. When after the maintenance, the need to get rid of fault codes.

Fault Code And The Sensors Of The Table

No.	Fault codes	Fault Description
1	XXXXX	Un define
2	B2225	Tilt switch diagnosis (Short Circuit Battery)
3	B2226	Tilt switch diagnosis (Short Circuit Ground/Open Circuit)
4	P0000	No DTC
5	P0031	Sensor heater diagnosis #0 (Short Circuit Ground/Open Circuit)
6	P0032	Sensor heater diagnosis #0 (Short Circuit Battery)
7	P0107	MAP sensor diagnosis (Short Circuit Ground/Open Circuit)
8	P0108	MAP sensor diagnosis (Short Circuit Battery)
9	P0112	Intake air temperature sensor diagnosis (Short Circuit Ground)
10	P0113	Intake air temperature sensor diagnosis (Short Circuit Battery/Open Circuit)
11	P0114	Electrical intake air temperature intermittent diagnosis (failure)
12	P0117	Coolant Temperature Sensor (Short Circuit Ground)
13	P0118	Coolant Temperature Sensor (Short Circuit Battery/Open Circuit)
14	P0119	Coolant temperature intermittent diagnosis (failure)
15	P0121	TPS position sensor adaptation diagnosis (out of range)
16	P0122	Throttle Position Sensor 1 (Short Circuit Ground/Open Circuit)
17	P0123	Throttle Position Sensor 1 (Short Circuit Battery)
18	P0131	Lambda sensor #0 diagnosis (Short Circuit Ground)
19	P0132	Lambda sensor #0 diagnosis (Short Circuit Battery)
20	P0133	Lambda sensor #0 diagnosis (Open Circuit)
21	P0171	Lambda control diagnosis #0 (too high)
22	P0172	Lambda control diagnosis #0 (too low)
23	P0217	Engine coolant over temperature protection diagnosis
24	P0219	Engine over speed detection diagnosis
25	P0231	Electric fuel pump diagnosis (Short Circuit Ground/Open Circuit)
26	P0232	Electric fuel pump diagnosis (Short Circuit Battery)
27	P0261	Injection valve diagnosis #0 (Short Circuit Ground/Open Circuit)
28	P0262	Injection valve diagnosis #0 (Short Circuit Battery)
29	P0264	Injection valve diagnosis #1 (Short Circuit Ground/Open Circuit)
30	P0265	Injection valve diagnosis #1 (Short Circuit Battery)
31	P0351	Ignition diagnosis #0 (Short Circuit Battery)
32	P0352	Ignition diagnosis #1 (Short Circuit Battery)
33	P0370	Loss of synchronization diagnosis
34	P0371	Crankshaft sensor diagnosis

35	P0373	Crankshaft sensor diagnosis
36	P0462	FUEL sensor diagnosis (Short Circuit Ground)
37	P0463	FUEL sensor diagnosis (Short Circuit Battery/Open Circuit)
38	P0484	Cooling fan diagnosis (Short Circuit Battery)
39	P0485	Cooling fan diagnosis (Short Circuit Ground/Open Circuit)
40	P0560	Battery voltage diagnosis (too low)_VBR
41	P0561	Battery voltage diagnosis (too high)_VBR
42	P0562	Battery voltage diagnosis (too low)_VBK
43	P0563	Battery voltage diagnosis (too high)_VBK
44	P0608	Reference voltage diagnosis (Short Circuit Battery)
45	P0609	Reference voltage diagnosis (Short Circuit Ground/Open Circuit)
46	P0615	Starter 1 diagnosis (Open Circuit)
47	P0616	Starter 1 diagnosis (Short Circuit Ground)
48	P0617	Starter 1 diagnosis (Short Circuit Battery)
49	P0630	VIN coherence
50	P0651	MIL diagnosis (Short Circuit Ground/Open Circuit)
51	P0652	MIL diagnosis (Short Circuit Battery)
52	P1352	Ignition diagnosis #0 (Short Circuit Ground/Open Circuit)
53	P1353	Ignition diagnosis #1 (Short Circuit Ground/Open Circuit)
54	P1508	Stepper motor diagnosis (Short Circuit Ground/Open Circuit)
55	P1509	Stepper motor diagnosis (Short Circuit Battery)
56	P1615	Starter 2 diagnosis (Open Circuit)
57	P1616	Starter 2 diagnosis (Short Circuit Ground)
58	P1617	Starter 2 diagnosis (Short Circuit Battery)

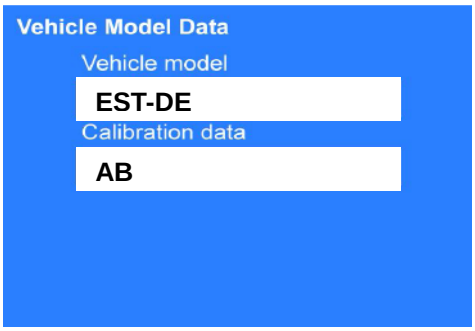
Use diagnosis tool

Note:

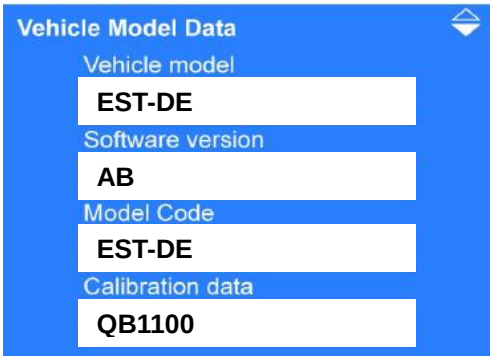
- When problems arise, can be used for diagnosis tool of the fault is detected, and exclusion.
- In addition to testing, troubleshooting, another of the operation can be carried out data analysis-type monitor.

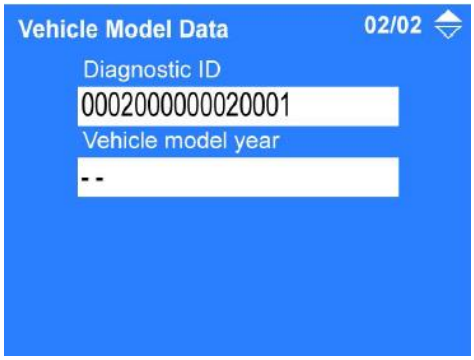
Method of Use:

1. Connected to the diagnostic connector for diagnosis tool.
   NACS→TGB interface→Transfer Cable→TGB 3 pin/6 pin Diagnosis Cable→Vehicle.
2. When the IG of the motorcycle is on, the system starts to run, entering into boot screen.
3. Key ON and the diagnosis display screen appeared the words connection.
4. Press the “ENTER” button and the system will identify the vehicle model automatically and display the vehicle info on the screen, as following picture



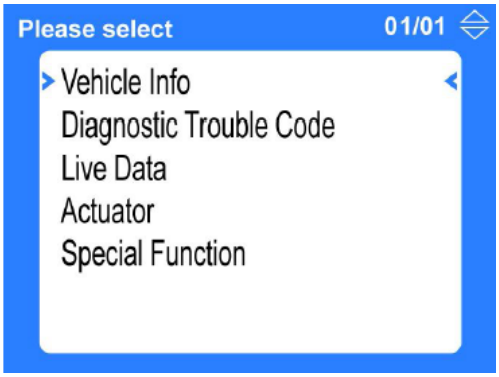
5. Press “ENTER” button again for more detailed vehicle information. Press ▲▼ button to view all information.





Diagnosis Use Note

Press ”ENTER” button to the function menu.



Options main functional areas:

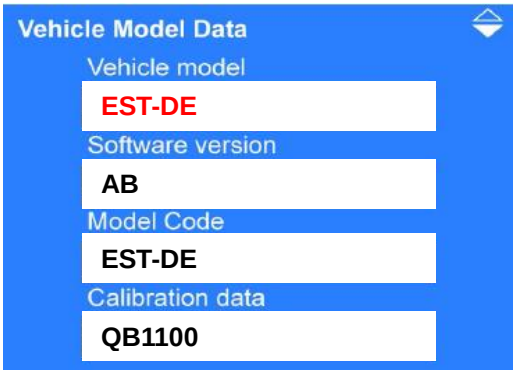
1. **Vehicle Info**
2. **Diagnostic Trouble Code**
3. **Live Data**
4. **Actuator**
5. **Special Function**

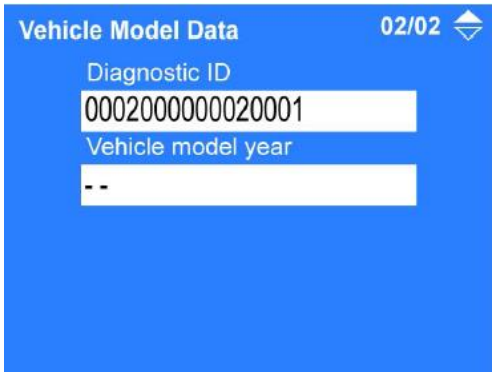
Press ▲▼ button to choose one function.

1. Vehicle Info

Move the cursor to ”**Vehicle Info**” and press **ENTER** to see the content

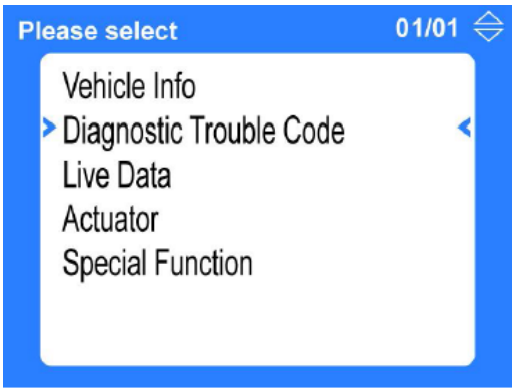
This is the page of “**Vehicle Info**”, press ▲▼ button to view all vehicle info.

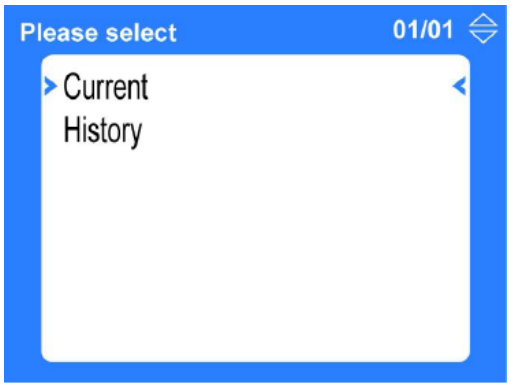




2. Diagnostic Trouble Code

Move the cursor to "**Diagnostic Trouble Code**" and press **ENTER** to see the content.



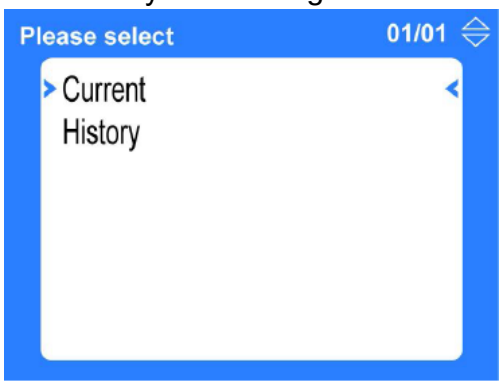


2-1. Current

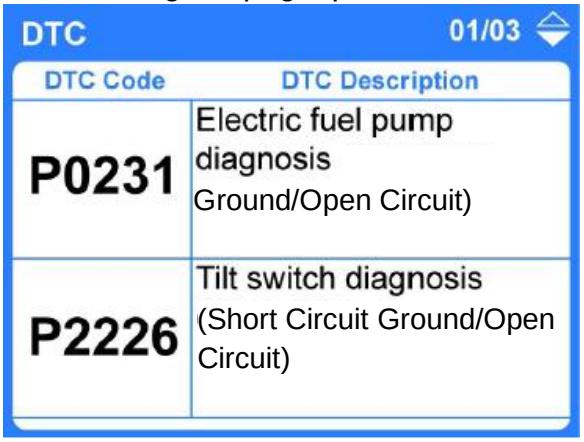
Current" is for the Diagnostic Trouble Code occurred at the time

2-2. History

"History" is for Diagnostic Trouble Code occurred in the past.

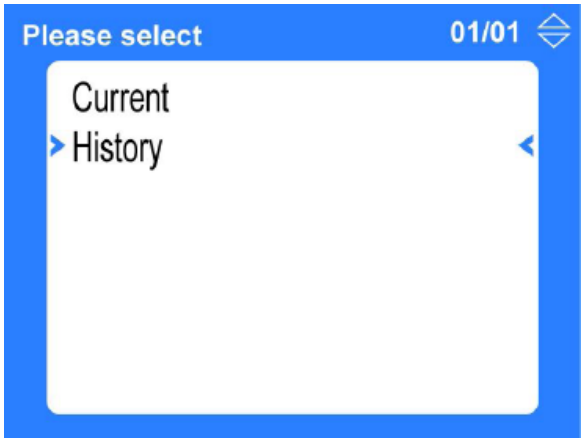


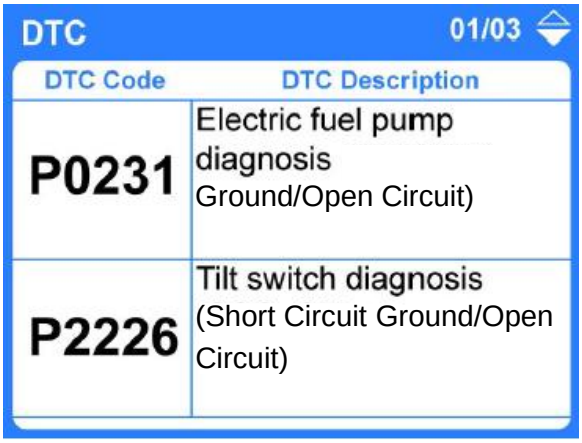
Move the cursor to "**Current**" and press "**ENTER**" to continue
After entering the page, press ▲▼ to view all the Diagnostic Trouble Code.



After viewing the Diagnostic Trouble Code, press ESC to return to the previous page.

Move the cursor to “**History**” and press “**ENTER**” to continue

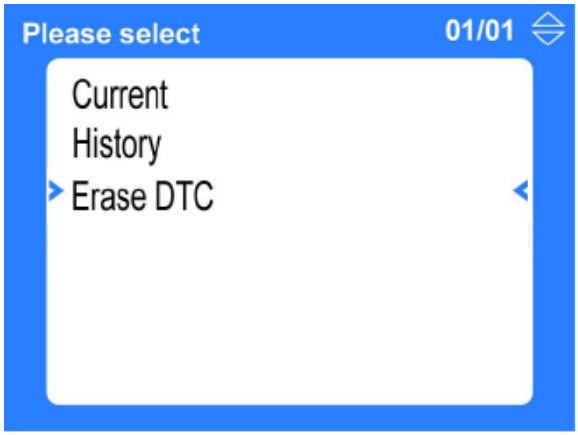


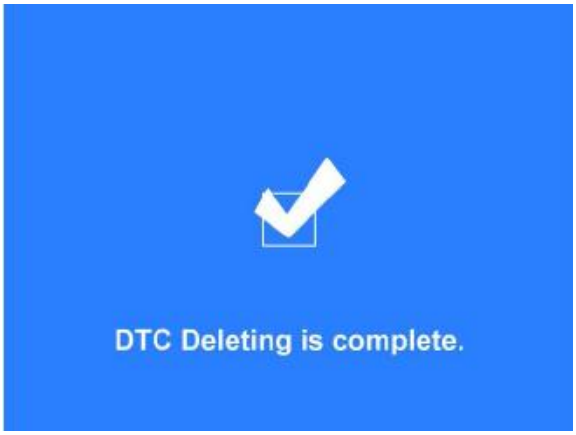


After entering the page, press ▲▼ to view all the Diagnostic Trouble Code occurred in the past.
After viewing the Diagnostic Trouble Code, press ESC to return to the previous page.

※
After viewing the content of “Current” or “History” Diagnostic Trouble Code, press **ESC** to return to the previous page, you will see two more items on the screen - “Freeze Data” and “Erase DTC”.
“**Erase DTC**” is the function to erase all Diagnostic Trouble Code in both “Current” and “History”.

2-3. Erase DTC
Move the cursor to “Erase DTC” item and press ENTER to EARSE ALL DIAGNOSTIC TROUBLE CODE DIRECTLY!

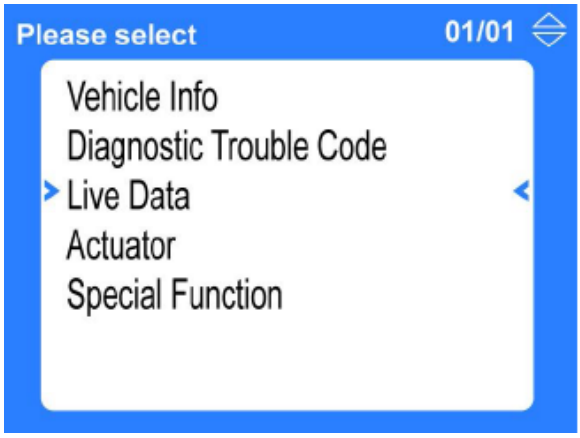




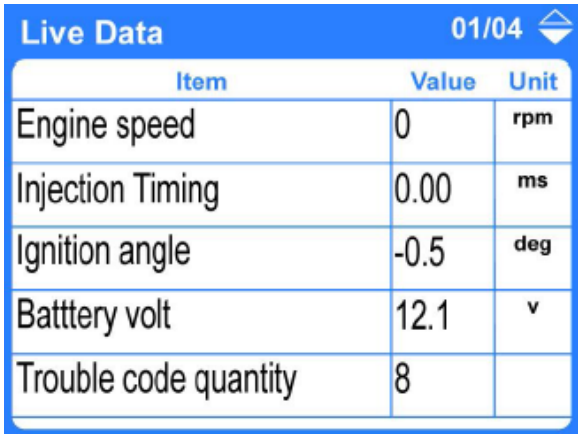
When you see the following picture on the screen, the Diagnostic Trouble Code erasure is completed. Press ESC button back to the main menu.

3. Live Data

Back to the main menu, move the cursor to “**Live Data**” and press ENTER to view the content.



Press ▲▼ button to view all Live Data



Troubleshooting Table

Test Items / Abnormal phenomena		Comprehensive Testing Program						Parts		
		Power voltage	Fuel press.	Ignition state	Engine vacuum	Injection state	Fault code detection	ECU	Throttle position sensor	Engine temp. sensor
Start state	Can't start	※	※	※	※	※	※	※		
	Difficult to start	※	※		※		※		※	※
Idle state	Without Idle			※	※	※	※		※	※
	Idle not smooth					※	※	※	※	
	RPM NG						※	※		
	CO NG		※			※	※	※		
Acceleration	Not smooth		※	※	※	※	※	※	※	※
	Inability and slow		※	※	※	※	※	※	※	※
Flameout	Idle flameout				※		※			
	Acceleration flameout						※	※		

Related spare parts					
	Roll over sensor	Fuel pump	Ignition coil	Inlet pipe	Injector
	Power relay	Fuel pressure adjustment valve	Spark plug	Cylinder head	Fuel pump
		Fuel pump relay		Inlet pressure sensor	Fuel pressure adjustment valve
	Main switch	Fuel filter			
	Battery				

Notes: 1. Integrated test motorcycle, according to the "Comprehensive Maintenance list" implementation.

2. Spare parts, according to the "EFI System components description" implementation.

Comprehensive Maintenance List

No.	Maintenance Project	Testing Procedures	Test items	Determine benchmarks	Fault reasons
1	**Power and voltage**	Use meter direct measurement battery voltage Use diagnosis tool detection of battery voltage	Battery	Battery voltage = 10 V above	Battery electricity Battery connector loose Harness circuit opening ECU coupler not connected properly
2	**Fuel pressure**	Use fuel pressure gauge connected in series between the injector and the pressure regulating valve Main switch ON but not start engine Check fuel pressure Start engine (Idle) Check change of fuel pressure Throttle several rotation Check to the change of fuel pressure again	Open the main switch but not to start the engine of pressure Pressure in Idle Rotating throttle, situation of pressure changes	Open main switch but not start: Pressure = 250 kPa (stable value) Idle state: Pressure = 300+/-6 kPa (Beating situation from top to bottom) Rotating throttle moment: Pressure=300+/-6kPa(slightly beating)	Fuel not enough Fuel pump relay fault Fuel pump fault Injector fault ECU fault
3	**Ignition state**	The spark plug removed from the cylinder head but the power lines still ring Start engines or use for the diagnosis tool of output view spark plug ignition conditions	Spark plug specifications Whether the spark plug ignition Spark plug sparks whether it is normal strength	Specifications: NGK-CR7H Ignition conditions: With traditional engines found ways	Spark plug fault Roll over sensor fault ECU No. 12 pin fault Ignition coil fault Crankshaft position sensor fault
4	**Engine vacuum**	Diagnosis tool to detect the use of	Manifold pressure of diagnosis tool	Manifold pressure = 32~38 kPa	Valve clearance abnormal Intake system leak
5	**Injection state**	The injector removed from the throttle body but not dismantle pipeline Main switch ON but not start engine Investigation the injector it's leaking fuel? Start engines again or use for the diagnosis tool of output function Check injector fuel injection and the injection situation	Open the main switch but did not start engine the injection situation Injector state when start	Not started, Injector not leaking fuel In started, the injection state must show fan shape	Fuel pump relay fault Fuel pump fault Injector fault ECU fault
6	**Fault Code Detection**	Use of diagnosis tool existing fault detection code or historical Fault Code Eliminated of the implementation of fault codes, check can be eliminated Start engine again Check fault is it happen again	Diagnosis toll of the fault code is it can be eliminated Start engine, the fault is it will happen again	Without any residual Fault Code If residual Fault Code, according to the "Fault Code Maintenance Form" implementation of troubleshooting	Throttle position sensor fault Engine temperature sensor fault Intake temperature sensor fault Manifold pressure sensor fault CPS fault ECU fault Tilt sensor fault

Notes: 1. Fuel pressure gauge connected between the fuel tank and injector, open the main switch to repeatedly shut down, fuel system makes pressure stability.

2.Injector and injector cap tightly by hands, fuel spills should not be the case.

ENGINE REMOVAL AND INSTALLATION

WARNING

To avoid potential burns, let engine and exhaust system cool down before servicing.

During assembly/installation, use the torque Values and service products.
Clean thread before applying a thread locker.

WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be installed or replaced with new one where specified. If the efficiency of a locking device is impaired, it must be renewed.

ENGINE REMOVAL

Preparation

1. Place vehicle on a workstation that will have access to an engine-lifting hoist.
2. Safely lift and support the vehicle.
3. Disconnect BLACK (-) cable from battery, then the RED (+) cable.

WARNING

Always disconnect battery cables exactly in the specified order, the BLACK (-) cable first. It is recommended to disconnect electrical connections prior to disconnecting fuel lines.

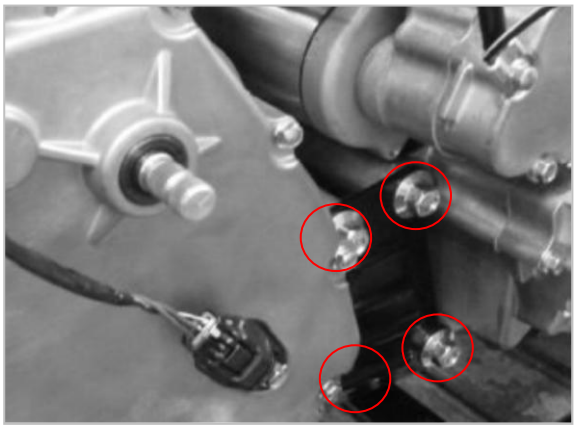
4. Remove air cleaner and bracket.
5. Remove the throttle body, air intake manifold.
6. Drain engine oil.

NOTE: *Drain engine oil and gearbox oil only if engine overhaul and gearbox need to repair is necessary.*

7. Remove the front and rear exhaust head pipes and muffler.
8. Remove the shift connecting rod.
9. Disconnect the CVT inlet duct from the CVT cover.
10. Remove the CVT outlet duct.
11. Disconnect the coolant hose at water pump and thermostat cover.
12. Disconnect the crankcase vent hose.
13. Disconnect the gearbox vent hose.
14. Unplug and remove the ETS (engine temperature sensor).
15. Unplug all remaining connectors and remove cables from engine. Cut all necessary locking ties.
    - Spark plug cables.
    - Starter cable (retaining nut on starter body).
    - Gear Position Switch.
    - Vehicle speed sensor.
    - Oil Pressure Sensor.
    - Crankshaft Position Sensor.
    - Engine ground cable.
    - ACG connector.
16. Remove CVT assy. and crankcase cover LH.
17. Remove bracket and cushion bush at cylinder head.

Lifting and Remove the Engine

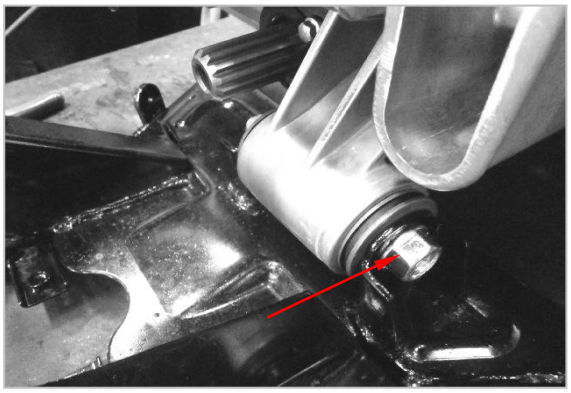
1. Remove four bolts on the rear output drive shafts connecting plate.
2. Remove the front and rear engine support bolts. Remove front output drive shaft bolts.
3. Carefully backward the engine and gearbox then raise the front of engine to separate front output drive shaft from engine.
4. Raise and slide the engine to left side and remove engine from vehicle.



ENGINE INSTALLATION

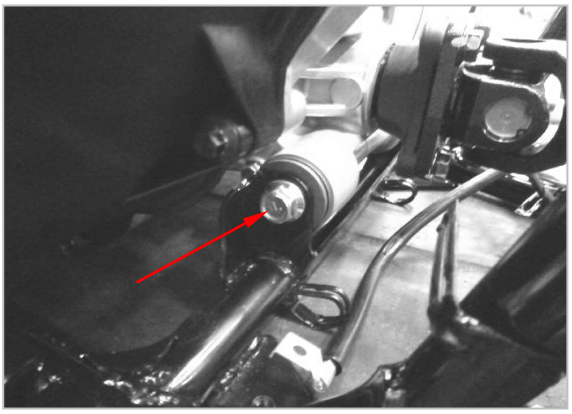
For installation, reverse the removal procedure. However, pay attention to the following.

- Before install the engine, inspect condition of engine mounts.
- Install the rear output drive shaft onto engine output shaft.
- Connect the front output drive shaft to the engine output shaft while lowing engine.
- Install connecting plate bolts, rear and front mounting bolts then torque all mounting bolts.



Final Assembly Procedure

1. Fill engine with the recommended oil and quantity.
2. Fill and bleed cooling system.
3. Check for any leaks.
4. Reinstall plastic parts, seat and body cover.
5. Test drive vehicle to confirm proper operation.

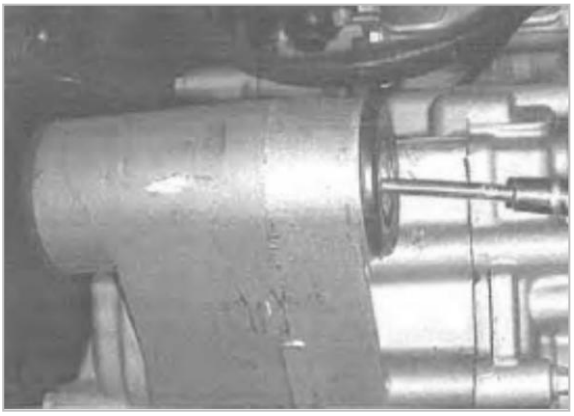


ENGINE MOUNTS

NOTE: *Use the same procedure for the front and rear engine mounts.*

Engine Mount Removal

Insert a punch into engine mount busing and push the opposite engine mount out.

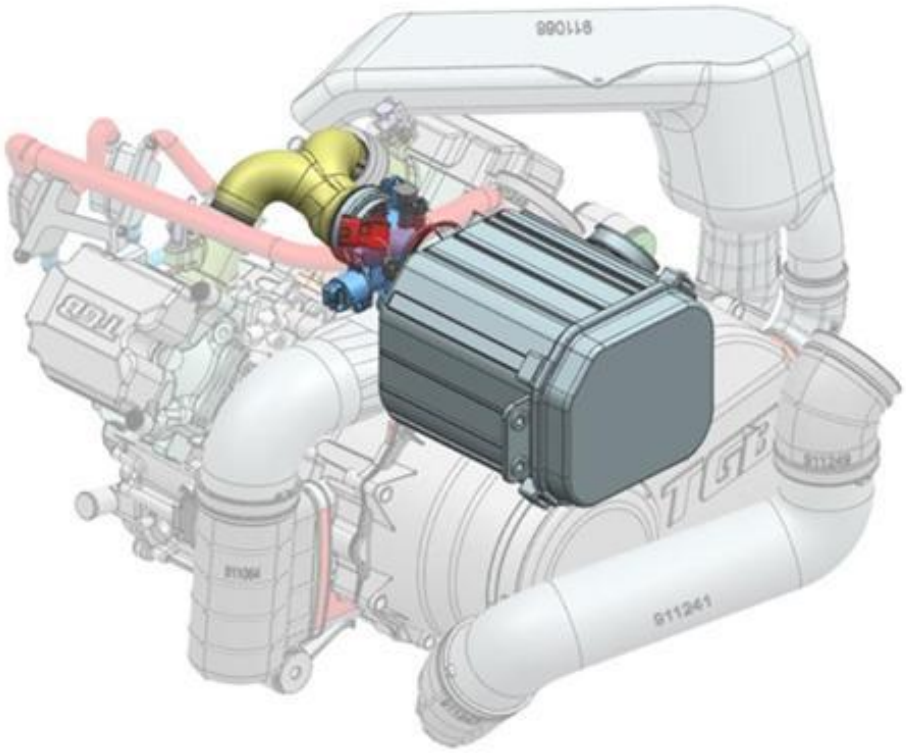


Engine Mount Installation

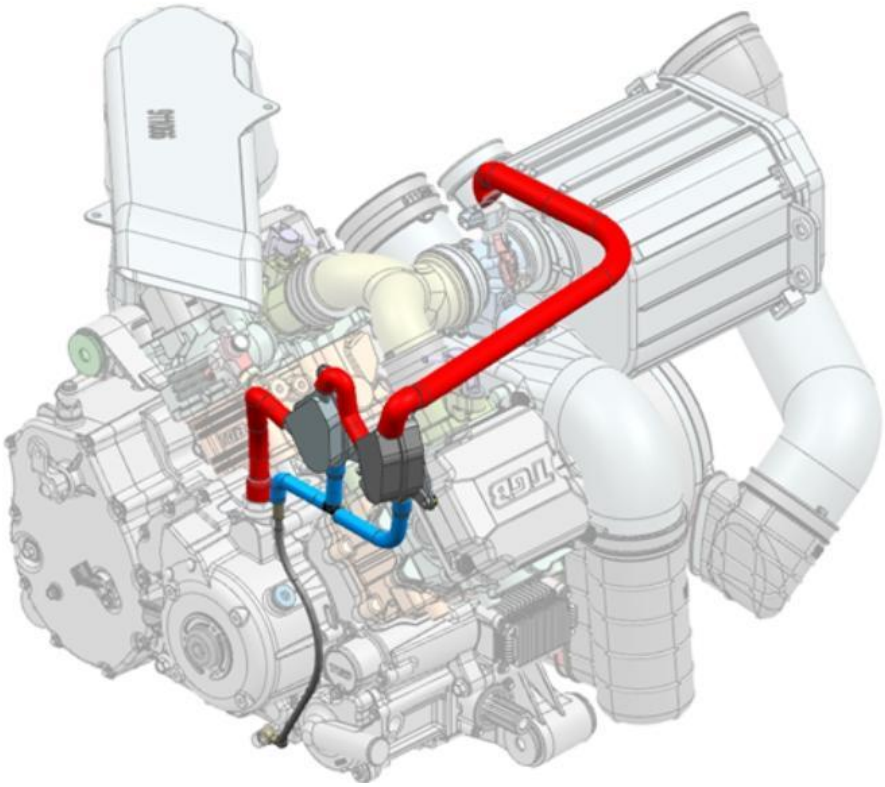
For installation, reverse the removal procedure.

AIR INTAKE SYSTEM

AIR CLEANER



BLOW-BY SYSTEM



GENERAL

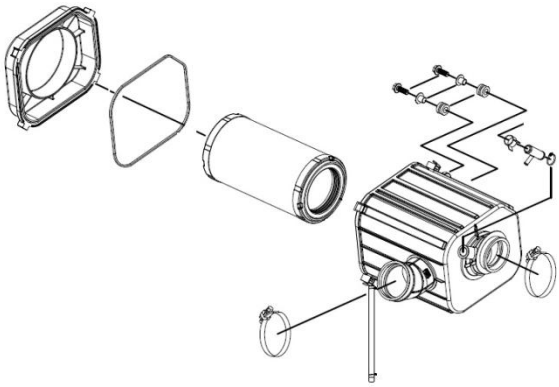
During assembly/installation, use the torque values and service products.

Clean thread before applying a thread locker.

WARNING

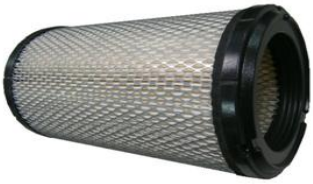
Never modify the air intake system. Otherwise, engine performance degradation or damage can occur. The engine is calibrated to operate specifically with these components.

AIR CLEANER

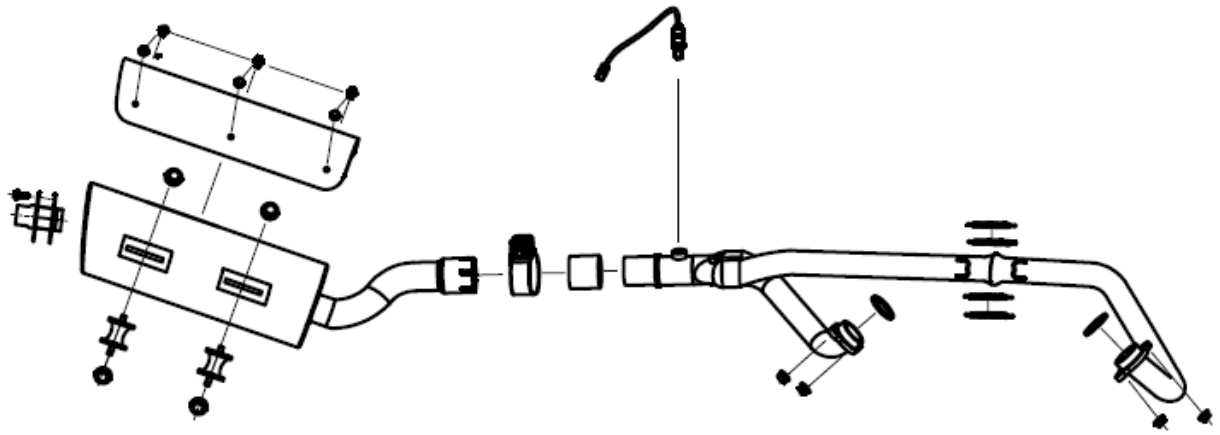


Air Filter Element Replacement

1. Open the four hooks and remove the cover.
2. Turn and pull out the element.
3. Replace if necessary.
4. For the installation, reverse the removal procedure.



EXHAUST SYSTEM



GENERAL

WARNING

To avoid potential burns, never touch exhaust system components immediately after the engine has been run because these components are very hot. Let engine and exhaust system cool down before performing any servicing.

During assembly/installation, use the torque values and service products.

Clean thread before applying a thread locker.

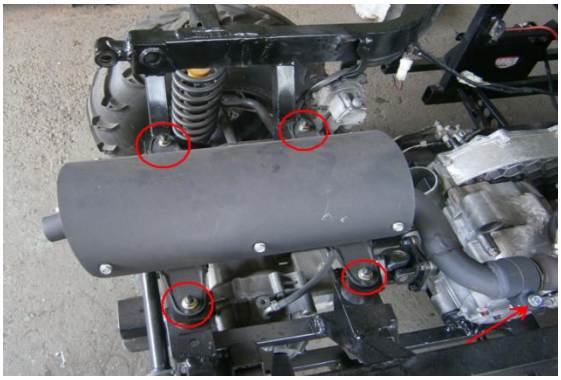
WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced.

MUFFLER

Muffler Removal

1. Remove muffler retaining bolts.
2. Loose the clamp of muffler.
3. Discard the gasket at the end of “Y” exhaust pipe.



Muffler Inspection

Check muffler for cracks or other damages.

Replace if necessary.

Muffler Installation

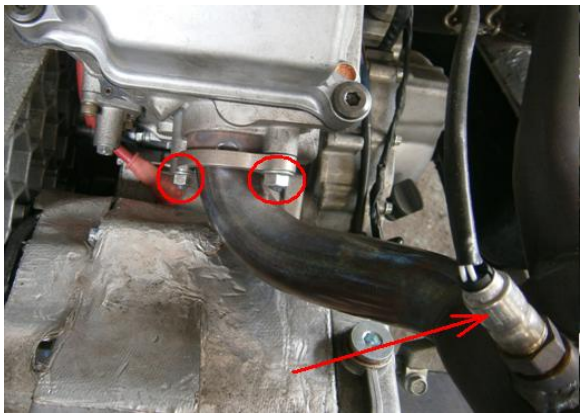
For the installation, reverse the removal procedure.

NOTE：Always install new plumbago gasket after muffler disassemble.

EXHAUST PIPE

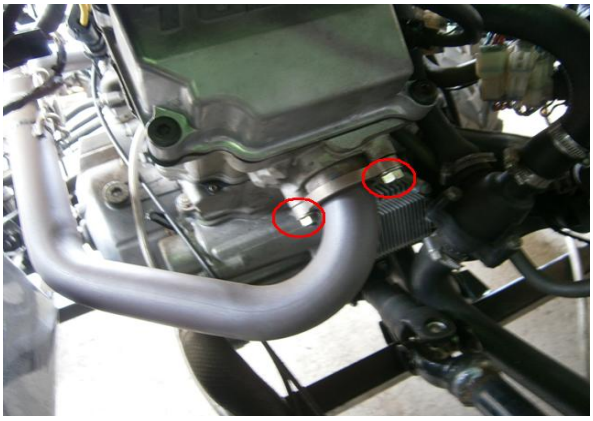
Exhaust Pipe Removal

1. Remove the mounting bolts from the two cylinder.
2. Remove O2 sensor and exhaust pipe from vehicle.
3. Remove the Muffler.



CAUTION:

Do not damage the O2 sensor connecting wire.



"Y" Exhaust Pipe Inspection

Check "Y" exhaust pipe for cracks, bending or other damages. Replace if need.

"Y" Exhaust Pipe Installation

The installation is the reverse of the removal procedure.

Install new exhaust gasket.

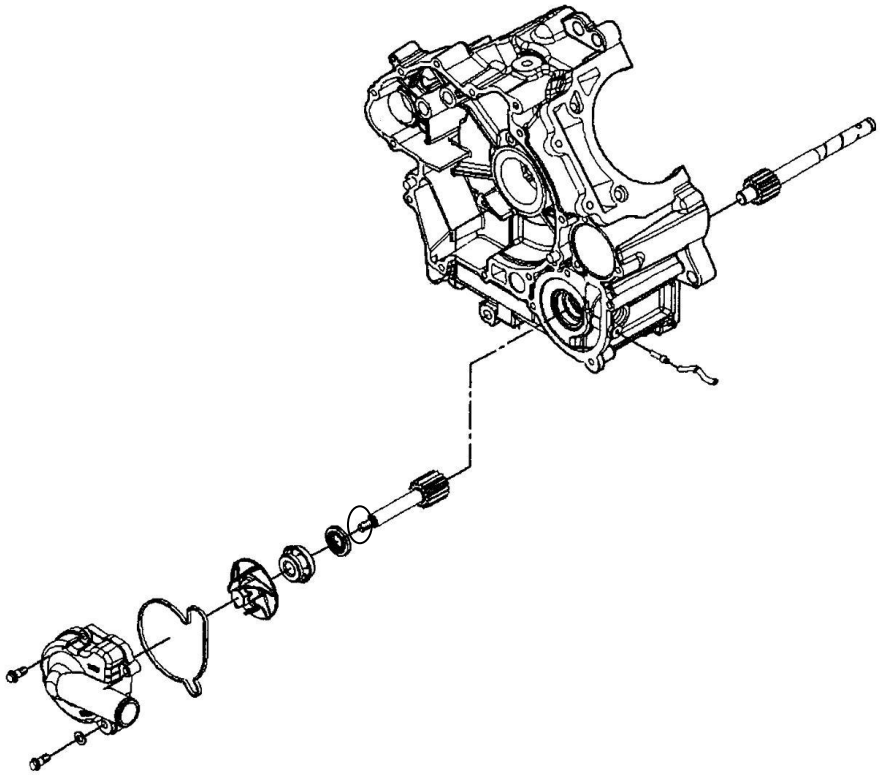
Clamp Torque：2.5 kgf-m

Nut Torque: 2-2.5 kgf-m

O2 Sensor：2.5 kgf-m

COOLING SYSTEM

WATER PUMP



GENERAL

WARNING

Never start engine without coolant. Some engine parts such as the rotary seal on the water pump shaft can be damaged.

During assembly/installation, use the torque values and service products.

Clean thread before applying a thread locker.

WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced.

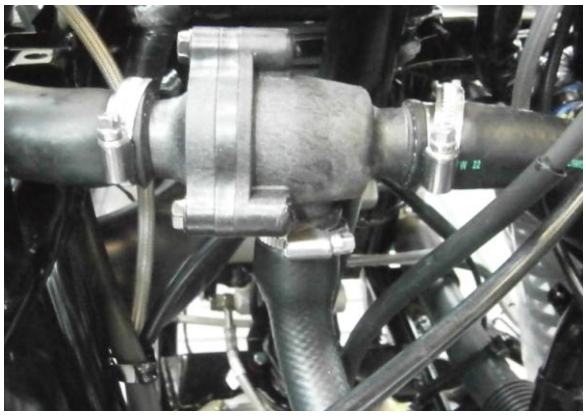
PROCEDURE

THERMOSTAT

The thermostat is a single action type.

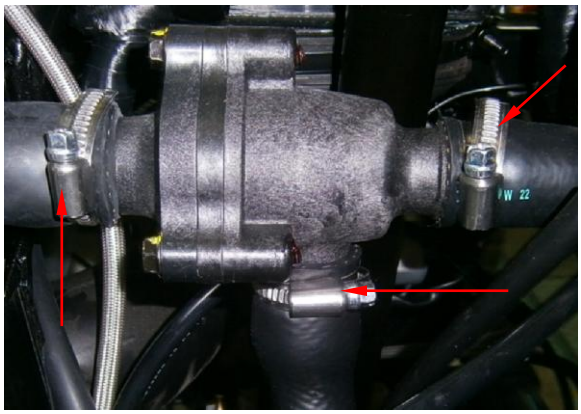
Thermostat Location

The thermostat is mounted in-line in the cooling system circuit.



Thermostat Removal

1. Remove service cover.
2. Remove air filter housing.
3. Remove clamp that secures thermostat housing to frame.
4. Install large hose pincher on both radiator hoses.
5. Drain remaining coolant.
6. Pull hoses from thermostat housing to remove thermostat.
7. Remove clamps that secure hose to thermostat.
8. Pull hoses from thermostat housing to remove thermostat.



Thermostat Test

▪ To check thermostat, put it in water and heat the water.

THERMOSTAT OPENING TEMPERATURE	
STARTS TO OPEN	FULLY OPEN
65 ℃	88 ℃

▪ Replace thermostat if it does not begin to open at specified temperature.

▪ Check if gasket is brittle, hard or damaged. If so, replace gasket.

Thermostat Installation

▪ Reverse removal procedures.

▪ Refill cooling system.

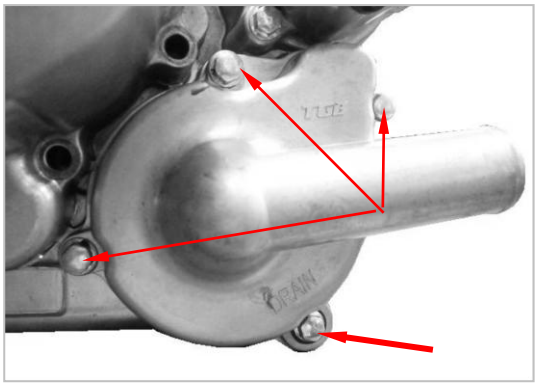
▪ Bleed cooling system.

▪ Check for coolant leaks.

Torque:0.6~0.8 kgf-m

WATER PUMP HOUSING

It is located on the engine ACG side.

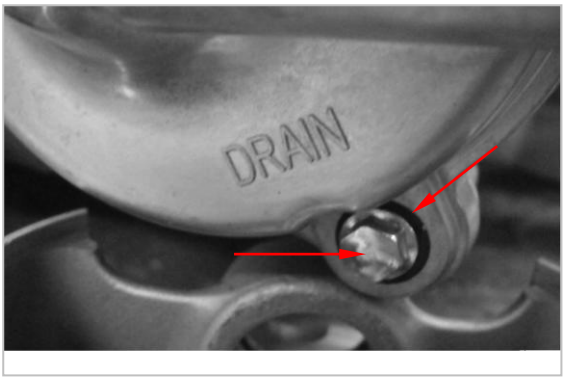


Water Pump Housing Removal

WARNING

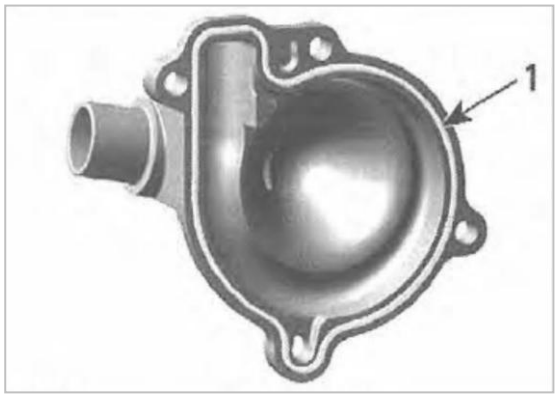
To avoid potential burns, do not remove the radiator cap or loosen the coolant drain plug if the engine is hot.

1. Drain cooling system.
2. Remove radiator outlet hose from water pump housing.
3. Remove screws retaining water pump housing and pull water pump housing to remove it.



Water Pump Housing Inspection

Check if gasket is brittle, hard or damaged and replace as necessary.



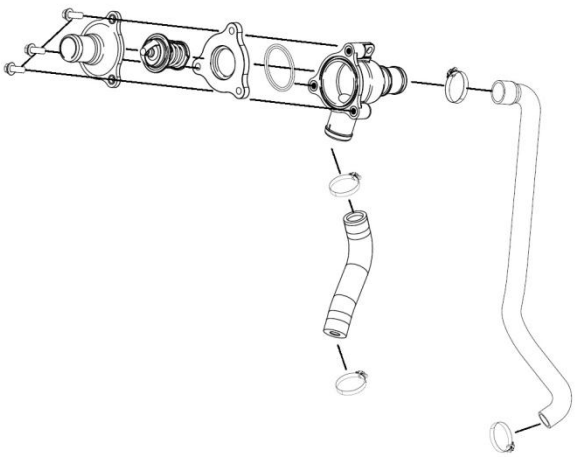
Water Pump Housing Installation

1.The installation is reverse of the removal procedure.

2. Install and tighten the drain screw and washer.

NOTICE: *To prevent leaking, take care that the gasket is exactly in groove when you reinstall the water pump housing.*

3.Tighten screws of water pump housing in a criss cross sequence.



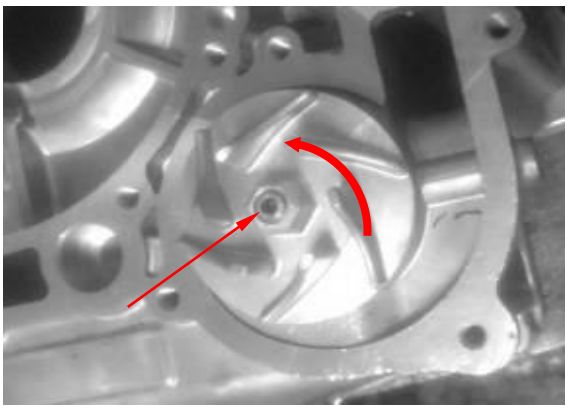
WATER PUMP IMPELLER

Water Pump Impeller removal

1. Remove water housing.
2. Unscrew impeller.

NOTICE: *Water pump shaft and impeller have right hand threads. Remove by turning counterclockwise and install by turning clockwise.*

TORQUE: 240~260 kgf.cm



Water Pump Impeller Inspection

Check impeller for cracks or other damage. Replace impeller if damaged.

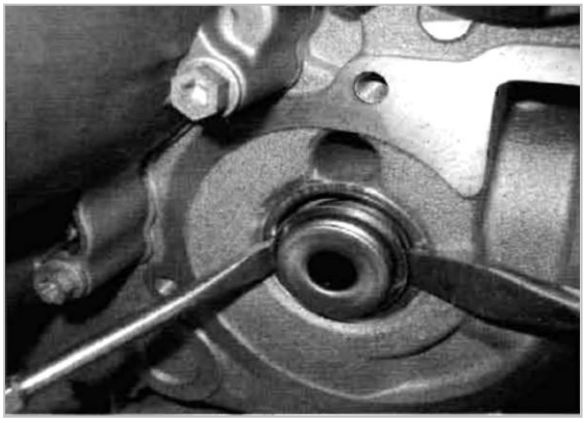
Water Pump Impeller Installation

The installation is reverse of the removal procedure.

NOTICE:

1.Be careful not to damage impeller fins during installation.

2.Check the rotary seal spring function normally.



WATER PUMP SHAFT AND SEALS

Rotary Seal and Oil Seal Removal

(Assembled Engine)

Remove water pump housing.

1. Using special tool onto the rotary seal and insert the small chisel pin strong punch with hammer on the seal plate.
2. Install three screws through the tool hole.
3. Screw the special tool and pull out the rotary seal.

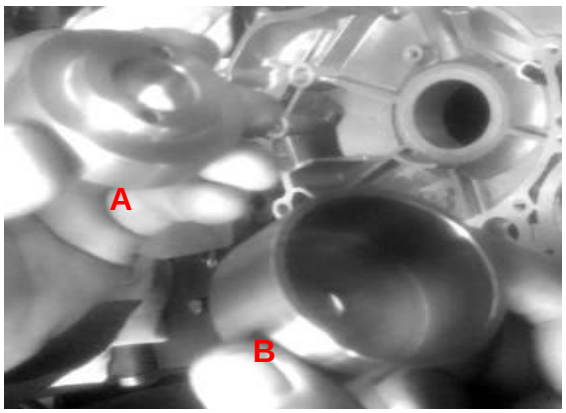
NOTICE: *Be careful not to damage the crankcase while removing outer part of the rotary seal.*

4. Thoroughly remove carefully sealing residue and burr of rotary seal using a scraper.

NOTICE: *Be careful not to damage water pump shaft.*

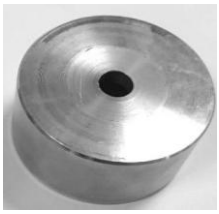
5. Lightly push back the water pump shaft and install special tool A #560024 as shown.

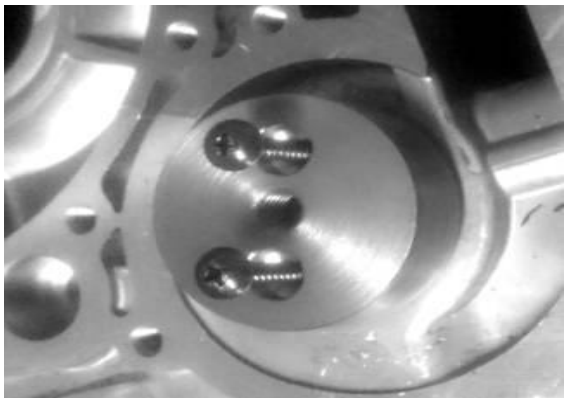
Special tool A



6. Install 2 screws on the tool A.

Special tool B

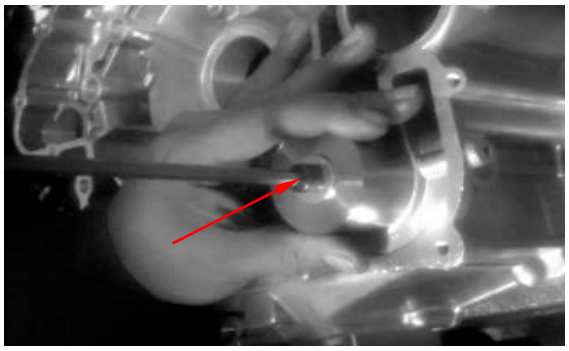




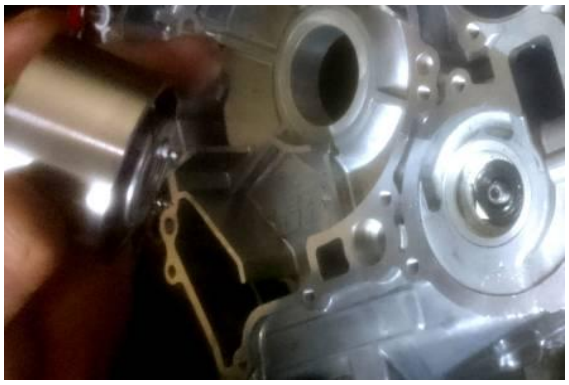
7. Install special tool B on the top of tool A then install a bolt with M8x1.25P shown.

Special tool B

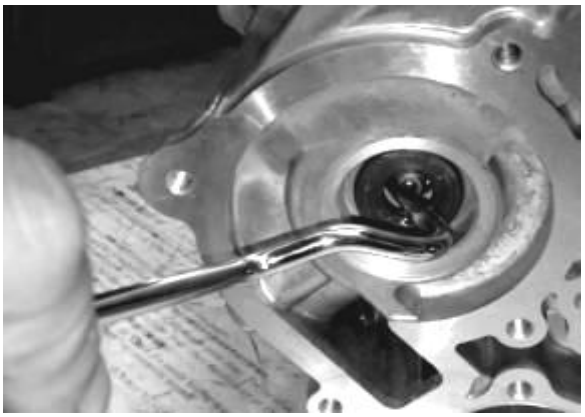
Special tool A



8. Screw in the bolt to the end until the seal remove from the crankcase.



9. Using special tool #440650 to remove the oil seal from crankcase.
10. Check water pump shaft axial play. If not adequate, engine must be disassembled to replace the water pump shaft.
11. Clean oil seal seat.

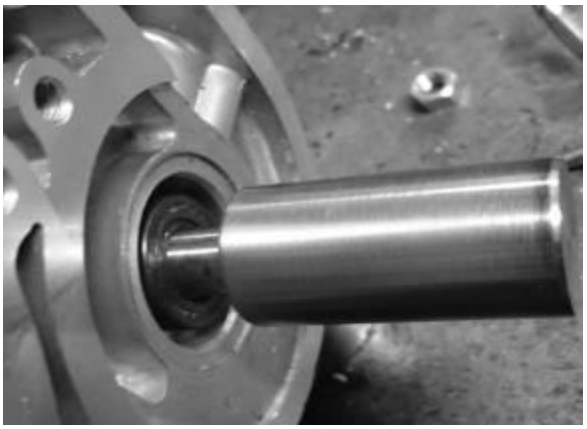


Rotary Seal and Oil Seal Installation

Oil Seal

Apply engine oil on water pump shaft.

1. Apply grease to the lips of the oil seal.
2. Carefully install the oil seal over the water pump shaft.
3. Push the oil seal into the water pump cavity using special tool # as shown.
4. Ensure that the oil seal is properly seated in water pump cavity.



Rotary Seal

NOTICE: *Read and thoroughly understand the entire procedure of installing the rotary seal before starting it.*

1. Apply engine oil on water pump shaft.

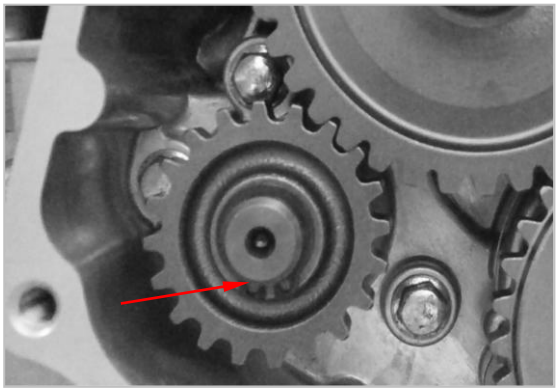
2. Apply Silicon glue #5699 on the seal bore and outer portion as shown.

3.Install special tool with rotary seal on the water pump shaft and screw in by hand.
4. Then thread the tool install rotary.
5. Ensure that the rotary seal is going straight into crankcase.
6. Remove tools from crankcase.

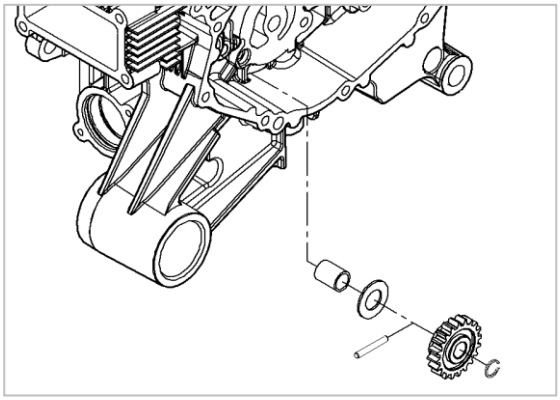
TORQUE：100kgf-cm

NOTICE: *After installed, Clean and remove the overflow of glue to prevent block the shaft motion.*

Water Pump Shaft/Seal Removal (Disassembled Engine)

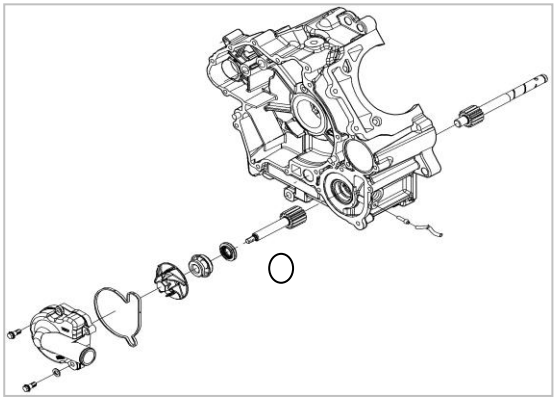


1. Remove the water pump housing and impeller.
2. Remove the circlip retaining the driven gear on water pump shaft.
3. Remove water pump driven gear, needle pin and thrust washer.
4. Using soft hammer; push out water pump shaft with inner portion of rotary seal from inside of crankcase ACG side.
5. To remove outer part of rotary seal, use an expander special tool.
6. Install expander against outer part of rotary seal and pull seal out.



NOTICE: *When removing water pump shaft, always replace rotary seal with water pump shaft. Also replace oil in crankcase.*

7. Remove oil seal from inside of crankcase ACG side using a pusher tool.



NOTICE: *Be careful not to damage the rotary seal surface in crankcase.*

Water Pump Shaft/Seal Inspection (Disassembled Engine)

- Inspect water pump gear for wear and damage on the snap mechanism to the needle pin. Replace if damaged.
- Check water pump intermediate drive gear for wear or broken teeth. Replace if damaged.

NOTICE: *Never use the circlip a second time. Always install a NEW one.*

Water Pump Shaft/Seal Installation (Disassembled Engine)

For installation, reverse the removal procedure.

NOTE: *For installation use the torque values specified in the exploded view.*

NOTICE: *Always replace rotary seal and water pump shaft together. Also install a NEW oil seal (behind rotary seal) at the same time.*

NOTE: *Never use oil in the press fit area of the oil seal and rotary seal.*

▪ Clean rotary seal surface of any old sealant.

1. Use the OIL SEAL PUSHER and the HANDLE to install oil seal.
2. When installing the oil seal on the pusher, make sure the sealing lip points outwards.
3. Push NEW oil seal in place.

▪ Apply engine oil on sealing lip of the oil seal.

▪ Apply engine oil on the water pump shaft and intermediate shaft.

▪ Slide water pump shaft with new rotary seal into crankcase.

▪ To properly install water pump shaft with rotary seal, use SEAL PUSHER.

NOTICE: *Never use a hammer for rotary seal installation. Only use a press to avoid damaging the ceramic component.*

▪ Install thrust washer and needle pin on water pump shaft.

NOTICE: *A missing thrust washer will cause a leaking rotary seal.*

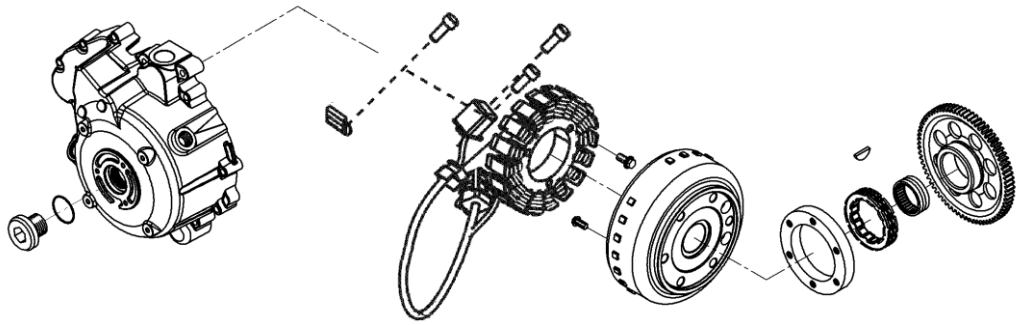
▪ Ensure water pump intermediate driven gear snaps properly onto needle pin, then install the circlip to retain the gear onto shaft.

NOTICE: *Never use the circlip a second time. Always install a NEW one.*

NOTICE: *After installation, water pump shaft with rotary seal must rotate freely.*

▪ Tighten screws of the water pump housing crosswise.

AC GENERATOR SYSTEM



GENERAL

During assembly/installation, use the torque values and service products.

Clean thread before applying a thread locker.

W ARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced.

ACG COVER

ACG Cover Removal

- Drain engine oil.
- Disconnect ACG connector.
- Remove the vent hose.
- Remove ACG cover retaining screws.
- Pull out ACG cover.

ACG Cover Inspection and Cleaning

- Check ACG cover for cracks or other damage.
- Replace if necessary.

NOTE: *Clean all metal components in a nonferrous metal cleaner.*

WARNING

Wear safety glasses and work in a well-ventilated area when working with strong chemical products. Also wear suitable non-absorbent gloves to protect your hands.

ACG Cover Installation

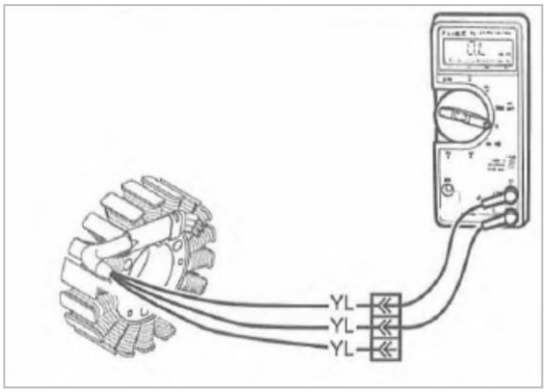
For installation, reverse the removal procedure.

NOTE: *At installation replace ACG cover gasket.*

- Apply *SEALING COMPOUND* on stator cable grommet as shown in next illustration.
- Tighten screws using the following sequence.
- Refill engine with recommended oil.

STATOR

Stator Static test: Continuity



1. Disconnect the ACG connector.
2. Install the ACG DIAGNOSTIC HARNESS on ACG connector.
3. Set multimeter to Ω.
4. Connect multimeter between YELLOW wires.
5. Read resistance.

TERMIINAL	RESISTANCE 20 ℃
1 and 2	0.15 – 0.30 Ω
1 and 3	
2 and 3	

6. If any reading is out of specification, replace stator.
7. Re-plug connector properly.

Stator Static Test: Insulation

1. Install the MAGNETO DIAGNOSTIC HARNESS on ACG connector.
2. Set multimeter to Ω.
3. Connect multimeter between any YELLOW wire and engine ground.
4. Read resistance.

TEST PROBES	RESISTANCE 20 ℃
Any YELLOW wire and engine GND	Infinite (open circuit)

5. If there is a resistance or continuity, the stator coils and/or the wiring is shorted to ground and needs to be repaired or replaced.
6. Re-plug connectors properly.

Stator Dynamic Test: AC Voltage

1. Unplug magneto wiring harness connector.
2. Install the ACG DIAGNOSTIC HARNESS between unplugged connectors.

NOTE: Both connectors must be plugged.

3. Set multimeter to VAC.
4. Start engine.
5. Connect multimeter between YELLOW wires.

6. Read voltage as per following table.

TEST ENGINE SPEED	TERMINAL	VOLTAGE
4000 RPM	1 and 2	10 – 25 VAC
	1 and 3	
	2 and 3	

7. If voltage is lower than specification, replace stator.
8. Re-plug connectors properly.

Stator Removal

- Remove ACG cover.
- Remove screws securing the wiring holding strip.
- Remove stator retaining screws then stator.

Stator Inspection

- Check stator windings and insulation for cracks or other damages. If damaged replace it.
- Check if stator wires are brittle, hard or otherwise damaged.

Stator Insulation

For installation, reverse the removal procedure.

NOTICE: *When installing the stator take care to route wires properly and install retaining strip.*

NOTE: *There is only one position for the stator (notch in the ACG housing cover).*

ROTOR

Rotor Removal

- Remove ACG cover.
- Remove screw and washer securing rotor to crankshaft.
- Install ACG PULLER and CRANKSHAFT PROTECTOR then remove rotor.

NOTE: *Use grease to place protector on crankshaft end prior to screw on the ACG puller.*

Screw ACG puller bolt to remove rotor.

Rotor Inspection

- Check inner side of rotor for scratches or other damage.
- Check keyway of the rotor for wear or damages.
- Check if trigger wheel teeth are bent or otherwise damaged.
- Check woodruff key and keyway on the crankshaft for wear or damages.
- Replace parts as necessary.

Rotor Installation

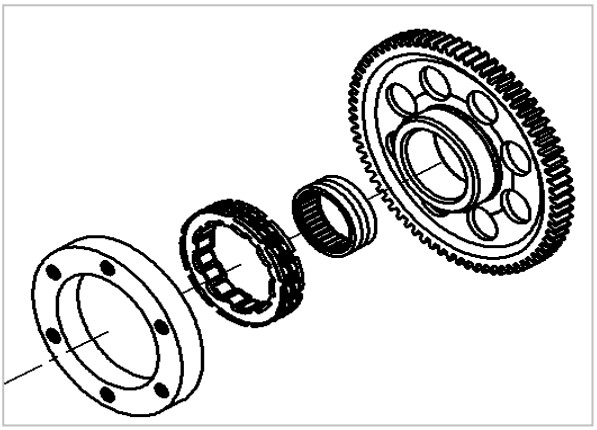
For installation, reverse the removal procedure.

- Clean crankshaft taper and rotor with PULLY FLANGE CLEANER.

NOTICE: *Taper on crankshaft and rotor must be free of grease.*

- Clean the crankshaft oil passage and threads using PULLY FLANGE CLEANER.
- Oil starting unidirectional clutch and install starting clutch gear.
- Slide rotor onto crankshaft. The woodruff key and the keyway must be aligned.
- Rotate idle gear counterclockwise to align idle gear teeth with starting clutch gear.

UNIDIRECTIONAL CLUTCH



Unidirectional Clutch Removal

- Remove ACG cover.
- Loosen thrust plate screws located inside rotor.
- Remove rotor (refer to ROTOR above).
- Remove starting clutch gear.
- Remove thrust plate screws and thrust plate.

Unidirectional clutch inspection

- Inspect unidirectional clutch and thrust plate for wear and damage.
- Check the collar of the starting clutch gear.
- Perform a functional test of the starting clutch gear. To do so, rotate starting clutch gear in unidirectional clutch.

NOTE: *Unidirectional clutch must lock in counterclockwise direction.*

NOTE: *Unidirectional clutch, thrust plate and gear must be replaced at the same time, if damaged.*

Unidirectional Clutch Installation

For installation, reverse the removal procedure.

- Apply LOCTITE 648 (GREEN) on threads of thrust plate screws.
- Install screws but do not torque yet.
- Apply engine oil on unidirectional clutch and inside starting clutch gear hole.
- Install rotor then torque thrust plate screws to 30 Nm.

STARTING CLUTCH GEAR

Starting clutch Gear Removal

- Remove ROTOR.
- Pull starting clutch gear out of the rotor.

Starting Clutch Gear Inspection

- Inspect gear, especially teeth and unidirectional collar, for wear and other damage.
- Check needle bearing condition. Replace starting clutch gear if necessary.

Starting Clutch Gear Installation

The installation is the reverse of the removal procedure.

NOTE: *apply engine oil on needle bearing and collar of starting clutch gear.*

STARTER DRIVE GEARS

The starter drive gears are located on the engine ACG side behind the ACG cover.

Starter Drive Gear Removal

- Remove ACG cover. See procedure in this subsection.
- Remove location pins, starter double gear and idle gear.

Starter Drive Gear Inspection

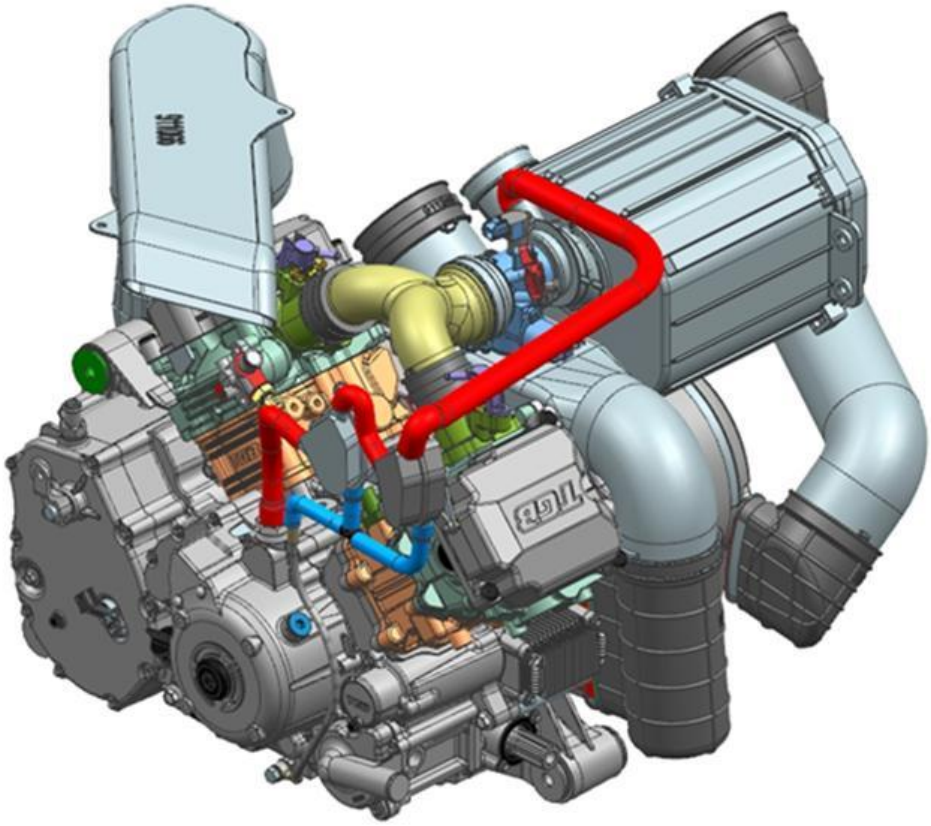
- Inspect gears and location pins for wear and damage.
- Replace parts as necessary.

Starter Drive gear Installation

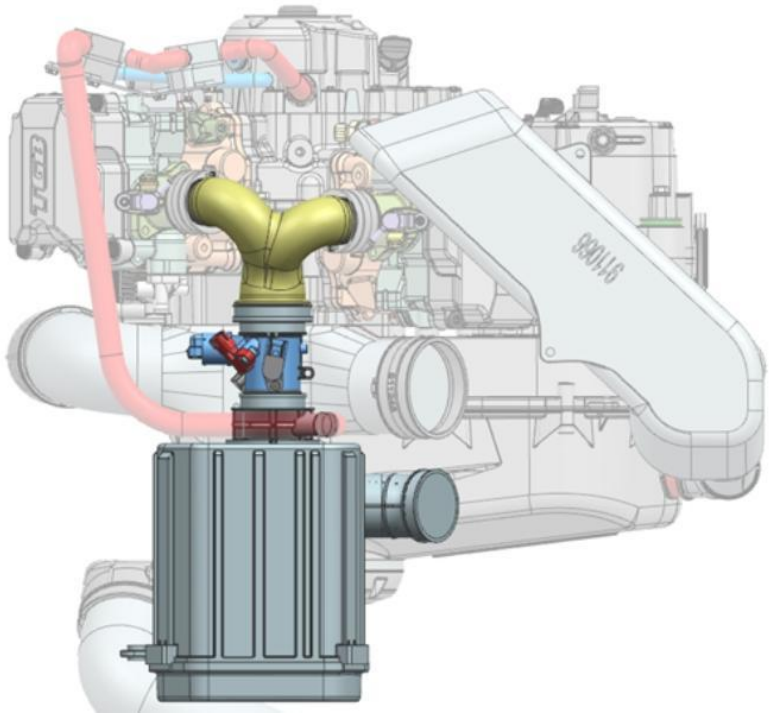
The installation is the reverse of the removal

- Apply LOCTITE 767 (ANTISEIZE LUBRICANT) on starter gear before installing the starter idle gear.
- Apply engine oil on location pins.

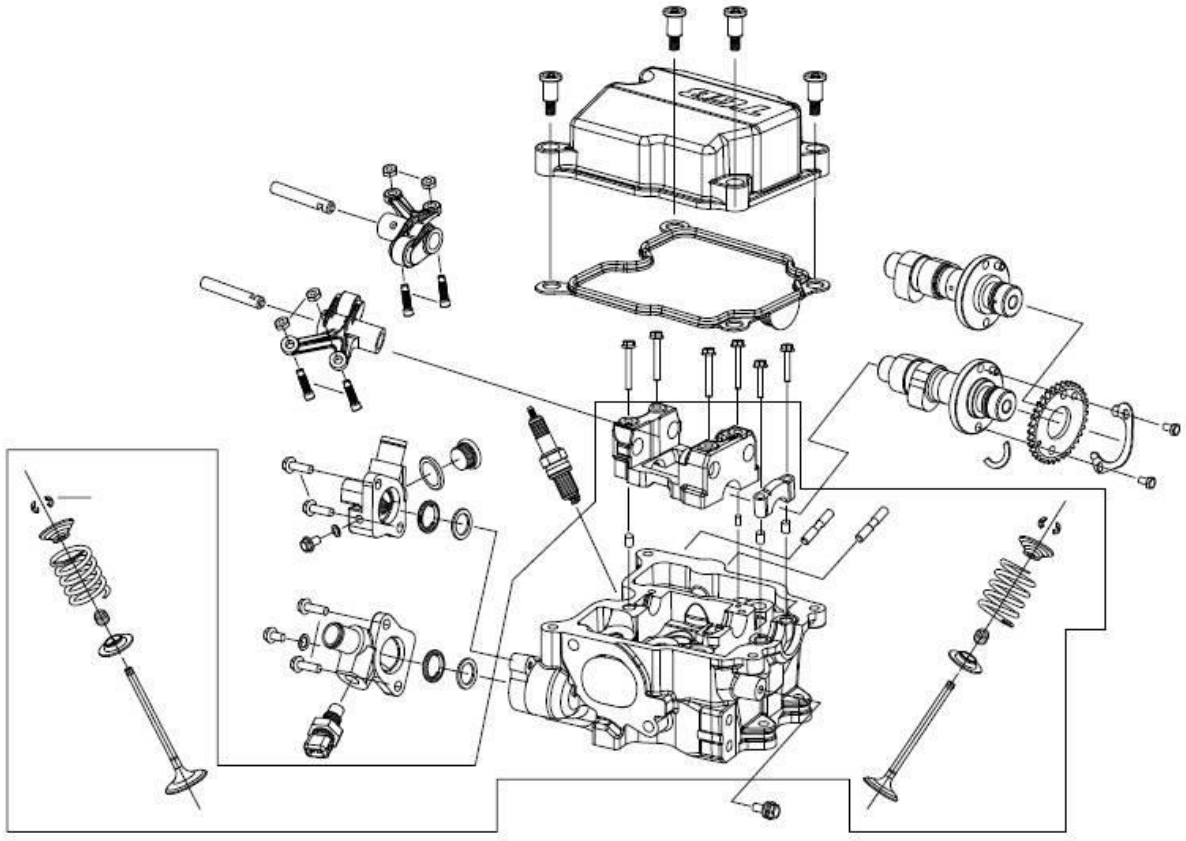
ENGINE TOPEND



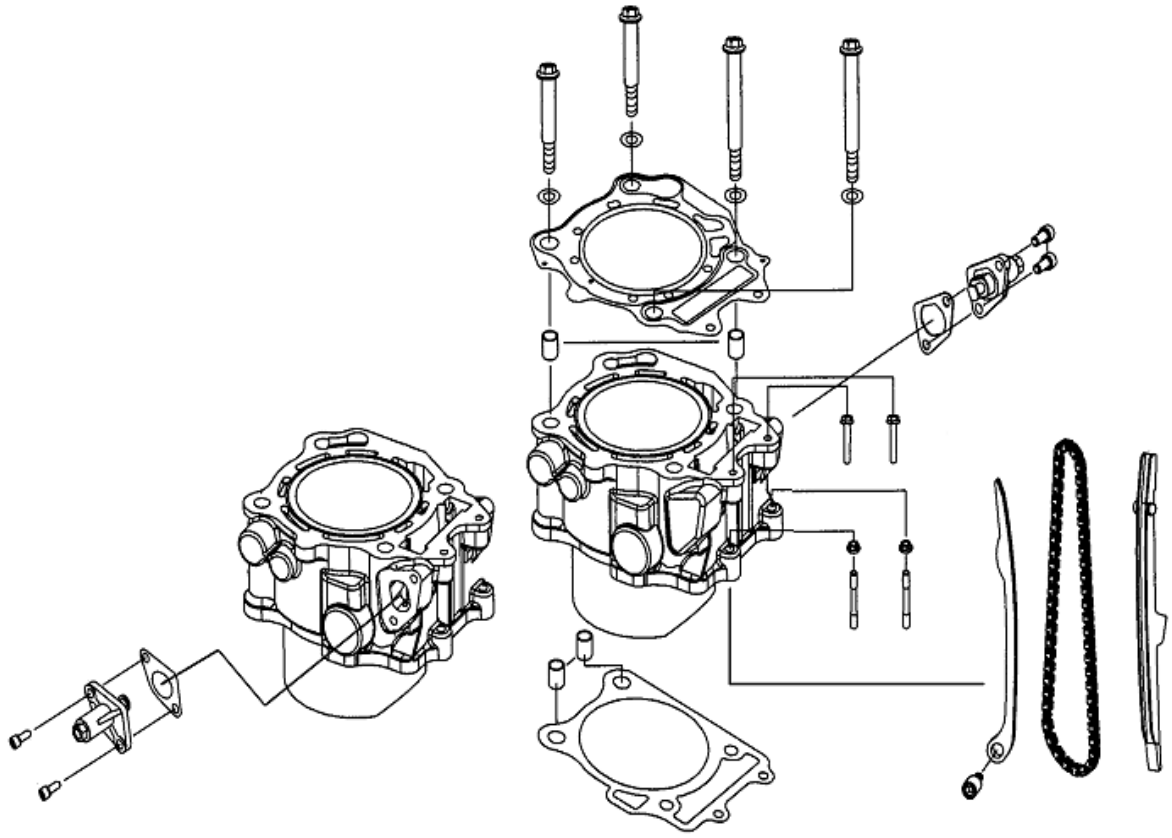
INTAKE MANIFOLD

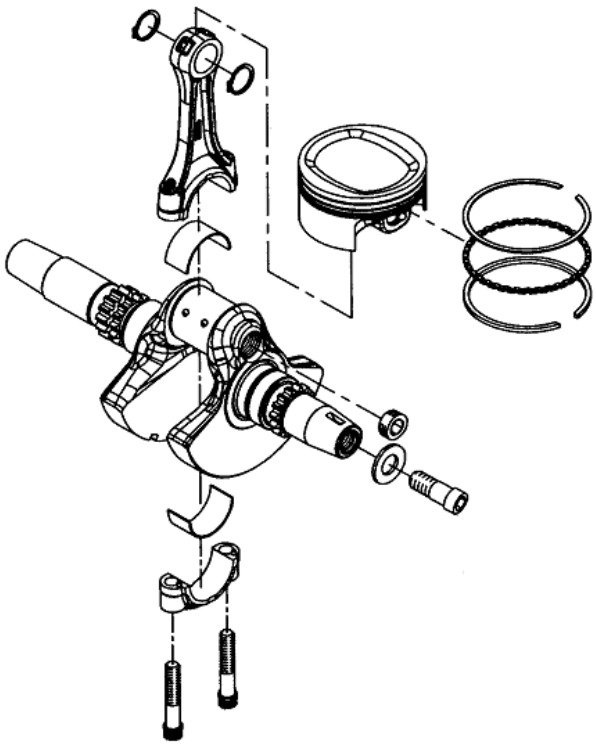


CYLINDER HEAD



CYLINDERS AND PISTONS





GENERAL

- Special references are made in the text for procedures, which are different for front cylinder and rear cylinder.
- When diagnosing an engine problem, always perform a cylinder leak test.
- Always place the vehicle on level surface.

NOTE: *Even though the following procedures do not require the engine removal. Many Illustrations show the engine out of the vehicle for more clarity.*

- Always disconnect BLACK (-) cable from the battery, then RED (+) cable before working on the engine.
- Even if the removal of many parts is not necessary to reach another part, it is recommended to remove these parts in order to check them.
- During assembly/installation, use the torque values and service products as in the exploded views.
- Clean threads before applying a thread locker.

WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced.

- When disassembling parts that are duplicated in the engine, (e.g.: valves), it is a strongly recommended to note their position and keep them as a “group”. If you find a defective component, it would be much easier to find the cause of failure among its group of parts (e.g.: you found a worn valve guide.
- A bent spring could be the cause and it will be easy to know which one among the springs is the cause to replace it if you grouped them at disassembly). Also since used parts have matched together during the engine operation, they will keep their matched fit when you reassemble them together within their “group”.

MAINTENANCE

VALVE ADJUSTMENT

NOTE: *Check and adjust valve clearance only when engine is cold.*

- Remove valve covers.
- Before checking or adjusting the valve clearance, turn crankshaft to TDC ignition of respective cylinder.
- Using feeler gauge check the valve clearance.

INTAKE: 0.10 ± 0.02 mm

EXHAUST: 0.15 ± 0.02 mm

- If valve clearance is out of specification, adjust valves as follow:

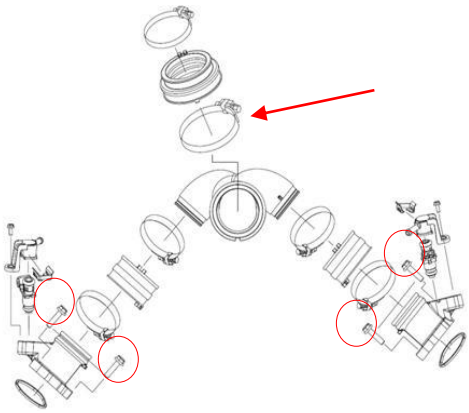
NOTE: *Use mean value of intake/exhaust to ensure a proper valve adjustment.*

- Hold the adjustment screw at proper position and torque the locking nut.
- Repeat the procedure for each valve.
- Before installing valve covers, recheck valve clearance.

INTAKE MANIFOLD

Intake Manifold Removal

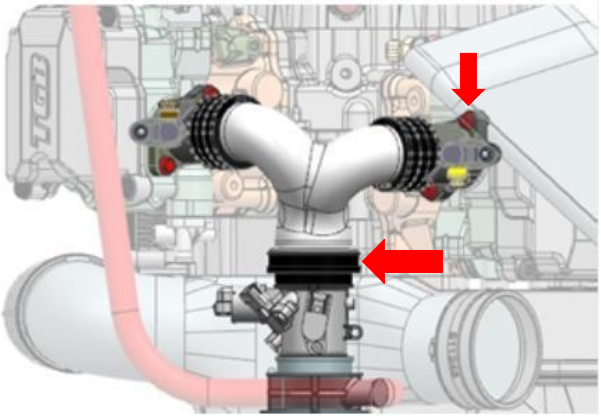
1. Loosen clamp of intake adapter
2. Remove four mounting bolts of intake manifold.
3. Disconnect the fuel hoses.



CAUTION

The fuel hose may still be under pressure.

4. Disconnect fuel injectors wire connectors.
5. Disconnect and pull out the intake manifold.



Intake manifold Inspection

Check intake manifold and seal for cracks, warping at flanges or any other damage. Replace if necessary.

Intake manifold Installation

▪ The installation is the reverse of the removal procedure.

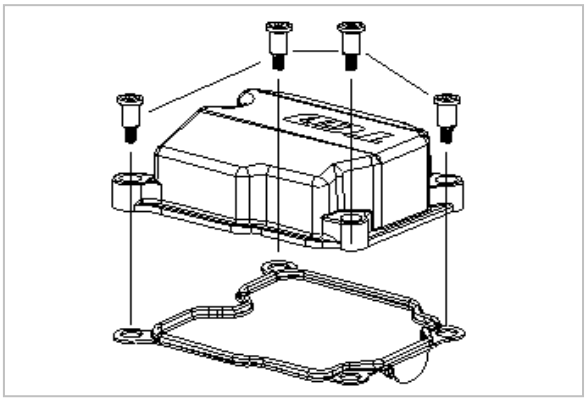
▪ Tighten intake manifold retaining bolts to specified torque one cylinder at time.

TORQUE: 1.6~1.8 kgf-m

CYLINDER HEAD COVER

Cylinder Head Cover Removal

- Remove the bolts of cylinder head cover.
- Remove cover and gasket.
- Repeat at the procedure for the other cylinder head cover if required.



Cylinder Head Cover Inspection

Check the gasket on the cover if it is brittle, cracked or hard. If so, replace the gasket.

Cylinder Head Cover Installation

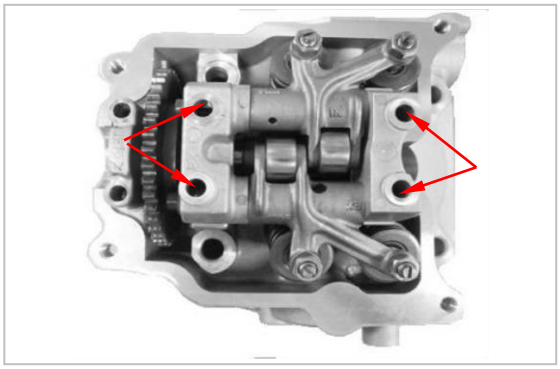
- For installation, reverse the removal procedure.
- Tighten cylinder head cover retaining bolts to specified torque in a criss-cross sequence.

TORQUE: 1.0~1.2 kgf-m

ROCKER ARM

Rocker Arm Removal

- Remove cylinder head cover.
- Place the cylinder at TDC ignition.
- Remove four bolts of the camshaft holder and remove rocker arm shafts
- Remove rocker arm assembly.



Rocker Arm Inspection

- Inspect each rocker arm for cracks and scored friction surfaces. If so, replace rocker arm assembly.
- Check the rocker arm rollers for free movement, wear and excessive radial play.

  Replace rocker arm assembly if necessary.
- Measure rocker arm bore diameter. If diameter is out of specification, change the rocker arm assembly.
- Check adjustment screws for free movement, cracks and/or excessive play.

Rocker Arm Shaft

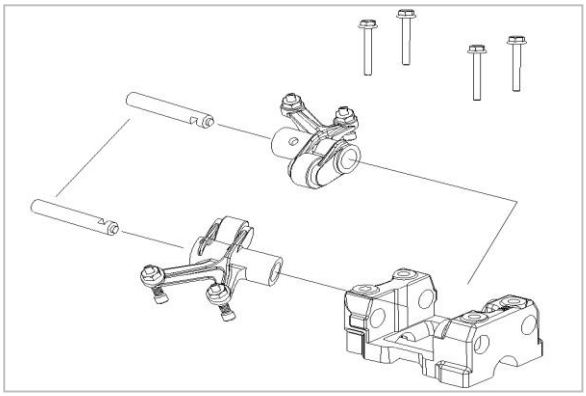
- Clean the oil hole of rocker arm shaft.
- Check for scored friction surface; if so, replace parts.

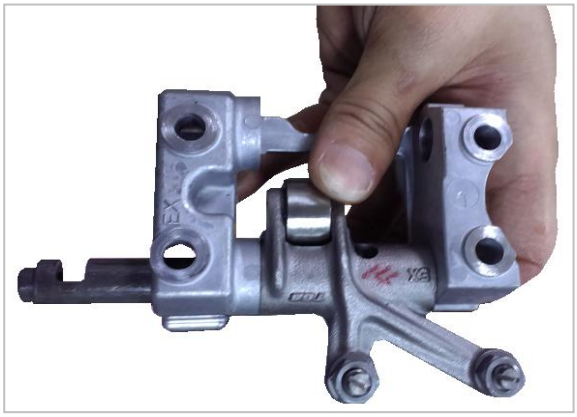
Rocker Arm Installation

NOTE: *Use the same procedure for exhaust and intake rocker arm.*

- Apply engine oil on rocker arm shaft.
- Install the rocker arm shafts with flat end first.
- Install four bolts of the camshaft holder according to the order, as shown.

TORQUE: 1.0 kgf-m

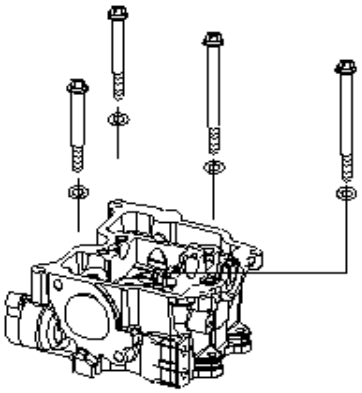




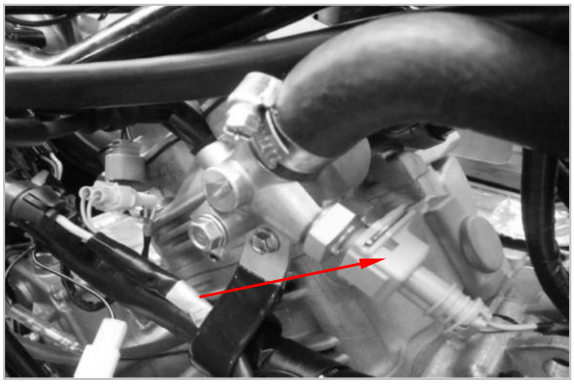
CYLINDER HEAD

Cylinder Head Removal

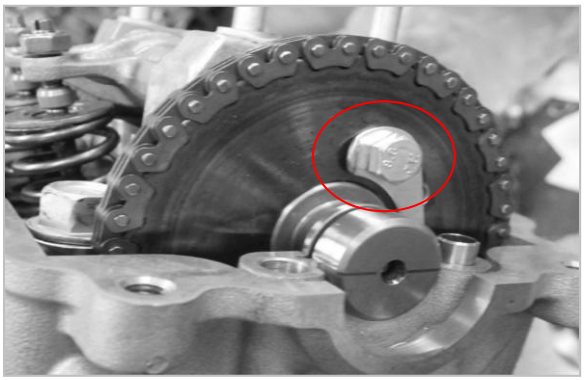
- The removal procedure is the same for both cylinder heads.
- Drain coolant and remove the hoses.



NOTE: *Before removing cylinder head, blow out remaining coolant by air pressure. During cylinder head removal, the remaining coolant in cylinder head could overflow into engine and a little quantity of coolant could drop into the engine. In this case, the engine oil will be contaminated.*

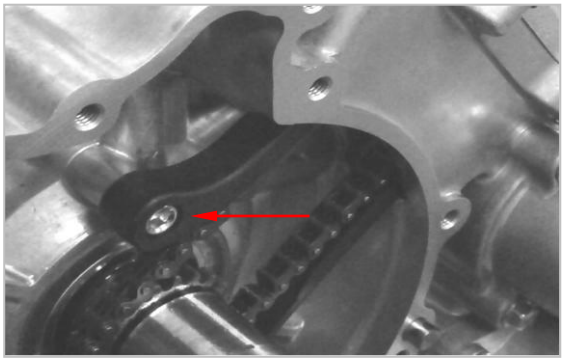


- Disconnect spark plug wire.
- Disconnect coolant temperature sensor connector, located at rear cylinder head.
- Remove air cleaner.
- Remove the intake manifold and exhaust pipe.
- Remove the chain tensioner.
- Remove the cylinder head cover and its gasket.
- Remove the camshaft holder.
- Remove the camshaft timing gear.
- Remove the camshaft.
- Unscrew cylinder head M6 and M10 bolts retaining cylinder head and cylinder to cylinder base.
- Pull out cylinder head.
- Remove timing chain guide (fixed).
- Remove and discard the cylinder head gasket.



Cylinder Head Inspection

- Inspect timing chain guide (fixed) for wear, cracks or other damages. Replace if necessary.
- Check for cracks between valve seats, if so, replace cylinder head.
- Check mating surface between cylinder and cylinder head for contamination. If so, clean both surfaces.
- Clean oil supply through the cylinder head from contamination.



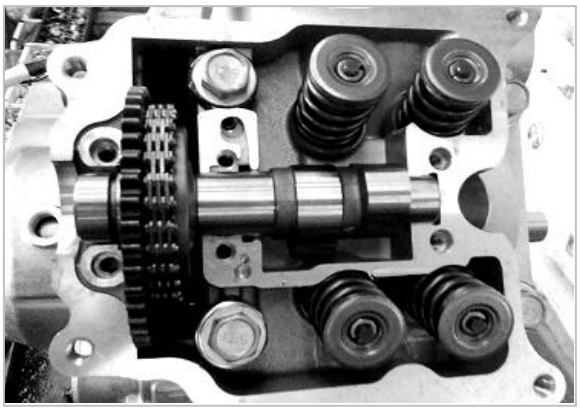
Cylinder head Installation

For installation, reverse the removal procedure.

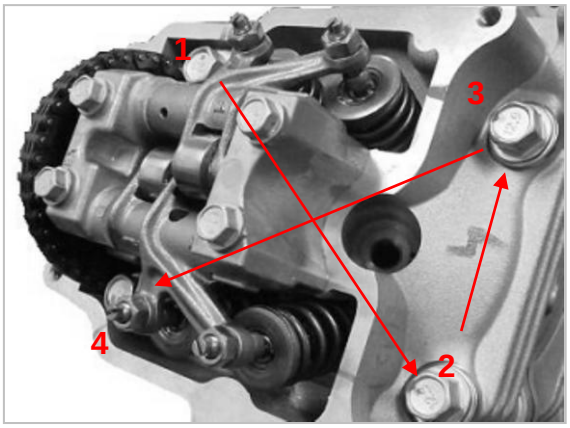
NOTE: *Never invert front and rear cylinder heads.*

▪ Ensure dowel pins and key are in place.

NOTICE: *Timing chain guide (fixed) has to be fixed between cylinder and cylinder head.*



▪ Install a NEW cylinder head gasket.
▪ First torque M10 cylinder head bolts with LOCTITLE in cross sequence to 20 Nm+/- 1 Nm two times then finish by tightening to 180° +/- 5°.
▪ Install cylinder head M6 bolts.
▪ Check timing chain guide (tensioner side) for movement.



CAMSHAFT

NOTE: *The engine is equipped with two different camshaft.*

Mark “A” to front cylinder.

Mark “B” to rear cylinder

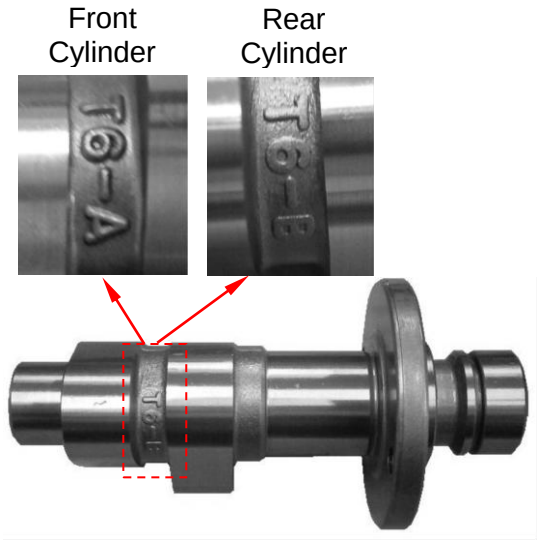
Camshaft Removal

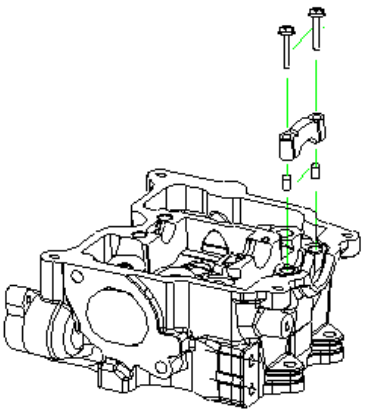
▪ The removal procedure is the same for both camshafts.
▪ Remove cylinder head cover.
▪ Remove the chain tensioner.
▪ Remove the rocker arm assembly.
▪ Remove the camshaft two retaining bolts.
▪ Remove the camshaft timing gear.
▪ Remove the camshaft.

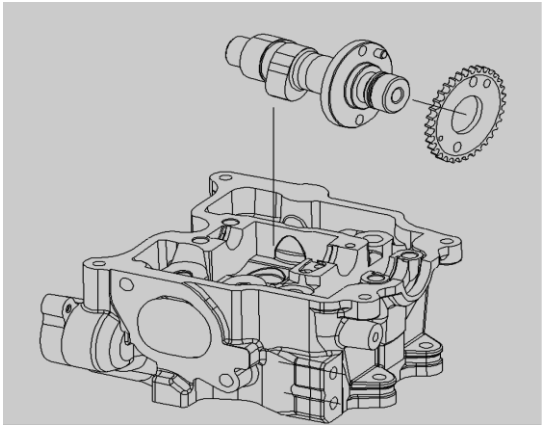
NOTICE: *During removal, pay attention to avoid key fall into engine via chain hole.*

Camshaft Inspection

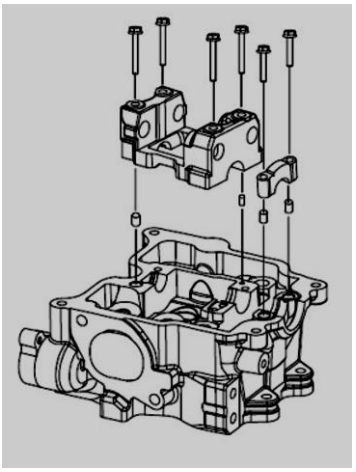
- Check each lobe and bearing journal of camshaft for scoring, scuffing, cracks or other signs of wear.
- Using a micrometer measure camshaft journal diameter and lobe height.
- Replace parts that are not within specifications.







Camshaft Installation



- For installation, reverse the removal procedure.

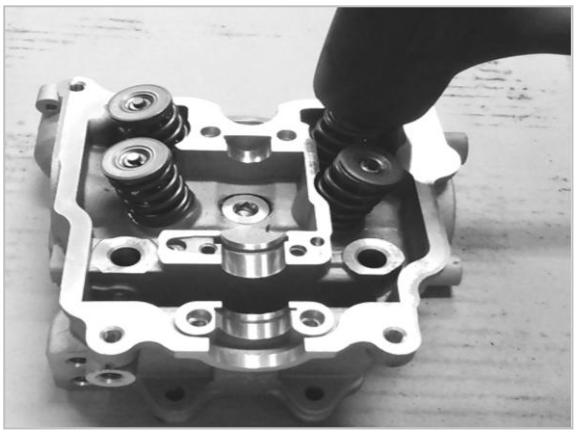
  NOTICE: *Do not invert the camshaft during assembly. Any mix-up of the components will lead to engine damage.*

- Tighten the camshaft retaining bolts with specified torque.

  TORQUE: 1.0 kgf-m

VALVE SPRING

Valve Spring Removal



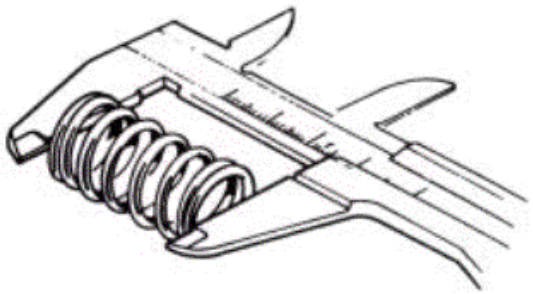
- Remove rocker arms.
- Remove cylinder head.

WARNING

Always wear safety glasses when disassembling valve springs. Be careful when unlocking valves. Components could fly away because of the strong spring preload.

- Remove valve cotters.
- Remove valve spring compressor and withdraw valve spring retainer and valve spring.

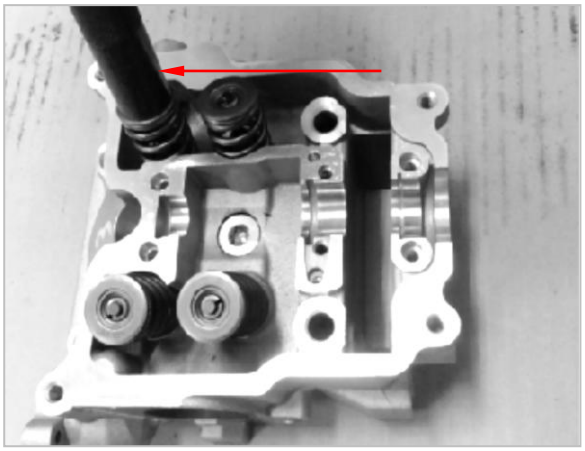
Valve Spring Inspection



- Check valve spring for visible damage. If so, replace valve spring.
- Check valve spring for free length and straightness.

- Replace valves springs if not within specifications.

Valve Spring Installation



- For installation, reverse the removal procedure.
- To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.
- Compress valve spring using VALVE SPRING COMPRESSOR special tool #440609.

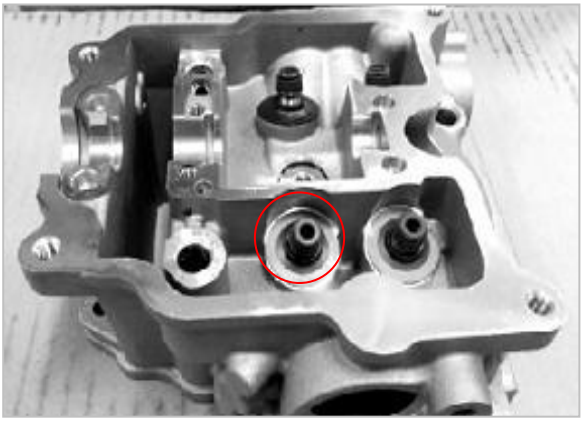
NOTE: *Valve cotter must be properly engaged in valve stem grooves.*

- After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

NOTICE: *An improperly locked valve spring will cause engine damage.*

VALVES

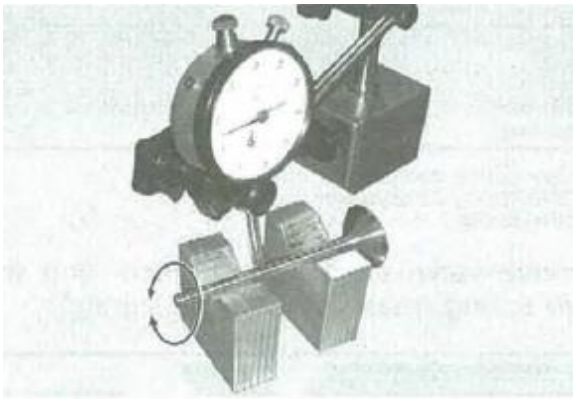
Valve Removal



- Remove valve spring.
- Push valve stem, then pull valves (intake and exhaust) out of valve guide.
- Remove valve stem seal with SNAP-ON PLIERS and discard it.

Valve Inspection

Valve Stem Seal

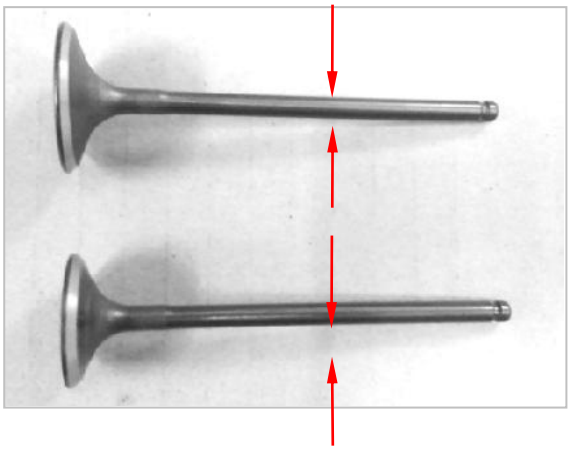


- Always install new seals whenever valves are removed.

Valve

- Inspect valve surface, check for abnormal stem wear and bending. If out of specification, replace by a new one.

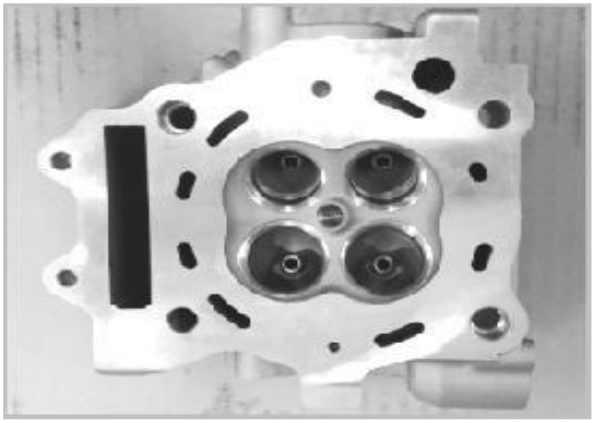
VALVE OUT OF ROUND



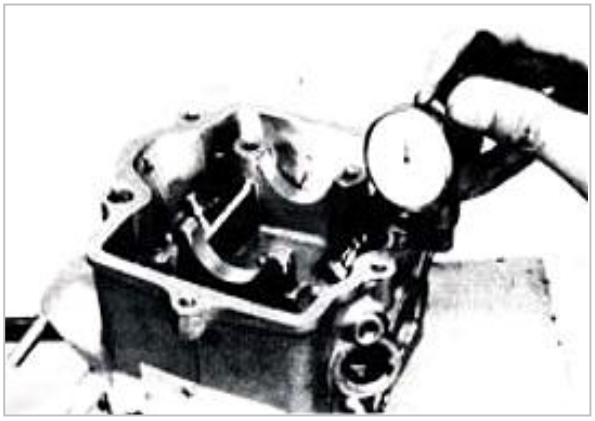
Valve Stem and Valve Guide Clearance

- Using a micrometer and a small gauge measure valve stem and valve guide in three places.

NOTE: *Clean valve guide to remove carbon deposits before measuring.*



- Change valve if valve stem is out of specification or has other damages such as wear or friction surface.
- Replace valve guide out of cylinder head if valve guide is out of specification or has other damages such as wear or friction surface.



Valve Face and Seat

- Check valve face and seat for burning or pittings and replace valve or cylinder head if there are signs of damage.
- Ensure to seat valves properly. Apply some lapping compound to valve face and work valve on its seat with a lapping tool.
- Measure valve face contact width.

NOTE: *The location of contact area should be in center of valve seat.*

- Using a caliper measure valve seat width.
- If valve seat contact width is too wide or has dark spots, replace the cylinder head.

Valve Installation

- For installation, reverse the removal procedure.
- Install a NEW valve stem seal. Make sure thrust washer is installed before installing seal.
- Apply engine oil on valve stem and install it.

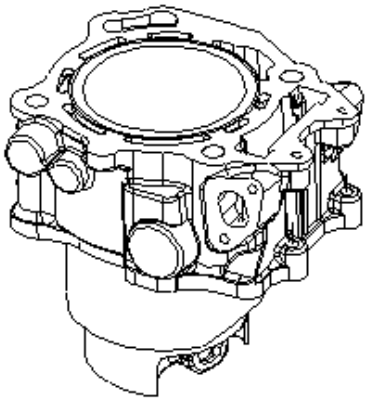
NOTICE: *Be careful when valve stem is passed through sealing lips of valve stem seal.*

- To ease installation of cotters, apply oil or grease on them so that they remain in place while releasing the spring.
- After spring is installed, ensure it is properly locked by tapping on valve stem end with a soft hammer so that valve opens and closes a few times.

NOTICE: *An improperly locked valve spring will cause engine damage.*

CYLINDER

Cylinder Removal



- Remove chain tensioner.
- Remove timing gear.
- Remove the camshaft
- Remove the nuts at cylinder
- Remove the cylinder head and gasket.
- Pull out the cylinder
- Discard cylinder base gaskets.

Cylinder Inspection

- Check cylinder for cracks, scoring and wear ridges on the top and bottom of the cylinder. If so, replace cylinder.

Cylinder Taper

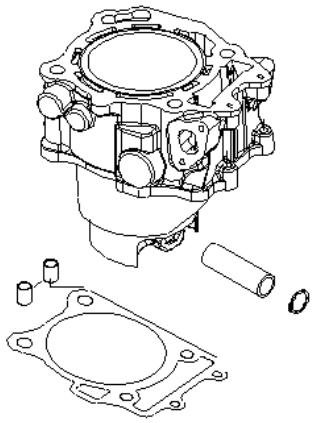
- Measure cylinder bore and if it is out of specifications, replace cylinder and piston rings.
- Measure cylinder bore at three recommended positions.
- Distance between measurement should not exceed the service limit mentioned above.

Cylinder Out of Round

- Measure cylinder diameter in piston axis direction from top of cylinder. Take another measurement 90° from first one and compare.

NOTE: *Take the same measuring points like described in CYLINDER TAPER above.*

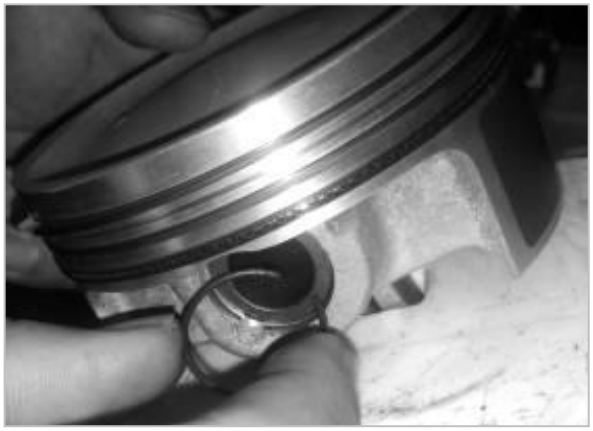
Cylinder Installation



▪ For installation, reverse the removal procedure.

NOTICE: *Always replace cylinder base gasket before installing the cylinder.*

NOTE: *Ensure the front and rear cylinder installation correct, the timing chain adjuster should face to the backside of cylinder. Wrong install direction will lose the function of chain adjuster and cause timing chain damage.*



PISTON

Piston Removal

▪ Remove cylinder head.
▪ Remove the cylinder.
▪ Place a rag under piston and in the area of timing chain compartment.

WARNING

Piston circlip are spring loaded.

▪ Remove one piston circlip and discard it.

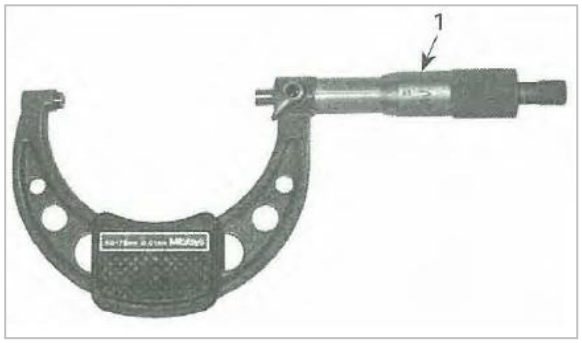
NOTE: *The removal of both piston circlip is not necessary to remove piston pin.*

▪ Push piston pin out of piston.
▪ Remove the piston from connecting rod.

Piston Inspection

- Inspect piston for scoring, cracking or other damages. Replace piston and piston rings if necessary.
- Using a micrometer. Measure piston pin.
- The measured dimension should be as described in the following tables. If not, replace piston.

Piston/Cylinder Clearance



- Adjust and lock a micrometer to the piston dimension.
- With the micrometer set to the dimension, adjust a cylinder bore gauge to the micrometer dimension and set the indicator to zero.
- Position the dial bore gauge 22 mm above cylinder base, measuring the piston pin axis.
- Read the measurement on the cylinder bore gauge. The result is the exact piston/cylinder wall clearance.

NOTE: *Make sure used piston is not worn.*

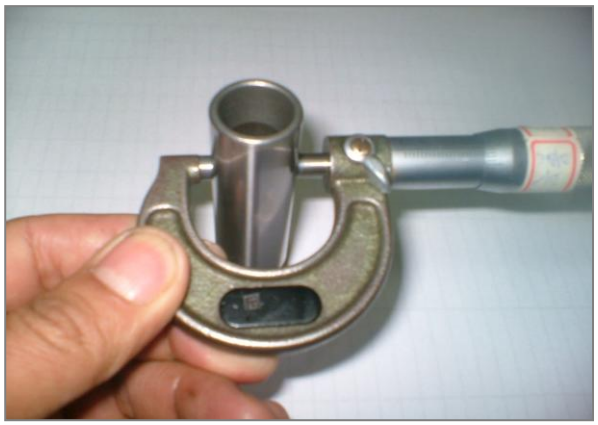
- If clearance exceeds specified tolerance, replace piston by a new one and measure piston/cylinder clearance again.

NOTE: *Make sure the cylinder bore gauge indicator is set exactly at the same position as with micrometer, otherwise the reading will be false.*

Connecting Rod/Piston Pin Clearance

- Using synthetic abrasive woven, clean piston pin from deposits.
- Inspect piston pin for scoring, cracking or other damages.

- Measure piston pun. See the following illustration for the proper measurement positions.
- Replace piton pin if diameter is out of specifications.
- Measure inside diameter of connecting rod small end bushing.
- Replace connecting rod if diameter of connecting rod small end is out of specifications.
- Compare measurements to obtain the connecting rod/piston pin clearance.



Piston Installation

- For installation, reverse the removal procedure.
- Apply engine oil on the piston pin.
- Insert piston pin into piston and connecting rod.
- For each cylinder, install piston with punched arrow on piston dome is pointing toward the exhaust side of the engine.

CAUTION

Mark on top of position must show to both cylinders exhaust side.

- Install NEW piston circlip, and double check the C-clip is seating at the groove..

NOTICE: *Always replace disassembled piston circlip(s) by new ones. Place a rag on cylinder base to avoid dropping the circlip inside the engine.*

PISTON RINGS

Ring Removal

▪ Remove the piston.

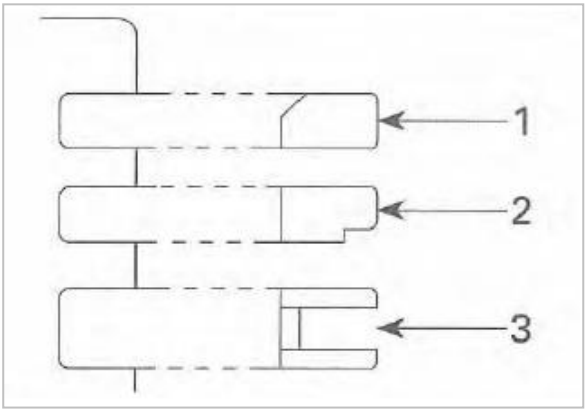
Ring Inspection

Ring/Piston Groove Clearance

▪ Using a feeler gauge measure each ring/piston groove clearance. If the clearance is too large, the piston and the piston rings should be replaced.

▪ To measure the ring end gap place the ring in the cylinder in the area of 8 mm to 16 mm from top of cylinder.

NOTE: *In order to correctly position the ring in the cylinder, use piston as a pusher.*



▪ Using a feeler gauge, check ring end gap.

▪ Replace ring if gap exceeds above described specified tolerance.

Ring Installation

- For installation, reverse the removal procedure.

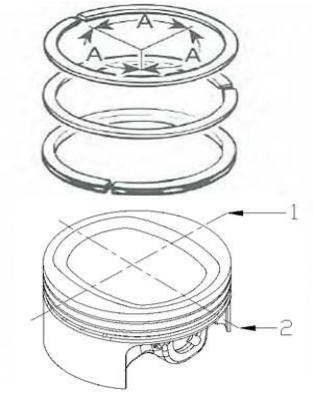
NOTE: *First install spring and then ring of oil scraper ring.*

- Install the oil scraper ring first, then the lower compression ring with the open edge facing up, then the upper compression ring with the word “R” facing up.

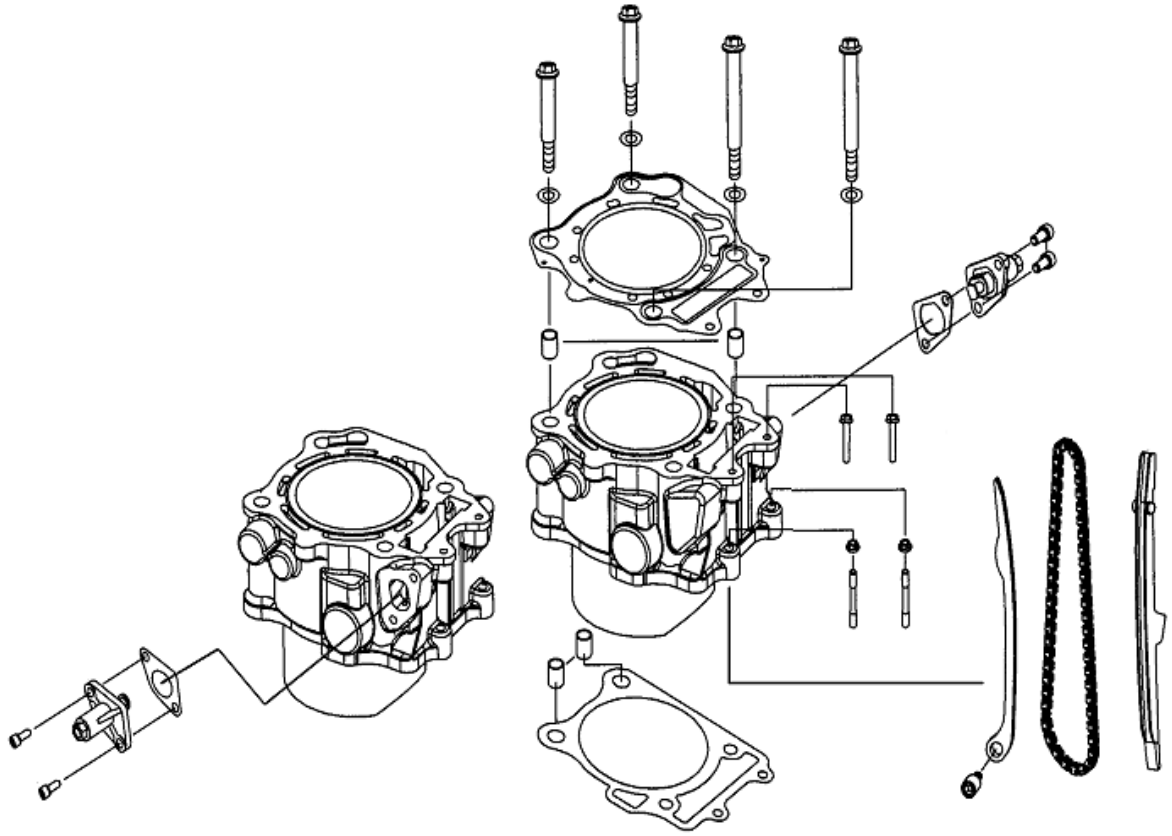
NOTICE: *Ensure that top and second rings are not interchanged..*

NOTE: *Use a ring expander to prevent breakage during installation. The oil ring must be installed by hand.*

- Check that rings rotate smoothly after installation.
- Space the piston ring end gap 120° apart and do not align the gaps with the piston pin bore.



TIMING CHAIN



GENERAL

During assembly/installation, use the torque values and service products as in the exploded views.

Clean threads before applying a thread locker.

WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced.

TROUBLESHOOTING

USUALL ENGINE NOISE OR VIBRATION

1. Improper valve clearance adjustment and/or worn out rocker arm(s)

Re-adjust valve clearance and/or replace defective parts.

2. Defective chain tensioner

Replace chain tensioner.

3. Worn out timing chain guide(s)

Replace timing chain guide(s)

4. Stretched timing chain or worn out timing gears

Replace timing chain and timing gears.

5. Loose timing gear retaining bolts

Retighten bolts to recommended torque.

6. Incorrect camshaft timing

Replace damaged components and readjust camshaft timing.

ENGINE LACKS ACCELERATION OR POWER

1. Incorrect camshaft timing

Replace damaged components and readjust camshaft timing.

TIMING CHAIN TENSIONERS

Timing Chain Tensioner Removal

- Make sure the respective cylinder is set to TDC ignition.
- Carefully unscrew chain tensioner plug and release spring tension.

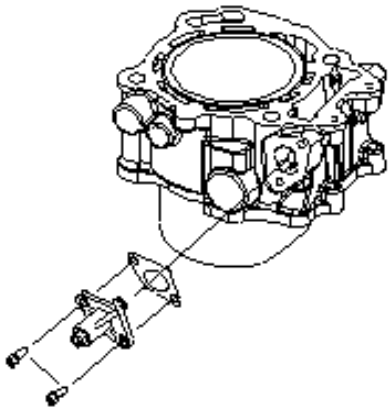
CAUTION

Tensioner is spring loaded.

- Remove O-ring, spring and chain tensioner plunger.
- Remove chain tensioner housing retaining bolts.
- Remove chain tensioner housing and O-ring.

Timing Chain Tensioner Inspection

- Check the chain tensioner housing and plug for cracks or other damages. Replace if necessary.
- Check chain tensioner plunger for free movement and/or scoring.
- Check if O-ring are brittle, cracked or hard.
- Replace if necessary.
- Check spring condition. Replace if damage.



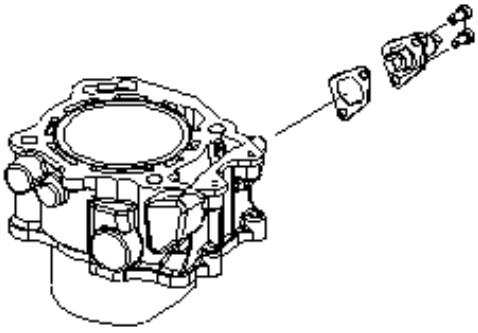
Timing Chain Tensioner Installation

- For installation, reverse the removal procedure.

NOTE: *Before installing the chain tensioner make sure, that the camshaft timing gear can be moved back and forth.*

- Slightly turn the camshaft timing gear in order to get the timing chain play on the tensioner side.
- Slightly screw the plunger in until the timing chain allows no more back and forth movement of the camshaft timing gear.
- Screw the plunder in an additional 1/8 turn to reach the required specified torque.

TORQUE: 1.0 kgf-m.



NOTE: *Install the new gasket of chain tensioner.*

NOTICE: *Improper adjustment of the timing chain will lead to severe engine damage.*

▪ Fit the spring on one side into the slot of the plug and on the other side into the plunger.

NOTE: *Turn spring only clockwise in order to fit the spring end into the notch of the plunger and to avoid loosening the plunger during spring installation. Do not reload the spring.*

NOTE: *Do not forget to replace the O-ring on chain tensioner plug.*

▪ Then compress the spring and screw the plug in.

NOTE: *To avoid overstressed timing chain, the plug must engage into threads within the first full turn.*

▪ Install all other removed parts.

▪ Finally, tighten the plug.

CAMSHAFT TIMING GEARS

Camshaft Timing Gears Removal

▪ Remove the cylinder head cover.

▪ Turn crankshaft to TDC ignition of the respective cylinder and lock magneto flywheel.

▪ Unscrew timing chain tensioner.

▪ Remove timing gear retaining bolts.

▪ Remove the timing gear.

NOTE: *Secure timing chain with a piece of wire.*

Timing gear Inspection

▪ Check timing gear for wear or deterioration.

▪ If gear worn or damaged, replace it as a set (camshaft timing and timing chain).

Timing Gear Installation

- For installation, reverse the removal procedure.
- Clean mating surface and threads of camshaft prior installing timing gear.
- Crankshaft must be set to TDC position before install the timing chain.

NOTICE: *Crankshaft and camshaft must be locked at TDC ignition position to place timing gear and timing chain in the proper position.*

- Place timing gear along with the timing chain on the camshaft.

NOTE: *The printed marks on the camshaft must be parallel to the cylinder head base.*

- Install and adjust timing chain tensioner.
- Install and tighten timing gear retaining bolts to specified torque.

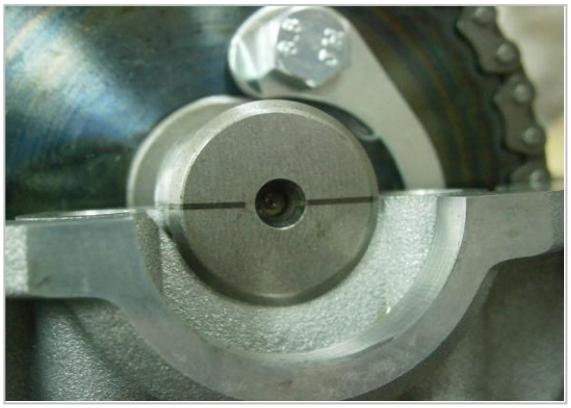
NOTE: *The hole on the timing gear sprocket should at the exhaust side.*

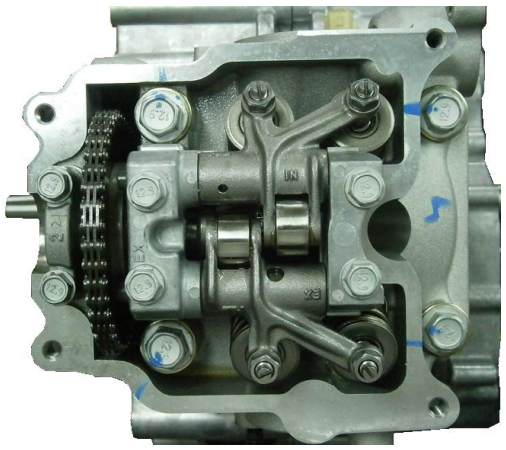
TORQUE: 1.0~1.2 kgf-m

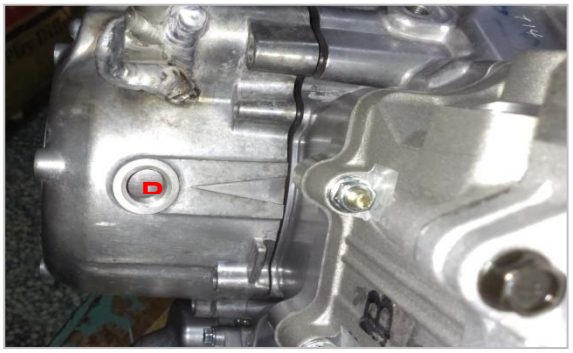
NOTE: *If a piston (front or rear cylinder) is set to TDC ignition, the timing gear of the opposite cylinder must be in the following position.*

Camshaft Timing Cylinder (rear)

- Turn crankshaft until piston is at TDC ignition as follow:
- Remove spark plug of both cylinders.
- Remove both cylinder head covers.
- Remove the plug and O-ring of magneto cover.
- Use 14 mm Allen key to turn crankshaft until rear piston is at TDC ignition.
- When rear piston is at TDC ignition, marks on magneto flywheel “R” and on the magneto cover are aligned.
- At TDC ignition, the printed marks on the camshaft have to be parallel to cylinder head base.



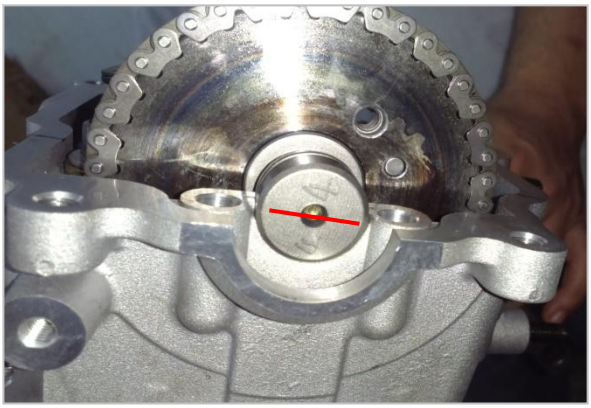




Camshaft Timing Cylinder (front)

- Turn cylinder to TDC ignition.
- Using a 14 mm Allen key, turn crankshaft 450° clockwise, until marks on magneto flywheel and magneto cover are aligned.

NOTE: *At TDC ignition, the printed marks on the camshaft have to be parallel to cylinder head base as per following illustration.*

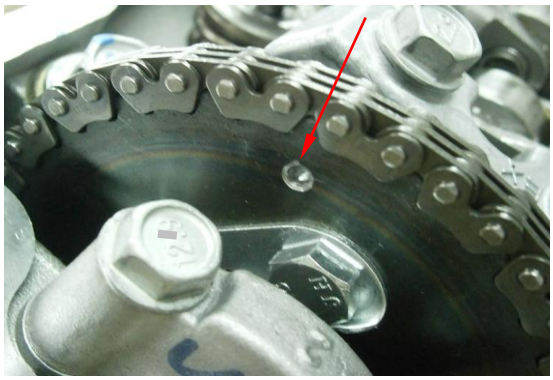


NOTE: *Before installing camshaft of rear cylinder, it should be confirm mark "B" on the camshaft.*

NOTE: *Before installing camshaft of front cylinder, it should be confirm mark "A" on the camshaft.*

NOTE: *Reconfirm the TDC ignition of front cylinder, at this time, the rear cylinder timing chain sprocket will show up an hole at up-left corner on the intake side.*

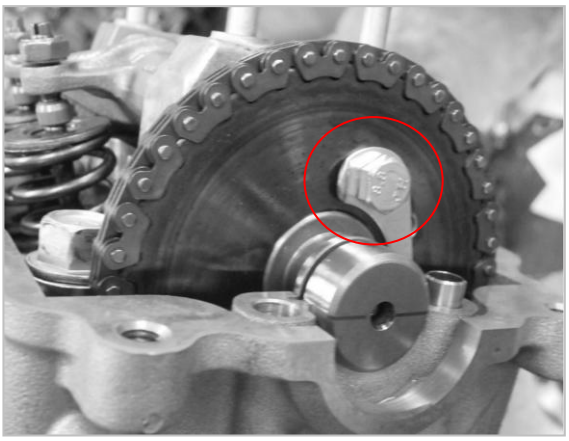
NOTE: *Check the timing chain identification hole, during assemble, when one cylinder camshaft on the TDC position, the other cylinder timing chain sprocket left up corner will shown the hole, If not, please re-adjust and re-assemble.*



NOTE: *It will show one hole only, if shows two hole or no hole, it mean the installation incorrect.*

TIMING CHAIN

The engine is equipped two timing chains. One of timing chain is located on engine ACG side behind the magneto cover. The second timing chain is located on engine PTO side behind the PTO cover.



Timing Chain Removal (ACG Side)

▪ Remove the following parts:

- ACG cover.
- Starting idle gear
- Rotor.
- Starting clutch gear.
- Cylinder head cover.

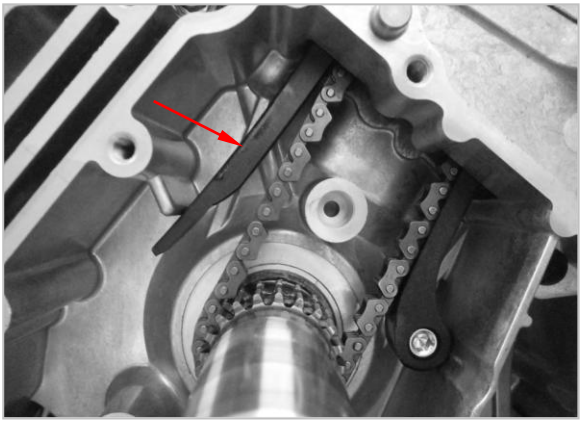
Chain tensioner.

- Timing gear.

▪ Remove timing chain guide (tensioner side) and lower timing chain guide.

NOTE: *Mark the operating direction of the timing chain before removal.*

▪ Carefully pull the timing chain downwards and sideways, then out of the crankcase.



Timing Chain Removal (CVT Side)

▪ Remove the following parts:

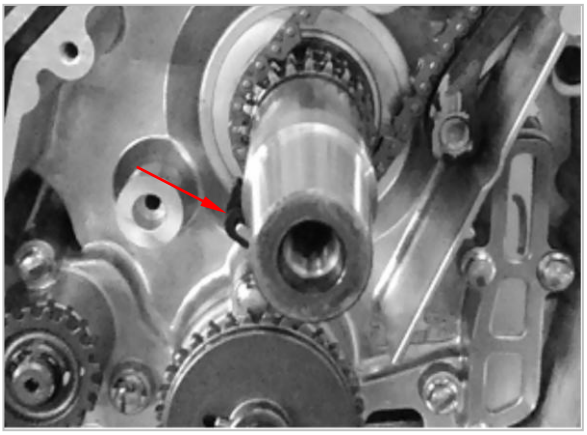
- CVT cover.
- Idle gear.
- Cylinder head cover.

Chain tensioner.

- Timing gear.

▪ Remove timing chain guide (tensioner side) and lower timing chain guide.

▪ Carefully pull the timing chain downwards and down from the crankcase.

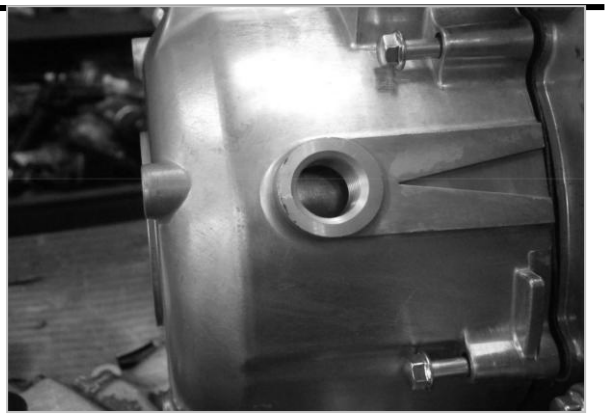


NOTE: *Mark the operating direction of the timing chain before removal.*

Timing Chain Inspection

- Inspection is the same for both timing chains.
- Check timing chain on timing gear for excessive radial play.
- Check chain condition for wear and teeth condition.
- If chain is excessively worn or damaged, replace it as a set (timing gear and timing chain).
- Check timing chain guides for wear, cracks or deforming. Replace as required.

NOTE: *Check also the timing chain guide (tensioner side).*



Timing Chain Installation

- The installation is essentially the reverse of the removal procedure, but pay attention to the following details.

NOTE: *Installation is the same for both timing chains.*

TIMING CHAIN GUIDE SOCKET SCREW

TIGHTENING TORQUE: 1.0~1.2 kgf-m

- Install timing chain with camshaft timing gear.

NOTE: *Ensure to carry out proper valve timing.*

NOTICE: *Improper valve timing will damage engine components.*

TIMING CHAIN GUIDE (TENSIONER SIDE)

Timing Chain Guide Removal

- Refer to TIMING CHAIN in this subsection.

Timing Chain Guide Inspection

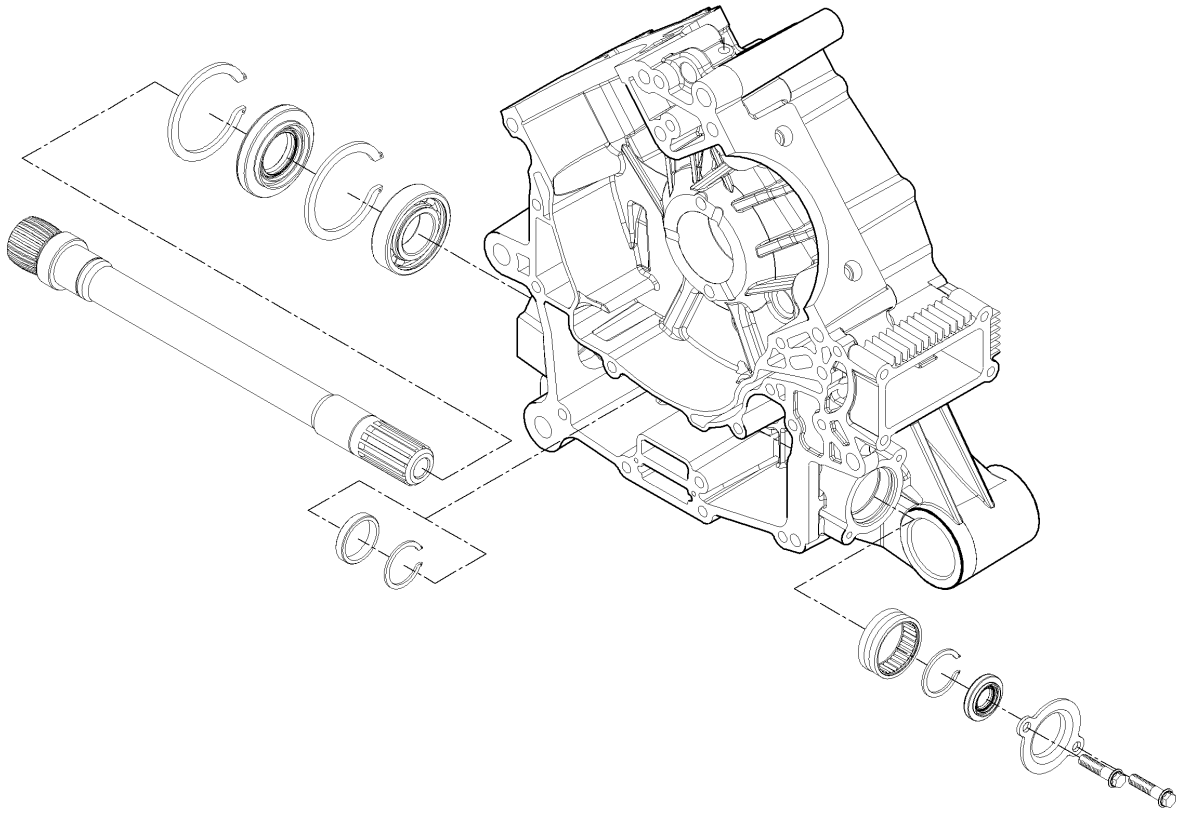
- Check timing chain guide for wear, cracks or deforming. Replace if necessary.

Timing Chain Guide Installation

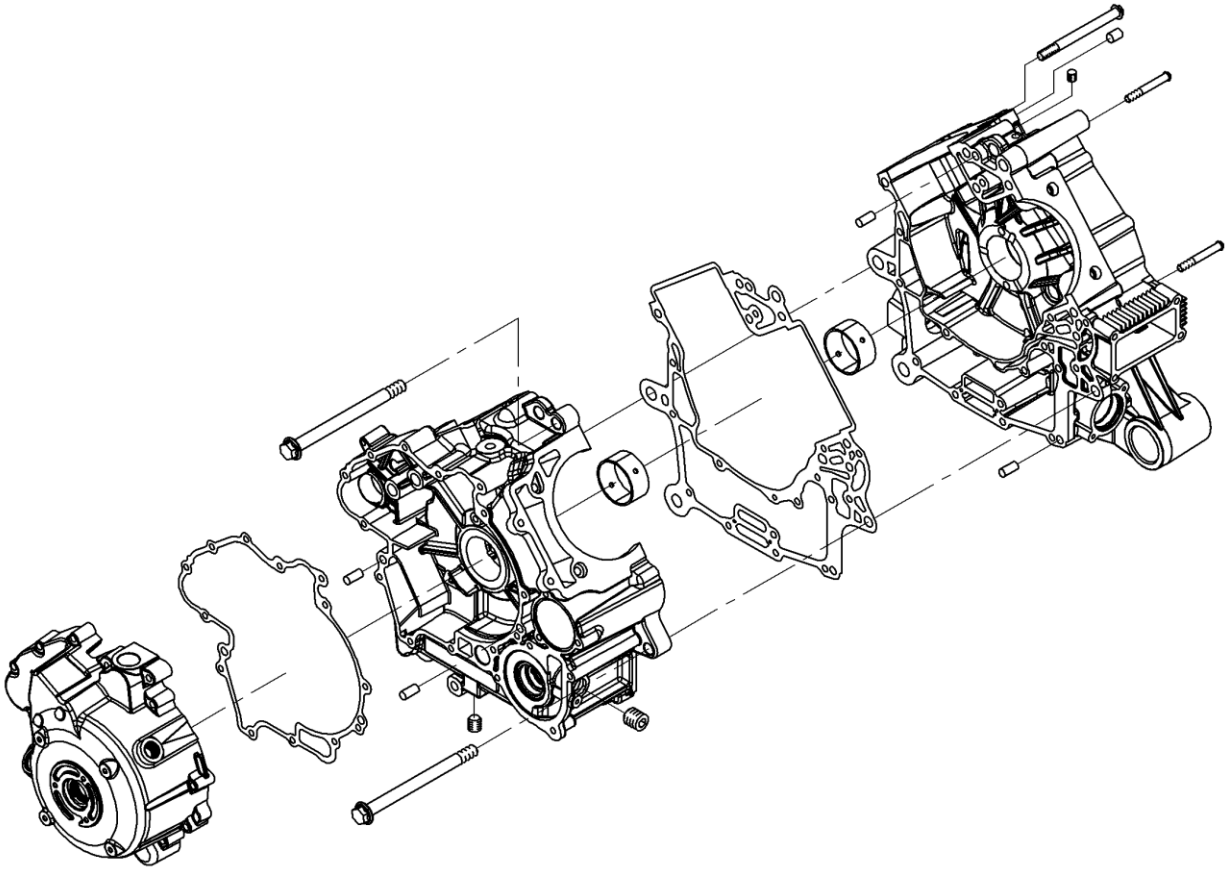
- For installation, reverse the removal procedure.

BOTTOM END

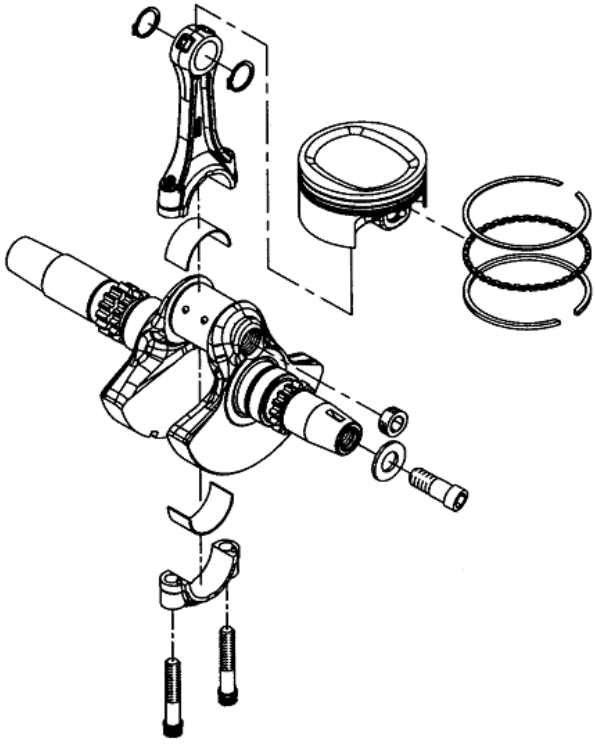
ENGINE DRIVE SHAFT



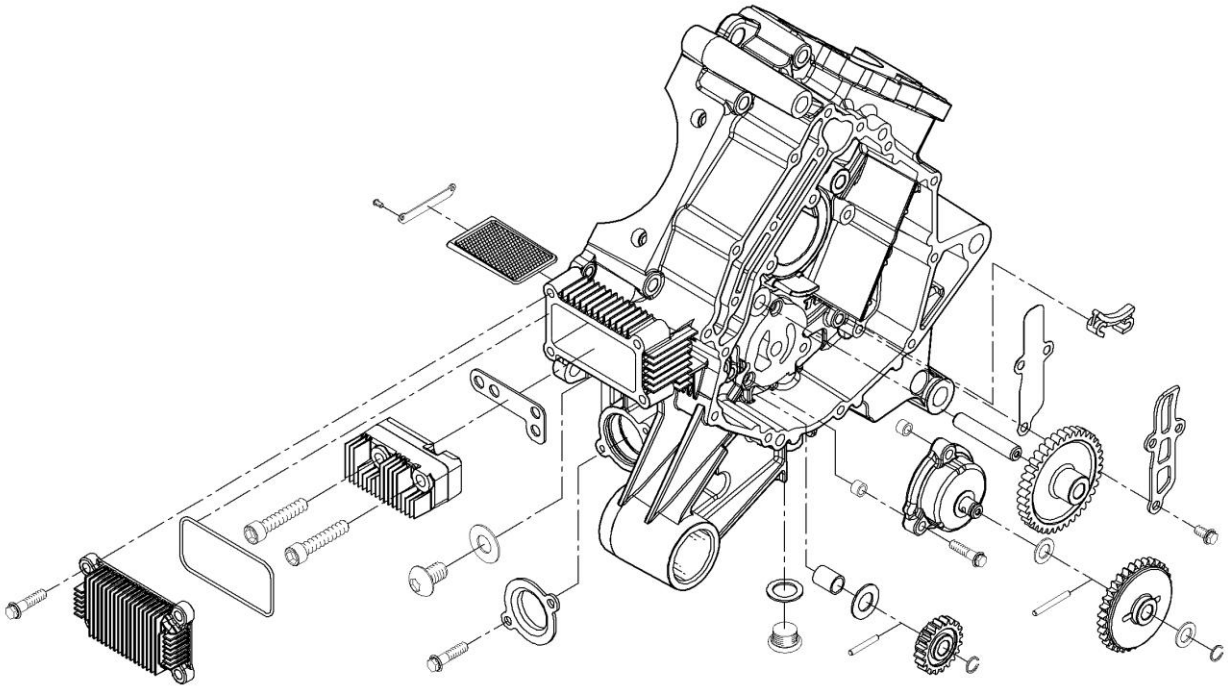
CRANKCASE

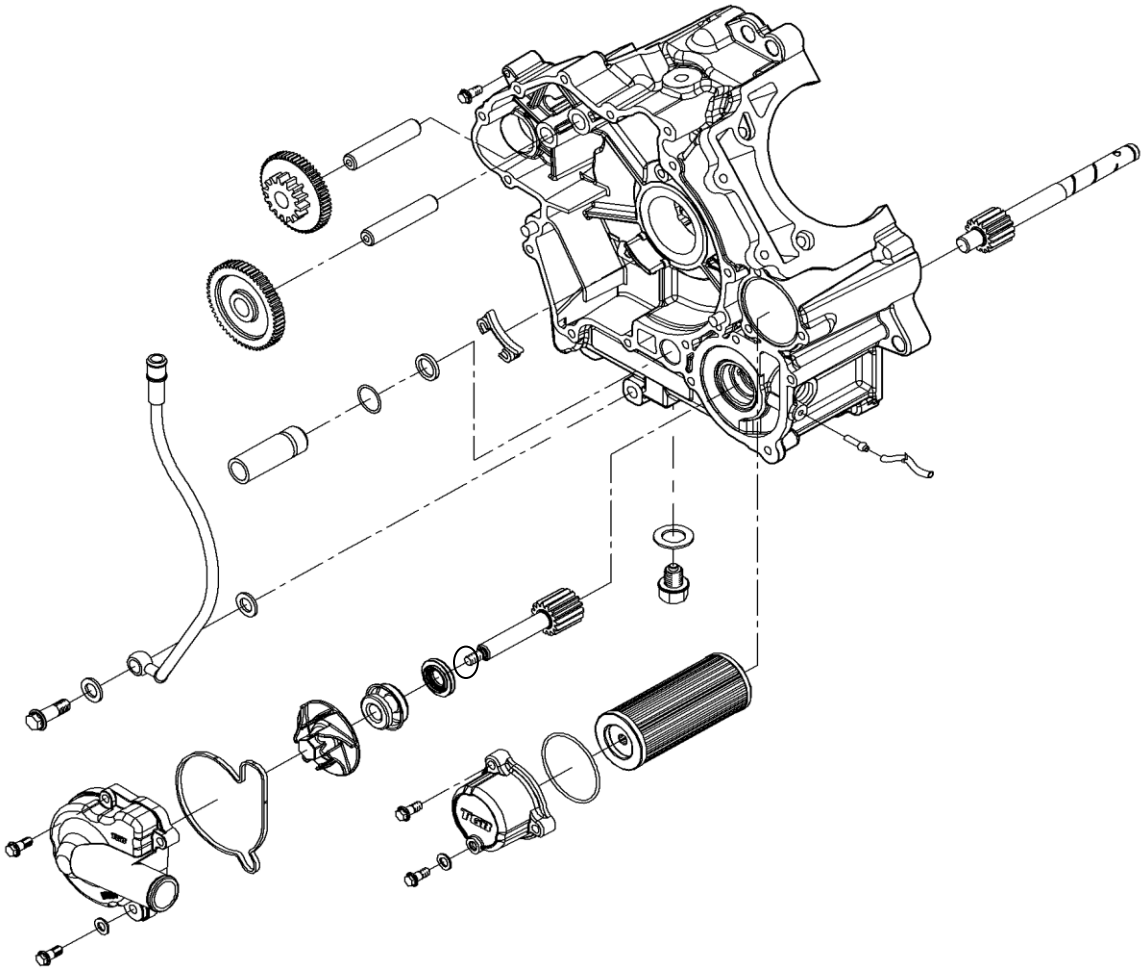


CRANKSHAFT



WATER PUMP, OIL PUMP





BOTTOM END

GENERAL

- During assembly/installation, use the torque values and service products as in the exploded views.
- Clean threads before applying a thread locker.

WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced with new ones where specified.

ENGINE DRIVE SHAFT

NOTE: *The engine drive shaft transmits the power from gearbox to the front differential and is located inside the crankcase.*

Oil Seal Replacement (Engine Drive Shaft)

- Remove the engine.
- To remove the rear oil seal, the gearbox has to be removed from the engine.
- To replace drive shaft oil seals, refer to drive shaft removal.

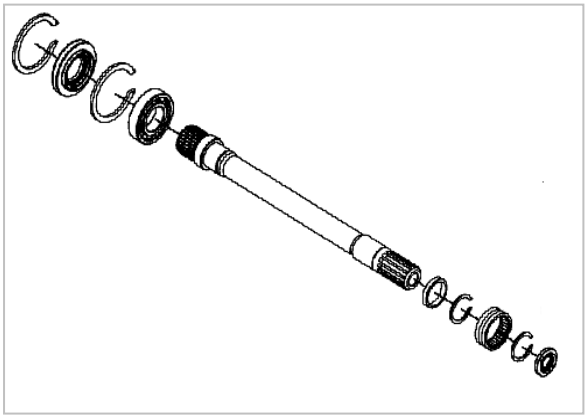
Engine Drive Shaft Removal

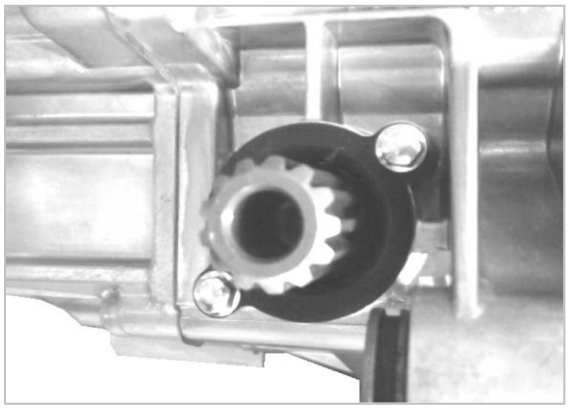
- Remove the engine.

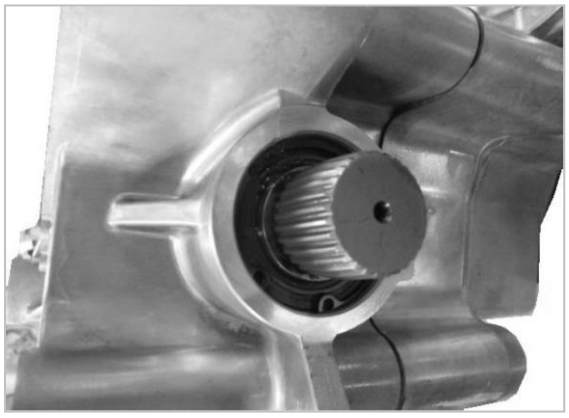
At rear of engine, remove the O-ring.

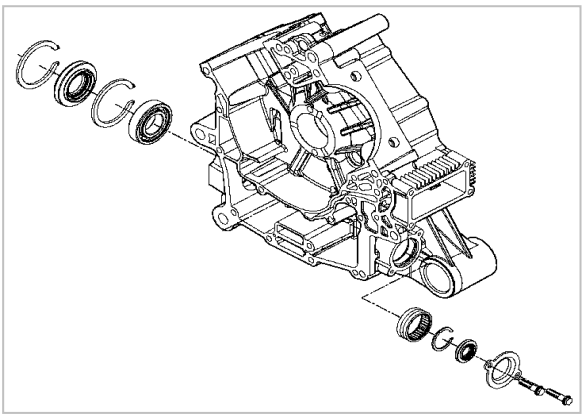
NOTE: *Check ends of the circlip for sharp edges or burr before removing the drive shaft, to avoid damaging the oil seal.*

- Split the crankcase.
- Remove engine drive shaft from the crankcase.

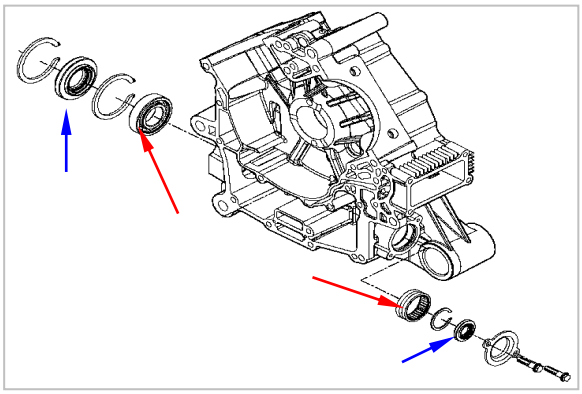








Engine Drive Inspection



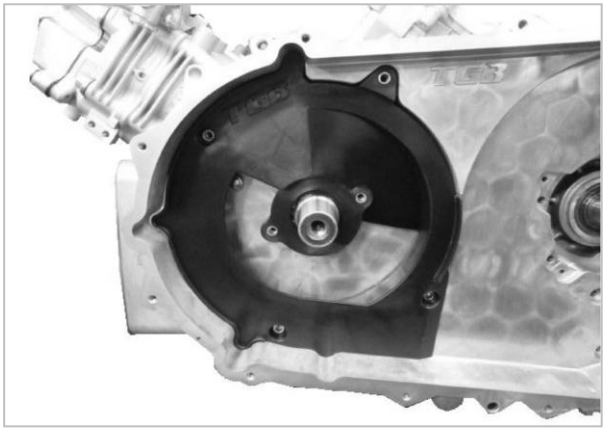
- Replace oil seals and/or O-ring if they are brittle, hard or damaged.
- Check drive shaft bearings for contamination and/or metal shavings. Check if bearing turn freely and smoothly. Replace if necessary.
- Check drive shaft for cracks, bend, pitting or other visible damages.
- Check drive shaft splines for wear or damages.
- Check oil seal running surface of the drive shaft for scratches. Replace if necessary.

Engine Drive Shaft Installation

- For installation, reverse the removal procedure.
- Pay attention to the following details.
- Clean all metal components in solvent.
- Crankcase surface is best cleaned using a combination of LOCTITE CHISEL (gasket remover) and a brass brush. Brushes a first pass in one direction then makes the final brushing perpendicularly to the first pass.

NOTICE: *Do not wipe with rag. Use a new clean hand tower only.*

- Use a suitable installer for install bearing.
- Use LOCTITE 5910 on mating surfaces.



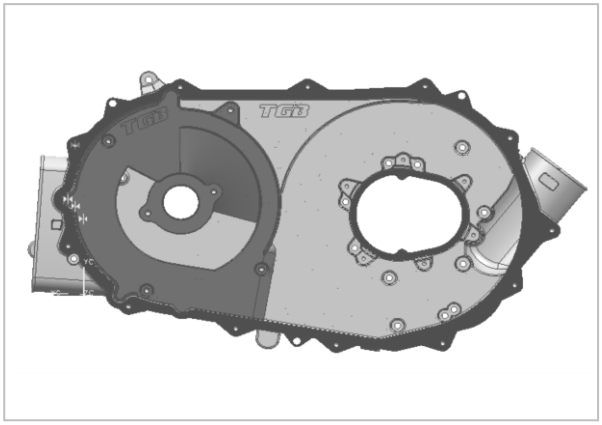
IMPORTANT: *When beginning the application of the sealant, the assembly and the first torquing should be done within 10 minutes. It is suggested to have all you need on hand to save time.*

CVT VENT BACKBOARD OIL SEAL

To replace oil seal it is not necessary to remove engine from vehicle.

CVT Vent Backboard Oil Seal Removal

- Drain engine oil and remove the following parts:
  - CVT cover.
  - Drive Pulley.
  - Driven Pulley.
  - CVT air ducting guide.



▪ Remove oil seal with a small flat screwdriver.

NOTICE: *Avoid scoring surface with tool.*

Vent Backboard Oil Seal Inspection

Check oil seal running surface of crankshaft CVT side for grooves. Replace if necessary.

CVT Vent Backboard Oil Seal Installation

▪ For installation, reverse the removal procedure.

▪ Pay attention to the following details.

NOTICE: *Oil Seal must be installed with sealing lip toward engine.*

▪ Push oil seal in place by using the CVT COVER OIL SEAL INSTALLER.

CVT Vent Backboard

CVT Vent Backboard Removal

▪ Remove the following parts:

- CVT cover.
- Drive Pulley.
- Driven Pulley.
- CVT air ducting guide.

▪ Disconnect vent hose.

▪ Remove CVT cover bolts and pull CVT cover.

CVT Vent Backboard Inspection

▪ Check the CVT vent backboard for cracks or other damage.

▪ Replace CVT vent backboard if damaged.

▪ Clean oil breather bore in CVT vent backboard from contaminations with part cleaner then use pressurized air to dry it.

WARNING

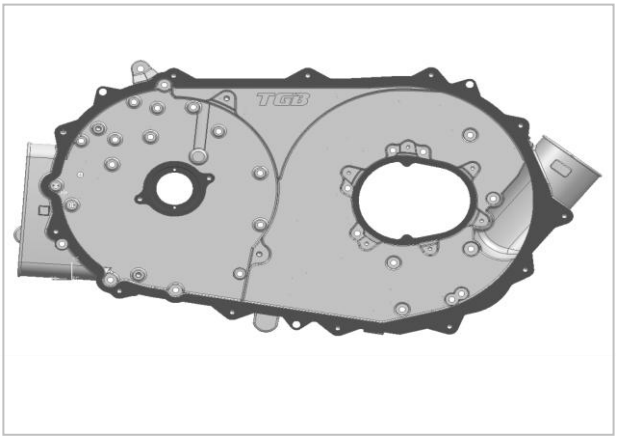
Always wear skin and eye protection. Chemicals can cause skin rash, skin burns and severe eye injury.

▪ Check surface of sealing sleeve for wear or other damages. Replace CVT vent backboard if damaged.

▪ Check plain bearings for scoring or other damages.

NOTE: *Measure plain bearing inside diameter and compare to crankshaft journal diameter.*

▪ Replace if the measurement is out of specification.



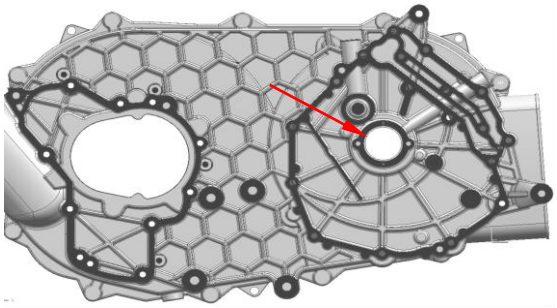
PLAIN BEARING INSDIE DIAMETER (CVT BACKBOARD)

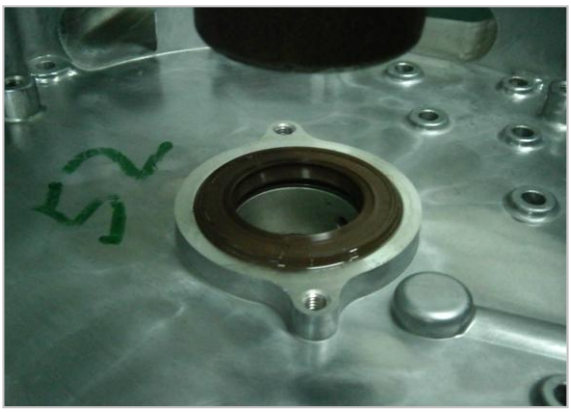
Plain Bearing Replacement (CVT Vent Backboard Cover)

Plain Bearing Removal

NOICTE: *Unless otherwise instructed. Never use a hammer to install plain bearing. Use a press only.*

- Carefully remove the CVT oil seal with a screwdriver, without damaging the CVT cover.
- Push out the plain bearings from the outside towards the inside using the PLAIN BEARING REMOVER/INSTALLER.
- The CVT cover has to be supported from below with suitable support with straight surface, in order to prevent damage of the sealing surface.





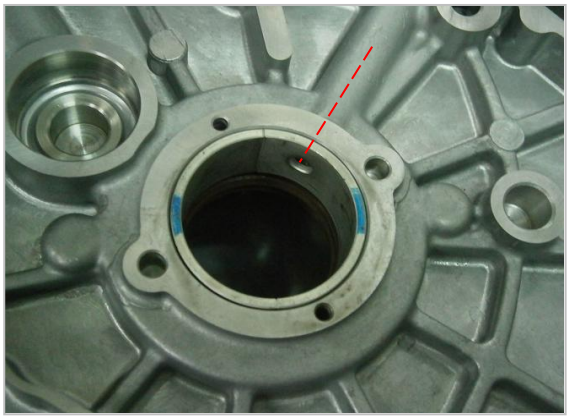
Plain Bearing Installation

NOTE: *Do not lubricate plain bearing and/or CVT cover for installation.*

- Install plain bearings with the proper PLAIN BEARING REMOVER/INSTALLER in a cool PTO cover.

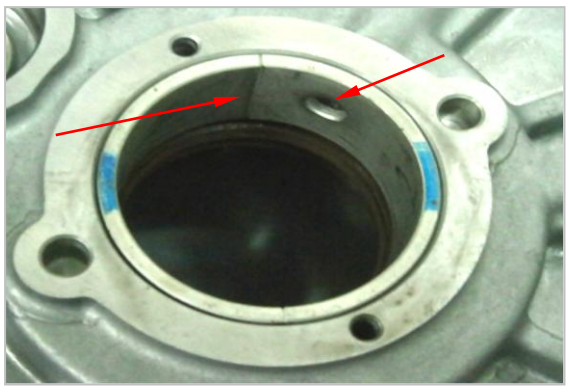
NOTICE: *Mark position of oil bore on CVT cover and on plain bearing remover/installer. Align mark on plain bearing remover/installer with mark on CVT cover.*

- Carefully press-in the plain bearings in the same direction as during disassembly, from the outside towards the inside. Support CVT cover with suitable support with straight surface, in order to prevent damage of sealing surface.



NOTE: *Wrong oil bore position will stop oil supply to plain bearings and will damage the engine.*

NOTICE: *The partition of the plain bearings must be positioned near to oil bore in counterclockwise direction.*



CVT Vent Backboard Installation

- For installation, reverse the removal procedure.
- Pay attention to the following details.

NOTE: *At installation, replace CVT cover gasket and oil seal.*

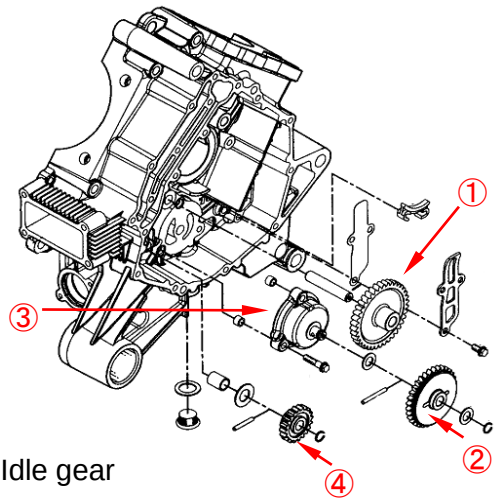
- Tighten CVT cover bolts following the illustrated sequence.

DRIVE GEARS

The drive gears are located on the engine CVT side behind the CVT vent backboard cover.

Drive Gear Removal

- Remove CVT cover.
- Withdraw idle gear.
- Remove oil pump gear c-clip and washer.
- Remove the bolts and pull out water pump.
- Remove c-clip and pull out the water pump gear.

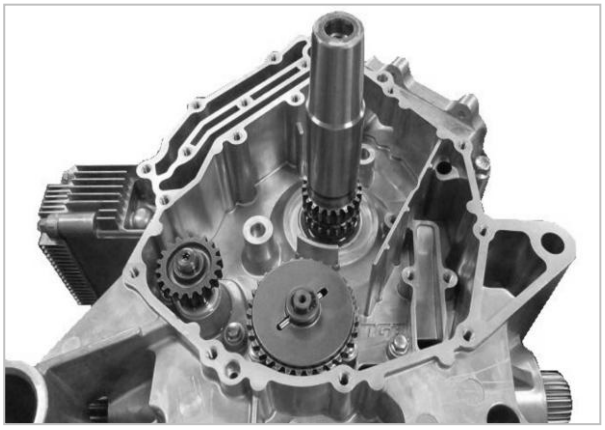


1. Idle gear
2. Oil pump gear
3. Oil pump
4. Water pump drive gear

Drive Gears Inspection

Idle Gear/Oil Pump Drive Gear/Water Pump Drive Gear

- Inspect gears for wear or other damage.
- Replace if damaged.
- Check if oil seal is brittle, hard or damaged. Replace if necessary.
- Inspect gear for wear or other damage.
- Check ball bearing for excessive play and smooth operation. Replace breather gear assembly if necessary.

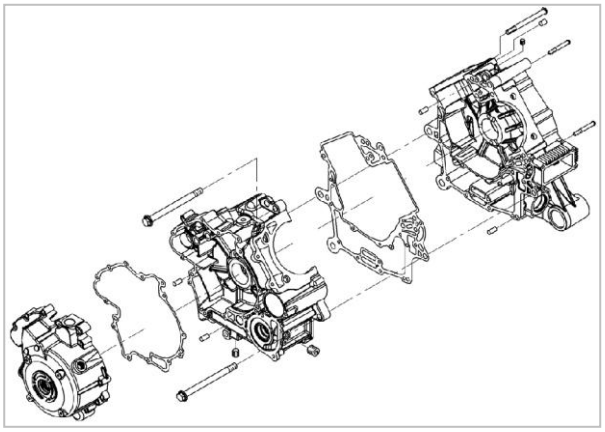


Drive Gear Installation

- For installation, reverse the removal procedure.
- Adequately oil the ball bearing of the breather gear.

CRANKCASE

Crankcase Disassembly



1. Drain the following system:
   1.1 Cooling system
   1.2 Engine oil.
   1.3 Gearbox oil.
2. Lock crankshaft.
3. Remove the following parts:
   - CVT cover.
   - Drive Pulley.
   - Driven Pulley.
   - CVT air guide.
4. Remove the engine from vehicle.
5. Disconnect gearbox from engine.
6. Remove the following parts:
   - ACG cover.
   - Rotor with starting clutch gear.
   - Starter drive gears.
7. Remove the following parts:
   - CVT vent backboard cover.
   - Drive gears.
8. Remove the following parts:
   - Chain tensioners.
   - Camshaft timing gears.
   - Timing chains.
   - Timing chain guides.
9. Remove the following parts:
   - Front cylinder head.
   - Rear cylinder head.
   - Both cylinders.
10. Remove the following parts:
    - Water pump housing.

11. Remove the following parts:
    - Oil filter.
    - Oil cooler.
    - Oil pump drive gear.

NOTE: *Oil pump removal from crankcase is not necessary, but recommended to see condition of oil pump.*

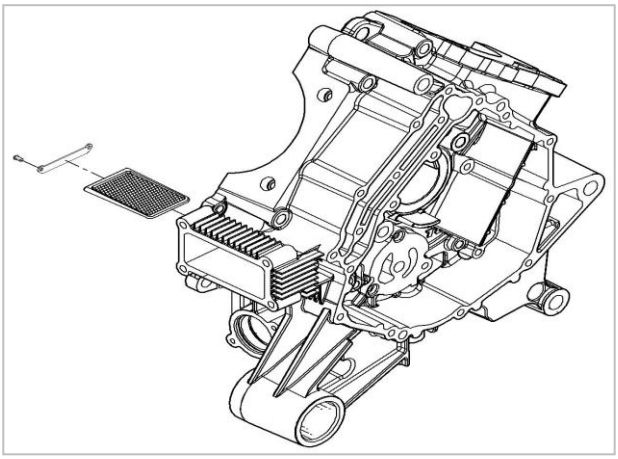
12. Remove electric starter.

NOTE: *Before splitting the crankcase, measure crankshaft axial play.*

- Remove retaining bolts of crankcase.
- Carefully split crankcase halves by using a screwdriver and a soft hammer.

NOTE: *During disassembly, do not damage the sealing surface of the crankcase halves.*

- Pull crankshaft out of crankcase.
- Remove the water pump idle shaft and the water pump gear.
- Remove engine oil strainer.



Crankcase Cleaning

WARNING

Use safety goggles to avoid eye injuries.

- Clean crankcase using a part cleaner.
- Dry crankcase using compressed air.
- Below the oil supply lines.

Oil Strainer

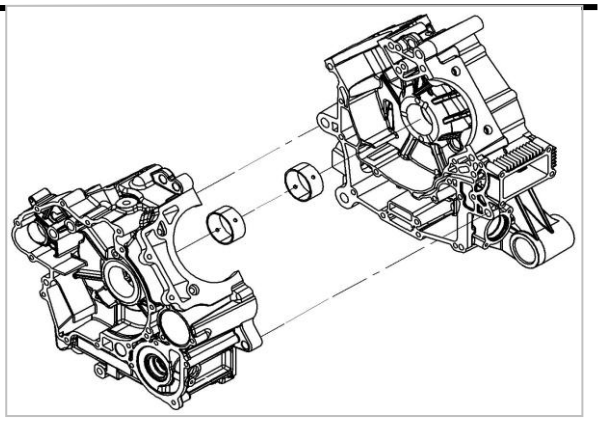
- Clean the engine oil strainer (same procedure as for the crankcase)

Crankcase Inspection

- Check crankcase halves for cracks or other damage. Replace if damaged.
- Check main bearings in ACG and CVT crankcase half for scorings or other damages.

NOTE: *Measure plain bearing inside diameter and compare to CVT/ACG main journal diameters of crankshaft. Replace if the measurement are out of specification.*

MAIN BEARING INSIDE DIAMETER (CVT/ACG)



Plain Bearing Replacement (Main)

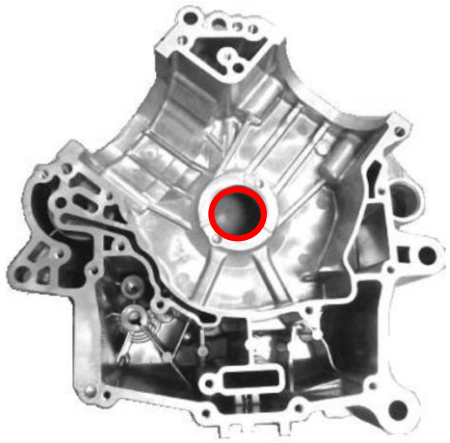
Plain Bearing Removal

NOTICE: *Always use a press for removal of plain bearings.*

- Remove plain bearings with the PLAIN BEARING REMOVER/INSTALLER
- Carefully push the plain bearings out, from the crankcase half inside towards the outside.

NOTE: *Place the proper CRANKCASE SUPPORT ACG/CVT under crankcase halves before removing plain bearings.*

NOTE: *During disassembly, make sure not to damage the sealing surfaces of the crankcase halves.*



Plain Bearing Installation

NOTICE: *Unless otherwise instructed, never use hammer to install plain bearings. Use press only.*

- Install plain bearing with the proper PLAIN BEARING REMOVER/INSTALLER in a cool crankcase. Do not lubricate plain bearings and/or crankcase for installation.

NOTE: *Place the proper crankcase support sleeve under crankcase halves before installing the plain bearing.*

- Carefully press in the plain bearings in the same direction as during disassembly, from the crankcase inside towards the outside.
- During reassembly, make sure not to damage the sealing surface of the crankcase halves.

NOTE: *Use O-rings to hold plain bearings in place during installation. The O-ring will disappear in the groove of the plain bearing remover/installer.*

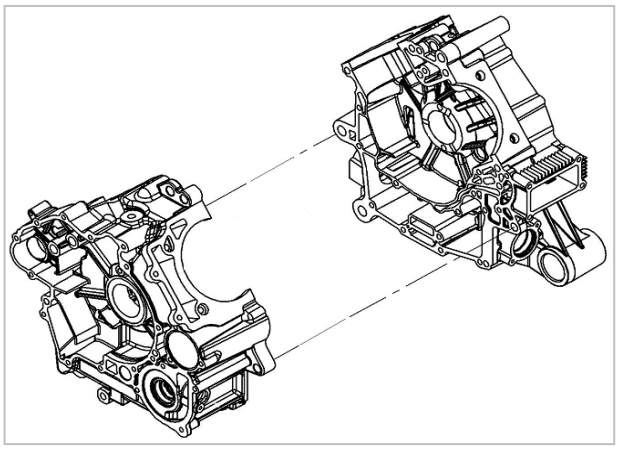
NOTICE: *Mark position of plain bearing oil bore on plain bearing remover/installer.*

NOTE: *Mark position of oil bore on crankcase half. Align mark on plain bearing remover/installer with mark on crankcase half.*

NOTE: *Wrong oil bore position will stop oil supply to plain bearings and will cause engine damage.*

NOTICE: *The partition of the plain bearing in crankcase half ACG side must be positioned near to oil bore in clockwise direction.*

NOTICE: *The partition of the plain bearing in crankcase half CVT side must be positioned near to oil bore in counterclockwise direction.*



Crankcase Assembly

- The assembly of crankcase is essentially the reverse of removal procedure. However, pay attention to the following details.
- Clean oil passages and make sure they are not clogged.
- Clean all metal components in a solvent.
- Install a new crankcase gasket.
- Oil the plain bearings before mounting the crankshaft.

NOTICE: *Correctly reinstall crankshaft.*

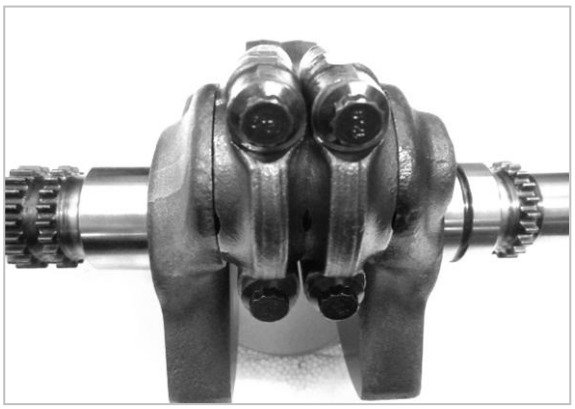
- Properly reinstall engine oil strainer and bolts.
- Reinstall water pump shafts/gears.
- Tightening sequence for bolts on crankcase is as per following illustration.

Crankshaft Inspection

NOTE: *Check each bearing journal of crankshaft for scoring, scuffing, cracks or other signs of wear.*

NOTE: *Replace crankshaft if the gears are worn or otherwise damaged..*

NOTICE: *Components out of specifications always have to be replaced. If this is not observed, severe damage may be caused to the engine.*



Connecting Rod Big End Axial Play

- Using a feeler gauge, measure distance between butting face of connecting rods and crankshaft counterweight.

Connecting Rod Big End Radial Play

NOTE: *Prior to remove connecting rod from the crankshaft, mark big end halves together to ensure a correct reinstallation (cranked surface fits in only one position).*

- Remove connecting rods from crankshaft.

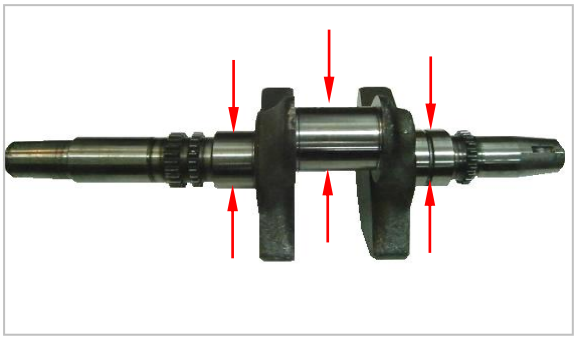
NOTICE: *Connecting rod bolts are not reusable. Always discard bolts and replace by new ones. It is recommended to install new plain bearings when reinstalling connecting rods.*

- Measure crankpin. Compare to inside diameter of connecting rod big end.
- Carry out the tightening procedure described in this subsection.

Connecting rod big end radial clearance

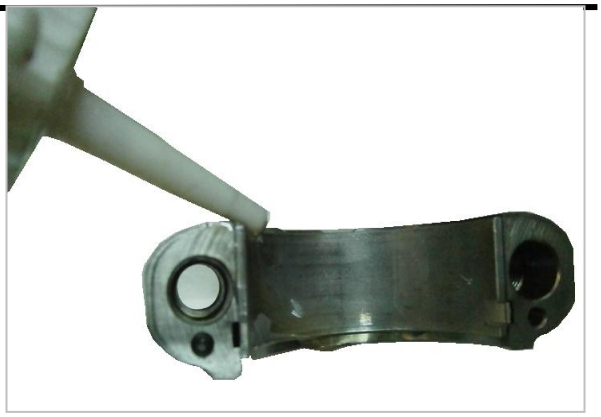
- If crankshaft pin diameter is out of specification, replace crankshaft.
- If connecting rod big end diameter or radial clearance is out of specification, replace plain bearings and recheck.

Crankshaft Radial Play ACG/CVT Side



- Measure crankshaft on ACG/CVT side. Compare to inside diameter of ACG/CVT plain bearing.
- Measure crankshaft journal diameter Compare to plain bearing inside diameter.
- If crankshaft journal diameter is out of specification, replace crankshaft.
- If crankshaft radial play (CVT cover bearing) out of specification, replace plain bearings and recheck.

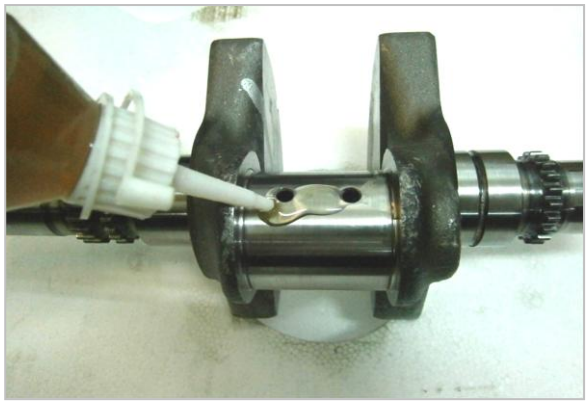
Crankshaft Assembly



- For assembly, reverse the disassembly procedure. Pay attention to following details.
- Put plain bearings correctly in place and clean the split surface on both sides (cracked area) carefully with compressed air.

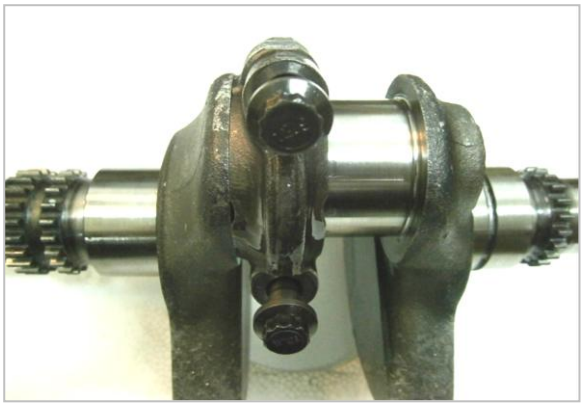
NOTE: *Oil the plain bearing surface of the connecting rod and crank pin before installation.*

- Oil NEW connecting rod bolts.



NOTICE: *Always use NEW connecting rod bolts at final assembly. They are not reusable.*

- Thread bolts in the connecting rods, tighten bolts in the following sequence:
  1. Tighten to 1/2 of specified torque.
  2. Tighten to 30 NM+/- 2 NM.
  3. Torque by an additional 90 +/- 5° turn using an angle torque wrench.

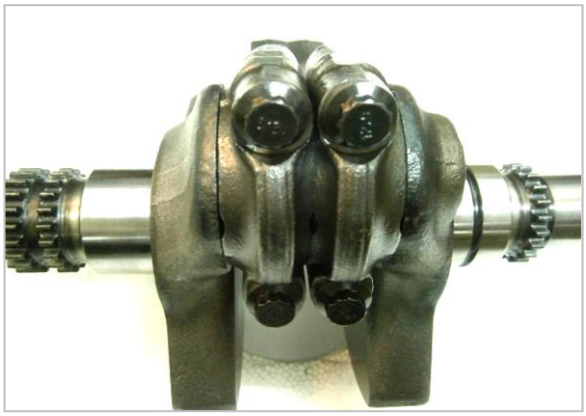


NOTE: *Do not apply any thread locker.*

NOTICE: *Failure to strictly follow this procedure may cause bolts to loosen and lead to severe engine damage.*

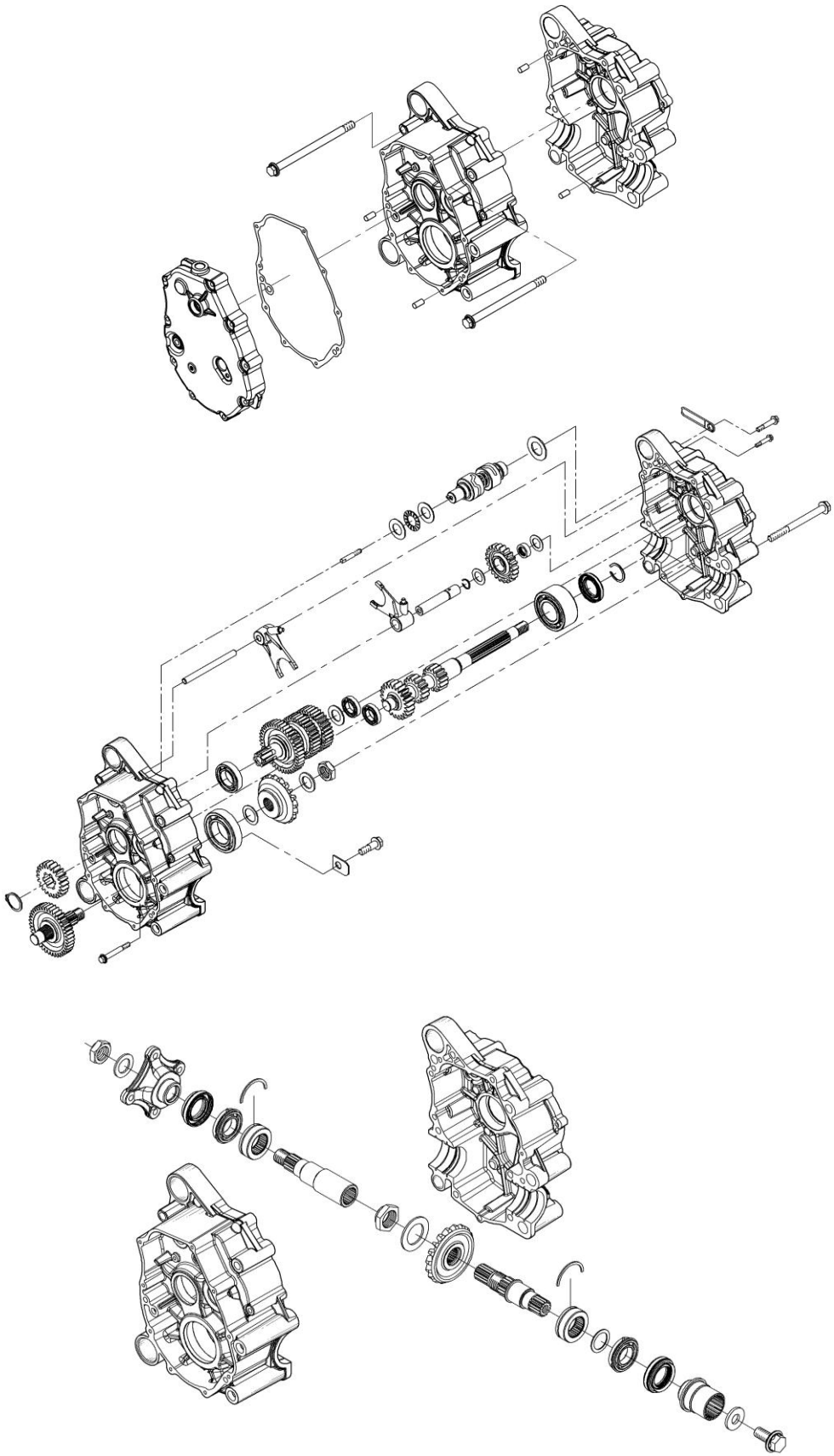
Crankshaft Installation

- For installation, reverse the removal procedure.
- Pay attention to the following details.
- Do not mix up the connecting rods of each cylinder during installation.



NOTICE: *Observe the correct installation position when fitting the crankshaft* with *the connecting rods. The connecting rod ACG side has to face rear cylinder.*

TRANSMISSION GEARBOX



GENERAL

During assembly/installation, use the torque values and service products as in the exploded views.

Clean threads before applying a thread locker.

WARNING

Torque wrench tightening specifications must strictly be adhered to.
Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced.

NOTICE: *Hoses, cables and locking ties removed during a procedure must be reinstalled as per factory standards.*

TROUBLESHOOTING

UNUSUAL GEARBOX NOISE AND/OR VIBRATIONS

1. Low oil level in gearbox.
   - Oil leakage from gearbox. Replace damaged gasket and/or oil seal.
2. Defective bearings.
   - Bearings do not turn smoothly. Replace bearing.
3. Damaged or worn gears.
   - Inspect gears for damages or missing teeth. Replace respective gears.

GEAR INDICATION FAILS

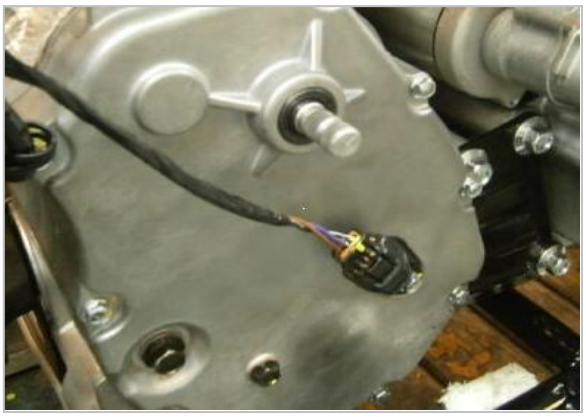
1. Defective gear switch.
   - Perform a gear switch test.
   - Damaged wires. Repair as required.

GEAR IS HRAD TO SHIFT

1. Incorrect shifter connecting rod adjustment.

- Adjust shifter connecting rod.

VSS (VEHICLE SPEED SENSOR)



VSS Location

- The vehicle speed sensor is located on the right housing of the gearbox.
- To reach the VSS, remove the following parts:
  - Passenger seat.
  - RH side cover.

VSS Wire identification

PIN	COLOR	FUNCTION
A	BN/BK	12 Volt
B	PU	Speed signal
C	Black	Ground

VSS Input Voltage Test

1. Use the multimeter and select VDC.
2. Turn ignition switch ON.
3. Measure voltage as per following table.

   PIN A and PIN B = Battery Voltage

If voltage is not as specified. Test positive and ground separately.

VSS Signal Test

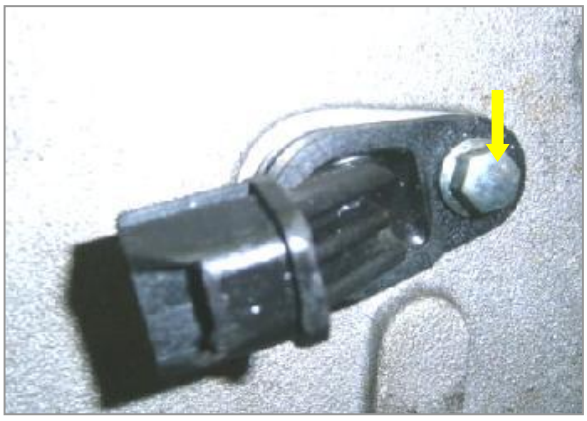
1. Lift rear of vehicle so that rear wheels are off the ground.
2. Set transmission to Neutral.
3. Turn ignition switch ON.
4. Set multimeter to VDC.
5. Measure voltage while slowly rotating rear wheels by hand.

   PIN B and PIN C = Alternate reading between battery voltage and 0 VDC.

NOTE: *Since we measure pulsating voltage, the numeric display will continuously change. The analog display may be easier to follow.*

VSS Removal

- Remove RH side cover
- Remove VSS retaining bolts.
- Turn sensor and pull it out of the gearbox right cover.



VSS Installation

- For installation, reverse the removal procedure. Apply GREASE on VSS O-ring.

GEAR SWITCH

To reach the VSS, remove the following parts:

- Passenger seat.
- LH side cover.
- Drain engine oil.
- Drain gearbox oil.
- Remove CVT assembly

Gear Switch Input Test

- Set shift lever in NEUTRAL position.
- Unplug the gear switch connector.
- Connect the ground (Black) cable and other cable (ex: Red, reverse gear), there should indicate the relative gear position on the dashboard.
- Repair or replace if necessary.

If there is indication, conducting the continuity test for each gear switch as follows.

- Connect the connector to multimeter, negative probe to ground (Black) and positive prove to gear position cable to be tested.
- Using a piece of wire connect the Ground point and each gear position point.
- They should be continuity when each gear position is OK.
- Replace if necessary.

Gear Switch Removal

- Disconnect the gear switch connector.
- Remove LH side cover.
- Drain the engine oil and gearbox oil.
- Remove the CVT assembly.
- Remove two bolts and replace gear switch.

Gear Switch Installation

For installation, reverse the removal procedure.

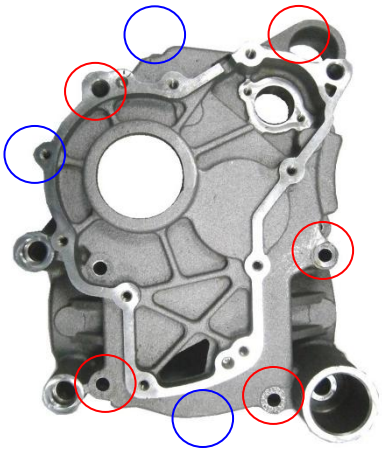
GEARBOX

Gearbox Removal

- Drain engine and gear box oil.
- Disconnect VSS and Gear switch connector.
- Remove the CVT assembly.
- Unscrew the bolts on the CVT air guide that retaining the gearbox.
- Detach the gearbox from the engine.
- Pull gearbox to separate it from engine.

Gearbox Disassembly

NOTE: *During gearbox disassembly, inspect the condition of each part closely.*



Gearbox Case

- Remove the bolts (M8x5, M6 x3) as shown.
- Using a big flat screwdriver and a soft hammer to split the gearbox case.
- Remove the bolts and right cover.

Output Drive Shaft Oil Seal Replacement

To replace the output drive shaft oil seal, processed as follows:

- Remove output drive shaft from gearbox.
- Remove keys.
- Replace the front and rear oil seal.
- Install the new oil seal using special tool.

Gearbox Bearings

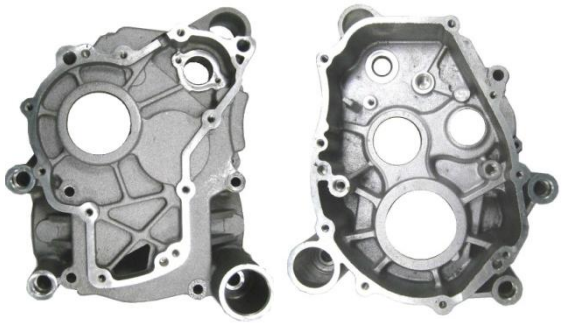
NOTE: *Always support gearbox housings properly when ball bearings are removed. Housing damages mat occur if this procedure is not performed correctly.*

- Check if ball bearings turn freely and smoothly.
- Check all bearings, bearing points, tooth flanks and taper grooves.

Gearbox Inspection

Always verify for the following when inspecting gearbox components:

- Gear teeth damage.
- Worn or scoured bearing surfaces.
- Rounded engagement dogs and slots.
- Worn shift fork engagement groove.
- Worn splines on shafts and shifting sleeves.



Gearbox Installation

For installation, reverse the removal procedure.

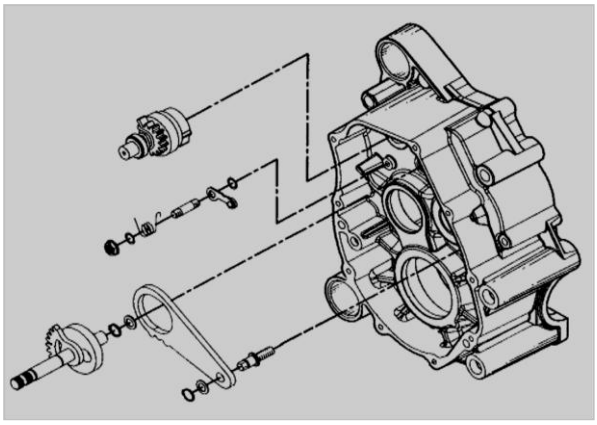
- Before gearbox installation check O-ring in bearing cover if brittle, hard or damaged. Replace if necessary.
- Install the keys on the output shaft.
- After installation refill gearbox oil.

Gear box oil : 75W-140, 0.75L

Torque: 330 kgf/cm

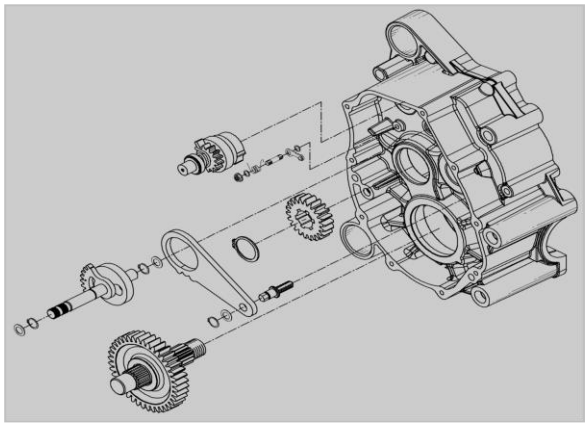
Gear Camshaft Comp.

- Check all the gear tooth wear, cracks or other damage.
- Replace if necessary



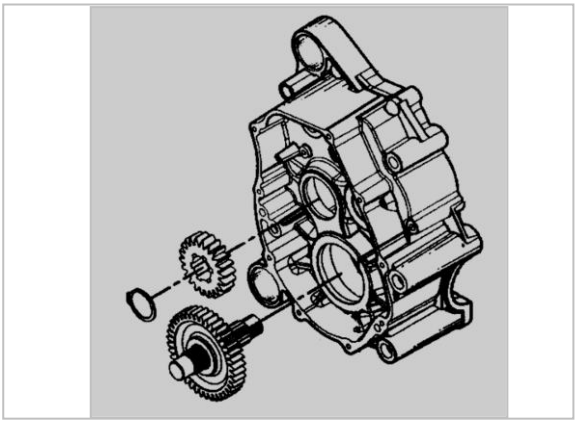
Parking Gear

- Check the gear tooth wear, cracks or other damage.
- Replace if necessary.



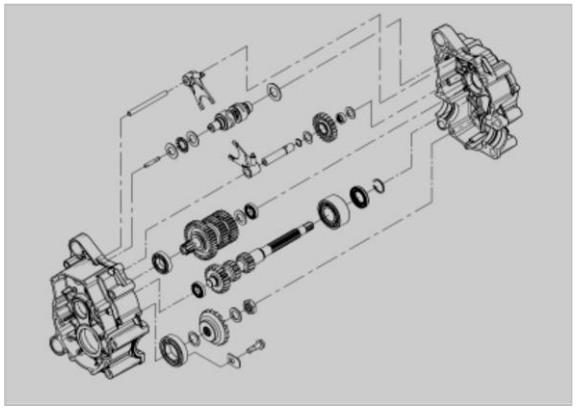
Output Secondary gear shaft and 17 tooth Gear

- Check all the gear tooth wear, cracks or other damage.
- Replace if necessary

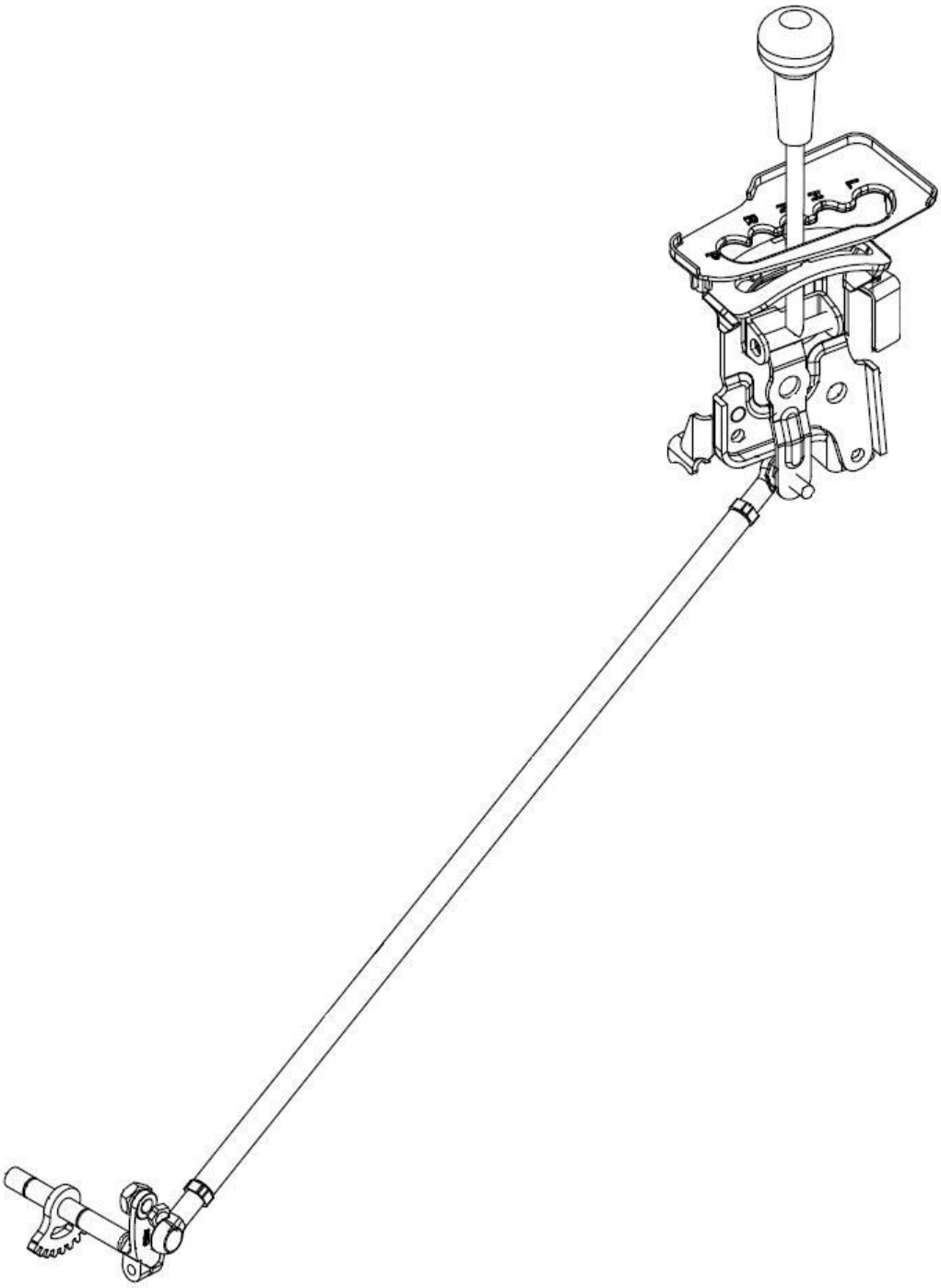


Transmission Gear

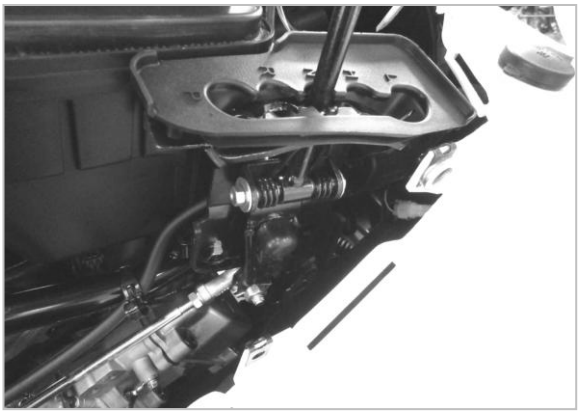
- Check all the gear tooth wear, cracks or other damage.
- Replace if necessary



SHIFT LEVER



SHIFT LEVER

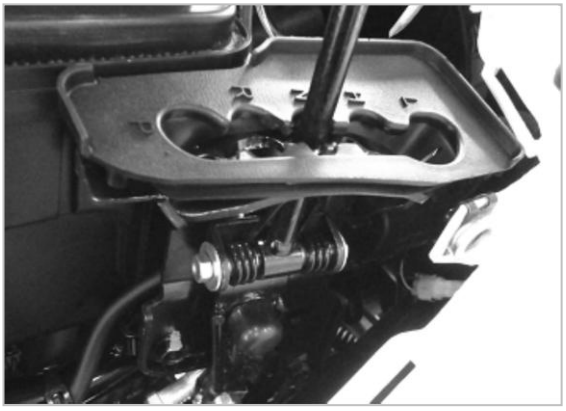


▪.before performing any servicing on the transmission linkage system, be sure the transmission lever is on NEUTRAL position and the parking brake is applied.

▪ During assembly/installation, use the torque values and services products as in the exploded view.

▪.Clean threads before applying a thread locker.

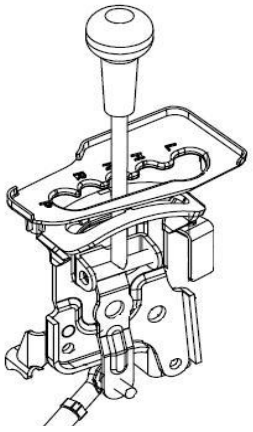
TRANSMISSION LEVER



Shifter Lever Removal

To remove the transmission lever, do the following:

- Place shift lever in NEUTRAL position.
- Apply parking brake.
- Unscrew the shift lever handle.
- Remove the RH side cover and the top cover.
- Detach shift rod from shift lever..
- Detach shift lever support.
- Remove shift lever.



Shift Lever Inspection

▪ Check shift lever for bending or cracks.

▪ Check spring and bushing condition.

▪ Check ball joint condition.

▪ Replace all damaged parts.

Shift Lever Installation

▪ The installation is the reverse of the removal procedure. However, pay attention to the following.

▪ Adjust shift lever handle as per the following illustration.

▪ Check if shift lever works properly in all positions. IF not, please follow below adjustment procedure.

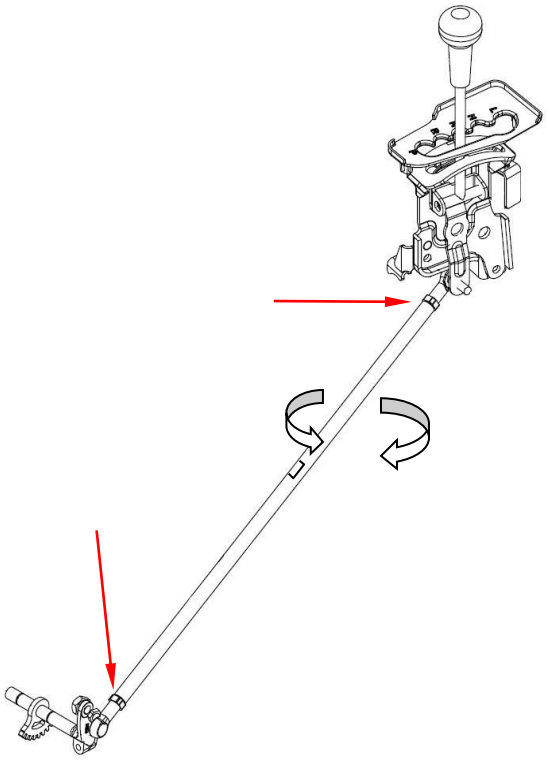
SHIFT ROD

Shift Rod Adjustment

1. Place shift lever in NEUTRAL position.

NOTICE：Move vehicle back and forth to ensure gearbox is seat in neutral position.

2. Secure vehicle using parking brake.
3. Remove side cover.
4. Loosen shift rod adjustment nuts.
5. Turn rod adjuster to center shift lever in neutral notch.

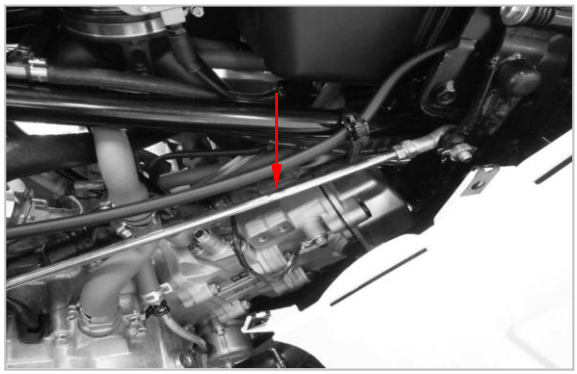


NOTE：Ensure there is the same threaded length each side of rod adjuster.

NOTE：Be aware that a nut has LH threads.

6. Move shift lever in R position then in H position.
7. Place shift lever in NEUTRAL position.
8. Check if shift lever is properly centered in neutral notch. Readjust as required.
9. Test the shifter to confirm that the system works properly in all positions.

NOTE：It may be necessary to realign shift rod ball joints to allow easy movement.



SHIFT PLATE

Shift Plate Removal

***NOTE**：Do not remove shift plate needlessly.*

1. Remove shift rod from shift plate.
2. Trace an index mark on shift plate and shaft.
3. Remove shift plate nut and bolt.
4. Remove shift plate.

Shift Plate Inspection

- Check shift plate for:
- Cracks.
- Bending.
- Spline condition.

Shift Plate Installation

▪ The installation is the reverse of the removal procedure. However, pay attention to the following.

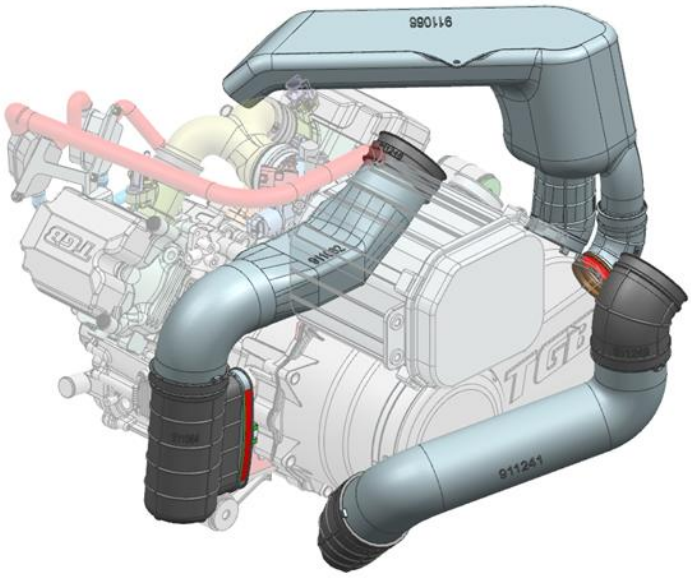
▪ Place gearbox in NEUTRAL position before shift plate installation.

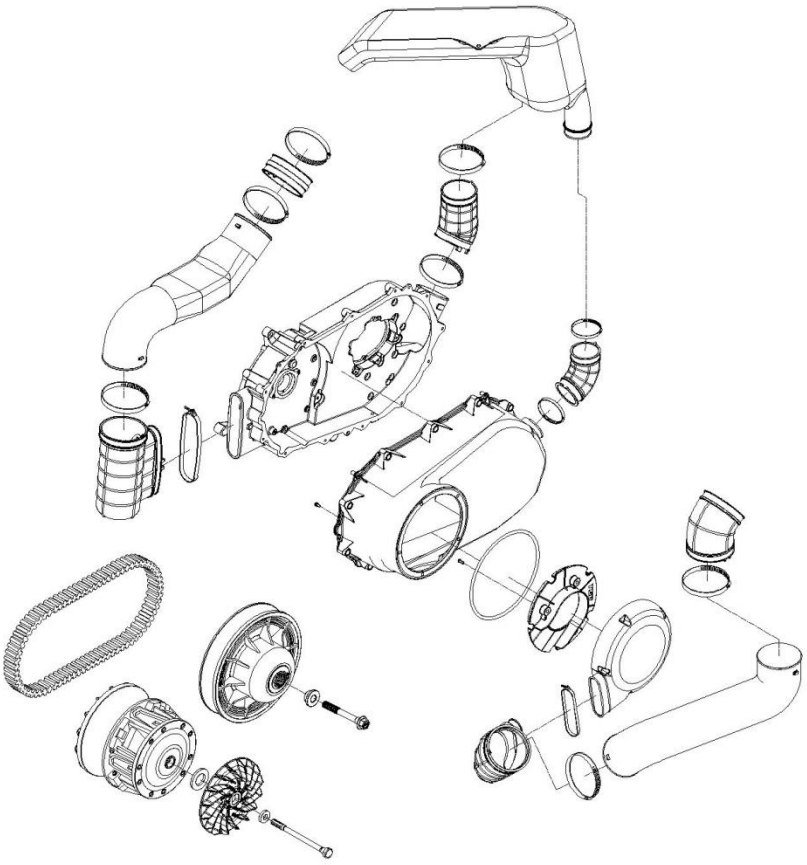
▪ Align shift plate using marks previously traced.

▪ Tighten shift plate nut to specification

TORQUE： 9NM+/- 1 Nm.

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)





CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

GENERAL

NOTE: *For a better understanding, the following illustrations are taken with engine out of vehicle. To perform the following instructions, it is not necessary to remove engine.*

- This CVT is lubrication free. Never lubricate any components except drive pulley one-way clutch.
- During assembly/installation, use the torque values and service products as in the exploded views.
- Clean threads before applying a thread locker.

WARNING

Torque wrench tightening specifications must strictly be adhered to. Locking devices (e.g.: locking tabs, elastic stop nuts, self-locking fasteners, cotter pin, etc.) must be replaced.

CVT COVER

CVT Cover Removal

1. Remove the bolts of CVT cover.

NOTE: *Remove the center top bolt last. These bolts allow to support the cover during removal.*

2. Remove the CVT cover and its gasket.

CVT Cover Installation

- Install the center top bolt first.
- Tighten the CVT cover bolts as criss-cross sequence.

TORQUE: 70 kgf.cm

WARNING

Never touch CVT while engine is running. Never drive vehicle when CVT cover is removed.

WARNING

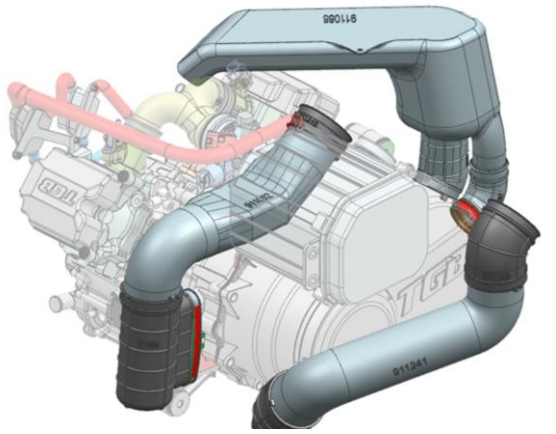
Any drive pulley repairs must be performed by an authorized TGB dealer. Subcomponent installation and assembly tolerance require strict adherence to procedure detailed.

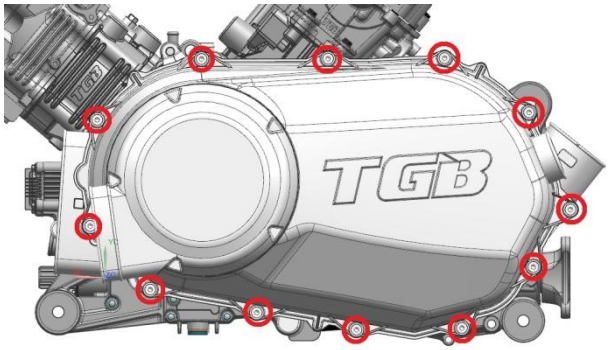
NOTICE: *Never use any type of impact wrench at drive pulley removal and installation.*

WARNING

The clutch assembly is a precisely balanced unit. Never replace parts with used parts from another clutch assembly.

NOTICE: *Always tighten puller by hand to ensure that the drive pulley has the same type of threads prior to fully tightening.*





CVT Draining

If water is present in CVT, it can be drained as follows:

1. Remove drain bolt.
2. Let water drain from CVT.
3. Reinstall drain bolt.

NOTICE: *If any debris entered the CVT, CVT must be cleaned and inspected.*

DRIVE BELT

Drive Belt Removal

NOTICE: *In case of a drive belt failure, the CVT, cover and air outlet must be cleaned.*

- Remove CVT COVER.
- Open driven pulley with GEAR LOCK PIN.
- Screw tool in the threaded hole of driven pulley and tighten to open the pulley.
- To remove belt, slip the belt over the top edge of fixed sheave, as shown.

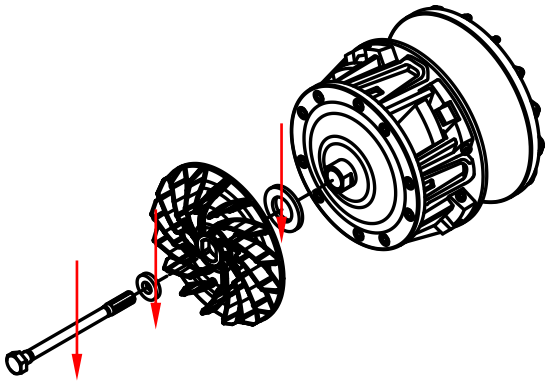
Drive belt Installation

- For installation, reverse the removal procedure.
- Pay attention to following details.
- The maximum drive belt life span is obtained when the drive belt has the proper rotation direction. Install it so that the arrow printed on belt is pointing towards front of the vehicle, viewed from top.

DRIVE PULLEY

DRIVE PULLEY REMOVAL

- Remove DRIVE BELT.
- Remove the colling fan bolt 、washers and colling fan as shown.



- Using special tool to loose and remove the drive pulley assembly.
- Prior to removing the drive pulley., mark sliding sheave and governor cup to ensure correct indexation at reinstallation.

NOTICE: *Do not lean the tool hook on the slider shoe guides.*

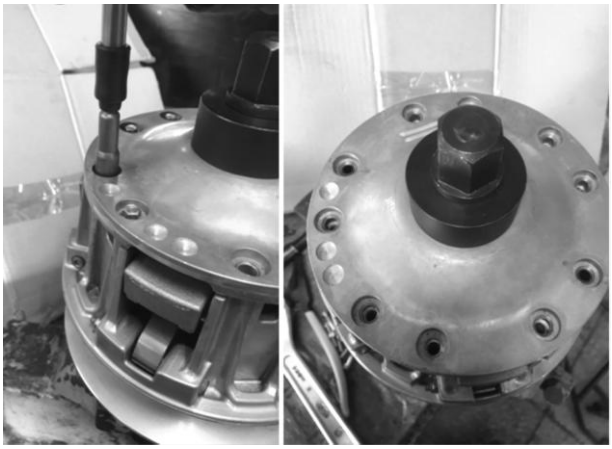
TUNER HAFT COVER REMOVAL

- Install the drive pulley on the special tool fixing seat #560020A as shown.
- Screw in the nut to the end.
- Mark the align line used for installation.

- Loosen ten bolts on the tuner cover.

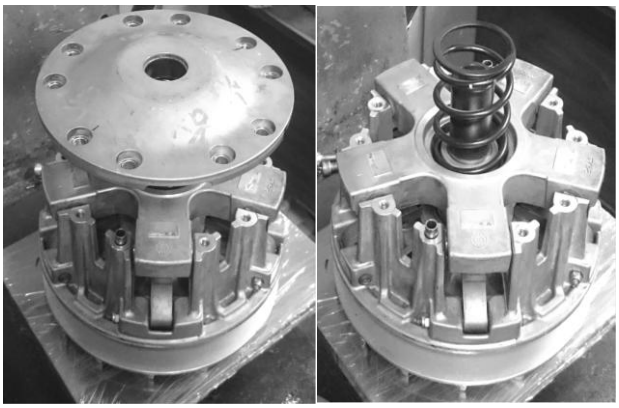
NOTE: *the bolts discard after reinstall for twice.*

Always use new bolts after disassemble twice.



- remove tuner cover.
- Remove the spring.

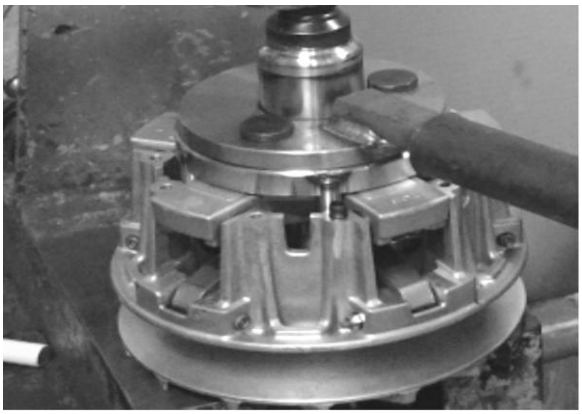
NOTICE: *Make sure to use the specified tool. Using another tool will damage the crankshaft threads.*



GOVERNOR CUP REMOVEAL

▪ Using special tool #560019 loose and remove the governor cup.

NOTICE: *During removal, press and hold the governor cup.*



Centrifugal lever Replacement

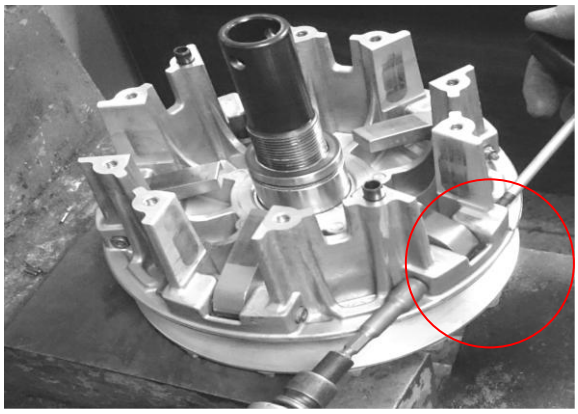
Removal

▪ Loosen and remove the bolts and nuts on the centrifugal lever.

▪ Replace new centrifugal lever.

▪ For installation, reverse the removal order.

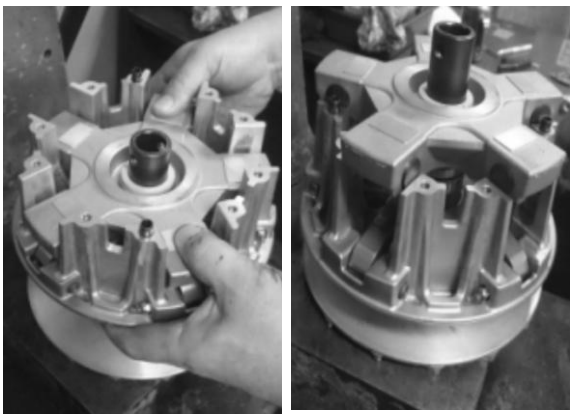
TORQUE:44~56kgf-cm.



GOVERNOR CUP INSTALLATION

▪ For installation, reverse the removal order.

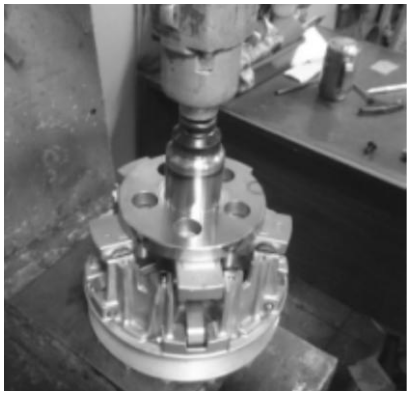
▪ Using hand lift up the sliding sheave and install the governor cup.



▪ Install the special tool #560019 on the top of centrifugal cop.

▪ Tighten the centrifugal cup.

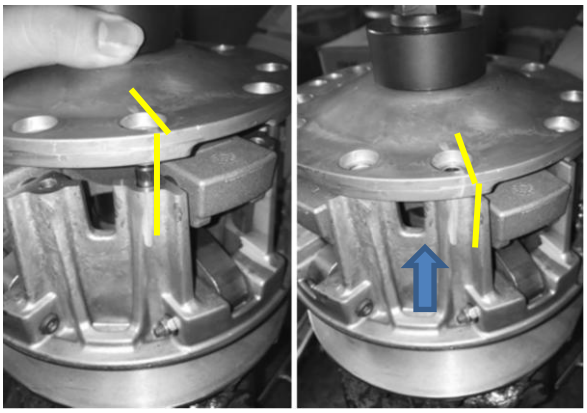
TORQUE: 2000~2500kgf-cm.



TUNER HAFT COVER INSTALLATION

- For installation, reverse the removal order.
- Install the spring.
- Install the special tool and using wrench press the tuner cover to the end.

- Check the mounting area should align.
- Raise up the bottom and guide the pin and cover at right position as shown.
- Tighten the bolts on the tuner cover, follow the cross sequence.



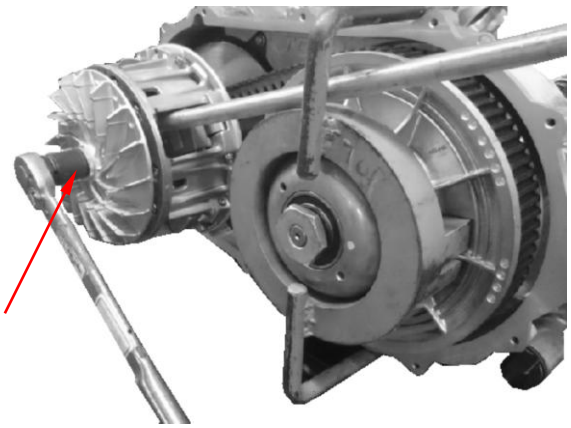
TORQUE: 80~120kgf-cm.

NOTE: *the bolts discard after reinstall for twice.*

Always use new bolts after disassemble twice.

DRIVE PULLEY INSTALLATION

- For installation, reverse the removal procedure.
- Apply **LOCTITE 263** on the end of thread.
- Pay attention to the following details.



WARNING

Do not apply antiseize or any lubricant on crankshaft and drive pulley tapers.

NOTICE: *Never use any type of impact wrench at drive pulley removal and installation.*

- Using mounting special tool lock the drive pulley.

NOTICE: *Do not lean the tool hook on the slider shoe guides.*

- Install the cooling fan and washers.
- Tighten drive pulley screw to specified torque.

TORQUE: 700 ~750 kgf.cm

DRIVEN PULLEY

Driven Pulley Removal

- Remove DRIVE BELT.
- Using the DRIVEN CLUTCH HOLDER, hold the driven pulley and loosen the driven pulley screw.

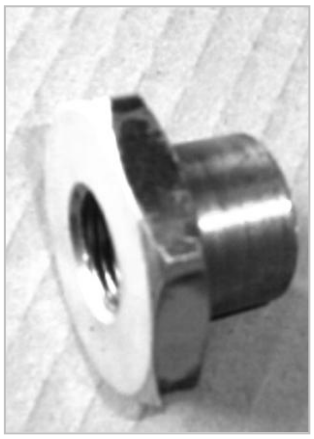
NOTE: *Do not unscrew the driven pulley screw completely.*

- Apply axial pressure with your hand on driven pulley and maintain during screw removal.
- Remove driven pulley screw.
- Discard locking washer.

CAUTION

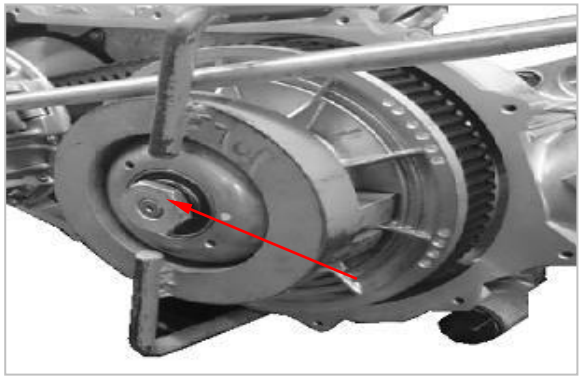
Driven pulley is spring loaded. Hold driven pulley tight and slowly remove the driven pulley screw to release spring tension.

- Remove the driven pulley with the spring and the cam.



Driven Pulley Installation

- For installation, reverse the removal procedure.
- Always replace NEW locking washer.
- Apply LOCTITE 263 on the end of thread.

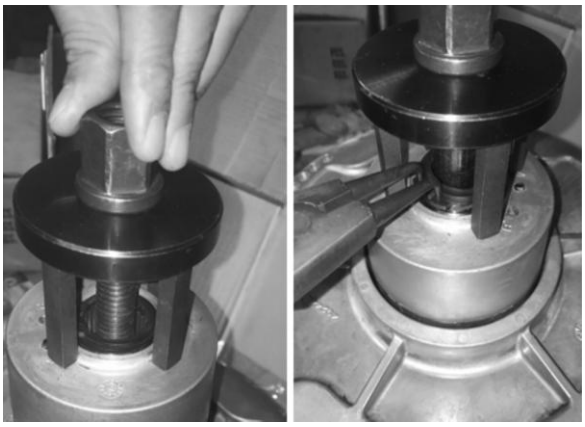


TORQUE: 1000~1200 kgf.cm

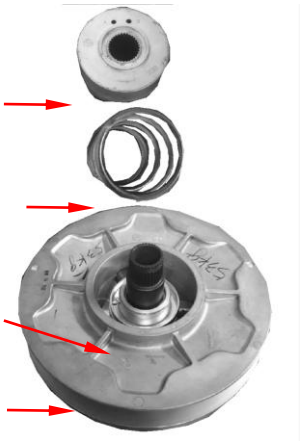
DRIVEN PULLEY DISASSEMBLY

- Install the special #560017 on the top of cam.

- Screw in the special tool #560017 down and remove the two C-clips.

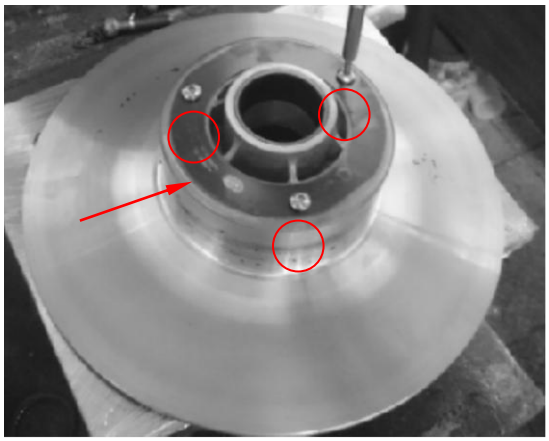


- Disassemble the cam, spring, spring seat and outer haft sheave.

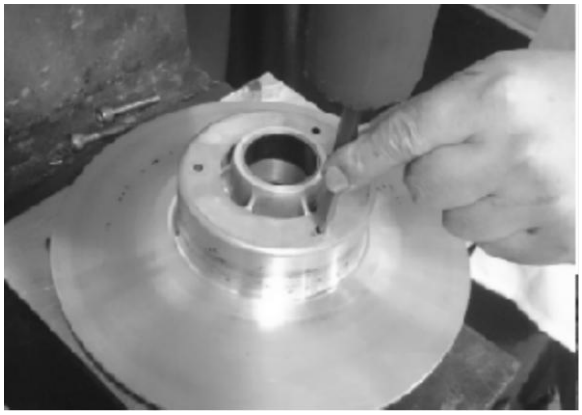


Slider Shoe Replacement

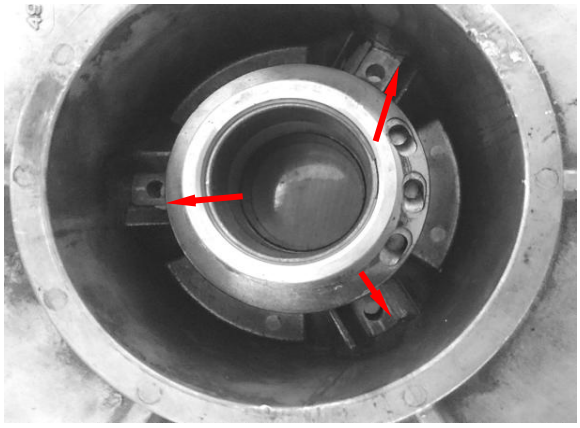
- Remove three screws and washer from the back side of outer haft sheave.



- Using rubber hammer push out the slider shoe.

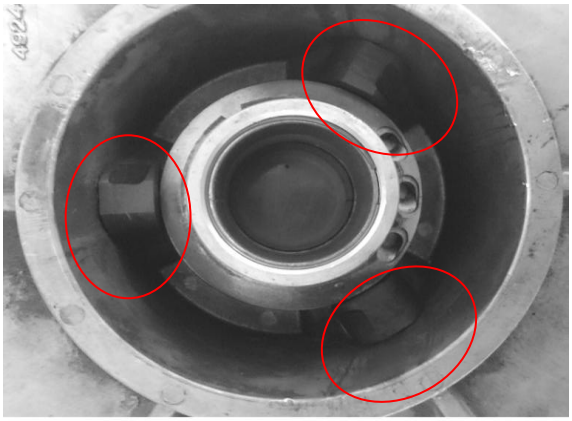


▪ Replace and install new slider shoe.



CAUTION

The slider shoe have two side, the flat side should toward the center.



▪ Tighten the screws and washer.

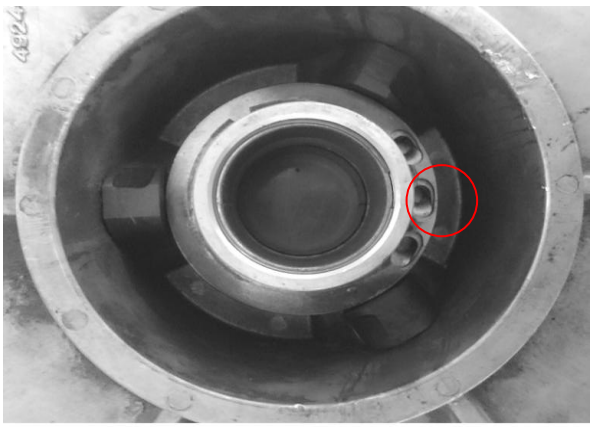
***NOTE**: Apply **LOCTIE 263** on the end of thread before install.*

TORQUE: 25~35 kgf.cm

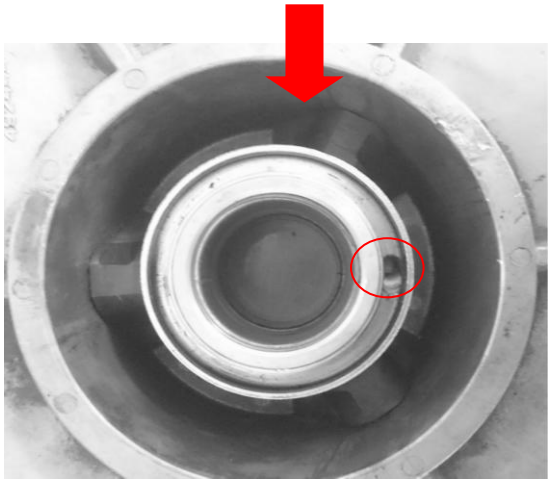
DRIVEN PULLEY ASSEMBLY

For assemble the driven pulley, the sequence as follow:

▪ Install the spring seat into the outer haft sheave.

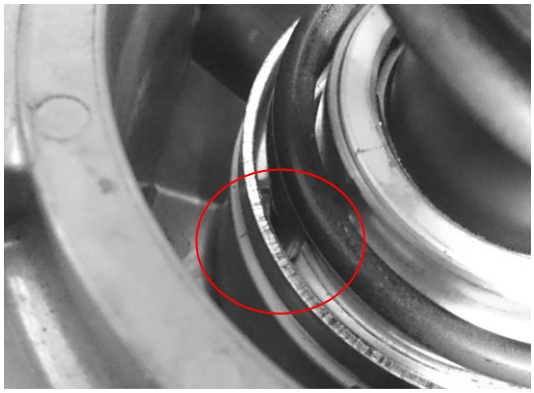


NOTE: *The hole of spring seat should align the center hole of outer haft sheave.*



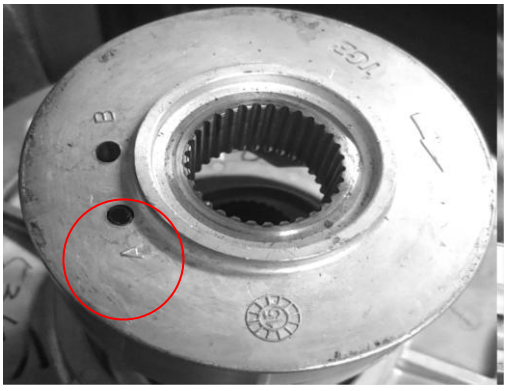
▪ Install the spring on the spring seat.

NOTE: *the bottom end of spring should insert into the hole of spring seat.*



▪ Install the cam on the spring.

NOTE: *the upper end of spring should insert into the hole of cam with mark* ***"A".***



- Install two “C-clip” ① and special tool #560017 ②.
- Using special tool #560017 screw-in push down.

NOTE: *The flat surface of should face outward.*

CAUTION

During push down, you should counter-clockwis turn the outer haft sheave to let the spline of car align to the shaft.

NOTE: *If the spline not aligns the shaft, the cam cannot push down.*

- When the cam on the position, the haft sheave cannot turn clockwise. Only can turn counter-clockwise.

- Install two C-clips.

▪ Adjust the open area of two C-clips to perpendicular direction as shown.

▪ Ensure the open area of two C-clips to perpendicular direction and same distance as shown.