



Multi-Terrain Vehicle  
**(MTV)**  
**Service Manual**



All information contained within this publication is based on the latest product information at the time of publication. Due to constant improvements in the design and quality of production components, some minor discrepancies may result between the actual vehicle and the information presented in this publication.

**Model 1500**  
(Gas Powered)



This service manual contains the technical data of each component inspection and repair for the MTV (Multi-Terrain Vehicle) by Bad Boy Mowers. The manual is shown with illustrations and focused on “Service Procedures,” “Operation Key Points,” and “Inspection Adjustment” which provides technician with service guidelines.

All information contained within this publication is based on the latest product information at the time of publication. Due to constant improvements in the design and quality of production components, some minor discrepancies may result between the actual vehicle and the information presented in this publication.

Depictions and/or procedures in this publication are intended for reference use only. No liability can be accepted for omissions or inaccuracies. Any reprinting or reuse of the depictions and/or procedures contained within, whether whole or in part, is expressly prohibited.

**Bad Boy, Inc.**  
**102 Industrial Drive**  
**Batesville, Arkansas 72501**  
**United States of America**



## HOW TO USE THIS MANUAL

This service manual describes basic information of different system parts and system inspection & service for the Bad Boy MTV.

In addition, please refer to the manual contents for details on servicing, inspecting and adjusting the Bad Boy MTV.

<b><u>Chapter 1</u></b>	<b><u>Page 4</u></b>	covers general information and troubleshooting diagnosis.
<b><u>Chapter 2</u></b>	<b><u>Page 24</u></b>	covers the service maintenance information and special tools manual.
<b><u>Chapters 3 - 11</u></b>	<b><u>Page 36</u></b>	cover engine and driving systems.
<b><u>Chapter 12</u></b>	<b><u>Page 100</u></b>	covers the cooling system.
<b><u>Chapters 13 -14</u></b>	<b><u>Page 107</u></b>	covers the frame and body assembly.
<b><u>Chapter 15</u></b>	<b><u>Page 122</u></b>	covers the electrical equipment and the wiring diagram.

<b>Chapter</b>	<b>CONTENTS</b>
1	GENERAL INFORMATION
2	SERVICE MAINTENANCE INFORMATION
3	LUBRICATION SYSTEM
4	FUEL SYSTEM
5	ENGINE REMOVAL
6	CYLINDER HEAD/VALVE
7	CYLINDER/PISTON
8	“V” TYPE BELT DRIVING SYSTEM
9	FINAL DRIVING MECHANISM
10	ALTERNATOR / STARTING CLUTCH
11	CRANKSHAFT / CRANKCASE
12	COOLING SYSTEM
13	FRONT BRAKE AND FRONT WHEEL
14	STEERING / FRONT SUSPENSION
15	REAR BRAKE/REAR WHEEL / REAR CUSHION
16	ELECTRICAL EQUIPMENT
17	ELECTRICAL DIAGRAM



## **CHAPTER 1 GENERAL INFORMATION/TROUBLESHOOTING**

**General Safety** .....pages 6–7

**Service Precautions** .....page 8–11

**Specifications** .....pages 12–13

**Torque Values** .....pages 14 –15

**Troubleshooting/Diagnosis** .....page 16 – 23

### **General Safety**

#### **Carbon Monoxide Warning**

If you must run your engine, ensure the place is well ventilated. Never run your engine in a closed area.

---

**CAUTION**

Exhaust contains toxic gas which may cause unconsciousness and even result in death.

---

#### **Gasoline**

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

---

**CAUTION**

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

---

**CAUTION**

**Used Engine Oil** - 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 used oil beyond reach of children.

---



---

**CAUTION**

**Hot Components** - 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.

---

**CAUTION**

**Battery** - Battery emits explosive gases; flame is strictly prohibited. Keep the work area well ventilated when charging the battery. The battery contains sulfuric acid (electrolyte) which can cause serious burns, so be careful. Avoid contact with your eyes and skin. If you get battery acid on your skin, wash immediately with water. If you get battery acid in your eyes, wash immediately with water and then see a doctor.

---

**Brake shoe quick tip:**

Do not use an air hose or a dry brush to clean components of the brake system; use a vacuum cleaner or equivalent to avoid flying dust.

---

**CAUTION**

**Brake Shoe Caution** - Inhaling brake shoe or pad ash or dust may cause disorders or cancer.

---

**CAUTION**

**Brake Fluid Caution** - Spilling brake fluid on painted, plastic, or rubber parts may cause damage to the parts. Place a clean towel on the above-mentioned parts for protection when servicing the brake system. Keep the out of reach of children. Brake fluid is hygroscopic which means it absorbs moisture from the surrounding air. For this reason, we recommend that the reservoir cap is always secured. When filling the reservoir, leave the cap off only long enough to fill the reservoir to the appropriate level then re-secure the cap.

### Service Precautions

Always use with Bad Boy genuine parts and recommended oils. Using non-recommended parts for the Bad Boy MTV may damage the Vehicle.

Special tools are designed for removal and installation of engine components without damage. Using the wrong tools may result in damage to the parts.

When servicing this MTV, be sure to select appropriate tools. This machine uses both Metric and English system bolts, screws, nuts, etc. Using improper tools can damage components.

Clean the outside of the parts or the cover before removing it from the MTV. Otherwise, dirt and deposits accumulated on the part's surface may fall into the engine, chassis, or brake system and 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 cable damage or premature wear.

Old rubber parts may become deteriorated and prone to damage 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, work with a diagonal pattern and 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 assembled order and tie them together with wire for ease of installation later.

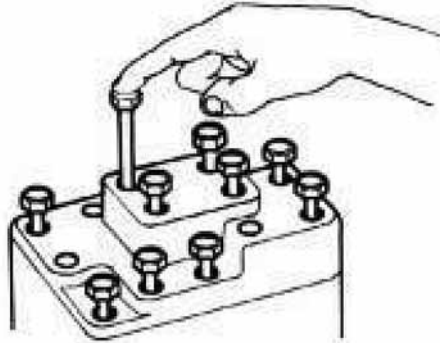
Note the position of components before disassembling them to ensure they will be reassembled in correct order. (depth, distance or position).

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



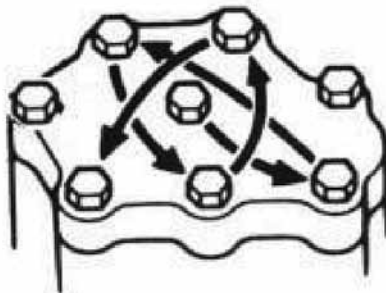
## General Information

If 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,

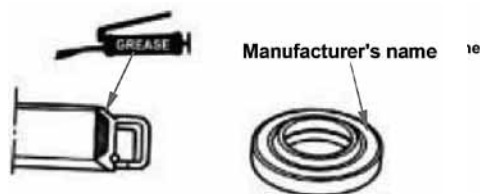


Insert the bolt into the hole to compare its length with other bolts, if its length out side the hole is the same with other bolts, it is a correct bolt. Bolts for the same assembly should have the same length.

Tighten assemblies with different dimension fasteners as follows: Tighten all the fasteners with fingers, then work 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.



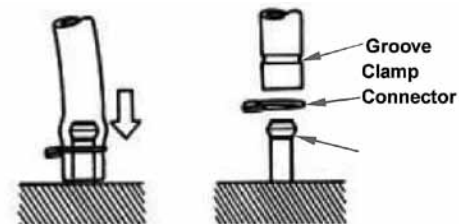
When oil seal is installed, fill the groove with grease, install the oil seal with the name of the manufacturer facing outside, and check the shaft on which the oil seal is to be installed for smoothness and for burrs that may damage the oil seal.



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

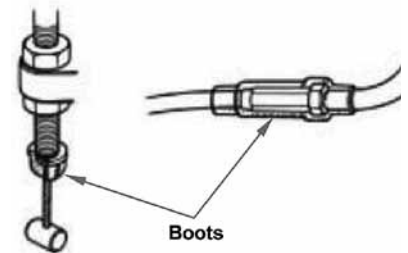


The ends of rubber hoses for fuel, vacuum, or coolant should be pushed as far as they can go to their connections

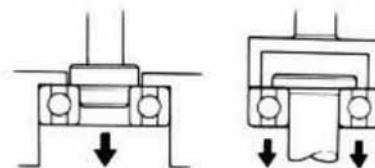


so that there is enough room below the enlarged ends for tightening the clamps.

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



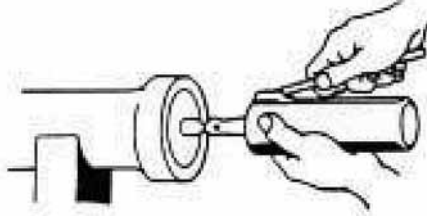
The tool should be pressed against two (inner and outer) bearing races when removing a ball bearing. Damage may result if the tool is pressed against only one race (either inner race or outer race). In this case, the bearing should be replaced. To avoid damaging the bearing, use equal force on both races.



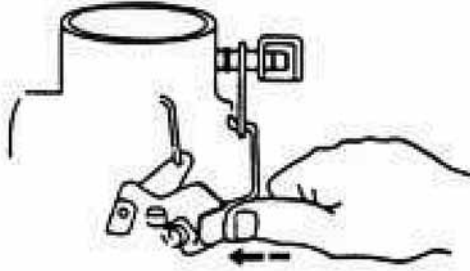
Both of these examples can result in bearing damage.

## General Information

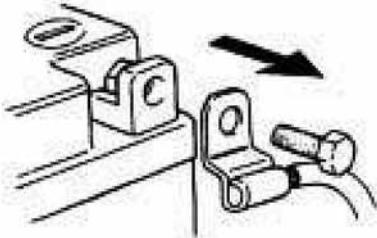
Lubricate the rotation faces with specified lubricant on the lubrication points before assembling.



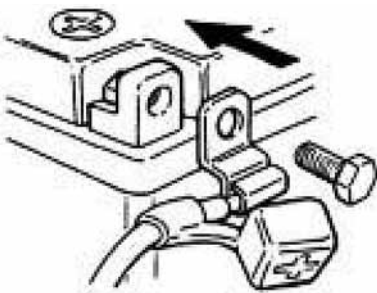
Check the positions and operation of installed parts is in correct and properly.



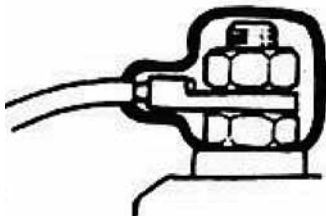
Before battery removal make sure to remove the battery negative (-) cable first. Note - make sure tools like open-ended wrenches do not make contact with the body. This prevents the circuit from shorting and creating spark.



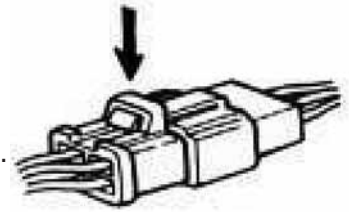
After service is completed, make sure all connection points are secured. Battery positive (+) cable should be connected first. The two battery posts have to be greased after connected the cables.



Make sure that the battery post caps are placed in their proper position after the battery posts have been serviced.



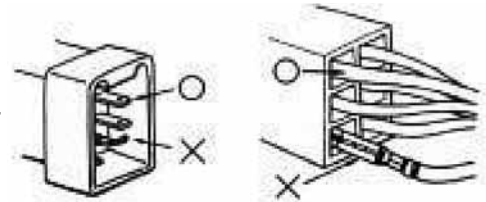
When separating a connector, its locker needs to be unlocked first. Then, conduct the service operation.



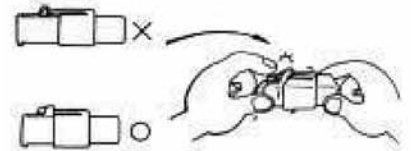
Do not pull the wires when disconnecting a connector or wires. Hold the connector body.



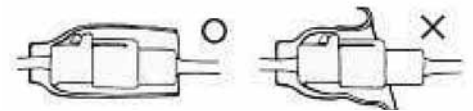
Check to see if the connector pins are bent or loose.



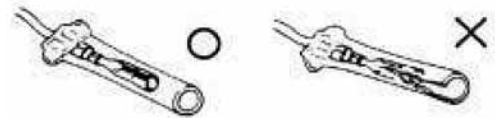
Insert the connectors completely. If there are two locks on two connector sides, make sure the locks are locked in properly. Check to see if any wires are loose.



If the connector is covered by a twin connector boot, then secure it properly.



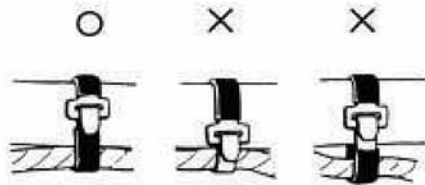
Before terminal connection, check to see if the boot is cracked or the terminal is loose.



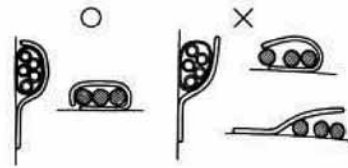
Insert the terminal completely.



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



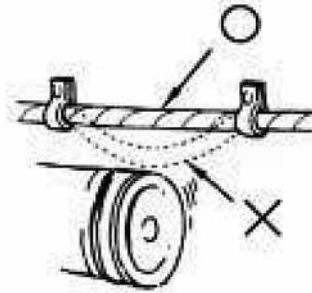
Wire band and wire harness must be clamped and secured properly.



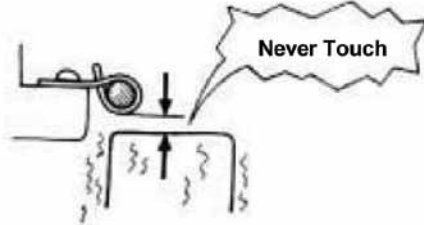
Do not squeeze wires against the weld or its clamp.



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

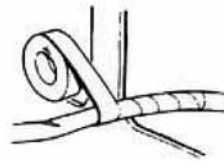
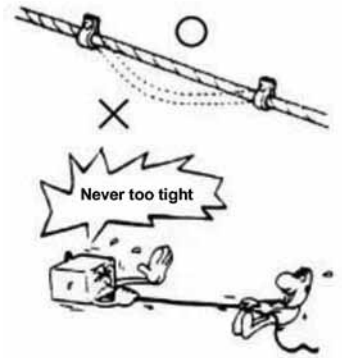


Keep wire harnesses far away from hot parts.



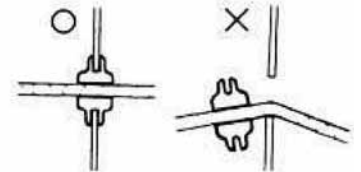
Route wire harnesses to avoid sharp edges or corners and also avoid the projected ends of bolts and screws.

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

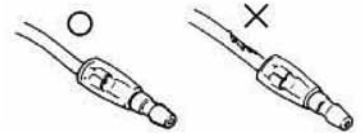


Protect wires and wire harnesses with electrical tape or tube to protect them from contact with a sharp edge or corner. Thoroughly clean the surface where tape is to be applied.

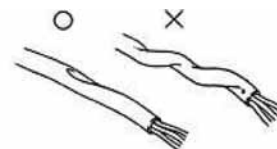
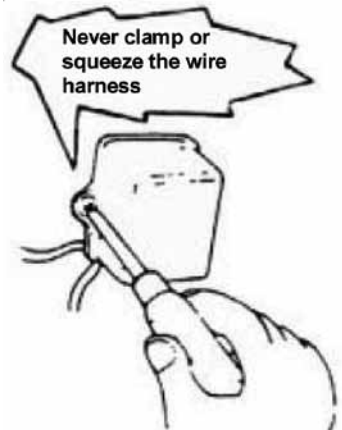
Secure the rubber boot firmly when applying it to wire harness.



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



Never clamp or squeeze the wire harness while installing other components.



Do not let the wire harness become twisted during installation.

Before operating a test instrument, operator should read the operation manual for the instrument. Conduct the test in accordance with the instructions. Clean rust with sand paper on connector pins/ terminals if found. Conduct connection operation.

## **Specifications**

### ***Engine:***

Type .....	4 Stroke Engine
Installation and Arrangement....	Vertical, Below Center, Incline
Fuel Used .....	87 Octane Unleaded
Cycle/Cooling .....	4-Stroke Water Cooled
Displacement .....	403.1
Compression Ratio .....	9.2 : 1
Maximum HorsePower .....	28 / 6500rpm
Maximum Torque .....	18.8 ft.lbs / 4000rpm
Ignition .....	C.D.I
Starting System .....	Electrical Starter with backup recoil starter
Air Filtration .....	Paper

### ***Cylinder:***

Bore .....	Ø 86mm
Stroke .....	69.4 mm
Number/Arrangement .....	Single Cylinder

### ***Suspension System:***

Front .....	Double Arm
Rear .....	Unit Swing

### ***Tire Specifications:***

Front .....	25 x 8 x 12
Rear .....	25 x 10 x 12
<b>Rim is made of Steel</b>	

Muffler.....Expansion & Pulse Type

Exhaust Pipe Position and Direction .....Right side, and Backward Exhaust Concentration

Lubrication System.....Forced Circulation & Splashing

### ***Solid Particulate:***

CO ..... Below 7.0g/km  
HC ..... Below 1.5g/km  
NOx..... Below 0.4g/km

E.E.C. .... None  
P.C.V..... None  
Catalytic Reaction Control System..... None

### ***Brake System:***

Front ..... Disk (Ø180mm)  
Rear ..... Disk (Ø200mm)

### ***Performance:***

Max Speed ..... Up to 55 mph  
Climb Ability ..... Below 25°

### ***Reduction:***

Primary Reduction ..... Belt  
Secondary Reduction..... Gear / Shaft  
Clutch ..... Centrifugal, wet-type  
Transmission ..... C.V.T., Auto Speed Change

## Torque Values

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

### Standard Torque Values

Type	Tighten Torque	Type	Tighten Torque
5 mm bolt	3-4 ft/ lbs	5 mm screw	2.5-3.5 ft/lbs
6 mm bolt	6-8 ft/ lbs	6 mm screw, SH nut	5-7 ft/lbs
8 mm bolt	13-18 ft/lbs	6 mm bolt, nut	7-10 ft/lbs
10 mm bolt	22-29 ft/ lbs	8 mm bolt, nut	17-21 ft/lbs
12 mm bolt	36-44 ft/ lbs	10 mm bolt, nut	25-33 ft/lbs

### Engine Torque Values

Item	QTY	THREAD DIAMETER	TORQUE VALUE	REMARKS
Cylinder stud bolt	4	10	22-29 ft/lbs	
Cylinder head nut	4	8	17-21 ft/lbs	
Cylinder head right bolt	2	8	15-17 ft/lbs	
Cylinder head side cover bolt	2	6	7-10 ft/lbs	
Cylinder head cover bolt	4	6	7-10 ft/lbs	
Cylinder head stud bolt (inlet pipe)	2	6	7-10 ft/lbs	
Cylinder head stud bolt (EX. pipe)	2	8	17-21 ft/lbs	
Air inject pipe bolt	4	6	7-10 ft/lbs	
Tappet adjustment screw nut	4	5	5-7 ft/lbs	Apply Oil To Thread
Spark plug	1	10	7-10 ft/lbs	
Tensioner lifter bolt	2	6	7-10 ft/lbs	
Carburetor insulator bolt	2	6	5-7 ft/lbs	
Oil pump screw	2	3	2 ft/lbs	
Water pump impeller	1	7	7-10 ft/lbs	
Engine left cover bolt	9	6	8-12 ft/lbs	
Engine oil draining bolt	1	12	25-33 ft/lbs	
Engine oil strainer cap	1	30	9-12 ft/lbs	
Mission draining bolt	8	8	8-12 ft/lbs	
Mission filling bolt	1	12	25-33 ft/lbs	
Shift drum fixing bolt	1	14	25-33 ft/lbs	
Clutch driving plate nut	1	28	36-44 ft/lbs	
Clutch outer nut	1	14	36-44 ft/lbs	
Drive face nut	14	14	60-75 ft/lbs	
ACG. Flywheel nut	1	14	36-44 ft/lbs	
Crankcase bolts	7	6	6-8 ft/lbs	
Mission case bolt	7	8	20-22 ft/lbs	

## Frame Torque Values

ITEM	QUANTITY	THREAD DIAMETER	TORQUE VALUE	REMARKS
Knuckle nut	2	10	36	
Tie rod lock nut	4	10	26	
Front wheel nut	8	10	30	
Front axle castle nut	2	14	36	
Rear axle castle nut	2	14	36	
Rear wheel nut	8	10	30	
Engine hanger nut	4	12	34	
Rear axle holder bolt	4	12	50	
Drive gear bolt	2	10	34	
Driven gear nut	4	10	34	
Swing arm pivot bolt	1	14	50	
Front suspension arm nut	4	10	36	
Front / Rear cushion mounting bolt	6	10	30	
Brake hose bolt	13	10	20	
Brake disk mounting bolt	11	8	26	
Air-bleed valve	3	5	3.5	
Exhaust muffler mounting bolt	2	8	20	
Exhaust muffler connection nut	2	7	20	

## Troubleshooting

---

### A. Engine is hard to start or cannot be started

---

**Check and Adjustment:** Loosen carburetor drain bolt to see if there is gasoline inside the carburetor.

**Fault Condition:** If no fuel is supplied to carburetor then check the following probable causes. IF FUEL SUPPLY IS SUFFICIENT CONTINUE TO NEXT CHECK AND ADJUSTMENT.

**Probable Causes:**

- Fuel tank valve turned off
- No fuel in fuel tank
- Check fuel lines, fuel tank, carburetor and intake vacuum.
- Float valve clogged
- Lines in fuel tank evaporation system clogged
- Malfunction of fuel pump
- Loosen or damaged fuel pump vacuum hose
- Fuel filter clogged
- Closed fuel tank cap

---

**Check and Adjustment:** Remove spark plug, install it into spark plug cap, and perform a spark test against engine ground. Check to make sure it sparks properly. IF SPARK PLUG IS FUNCTIONING PROPERLY CONTINUE TO NEXT CHECK AND ADJUSTMENT.

**Fault Condition:** Weak sparks or no spark at all.

**Probable Causes:**

- Malfunction of spark plug
- Spark plug foul
- Malfunction of CDI set
- Malfunction of AC generator
- Ignition coil is in open or short circuit
- Ignition coil leads open or short circuit
- Malfunction of main switch

---

**Check and Adjustment:** Perform cylinder compression test. IF CYLINDER COMPRESSION TEST IS NORMAL CONTINUE TO NEXT CHECK AND ADJUSTMENT.

**Fault Condition:** Low Compression pressure or no pressure.

**Probable Causes:**

- Piston ring seized
- Malfunction of cylinder valves
- Worn cylinder and piston ring
- Cylinder gasket leak



---

**Check and Adjustment:** If there are no signs of ignition CONTINUE TO NEXT CHECK AND ADJUSTMENT. If there are signs of ignition, but engine cannot be started then check these probable causes:

**Probable Causes:**

- Malfunction of throttle valve operation
- Air leak in intake manifold
- Incorrect ignition timing

---

**Check and adjustment:** Remove the spark plug and check it again. IF SPARK PLUG IS DRY CONTINUE TO NEXT CHECK AND ADJUSTMENT.

**Fault Condition:** Spark plug is Wet

**Probable Causes:**

- Fuel level in carburetor too high
- Malfunction of throttle valve operation
- Throttle valve opening too wide

---

**Check and Adjustment:** Remove carburetor and connect a hose onto fuel inlet. Then blow air into the hose.

**Check and Adjustment:** Check to see if air is blowing

**Fault Condition:** Clogged

**Probable Cause:** Malfunction of float meter.

---

## **B. Sluggish Engine, Lack of Acceleration, Lack of Power**

---

Try gradually accelerating to check engine speed.

**Check and Adjustment:** Check to see if engine speed can be increased.

**Fault Condition:** Engine speed cannot be increased.

**Probable Causes:**

- Air cleaner clogged
- Poor fuel supply
- Lines in fuel tank evaporation system clogged
- Exhaust pipe clogged
- Fuel nozzle clogged in carburetor.
- Ignition timing incorrect

---

**Check and Adjustment:** Check ignition timing using ignition timing light.

**Fault Condition:** Incorrect engine timing.

**Probable Causes:**

- Malfunction of CDI
- Malfunction of AC alternator

---

**Check and Adjustment:** Check cylinder compression pressure (using compression pressure gauge)

**Fault Condition:** No compression pressure

**Probable Causes:**

- Cylinder & piston ring worn out
- Cylinder gasket leaked
- Valve deterioration
- Seized piston ring

---

**Check and Adjustment:** Check to see if carburetor jet is clogged.

**Fault Condition:** Clogged

**Probable Causes:** Remove foreign object

---

**Check and Adjustment:** Remove spark plug.

**Fault Condition:** Fouled or Discolored

**Probable Causes:**

- Remove dirt
- Incorrect spark plug heat range

---

**Check and Adjustment:** Check to see if the engine is overheating

**Fault Condition:** Engine Overheating

**Probable Causes:**

- Piston and cylinder worn out
- Lean mixture
- Poor fuel quality
- Too much carbon deposited in combustion chamber
- Ignition timing too advanced
- Poor circuit on the cooling system

---

**Check and Adjustment:** Continually drive in acceleration or high speed.

**Fault Condition:** Engine Knocking

**Probable Causes:**

- Too much carbon deposited in combustion chamber
- Lean mixture
- Poor fuel quality
- Ignition timing too advanced

---

### **C. Engine runs Sluggish at low speeds or idling**

---

**Check and Adjustment:** Check ignition timing using ignition lamp

**Fault Condition:** Abnormal

**Probable Causes:**

- Incorrect ignition timing (malfunction of CDI or AC alternator)

**Check and Adjustment:** Adjust the air screw of the carburetor.

**Fault Condition:** Poor engine performance

**Probable Causes:**

- Rich mixture (tighten the screw)
- Lean mixture (loosen the screw)

**Check and Adjustment:** Air leak through carburetor gasket

**Fault Condition:** Air leak

**Probable Causes:**

- Bad heat insulation gasket
- Carburetor loose
- Bad intake gasket
- Bad carburetor O-ring
- Vacuum hose leak

---

**Check and Adjustment:** Remove spark plug, install spark plug into spark plug cap and perform spark test against engine ground

**Fault Condition:** Poor spark

**Probable Causes:**

- Spark plug fouled
- Malfunction of CDI
- Malfunction of AC generator
- Malfunction of ignition coil
- Open or short circuit in spark plug leads
- Malfunction of main switch

---

### **D. Engine runs Sluggish at high speeds**

---

---

**Check and Adjustment:** Check ignition timing.

**Fault Condition:** Abnormal

**Probable Causes:**

- Malfunction of CDI
- Malfunction of AC alternator

---

**Check and Adjustment:** Check fuel supplying system in fuel bowl

**Fault Condition:** Abnormal

**Probable Causes:**

- Insufficient fuel in fuel tank
- Fuel filter clogged
- Restricted fuel tank vent

---

**Check and Adjustment:** Check if carburetor is clogged

**Fault Condition:** Clogged

**Probable Causes:**

- Clean Carburetor

---

## E. Clutch & Driving Pulley

---

**Fault Condition:** Engine can be started but MTV can not be moved.

**Probable Causes:**

- Shift cable is out of adjustment.
- Drive belt worn out or deformation
- Ramp plate of movable drive face damaged
- Driving pulley spring broken
- Clutch weights broken
- Drive slide-shaft gear groove broken
- Transmission gear damaged

---

**Fault Condition:** Engine running and misfires as MTV initially moves forward or jumps suddenly (rear wheel rotating as engine in running).

**Probable Causes:**

- Clutch weights spring broken
- Clutch outer stuck with clutch weights
- Connection parts in clutch and shaft worn out or burned

---

**Fault Condition:** Poor initial driving (Poor climbing performance)

**Probable Causes:**

- Drive belt worn out or deformed
- Weight roller worn out
- Movable drive face shaft worn out
- Driven pulley spring deformation
- Driven pulley shaft worn out
- Grease in drive belt and driven face

---

## F. Poor Handling

---

**Fault Condition:** Steering is heavy.

**Probable Causes:**

- Damaged steering Joint
- Damaged steering shaft bushing

---

**Fault Condition:** One wheel is wobbling

**Probable Causes:**

- Bent rim
- Improperly installed wheel hub
- Excessive wheel bearing play
- Bent swing arm
- Bent frame
- Swing arm pivot bushing excessive play
- Worn or bent axle

---

**Fault Condition:** Vehicle pulls to one side.

**Probable Causes:**

- Bent tie-rod
- Incorrect tie-rod adjustment
- Air pressure incorrect
- Improper wheel alignment
- Bent frame

---

### G. Loss of Power

---

**Check and Adjustment:** Raise wheels off ground and spin by hand.

**Fault Condition:** Abnormal - don't spin freely

**Probable Causes:**

- Brake dragging
- Damaged wheel bearing
- Wheel bearing needs lubrication

---

**Check and Adjustment:** Check tire pressure

**Fault Condition:** Abnormal - low

**Probable Causes:**

- Punctured tire
- Faulty tire valve

---

**Check and Adjustment:** Accelerate lightly to see if engine speed can be increased.

**Fault Condition:** Abnormal

**Probable Causes:**

- Fuel / air mixture ratio too rich or lean
- Clogged in air cleaner
- Clogged in muffler
- Restricted fuel flow
- Clogged fuel tank cap breather hole

---

**Check and Adjustment:** Check ignition timing

**Fault Condition:** Abnormal

**Probable Causes:**

- Faulty pulse generator
- Faulty CDI unit

---

**Check and Adjustment:** Test cylinder compression

**Fault Condition:** Abnormal

**Probable Causes:**

- Leaking head gasket
- Worn cylinder and piston rings

---

**Check and Adjustment:** Check Carburetor

**Fault Condition:** Clogged

**Probable Causes:**

- Needs Cleaned

---

**Check and Adjustment:** Check spark plug

**Fault Condition:** Fouled or discolored

**Probable Causes:**

- Clean the spark plug
- Spark plug is incorrect heat range

---

**Check and Adjustment:** Check engine for overheating

**Fault Condition:** Overheating

**Probable Causes:**

- Excessive carbon deposited in combustion chamber
- Wrong type of fuel
- Fuel / air mixture ratio is lean
- Use of poor quality fuel

---

**Check and Adjustment:** Accelerate or run at high speed

**Fault Condition:** Knocks

**Probable Causes:**

- Worn piston and cylinder
- Fuel / air mixture ratio is lean
- Wrong type of fuel
- Ignition timing too advanced
- Excessive carbon deposited in combustion chamber

## **CHAPTER 2 MAINTENANCE INFORMATION**

<b>Specifications .....</b>	<b>Page 25</b>
<b>Periodical Maintenance Schedule .....</b>	<b>Page 26</b>
<b>Shift cable .....</b>	<b>Page 27-28</b>
<b>Fuel Lines .....</b>	<b>Page 29</b>
<b>Acceleration Operation .....</b>	<b>Page 29</b>
<b>Air Cleaner .....</b>	<b>Page 29</b>
<b>Spark Plug .....</b>	<b>Page 30</b>
<b>Valve Clearance .....</b>	<b>Page 30</b>
<b>Carburetor Idle Speed Adjustment .....</b>	<b>Page 31</b>
<b>Ignition System .....</b>	<b>Page 32</b>
<b>Cylinder Compression Pressure .....</b>	<b>Page 32</b>
<b>Drive Belt .....</b>	<b>Page 33</b>
<b>Brake System (Disk Brake) .....</b>	<b>Page 33</b>
<b>Brake Lining Wear .....</b>	<b>Page 34</b>
<b>Brake Light Switch/Starting Inhibitor.....</b>	<b>Page 34</b>
<b>Clutch Shoe Wear .....</b>	<b>Page 34</b>
<b>Wheel/Tire .....</b>	<b>Page 35</b>
<b>Nuts, Bolts Tightness .....</b>	<b>Page 35</b>
<b>Differential Oil Change: Front/Rear .....</b>	<b>Page 36</b>



## Specifications

<b>Fuel tank</b>	Capacity	4.75 gallons
<b>Engine Oil</b>	Capacity	3482 ml
<b>Engine Oil</b>	Change	3179 ml
<b>Differential Gear Oil</b>	Capacity	350 cc's
<b>Differential Gear Oil</b>	Change	350 cc's
<b>Capacity of coolant</b>	Engine + Radiator	2195 ml
<b>Clearance of throttle valve</b>	N/A	1~3 mm
<b>Spark plug</b>	Type	Type NGK CR7E
<b>Spark plug</b>	Gap	0.7~0.8 mm
<b>"F" Mark in idling speed</b>	N/A	BTDC 20o / 1500 rpm
<b>Full timing advanced</b>	N/A	BTDC 51o / 6200 rpm
<b>Idling speed</b>	N/A	1500rpm (+/- 100 rpm)
<b>Cylinder compression pressure</b>	N/A	9.2 kgf/cm <sup>2</sup>
<b>Valve clearance</b>	N/A	(IN:0.10 +/- 0.02 mm) (EX:0.15 +/- 0.02 mm)
<b>Tire Dimension</b>	Front	AT25x8-12
<b>Tire Dimension</b>	Rear	AT25x10-12
<b>Tire Pressure</b>	N/A	10psi ( +/- 1 psi)
<b>Battery</b>		12V18Ah (type : MF battery)

## Periodic Maintenance Schedule

ITEM	1st Month / 25 hr	Every 6 months / 500 hr	Replacement Schedule
Muffler Bolts and Exhaust Pipe	T	T	
Valve Clearance	I	I	
Air Cleaner -	-	R	
Engine Idle RPM	I	I	
Spark Plugs	-	R	
Engine Oil	R	R	
Oil Filter	R	R	
Front Differential Set Oil	-	I	Replace Every 2 Years
Final Gear Oil	-	I	Replace Every 2 Years
Spark Arrester	-	C	
C.V.T. Belt	-	I	
Fuel Tube	-	I	Replace Every 4 Years
Throttle Cable Play	I	I	
Brakes	I	I	
Brake Hose	-	I	Replace Every 4 Years
Brake Fluid	-	I	Replace Every 2 Years
Tires	-	I	
Suspension	-	I	
Steering System	I	I	
Chassis Nuts and Bolts	T	T	
General Lubrication	-	L	
T = Tighten, R = Replace, L = Lubrication, I = Inspect clean and adjust			

**Have your MTV checked, adjusted, and record maintenance data periodically by your Bad Boy Authorized Dealer to maintain the MTV at the optimum condition**

1. Replace the air cleaner element more often when the MTV is operated on dusty roads or in a Heavily-polluted environment.
2. Maintenance should be performed more often if the MTV is frequently operated at high speed and after the MTV 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.

### Adjusting Shift Linkage Cable

- Engage parking brake
- Turn key to run setting \*Do not modify shift linkage while engine is running
- Verify heim joint is fully threaded in and jam nut is securely fastened. Only a few threads should be showing as in picture.



- Break loose 15/16 nuts on shift cable bracket as shown in picture



## Maintenance

- Shift gear selector lever on dash board to reverse position as shown in picture.
- Manually push gear selector lever on engine to reverse (aft most position) as shown in picture.  
*\*if vehicle is between gears you may have to rock the vehicle back and forth to engage the gears.*
- When the engine's reverse gear is engaged, the reverse indicator light on the dash panel will illuminate.
- Tighten rear shift bracket nut snugly against shift cable bracket while ensuring the engine shift lever is still in the reverse position.
- Tighten front shift cable bracket nut snugly against shift cable bracket. While doing this make sure the shift light is still illuminated.
- When all nuts are fully tightened, check that the shift position indicator lights illuminate in their respected positions. If the lights remain illuminated while between gear positions, the linkage was not properly adjusted.



## Maintenance

### Fuel Lines:

Open the tank cover and Check all lines. Replace when there is deterioration, damage, or leaking prevalent.

---

#### **WARNING**

Gasoline is Extremely Flammable—Keep Away From Fire!

---

### Acceleration Operation:

Ensure pedal operation is smooth.

Check acceleration cable and replace it if deteriorated, twisted or damaged.

Lubricate the cable if operation is not smooth.

Measure the throttle pedal free play.

Remove rubber boot, loosen fixing nut, and then adjust it by turning the adjustment screw. Tighten the fixing nut, and check acceleration operation condition.

Free Play: 12 mm — 1/2"

### Air Cleaner:

Remove seat and loosen 2 hooks from the air cleaner cover and then remove the cover.

Do not clean the filter, replace as necessary

---

#### **CAUTION**

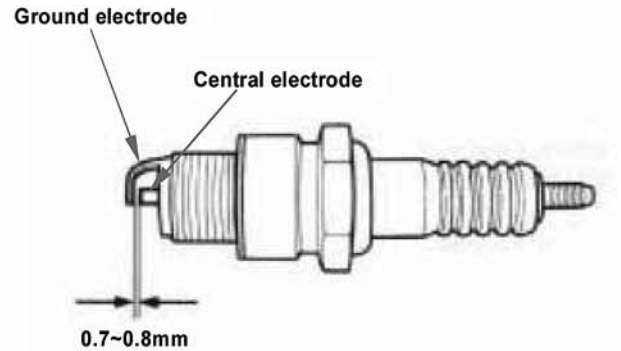
Never use compressed air to clean the element.

---

## Maintenance

### Spark Plug:

- Recommended spark plug: CR7E
- Remove spark plug cap.
- Clean dirt around the spark plug hole.
- Remove spark plug.
- Measure spark plug gap.
- Spark plug gap: 0.7 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 clockwise.
- Tighten the plug by turning 1/2 turn more with plug socket after installed.
- Tighten torque: 9 ft/lbs.



### Valve Clearance:

---

#### CAUTION

Checks and adjustment must be performed when the engine temperature is below 35° celsius or 95° Fahrenheit

---

Remove cylinder head cover. Turn camshaft bolt in Clockwise direction and make the “T” mark on the camshaft sprocket align with the cylinder head mark so that the piston is placed at TDC position in compression stroke.

---

#### CAUTION

Do not turn the bolt in the Counter Clockwise direction to prevent camshaft bolt loosening

---

### 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 Jam nut and turn the adjustment nut for adjustment.



#### CAUTION

Re-check the valve clearance after tightening the fixing nut.

---

## Maintenance

### Carburetor Idle Speed Adjustment:

---

#### CAUTION

- Inspection & adjustment for idle speed must be performed after all parts in the engine that needed adjustment have been adjusted.
  - Idle speed check and adjustment have to be done after engine is warmed up. (Run engine for 10 minutes.)
- 

Park the MTV in neutral and warm up the engine.  
Turn the throttle valve stopper screw to specified idle speed.  
Specified idle speed: 1500rpm (+/- 100 rpm)

### *Emission adjustment in idle speed*

Warm up the engine for around 10 minutes and then conduct this adjustment.

1. Connect the tachometer onto engine.
2. Adjust the throttle valve stopper screw and let engine runs in  $1500 \pm 100$  rpm.
3. Insert the exhaust sampling pipe of exhaust analyzer into the front section of exhaust pipe. Adjust the air adjustment screw (Shown with Arrow) so that emission value in idle speed is within standard.
4. Slightly accelerate the throttle valve and release it immediately. Repeat this 2-3 times.
5. Read engine RPM and value on the exhaust analyzer. Repeat step 2 to step 4 procedures until measured value within standard.

Emission standard CO: below 2.5~3.5% HC: below 2000ppm



## Maintenance

### Ignition System:

---

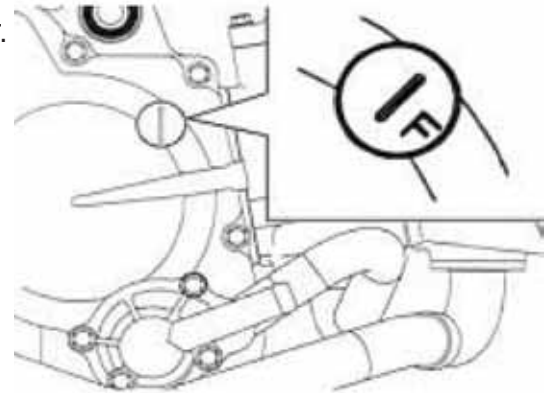
#### CAUTION

- C.D.I ignition system is set by manufacturer so it can not be adjusted.
  - Ignition timing check procedure is for checking whether CDI function is normal
- 

1. Connect tachometer and ignition light.
2. Start engine.
3. As engine hits idle speed, 1600 rpm, aim at the mark "F" with the ignition light.

Increase engine speed to 5500 rpm to check ignition advance degree. If indent is located within the ignition advance degrees, it means that the ignition advance degree is in normal.

If ignition timing is incorrect, check CDI set, pulse rotor and pulse generator. Replace it if malfunction of these parts is found.



### Cylinder Compression Test:

Warm up engine.  
Turn off the engine.  
Remove the seat.  
Remove 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 gauge stops increasing.
  - Usually, the highest pressure reading will be obtained in 4 - 7 seconds.
- 

Compression pressure: 130 PSI (+ / - 25PSI)

Check following items if the pressure is too low:

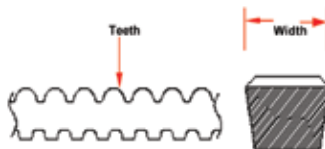
- Incorrect valve clearance.
- Leaking Valve.
- Cylinder head leaking, piston, piston ring and cylinder worn out.

If the pressure is too high, this means there may be carbon deposits in combustion chamber or piston head.



## Drive Belt:

- Remove 14 bolts of the clutch cover.
- Check to see if the belt is cracked or worn out.
- Replace the belt if necessary or in accordance with the periodical maintenance schedule.
- Width limit: 26.8 mm or above



## Brake System (Disk Brake):

### **Brake System Hose**

Check the brake hoses for corrosion or leaking oil.

### **Brake Fluid**

Check brake fluid level in the brake fluid reservoir.

- If the level is lower than the LOWER limit, add brake fluid to UPPER limit.
- Also check the brake system for leaking if low brake level found



### **Air Bleed Operation**

Connect a transparent hose to draining valve. Hold the brake pedal and open air bleeding valve. Perform this operation alternative until there is no air inside the brake system hoses.

## **CAUTION**

Before closing the air bleed valve, do not release the brake pedal.

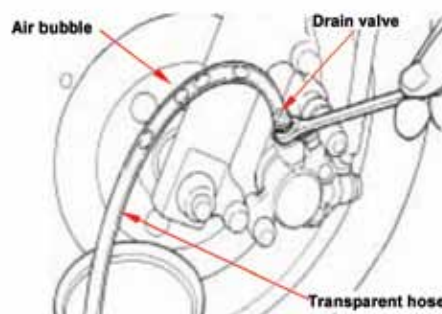
### **Adding Brake Fluid**

Add brake fluid to UPPER limit lever.

Recommended brake fluid: DOT3 or DOT4 WELL RUN brake fluid.

## **CAUTION**

Never mix or use dirty brake fluid to prevent damage to the brake system or reducing brake performance.

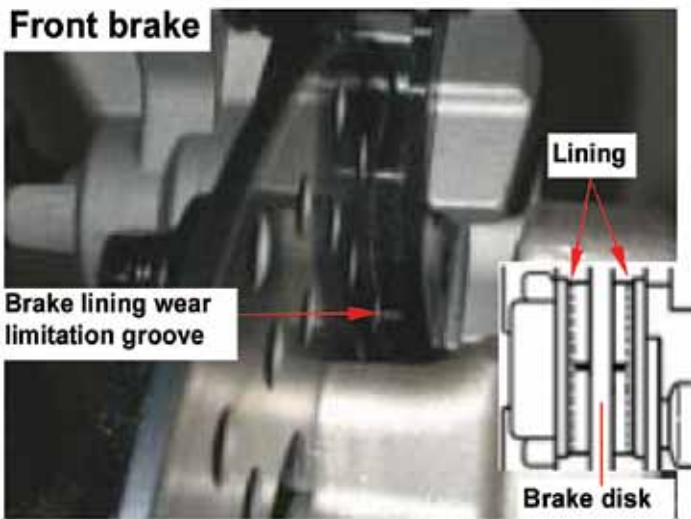


## Maintenance

### Brake lining wear:

- The indent mark on brake lining is the wear limit.
- Replace the brake lining if the wear limit mark is close to the edge of brake disc.
- Brake Lining Replacement

Check the brake lining condition. Replace the lining if the brake lining wear limitation groove close to the brake disc.

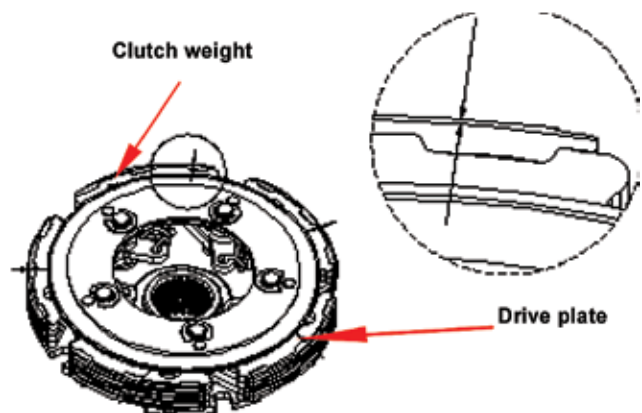


### Brake Light Switch/Starting Inhibitor Switch:

- Make sure that electrical starter can be operated only under brake applying.

### Clutch Shoe Wear:

- Run the MTV and increase throttle valve opening gradually to check clutch operation.
- If the MTV has a shudder when moving forward, check clutch disc condition.



## Maintenance

### Wheel/Tire:

---

**CAUTION**

Tire pressure check should be done cold.

---

### Recommended Tire pressure (Cold):

**Front:** 10 PSI (+ / - 1 PSI)

**Rear:** 10 PSI (+ / - 1 PSI)

- Check to see if front and rear tire pressure is normal.
- Measure tire thread depth from tire central surface.
- Replace the tire if the depth does not come with following specification:

**Front tire:** .25"

**Rear tire:** .28"

### Nuts, Bolts Tightness:

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

## Maintenance

### Front differential oil:

---

#### **CAUTION**

- Be sure the differential set temperature is below 35° Celsius or 95° Fahrenheit.
- 

- Oil Standard: SAE #90 hypoid gear oil
- Oil Capacity: 300 c.c.
- Remove the under cover

- Place an oil pan below the differential set case.



**Filler Nut** -----



- Remove drain bolt, filler nut and drain oil out.
- Tighten the drain bolt to specified torque.
- Pour the oil through the filler hole.
- Tighten the filler cap to the specified torque

**Oil Drain Bolt** -----



- Drain Bolt: 24 ft.lbs
- Oil Filler Unit: 26.5 ft.lbs

### Rear Differential Set:

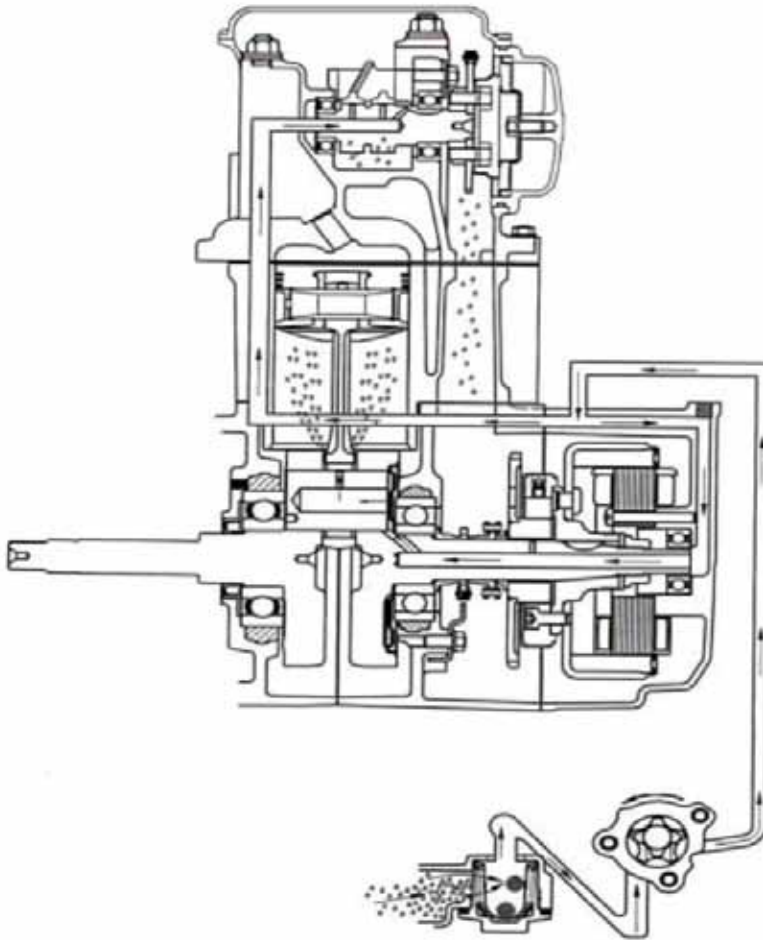
- Place an oil pan below the case of final gear set.
- Remove the drain blot.
- Remove the filler cap
- Drain oil
  
- Tighten the drain blot.
- Remove the oil check bolt.
- Pour the specified oil through the filler hole until the oil level reaches bottom of the hole.
- Tighten the oil level bolt.
- Tighten the filler cap.
- Final gear oil drain bolt: 24 ft/lbs
- Final gear oil filler cap: 26.5 ft/lbs



## **CHAPTER 3 LUBRICATION SYSTEM**

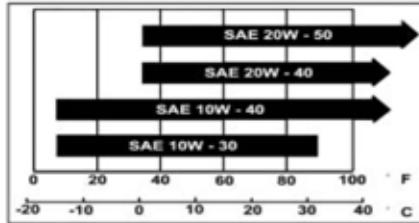
Mechanism Diagram .....	Page 38
Troubleshooting .....	Page 39
Engine Oil .....	Page 40
Engine Oil Strainer Clean .....	Page 40
Oil Pump .....	Pages 41-42

### **Mechanism Diagram:**



**Precautions in Operation:**

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



**Specifications:**

Engine oil quantity Disassembly: 3500 c.c.  
 Filter change: 3200 c.c.  
 Change: 3000 c.c.  
 Oil viscosity: Use Bad Boy Mowers - MTV Engine Lubricant SAE 10w40 Only

Items		Standard (mm)	Limit (mm)
Oil Pump	Inner rotor clearance	0.15	0.20
	Clearance between outer rotor Oil pump 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 10Ft/Lbs  
 Engine oil drain bolt 17-20 Ft/Lbs

**Troubleshooting:**

- Low engine oil level:
- Oil leaking
  - Valve guide or seat worn out
  - Piston ring worn out
- Low oil pressure:
- Low engine oil level
  - Clogged in oil strainer, circuits or pipes
  - Oil pump damage
- Dirty oil:
- Oil not changed periodically
  - Cylinder head gasket damage
  - Piston ring worn out

## Lubrication

### Engine Oil:

- Turn off engine, and park the MTV on flat surface
- Check oil level with oil dipstick.
- Do not screw the dipstick into engine as checking.
- If oil level is near the low level, fill with recommended oil to upper level.

### Oil Change:

- Place an oil pan under the MTV, and remove oil drain bolt.
- After drained, make sure washer can be re-used.
- Install oil drain bolt.
- Torque value: 17-20 ft/lbs

### Engine Oil Strainer Clean:

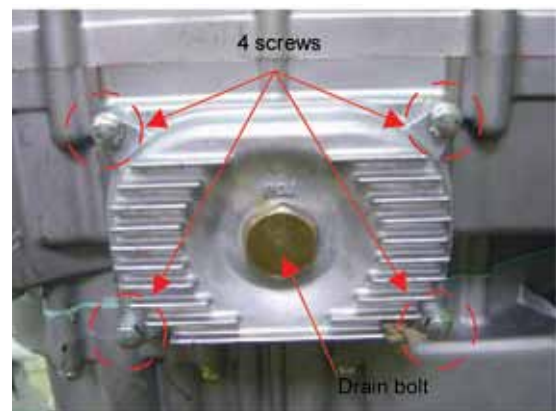
- Drain engine oil.
- Remove oil strainer cap.
- Clean oil strainer.
- Check if O-ring can be re-used.
- Install oil strainer cap.
- Torque value: 7 ft/lbs
- Engine oil capacity: 3000c.c. when replacing

### Replacing The Oil Filter:

- Same as oil change, drain the oil out.
- Remove the oil filter by special tool.
- Apply engine oil lightly to the gasket of the new oil filter when installation.

- Torque value: 10 ft/lbs
- Oil and filter change: 3200c.c. when replacing

- Install dipstick, start the engine for running several minutes.
- Turn off engine, and check oil level again.
- Check for engine oil leaks.

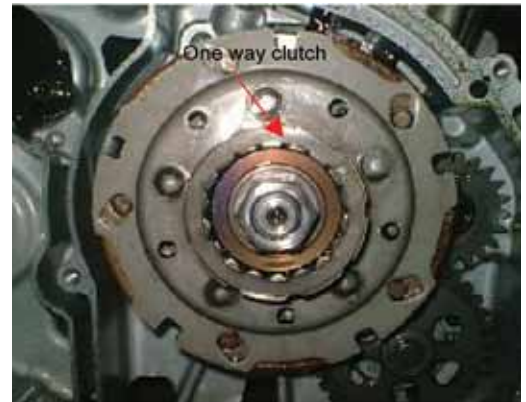




## Oil Pump:

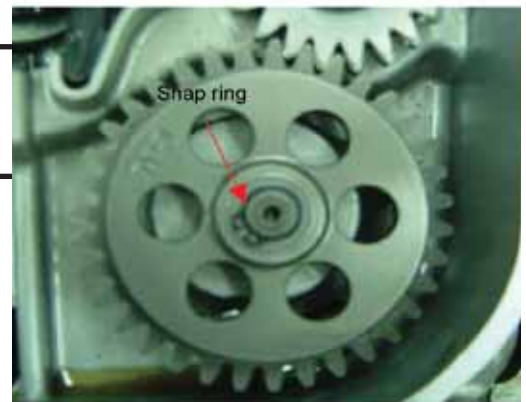
### Oil Pump Removal:

- Remove the one way clutch.
- Remove the clutch shoe.
- Remove the snap ring.
- Remove the washer.
- Remove the oil pump driver gear.



### CAUTION

The clutch shoe nut has left-hand threads.



- Remove the snap ring.
- Remove the washer.
- Remove the oil pump driver gear.
- Remove the pin.
- Remove the washer.



- Make sure that pump shaft can be rotated freely.
- Remove 3 screws on the oil pump
- Remove oil pump.

### Oil Pump Disassembly:

- Remove the screws on oil pump cover
- Remove the cover.
- Remove oil pump shaft roller and shaft.



## Lubrication

### Oil Pump Inspection:



Check the clearance between oil pump body and outer rotor.

**Limit: 0.25 mm**



Check clearance between inner and outer rotors.

**Limit: 0.20 mm**



Check clearance between rotor side face and pump Body.

**Limit: 0.12 mm**

### Oil Pump Re-Assembly:

- Install inner and outer rotors into the pump body.
- Align the indentation on driving shaft with that of inner rotor.
- Install the oil pump shaft and roller.
- Install the oil pump cover and fixing pins properly.
- Tighten the oil pump screw.



### Oil Pump Installation:

- Install the oil pump, and then tighten 3 screws.
- Torque value: 7 ft/lbs.
- Make sure that oil pump shaft can be rotated freely.



- Install the washer.
- Install the pin.
- Install the oil driven gear.
- Install the washer.
- Install the snap ring.



## CHAPTER 4 FUEL SYSTEM

Precautions in Operation .....	Page 43
Troubleshooting .....	Page 44
Carburetor Removal / Installation .....	Page 45
Air Cut-Off Valve .....	Page 45
Throttle Valve .....	Page 46
Float Chamber .....	Page 47
Adjustment of Idle Speed .....	Page 48
Fuel Tank.....	Page 49
Fuel Valve Operation.....	Page 49

### Precautions in Operation:

---

#### WARNING

Gasoline has a low ignition point and explosive materials, so always work in a well-ventilated place and strictly prohibit flame when working with gasoline.

---

#### CAUTION

- Do not bend throttle cable. Damaged throttle cable will make MTV unstable.
  - When disassembling fuel system parts, pay attention to O-ring position, replace with new one as needed.
    - There is a drain screw in the float chamber for draining residual gasoline.
      - Do not disassemble air cut valve arbitrarily.
- 

Item	BSR33
Carburetor Diameter	33mm
I.D. number	33_77
Fuel level	31.5±0.5mm
Main injector	# 122.5
Idle injector	# 35
Idle speed	1500 ± 100rpm
Throttle handle clearance	1-3 mm
Pilot screw	2-1/2 turns

### Tool (Special service tools):

- Vacuum/air pressure pump
- Fuel level gauge

## Fuel System

### Troubleshooting:

#### ***Engine starting poorly***

No fuel in fuel tank

Clogged fuel tube

- Too much fuel in cylinder
- Clogged air cleaner
- Malfunction of throttle operation
- No spark from spark plug (malfunction of ignition system)
- Malfunction of carburetor choke

---

#### ***Stall after started***

- Malfunction of carburetor choke
- Malfunction of carburetor
- Air leak in intake system
- Incorrect ignition timing
- Dirty engine oil
- Incorrect idle speed

---

#### ***Rough Idle***

- Malfunction of ignition system
- Malfunction of carburetor
- Incorrect idle speed
- Dirty fuel

---

#### ***Intermittently misfire under acceleration***

- Malfunction of ignition system

---

#### ***Late ignition timing***

- Malfunction of ignition system
- Malfunction of carburetor

---

#### ***Insufficient power or fuel economy***

- Fuel system clogged
- Malfunction of ignition system

---

#### ***Mixture too lean***

- Clogged fuel injector
- Malfunction of float valve
- Clogged fuel tank cap vent
- Obstructed fuel pipe
- Air leak in intake system
- Vacuum piston stuck closed
- Fuel level too low in float chamber
- Clogged fuel filter
- Clogged air vent hose

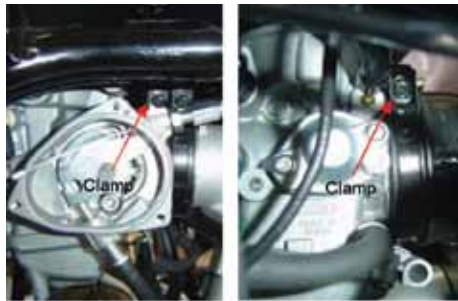
---

#### ***Mixture too rich***

- Clogged air injector
- Fuel level too high in float chamber
- Dirty air cleaner
- Malfunction of float valve
- Malfunction of carburetor choke

## Carburetor Removal / Installation:

### Removal:



- Lift Seat.
- Loosen the carburetor clamp screws.



- Loosen the carburetor side cap 3 screws.
- Remove cap.



- Disconnect the throttle cable.



- Disconnect the choke cable.
- Remove the carburetor.

### Installation:

- Install in reverse order of removal procedures.

## Air Cut-Off Valve:

### Disassembly

- Remove air vent hoses.
- Remove fuel hose.
- Remove vacuum hose.
- Remove air cut-off valve cover 2 screws, spring, and valve.

### Inspection

- Check the valve.
- If the valve is normal, it will restrict air-flow
- If air-flow is not restricted, replace carburetor assembly.
- Check the vacuum pipe o-ring.

### Assembly

- Install in reverse order of removal procedures.



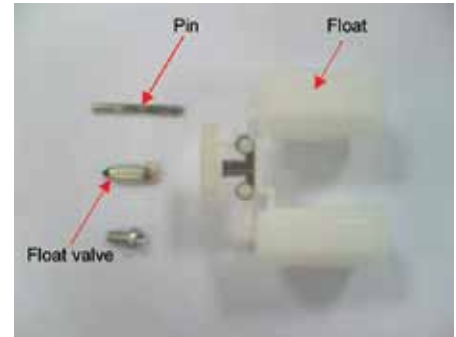
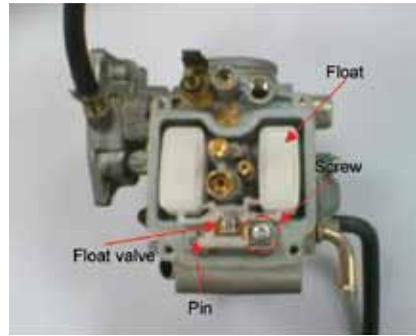
## Fuel System

### Throttle Valve: *Disassembly*



- Remove carburetor top.
- Remove the spring, holder, needle set jet, and piston valve.
- Remove the cable adjuster assembly.

### Float Chamber: *Disassembly*

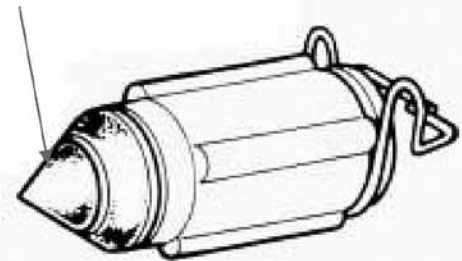


- Remove 4 mounting screws and remove float chamber cover.
- Remove the screw, float pin, float, and float valve.

### *Inspection*

- Check float valve and valve seat for damage, blocking.
- Check float valve and seat face for wearing

Check for wear or damage



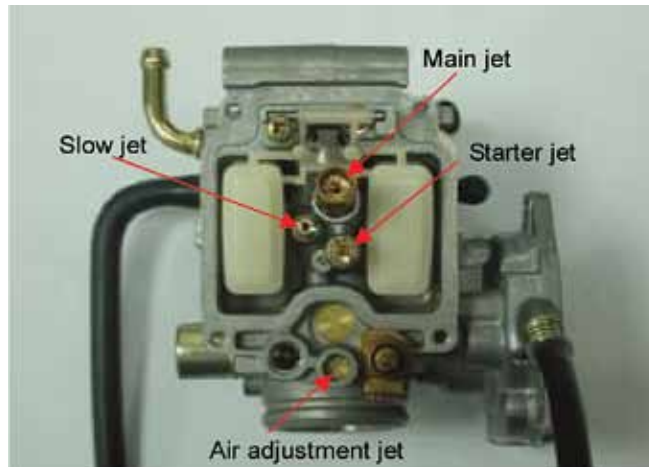
---

### **CAUTION**

- If the float valve is worn out or dirty, the seat will not tightly close causing fuel level to increase and as a result, fuel flooding. A worn out or dirty float valve must be replaced with a new one.
-

### Float Chamber:

- Remove main jet, needle jet holder, needle jet, slow jet, and air adjustment screw.



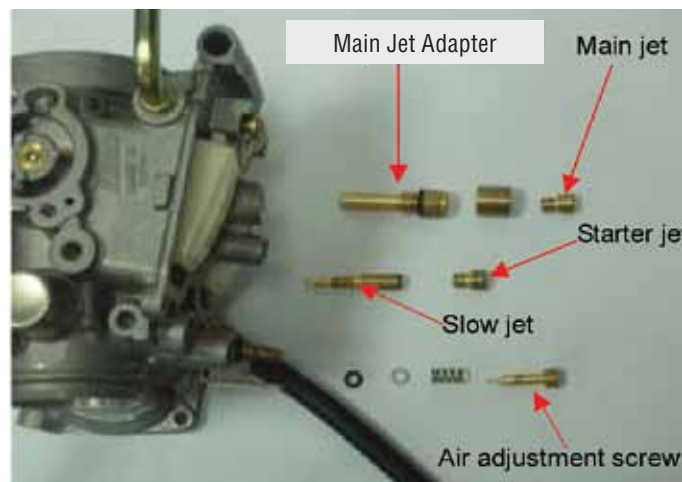
---

### CAUTION

- Be very careful not to damage jets or adjust screw.
  - Before removing adjustment screw, turn it all the way down and note the number of turns.
  - Do not turn adjust screw forcefully to avoid damaging valve seat face.
- 

### Assembly

- Install main jet, needle jet holder, needle jet, slow jet and air adjustment screw.
- Install the float valve, float, and float pin.



---

### CAUTION

- Set the air adjustment screw in according to number of turns noted before it was removed.
-

## Fuel System

### Checking fuel level:

---

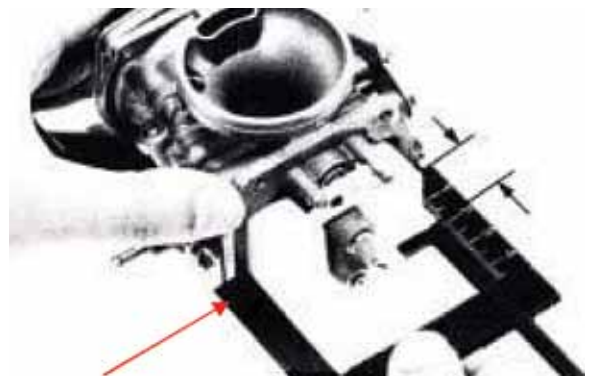
#### CAUTION

- Check again to ensure float valve and float are properly installed.
  - To ensure correct measurement, position the float meter in such a way so that the float chamber face is vertical to the main jet.
- 

Fuel level:  $31.5 \pm 0.5$ mm

### Installation of carburetor:

- Install carburetor in the reverse order of removal.
- Following adjustments must be made after installation.
- Throttle cable adjustment.
- Idle adjustment



Float Gauge

### Adjustment of idle speed:

---

#### CAUTION

- Air screw was set at factory, so no adjustment is needed. Note the number of turns it takes to screw it all the way in for ease of installation.
- 



- Use a tachometer when adjusting engine RPM. Screw in air adjustment screw gently, then back up to standard turns.
  - Standard turns: 2-1/2 turns
  - Warm up engine; adjust the throttle stopper screw of throttle valve to standard RPM.
  - Idle speed rpm:  $1500 \pm 100$  rpm
  - Connect the hose of exhaust analyzer to exhaust front end. Press test key on the analyzer.
  - Adjust the pilot screw and read CO reading on the analyzer.
  - CO standard value: 1.0-1.5 %
- 
- Accelerate in gradual increments; make sure rpm and CO value are in standard value after engine running in stable. If rpm and CO value fluctuated, repeat the procedures described above for adjusting to standard value.



## Fuel Tank:

### *Fuel Unit Removal*

1. Open the seat
2. Open the front cover
3. Remove tank clamps
4. Disconnect fuel lines
5. Remove fuel unit

***FOR FULL FRONT ASSEMBLY DRAWING CHECK LAST 2 PAGES OF CHAPTER 4***

## Carburetor Hose Routing:



## Fuel Pump:



## Fuel Valve Operation:



***Fuel Valve ON:***



***Fuel Valve OFF:***

## **CHAPTER 5 ENGINE REMOVAL**

**Precautions in Operation .....Page 50**  
**Removal of Engine .....Page 51-53**  
**Engine Installation .....Page 54**  
**Engine Disassembly .....Page 55**

### **Precautions in Operation:**

#### ***General Information***

The following parts can be serviced with engine mounted in frame:

- Carburetor.
- Drive pulley, drive belt, clutch, and movable drive face assembly. Start motor.
- AC. Generator, oil pump and start one way clutch.
- Crankcase RH cover.
- Clutch housing assembly.
- Directional clutch.
- Clutch assembly.

	Item	Capacity
Engine Oil Capacity	Replacement	3100 c.c.
	Oil and Oil Filter Change	3200 c.c.
	Disassembly	3500 c.c.
Coolant Capacity	Engine & Reservoir	2200 c.c.
	Total	3400 c.c.

### **Torque Values:**

- Engine hanger bolt 34 ft/lbs
- Exhaust muffler mounting bolt 20 ft/lbs
- Exhaust muffler connection nut 20 ft/lbs

## Engine Removal:

Before taking the engine out of the frame clean and wash the engine using a steam cleaner.  
Engine removal is explained in the following steps:

*(Reinstall the engine by reversing the removal procedure.)*

- Before removal the engine drain all engine oil
- Remove the seat.
- Remove the seat bracket.
- Remove the battery negative post (-).
- Remove the battery positive post (+).
- Remove the starter motor wire.
- Remove the gearshift cable.



- Remove the fuel hose and vacuum hose.



- Remove the air cleaner



- Remove the carburetor.



## Engine Removal

- Remove the signal generator lead wire connector and generator lead wire connector.

**Connectors** -----



- Remove the spark plug cap.

**Cap** -----



- Remove the exhaust pipe

**Bolt** -----



- Remove the front and rear tube.



- Remove the front shaft bolts. — 6 in total.
- Remove the engine mounting bolts and nuts.
- Remove the engine mounting bracket.

Front engine mount —



Rear engine mount —



Rubber Isolator —



# Engine Removal

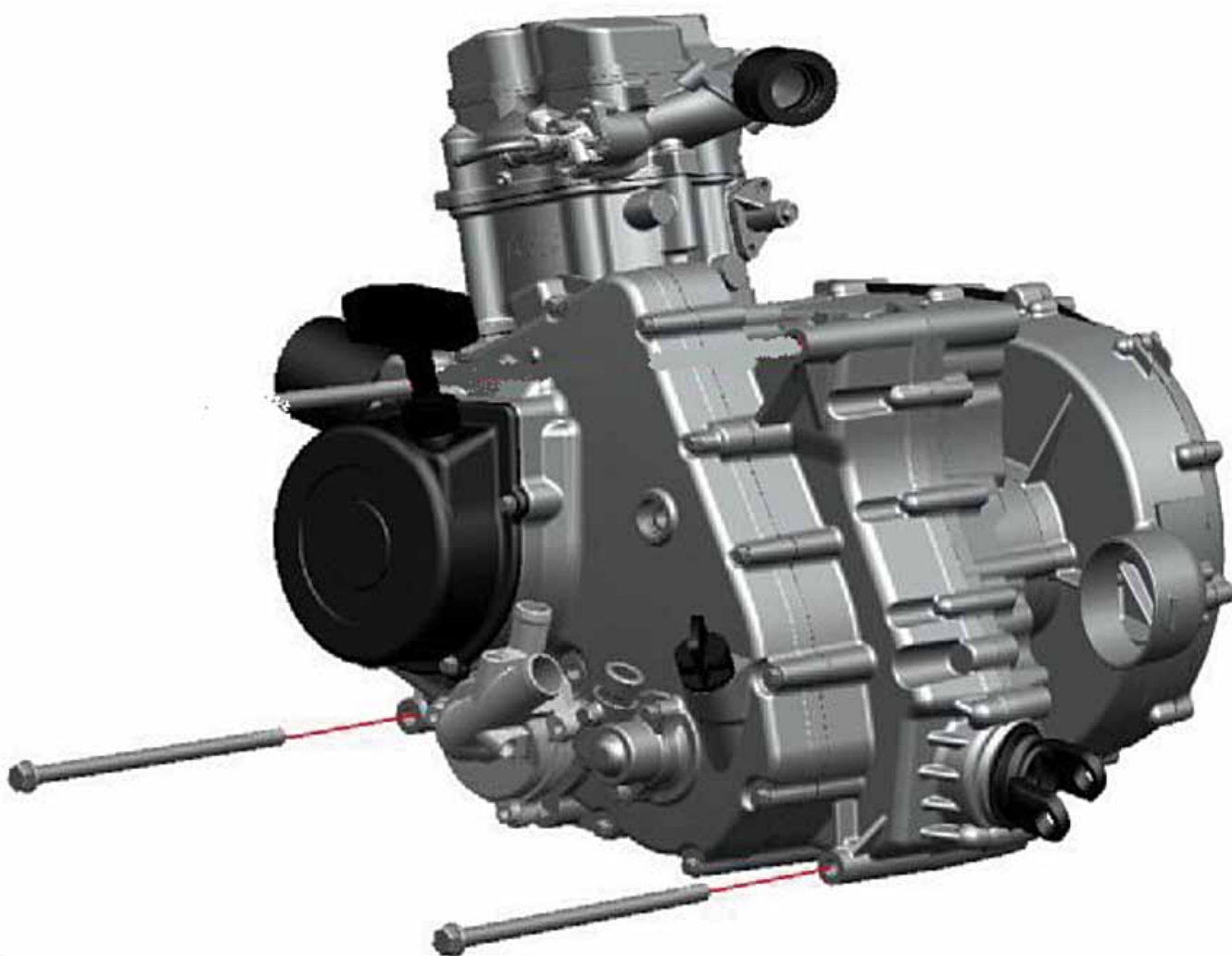
### Engine Installation:

*Install the engine in the reverse order of engine removal.*

---

### CAUTION

- The engine mounting nuts are self-locking, once the nut was been removed it is no longer of any use.
  - Be sure to use new nuts. For every time engine installation and tighten them according the torque standard.
- 



**Torque value:**

- Engine mounting bracket bolt 19 ft/lbs.
- Apply sealant to the screw.
- Apply sealant to the propeller shaft flange coupling bolts.
- Tighten them to the standard torque.
- Apply sealant to the front propeller shaft flange coupling bolts.



**Torque value:**

- Tighten them to the standard torque.
- Front and rear propeller shaft flange coupling bolt: 32.5 ft/lbs.

**Exhaust Installation, Removal:**

- Install the new gasket



- Apply sealant to the muffler mounting bolt
- Install muffler.
- Tighten the exhaust pipe nuts and muffler bolts to specified torque.

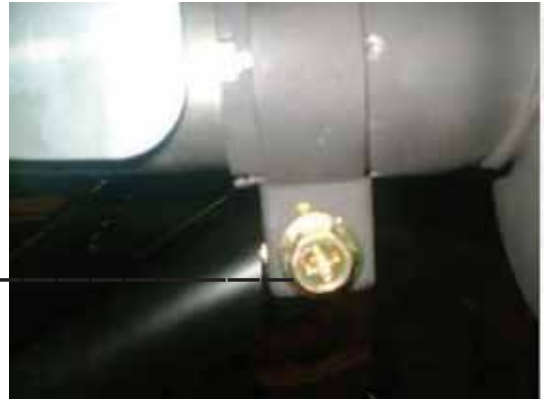


## Engine Removal

### Engine Removal:

- Exhaust pipe nut: 16.5 ft/lbs
- Connector bolt: 16.5 ft/lbs
- Muffler mounting bolt: 16.5 ft/lbs

Exhaust pipe nut



- Apply sealant to the muffler mounting bolt and also to the muffler fixed bolts.
- Tighten bolts.



- Remove starter motor wire



- Remove the spark plug cap

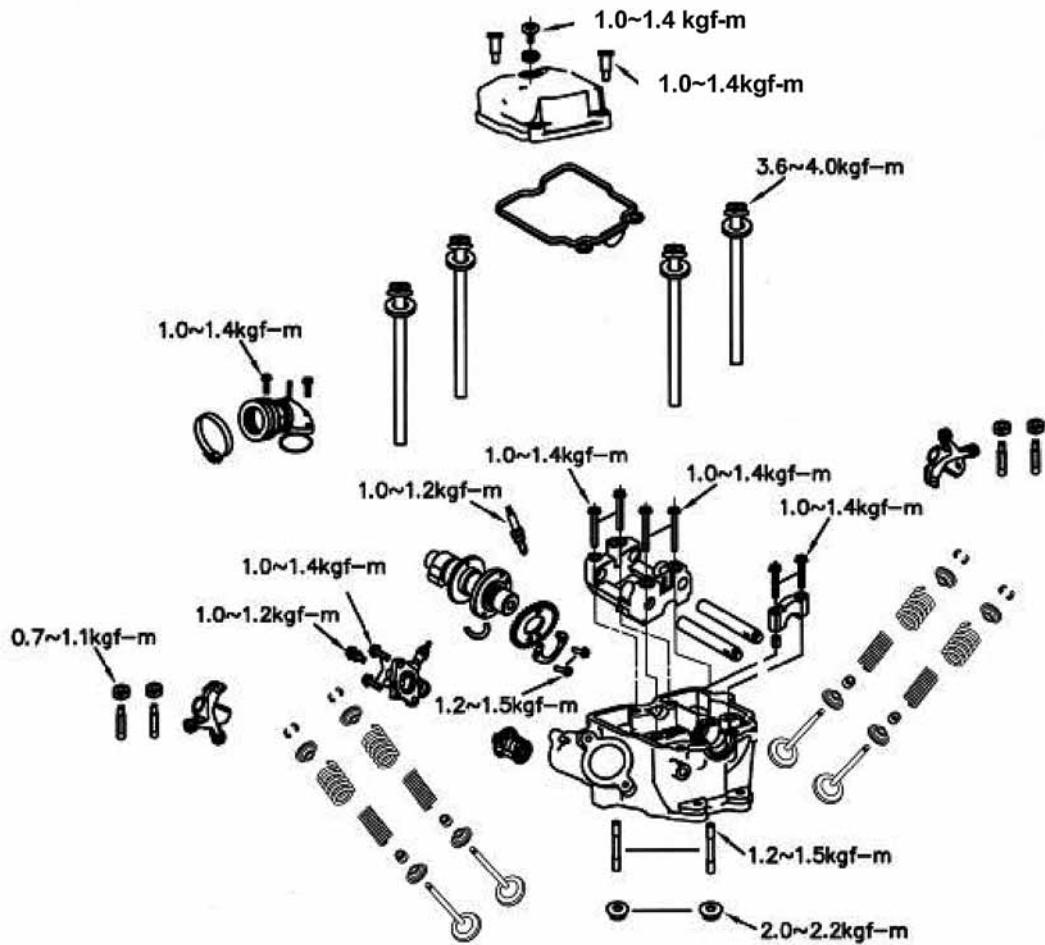




## CHAPTER 6 CYLINDER HEAD/VALVE

Mechanism Diagram .....	Page 58
Precautions in Operation .....	Page 59
Troubleshooting .....	Page 60
Cylinder Head Removal .....	Page 60-61
Cylinder Head Inspection.....	Page 63
Valve Stem Replacement .....	Page 64
Valve Seat Inspection and Service.....	Page 65-66
Cylinder Head Reassembly .....	Page 67
Cylinder Head Installation .....	Page 67
Valve Clearance Inspection .....	Page 68-69

Mechanism Diagram:



## Precautions in Operation:

This chapter contains maintenance and service for cylinder head, valve, and camshaft as well as rocker arm.

Cylinder head service can be carried out when engine is in frame.

Item		Standard	Limit	
Compression Pressure		12 ± 2 kg/cm <sup>2</sup>	/	
Camshaft	Height of cam lobe	Intake	33.442	
		Exhaust	33.327	
Rocker Arm	ID of valve rocker arm	12 - 12.018	12.080	
Valve	OD of valve rocker arm	11.966 - 11.984	11.936	
Valve	OD of valve system	Intake	4.975-4.990	
		Exhaust	4.950-4.975	
	ID of valve guide		5.000-5.012	5.030
	Clearance between valve stem & guide	Intake	0.010-0.037	0.080
		Exhaust	0.025-0.062	0.100
	Free length of valve spring	Inner	36	32.500
		Outer	39.5	36.000
	Valve seat width		1.600	/
	Valve clearance	Intake	0.1± 0.02mm	/
		Exhaust	0.15± 0.02mm	/
Cylinder Head Warpage		/	0.050	

Torque Value	Ft/Lbs
Cylinder head cover bolt	7-10 ft/lbs
Exhaust pipe stud bolt	17-21 ft/lbs
Cylinder head bolt	7-10 ft/lbs
Cylinder head Nut	14-16 ft/lbs
Sealing bolt of cam chain auto-tensioner	6-8 ft/lbs
Bolt of cam chain auto-tensioner	8-12 ft/lbs
Cylinder side cover bolt	7-10 ft/lbs
Cam sprocket bolt	7-10 ft/lbs
Tappet adjustment screw nut	5-7 ft/lbs
Spark plug	7-10 ft/lbs

### Tools: Special service tools

- Valve reamer: 5.0mm
- Valve guide driver: 5.0mm
- Valve spring compressor

# Cylinder Head / Valve

### Troubleshooting:

Engine performance will be affected by trouble with engine top parts. The trouble usually can be determined by performing cylinder compression test.

#### ***Low compression pressure***

##### **1. Valve**

- Improper valve adjustment
- Burnt or bent valve
- Improper valve timing
- Valve spring damage
- Valve carbon deposit

##### **2. Cylinder head**

- Cylinder head gasket leaking or damage
- Cracked cylinder

##### **3. Piston**

- Piston ring worn out.

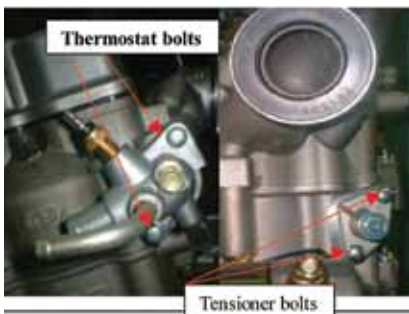
#### ***High compression pressure***

- Too much carbon deposit in combustion chamber or piston head
- Improper valve clearance adjustment
- Camshaft wear out or damage
- Chain wear out or looseness
- Auto-tensioner wear or damage
- Camshaft sprocket problem
- Rocker arm or rocker arm shaft wear

## Cylinder Head Removal:



- Remove the inlet pipe (2 nuts).
- Drain coolant
- Remove Carburetor



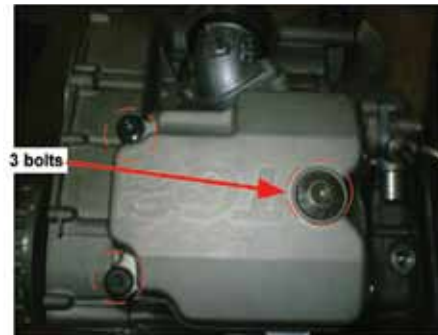
- Remove 1 bolt of thermostat and then remove the thermostat.
- Remove hole bolt and spring for the cam chain tensioner.
- Loosen 2 bolts, and then remove tensioner.
- Remove thermostat (2 bolts).



- Remove spark plug.



- Remove the nuts of cylinder head(4 nuts)



- Remove cylinder head cover (3 bolts)



- Remove fix stand cam (6 bolts)



- Remove cam sprocket bolts and then remove the sprocket by prying chain out.
- Remove cam chain tensioner and hole bolt.



- Remove cam shafts.
- Remove Rocker arm and cam shaft.

## Cylinder Head / Valve



- Remove the 4 cylinder head mounting bolts from cylinder head right side, and then remove 4 bolts and washers from cylinder head upper side.
- Remove the cylinder head.



- Remove cylinder head gasket and 2 dowel pins.
- Remove chain guide.
- Clean up residue from the matching surfaces of cylinder and cylinder head.

### CAUTION

- Do not damage the mating surfaces of cylinder and cylinder head.
- Do not allow gasket material to fall into crankcase when cleaning.

- Use a valve cotter removal & assembly tool to press the valve spring, and then remove valves.

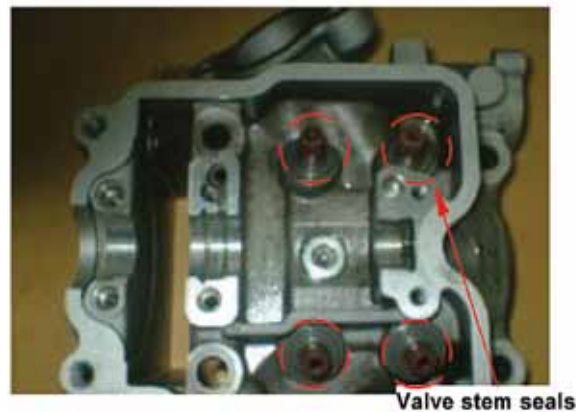
### CAUTION

- In order to avoid losing spring elasticity, do not compress the spring too far.

## Special Service Tool:



- Valve cotter remove & assembly tool

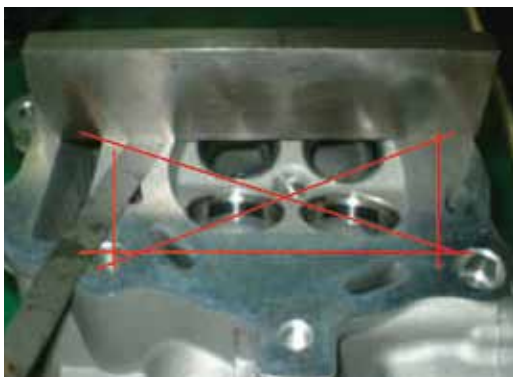


- Remove valve stem seals
- Clean carbon deposits in combustion chamber.
- Clean residues and foreign materials on cylinder head matching surface.

### CAUTION

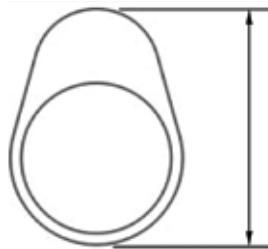
- Do not damage the matching surface of cylinder head.

## Cylinder Head Inspection:



- Check spark plug and valve seats for cracking.
- Measure cylinder head warp with a straightedge and thickness gauge.

- Service limit: 0.05 mm



## Camshaft

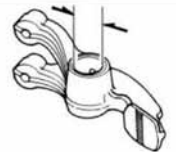
- Inspect cam lobe height for damaged.
- Service Limit:  
IN: Replacement when less than 33.392mm  
EX: Replacement when less than 33.277mm
- Inspect the camshaft bearing for damage or wear. If damaged, replace set of camshaft and cylinder head.

## Rocker Arm

- Measure the cam rocker arm I.D., and inspect for wear or damage

Service Limit:

Replace when it is less than 12.080 mm.



## Rocker Arm Shaft

- Measure the O.D. of the cam rocker arm shaft and cam rocker arm.

Service Limit:

Replace when it is less than 11.936 mm.

- Calculate the clearance between the rocker arm shaft and the rocker arm.

Service Limit:

Replace when it is greater than 0.10mm.



## Valve spring free length

- Measure the free length of intake and exhaust valve springs.

Service limit:

Inner spring 32.5 mm

Outer spring 36.0 mm



## Valve stem:

- Check if valve stems are bent, cracked, or burnt.
- Check the condition of valve stem in the valve guide then measure & record the valve stem outer diameter.

Service Limit:

IN: 4.90 mm

EX: 4.90 mm

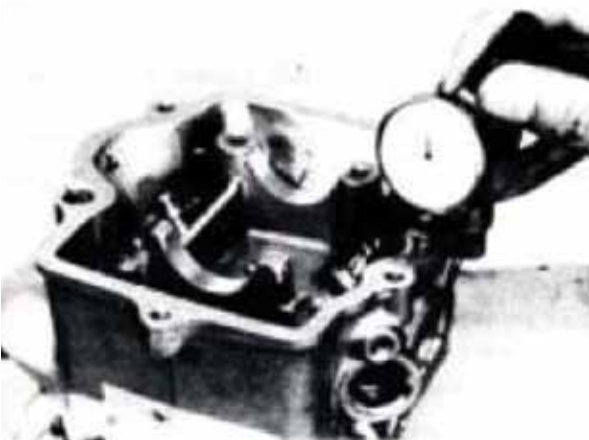


## Cylinder / Head Valve

### Cylinder Head Inspection:

**CAUTION**

- Before measuring the valve guide, clean carbon deposits with reamer.



- Tool: 5.0 mm valve guide reamer
- Measure and record each valve guide inner diameters.

Service limit: 5.03 mm

### Valve Stem Replacement:

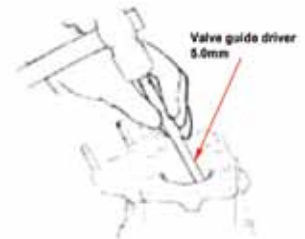
- Heat cylinder head to 100-150° Celsius (212° - 302° Fahrenheit) with heated plate or oven.

**CAUTION**

- Do not apply torch heat cylinder head directly. Otherwise, the cylinder head may be deformed. Wear gloves to protect your hands when heating.

### Valve guide driver

5.0mm



- Hold the cylinder head, and then press out old valve guide from combustion chamber side.

Tool: Valve guide driver: 5.0 mm

**CAUTION**

- Check for deformation after valve guide is pressed in.
- When pressing in the new valve guide, cylinder head must be kept 100-150°C (212° - 302° Fahrenheit).

- Valve guide height should be 13 mm.



- Press in new valve guide from rocker arm side.

Tool: Valve guide driver: 5.0 mm

- Wait for the cylinder head cooling down to room temperature, and then correct the new valve guide with reamer.



**CAUTION**

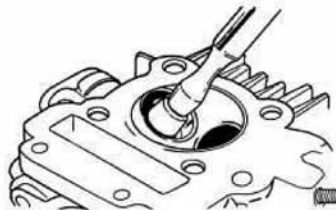
- Use cutting oil when correcting valve guide with a reamer.
- Turn the reamer in same direction when inserting or rotating.



- Correct valve seat, and clean up all metal residues from cylinder head.

**Valve Seat Inspection and Service:**

- Clean up all carbon deposits on intake and exhaust valves.
- Polish valve face lightly with emery.
- Grind valve seat with manual grinding tool.



**CAUTION**

- Do not let emery enter between valve stem and valve guide.
- Clean up the emery after corrected, and apply engine oil onto contact faces of valve and valve seat.

- Remove the valve and check its contact face.

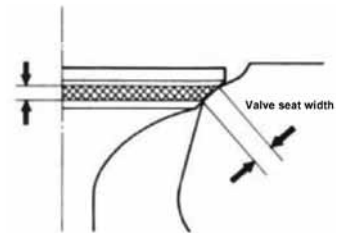
**Valve seat inspection:**

- If the valve seat is too wide, narrow or rough, it needs correcting.

**Valve seat width:**

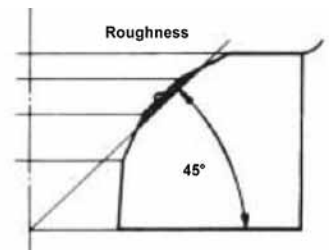
Service limit: 1.6mm

- Check the contact condition of valve seat.



**Valve seat grinding:**

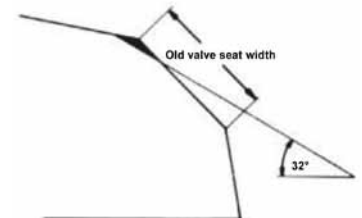
- The worn valve seat has to be ground with valve seat chamfer cutter.
- Refer to operation manual of the valve seat chamfer cutter.
- Use 45° valve seat chamfer cutter to cut any rough or uneven surface from valve seat.



**CAUTION**

- After valve guide has been replaced, it has to be ground with 45° valve seal chamfer cutter to correct its seat face.

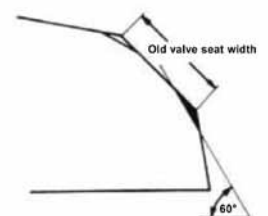
- Use 32° cutter to cut upper part.



**Valve Seat Inspection and Service:**

- Use 60° cutter to cut lower parts out.
- Remove the cutter and check new valve seat.

- Use 45° cutter to grind the valve seat to specified width.



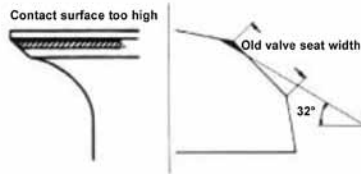
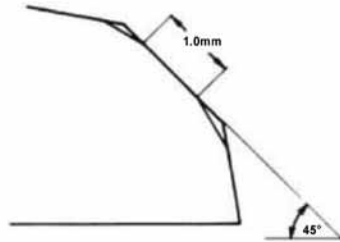
## CAUTION

- Make sure that all roughness and uneven faces have been ground.

- Grind valve seat again if necessary.

- Coat the valve seat surface with red paint.

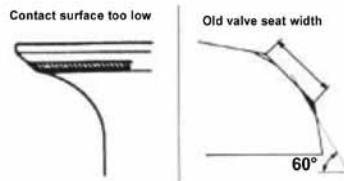
- Install the valve through valve guide until the valve contacting with valve seat, slightly press down the valve but do not rotate it so that a seal track will be created on contact surface.



## CAUTION

- The contact surfaces of valve and valve seat are very important to the valve sealing completely.

- If the contact surface is too high, grind the valve seat contact surface lower with 32° cutter.



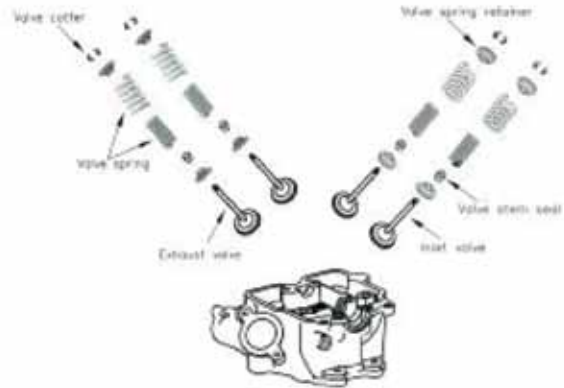
- Then, grind the valve seat to specified width.
- If the contact surface is too low, grind the valve seat with 60° cutter.
- Then, grind the valve seat to specified width.

## Valve Seat Inspection and Service:

- After the valve seat has been ground, coat valve seat surface with emery and then grind surface.
- Clean up all emery coat from cylinder and valve after grinding.



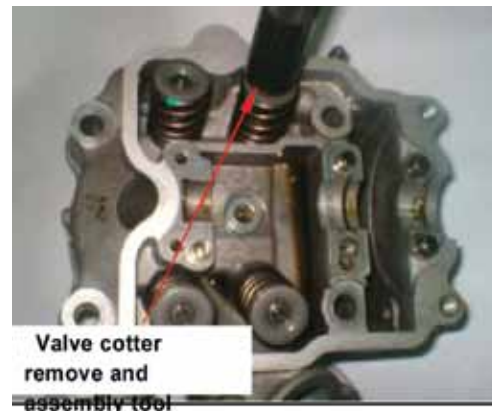
## Cylinder Head Reassembly:



- Lubricate valve stem with engine oil, and then insert the valve into valve guide.
- Install new valve stem oil seal.
- Install valve springs and retainers.

## CAUTION

- The closed coils of valve spring should face down to combustion chamber.



- Use a valve coter remove & assembly tool to press the valve spring, and then reinstall valves.
- Special Service Tool:*

- Valve coter remove & assembly tool

## CAUTION

- In order to avoid damaging the valve stem and the cylinder head, in the combustion chamber place a rag between the valve spring remover/installer when compressing the valve spring.



- Tap the valve stems gently with a plastic hammer to make sure valve retainer and valve cotter is seated.

**CAUTION**

- Place and hold cylinder head on to working table to prevent valve damaged.

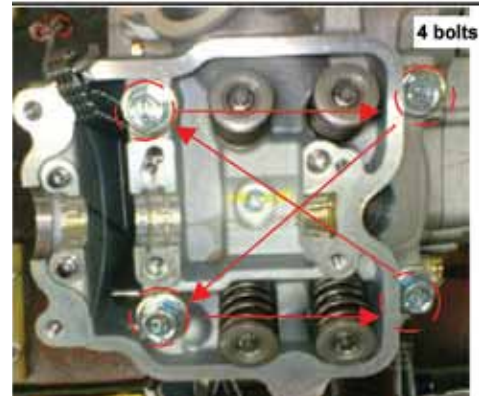
**Cylinder head installation:**



- Clean up all residue and foreign materials on the matching surfaces of both cylinder and cylinder head.
- Install chain guide, dowel pins and a new cylinder head gasket onto the cylinder.

**CAUTION**

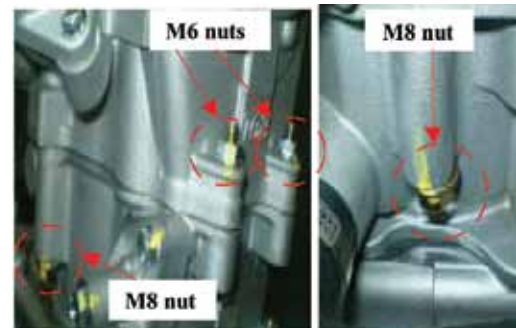
- Do not damage the mating surfaces of cylinder and cylinder head.
- Avoid gasket materials falling into crankcase.



- Install 4 washers and tighten 4 bolts on the cylinder head upper side, and then tighten 4 cylinder head nuts to the specified torque. (2 M6,2 M8).

Cylinder head bolt

- Bolt: 22-29 ft/lbs



Nut: M6:7-10 ft/lbs

M8: 17-21 ft/lbs

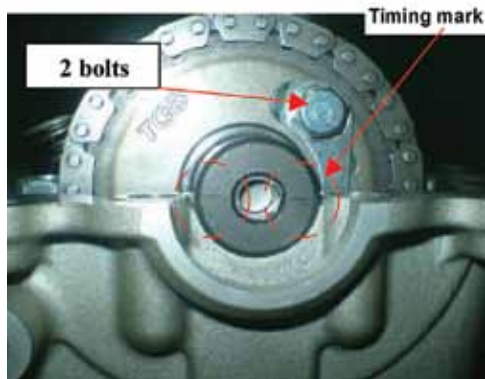


- Install camshaft into cylinder head.
- Install rocker arm, rocker arm shaft.
- Install cam chain tensioner into cylinder head
- Install 6 bolts on the stand for spindle, cam.

6 Bolts: 7-10 ft/lbs

## Cylinder / Head Valve

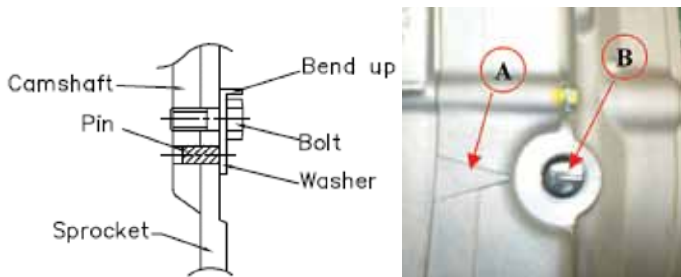
### Cylinder head installation:



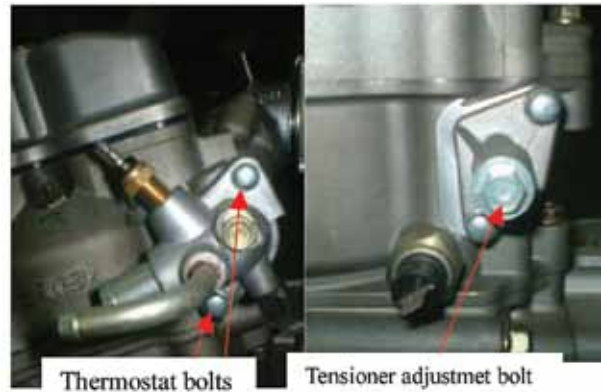
- Install cam chain on to sprocket and align the timing mark on the sprocket with that of cylinder head.
- Align sprocket bolt hole with camshaft bolt hole.
- Tighten the sprocket mounting bolts.

**CAUTION**

- Make sure timing marks are matched.



- Install the lock washer so that it is covering the locating pin.
- Bend up the washer tongue positively to lock bolts.
- Align the line **A** on the generator rotor with the index mark **B** on the crankcase.



- Loosen auto tensioner adjustment bolt and remove bolt and spring.
- Install tensioner and install spring and adjustment bolt.
- Install thermostat (2 bolts)
- Install cylinder cover (3 bolts)

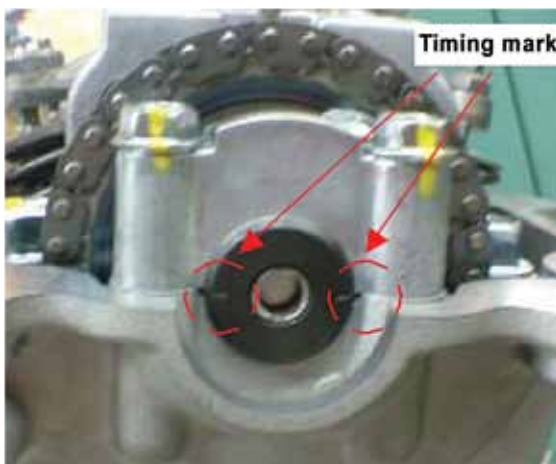


- Install and tighten spark plug.
- Torque value: 7 - 10 ft/lbs

### Valve clearance adjustment:



- Remove cylinder head cover. (3 bolts)
- Align the line (A) on the generator rotor with the index mark (B) on the crankcase.



- Loosen valve clearance adjustment nuts and bolts located on valve rocker arm.
- Measure and adjust valve clearance with feeler gauge.
- After valve clearance has been adjusted to standard value, hold adjustment bolt and then tighten the Adjustment nut.

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



- Start the engine and make sure that engine oil flows onto the cylinder head.
- Stop the engine after confirmed, and then install the cylinder head cover.

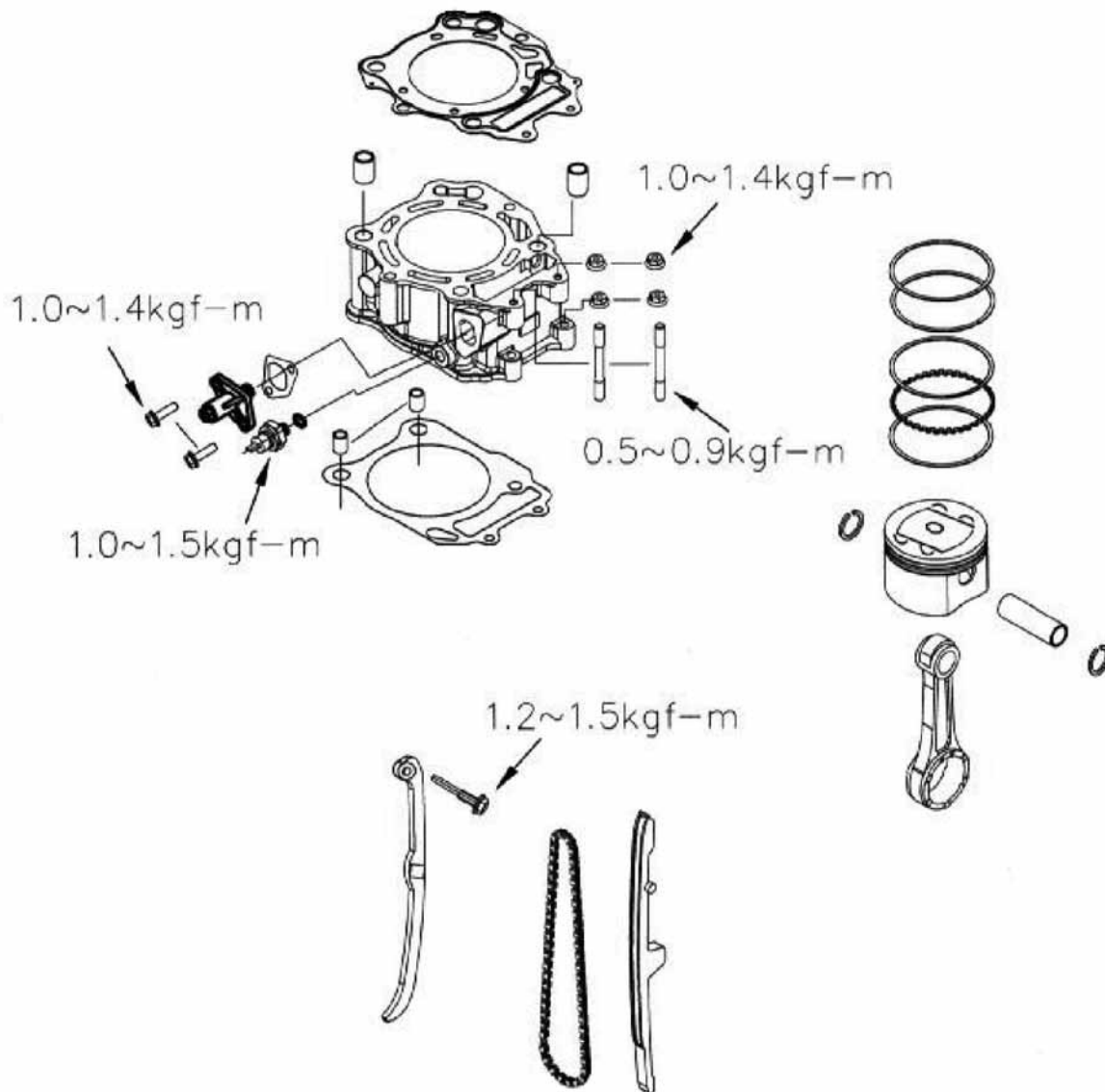
### CAUTION

- If lubricant does not flow to cylinder head, engine components will be seriously damaged.
- When checking lubricant flow, run the engine at idle speed. Do not accelerate engine speed.

## CHAPTER 7 CYLINDER/PISTON

Mechanism Diagram .....	Page 70
Precautions in Operation .....	Page 71
Troubleshooting .....	Page 71
Cylinder & Piston Removal .....	Page 72-73
Piston Ring Installation .....	Page 74
Piston Installation .....	Page 74
Cylinder Installation .....	Page 75

### Mechanism Diagram:



## Precautions in Operation:

Item		Standard	Limit	
Cylinder	ID	86.022-86.052	86.100	
	Warpage	/	0.050	
Piston/ Piston Ring	Clearance between piston rings	Top Ring	0.04-0.075	
		2nd Ring	0.02-0.055	
	Ring-end gap	Top Ring	0.150-0.300	
		2nd Ring	0.300-0.450	
		Oil ring side rail	0.200-0.700	
	OD of piston (2nd)		85.30-85.50	85.25
	Clearance between piston and cylinder		0.04-0.058	0.120
ID of piston pin boss		20.001-20.006	20.020	
OD of piston pin		19.996-20.000	19.960	
Clearance between piston and piston pin		0.001-0.010	0.020	
ID of connecting rod small-end		20.002-20.01	20.040	

## Troubleshooting:

### ***Low or Unstable Compression Pressure***

- Cylinder or piston ring worn out

### ***Knock or Noise***

- Cylinder or piston ring wear
- Carbon deposits on cylinder head top-side
- Piston pin bore and piston pin wear

### ***Smoking in Exhaust Pipe***

- Piston or piston ring wear
- Piston ring improper installation
- Cylinder or piston damage

### ***Engine Overheat***

- Carbon deposits on cylinder head top side
- Cooling pipe clogged or not enough coolant flow

## Cylinder / Piston

### Cylinder & Piston Removal:



- Remove cylinder head (refer to chapter 6).
- Remove coolant hose from cylinder.
- Remove cylinder.



- Cover the holes of crankcase and cam chain with a piece of cloth.
- Remove piston pin clip, and then remove piston pin and piston.



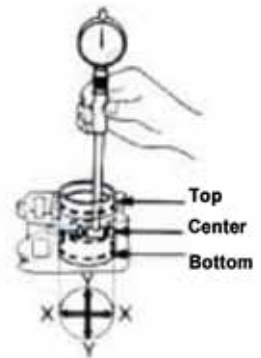
- Remove cylinder gasket and dowel pin.
- Clean up all residue or foreign materials from the two matching surfaces of cylinder and crankcase.

### **CAUTION**

- Soak gaskets in solvent so that the residue can be removed more easily.

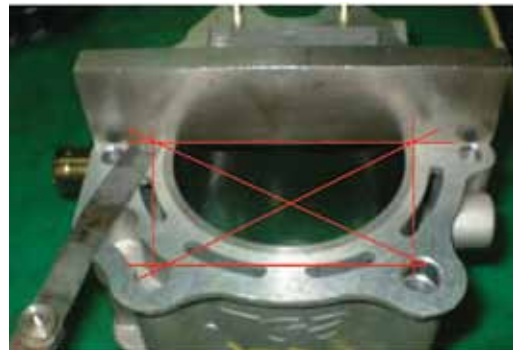
### Inspection:

- Check the inner diameter of cylinder for wear or damage.
- In the 3 positions: top, center and bottom of cylinder, measure the X and Y values in the cylinder.



Service limit: 86.100 mm

### Cylinder & Piston Removal:



- Check cylinder for warping.
- Service limit: 0.05 mm



- Measure clearance between piston rings and grooves.
- Service Limit:      Top ring: 0.09 mm  
                              2nd ring: 0.09 mm

### **CAUTION**

- Be careful removing piston rings because they are fragile.





- Remove piston rings
- Check if the piston rings are damaged or its grooves are worn.



- Place piston rings into cylinder below 20 mm of cylinder top. Keep the piston rings horizontal in cylinder, push the rings with piston.
- Measure ring end gap.
- Service Limit: Top ring: 0.50 mm  
2nd ring: 0.65 mm



- Measure the outer diameter of piston pin.
- Service Limit: 19.96 mm



- Measure the inner diameter of connecting rod small end.
- Service Limit: 20.065 mm



- Measure the inner diameter of piston pin hole.
- Service Limit: 20.02 mm
- Calculate clearance between piston pin and its hole.
- Service Limit: 0.02 mm

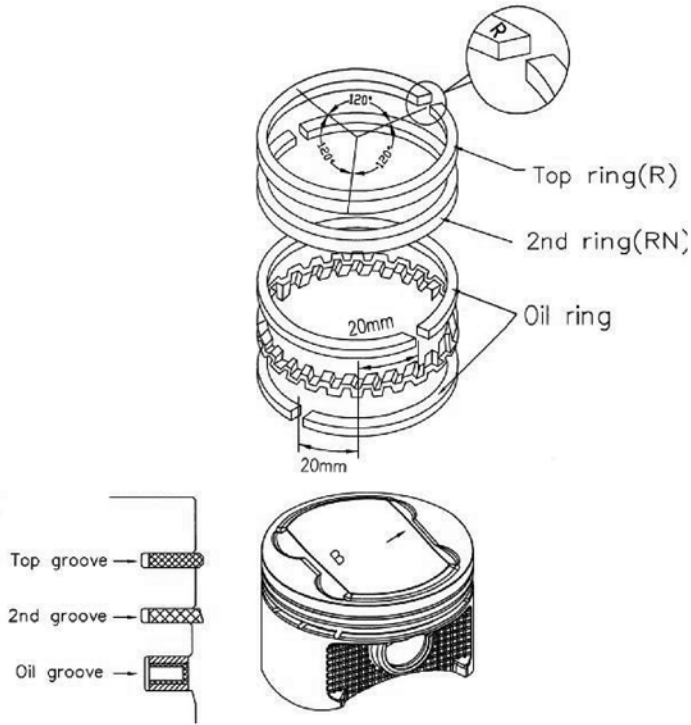
### CAUTION

- The measurement position is 8 mm distance from piston bottom side, and 90° to piston pin.



- Measure piston outer diameter.
- Service limit: 85.850 mm
- Compare measured value with service limit to calculate the clearance between piston & cylinder.

## Cylinder / Piston



### Piston Ring Installation:

- Clean up piston top, ring groove, and piston surface.
- Install the piston ring onto piston carefully.
- Place the openings of piston ring as diagram shown.

### CAUTION

- Do not damage piston or piston rings during installation.
- All marks on the piston rings must face up.
- Make sure that all piston rings can be rotated freely after installed.



- Clean up all residue and foreign materials on the matching surface of crankcase.

### CAUTION

- Soak gaskets in solvent so that the residue can be removed more easily.

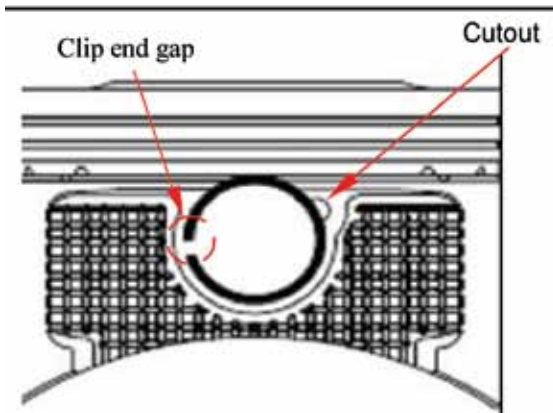


### Piston Installation:

- Install piston and piston pin, and place the marks on the piston top side toward exhaust valve.

### CAUTION

- Do not let the opening of piston pin clip align with the piston cutout.
- Place a piece of cloth between piston and crankcase in order to prevent snap ring from falling into crankcase.



- Install new piston pin clip.

### Cylinder Installation:



- Install dowel pins and new gasket.



- Coat cylinder piston and piston rings with Engine oil. Care needs to be taken when installing piston into cylinder. Press piston rings in one by one.

### CAUTION

- Do not push piston into cylinder forcefully because piston and piston rings will be damaged.

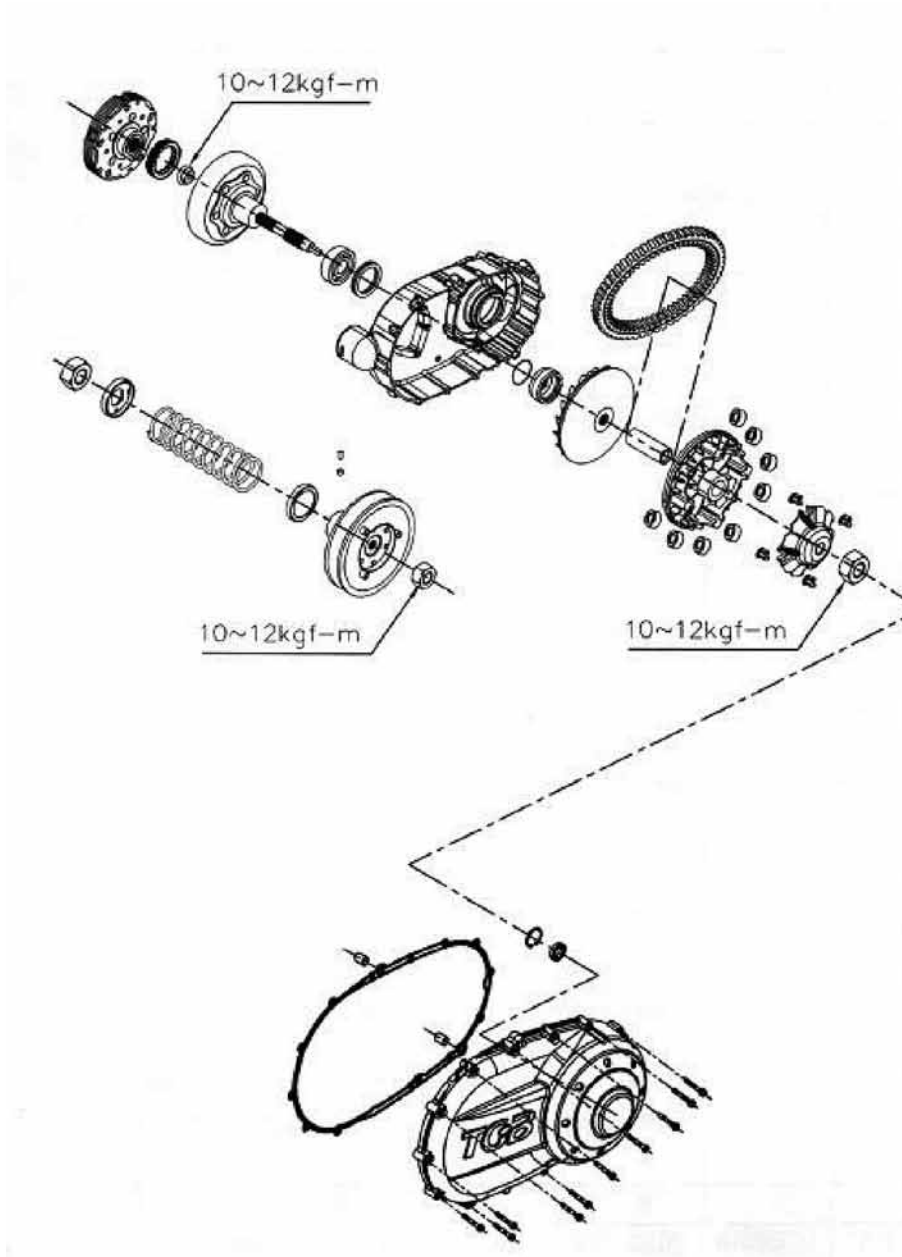


- Install coolant hose onto cylinder.
- Install cylinder head (refer to Chapter 6)

## CHAPTER 8 V-BELT DRIVE SYSTEM

Mechanism Diagram.....	Page 76
Precautions in Operation.....	Page 78
Troubleshooting .....	Page 78
Clutch Cover.....	Page 79
Drive Belt .....	Page 79
Drive Face .....	Page 80
Clutch Outer/Driven Pulley.....	Page 81-82

### Mechanism Diagram:



**Maintenance:**

**General Information**

- Drive face, clutch outer, and driven pulley can be serviced on the MTV.
- Drive belt and drive pulley must be free of grease.

**Specifications:**

Item	Standard	Limit
Driving belt width	28.500 mm	27.000 mm
OD of movable drive face boss	26.946-26.980 mm	26.926 mm
ID of movable drive face	27.000-27.040 mm	27.060 mm
OD of weight roller	25.800-26.000 mm	25.000 mm
ID of clutch outer	140.000-140.200 mm	140.500 mm
Free length of driven pulley spring	230.000 mm	225.000 mm
OD of driven pulley boss	44.965-44.985 mm	40.935 mm
ID of driven face	45.000-45.035 mm	45.600 mm
Weight of weight roller	13.300-13.700 g	12.800 g

**Torque value**

- Drive face nut: 55 ft. lbs
- Clutch outer nut: 55 ft. lbs
- Drive plate nut: 55 ft. lbs

**Special Service Tools**

- Clutch spring compressor:
- Inner bearing puller: TGB Clutch
- Nut wrench 27 x 15 mm: TGB Universal
- Holder: TGB Bearing
- Driver: TGB Trouble

**Troubleshooting:**

**Engine can be started but MTV cannot be moved:**

1. Worn drive Belt
2. Worn drive face
3. Worn or damaged clutch weight
4. Broken driven pulley

**Shudder when driving:**

1. Broken clutch weight
2. Worn clutch weight

**Insufficient power or poor high speed performance:**

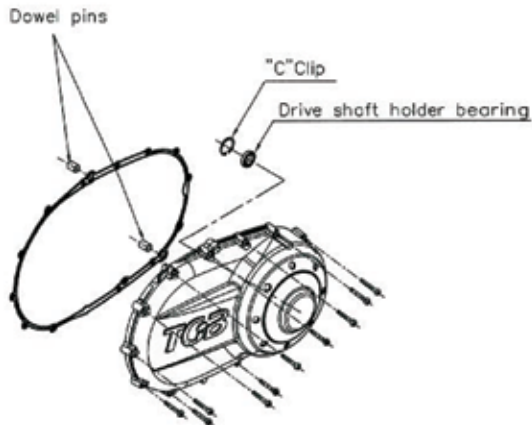
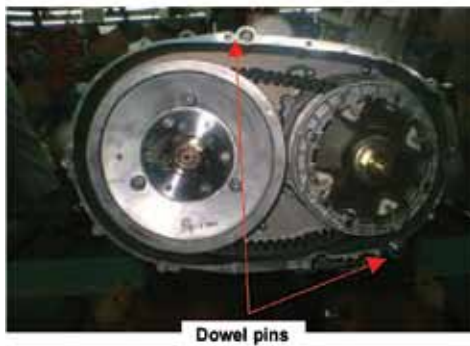
1. Worn drive belt
2. Insufficient spring force on driven pulley
3. Worn roller
4. Driven pulley surface is rough

## V-Belt Driving System



### Clutch Cover:

- Remove clutch cover. (14 Bolts)
- Remove the 2 dowel pins and gasket.
- The clutch cover's 14 bolts are located around the outside of the clutch cover.



### Clutch Cover Install:

- Install left clutch cover in the reverse order of removal.



### Clutch cover inspection:

- Check bearing on clutch cover. Rotate bearing's inner ring with fingers.
- Ensure bearings can be turned smoothly and silently, and bearing outer ring is mounted in cover tightly.
- If bearing rotation is uneven, noisy, or loose, then replace it.



### Drive Belt:

#### Removal

- Remove belt cover.
- Hold drive face with universal holder, and remove nut and drive face.
- Special Tool: universal holder
- Hold clutch outer with universal holder, and remove nut, and clutch outer.

### CAUTION

- Use special service tools for tightening or loosening the nut.
- Fixed rear wheel or rear brake will damage reduction gear system.

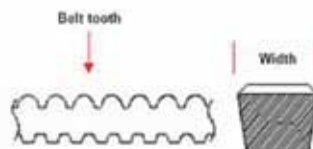


- Push the drive belt into belt groove as diagram shown so that the belt can be loosened, and then remove the driven pulley.
- Remove driven pulley. Do not remove drive belt.
- Remove the drive belt from the groove of driven pulley.



### Inspection

- Check the drive belt for crack or wear. Replace it as necessary.
- Measure the width of drive belt as diagram shown.
- Service Limit: 27.0 mm
- Replace the belt if exceeds the service limit.



### CAUTION

- Use only genuine parts for replacement.
- The surfaces of drive belt or pulley must be free of grease. Clean up all grease or dirt before installation.



### Installation

- Install the clutch outer . Hold the clutch outer with universal holder, and then tighten nut to specified torque value.
- Torque value: 55 ft. lbs



- Install the drive face, washer and drive face nut.
- Hold drive face with universal holder, and then tighten nut to specified torque value.
- Torque value: 55 ft. lbs

## V-Belt Driving System

### Drive Face:



### Removal

- Remove right crankcase cover.
- Hold drive face with universal holder, and then remove drive face nut.
- Remove drive face and drive belt.



- Remove movable drive face comp and drive face boss from crankshaft.



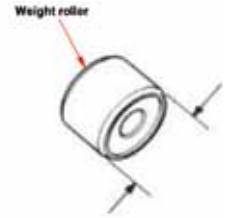
- Remove ramp plate.



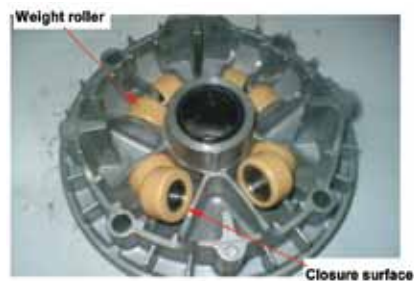
- Remove weight rollers from movable drive face.

### Inspection:

- The weight rollers press the movable drive face by means of centrifuge force.
- If weight rollers are worn out or damaged, the centrifuge force will be affected.
- Check rollers for wear or damage. Replace as necessary.
- Measure each roller's outer diameter. Replace if it exceeds the service limit.
- Service limit: 25.0 mm
- Weight: 12.5g



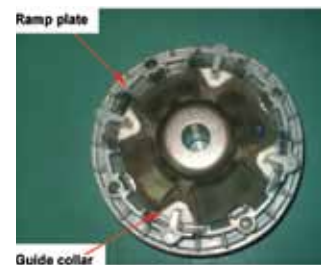
- Check drive face boss for wear or damage and replace it as necessary.
- Measure the outer diameter of movable drive face boss, and replace it if it exceed service limit.
- Service limit: 26.962 mm



- Measure the inner diameter of movable drive face, and replace it if it exceed service limit.
- Service limit: 27.060 mm

### Reassembly/installation

- Install weight rollers.
- Install Ramp Plate.





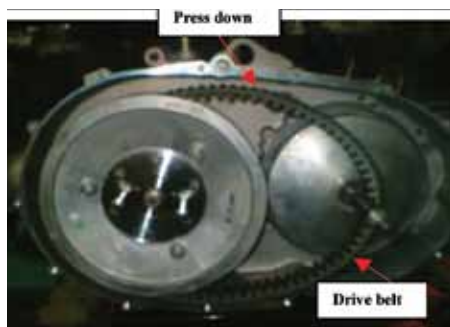
## Driven pulley installation:

### CAUTION

- The movable drive face surface has to be free of grease. Clean it with cleaning solvent.



- Driven pulley installation (with 2 screws)
- Press drive belt into pulley groove, and then pull the belt onto drive shaft.



- Install Movable drive face, and nut.
- Loosen the 2 screws.

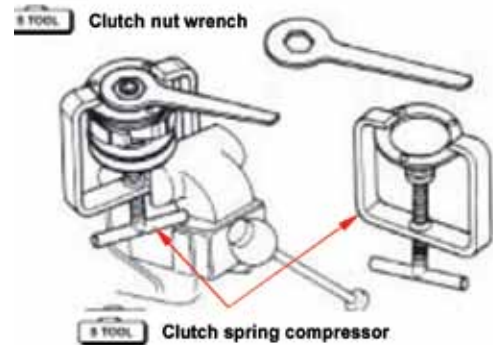
### CAUTION

- Both sides of pulley surfaces have to be free of grease. Clean with cleaning solvent.

- Hold drive face with universal holder.
- Tighten nut to specified torque.
- Torque value: 55 ft. lbs
- Install belt cover.

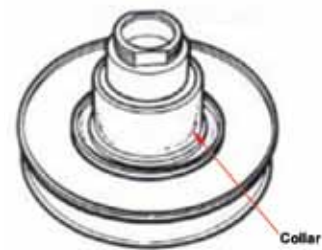


## Clutch Outer/Driven Pulley:

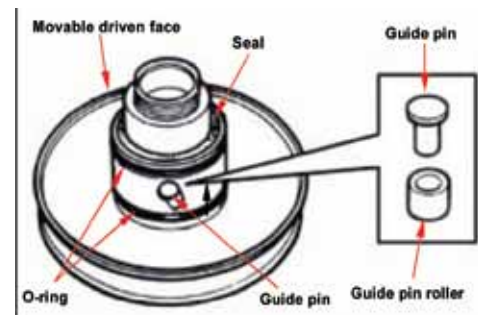


### Disassembly

- Remove drive belt, and driven pulley. Install clutch spring compressor onto the pulley assembly. The compressor will let the wrench be installed more easily.



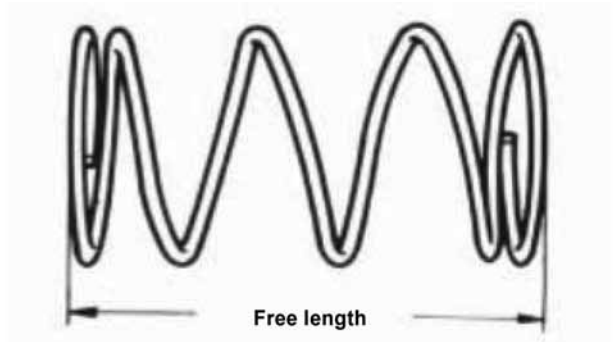
- Hold the clutch spring compressor in bench vise, and then remove mounting nut with special service tool.
- Release the clutch spring compressor and remove movable driven sheave and spring from driven pulley.
- Remove seal collar from driven pulley.



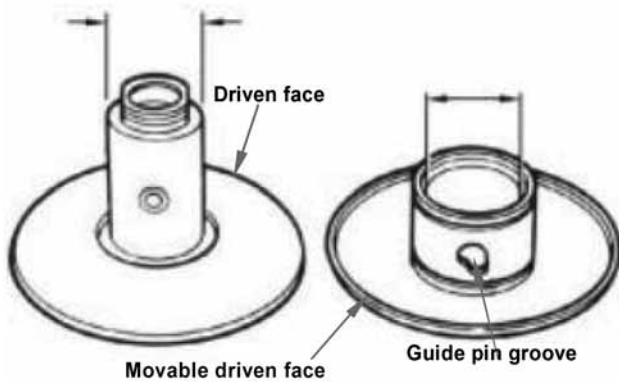
- Remove guide pin, guide pin roller, and movable driven face, and then remove O-ring & oil seal seat from movable driven face.

## V-Belt Driving System

### Driven pulley spring:



- Measure the length of driven pulley spring.
- Replace it if exceeds service limit.
- Service limit: 225 mm

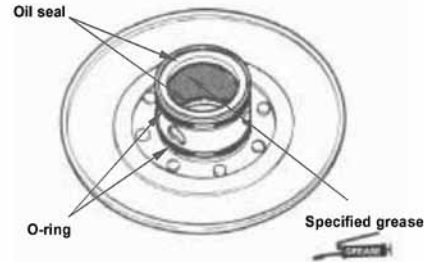


### Driven pulley

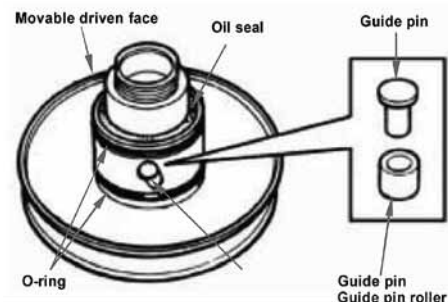
Check following items:

- Both surfaces for damage or wear
- Guide pin groove for damage or wear.
- Replace damaged or worn components.
- Measure the outer diameter of driven face and the inner diameter of movable driven face. Replace it if exceeds service limit.
- Service limit: Outer diameter 44.93 mm
- Inner diameter 45.60 mm

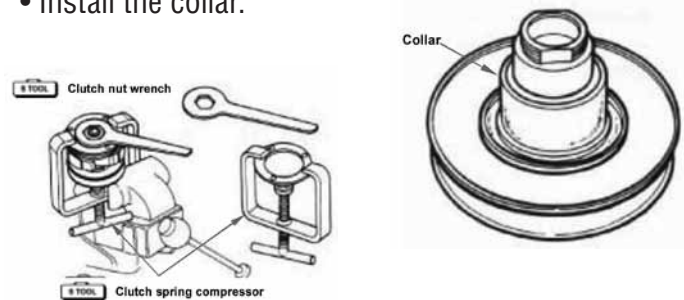
### Installation of Clutch OUTER/Driven Pulley Assembly:



- Install new oil seal and O-ring onto movable driven face.
- Apply with specified grease to lubricate the inside of movable driven face.



- Install the movable driven face onto driven face.
- Install the guide pin and guide pin roller.
- Install the collar.



- Install friction plate and spring into clutch spring compressor, and press down the assembly by turning manual lever until mounting nut can be installed.
- Hold the compressor with bench vise and tighten the mounting nut to specified torque with clutch nut wrench.
- Remove the clutch spring compressor.
- Torque value: 30 ft. lbs
- Install driven pulley and drive belt onto drive shaft.

## CHAPTER 9 TRANSMISSION SYSTEM

Final Driving Mechanism ..... Page 83-87

### Transmission System:



#### Remove

- Remove the driven output rear shaft and front shaft.
- Separate the driven output rear shaft and front shaft.



- Remove the c-ring from the universal joint assembly.
- Remove the driven output front shaft with a chisel.



- Remove the joint parts.

- Replace the removed nut with a new one when reassembled.



- Unlock the nut with a chisel.



- Remove the nut.



- Remove the bearing by tapping with hammer.

- Remove the universal joint assembly.



- Rear universal joint disassembly.
- Remove the c-rings from the universal joint assembly.



- Remove the parts.



- Using a vise hold the driven output rear shaft and remove the nut.
- Reassemble with a new nut.



- Unlock the nut with a chisel.
- The new bearing and oil seal must be replaced when reassembled



- Remove the nut from Driven output front shaft



- Disassemble the bevel gear
- Unlock the nut with a chisel.



- Using a vise hold the driven output front shaft and remove the nut.
- Remove the washer driven bevel gear and bearing.



- Remove the parts.
- Replace with new nut when reassembling.
- Replace with new bearing and oil seal when reassembling.



**Inspection:**

- Check the bearings and joint surface. If any damage, wear or scuffing, replace the bearings and joint assembly.
- Install the parts as shown.



- Reassemble the driven output rear shaft and front shaft in the reverse order of disassembly.



- Stake the nut with a punch after the tooth.
- Contact and backlash have been adjusted and checked.



- Reassemble driven output rear shaft.
- Before reassembly, thoroughly clean all parts with solvent.



- Using a vise hold the bevel gear.
- Tighten the new nut to the specified torque.
- Torque: 73 ft/lbs



- Stake the nut with a punch.



- Apply grease to the bearing and seal lip.



- Apply grease to the oil seal lip.
- Install the oil seal on the joint yoke. (The oil seal lip should be positioned joint yoke side.) Using a vise hold the driven output rear shaft. Tighten the new nut to the specified torque.
- Torque: 73 ft/lbs



- Stake the nut with a punch after the tooth contact and backlash have been adjusted and checked.



- Put the bearing rings and shaft in the crankcase.
- Position the bearing pin to the pin grooves in the crankcase.
- Check the gear backlash and tooth contact correctly. (Tooth face contact 80% up)
- Torque: 73 ft/lbs



- Stake the nut with a punch
- The bearing knock-pin should be outside.



- Tooth contact: face contact 80% up



- Using the tool to install the bearings and joint.
- Reassemble the universal joint.



- Tool: 440668

- Install the new c-ring by tapping with hammer. (copper)
- Using the new c-ring for reassembly



- After reassembling the universal joint assembly.
- Check for resistance. Tap the bearing with plastic mallet lightly.



### Final Assembly:

- After adjusting tooth contact correctly, remove the front and rear output shafts and drive bevel gear
- Clean off any dye or paste from the gear teeth, and lubricate the teeth with engine oil.
- Tighten the drive bevel gear nut and rear out put Shaft nut to the specified torque.



- Rear output shaft nut: 100N: M(10.0 kgf-m, 73 lb-ft)
- Drive bevel gear nut: 100N: M(10.0 kgf-m, 73 lb-ft)

- Stake the collar of the nut A into the notch in the shaft.



### NOTE:

*After the tooth contact has been checked and adjusted, reassemble the joint.*



## Engine Reassembly:

### NOTE:

*When reassembling the engine, apply engine oil to sliding parts and running parts before re-assembling.*

### CAUTION

- Be sure to keep the drive belt, drive face and driven face away from any oil or grease.



- Install the output shaft assembly with a plastic mallet.
- Install the shim drive bevel gear and washer.



- Tighten the bevel gear nut to the specified torque.
- Bevel gear nut torque: 73 ft/lbs



- Use a center punch and stake the nut.



## Drive Train:

- Install the rear and front output shaft.
- Install the C-ring.



### NOTE:

*Fit the pins on the bearing into the groove of the crankcase.*

## Transfer/Gearshift:

- Install the transfer related parts.



- Install the spacer spring, shaft and reverse idle gear.
- Install the washer.



## Crankcase:

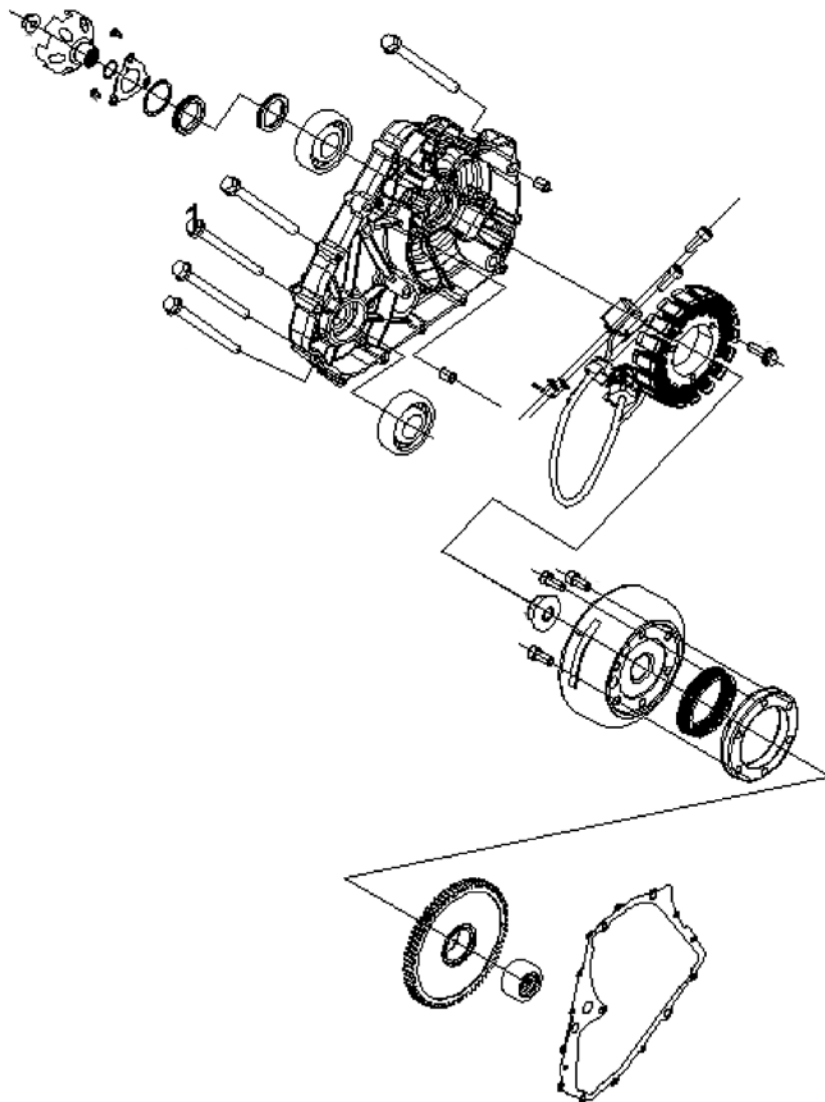
- Clean R and L crankcase surfaces with cleaning solvent.
- Fit the dowel pins in the holes.
- Apply engine oil to the gears and connecting rod.



## **CHAPTER 10 ALTERNATOR/STARTING CLUTCH**

Mechanism Diagram .....	Page 88
Precautions in Operation .....	Page 89
Left Crankcase Cover Removal .....	Page 90
A.C.G. Set Removal .....	Page 90
Lift Cover Bearing .....	Page 80
Flywheel Removal .....	Page 90
A.C.G. Set Installation .....	Page 90
Right Crankcase Cover Installation .....	Page 92

**Mechanism Diagram:**





## Precautions in Operation:

### General Information

Refer to chapter 17: The troubleshooting and inspection of alternator

Refer to chapter 17: The service procedures and precaution items of starter motor

Specifications:

Item	Standard Value (mm)	Limit (mm)
ID of starting clutch gear	29	
OD of starting clutch gear	52.548-52.445	

### Torque value:

- Flywheel nut 85 ft/lbs
- Flywheel nut not to be reused. Should be replaced when disassembled
- Coat starting clutch hexagon bolt with adhesive 30-34 ft/lbs

### Tools:

- Special tools
- A.C.G. flywheel puller: 440659

## Alternator/Starting Clutch

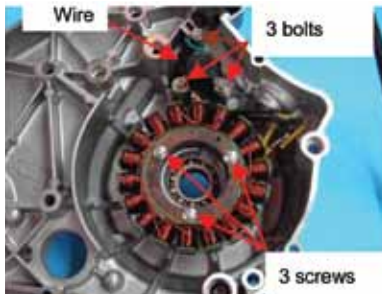
### Left Crankcase Cover Removal:

- Drain out the engine oil and coolant, and then remove coolant hoses.
- Remove water pump (2 bolts).
- Remove 15 bolts from the left crankcase cover.
- Remove the left crankcase cover.
- Remove dowel pin and gasket.



### A.C.G. Set Removal:

- Remove 3 mounted screws from pulse generator and then remove it.
- Remove 3 screws from left crankcase cover and then remove generator coil set.



### Left Cover Bearing:

#### Inspection

- Rotate the bearing with finger to check if the bearing rotation is smooth and silent.
- Replace it if necessary.



- Remove the bearing.



- Check the oil seal for wear or damage.
- Replace it if necessary.



- Install a new bearing (16005) with bearing driver.



### Flywheel Removal:

- Remove left crankcase cover.

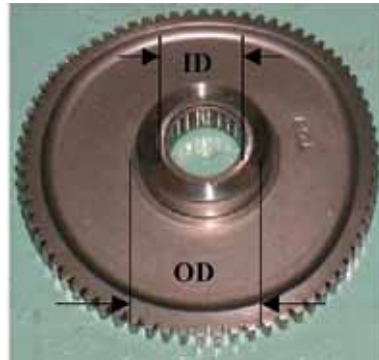


- Remove starter reduction gear and shaft.
- Pull out flywheel with A.C.G. flywheel puller.
- Special tool: A.C.G. Flywheel puller
- Remove flywheel and starter driven gear.



### Starting Clutch:

- Starting Clutch Inspection
- Remove starting clutch driven gear. Check the gear for wear or damage.
- Measure the ID and OD of the starting clutch driven gear.
- Service Limit:



ID: 29 mm  
OD: 52.54mm

- Check the starting reduction gear and shaft for wear or damage.



- Check each roller for wear or damage.

- Install starting clutch driven gear onto one way clutch.
- Hold flywheel and rotate starting clutch gear.
- The starting clutch gear should be rotated in C.C.W direction freely, but not C.W direction. (View as shown in this figure.)



### One way clutch removal:

- Remove starting driven gear.

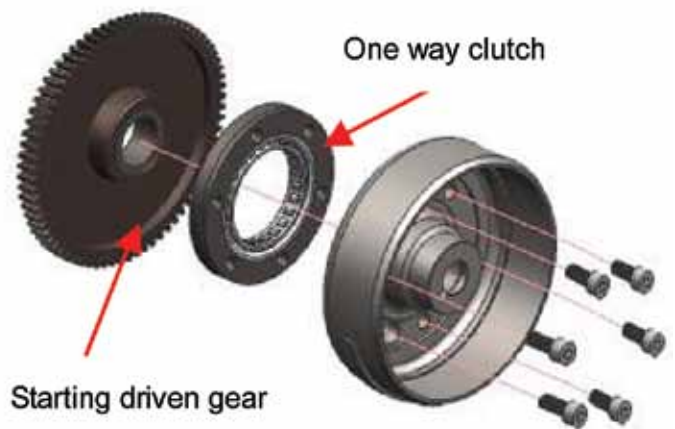


Starting driven gear

- Remove 6 socket bolts.
- Then remove one way clutch.



6 socket bolts



One way clutch

Starting driven gear

### One way clutch Installation:

- Install the components in the reverse procedures of removal.
- Torque value: 21 - 25 ft/lbs
- **USE LOCKTITE IN THE THREAD OF BOLT**



6 socket bolts

## Alternator/Starting Clutch

- Install starting driven gear.



### Flywheel Installation:

- Align the key on crankshaft with the flywheel groove, and then install the flywheel.



- Hold the flywheel by drive face with universal holder, and tighten flywheel nut.



- Flywheel nut not to be reused. Nut should be replaced when disassembled.

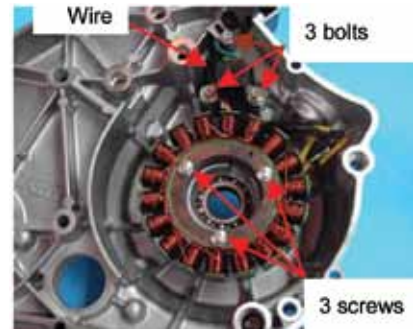
- Torque value: 85 ft/lbs
- Special tool: Universal Holder

- Install reduction gear shaft and reduction gear.



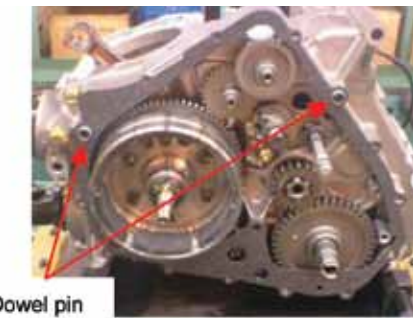
### A.C.G. Set Installation:

- Install the A.C.G. coil set onto right crankcase cover (3 screws).
- Install pulse generator (3 screws).
- Tie the wire harness securely onto the indent of crankcase.



### Left Crankcase Cover Installation:

- Install dowel pin and new gasket.



- Install left crankcase cover onto the crankcase.



### Note:

*Align the water pump shaft indent with the water pump gear shaft.*



- Install left crankcase cover (15 screws).
- Install the dowel pin, new gasket and water pump cover onto left crankcase cover.

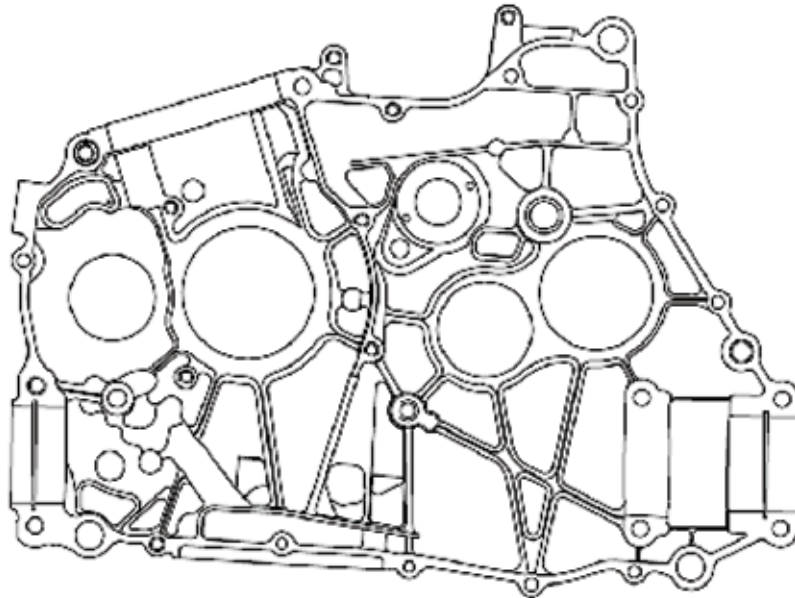


## CHAPTER 11 CRANKSHAFT/CRANKCASE

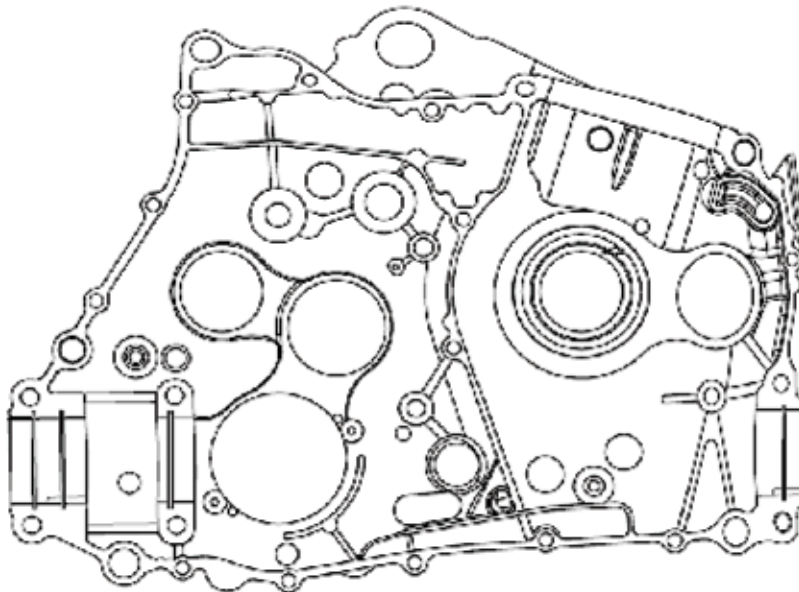
Mechanism Diagram .....Page 93

Mechanism Diagram:

LEFT CASE



RIGHT CASE



## Crankshaft/Crankcase

### Oil Seal:

- Remove the oil seal with the special tool.
- Oil seal remover 440656



- Install the oil seal with the special tool:
- Bearing installer set 440655



### CAUTION

- Replace oil seal to prevent oil leakage.

### NOTE:

*Be sure the stamped mark on the oil seal faces outside.*



### OIL SEPARATOR

- When installing the oil guide plate, apply a small amount of Locktite 262TM (Thread locker) to the screw.



### Bearing Reassembly:

- Install the bearing.



### NOTE:

*The sealed cover of the bearing must face outside.*



- Install the bearing chuck.



### NOTE:

*When installing the Bearing chuck, apply a small amount of Locktite 262TM (Thread locker) to the screws.*



### DRIVE BELT COVER

- Remove the snap ring with the snap ring pliers.



### NOTE:

*If bearing is damaged, replace with new one.*

- Remove the bearing.



### REASSEMBLY

- Install the bearing.



- Install the snap ring with snap ring pliers.



### Left Crankcase Cover:

- Remove the oil pressure valve.
- When installing the oil valve, tighten it to the specified torque.
- Oil pressure value: 25N: M(2.5kgf-m, 17lb-ft)
- Using a tool, check the oil pressure valve operation. If the piston does not operate, replace it.



### ASSEMBLY

- Remove the oil seal.



### REASSEMBLY

- Install the bearing.



- Apply Grease to the bearing, O-ring and Oil seal lip.
- Install the oil seal.



### NOTE:

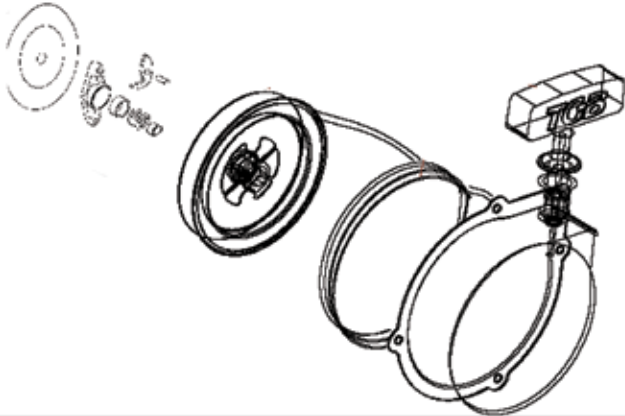
*When installing the oil seals, be sure the stamped mark on the oil seal faces outside.*

- Apply a small amount of Loctite 262TM (Thread locker) to the screws and install the bearing retainer.



## Crankshaft/Crankcase

### Recoil starter:



### DISASSEMBLY

- After removing the nut, remove the recoil starter related parts from the housing.



### WARNING

- When removing the plastics disc.
- Wear eye and hand protection, because the spring may quickly unwind and cause an injury.

### REASSEMBLY

- Hook the spiral spring end with the recoil starter case.



### WARNING

- Wear eye and hand protection during wheel reassembly.

- Apply Grease to the spiral spring.
- Wind the starter rope on the reel properly.
- Engage the part of the reel with the spiral spring end



- Hook the rope onto the hook part of the reel then turn the reel clockwise 5 times with the rope.



- Install the ratchet related parts.

### NOTE:

*Apply grease to the shaft and ratchet with Grease.*

- Pull the rope and check that the ratchet is pushed out.



### CRANKSHAFT

- Mounting the crankshaft in the crankcase.

### NOTE:

*Use the front fork oil seal installer as an attachment.*



- Front fork oil seal installer 440655
- Apply a small quantity of Loctite 262TM (Thread locker) to the thread and install the gearshift cam stopper.





## BALANCER

- Install the balancer shaft.
- Install the key.
- Install the balancer shaft driven gear.
- Install the driven gear balancer shaft by aligning the punched marks.
- Apply Loctite 510 (Flange sealant) to the mating surface of the left crankcase.



- Assemble the crankcase within few minutes.

## NOTE:

*After crankcase screws have been tightened, check to see if crankshaft rotates smoothly.*



- Check that each shaft rotates smoothly after the crankcase bolts have been tightened.



## OIL PUMP

- Install the oil pump.
- Install the washer and pin.
- Install the oil pump driven gear.
- Install the snap ring with snap ring pliers.

## NOTE:

*Assemble the oil pump gear as shown.*



## OIL PUMP DRIVE GEAR

- Install the pin.
- Install the oil pump drive gear and washer.
- Apply Loctite to the oil pump drive gear bolt.



## NOTE:

*Flange side of the gear is positioned inside.*

- Tighten the oil pump drive gear bolt to the specified torque.
- Oil pump drive gear bolt: 37 lb-ft
- Rotor holder 440665



## Crankshaft/Crankcase

### CAM CHAIN

- Install the cam chain.



### CLUTCH SHOE

- Install the clutch shoe assembly.
- Apply Locktite 262TM (Thread locker) to the clutch shoe.
- Tighten nut to the torque with the special tool.
- Shoe nut torque: 88 lb-ft
- Rotor holder 440666



### NOTE:

*The nut of clutch shoe has left-hand threads.*

- Install the one way clutch outside.
- Install the clutch housing.
- The one way clutch outside must face the shaft outside.



### NEUTRAL SWITCH

- Install the springs and switch contacts.
- Install the neutral switch.

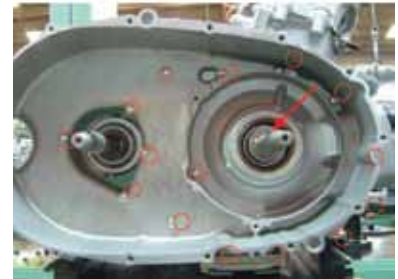


## CLUTCH CASE

- Install the dowel pins and new gasket.



- Tighten the clutch case bolt
- Install the collar.



## FIXED DRIVE FACE

- Install the fixed drive face.



## MOVABLE DRIVE/DRIVEN FACE AND DRIVE BELT

- Install the drive belt between the movable driven face and fixed driven face by tapping with a plastic mallet.



### CAUTION

- The drive belt contact surface of the driven face should be thoroughly cleaned.

- Install the movable driven face assembly.



- Tighten the movable drive face nut to the specified torque with the special tool.
- Movable drive face nut: 55 ft.lbs
- Rotor holder 440666



**NOTE:**

*Turn the fixed drive face until the belt is seated into both the drive and driven faces check the belt for slippage.*

**CLUTCH COVER**

- Install the dowel pins and new gasket.



- Install the clutch cover.

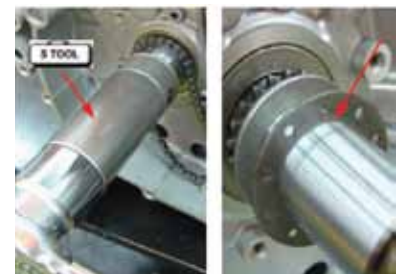
**OIL FILTER**

- Apply engine oil lightly to the O-ring.
- Install the oil filter by turning it by hand until you feel the filter gasket contacts the surface of case.
- Then tighten it 1 turn using the oil filter wrench.
- Oil filter wrench 440670



**WATER PUMP GEAR**

- Install the pin.
- Install the water pump chain to the two water pump gears as shown.
- Install the water pump gears with special tool.
- Install the washer.
- Bearing installer set 440660



- Install the water pump gears and tighten the nut



**NOTE:**

*Make sure the crankshaft can turning smoothly.*

- Install the washer.



## Crankshaft/Crankcase

### GENERATOR

- Install the key.



- Install the one way clutch and generator rotor sets.



### CAUTION

- Be sure the one way clutch on the crankshaft is fitted into the generator rotor properly.

- Tighten the generator rotor nut to the specified torque with the special tool.
- Generator rotor nut: 85 ft/lbs.



- Install the output drive gear by installing the snap ring.



### GEARSHIFT

- Install the cam driven gear.
- Reassemble the gearshift shaft.



- Install the gearshift shaft by aligning the Punched mark with the center of the cam driven gear.



### STARTER DRIVEN GEAR/IDLE GEAR

- Install the starter idle gear and driver gear.



### LEFT CRANKCASE COVER

- Install the dowel pins and new gasket.



- Tighten the left crankcase cover bolts.



## WATER PUMP

- Check the water pump shaft position with water Pump gear shaft.
- Apply engine oil on the O-ring of water pump.
- Install water pump.



- Tighten the screws.



## STARTER CUP

- Apply engine oil to the O-ring and lip of the oil seal.
- Install the starter cup.
- Tighten the starter cup nut by using a suitable bar.
- Starter cup nut: 30 -34 ft. lbs.



## **CHAPTER 12 COOLING SYSTEM**

<b>General Information.....</b>	<b>Page 102</b>
<b>Troubleshooting .....</b>	<b>Page 103</b>
<b>Systems Test .....</b>	<b>Page 104</b>
<b>Radiator .....</b>	<b>Page 104</b>
<b>Water Pump .....</b>	<b>Page 105-107</b>

### **General Information:**

---

**WARNING**

- While the engine is running, never attempt to open the radiator filler cap, the pressurized hot coolant may cause serious scalding injury.
  - No maintenance work is allowed until the engine is completely cooled down.
- 

- Refill the radiator with distilled water or specified additives.
- Add coolant to the reservoir.
- The cooling system can be serviced on the MTV.
- Never spill the coolant to the painted surface.
- Test the cooling system for any leakage after the repair.

### **Technical Specification:**

<b>Item</b>	<b>Specification</b>
Pressure to open filler cap.....	0.9 (+/-0.15) kgf/cm <sup>2</sup>
Capacity of coolant: Engine + radiator .....	2200c.c.
Reservoir upper .....	1200c.c.
Thermostat .....	Begins to activate at 65~72°C Stroke: 0.05~5m
Thermos switch (fan).....	Begins to activate at 85 +/-3°C
Boiling point .....	Not-pressurized: 107.7°C Pressurized: 125.6

### **Torque Value:**

- 7 – 10 ft.lbs
- For water pump impeller 1.0~1.4kgf-m

### Tools Requirement:

#### Special tools

- Water pump bearing driver (6901): TGB-440640
- Water pump oil seal driver (Inner): TGB-440641
- Water pump mechanical seal driver: TGB-440642
- Inner bearing puller: TGB-440645

### Troubleshooting:

#### The engine temperature is too high IF:

- Insufficient coolant.
- The water hose and jacket are clogged.
- Fan motor malfunction.
- Filler malfunction.
- Loose cylinder bolts or nuts

#### Coolant is leaking:

- The water pump mechanical seal does not function properly.
- The O ring is deteriorated.
- The water hose is broken or aged.

#### The temperature indicated is too high:

- Stop and wait for the engine is completely cooled down, open cap to check the capacity of coolant in radiator.
- Refill the radiator with coolant then check for any leakage.

### If the temperature indicated is too high:

---

#### **WARNING**

- Allow engine to cool before proceeding!
- 

A: Open radiator cap and softly throttle, inspect to see if coolant has circulated.

B: Stop engine and remove water pump cover, start the motor to inspect pumps proper rotation.

#### If not:

- Water pump needs repair
- Water hose is clogged

C: Keep eng. 3000~4000 rpm and inspect cooling fan operation.

- Connect cooling fan terminals with battery (12V) directly to inspect its operation. Replace cooling fan if malfunctioning.

- To bleed the air bubbles completely, open radiator cap and start engine while engine is cool. Press water hose softly by hand bleed. Press the throttle repeatedly until the coolant surface becomes stable.

## Cooling System

### System Test:

- Seal the filler cap, apply water and pressure to the filler cap. Replace it with new one if failing to maintain the specified pressure within a given time limit, or the opening pressure is too high or too low. The specified pressure shall be maintained at least for 6 seconds in the Relief pressure for the filler cap: 12 psi.
- Apply pressure to the radiator, engine and water hose to check for any leakage

### CAUTION

- Pressure which is too high may damage the radiator. Never use pressure which exceeds 14 psi.

- If the system fails to maintain the specified pressure for at least 6 seconds, repair or replace parts.
- Change of coolant



### WARNING

- Never attempt to carry out service work on the cooling system unless the engine is completely cooled down.

- Remove filler cap.
- Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.
- Reinstall the drain bolt.
- Refilling system with coolant and bleed the air bubbles.
- Add coolant to proper level if necessary.
- Tighten the radiator filler cap. Coolant recommended: Bad Boy MTV radiator agent or equivalent extended life coolant.
- Concentration: 50%



- Check reserve tank
- Add coolant to proper level if too low.
- Reinstall the reserve tank filler cap.



### Radiator:

#### Check:

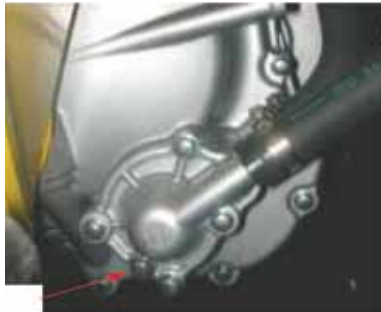
- Blow radiator clean using compressed air. If the radiator is blocked by dirt, use low pressure water jet to clean it.
- Care shall be taken when straightening the sinks



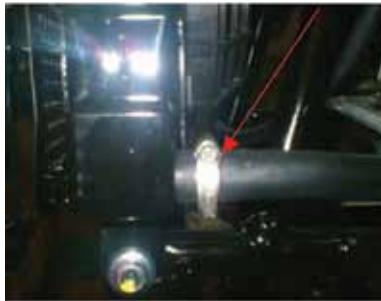


**Removal:**

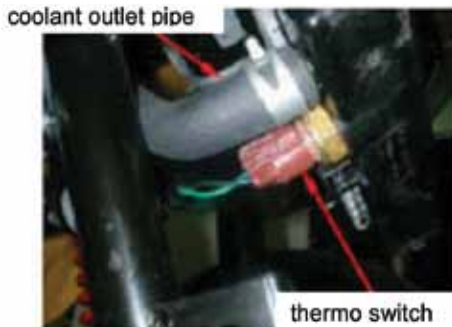
- Place a water pan under the water pump; loosen the drain bolt to drain out the coolant.



- Remove coolant filler pipe.



- Remove coolant outlet pipe.
- Disconnect the couplers for the thermo switch and fan motor, and then remove radiator and cooling fan.



**Disassembly:**

- Loosen the 4 bolts from the fan duct, and then remove the fan duct.
- Loosen 4 screws from the fan motor, and take off the fan motor.
- Remove nut to remove the fan from fan motor.



**Assembly:**

- Install fan motor onto fan duct and insert the fan into the motor shaft.
- Apply a coat of the adhesive to the shaft thread of the motor, and then install the washer and the lock nut.
- Tighten the fan duct onto the radiator with 4 bolts.



**CAUTION**

- Liquid sealant must be applied to the thermo switch before installing to avoid damaging the radiator.

**Installation:**

- Install the removed parts in the reverse order of removal.
- Install radiator in the reverse order of removal.
- Upon completion, check for any leakage.

**Water Pump:**

**Removal of water pump**

- Loosen the drain bolt to drain out the coolant.
- Remove the water hose.
- Loosen 4 bolts and remove the pump cover.
- Loosen 9 bolts and remove the right cover.
- Take off the gasket and dowel pins.
- Turn pump impeller clockwise and remove.



**CAUTION**

- The impeller has left turning threads.

## Cooling System

- Remove the cir clip from the right crankcase cover.
- Remove the water pump shaft and the inner bearing.
- Remove the outside bearing by inner bearing puller.
- Rotate the inner ring of bearing, the bearing shall move smoothly and quietly.
- If the bearing does not rotate smoothly or produces a noise, replace it with new one.



- Check for wear and damage of the mechanical seal and inside seal.



### CAUTION

- The mechanical seal and inside seal must be replaced as a unit.

## Replacement of Mechanical Seal

- Remove the inside bearing with inner bearing puller.
- Drive the mechanical seal and inner seal out of the right crankcase.



### Special tools:

- Inner bearing puller
- Water pump bearing driver

### CAUTION

- Replace with new mechanical seal after removing it.

- Apply a coat of sealant to the mating surfaces of the right crankcase before installing the new mechanical seal.



- Install the mechanical seal onto the right crankcase.



### Special tools:

- Water pump mechanical seal driver

- Install the new inner seal onto the right crankcase.

### Special tools:

- Water pump oil seal driver (inner)

- Install a new outside bearing in the right crankcase cover.

**Special tools:**

- Water pump bearing driver (6901)



**CAUTION**

- Do not reuse old bearing. It must be replaced with a new one once it has been removed.

- Mount the water pump shaft and the inner bearing in the right crankcase cover.



- Install the cir clip to hold the inner bearing.



- Install the seal washer under the impeller.



**CAUTION**

- Washer must be replaced together with the mechanical seal.

- Install the impeller onto the water pump shaft and tighten.
- Torque Value: 2-3 ft.lbs



**CAUTION**

- The impeller is left thread.

- Install the dowel pin and new gasket. Install the water pump cover with 4 bolts.

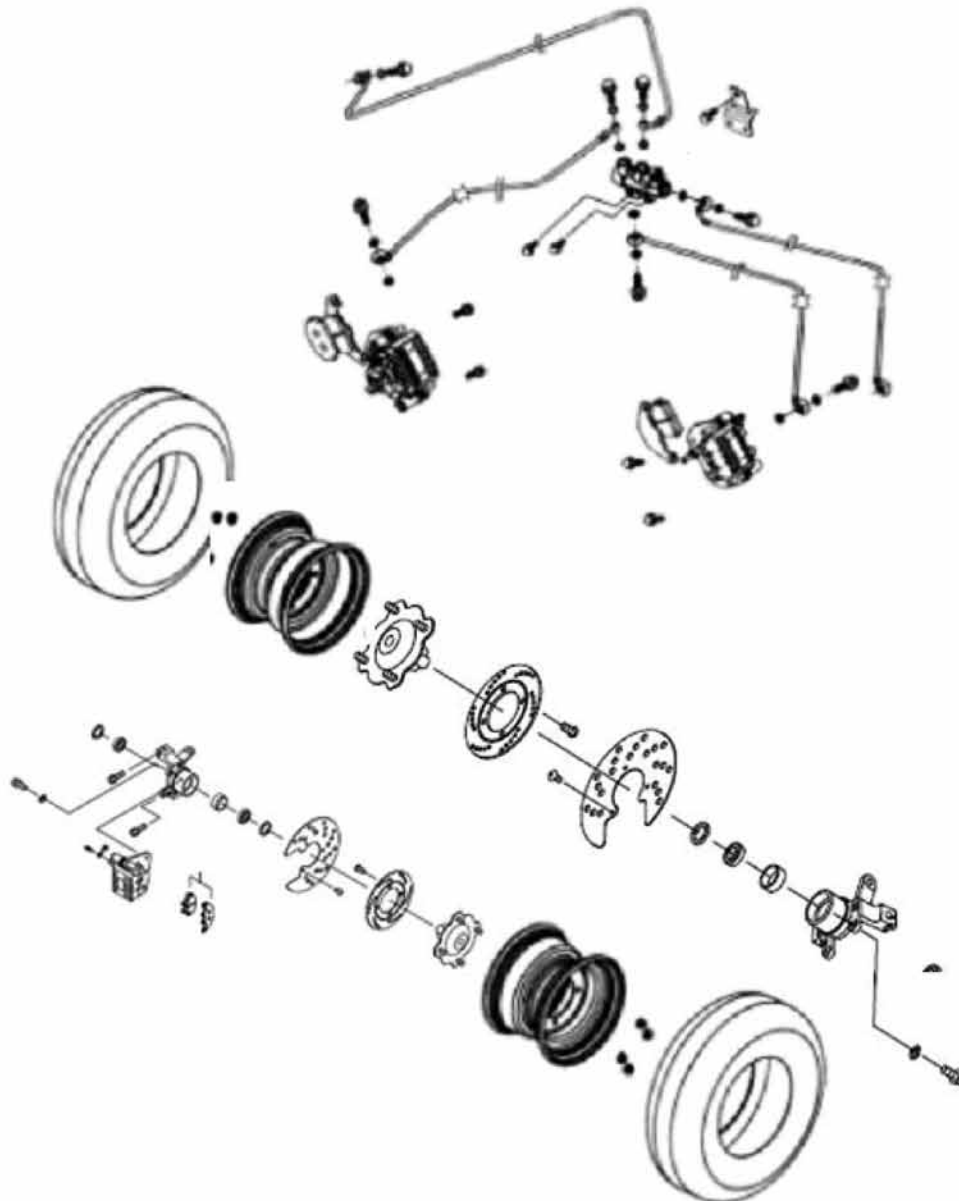




## CHAPTER 13 FRONT BRAKES AND FRONT WHEELS

Mechanism Diagram .....	Page 109
Maintenance Description .....	Page 110
Troubleshooting .....	Page 111
Front Wheel .....	Page 112
Front Wheel Hub .....	Page 112
Disk Brake System Inspection .....	Page 112-113
Brake Fluid Replacement/Air Bleed .....	Page 113
Front Brake Caliper .....	Page 114

### Mechanism Diagram:



## Front Brakes And Front Wheels

### Maintenance Description

### Operational precautions:

---

#### **CAUTION**

- Inhaling asbestos may cause disorders of respiratory system or cancer, therefore, never use air hose or dry brush to clean brake parts. Use vacuum cleaner or other authorized tool instead.
- 

- The brake caliper can be removed without removing the hydraulic system.
- After the hydraulic system is removed, or the brake system is felt to be too soft, bleed the hydraulic system.
- While refilling brake fluid, care should be taken not to let foreign material enter into the brake system.
- Do not spill brake fluid on the painted surfaces, plastic or rubber parts to avoid damage.
- Check the operation of the brake system before riding.
- Please refer to the Maintenance Manual of tubeless tire in respect to the removal, repair and installation of the tire.

### Specifications:

<b>Item</b>	<b>Standard (mm)</b>	<b>Limit (mm)</b>
The thickness of front and rear brake disk	3.500	2.000
Front and rear brake disk run out	< 0.100	0.300
Master cylinder inner diameter	14.000-14.043	14.055
Master cylinder piston outer diameter	13.957-13.984	13.945
Diameter of front disk	175.000	-----
Thickness of front brake lining	5.500	2.000

**Tire pressure as cold: 0.8 kg/cm<sup>2</sup> (12psi)**

### Torque Values:

Brake hose bolts	15-18 ft. lbs
Bolt for brake caliper	23 ft. lbs
Bolts for the brake disk	30 ft. lbs
Air-bleed valve	3.5 ft. lbs
Front wheel nut	28-30 ft. lbs
Front axle castle nut	36 ft. lbs

## Troubleshooting:

### Soft brake lever

1. Air inside the hydraulic system
2. Hydraulic system leaking
3. Worn master piston
4. Worn brake pad
5. Worn brake caliper
6. Worn brake lining/disk
7. Low brake fluid
8. Blocked brake hose
9. Warp/bent brake disk
10. Bent brake lever

### Hard operation of brake lever:

1. Blocked brake system
2. Worn brake caliper
3. Blocked brake pipe
4. Seized/worn master cylinder piston
5. Bent brake lever

### Uneven brake:

1. Dirty brake lining/disk
2. Poor wheel alignment
3. Clogged brake hose
4. Deformed or warped brake disk
5. Restricted brake hose and fittings

### Tight brake:

1. Dirty brake lining/disk
2. Poor wheel alignment
3. Deformed or warped brake disk

### Brake noise:

1. Dirty lining
2. Deformed brake disk
3. Poor brake caliper installation
4. Imbalance brake disk or wheel

### Hard steering:

1. Faulty tire
2. Insufficient tire pressure

### Front wheel wobbling:

1. Faulty tire
2. Worn front brake drum bearing
3. Bent rim
4. Axle nut not tightened properly

### Steers to one side

1. Bent tie rods
2. Wheel installed incorrectly
3. Unequal tire pressure
4. Incorrect wheel alignment

## Front Brake & Front Wheel

### Front Wheel:

#### Removal:

- Raise the front wheels off the ground by placing a jack or other support under the frame.

- Remove the front wheel nuts, and then remove front wheels.



#### Installation:

- Install the front wheel and tighten the nuts.
- Torque: 28-30 ft.lbs

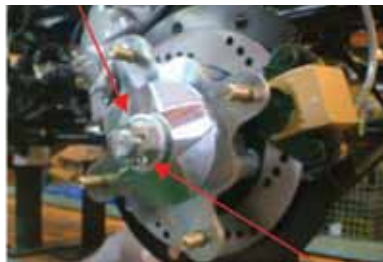
### Front Wheel Hub:

#### Removal

- Remove front brake caliper (2 bolts).



- Remove cotter pin, wheel hub nut and washer.
- Remove wheel hub and brake disk.



- Remove 4 socket bolts, and then remove the brake disk from wheel hub.



### Installation

- Install the front brake disk onto the wheel hub.
- Install wheel hub and brake disk on to knuckle.
- Install wheel hub washer and tighten the wheel hub nut.



- Torque: 50 ft. lbs
- Install cotter pin



- Install front brake caliper.
- Torque: 23 ft. lbs



### Disk Brake System Inspection:

- Check the brake from behind the brake caliper.
- The brake pad must be replaced with new lining when the brake pad wear limit reaches the brake disk.



### CAUTION

- Check the front brake lining by removing front wheel first.



- Park the MTV on a level ground, and check if fluid level is under the “LOWER” mark.
- Recommended Brake Fluid: WELL RUN BRAKE OIL (DOT 4).

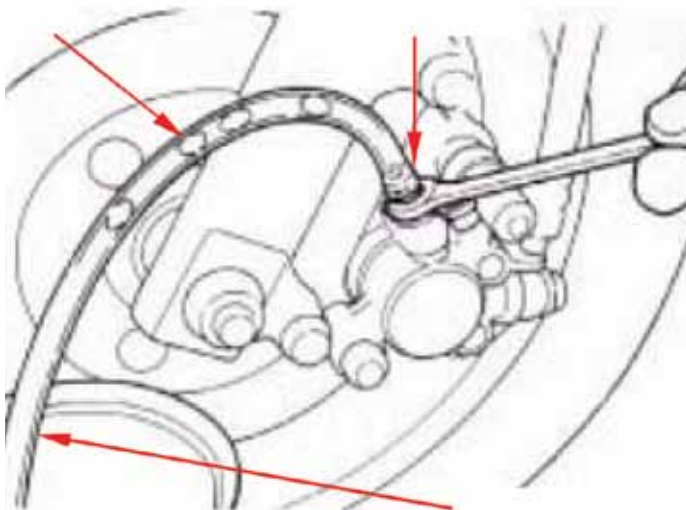


### Brake fluid replacement / Air-bleed:

- Connect drain hose to air-bleed valve.
- Open the drain valve on the caliper and operate the brake lever until the old brake fluid is entirely drained out.
- Close the drain valve and add specified brake fluid into the brake master cylinder.
- Recommended brake fluid: WELLRUN (DOT 4) brake fluid



- Bleed air from pressure control valve fist.
- Connect one end of transparent hose to the air-bleed valve, and put the other end into a container.



- Open the drain valve around 1/4 turns, at the same time hold the brake lever until there is no air bubble in the drain hose.
- Close the drain valve when finished with the brake system refilling fluid procedure, and operate the brake lever to check for air bubbles.
- If brake is still soft, please bleed the system as described below:
  1. Tightly hold the brake lever and open the drain valve around 1/4 turns, and then close the valve.

### CAUTION

- Do not release the brake lever before the drain valve is closed.
  - Always check the brake fluid level when carrying out the air bleeding procedure to avoid air entering into the system.
2. Slowly release the brake lever, and wait for a few seconds until it reaches its top position.
  3. Repeat the steps 1 and 2 until there is no air bubble at the end of the hose.
  4. Tightly close the drain valve.
  5. Make sure the brake fluid is in the UPPER level of the master cylinder, and refill the fluid as necessary.
  6. Replace the cap.

## Front Brake & Front Wheel

### Front Brake Caliper: *Removal*

- Place a container under the brake caliper, and loosen the brake hose bolt and finally remove the brake hose.



**CAUTION**

- Do not spill brake fluid on painted surfaces.

- Remove two caliper bolts and the caliper.



### Inspection

- Check brake lining condition. Replace the linings if the brake linings wear limitation groove reaches to the brake disk.

### Brake lining replacement:

- Remove two guide pins.
- Compress caliper mounting plate, and then remove brake linings.
- Install new linings, and tighten the guide pins.



### Installation

- Install the brake caliper and tighten the attaching bolts securely.
- Torque: 23 ft. lbs.

**CAUTION**

- Use M8 x 18 mm flange bolt only.
- Long bolt will impair the operation of brake disk.

- Torque: 23 ft. lbs

- Refill the brake fluid reservoir and bleed all air.



## CHAPTER 14 STEERING/FRONT SUSPENSION

Front Differential Oil .....	Page 115
Troubleshooting .....	Page 116
Front Cushion .....	Page 116
Suspension Arm .....	Page 116-117
Toe-In.....	Page 117

## Front differential oil:

### CAUTION

- Be sure the differential set temperature is below 35° Celsius or 95° Fahrenheit.

- Oil Standard: SAE #90 hypoid gear oil
- Oil Capacity: 300 c.c.

- Remove the under cover



- Place an oil pan below the differential set case.

### FILLER NUT

- Remove drain bolt, filler nut and drain oil out.



### OIL DRAIN BOLT

- Tighten the drain bolt to specified torque.
- Pour the oil through the filler hole.
- Tighten the filler cap to the specified torque



- Drain Bolt: 24 ft.lbs
- Oil Filler Unit: 26.5 ft.lbs

## Rear Differential Set:

- Place an oil pan below the case of final gear set.
- Remove the drain blot.
- Remove the filler cap
- Drain oil



- Tighten the drain blot.
- Remove the oil check bolt.
- Pour the specified oil through the filler hole until the oil lever reaches bottom of the hole.
- Tighten the oil level bolt.
- Tighten the filler cap.
- Final gear oil drain bolt: 24 ft/lbs
- Final gear oil filler cap: 26.5 ft/lbs



## Steering/Front Suspension

### Troubleshooting:

#### Hard to steer

- Faulty tire.
- Steering shaft holder too tight.
- Insufficient tire pressure.
- Faulty steering shaft bushing.
- Damaged steering shaft bushing.

#### Front wheel wobbling

- Faulty tire.
- Worn front brake drum bearing.
- Bent rim.
- Axle nut not tightened properly.

#### Steers to one side

- Bent tie rods.
- Wheel installed incorrectly.
- Unequal tire pressure.
- Bent frame.
- Worn swing arm pivot bushings.
- Incorrect wheel alignment.

#### Front suspension noise

- Loose front suspension fasteners.
- Binding suspension link.

#### Hard suspension

- Faulty front swing arm bushings.
- Improperly installed front swing arms.
- Bent front shock absorber swing rod.

#### Soft suspension

- Weak front shock absorber springs.
- Worn or damage front swing arm bushings.

### Front Cushion

#### Remove:

- Remove front cushion under bolt nut, and remove the bolt.
- Remove front cushion upper bolt nut, and remove the bolt and cushion.



#### Installation

- Install in reverse order of removal procedures.
- Torque value: 25 ft. lbs

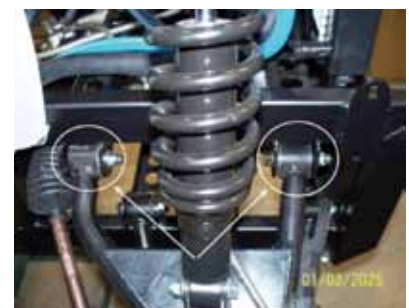
### Suspension Arm

#### Remove

- Remove front wheel, wheel hub, and brake caliper, brake disk, tie-rod, knuckle and front cushion.



- Loosen upper suspension arm nuts, remove swing arm bolts.
- Remove upper suspension arm.

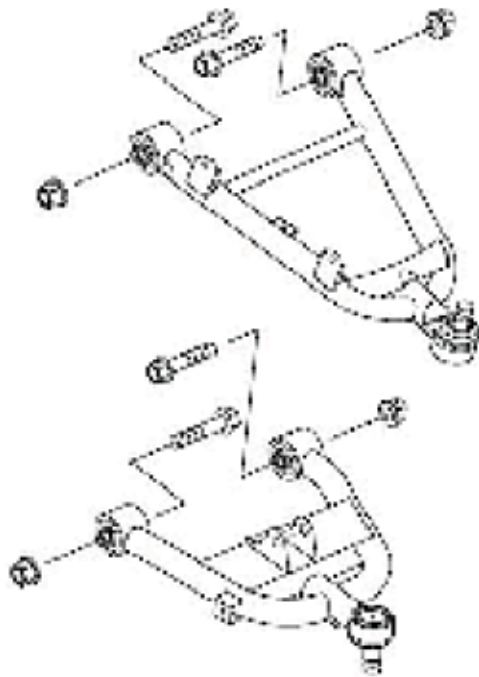


- Loosen under suspension arm nuts, remove swing arm bolts.
- Remove under suspension arm.



### Inspection

- Inspect the suspension arm, ball joint and bush for damage or bending.
- Suspension arm nuts and bolts
- Suspension arm nuts and bolts



### Installation

- Install in reverse order of removal procedures.
- Torque value:  
Suspension arm nut: 25 ft. lbs
- Grease the suspension arm.

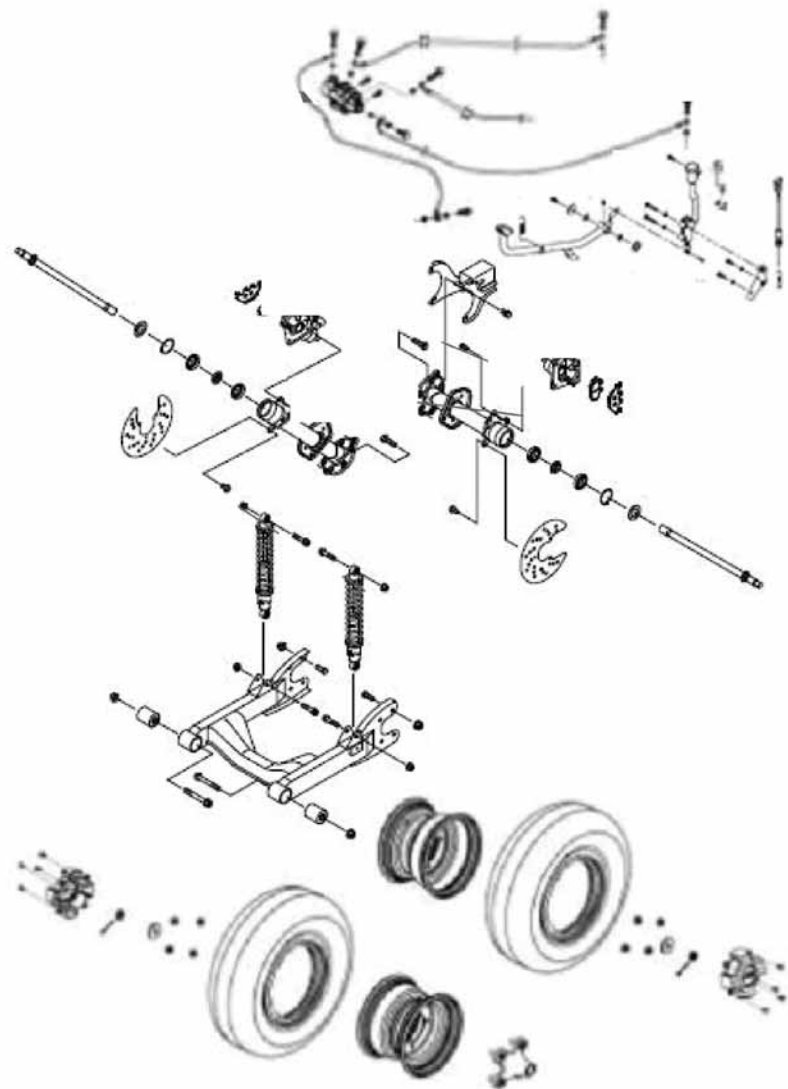
- If the toe-in is out of adjustment, adjust it by turning the tie-rod while holding the ball joint.
- Loosen tie-rod lock nuts; turn the tie-rods to adjustment toe-in.
- Tighten the lock nuts.
- Torque value:  
25 ft. lbs



## **CHAPTER 15 REAR BRAKE & REAR WHEEL & REAR CUSHION**

<b>Mechanism Diagram .....</b>	<b>Page 118</b>
<b>Maintenance Description .....</b>	<b>Page 119</b>
<b>Troubleshooting .....</b>	<b>Page 120</b>
<b>Rear Wheel .....</b>	<b>Page 121</b>
<b>Disk Brake System Inspection.....</b>	<b>Page 121</b>
<b>Rear Wheel Axle.....</b>	<b>Page 122</b>
<b>Adding Brake Fluid .....</b>	<b>Page 122</b>
<b>Rear Brake Master Cylinder .....</b>	<b>Page 123</b>
<b>Rear Cushion.....</b>	<b>Page 123</b>

**Mechanism Diagram:**



## Maintenance Description

### Operational precautions:

#### CAUTION

- Inhaling asbestos may cause disorders of respiratory system or cancer, therefore, never use air hose or dry brush to clean brake parts. Use vacuum cleaner or other authorized tool instead.

- The brake caliper can be removed without removing the hydraulic system.
- After the hydraulic system is removed, or the brake system is felt to be too soft, bleed the hydraulic system.
- While refilling brake fluid, care should be taken not to let foreign material enter into the brake system.
- Do not spill brake fluid on painted surfaces, plastic or rubber parts to avoid damage.
- Check the operation of the brake system before riding.
- Please refer to the Maintenance Manual of tubeless tire in respect to the removal, repair and installation of the tire.

### Specifications:

Item	Standard (mm)	Limit (mm)
The thickness of front and rear brake disk	4.000	2.500
Front and rear brake disk run out	< 0.100	0.300
Master cylinder inner diameter (foot brake)	15.900 ~ 15.943	15.955
Master cylinder piston outer diameter (foot brake)	15.857 ~ 15.884	15.845
Diameter of rear disk	220.000	-
Thickness of rear brake lining	7.000	2.000

Tire pressure as cold:.....0.8 kg/cm<sup>2</sup> (12psi)

### Torque values:

Brake hose bolt .....	15-18 ft. lbs
Bolt for brake caliper .....	18 ft. lbs
Bolts for the brake disk .....	26 ft. lbs
Air-bleed valve .....	3.5 ft. lbs
Rear wheel nut .....	30 ft. lbs
Rear axle castle nut .....	36 ft. lbs
Rear axle holder bolt .....	50 ft. lbs
Rear wheel axle nut .....	50 ft. lbs
Rear cushion mounting bolt.....	30 ft. lbs
4 Swing arm pivot bolt .....	50 ft. lbs

### Special tools:

- Inner bearing puller: TGB-440645
- Rear axle bearing driver (6007LLU): TGB-440640

# Rear Brake & Rear Wheel & Rear Cushion

### Troubleshooting:

#### Soft brake lever

1. Air inside the hydraulic system
2. Hydraulic system leaking
3. Worn master piston
4. Worn brake pad
5. Worn brake caliper
6. Worn brake lining/disk
7. Low brake fluid
8. Blocked brake hose
9. Warp/bent brake disk
10. Bent brake lever

#### Hard operation of brake lever

1. Blocked brake system
2. Worn brake caliper
3. Blocked brake pipe
4. Seized/worn master cylinder piston

#### Uneven brake

1. Dirty brake lining/disk
2. Poor wheel alignment
3. Clogged brake hose
4. Deformed or warped brake disk
5. Restricted brake hose or fittings

#### Tight brake

1. Dirty brake lining/disk
2. Poor wheel alignment
3. Deformed or warped brake disk

#### Brake noise

1. Dirty lining
2. Deformed brake disk
3. Poor brake caliper installation
4. Imbalance brake disk or wheel

#### Vibration or Wobble

1. Bent rim
2. Axle bearings are worn
3. Faulty tires
4. Rear axle bearing holder is faulty (loose axle)

#### Hard Suspension

1. Bent dampener rod
2. Faulty swing arm pivot bushings

#### Soft Suspension

1. Weak shock absorber dampener
2. Weak shock absorber spring



## Rear Wheel:

### Removal

- Raise the rear wheels off the ground by placing a jack or other support under the frame.



- Remove the rear wheel nuts, and then remove rear wheels.



### Installation

- Install the rear wheel and tighten the nuts.
- Torque: 30 ft. lbs

### Removal

- Remove the brake caliper bolts and then remove the brake caliper.



### Installation

- Install the rear wheel axle nut.
- Install axle shaft washer and tighten the axle nut.
- Torque: 50 ft.lbs
- Install cotter pin.



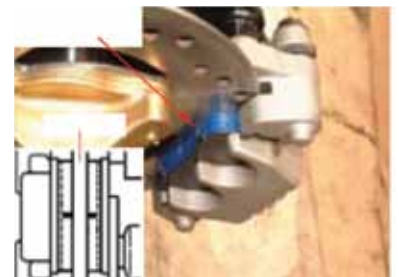
- Check the brake from behind the brake caliper.
- The brake pad must be replaced with new lining when the brake pad wear limit reaches the brake disk.



### CAUTION

- Wheel must be removed before checking brake lining.

- Park the MTV on a level ground, and check if fluid level is under the "LOWER" mark.
- Recommended Brake Fluid: WELL RUN BRAKE OIL (DOT 4)



## Rear Brake & Rear Wheel & Rear Cushion

### Rear Wheel Axle:

- Remove rear wheel housing 4 bolts.



- Remove rear wheel housing from rear fork assembly.



- Remove tow ball mount 4 bolts (2 bolts each side).



- Remove rear axle housing (4 bolts).



- Remove rear axle housing.



### Inspection

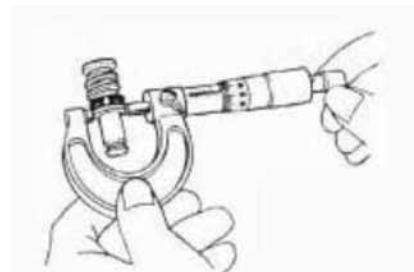
- Check bearings on rear wheel axle bearing seat.
- Rotate each bearing's inner ring with fingers.
- Check if bearings can be turned smoothly and silently, and also check if bearing outer ring is mounted on bearing seat.
- If bearing rotation is uneven, noisy, or loose then replace it.
- Check oil seal for wear or damage, and replace it as necessary.



### CAUTION

- Never install used bearings. Once bearing removed, it has to be replaced with new one.

- Measure the outer diameter of the piston. Replace the piston if its measured value exceeds allowable limit.



- Allowable limit:
- Foot brake 15.850 mm

---

## Master Cylinder Assembly:

---

### CAUTION

- It is necessary to replace the piston, spring, piston cup, and cir clip.
  - Clean all components before assembling.
- 

- Apply clean brake fluid to the piston cup, and then install the cup onto the piston.
  - Install the larger end of the spring onto the master cylinder.
  - The master cup's cavity should face inside of master cylinder when installing the master cup.
  - Install the cir clip.
- 

### CAUTION

- Never install cup lip in the opposite direction. Make sure the cir clip is seated securely in the groove.
- 

- Install the rubber boot into groove properly.

## Master Cylinder Install

---

### CAUTION

- Improper routing may damage leads, hoses or pipes.
- 

### CAUTION

- Kinking of brake leads, hoses or pipes may reduce brake performance.
- 

## Rear Cushion:

### Removal

- Support the frame.
- Loosen rear cushion bolt, and remove rear cushion.
- Remove rear cushion upper bolt, and then remove rear cushion.

### Installation

- Install rear cushion, and install rear cushion upper bolt.
- Install rear cushion under bolt, and install nut. Tighten the rear cushion upper bolt and under nut to the specified torque value.
- Torque: 30 ft. lbs

## CHAPTER 15 ELECTRICAL SYSTEM

Maintenance Data .....	Page 124
Technical Specifications .....	Page 124
Troubleshooting .....	Page 125
Battery .....	Page 126
Charging System .....	Page 127
Ignition System .....	Page 128
Starting System .....	Page 129
Cooling Fan Thermo Switch .....	Page 129

### Maintenance Data:

#### Operational Precaution

- When removing the battery, the disconnect sequence of cable terminals should be strictly observed (First disconnect the negative cable terminal, next, the positive cable terminal.)
- The model of the spark plug and the tightening torque.
- The ignition timing.
- Removal and installation of AC generator.
- To recharge the battery, remove the battery from rack without removing ventilation caps
- Unless in emergency, never rapid charge the battery.
- C.D.I assembly does not require an ignition timing check. In case ignition timing is incorrect, replace C.D.I and AC generator. Verify with an ignition timing light, replace if necessary.

#### Technical Specification:

Charging System		
Description		Specification
Battery	Capacity	12V18Ah
	Charging Rate	1.4A/ 5-10 hours (standard)
		14 A/0.5 hour (fast charging)
Leak Current		<1mA
Charging Current		1.2A / 1500rpm
Control voltage in charging		14.5 + 0.5 V / 1500 rpm

Charging System		
Description		Specification
Spark Plug	Model	NGK CR7E (recommended)
	Gap	0.8 mm
Ignition coil and resistance	Primary winding	2.9 +/- 10%Ω
	Secondary winding	Without cap 15. +/- 10KΩ
		With cap 20 +/- 10KΩ
Ignition Timing "F" Mark		15° TDC / 1700 rpm
		46°TDC / 4200 rpm

## Troubleshooting:

### No voltage

- Battery discharged
- The cable disconnected
- The fuse is blown
- Improper operation of the main switch

### Low voltage

- The battery is not fully charged
- Bad contact
- Bad charging system
- Bad voltage regulator

### No spark produced by spark plug

- The spark plug is bad
- The cable is poorly connected, open or short-circuited - Between A.C.G. and C.D.I.
- Bad connection between C.D.I. and ignition coil
- Bad connection between C.D.I. and the main switch
- Bad main switch
- Bad C.D.I.

### Starter motor does not work

- The fuse is blown
- The battery is not fully charge
- Bad main switch
- Bad starter switch
- The front and rear brake switches do not operate correctly
- Bad Starter relay
- The ignition coil is poorly connected, open or short-circuited
- Bad starter motor

### Intermittent power supply

- The connector of the charging system becomes loose
- Bad connection of the battery cable
- Bad connection or short-circuit of the charging system
- Bad connection or short-circuit of the power generating system

### Charging system does not operate properly

- Burnt Fuse
- Bad contact, open or short circuit
- Bad regulator
- Bad ACG

### Engine does not crank smoothly

- Primary winding circuit
  - Bad ignition coil
  - Bad connection of cable and connectors
  - Bad main switch
- Secondary winding circuit
  - Bad ignition coil
  - Bad spark plug
  - Bad ignition coil cable
  - Current leakage in the spark plug
- Incorrect ignition timing
  - Poor A.C.G.
  - Improper installation of the pulse sensor
  - Bad C.D.I.

### Weak starter motor

- Bad charging system
- The battery is not fully charged
- Bad connection in the windings
- The motor gear is jammed by foreign material

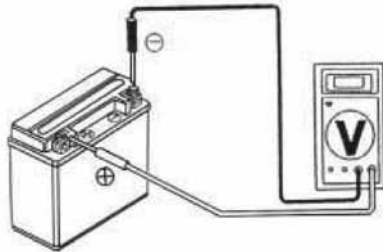
### Starter motor is working, but engine does not crank

- Bad starter motor pinion
- The starter motor run in reverse direction
- Bad battery

## Electrical System

### Battery Removal:

- Remove the seat, and then you can see the battery.
- Disconnect the negative cable terminal first, then the positive cable terminal.
- Remove the battery clamp, and then remove battery.

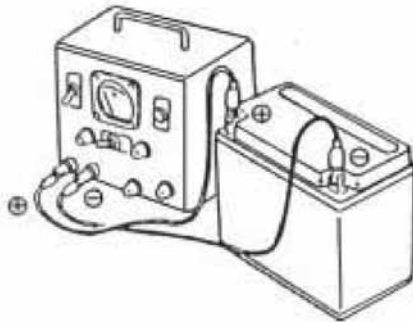


### Voltage Check

- Use the digital voltmeter to check the voltage of the battery.
- Voltage:
  - Fully charged: 13.0~13.2 V at 20°C
  - Undercharged: Below 12.3 V at 20°C

### Charging:

- Connect the positive terminal (+) of the charger to the battery positive terminal (+).
- Connect the negative terminal (-) of the charger to the battery negative terminal (-).



	Standard	Maximum
Charging current	1.8A	18.0A
Charging time	5H	0.5H

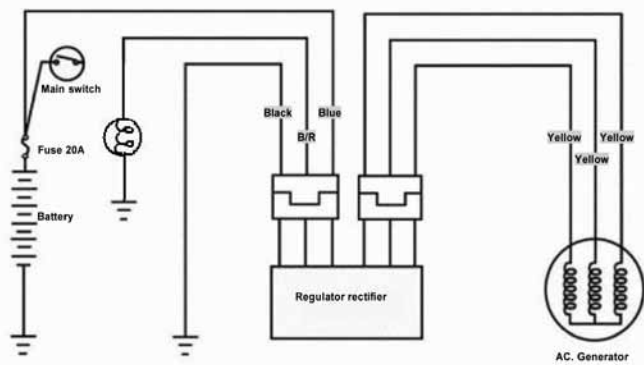
### WARNING

- Keep flames away while recharging.
- Charging is completely controlled by the ON/OFF switch on the charger, not by battery cables.

### CAUTION

- Never rapid charge the battery unless in emergency.
- Verify the battery is recharged with current and duration prescribed above.
- High current will damage the battery.

### Charging circuit:

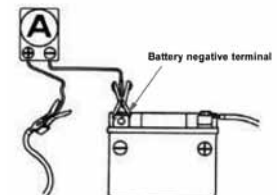


### Current Leakage Inspection:

- Turn the main switch to OFF position, and remove the negative cable terminal (-) from the battery.
- Connect an ammeter between the negative cable terminal and the battery negative terminal.

### CAUTION

- In the current leakage test, set the current range at the largest scale. Gradually decrease to the lower scale as the test progresses to avoid possible damage to the ammeter and the fuse.
- Do not turn the main switch to ON position during test.



Allowable current leakage: Less than 1mA

Disconnect each cable one by one and take measurement of the current of each cable to locate the short circuit.

---

## Inspection of Charging Voltage:

---

### CAUTION

- To replace the old battery, use a new battery with the same current and voltage.
- 

### CAUTION

- Before conducting the inspection, be sure that the battery is fully charged. If undercharged, the current changes dramatically.
  - Use a fully charged battery having a voltage larger than 13.0 V
  - While starting the engine, the starter motor draws large amount of current from the battery.
- 

- After the engine is warmed up, replace original battery with a fully charged battery.
- Connect a digital voltmeter to the battery terminals.
- Connect an ammeter between both ends of the main fuse.

## Connect a tachometer.

- Turn on the headlights and start the engine.
- Accelerate the engine to the specified revolution per minute and measure the charging voltage.
- Specified Charging Current:  
1.2 A / 6000 rpm
- Control Charging Voltage:  
14.5 + 0.5 V / 2000 rpm

---

### CAUTION

- Do not use short-circuit cable.
  - It is possible to measure the current by connecting an ammeter between the battery positive terminal and the cable position terminal, however, while the starter motor is activated, the surge current the motor draws from the battery may damage the ammeter. Use the pull starter to start the engine.
  - The main switch should be turned to OFF position during the process of inspection. Never tamper with the ammeter and the cable while there is current flowing through. It may damage the ammeter.
- 

- The following problems are related to the charging system; follow the instructions provided in the checking list to correct it if any one of the problems takes place.

- The charging voltage and current are much higher than the standard values.

- The following problems are not related to the charging system; correct it if any by following steps indicate in the checking list.

### (1) The standard charging voltage and current can only be reached when the revolution of the engine exceeds the specified rpm.

- Bulbs exceed their rate and consume too much power.
- The replacement battery is aged and does not have enough capacity.

### (2) The charging voltage is normal, but the current is not.

- The replacement battery is aged and does not have enough capacity.
- Battery does not have enough voltage or is over charged.
- The fuse of the ammeter is blown.
- The ammeter is improperly connected.

### (3) The charging current is normal, but the voltage is not.

- The fuse of the voltmeter is blown.

## Electrical System

### Inspection on regulator rectifier:

- Remove the seat,
- Disconnect two 3 pin couplers of the regulator rectifier.
- Inspect the rectifier coupler & the wire harness condition.



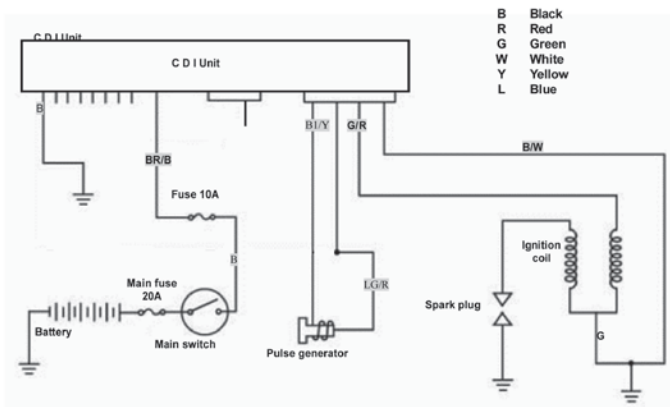
Item	Check Points	Standard Value
Main switch connection	Bl - B	Battery voltage (ON)
Battery connection	Bl - B	Battery voltage
Charging coil	B - B	0.1 ~ 0.5Ω

- If the readings measured are not normal, check parts in the circuit.
- If the parts are normal, then trouble is in the wiring. If there is nothing wrong with parts and wiring, replace the regulator rectifier.



### Ignition System:

Ignition circuit diagram



### C.D.I unit:

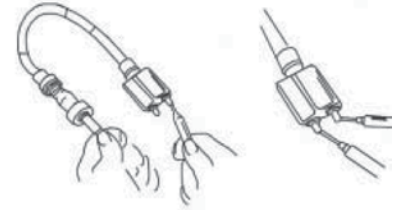
Disconnect connectors of the C.D.I unit.

Check the following connectors as indicated in the table at the harness side.

Item	Points to Check	Result	
Main Switch turn to "on" position	Br/Bl - B	Battery Voltage	
Pulse Generator	Bl/Y - G/R	50-170Ω	
Ignition Coil	Primary Circuit	G/R - B	
	Secondary Circuit	Terminal-B - with no cap	2.9 +/- 10Ω
		Terminal-B - with cap	15.0 +/- 10Ω
			20.0 +/- 10Ω

### Inspection of Ignition Coil:

- Disengage the connector of the ignition coil and the spark plug cap.
- Measure the resistance between the terminals of the primary winding.
- Standard resistance: 2.9Ω +/- 10%
- Remove the cap from the spark plug and measure the resistance between the spark plug and the primary winding.
- Standard resistance:
  - With no cap: 15.0Ω +/-10%
  - With cap: 20.0 ± 10%KΩ



### Ignition Coil Replacement:

- Loosen the lock bolt and replace the ignition coil if necessary.

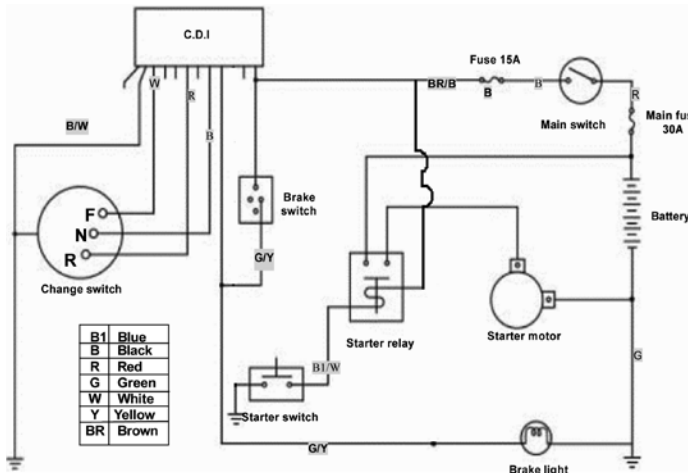
### Inspection of Pulse Generator:

- Disconnect the coupler of the pulse generator and measure the resistance between the terminals of green/white and blue/yellow.
- Standard resistance: 50~170Ω



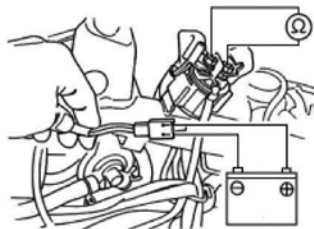
## Starting System:

Starting circuit diagram



## Inspection on starter relay

- Open the main switch.
- Press the brake.
- Push down the starter switch.
- If a sound of “CLICK” is heard, it indicates the relay function normally.
- Remove the seat.
- Disconnect the negative cable terminal of the battery.
- Disconnect the cable positive terminal from the relay.
- Disconnect the positive cable of the starter motor.
- Disconnect the coupler of the relay.
- Connect an ohmmeter to the large terminal end.
- Connect the yellow/red cable to the battery positive terminal and the black / blue cable to the battery negative terminal.
- Check the continuity of the large terminal end. If there is no continuity, replace the relay.



## Removal of Starter motor:

- Remove the seat.
- Disconnect the cable negative terminal (-), then the cable positive terminal (+).
- Remove starter motor cable.
- Loosen the lock bolts and remove the starter motor.

## Installation of Starter motor

- Install in reverse order of removal procedures.

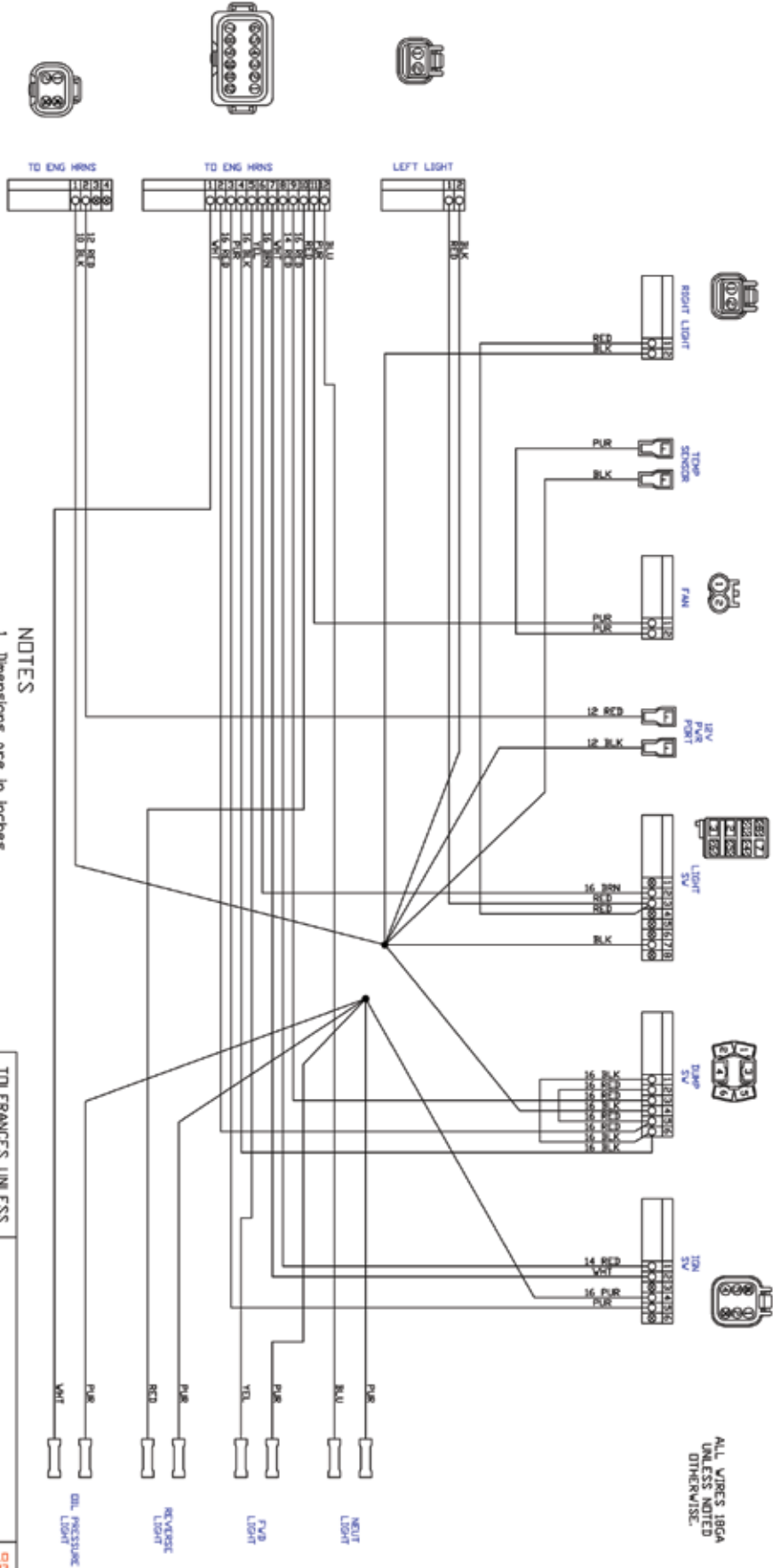
## Cooling Fan Thermo Switch:

- The thermo switch mounted on the radiator controls the operation of the cooling fan motor.
- In case that the fan motor fails to work, disconnect the green and black/blue leads and connect jump wires to the terminals, then, turn on the main switch, the fan motor should operate.
- If the fan motor still fails to run, measure battery voltage between the green and black/blue leads. If there is no voltage, check for blown fuse, loose connection or short-circuit.
- If the fan motor runs, check the thermo switch in the manner as described below:
- Hang the thermo switch on the bowl filled with coolant to check the switch’s opening and closing temperatures, confirm the switch is open circuited at room temperature, increase the coolant temperature gradually. The switch should have continuity at 85 +/- 3°C.

## CAUTION

- Keep the coolant at a constant temperature at Least for three minutes. Sudden increase the coolant temperature will cause the thermometer and the tester to indicate wrong readings.
- Never let the thermometer and the thermo switch contact the wall of the bowl, which may result in wrong readings.
- The thermo switch shall be placed in the coolant until the teeth are completely submerged.





**NOTES**

1. Dimensions are in inches.
2. Wire dimensions are to wire ends. Harness dimensions are to end of covering, between breakout centers, and to side of covering for breakout lengths.
3. See circuit chart for circuit details.
4. Harness covering is convoluted conduit.
5. Tape conduit at ends and breakouts.
6. Connector details shown from wire entry end.
7. All notes are for standard hrns ass'y unless otherwise specified.

TOLERANCES UNLESS OTHERWISE SPECIFIED FOR HARNESSSES & WIRE ASSEMBLIES

DKM	IDM
6.0	+50, -85
6.0 TO 36.0	+10, -0.5
36.0 TO 72.0	+20, -1.0
72.0	+3%, -15%

FOR OTHER DEVICES

LINEAR DKM 2.060	
HOLE POS. 4.030	
HOLE SIZE 4.010	

ALL WIRES 18GA UNLESS NOTED OTHERWISE.

**ELECTREX, INC.**

HUTCHINSON, KS  
 CUSTOMER BAD BOY  
 THEIR P/N 700-4060-00  
 DWG TITLE DASH HRNS  
 DUR P/N 9198070SCHEMATIC

P 1 OF 1 REVISION -  
 DRAWN BY DM DATE 11/23/09

THIS DRAWING AND THE INFORMATION IT CONTAINS ARE THE PROPERTY OF ELECTREX, INC. AND MAY BE USED BY OTHERS ONLY AS AUTHORIZED BY US.



For additional information, please see us at  
**[www.mtvbybadboymowers.com](http://www.mtvbybadboymowers.com)**

Bad Boy, Inc.  
102 Industrial Drive  
Batesville, Arkansas 72501  
(870) 698-0090