

ALL TERRAIN VEHICLE



**DL-901**

**Service Manual**



## DINLI 450 cc Service Manual

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Illustrations and photographs in this publication are intended for reference use only and may not depict actual model component parts.

## Foreword

This manual is designed primarily for use by trained mechanics in a properly equipped shop. A basic knowledge of mechanics, the proper use of tools, and workshop procedures must be understood in order to carry out maintenance and repair satisfactorily. In order to perform the work efficiently and to avoid costly mistakes, read the text, thoroughly familiarize yourself with the procedures before starting work, and then do the work carefully in a clean area. Precision measurements can only be made if the proper instruments are used, and the use of substitute tools may adversely affect safe operation.

**For the duration of the warranty period**, we recommend that all repairs and scheduled maintenance be performed in accordance with this service manual. Any owner maintenance or repair procedure not performed in accordance with this manual may void the warranty.

To get the longest life out of your vehicle:

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine DINLI vehicle parts. Genuine parts provided as spare parts are listed in the Parts Catalog.
- Follow the procedures in this manual carefully. Don't take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any replaced parts.

### **How to Use This Manual**

In preparing this manual, we divided the product into its major systems. These systems became the manual's chapters. All information for a particular system from adjustment through disassembly and inspection is located in a single chapter.

The Quick Reference Guide shows you all of the product's system and assists in location their chapters. Each chapter in turn has its own comprehensive Table of Contents.

The Periodic Maintenance Chart is located in the General Information chapter. The chart gives a time schedule for required maintenance operations.

If you want spark plug information, for example, go to the Periodic Maintenance Chart first. The chart tells you how frequently to clean and gap the plug. Next, use the Quick Reference Guide to locate the Electrical System chapter. Then, use the Table of Contents on the first page of the chapter to find the Spark Plug section.

Whenever you see these WARNING and CAUTION symbols, heed their instructions! Always follow safe operating and maintenance practices.

**△WARNING**

**This warning symbol identifies special instructions or procedures, which if not correctly followed, could result in personal injury, or loss of life.**

**CAUTION**

**This caution symbol identifies special instructions or procedures, which if not strictly observed, could result in damage to or destruction of equipment.**

This manual contains four more symbols (in addition to WARNING and CAUTION), which will help you distinguish different types of information.

**NOTE**

- This note symbol indicates points of particular interest for more efficient and convenient operation.
- Indicates a procedural step or work to be done.
- Indicates a procedural sub-step or how to do the work of the procedural step it follows. It also precedes the text of a NOTE.
- ★ Indicates a conditional step or what action to take based on the results of the test or inspection in the procedural step or sub-step it follows.

# CHAPTER INDEX

CHAPTER1	GENERAL
CHAPTER2	WHEELS/TIRES
CHAPTER3	BRAKE
CHAPTER4	SUSPENSION
CHAPTER5	FRAME
CHAPTER6	ENGINE
CHAPTER7	ELECTRICAL
CHAPTER8	APPENDIX





# **GENERAL INFORMATION**

## **Table of Contents**

Before Servicing-----1-2  
Model Identifications----- 1-5  
General Specifications-----1-6  
Periodic Maintenance Chart-----1-8



## **Before Servicing**

Before starting to perform an inspection service or carry out a disassembly and reassembly operation on a quad, read the precautions given below. To facilitate actual operations, notes, illustrations, photographs, cautions, and detailed descriptions have been included in each chapter wherever necessary. This section explains the items that require particular attention during the removal and reinstallation or disassembly and reassembly of general parts.

### **Especially note the following:**

#### (1) Dirt

Before removal and disassembly, clean the quad. Any dirt entering the engine will shorten the life of the quad. For the same reason, before installing a new part, clean off any dust or metal fillings.

#### (2) Battery Ground

Disconnect the ground (-) wire from the battery before performing any disassembly operations on the quad. This prevents the engine from accidentally turning over while work is being carried out, sparks from being generated while disconnecting the wires from electrical parts, as well as damage to the electrical parts themselves. For reinstallation, first connect the positive wire to the positive (+) terminal of the battery.

#### (3) Installation, Assembly

Generally, installation or assembly is the reverse of removal or disassembly. However, if installation or assembly sequence is given in this Service Manual, follow it. Note parts locations and cable, wire, and hose routing during removal or disassembly so they can be installed or assembled in the same way. It is preferable to mark and record the locations and routing whenever possible.

#### (4) Tightening Sequence

When installing bolts, nuts, or screws for which a tightening sequence is given in this Service Manual, mark sure to follow the sequence. When installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit, thus ensuring that the part has been installed in its proper location. Then, tighten them to the specified torque in the tightening sequence and method indicated. If tightening sequence instructions are not given, tighten them evenly in a cross pattern. Conversely, to remove a part, first loosen all the bolts, nuts, or screws that are retaining the part a 1/4-turn before removing them.

#### (5) Torque

When torque values are given in this Service Manual, use them. Either too little or too much torque may lead to serious damage. Use a good quality, reliable torque wrench.

#### (6) Force

Common sense should dictate how much force is necessary in assembly and disassembly. If a part seems especially difficult to remove or install, stop and examine what may be causing the problem. Whenever tapping is necessary, tap lightly using a wooden or plastic-faced mallet. Use an impact driver for screws (particularly for the removing screws held by non-permanent

locking agent) in order to avoid damaging the screw heads.

(7) Edges

Watch for sharp edges, as they could cause injury through careless handling, especially during major engine disassembly and assembly. Use a clean piece of thick cloth when lifting the engine or turning it over.

(8) High-Flash Point Solvent

A high-Flash point solvent is recommended to reduce fire danger. A commercial solvent commonly available in North America is standard solvent (generic name). Always follow manufacturer and container directions regarding the use of any solvent.

(9) Gasket, O-Ring

Replace a gasket or an O-ring with a new part when disassembling. Remove any foreign matter from the mating surface of the gasket or O-ring to ensure a perfectly smooth surface to prevent oil or compression leaks.

(10) Liquid Gasket, Locking Agent

Clean and prepare surfaces where liquid gasket or non-permanent locking agent will be used. Apply them sparingly. Excessive amount may block engine oil passages and cause serious damage.

(11) Press

When using a press or driver to install a part such as a wheel bearing, apply a small amount of oil to the area where the two parts come in contact to ensure a smooth fit.

(12) Ball Bearing and Needle Bearing

Do not remove a ball bearing or a needle bearing unless it is absolutely necessary. Replace any ball or needle bearings that were removed with new ones. Install bearings with the manufacturer and size marks facing out, applying pressure evenly with a suitable driver. Apply force only to the end of the race that contacts the press fit portion, and press it evenly over the base component.

(13) Oil Seal and Grease Seal

Replace any oil or grease seals that were removed with new ones, as removal generally damages seals. Oil or grease seals should be pressed into place using a suitable driver, applying a force uniformly to the end of seal until the face of the seal is even with the end of the hole, unless instructed otherwise. When pressing in an oil or grease seal, which has manufacturer's marks, press it in with the marks facing out.

(14) Cir-clip, Retaining Ring, and Cotter Pin

When installing cir-clips and retaining rings, take care to compress or expand them only enough to install them and no more. Install the cir-clip with its chamfered side facing load side as well. Replace any cir-clips, retaining rings, and cotter pins with new ones, as removal weakens and deforms them, they could become detached while the quad is driven, leading to a major problem.

(15) Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the sliding surfaces have an adequate lubrication film. During assembly, make sure to apply oil to any sliding surface or bearing that has been cleaned. Old grease or dirty oil could have lost its lubrication quality and may contain forging particles that act as abrasives; therefore, make sure to wipe it off and apply fresh grease or oil. Some oils and greases in particular should be used only in certain applications and may be harmful if used in an application for which they are not intended.

(16) Direction of Engine Rotation

To rotate the crankshaft manually, make sure to do so in the direction of positive rotation. Positive rotation is counterclockwise as viewed from the left side of the engine. To carry out proper adjustment, it is furthermore necessary to rotate the engine in the direction of positive rotation as well.

(17) Replacement Parts

When there is a replacement instruction, replace these parts with new ones every time they are removed.

Always replace these parts with new ones every time they are removed. Although the previously mentioned gasket, O-ring, ball bearing, needle bearing, grease seal, oil seal, cir-clip, and cotter pin have not been so designated in their respective text, they are replacement parts.

(18) Electrical Wires

All the electrical wires are either one-color or two-color. A two-color wire is identified first by the primary color and then the stripe color. For example, a yellow wire with thin red stripes is referred to as a “yellow/red” wire; it would be a “red/yellow” wire if the colors were reversed. Unless instructed otherwise, electrical wires must be connected to wires of the same color.

(19) Inspection

When parts have been disassembled, visually inspect these parts for the following conditions or other damage. If there is any doubt as to the condition of them, replace them with new ones.

Abrasion	Crack	Hardening	Warp
Bent	Dent	Scratch	Wear
Color change	Deterioration		Seizure

(20) Specifications

Specification terms are defined as follows:

“Standards” show dimensions or performances which brand-new parts or systems have.

“Service Limits” indicate the usable limits. If the measurement shows excessive wear or deteriorated performance, replace the damaged parts.

## Model Identification

Engine serial number

Vehicle identification number

**ENGINE SERIAL NUMBER (Ex. EW450SR00100000xxx)**



**VEHICLE IDENTIFICATION (ex. RFWAK85CX6Txxxxxx)**



Whenever corresponding with DINLI about a particular issues, the engine number and serial number are important for vehicle identification.

## General Specification

### NOTE:

Specifications subject to change without notice.

Model	DL901
Engine	4-stroke, DOHC
Bore and stroke	94mm x 64.6 mm
Compression ratio	11.6:1
Displacement	448 cc
Coolant system	Liquid cooled
Coolant	1:1 water/anti-freeze[ethylene glycol(containing corrosion inhibitors for aluminum engines and radiators)]
Starting system	Electric
Carburetor	Mikuni BSR42
Transmission	5-speed with reverse
Final drive	2WD/chain
Clutch type	Manual Release, Multi Plate(8 plates), wet
Engine idle speed	1600 rpm
Spark plug, standard	DCPR8E (NGK)
Spark plug gap	0.9 mm
Lubrication system	Dry sump
Lubricant	4-cycle motorcycle engine oil 10W-40, Grade SF or higher
Ignition system	DC-CDI
Gasoline	10.8 (Unleaded Automobile Premium Gasoline (Ron 98 or higher))
Alternator Output	DC14V-13.7A @ 3000rpm
Thermostat Opening Temperature	71°C

Note: Permissible operating temperature: -10°C~45°C ◦

**CHASSIS**

Frame	Steel
Overall length	183 cm
Overall width	109 cm
Overall height	115 cm
Seat height	85 cm
Wheel base	1250 mm
Front tire	21 x 7 – 10
Rear tire	20 x 11 – 9
Recommended cold tire pressure (front/rear)	35kpa/ 35kpa
Turning radius	2.0m
Fuse	20A
Loading limit (Incl. rider, cargo, etc....)	200kg
Voltage	12V
Battery	GS, GTX14-BS
Ground clearance, unloaded	200 mm
Water crossing maximum depth	575 mm
Front suspension travel	11”
Rear suspension travel	10”
Dry weight (approx KGs)	210
Fuel tank capacity	12L
Throttle lever free play	1~2 mm
Air filter	Foam
Brake fluid	DOT 4
Brake pad thickness (MIN)	2.0 mm
Brake disc thickness (MIN)	3.5 mm
Clutch lever free play (manual)	2 – 4 mm
Drive chain type	520 (O-ring type)
Drive chain slack	30 ~ 35mm

## Periodic Maintenance Chart

Perform a Pre-Ride inspection before every ride and at schedule maintenance periods.

C=Clean R=Replace L=Lubricate I=Inspect, Verify, Clean, Adjust, Lubricate, Replace if necessary.		Interval (whichever comes first)								
		Regular Maintenance Interval (hours)						Regular Maintenance (Riding Km)		
		Break-in (1 hour)	Initial After 10 hr	Every 1 month	Every 3 month	Every 6 month	Note	200 Km	500Km	1000Km
	WARNING LABELS (condition, readable)	I	I	I	I	I	I	I	I	I
○	FRAME (mainframe,subframe,swingarm)	I	I	I						
▲	FUEL SYSTEM (hoses, tank, level)	I	I							I
	BATTERY (terminals)			I,C				I		
▲	THROTTLE OPERATION	I	I		I				I	
	AIR FILTER	I	C	C		R	★	I		I
	AIRBOX DRAIN TUBE		I,C		I		★	I		I
	SPARK PLUG		I		R					R
○	IDLE SPEED		I		I			Adjust as required		
▲	EXHAUST (spark arrester)			C						C
	SWITCH (engine, stop, start, tether, ignition)	I			I		★			
▲	LIGHTING (headlight, tail light, turning lights)	I		I						
	ENGINE OIL	I	R			R	*	R		R
	ENGINE OIL FILTER(s)	C	R			R		R		R
	DRIVE CHAIN (sag, stretch, buffer, guide, sprockets (condition/tightness), guards.	I	I		I		★		I	
○	BRAKE FLUID	I				I	*			I
▲	BRAKE SYSTEM (cables, discs, pads, hoses, etc.)	I			I		★	I		
	BRAKE, REAR, DISC CARRIER	I	I		I	R		I		
▲	CLUTCH (lever, cable and arm position)	I	I		I					
	COOLANT (radiator, cap, hoses, level, strength)	I			I	R	*		I	
	SUSPENSION (front/rear shocks, condition, setting)	I	I	I	I					
	NUTS,BOLTS AND FASTENERS		I	I		I			I	
○	SEAT (condition, wear, damage)	I								
▲	WHEELS/TIRES (pressure, condition, wear)	I	I	I		I				I
	SWINGARM (bearings)		I	I			★			
▲	STEERING ASSEMBLY (fasteners, operation)		I				★			I
	A-ARM ( Bushing ball Joint)			I			★		I	
	TIE ROD ENDS	I	I	I			★			

▲DINLI dealer service suggested that servicing owners should have the proper tools, service data, and be mechanically qualified.  
 ○Operational safety involved, The service should be performed by a DINLI dealer.  
 ★Service more frequently if operation in dusty, sandy or snowy area or conditions.  
 \* Change every 2 years.

## Wheels/Tires

### Table of Contents

Specifications-----	2-2
Wheel Alignment-----	2-3
Steering Centering Inspection-----	2-3
Steering Centering Adjustment-----	2-3
Toe-in Inspection-----	2-4
Toe-in Adjustment-----	2-4
Wheels (Rims)-----	2-5
Wheel Removal-----	2-5
Wheel Installation-----	2-5
Wheel (Rim) Inspection-----	2-6
Wheel (Rim) Replacement-----	2-6
Tires-----	2-6
Tires Removal-----	2-6
Tires Installation-----	2-7
Tires Inspection-----	2-8
Front Hub-----	2-9
Front Hub Removal-----	2-9
Front Hub Installation-----	2-9
Rear Hub-----	2-10
Rear Hub Installation-----	2-10
Rear Hub Disassembly/Assembly-----	2-10



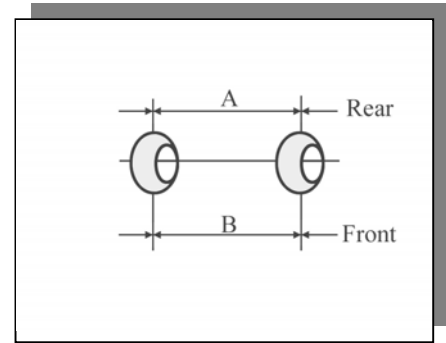
**Specifications**

Item	Standard
Wheel Alignment: Toe-in 2WD	25~40 mm
Tires:	
Standard tire: Front	AT 21×7-10 KENDA K300F-002, Tubeless
Rear	AT 20×11-9 KENDA K300-004, Tubeless
Tire air pressure (when cold): Front	35 kPa (0.35 kgf/cm <sup>2</sup> , 5.0 psi)
Rear	35 kPa (0.35 kgf/cm <sup>2</sup> , 5.0 psi)
Maximum tire air pressure (to seat beads, when cold)	250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi)

### Wheel Alignment

Toe-in is the amount that the front wheels are closer together in front than at the rear at the axle height. When there is toe-in, the distance A (Rear) is the greater than B (Front) as shown.

The purpose of toe-in is to prevent the front wheels from getting out of parallel at any time, and to prevent any slipping or scuffing action between the tires and the ground, if ton-in is incorrect, the front wheels will be dragged along the ground, scuffing and wearing the tread knobs. Measure the distance between vehicle center and each wheel. This will tell you which tie rod needs adjusting.



Caster and camber are build-in and require no adjustment.

$A \text{ (Rear)} - B \text{ (Front)} = \text{Amount of Toe-in}$   
(Distance A and B are measured at axle height)

#### CAUTION:

During the tie rod adjustment, it is very important that the precautions be taken when tightening tie rod end jam nuts.

#### Steering Centering Inspection

- Test ride the vehicle.
- ★ If the handlebar is straight when the vehicle is traveling in a straight line, go on to the Toe-in Inspection procedure.
- ★ Otherwise, go on to the Steering Centering Adjustment procedure.

#### Steering Centering Adjustment

- Support the vehicle so that the front wheels are off the ground and the front axles about the same height as the rear axle.
- Hold a straightedge [A] against the rear wheel rim on one side at axle height.
- With the handlebar straight ahead, loosen the locknuts [A] [B] and Turn the tie-rod adjusting sleeve [C] until the front wheel on that side is parallel to the straightedge.

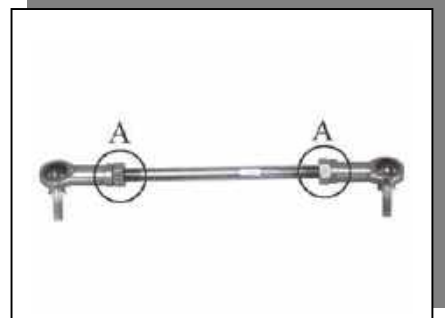


#### NOTE

The locknut [A] on the tie-rod has left-hand threads. Turn the wrench clockwise for loosening.

#### CAUTION

Adjust the tie-rod so that the visible thread length [A] is even on both ends of the tie-rod, or the threads could be damaged.



- Repeat the straightedge procedure on the other side of the vehicle, now the front wheels are parallel to each other and to the center line of the vehicle.
- Go on to the Toe-in Inspection procedure.

**Toe-in Inspection**

- Support the vehicle on a stand or the jack so that the front wheels are off the ground.
- Apply a heavy coat of the chalk near the center of the front tires.
- Using a needle nose scriber, mark a thin mark near the center of the chalk coating while turning the wheel.
- Keeping the front wheels off the ground, set the handlebar straight ahead.
- At the level of the axle height, measure the distance between the scribed lines for both front and rear of the front tires.
- Subtract the measurement of the front from the measurement of the rear to get the toe-in.
- ★ If the toe-in is not in the specified range, go on to the Toe-in adjustment procedure. Toe-in of Front Wheels Standard:

Standard                      0~2 mm

**Toe-in Adjustment**

- Loosen the locknuts [A] [B] and turn the adjusting sleeves [C] the same number of turns on both sides to achieve the specified toe-in.

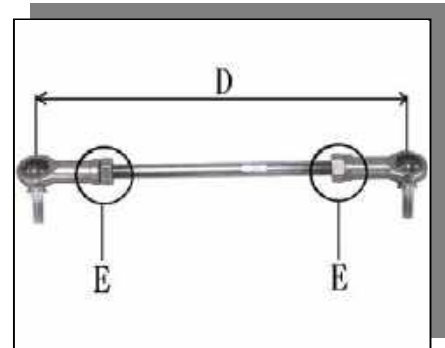
**NOTE**

- The nut [A] on the tie-rod has left-hand threads. Turn the nut clockwise for loosening.
- The toe-in will be near the specified value, if the tie-rod length [D] is 385 mm on each tie-rod.



**CAUTION**

**Adjust the tie-rod length so that the visible thread length [E] is even on both ends of the tie-rod. Uneven length could cause tie-rod damage.**



- Check the toe-in.
- Tighten:
  - Torque - Tie-Rod Adjusting Sleeve Locknuts: 33 N-m (3.4 kgf-m, 45 ft-lb)**
- Test ride the vehicle.

## Wheels (Rims)

### Wheel Removal

- Loosen the wheel nuts [A]
- Support the vehicle on a stand or the jack so that the wheels are off the ground.
- Take off the wheel nuts and remove the wheel.



### Wheel Installation

- Check the tire rotation mark [A] on the tire, and install the wheel accordingly.

### NOTE

- The direction of the tire rotation is shown by an arrow on the tire sidewall.



- Position the wheel so that the air valve [A] is toward the outside of the vehicle.
- Tighten the wheel nuts in a criss-cross pattern.
  - Torque- Wheel Nuts: 52 N-m (5.3 kgf-m, 38 ft-lb )**



### Wheel (Rim) Inspection

- Examine both sides of the rim for dents [A]. If the rim is dented, replace it.



- If the tire is removed, inspect the air sealing surfaces [A] of the rim for scratches or nicks. Smooth the sealing surfaces with fine emery cloth if necessary



### Wheel (Rim) Replacement

- Remove the wheel (see Wheel Removal)
- Disassemble the tire from the rim (see Tire Removal).
- Remove the air valve and discard it.

**CAUTION**

**Replace the air valve whenever the tire is replaced. Do not reuse the air valve.**

- Install a new air valve in the new rim.
- Remove the valve cap, lubricate the stem with a soap and water solution, and pull the stem [A] through the rim from the inside out until it snaps into place.



**CAUTION**

**Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.**

- Mount the tire on the new rim (see Tire Installation).
- Install the wheel (see Wheel Installation).

## TIRES

### Tire Removal

- Remove the wheel.
- Unscrew the valve core to deflate the tire.
- Use a paper valve core tool.
- Lubricate the tire beads and rim flanges on both sides of the wheel with a soap and water solution, or water. This helps the tire beads slip off the rim flanges.



**CAUTION**

**Do not lubricate the tire beads and rim flanges with engine oil or petroleum distillates because they will deteriorate the tire.**

- Remove the tire from the rim using a suitable commercially available tire changer.

**NOTE**

- The tires cannot be removed with hand tools because they fit the rims tightly.

**Tire Installation**

- Inspect the rim (see Wheel (Rim) Inspection).
- Replace the air valve with a new one.

**CAUTION**

**Replace the air with whenever the tire is replaced. Do not reuse the air valve.**

- Check the tire for wear and damage (see Tire Inspection)
- Lubricate the tire beads and rim flanges with a soap and water.

**△WARNING**

**Do not use the lubricant other than a water and soap solution, or water to lubricate the tire beads and rim because it may cause tire separation.**

- Check the tire rotation mark [A] on the tire, and install the tire on the rim accordingly.
- The tires should be installed on the rims so that each air valve is toward outside of the vehicle.

**NOTE**

- The direction of the tire rotation is shown by an arrow on the tire sidewall.

- Install the tire on the rim using a suitable commercially available tire changer.
- Lubricate the tire beads again and center the tire on the rim.



- Support the wheel rim [A] on a suitable stand [B] to prevent the tire from slipping off.
- Inflate the tire until the tire beads seat on the rim.

**Maximum Tire Air Pressure ( to seat beads when cold )**  
**Front and Rear: 250kpa (2.5 kgf-cm<sup>2</sup>, 36 psi )**

**△WARNING**

**Do not inflate the tire to more than the maximum tire air pressure. Over inflation can explode the tire with possibility of injury and loss of line.**



- Check to see that rim lines [A] on both sides of the tire are parallel with the rim flanges [B].
- ★ If the rim lines and the rim flanges are not paralleled, deflate the tire, lubricate the sealing surfaces again, and re-inflate the tire.
- After the beads are properly seated, check for air leaks.
- Apply a soap and water solution around the tire bead and check for bubbles.
- Deflate the tire to the specified pressure.
- Check the tire pressure using an air pressure gauge.



**Tire Air Pressure (when cold)**

**Front: 50 kPa (7.0 psi)**  
**Rear: 50 kPa (7.0 psi)**

- Install the wheel (see Wheel Installation).
- Wipe off the soap and water solution on the tire and dry the tire before operation.

**△WARNING**

**Do not operate the vehicle with the water and soap still around the tire beads. They will cause tire separation, and a hazardous condition may result.**

**Tire Inspection**

- Examine the tire for damage and wear.
- If the tire is cut or cracked, replace it.
- Lumps or high spots on the tread or sidewalls indicate internal damage requiring tire replacement.
- Remove any foreign objects from the tread. After removal, check for leaks with a soap and water solution.
- Check the shape of the tread knobs. If no vertical side is left on the drive side of the knobs, replace the tire.

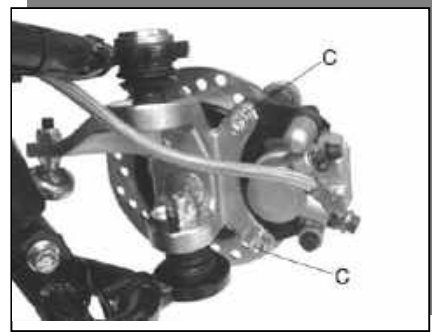


### Front Hub Removal

- Remove the cotter pin [A] and loosen the axle nut [B].
- Remove the wheel (see Wheel Removal).

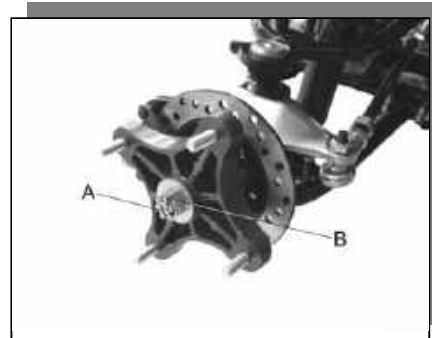


- Remove the caliper by taking off the mounting bolts [C], and let the caliper hang free.
- Remove the axle nut and pull off the front hub brake disc.
- Separate the brake disc from the front hub.



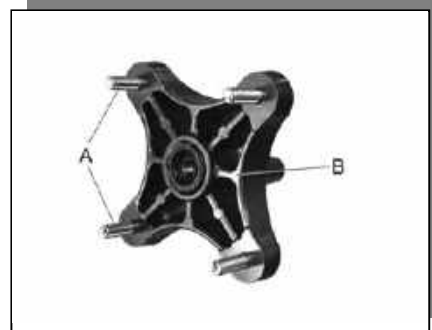
### Front Hub Installation

- Grease::
  - Seal
  - Front Spindle
- Tighten:
  - Torque - Front Spindle Nut: 145 N-m (15.0 kgf-m, 110 ft-lb )**
- Insert a new cotter pin [A] and bead it over the nut [B]



### Front Hub Disassembly/Assembly

- Don not press the hub bolts out.
- ★ If any hub bolt [A] is damaged, replace the hub [B] and bolts as a unit.





## Rear Hub

### Rear Hub Installation

- Grease the axle spindle.
- Apply non-permanent locking agent: Rear Axle Nuts [A]
- Tighten:  
**Torque - Rear Axle Nut: 265 N-m (27.0 kgf-m, 195ft-lb)**
- Insert a new cotter pin [B] and bend it over the nut.



### Rear Hub Disassembly/Assembly

- Do not press the hub bolts [A] out.
- ★ If any hub bolt is damaged, replace the hub [B] and bolts as a nut.



# Brake

## Table of Contents

Brake Fluid-----	3-2
Brake Fluid Recommendation-----	3-2
Brake Fluid Level Inspection-----	3-3
Brake Fluid Change-----	3-3
Brake Line Air Breeding-----	3-4
Master Cylinder-----	3-5
Master Cylinder Removal-----	3-5
Master Cylinder Installation-----	3-5
Calipers-----	3-6
Calipers Removal-----	3-6
Calipers Installation-----	3-6
Brake Pads-----	3-7
Brake Pads Removal-----	3-7
Brake Pads Installation-----	3-7
Brake Pads Wear Inspection-----	3-7
Brake Discs-----	3-8
Disc Cleaning-----	3-8
Disc Removal-----	3-8
Disc Installation-----	3-8
Disc Wear Inspection-----	3-8
Disc Runout-----	3-9
Brake Hoses-----	3-9
Brake Hose Inspection-----	3-9
Brake Hose Replacement-----	3-9
Rear Brake-----	3-10
Brake Pedal Position Inspection-----	3-10
Brake Pedal Position Adjustment-----	3-10
Brake Pedal Free Play Inspection-----	3-10
Brake Pedal Removal-----	3-10
Brake Pedal Installation-----	3-11
Caliper Removal-----	3-11
Caliper Installation-----	3-11
Rear Brake Pads Removal-----	3-12
Rear Brake Pads Installation-----	3-12
Master Cylinder Removal-----	3-13
Master Cylinder Installation-----	3-13
Brake Disc Removal-----	3-14
Brake Disc Installation-----	3-14

## Brake Fluid

<b>△WARNING</b>
-----------------

<b>When working with the disc brake, observe the precautions listed below.</b>
--

1. *Never reuse old brake fluid.*
2. *Do not use fluid from a container that has been left unsealed or that has or that has been open for a long time.*
3. *Do not mix two types and brand of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.*
4. *Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.*
5. *Don't change the fluid in the rain or when a strong wind is blowing.*
6. *Except for the disc pads and disc, use brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any parts will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.*
7. *When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Replace the pads with new ones if they cannot be cleaned satisfactorily.*
8. *Brake fluid quickly ruins painted surface; any spilled fluid should be completely washed away immediately.*
9. *If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE LINE.***

### Brake Fluid Recommendation

Recommended fluid is given in the table below. If none of the recommended fluid is available, use extra heavy-duty brake fluid only from a container marked DOT 3 or 4.

### Brake Fluid Level Inspection

- Position the reservoir horizontal, and check that the fluid level in the reservoir is higher than the lower level line [B].
- ★ If the fluid level is lower than the lower level line, check for fluid leakage of the brake line, and add the fluid as follow.
- Removal the reservoir cap, and fill the reservoir to the upper level line [A] in the reservoir with the same type and brand of the fluid that is already in the reservoir.



And then install the reservoir cap.

#### △WARNING

**Change the fluid in the brake line completely if the fluid must be refilled but the type and brand of the fluid that is already in the reservoir are unidentified.**

- Tighten:  
**Torque - Reservoir Cap Screws: 1.5 N-m (0.15 kg-m, 13 in-lb)**

### Brake Fluid Change

- Removal the reservoir cap and the rubber cap on the bleed valve.
- Attach a clear plastic hose to the bleed valve on the caliper, and run the other end of the hose into a container.
- Fill the reservoir with new brake fluid.
- Change the brake fluid as follows:
  - Open the bleed valve [A].
  - Apply the brake level and hold it [B].
  - Close the bleed valve [C].
  - Release the brake level [D].
- Check the fluid level in the reservoir often, replenishing it as necessary.



#### NOTE

- If the fluid in the reservoir runs completely out any time during fluid change, air will enter the line, and the system must be bled.

- Repeat this operation until fresh brake fluid comes out into the plastic hose or the color of the fluid change.



**△WARNING**

**Do not mix two brand of fluid. Change the brake fluid in the brake line completely if the fluid must be refilled but the type and brand of the brake fluid that is already in the reservoir are unidentified.**

●Tighten:

**Torque - Bleed Valve: 5.4 N-m (0.55 kg-m, 48 in-lb)**

●Apply the brake lever forcefully for a few second, and check for fluid leakage around the fittings.

**△WARNING**

**If the brake lever has a soft or "spongy feeling" when it is applied, there might be air in the brake line or the brake may be defective. Since it is dangerous to operate the vehicle under such condition, bleed the air from the brake line immediately.**

**Brake Line Air Bleeding**

- Bleed the air whenever brake parts are replaced or reassembled.
- Remove the reservoir cap and fill the reservoir with new brake fluid.
- Slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the hose at the bottom of the reservoir. This bleeds the air from the master cylinder and the brake line.

**NOTE**

- Tap the brake hose lightly going from the caliper to the reservoir side and bleed the air off at the reservoir.
- Attach a clear plastic hose to the bleed valve on the caliper, and run the other end of the hose into a container.
- Bleed the brake line and the caliper as follows:
  - Hold the brake level applied [B].
  - Quickly open and close the valve [C].
  - Release the brake level [A].
- The fluid level must be checked several times during the bleeding operation and replenished as necessary.



**NOTE**

- If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.
- If the brake level action still feels soft or "spongy", tap the brake hose from bottom to top and air will rise up to part of the hose. Slowly pump the brake level in the same manner as above.

● Tighten:

Torque - Bleed Valves: 5.4 N-m (0.55 kg-m, 48 in-lb)

- Apply the brake level forcefully for a few seconds, and check for fluid leakage around the fittings.

**Master Cylinder Removal**

● Removal:

Brake Hose Banjo Bolt [B]

Master Cylinder Clamp Bolts [A]

Master Cylinder

**CAUTION**

Brake fluid quickly ruins painted surface; any spilled fluid should be completely washed away immediately.



**Master Cylinder Installation**

- The master cylinder clamp must be installed with the "UP" mark [C] upwards.
- Tighten the upper clamp bolt first, and then the lower clamp bolt. There will be a gap at the lower part of the clamp after tightening.

**Torque - Master Cylinder Clamp Bolts:**

**8.8N-m(0.90kg-m,78in-lb)**

- Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolt.

**Torque - Brake Hose Banjo Bolt:25N-m(2.5kg-m,18.0ft-lb)**

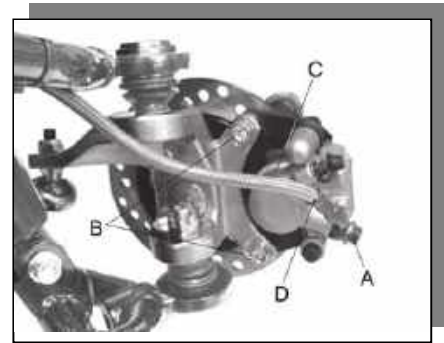
- Bleed the brake line after master cylinder installation (see Brake Line Air Bleeding).
- Check the brake for good braking power, no braking brag, and no fluid leakage.

**△WARNING**

Do not attempt to drive the vehicle until a full brake level is obtained by pumping the brake level until the pads are against each disc. The brakes will not function on the first application of the level if this is not done.

**Caliper Removal**

- Removal the front wheel (see Wheels/Tires chapter).
- Loose the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hose [D] from the caliper.



**CAUTION**

**Immediately wash away any brake fluid that spills.**

**NOTE**

- If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Caliper Disassembly).

**Caliper Installation**

- Install the caliper and brake hose lower end.
- Replace the washers that are on each side of hose fitting with new ones.
- Tighten:

**Torque -Caliper Mounting Bolts:25N-m(2.5kg-m,18.0ft-lb)**

**Brake Hose Banjo Bolt:25N-m(2.5kg-m,18.0ft-lb)**

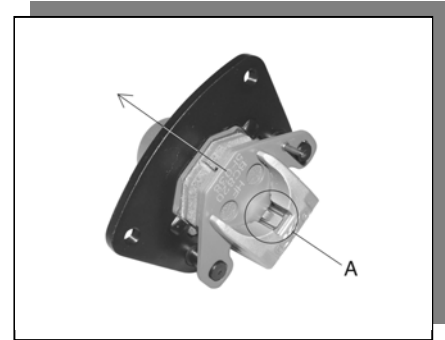
- Check the fluid level in the brake reservoir.
- Bleed the brake line (see Brake Line Air Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

**△WARNING**

**Do not attempt to drive the vehicle until a full brake level is obtained by pumping the brake level until the pads are against each disc. The brakes will not function on the first application of the level if this is not done.**

### Brake Pad Removal

- Remove the front wheel (see Wheels/Tires chapter).
- Remove the caliper (see Caliper Removal)
- Push the anti-rattle spring [A], remove the pads [B] [C].



### Brake Pad Installation

- Push the caliper piston in by hand as far as it will go.
- Be sure that the anti-rattle spring is in place.
- Install the pads
- Tighten:



**Torque - Pad Mounting Bolts: 18N-m(1.8kg-m,13.0ft-lb)**

### △WARNING

**Do not attempt to drive the vehicle until a full brake level is obtained by pumping the brake level until the pads are against each disc. The brakes will not function on the first application of the level if this is not done.**

### Brake Pad Wear Inspection

- Check the lining thickness [A] of the pads in each caliper.
- ★ If the lining thickness of either pad is less than the service limit [B], replace both pads in the caliper as a set.

Pad Lining Thickness:

Standard: 4.5mm

Service Limit: 2mm





## Disc Cleaning

Poor braking can be caused by oil on a disc. Oil on a disc must be cleaned off with an oil cleaning fluid such as trichloroethylene or acetone.

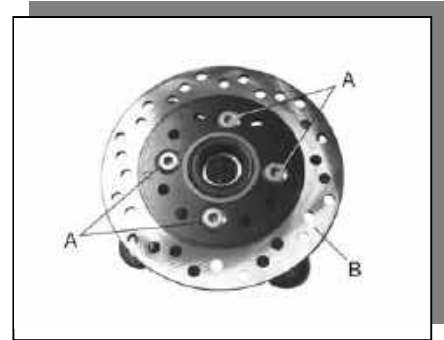
### △WARNING

**These cleaning fluids are usually highly flammable and harmful if breathed for prolonged periods. Be sure to heed the fluid manufacturer's warnings.**

## Disc Removal

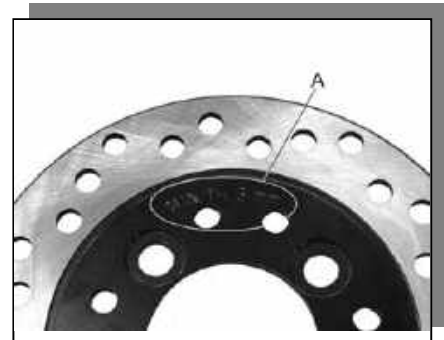
### ●Remove:

- Front Hub (see Wheels/Tires chapter)
- Brake Disc Mounting Bolts [A]
- Brake Disc [B]



## Disc Installation

- The disc must be installed with the marked side [A] facing toward the steering knuckle.
- Tighten:



## Non-permanent Locking Agent - Disc Mounting Bolts

**Torque - Disc Mounting Bolts: 37N-m(3.8kg-m,27ft-lb)**

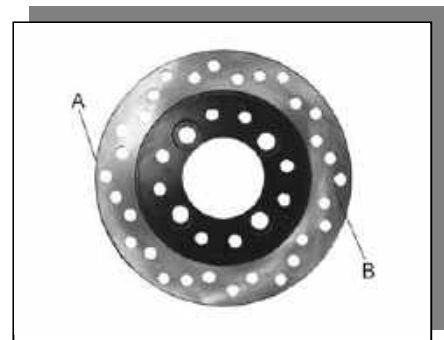
- After installing the discs, check the disc runout. Completely clean off any grease that has gotten on either side of the disc with a high flash point solvent.

## Disc Wear Inspection

- Measure the thickness of each disc at the point [A] where it has worn the most.
  - ★ Replace the disc if has worn past the service limit.
- [B] Measuring Area

### Disc Thickness

- Standard: 3.5mm
- Service Limit: 3mm

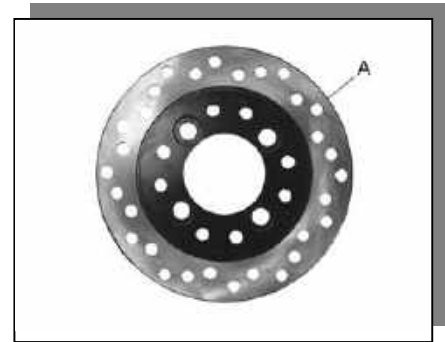


### Disc Runout

- Jack up the vehicle so that the wheels are off the ground.
- Remove the front wheels and turn the handlebar fully to one side.
- Set up a dial gauge against the disc [A], and measure the disc runout.
- ★ If the runout exceeds the service limit, replace the disc.

#### Disc Runout

Standard:	TIR	0.2 mm or less
Service Limit:	TIR	0.3 mm



### Brake Hose Inspection

- The high pressure inside the brake line can cause fluid to leak or the hose to burst if the line is not properly maintained. Bend and twist the brake hose while examining it.
- ★ Replace it if any cracks or bulges are noticed.

### Brake Hose Replacement

- Pump the brake fluid out of the line as explained in the Brake Fluid Change.
- Remove the banjo bolts at both ends of the brake hose, and pull the hose off the vehicle.
- Immediately wipe up any brake fluid that spills.

#### CAUTION

Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely washed away immediately.

- Use a new flat washer for each side of the hose fittings.
- Install the new brake hose in its place, and tighten the banjo bolts.

**Torque - Brake Hose Banjo Bolts: 25N-m(2.5kg-m,18.0ft-lb)**

## Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position as shown.

## Pedal Position [C]

**Standard:** 41 ~ 46 mm above footrest

- ★ If it is correct, adjust the brake pedal position.

## Brake Pedal Position Adjustment

- Remove the brake pedal (see Brake Pedal Removal).
- Loosen the nut [A], and turn the bracket [B] until pedal is correctly positioned.
- Tighten the nut [A].
- Check the brake pedal free play (see Brake Pedal Free Play Inspection).

## Brake Pedal Free Play Inspection

- Check the brake pedal free play [A].
- Depress the brake pedal lightly by hand until the brake is applied.
- ★ If the free play is incorrect, adjust it.

## Pedal Free Play

**Standard:**  $2.2 \pm 0.5$  mm

## Brake Pedal Removal

- Remove:
  - Cir-clip [B]
  - Pin [C]
  - Master Cylinder Joint [A]
- Pulling down the springs (where circled), remove the brake pedal.

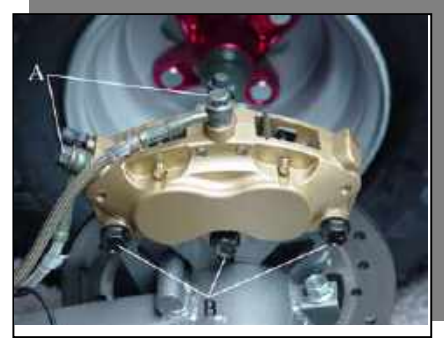


### Brake Pedal Installation

- Please reverse the Removal steps to install the brake pedal.

### Caliper Removal

- Removal the Rear wheel (see Wheels/Tires chapter).
- Loose the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper from the disc.
- Unscrew the banjo bolt and remove the brake hose from the caliper.



#### CAUTION

**Immediately wash away any brake fluid that spills.**

#### NOTE

- If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed.

### Caliper Installation

- Install the caliper and brake hose lower end.
- Replace the washers that are on each side of hose fitting with new ones.
- Tighten:

**Torque –**

**Caliper Mounting Bolts: 25N-m(2.5kg-m, 18.0ft-lb)**

**Brake Hose Banjo Bolt: 25N-m(2.5kg-m, 18.0ft-lb)**

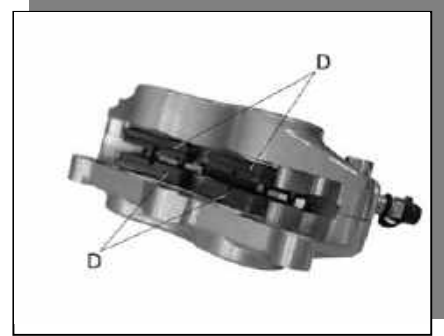
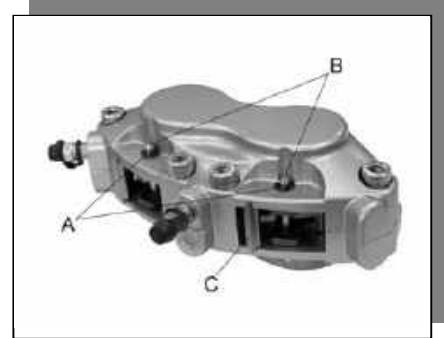
- Check the fluid level in the brake reservoir.
- Bleed the brake line (see Brake Line Air Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

#### △WARNING

**Do not attempt to drive the vehicle until a full brake level is obtained by pumping the brake level until the pads are against each disc. The brakes will not function on the first application of the level if this is not done.**

### Rear Brake Pads Removal

- Remove the caliper (see Caliper Removal)
- Remove:
  - Anti-rattle Spring [C]
  - Brake Pads [B]



### Brake Pad Installation

- Check the lining thickness (see Brake Pad Wear Inspection).
- Push the caliper piston in by hand as far as it will go.
- Be sure that the anti-rattle spring is in place.
- Install the pads.
- Be careful not mix it up inboard pads with the out board pad.
- Tighten:
  - Torque - Pad Mounting Bolts: 18N-m(1.8kg.m,13.0ft.lb)**

**△WARNING**

**Do not attempt to drive the vehicle until a full brake level is obtained by pumping the brake level until the pads are against each disc. The brakes will not function on the first application of the level if this is not done.**

### Master Cylinder Removal

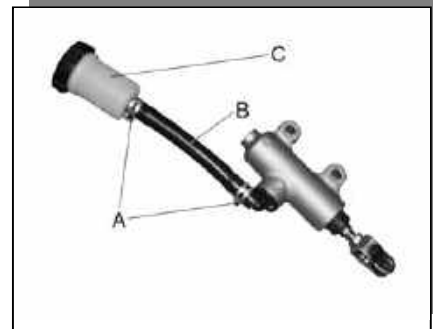
- Remove the master cylinder joint [A] and the banjo bolt [B] at the brake hose lower end, and tighten it loosely.
- Remove the brake hose [C].
- Loose the master cylinder mounting bolts [D].



#### CAUTION

**Brake fluid quickly ruins painted surface; any spilled fluid should be completely washed away immediately.**

- Remove:
  - Fastener [A]
  - Hose [B]
  - Reservoir [C]

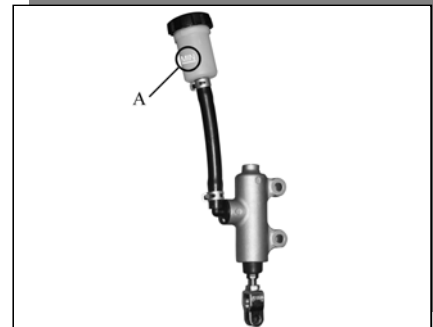


### Master Cylinder Installation

- Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolt.

#### Torque -Brake Hose Banjo Bolt: 25N-m(2.5kg-m,18.0ft-lb)

- Check the fluid level [A] in the brake reservoir.
- Bleed the brake line after master cylinder installation (see Brake Line Air Bleeding).
- Check the brake for good braking power, no braking brag, and no fluid leakage.



#### △WARNING

**Do not attempt to drive the vehicle until a full brake level is obtained by pumping the brake level until the pads are against each dis. The brakes will not function on the first application of the level if this is not done.**

### Brake Disc Removal

- Remove the rear caliper, unscrew the banjo bolt and remove the brake hose from the caliper.
- Loose the brake disc mounting bolts [A] and nut [B].
- Support the vehicle.
- Remove the rear wheel (see Wheel Removal).
- Remove the disc.



### Brake Disc Installation

- The disc must be installed with the marked side [A] facing toward the steering knuckle.
- Tighten:

**Non-permanent Locking Agent - Disc Mounting Bolts**

**Torque - Disc Mounting Bolts: 37N-m(3.8kg-m, 27ft-lb)**

- After installing the discs, check the disc runout (see Disc Runout). Completely clean off any grease that has gotten on either side of the disc with a high flash point solvent.
- Check the disc wear (see Disc Wear).



# Suspension & Steering

## Table of Contents

Shock Absorbers-----	4-2
Front Shock Absorber Removal-----	4-2
Front Shock Absorber Installation-----	4-2
Front Shock Absorber Inspection-----	4-2
Front Shock Absorber Preload Adjustment-----	4-2
Rear Shock Absorber Removal-----	4-2
Rear Shock Absorber Installation-----	4-2
Rear Shock Absorber Scrapping-----	4-3
Suspension Arms-----	4-3
Suspension Arm Removal-----	4-3
Suspension Arm Installation-----	4-3
Suspension Arm Disassembly-----	4-3
Suspension Arm Assembly-----	4-4
Swingarm-----	4-4
Swingarm Removal-----	4-4
Swingarm Installation-----	4-4
Swingarm Bearing Removal-----	4-4
Swingarm Bearing Installation-----	4-5
Swingarm Bearing Inspection-----	4-5
Swingarm Bearing Lubrication-----	4-5
Steering-----	4-6
Steering Stem Removal-----	4-6
Steering Stem Installation-----	4-7
Steering Knuckle Removal-----	4-7
Steering Knuckle Installation-----	4-8
Tie-Rod Removal-----	4-8
Tie-Rod Installation-----	4-8
Tie-Rod End Removal-----	4-8
Tie-Rod End Installation-----	4-9
Steering Maintenance-----	4-9
Steering Inspection-----	4-9
Steering Stem Warp-----	4-9
Steering Lubrication-----	4-10
Steering Stem Clamp Inspection-----	4-10
Tie-Rod End and Steering Knuckle Joint Inspection-----	4-10
Handlebar-----	4-11
Handlebar Removal-----	4-11
Handlebar Installation-----	4-11



### Front Shock Absorber Removal

- While supporting the vehicle to up with the jack.
- Remove:
  - Front Shock Absorber Mounting Bolt and Nut [A]
  - Front Shock Absorber [B]

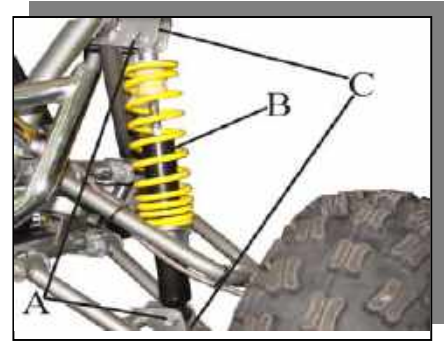
### Front Shock Absorber Installation

- Insert the shock absorber into the bracket [C].
- Tighten:

#### Torque - Mounting Bolts and Nuts:

**47 N-m (4.8 kgf-m, 35 ft-lb)**

- While supporting the vehicle to down with the jack.



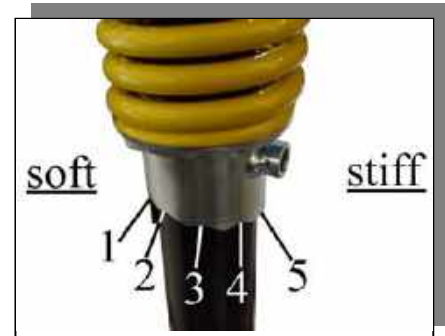
### Front Shock Absorber Inspection

Since the front shock absorbers are sealed units, which cannot be disassembled, only external checks are necessary.

- ★ If one unit is damaged, replace both shock absorbers as a set. If only one unit is replaced and the two are not balance, vehicle at high speed may endanger driver's safety.

### Front Shock Absorber Preload Adjustment

The spring adjusting sleeve on rear shock absorber has 5 positions so that the spring can be adjusted for different terrain and loading conditions. If the spring action feels too soft or too stiff, adjust it in accordance with the following photograph.



- Turn the adjusting sleeve on front shock absorber to the desired position with the wrench.

### Rear Shock Absorber Removal

- Support the vehicle on a stand or the jack so that the rear wheels are off the ground.
- While holding the rear wheels, remove the lower and upper shock absorber mounting bolts [A] and nuts.
- Remove the rear shock absorber [B].

### Rear Shock Absorber Installation

- Tighten-Torque-Rear Shock Absorber Mounting Nuts:
  - 6.2 N-m (6.3 kgf-m, 46ft.lb)
- See the Front Shock Absorber Preload Adjustment.



**Rear Shock Absorber Preload Adjustment**

- See the Front Shock Absorber Preload Adjustment

**Suspension Arm Removal**

- Remove:
  - Front Wheel (see Wheels/Tires chapter)
  - Front Hub (see Wheels/Tires chapter)
  - Cotter Pin, Nut and Bolt [A]
  - Tie-Rod End [B]
  - Front Shock Absorber Mounting Bolts [C]
  - Suspension Arm Pivot Bolts [D]



**Suspension Arm Installation**

- Tighten:

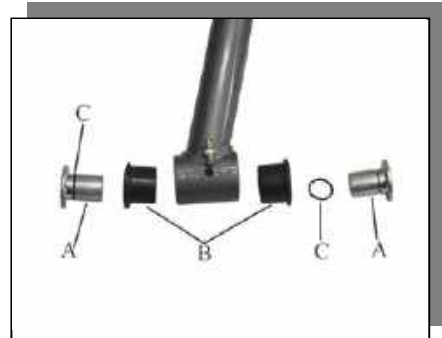
**Torque –**

- Suspension Arm Pivot Bolts: 88 N-m (9.0 kgf-m, 65 ft-lb)**
- Steering Knuckle Joint Nut: 42 N-m (4.3 kgf-m, 31 ft-lb)**

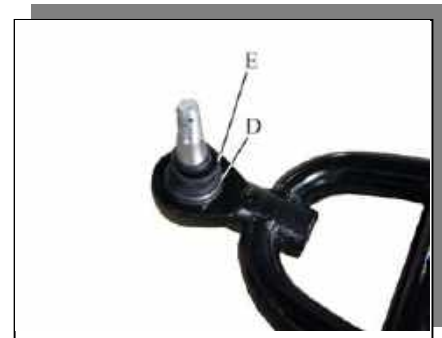


**Suspension Arm Disassembly**

- Tighten:
  - Bushings [A]
  - Rubber Bushings [B]
  - O-Ring [C]
- Holding the suspension arm with a vise, remove the cir-clip [D] and unscrew the knuckle joint [E].



**CAUTION**  
**Do not remove the knuckle joint grease seal. It is packed with grease.**



### Suspension Arm Assembly

- When installing the rubber bushing into the arm, lubricate the outer surface of the bushings with a soap and water solution.

#### CAUTION

**Do not lubricate the rubber bushings with engine oil or petroleum distillates because they will deteriorate the rubbers.**

- Position the bushings in the suspension arm as shown using a suitable bearing driver in the bearing driver set.

### Swingarm Removal

- Support the vehicle on a stand or the jack so that the rear wheels are off the ground.
- Remove:
  - Rear Wheels
  - Rear Brake Disc (see Caliper Removal)
  - Rear shock Absorber Mounting Bolt and nut
  - Chain
  - Speedometer Cable
  - Rear Axle
  - Swingarm Shaft Nut [A] and Shaft [B]

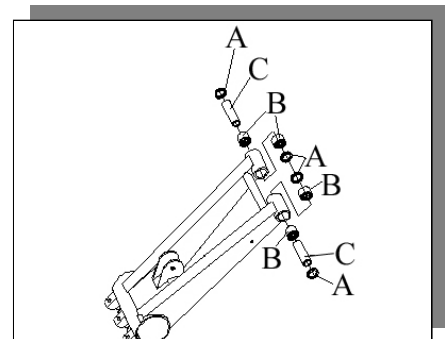


### Swingarm Installation

- Position the swingarm as shown.
- The distance between the frame and left end of the swingarm is 0.5 mm; also right side distance is 0.5 mm.
- Tighten:
  - Torque -**
  - Swingarm Shaft Nuts: 110 N-m (11.0 kgf-m, 80 ft-lb)**

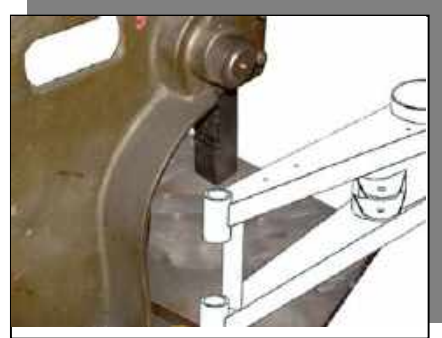
### Swingarm Bearing Removal

- Remove:
  - Grease Seals [A]\*4
  - Bearing [B]\*4
  - Spacer [C]\*2



### **Swingarm Bearing Installation**

- Lubricate the swingarm bearing before installation (see swingarm bearing Lubrication).
- Use the bearing driver set to press in the tapered roller bearing outer races and grease seals.



### **Swingarm Bearing Inspection**

- Move the swingarm up and down to check for abnormal friction, and push and pull it back and forth to check for bearing play.
- ★ If abnormal friction is felt, the bearings are damaged. Replace the grease seals and both left and right bearing.
- The play developed during use may indicate bearing damage. In this case, remove the swingarm and inspect the bearings. Replace both left and right bearings, if one of the bearing is damaged.



### **Swingarm Bearing Lubrication**

- Remove the swingarm.
- Using a high flash-point solvent, wash the bearings clean of grease, and dry them.
- Inspect the bearings and grease seals for abrasion, color change, or other damage.
- Apply grease to the outer races, and pack the tapered roller bearing with the same grease.
- Apply grease to the inside of the grease seals.

### Steering Stem Removal

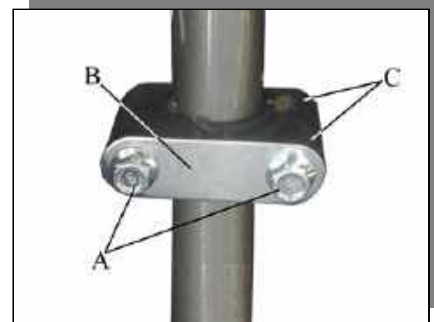
● Remove:

- Speedometer Cover Bolts [A]
- Speedometer Cover [B]
- Handlebar Holder Bolts \*4 [C]
- Handlebar [D]
- Front Cover (see Frame Chapter)



● Remove:

- Steering Clamp Bolts [A]
- Steering Clamp Support Plate [B]
- Steering Clamp [C]
- Tie-Rod End Nuts [D]
- Steering Stem Cotter Pin [E] and Nut [F]



**CAUTION**

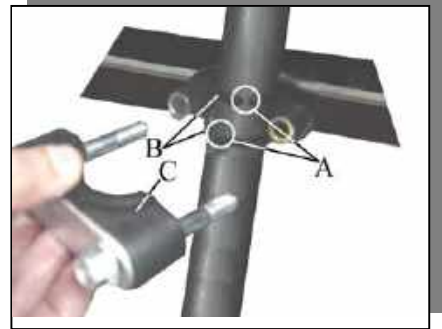
**Do not loosen the locknut at the ends of the tie-rod adjusting sleeve, or the toe-in of the front wheels will be changed.**

- Pull the steering stem out of the frame.
- To remove the steering stem bearing [G], remove the cotter pin and nut from the bottom end of the steering stem.



### Steering Stem Installation

- Lubricate the steering stem clamp, grease seals, (See Steering Lubrication).
- Install the grease seals [B] facing the end [A] rearward to prevent the entry of dirt.
- Install the steering stem clamps on both grease seals fit into the grooves on the steering stem clamps [C].



- Tighten:

#### Torque –

**Bottom End Nut: 29 N-m (3.0 kgf-m, 22 ft-lb)**

**Bearing Housing Bolts: 20 N-m (2.0 kgf-m, 14.5 ft-lb)**

**Clamp Allen Bolts: 25 N-m (2.5 kgf-m, 18.0 ft-lb)**

**Tie-Rod End Nuts: 47 N-m (4.8 kgf-m, 35 ft-lb)**

- Inspect the toe-in if necessary.

### Steering Knuckle Removal

- Remove:
  - Front wheel and Hub (see Wheels/Tires chapter)
  - Brake Hose Clamp
  - Tie-Rod End Nut [A] and Tie-Rod End

#### CAUTION

**Do not loosen the locknuts at the ends of the tie-rod adjusting sleeve, or the toe-in of the front wheels will be changed.**

- Remove:
  - Front Shock Absorber Clamp Bolt [B] and Nut
  - Knuckle Joint Bolt [C] and Nut
  - Suspension Arm [D]



**Steering Knuckle Installation**

- Clean the sealing surface [A] and the hole [B].
- Grease the sealing surface.
- Tighten:

**Torque –**

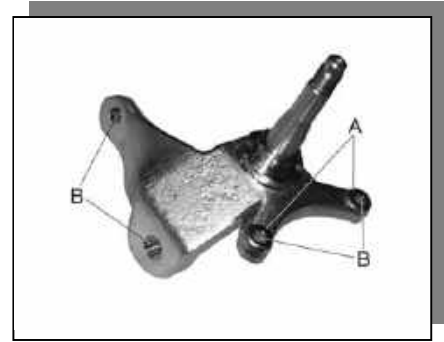
**Suspension Arm Pivot Bolts: 88 N-m (9.0 kgf-m, 65 ft-lb)**

**Steering Knuckle Joint Nut: 42 N-m (4.3 kgf-m, 35 ft-lb)**

**Front Shock Absorber Clamp Nut:**

**52 N-m (5.3 kgf-m, 38 ft-lb)**

**Tie-Rod End Nut: 47 N-m (4.8 kgf-m, 35 ft-lb)**

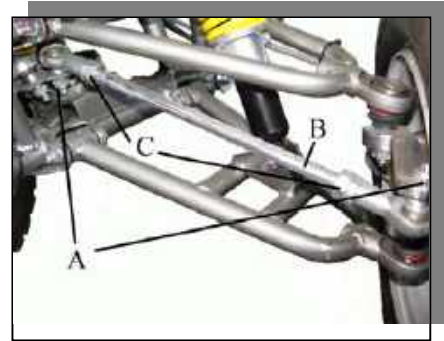


**Tie-Rod Removal**

- Remove:
  - Tie-Rod End Nuts [A]
  - Tie-Rod [B]

**CAUTION**

**When removing the tie-rod, be careful not to bend it. Do not loosen the locknut [C] at the end of the tie-rod adjusting sleeve, or the toe-in of the front wheel will be changed.**



**Tie-Rod Installation**

- The right and left tie-rods are identical.
- Install the tie-rod with the flattened area [A] located inboard.
- Tighten:
  - Torque - Tie-Rod End Nuts: 47 N-m (4.8 kgf-m, 35 ft-lb)**
- Inspect the toe-in if necessary

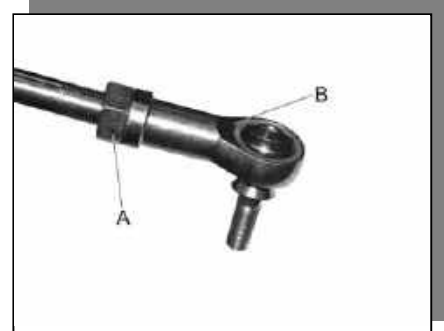


**Tie-Rod End Removal**

- Remove the tie-rod (see Tie-Rod Removal)
- Holding the tie-rod flattened area, loosen the locknut [A] and unscrews the tie-rod end [B].

**NOTE**

- The while locknut on the tie-rod has left-hand threads. Turn the wrench clockwise for loosening.



**CAUTION**

**Do not remove the grease seal. It is packed with grease.**

**Tie-Rod End Installation**

- Install the tie-rod ends so that the tie-rod has the correct length [A], and the both visible thread length [B] make equal.

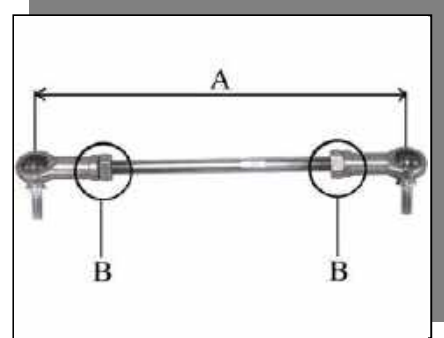
**Tie-Rod Length Standard: 385 mm**

- Tighten:

**Torque –**

**Tie-Rod adjusting Sleeve Locknut:**

**27 N·m (2.8 kgf·m, 20 ft·lb)**

**Steering Inspection**

- Turn the handlebar left and right, and check the steering action.
- ★ If the steering is not smooth, or if the steering binds or catches before the stop, lubricate the steering.

**NOTE**

- The cables and wires will have some effect on the steering action which must be taken into account.
- Check the steering action again.
- ★ If the steering lubrication does not remedy the problem, inspect the steering stem warp, steering stem clamps, and tie-rod bearings.
- ★ If you feel looseness, or if the steering rattles as it turns, check the tightness of the steering bolts and nuts.
- Tighten loose bolts and nuts to the specified torque (see Exploded View), and check the steering action again.
- ★ If the steering action does not change by tightening the bolts and nuts, inspect the steering stem clamps, steering stem bearing, tie-rod bearings, and steering knuckle joints.

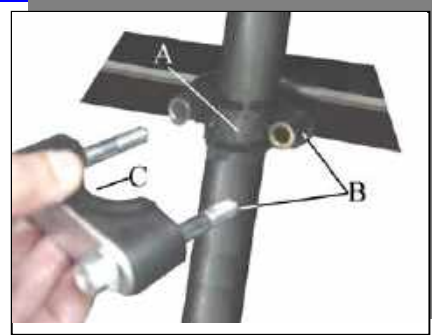
**Steering Stem Warp**

- Remove the steering stem (see Steering Stem Removal).
- Check the steering stem for straightness.
- Use a straightness along the stem.
- ★ If the steering stem is bent, replace the steering stem.



### Steering Lubrication

- Lubricate the steering stem clamps.
- Remove the steering stem (see Steering Stem Removal).
- Wipe all the old grease off the steering stem, and clamps, and out of the grease seals.
- Apply grease to the steering stem [A], grease seal lips and mating surface [B] of the clamp, and pack the grooves [C] in the clamp with grease.



### Steering Stem Clamp Inspection

- Inspect the steering stem clamps [A].
- ★ If roughness, excessive play, or seizure is found, replace both clamps.



### Tie-Rod End and Steering Knuckle Joint Inspection

- Inspect each spherical bearing [A].
- ★ If roughness, excessive play, or seizure is found, replace the tie-rod end, or steering knuckle joint.
- ★ If damage, wear or deterioration is found, replace the tie-rod end.



**Handlebar Removal**

- Remove:
  - Throttle Switch (see Steering Stem Removal)
  - Front Brake Master Cylinder
  - Left-hand Switch Housing
  - Handlebar Cover Screw
  - Handlebar Cover

- Remove:
  - Handlebar Holder Bolts [A]
  - Handlebar Holders [B]
  - Handlebar [C]

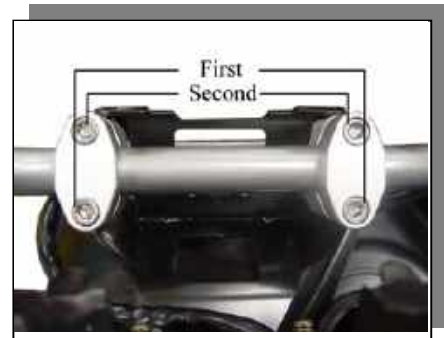


**Handlebar Installation**

- Install the handlebar so that the angle of the handlebar matches the angle of the steering stem as shown.
- Tighten the holder rear bolts first and then the front bolts.

**Torque –**  
**Handlebar Holder Bolts: 27 N-m (2.8 kgf-m, 20 ft-lb)**

- If the holder is correctly installed, there will be no gap at the rear and an even gap at the front after tightening.



*NOTE:*

# Frame

## Table of Contents

Seat-----	5-2
Seat Removal-----	5-2
Seat Installation-----	5-2
Front and Rear Fenders-----	5-3
Front Cover Removal-----	5-3
Front Fender Removal-----	5-3
Front Fender Installation-----	5-3
Rear Fender Removal-----	5-4
Rear Fender Installation-----	5-4
Radiator Removal-----	5-5
Foot Steps-----	5-6
Foot Steps Removal-----	5-6

## Seat

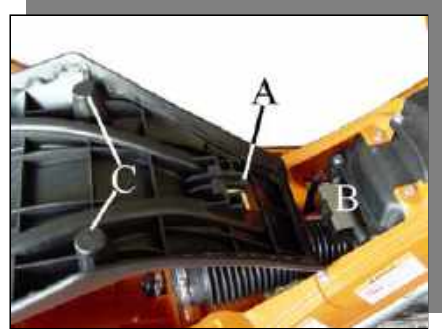
### Seat Removal

- To remove the seat [A] by pulling the seat latch lever [B] up and then pulling the seat up to the rear.



### Seat Installation

- Slip the seat hook [B] under seat; and put the stoppers [C] into the holes on the rear fender.
- Push down the rear parts of the seat until the lock clicks.



## Front and Rear Fenders

### Front Cover Removal

- Remove:
  - Headlight Assy. [A]
  - Handlebar [B]
  - Fuel Tank Cap



- Front Cover : Screws [C]\*2 [D]\*2 [E]\*6  
Bolts [A]\*2 [B]\*2



### Front Fender Removal

- Remove:
  - Front Left Fender Bracket Screws [A]\*4
  - Front Left Fender Bracket
  - Front Left Fender Screw [B]\*4
  - Front Left Fender



- Remove:
  - Front Right Fender Bracket Screw [C]\*4
  - Front Right Fender Bracket
  - Front Right Fender Screw [D]\*4
  - Front Right Fender



### Front Fender Installation

- Please reverse the Removal steps to install.

### Rear Fender Removal

- Remove:
  - Air Intake Duct [C]
  - Rear Fender Bracket Bolts [A]\*6
  - Rear Fender Bracket Screw [B]\*4



### Rear Fender Installation

- Please reverse the Removal steps to install.

### Radiator Removal

- Remove:
  - Side Cover Screw [A]
  - Side Cover [B]
  - Water Tube [C] [D] [E]
  - Connector [F] [G]
  - Cooler Bolts \*2 [H]
  - Cooler [I]



- Remove:
  - Radiator Cover Bolts [A]
  - Radiator Protector [B]



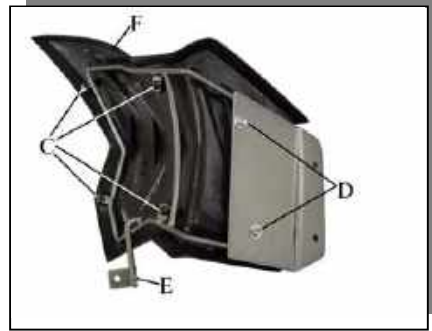
### Radiator Installation

- Please reverse the Removal steps to install.



### Foot Steps Removal

- Remove:  
Step Bracket Bolts [A] [B]  
Step Screw\*4 [C] and Bolts\*2 [D]  
Step Bracket [E]  
Step [F]



### Headlight Assy Removal

- Remove:  
Handlebar (see Handlebar Removal)  
Front Cover (see Front Cover Removal)  
Headlight Holder Bolts [A]  
Headlight Screws [B]  
Headlight Base



# Engine

## Table of Contents

Removal and Installation -----	6-2
Inspection -----	6-7
Reassembly -----	6-15
Attachment	
(1) Special Tool -----	6-32
(2) Timing Chain -----	6-33
(3) Matrix Table -----	6-34
(4) Tightening Torque table -----	6-35
(5) Tightening Torque chart -----	6-40
(6) Service Data -----	6-45
(7) Adhesive, Sealant and Oil application -----	6-47
(8) Periodic Maintenance Schedule -----	6-48
(9) Specifications -----	6-49

## Removal and Installation

- Thoroughly clean the ATV engine and chassis.
- Clean work area.
- Drain coolant and engine oil.

### Disassembly

Set the engine assembly onto Special Tool; Engine Base Plate AY.



- Take out Cover CP (Drive Chain) and Plate (Drive Chain).



- Operate Shift Pedal to engage the transmission gears.  
Remove bolts and take out Fixing Plate, and then remove Sprocket 14T.
- Remove Shift Pedal.
- Remove Reverse Arm Lever (Reverse Lock).
- Remove Carburetor.
- Remove upper side banjo bolt (oil fitting) first, after that other bolts, and then take out Oil Delivery Pipe Assy.



### Note:

Pay attention not to lose total 6 copper washer.

### MAG Cover CP.

Note:

Adopt tray or clothes (waste) to prevent oil pollution.

- Remove Reduction Gear 1, Shaft 1, Reduction Gear 2, Shaft 2.
- Make sure their original positions for reassembling.



- Remove Oil Filter Cover and take out Oil Filter CP, O-ring and Spring (Filter).

Note:

Adopt tray or clothes (waste) to prevent oil pollution.

- Remove Clutch Cover CP.

Note:

Adopt tray or clothes (waste) to prevent oil pollution.



### Clutch

- Remove bolts and take out Spring and Washer.
- Take out Disk (Clutch Pressure).
- Take out Pusher.
- Remove Push Rod by depressing Release Lever.
- Remove Lock Nut.

Note:

Lock Nut was caulked, and so unlock the caulk by using drill.

- Take out Lock Washer.
- Take out Clutch, Distance Collar and Thrust Washer.



### Oil Pump

- Take out Snap Ring and Oil Pump Gear.
- Remove bolts and take out Oil Pump Case.
- Take out Oil Pump; feed Pump, Scavenging Pump and Oil Pump Shaft etc.
- Take out Shift Shaft CP along with washer.

Note:

Fit the washer onto the Shaft, not to lose it.



### GUIDE PLATE, DRUM SHIFTER and SHIFT CAM

- Remove Guide Plate, Drum Shifter and Shift Cam.
- Remove Guide Plate and Drum Shifter.

Note:

Pay attention Drum Shifter is not disassembled.



- Take out Shifter Pin and then pull out Shifter Cam.
- Remove Stopper Arm and Spring (Stopper).
- Take out Point (Neutral) along with Spring (Point), and then remove Switch (Position).
- Remove nut and take out washer and Primary Gear.

### HEAD COVER

- Remove bolts and take out Rubber Mounts, O-ring and Head Cover.

### CHAIN TENSIONER

- Align the TDC, and remove adjusting bolt.
- Remove bolts and take out Tensioner.



### CAM SUPPORT, CAMSHAFTS

- Remove bolts and take out Cam Support
- Take out intake Camshaft, exhaust Camshaft and Bearing Stoppers.

Note:

Pay attention not to lose Bearing Stoppers.

- Take out Crank Sprocket by holding the chain at the upper portion (cylinder head side).
- Take out Timing Chain.

### MAGNETO ASSY

- Remove flange nut.
- Take out Magneto Assy along with Starter Gear, Needle Bearing and Spacer, by means of Special Tool; MAG Remover.



### THERMOSTAT

- Remove bolts and take out Thermostat Cover and Thermostat.

### WATER PUMP

- Remove bolts and take out Water Pump Case.

Note:

Adopt tray to prevent coolant pollution.

Make sure the original (one) position of a copper washer.



- Take out Impeller.
- Take out Sealing Washer.

Note:

When reassembling, replace with new Sealing Washer.

### CYLINDER HEAD

- Remove two (2) M6 bolts.
- Remove four (4) M11 bolts evenly and diagonally.



### LEVER CP

- Remove pivot bolt and take out Lever CP.
- Take out Cylinder and Gasket.

Note:

Hold Piston not to damage it.

### PISTON

- Take out Clip and pull out Piston Pin and then take out Piston.
- Remove Starter Motor.



## CRANKCASE

- Remove bolt on the clutch side.
- Remove bolts on the MAG side.



- Take out the crankcase from Special Tool; Engine Base Plate AY and set it with the clutch side facing up on the plastic containers.
- Attach the Special Tool; Case Separator Kit onto the clutch cover mating surface of the crankcase.
- Tighten two (2) bolts evenly, keeping the opening between mating surfaces of crankcase in the parallel condition.



## TRANSMISSION

- Take out Fork Shafts.
- Pull out Spring located under the Fork Shaft on the counter shaft side.
- Take out Shift Fork (Main), Shift Fork (Right) and Shift Fork (Left).

Note:

Make sure their original positions for reassembling.



- Take out Shift Drum CP with the Reverse Lock released.
- With the case put in the upright position, take out Main Shaft and Counter Shaft.
- With the case put in the original position again, take out Reverse Shaft CP (Reverse Idle Gear, collar, Washer etc.)

Note:

Pay attention not to lose the Counter Shaft washer.



## BALANCER GEAR

- Align the mating markings.
- Take out Balancer Shaft and Gear, by lightly tapping with plastic hammer.

## CRANKSHAFT

- Depress the MAG side end of the Crankshaft by means of hand-press machine and take out Crankshaft

## INSPECTION

### CYLINDER HEAD

#### Disassembling

Note:

Identify the original position of disassembled parts, with marking as necessary. Place them in order on the clean table.

- Remove Valve lifter and adjusting pad.
- While depressing Valve Spring with exclusive tool (Valve spring compressor), take out Colette.
- Take out Spring Retainer, Spring (inner and outer), Seat (spring).
- Take out IN and EX Valve.
- Take out Valve (Seal).



#### Cylinder Head warpage

- Clean and remove carbon deposits from the surface. Never damage the surface when cleaning.
- Place the measuring block diagonally on the surface, and check with thickness gauge.
- If the result is out of specifications, replace with new Cylinder Head.



Cylinder Head warpage	
Service Limit	0.05 mm

#### Inner diameter (ID) of Valve Guide

- Clean up the Valve Guide hole.
- Measure ID of Valve Guide at total 6 points; upper, middle and bottom positions and X- and Y-directions, by means of dial caliper.

Service Limit of Valve Guide ID	
IN	6.000 to 6.012 mm
EX	6.000 to 6.012 mm



## INTAKE & EXHAUST VALVE

### Valve Stem runout

- Remove carbon deposits.

### Place on the V-block.

- Measure the runout by means of dial gauge.
- If the result is out of specifications, replace with new Valve.

Valve Stem runout	
Service Limit	0.03 mm



### Outer diameter (OD) of Valve Stem

- Measure OD of Valve Stem sliding portion at total 6 points; upper, middle and lower positions and X- and Y-directions, by means of micrometer.

Service Limit of Valve Guide OD	
IN	5.950 to 5.965 mm
EX	5.945 to 5.960 mm



### Clearance between Valve stem and Guide

Service Limit of Clearance	
IN	0.15 mm
EX	0.15 mm



### Width of Valve face

- Measure the marginal width of valve face portion.
- If the result is out of specifications, replace with new valve.

Service Limit of marginal width	
IN	0.8 mm
EX	0.8 mm



**Valve Spring free length**

- Measure the free length of inner and outer Valve Spring.
- If the result is out of specifications, replace with Spring as a set.

Service Limit of free length	
IN	38.0 mm
EX	39.9 mm



**CAMSHAFT**

**Cam profile height**

- Check for damage and wear on cam profile portion.
- Measure the height of cam profile.

Service Limit of cam profile height	
IN	42.05 mm
EX	42.05 mm



**Oil clearance at cam journal portion**

- Measure the ID of cam journal portion with Cam Support fixed to the specified tightening torque: 9 – 11 N-m.

ID of cam journal portion	
Standard	25.000 to 25.021 mm



- Measure the OD of Camshaft journal portion with micrometer.

OD of Camshaft journal portion	
Standard	24.946 to 24.963 mm

- Oil clearance is ID minus OD.

Oil clearance at cam journal portion	
Service Limit	0.10 mm

### Visual Checking

- Check for wear and damage on Cam Sprocket gear teeth.
- Check for wear and damage on decompression related parts.
- Check if decompression would be operated smoothly.
- If any parts would be damaged or worn, replace with new Camshaft Assy.



## CYLINDER

### Cylinder warpage

- Clean and remove carbon deposits from the surface. Never damage the surface when cleaning.
- Place the measuring block diagonally on the surface, and check with thickness gauge.

Cylinder warpage	
Service Limit	0.05 mm



### Cylinder bore

- Check for damage or wear on bore surface.
- Measure the cylinder bore at total 6 positions; top, middle and bottom positions and axial (Camshaft) and right angle directions.

Cylinder bore	
Service limit	94.000 to 94.020mm

## PISTON and PISTON PIN

### Piston OD

- Check for wear and damage on the sliding surface.
- Measure OD of Piston at 11 mm distance from the bottom end in the right angle against Piston Pin with micrometer.

Piston OD	
Standard	93.955 to 93.970 mm



**Clearance between Piston and Cylinder**

- Clearance is Cylinder ID minus Piston OD.

Clearance between Piston and Cylinder	
Service Limit	0.100 mm



**ID of Piston hole for Pin**

- Clean Piston hole for Pin.
- Measure ID in the up and down direction and the right angle direction with dial caliper gauge.

ID of Piston hole for Pin	
Standard	23.001 to 23.007 mm

**Piston Pin OD**

- Check for ware and damage on the sliding surface.
- Measure OD at total 3 positions; both ends and middle position in the X- and Y-direction.

Piston Pin OD	
Standard	22.996 to 23.000 mm



**CONNECTING ROD**

**Small end ID**

- Check for ware and damage on the sliding surface.
- Measure ID in the X- and Y-direction with caliper dial gauge.

Small end ID	
Standard	23.007 to 23.020 mm



**Clearance between small end ID and Piston Pin OD**

- Clearance is small end ID minus Piston Pin OD.

Service Limit of Clearance	
Service Limit	0.05 mm

## PISTON RINGS

### Clearance between Piston Ring and groove

- Remove carbon deposits from Rings and grooves.
- Measure the clearance between Piston Ring and groove, by holding the Ring upwards in the groove, with thickness gauge.

Service Limit of clearance	
Top	0.15 mm
Second	0.15 mm



### Piston Ring gap (Opening)

- Insert Piston Ring into the lower portion of Cylinder horizontally by using Piston.
- Measure the Piston Ring gap (opening) with thickness gauge.

Service Limit of Piston Ring gap(Opening)	
Top ring	0.7 mm
Second ring	0.8 mm
Oil ring (side rail)	1.0 mm



## CRANKSHAFT

### Runout

- Set on the V-block and measure runout with dial gauge.

Crankshaft Runout	
Service Limit	0.06 mm



### Side-clearance at large end of Connecting Rod

- Measure the side-clearance at large end of Connecting Rod with thickness gauge.

Side-clearance at large end	
Service Limit	0.65 mm



## TIMING CHAIN

### Chain Pitch

- Check for wear, damage and roller fallout.
- Place Chain on the flat table and pull with the 4.53 kg force and then measure the length of 20 pitches.

Timing Chain Pitch (20 pitches)	
Service Limit	13.7 mm



## STARTER GEAR/ONE-WAY CLUTCH

### Disassembly

- Remove One-way Clutch from Flywheel Assy.

Fastener; M6 X 16L Bolt (socket head)\*8pcs.



## CLUTCH

### Visual checking – Pressure disk

- Check for wear and damage.
- Check for movement of bearing.
- If any fault would be found, replace with new one.



### Visual checking – Plate and Disk

- Check for wear and deformation on Plate.
- Check for wear and damage on Disk.
- If any damage or excessive wear would be found, replace with new one as a set.

### Visual checking – Release shaft and Push rod

- Check for wear and damage.

### Width of friction material

- Measure the width of friction material with caliper gauge.

Width of friction material	
Service Limit	2.8 mm



Note:

Clutch Disk A and B are available.

Clutch Disk B should be facing front side.

**TRANSMISSION**

**Visual checking – Shift Fork and Drum**

- Check for ware and damage.
- If any ware on the Fork crow portion, replace with new one.

**Visual checking – Main Shaft and Counter Shaft Assy.**

- After disassembling, check for ware and damage on dog clutch portion, gears and spline portions.
- If any ware and damage, replace with new one.



**Width of Shift Fork groove**

- Check for ware and scratch in the Fork groove.
- Measure the width of Shift Fork groove with caliper gauge.

Width of Shift Fork groove	
Standard	5.10 to 5.17 mm



**Width of Shift Fork crow**

- Measure the width of Shift Fork crow with micrometer.

Width of Shift Fork crow	
Standard	4.93 to 5.00 mm



**Clearance between Shift Fork and groove**

- Measure the clearance between Shift Fork and transmission gear groove, at crow portion, with thickness gauge.



## Reassembly

### CRANKCASE 1

- Press-fit crankshaft into crankcase 1 by means of Special Tool; CRANK ASSY TOOL KIT.

**Note:**

Hold Connecting Rod not to strike the Crankcase mating surface while press fitting.

- Install 1/8 plug in position.

Tightening Torque: 9 -15 N-m

- Attach Reverse Arm CP onto Crankcase 1.
- Retain the Reverse Arm CP with washer and snap ring from the outside of Crankcase 1.

**Note:**

Be sure not to damage oil seal. Make sure the snap ring is in the groove without fail.

- On plastic containers, place Crankcase 1 with the mating surface upwards.
- Install Balancer Shaft with the markings between Drive Gear of Crankshaft and Driven Gear of Balancer Shaft aligned.
- Install Reverse Shaft CP.





- Install Main Shaft Assy and Counter Shaft Assy with gears engaged into Crankcase 1.

Note:

Pay attention not to miss washer fitting to Counter Shaft. Be sure not to damage the lip portion of oil seal by the Counter Shaft end spline.

- Install Shifter Fork (Main), facing the ID marking “M” upwards, into the groove of Main Shaft.
- Install Shifter Fork (Right), facing the ID marking “R” upwards, into the upper groove of Counter Shaft.
- Install Shifter Fork (left), facing the ID marking “L” upwards, into the lower groove of Counter Shaft.



- Install Shift Drum CP in the pin side upright condition. Set each pin of Shift Forks into applicable groove of Shift Drum.
- Insert Spring (Fork Shaft) into the hole (Inner diameter; 11 mm) each of Shift Fork (Right) and (Left).
- Insert Fork Shaft into Shift Fork (Right) and (Left).
- Insert Fork Shaft into Shift Fork (Main).
- Apply oil into the grooves of Fork Shaft and Shift Drum.
- Turn Main Shaft and make sure that Counter Shaft, Shift Drum and Shift Fork can be smoothly operated.



## CRANKCASE 2

- (When replacing Bearing with new one) Install Bearing Retainer Plates.

### Stopper Plate for Main Shaft Bearing

Tightening Torque: 12 - 14 N-m

Fastener: M6 Hex bolt 1 pcs.

### Stopper Plate B for Shift Drum Bearing

Tightening Torque: 7 – 9 N-m

Fastener: M6 Hex bolt 1 pcs. Apply TB #1316 to threads.

- Install Drain Plug.  
Tightening Torque: 7 - 9 N-m  
Fastener: M16 Bolt 1 pcs.
- Fit Oil Strainer UN.
- On plastic containers, place Crankcase 2 with the mating surface to crankcase 1 upwards.
- Apply TB #1215 evenly onto the mating surface.



- Adjust the convex position on the end surface of Water Pump Shaft to meet with the groove on the end surface of Balancer Shaft (on Crankcase 1 side).



- Cover Crankcase 2 over Crankcase 1, assemble cases by lightly and carefully tapping with hammer to fit mating surfaces properly, without decline.

**Note:**

Hold Connecting Rod to keep the position of the groove on the end surface of Balancer Shaft.



- Tighten bolts to the specified tightening torque.

Tightening Torque: 9 - 11 N-m

Fastener	:	(Case 1 side)	M6X40L	7 pcs.,
			M6X75L	7 pcs.
			M6X50L	1 pc.
		(Case 2)	M6X75L	1 pc.



**Note:**

After tightening all bolts securely, make sure Crankshaft is smoothly rotated.

- Install Position Switch.

Caution: Install Position Switch after assembling Crankcase 1 and 2 without fail.

If the switch is installed onto Crankcase in advance, it will be depressed by Shift Drum and damaged when assembling.

- Insert Spring (Point) into the hole on the end surface of Shift Drum.
- Then insert Point (Neutral).
- Apply oil onto O-ring of Position Switch and set the switch.

Tightening Torque: 3 - 5 N-m

Fastener : M5 X 20L 2 pcs.



- Set the case assembly onto Special Tool; Engine Base Plate AY.



- Apply TB #1344 to Reverse Arm Lever threads (M6), and install along with Reverse Arm Spring.

Tightening Torque: 9 - 11 N-m  
Fastener : M8 X 12L 1 pc.

Note:  
Make sure the Reverse Arm Spring orientation.



- Apply TB #1316 to Stopper Pin threads, and tighten to the specified tightening torque.

Tightening Torque: 20 - 26 N-m

- Align the locator pin of Shift Drum at the groove of Shift Cam, and assemble. Fix with Shifter Pin.

Tightening Torque: 20 - 26 N-m

Note:  
When re-using Shifter Pin, apply TB #1316 to threads.  
Adhesive is applied onto new Shifter Pin threads.



- Apply TB #1316 to M6 Stepped bolt threads, and fix Stopper Arm CP and Spring (Stopper) with M6 Stepped bolt.

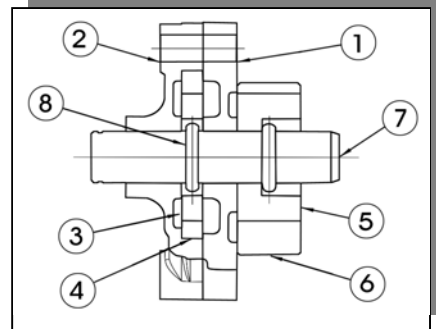
Tightening Torque: 9 - 11 N-m  
Fastener : M6 Stepped bolt 1 pc

Note:  
Make sure the Spring (Stopper) orientation.



**Assembly Oil Pump Assy. as shown in the illustration in advance.**

- (1) Oil Pump Case 1
- (2) Oil Pump Case 2
- (3) Inner Rotor (Feed)
- (4) Outer Rotor (Feed)
- (5) Inner Rotor (Scavenge)
- (6) Outer Rotor (Scavenge)
- (7) Oil Pump Shaft
- (8) Dowel Pin; 2 pcs.



- Insert shorter pin ( 3 X 15L) into the hole of Oil Pump Shaft, and then assemble with Inner Rotor (Scavenge).
- Set Pump Case 1 into Oil Pump Shaft.
- Insert another shorter pin ( 3 X 15L) into the hole of Oil Pump Shaft.
- Assemble Outer Rotor (Feed) and Inner Rotor (Feed) with Pump Case 2, and apply oil into rotor chamber.
- Set Oil Pump Shaft into Pump Case 2, fix Case 1 and 2 with two longer pins ( 3 X 19.8L).
- Fit Outer Rotor (Scavenge).

- Install Oil Pump Assy.

Tightening Torque: 9 - 11 N-m  
Fastener : M6 X 30L 3 pcs.

Note:  
Make sure the smooth rotation of Oil Pump shaft.



- Assemble Drum Shifter and related parts.

Make sure the spring force and smooth operation by moving the ratchet pole with finger.



- Install Drum Shifter along with Shifter Collar and Guide Plate onto Shift Cam.

Tightening Torque: 9 - 11 N-m

Fastener : M6 X 20L 2 pcs.



- Fit Oil Pump Gear and adopt snap ring into the groove on Oil Pump Shaft end.



- Insert Shift Shaft CP with Special Tool; Oil Seal Guide adopted.

Apply oil to Special Tool; Oil Seal Guide in advance.

Engage Stopper Pin and Shifter Collar into the groove of Shifter Lever.

Note:

Be sure to fit washer onto Shift Shaft.



- Take out Special Tool; Oil Seal Guide, temporarily fit Shift Pedal CP and make sure gear is shifted properly. Also make sure reverse locking operation.

- Apply oil to O-ring and install Starter Motor in position.

Tightening Torque: 9 - 11 N-m  
Fastener : M6 X 25L 2 pcs.

- Fit two Pipe Knocks and set Cylinder Gasket.



### Assemble and install Piston.

- Set Piston Rings into Piston grooves;
  - Expander Ring into Oil Ring groove
  - Second Ring, facing the marking upwards
  - Top Ring, facing the marking upwards
- Make sure rings are smoothly moved and adjust the openings (gaps) at 120-degrees intervals.
- Fit new clip into the groove on one side and make sure of the clip fitting properly in the groove.
- Place Special Tool; Piston Support Plate.



- Insert Piston, with the marking on the top surface faced to magneto side, into cylinder.
- Apply oil to small end hole of Connection Rod, Piston Pin and hole. Then fit Piston Pin into Piston.
- Fit new clip into the groove on another side and make sure the clip fitting properly in the groove.



- Apply oil around Piston and Rings, and cylinder bore.  
Install Cylinder by holding Rings by Special Tool; Ring Band.  
Make sure of the smooth operation by turning Crankshaft, with Cylinder pressed down by hand.



- Install Chain Guide 1 onto Cylinder.



**Assemble Cylinder Head as shown in the illustration**

- (1) Seal-valve ; 4 pcs.
- (2) Intake Valve ; 2 pcs.
- (3) Exhaust Valve ; 2 pcs.
- (4) Valve Spring (Inner) ; 4 pcs.
- (5) Valve Spring (Outer) ; 4 pcs.
- (6) Spring Retainer ; 4 pcs.
- (7) Colette (Valve) ; 8 pcs.
- (8) Seat (Valve Spring) ; 4 pcs.

- Press-fit Seal (Valve) by means of exclusive tool.

Note:

Pay attention on the Seal (Valve) appearance.

Intake (IN) side ----- Black

Exhaust (EX) side --- Green

- Fit Seat (Valve Spring) not to over-ride the step.
- Set Valve Spring (Inner), facing the green paint marking upwards.
- Set Valve Spring (Outer), facing the yellow paint marking upwards.
- Apply oil onto the shaft ends of IN and EX Valve, Valve Guide and Seal (Valve) and fit the valves into Cylinder Head.

Note:

Keep the IN and EX valve fitting in the original position. Do not mix IN and EX valves.

- While depressing Valve Springs with exclusive tool, fit Spring Retainer and Colette onto valve shaft end.

Note:

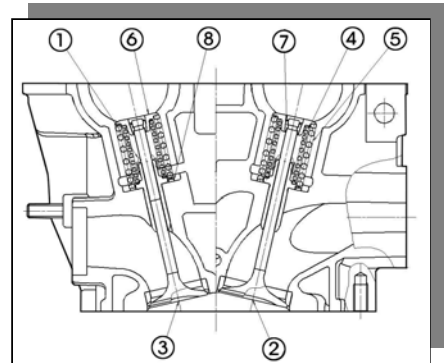
Make sure of Colette fitting securely to Valve Retainer. Do not depress Valve Spring extremely.

- Fit Adjusting Pad and Valve Lifter.

Note::

Keep Adjusting Pad and Valve Lifter fitting in the original positions.

- Fit two pipe knocks and Head Gasket.





**Install Cylinder Head.**

- Apply oil to M11 bolts threads and washer, and then tighten them in the following procedure. [As shown in Attachment (5)]

Fastener : M11 X 198L 4 pcs.



- Tighten M6 bolts.

Tightening Torque: 9 - 11 N-m

Fastener : M6 X 40L 2 pcs.



**Install Chain Lever with pivot bolt.**

Tightening Torque: 13.5 – 16.5 N-m

Fastener : M8 X 22.5L Pivot bolt 1 pc.



- Put Timing Chain from the Cylinder Head side and set in position as shown in Attachment (2).



- Fit Crank Sprocket with the chamfer portion inside and with each spline aligned



- Align the markings between Crank Sprocket and marking pale of Chain.



- Apply oil to Camshafts attaching portion, and install Camshaft (IN) and (EX) with Cam Sprocket marking and marking plate of Timing Chain aligned.



Note:

Decompression is furnished on Camshaft (EX).  
Do not mixed up.

- Fit Bearing Stopper onto Ball Bearing.



- Apply oil to Cam Support and install in position.

Tightening Torque: 9 – 11 N-m  
Fastener : M6 X 40L 8 pcs.



- Depress Chain Tensioner plunger into the bottom position by Special Tool; Chain Tensioner Tool and then Install Tensioner.

Tightening Torque: 9 – 11 N-m  
Fastener : M6 X 25L 2 pcs.



- Take out Special Tool and install bolt with Gasket (Aluminum).

Tightening Torque: 4.5 – 6 N-m

Fastener : M6 X 8L 1 pc.

- Make sure of smooth operation by turning Crankshaft.



- Adjust valve clearance with thickness gauge adopted at TDC position in the following procedures;

Valve Clearance (Cold condition)	IN; 0.15 +/- 0.05 mm
	EX; 0.27 +/- 0.05 mm

- Temporally fit original Adjusting Pad, and check the valve clearance.
- In accordance with the matrix table; Attachment (3), make sure the relationship between checking results and listed figures (3 digits).
- Select applicable Adjusting Pad and fit it in place with original one.
- Check again valve clearance and make sure it is within the specifications.
- If out of the specifications, repeat the procedures.



- Fit One-way Valve.

Tightening Torque: 15 – 21 N-m

Note:

Make sure One-way Valve Assy. is placed in position and then fix plug.



### Install Water Pump

- Fix Impeller along with Seal Washer by means of Special Tool; Wrench (Counter Shaft) adopted to Counter Shaft.  
Tightening Torque: 9 – 11 N-m
- Fit Case along with Gasket.

Tightening Torque: 9 – 11 N-m

Fastener: M6 X 25L 7 pcs.



Note:

At the bottom (one) position, fit the copper gasket without fail.



### Install Flywheel

- Fit Spacer with the chafer side inside onto Crankshaft on the MAG side.
- Apply TB #1306 and remove oil from the taper portion of Crankshaft.
- Fit Needle Bearing and apply grease. Not to apply grease onto the taper portion.
- Install One-way Clutch onto Flywheel.



Tightening Torque: 13 – 15 N-m

Fastener : M6 X 16L Adhesive applied bolt \*8 pcs.

- Fit Starter Gear and make sure of smooth counterclockwise rotation.
- Apply TB #1306 and remove oil from taper hole of Flywheel.
- Fit Flywheel, apply oil to threads and retaining surface of M14 nut.
- Tighten the nut to the specified tightening torque, with Special Tool; Wrench (Crank Sprocket) adopted to Crankshaft for preventing rotation.



Tightening Torque: 150 – 170 N-m

Fastener : M14 Nut

### Install Primary Gear with the inside marking aligned to spline.

Tightening Torque: 110 – 130 N-m

Fastener : M18 Nut



### Fit Release Shaft along with Spring (Release) and Plate (Release) in position.

Tightening Torque: 9 – 11 N-m

Fastener : M6 X 20L 1 pc.



**Install Clutch Assy.**

- Assemble Clutch Assy. properly after checking disassembled parts.
- Fit Distance Collar into Main Shaft, apply oil into hole and turn Collar by one-turn.
- Fit Clutch Outer CP, lock washer with the hollow surface inwards and lock nut.

Tightening Torque: 90 – 110 N-m  
Fastener : M18 Special nut

- Caulk the lock nut with Special Tool; Caulking Tool.
- Apply oil onto Push Rod and insert into Main Shaft, and then fit Pusher.
- Fit Disk (Clutch) and Plate (Clutch).

**Note:**

Make sure the widest friction plate is in the bottom position. Set the top plate into the shallow depth groove of Clutch Outer CP.

- Fit Disk (Clutch Pressure).
- Fit Spring (Clutch) and tighten bolts evenly.

Tightening Torque: 9 – 11 N-m  
Fastener : M6 X 36L 6 pcs.

- ★ Make sure again the tightening torque of Primary Gear fixing nut.

Tightening Torque: 110 – 130 N-m



**Install Clutch Cover.**

- Fit Spring (Filter).
- Fit Filter Cover along with Oil Filter CP and O-ring.

Tightening Torque: 9 – 11 N-m  
 Fastener : M6 X 25L 2 pcs.



- Fit Gasket (Clutch Cover) onto Crankcase after spot applying TB #1215 onto the Crankcase surface.
- Fit Clutch Cover and tighten bolts.

Tightening Torque: 9 – 11 N-m  
 Fastener: M6 X 25L 11 pcs.  
 M6 X 65L 1 pc.  
 = Commonly tighten Filter Cover



- Tighten Filter Cover plug to the specified tightening torque.

**Install Thermostat with the hole upward and Thermostat Cover.**

Tightening Torque: 7 – 9 N-m  
 Fastener : M6 X 20L 2 pcs.



**Install Thermo Switch with the TB #1344 applied to threads.**

Tightening Torque: 32 – 38 N-m



**Install Spark Plug.**

Tightening Torque: 15 – 20 N-m



### Install MAG Cover

- Apply grease around Shaft 1 and 2, and fit Reduction Gear 1 and 2 in position correspondingly.
- Apply grease to gears.
- Fit Stator Coil into MAG Cover.

Tightening Torque: 5.5 – 6.5 N-m  
Fastener : M5 X 30L 3 pcs.

- Route the coil wiring along the groove and fix Pulsar Coil over the wiring.

Tightening Torque: 2.5 – 3.5 N-m  
Fastener : M5 X 12L 2 pcs

- Fit Plug 1 and 2 (MAG Cover).

Tightening Torque: (Plug 1) 10 – 12 N-m (Plug 2) 3 – 5 N-m

#### Note:

Make sure O-ring is attached onto Plug (MAG Cover).  
Set the harness grommet into the groove.

- Fit Gasket (MAG Cover) onto Crankcase after spot applying TB #1215 onto the Crankcase surface.
- Fit MAG Cover and tighten bolts.

Tightening Torque: 9 – 11 N-m  
Fastener : M6 X 35L 11 pcs.



### Fit Oil Delivery Pipe

Tightening Torque: 15 – 21 N-m

#### Note:

Fit gasket on both sides of banjo (fitting).  
Set the rubber pipe in horizontal direction.



★ Make sure O-ring (Head Cover) and Chain Guide 2 are furnished and fit Head Cover.

**Fit rubber mount and tighten bolts.**

Tightening Torque: 9 – 11 N-m

**Install Adapter with convex portion upwards.**

Tightening Torque: 16 – 20 N-m

Fastener : M8 X 20L 2 pcs.



**Install carburetor onto Adapter.**

Set Adapter band screw with the screw head upwards on MAG side.

Fastener : M4 X 30L 1 pc.



**Fit Shift Pedal with the markings aligned.**

Tightening Torque: 9 – 11 N-m

Fastener : M6 X 25L 1 pc.



**Apply grease onto front and rear surfaces of Sprocket 14T, and install it in position.**

**Apply grease to Counter Shaft sprocket, and install Fixing Plate over the sprocket.**

Tightening Torque: 9 – 11 N-m

Fastener : M6 X 12L 2 pcs.



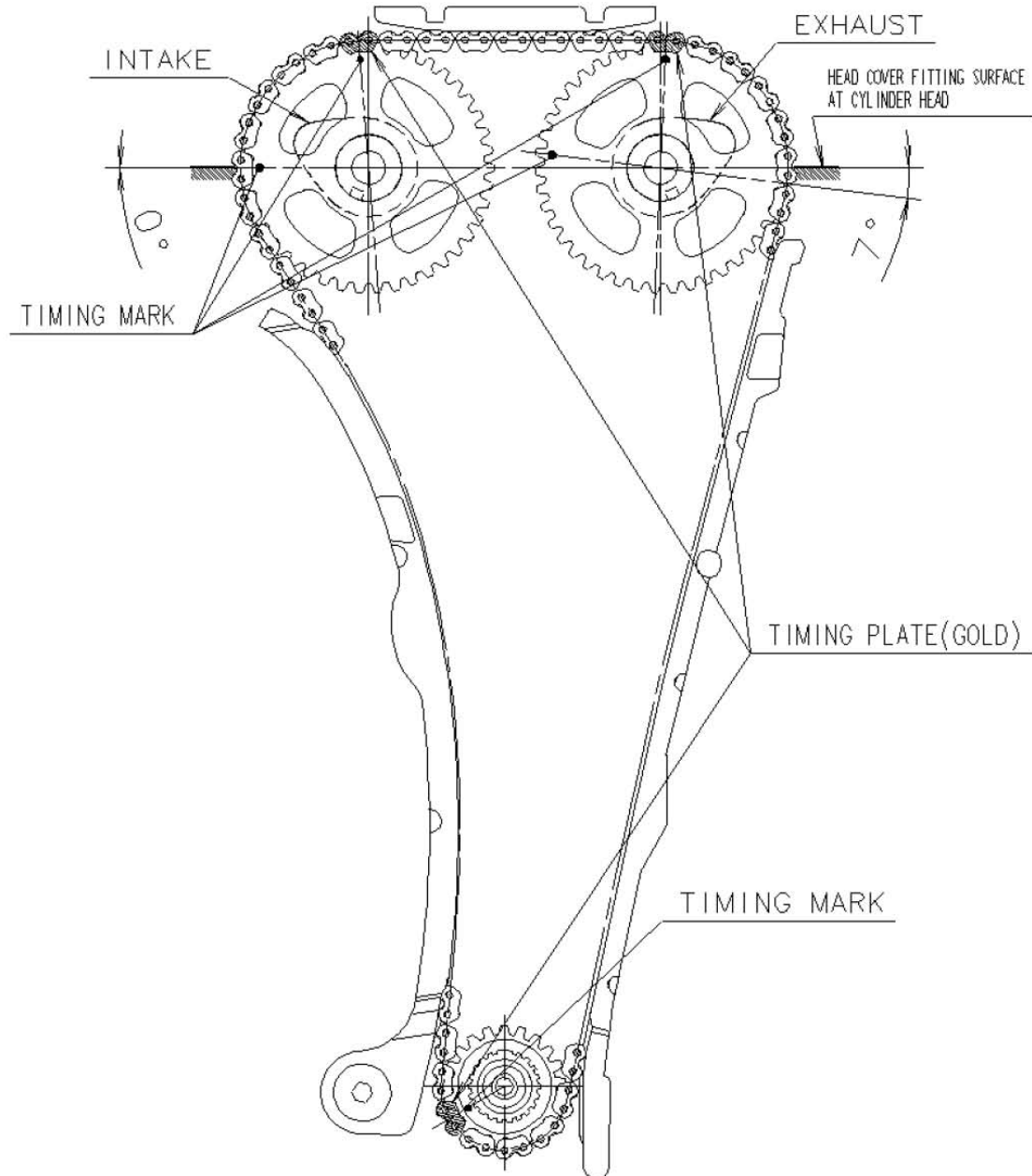


**Attachment (1) Special Tool**



ATTACHMENT (2)

EW45 ; Timing Chain arrangements



## ATTACHMENT (3) Matrix Table

<Intake-Adjusting Pad Selection Matrix>

		Existing Adjusting Pad Marking (numeral mark w/3 digits on Adjusting Pad)																												
		145	150	155	160	162	165	167	170	172	175	180	182	185	187	190	192	195	197	200	202	205	207	210	212	215	220	225	230	
		Suitable Adjusting Pad Marking (numeral mark w/3 digits on Adjusting Pad)																												
Valve Clearance Before Adjusting (mm)	0.00-0.04			145	150	150	155	155	160	160	152	165	167	170	172	175	177	180	182	185	187	190	192	195	197	200	202	207	212	220
	0.05-0.09		145	150	155	155	160	160	162	165	167	170	172	175	177	180	182	85	187	190	192	195	197	200	202	205	207	212	220	225
	0.10-0.20(=standard)	Existing Adjusting Pad = Suitable Adjusting Pad																												
		155	160	162	167	170	172	175	177	180	182	187	190	192	196	197	200	202	205	207	210	212	215	220	220	225	230			
	0.26-0.30	160	162	167	172	175	177	180	182	185	187	190	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230			
	0.31-0.35	162	167	172	177	180	182	185	187	190	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230	230				
	0.36-0.40	167	172	177	182	185	187	190	192	195	197	200	202	206	207	210	212	215	220	220	225	225	230	230						
	0.41-0.45	172	177	182	187	190	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230	230								
	0.46-0.50	177	182	187	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230	230										
	0.51-0.55	182	187	192	197	200	202	205	207	210	212	215	220	220	225	225	230	230												
	0.56-0.60	187	192	197	202	205	207	210	212	215	220	220	225	225	230	230														
	0.61-0.65	192	197	202	207	210	212	215	220	220	225	225	230	230																
	0.66-0.70	197	202	207	212	215	220	220	225	225	230	230																		
	0.71-0.75	202	207	212	220	220	225	225	230	230																				
	0.76-0.80	207	212	220	225	225	230	230																						
	0.81-0.85	212	220	225	230	230																								
	0.86-0.90	220	225	230																										
	0.91-0.95	225	230																											
0.96-1.00	230																													

<Exhaust-Adjusting Pad Selection Matrix>

		Existing Adjusting Pad Marking (numeral mark w/3 digits on Adjusting Pad)																												
		145	150	155	160	162	165	167	170	172	175	180	182	185	187	190	192	195	197	200	202	205	207	210	212	215	220	225	230	
		Existing Adjusting Pad = Suitable Adjusting Pad																												
Valve Clearance Before Adjusting (mm)	0.02-0.06						145	145	150	150	155	155	160	160	162	165	167	170	172	175	177	180	182	185	187	190	192	197	202	207
	0.07-0.11				145	145	150	150	155	155	160	160	162	165	167	170	172	175	177	180	182	185	187	190	192	195	197	202	207	212
	0.12-0.16			145	150	150	155	155	160	160	162	165	167	170	172	175	177	180	182	185	187	190	192	195	197	200	202	207	212	220
	0.17-0.21		145	150	155	155	160	160	162	165	167	170	172	175	177	180	182	185	187	190	192	195	197	200	202	205	207	212	220	225
	0.22-0.32	Std.																												
		155	160	162	167	170	172	175	177	180	182	187	190	192	195	197	200	202	205	207	210	212	215	220	220	225	230			
	0.38-0.42	160	162	167	172	175	177	180	182	185	187	190	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230			
	0.43-0.47	162	167	172	177	180	182	185	187	190	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230	230				
	0.48-0.52	167	172	177	182	185	187	190	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230	230						
	0.53-0.57	172	177	182	187	190	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230	230								
	0.58-0.62	177	182	187	192	195	197	200	202	205	207	210	212	215	220	220	225	225	230	230										
	0.63-0.67	182	187	192	197	200	202	205	207	210	212	215	220	220	225	225	230	230												
	0.68-0.72	187	192	197	202	205	207	210	212	215	220	220	225	225	230	230														
	0.73-0.77	192	197	202	207	210	212	215	220	220	225	225	230	230																
	0.78-0.82	197	202	207	212	215	220	220	225	225	230	230																		
	0.83-0.87	202	207	212	220	220	225	225	230	230																				
	0.88-0.92	207	212	220	225	225	230	230																						
	0.93-0.97	212	220	225	230	230																								
0.98-1.02	220	225	230																											
1.03-1.07	225	230																												
1.08-1.12	230																													

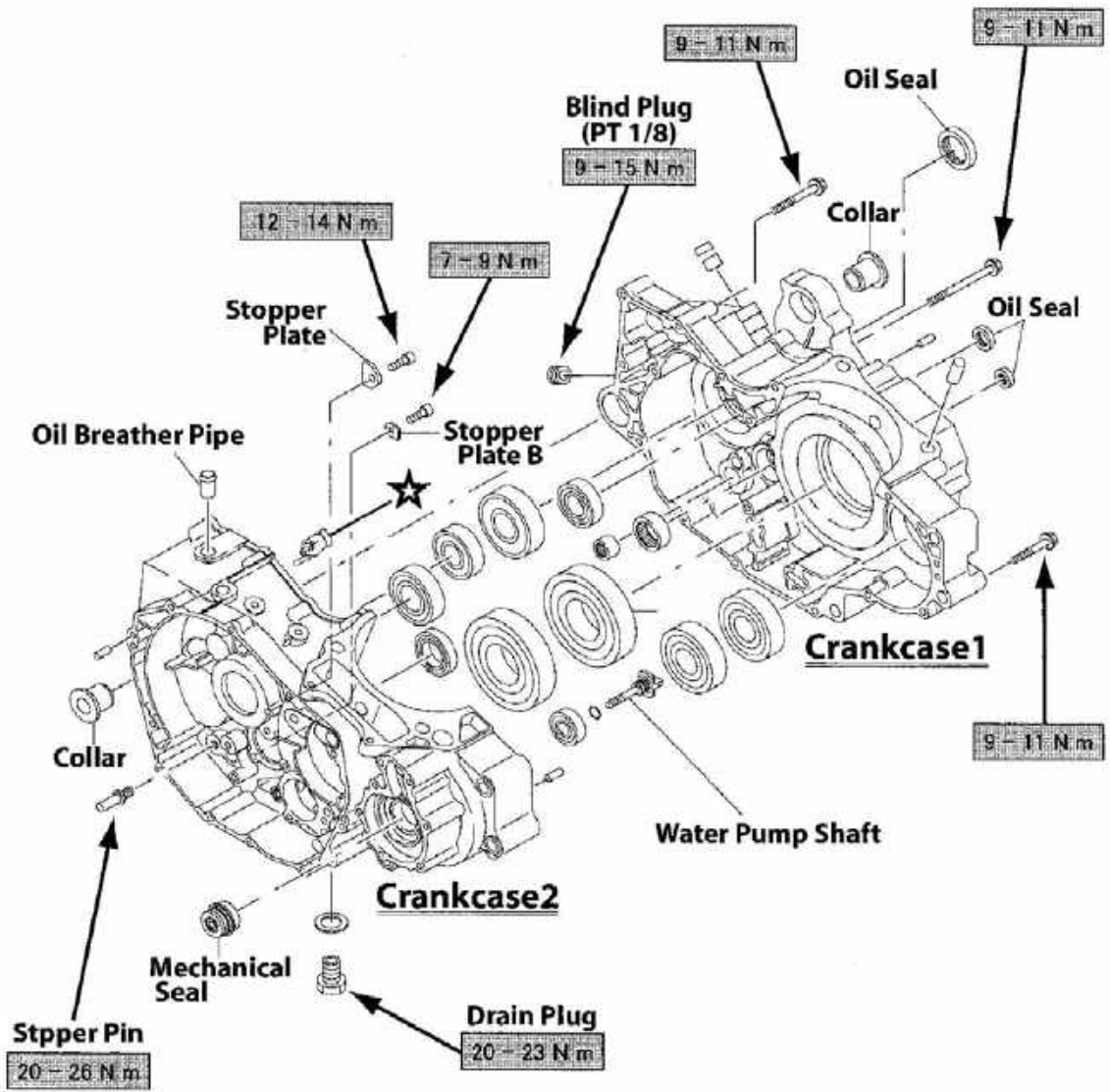
## ATTACHMENT (4)

### Fasteners and Tightening Torque table

Parts	Fasteners	Numbers	Tightening Torque (N-m)	Remarks
Adapter CP	Hex bolt M8	2	16-20	
Camshaft Support	Bolt M6	8	9-11	
Chain Guide	Special bolt M8	1	13.5-16.5	
Chain Tensioner	Bolt M6	2	9-11	
Chain Tensioner (itself)	Bolt M6	1	4.5-6	
Clutch	Nut M18	1	90-110	
Clutch Cover	Bolt M6	12	9-11	
Crankcase	Bolt M6	16	9-11	
	Hex bolt PT 1/8	1	9-15	At counter shaft
Crankshaft	Nut M18	1	110-130	Chain side
	Nut M14	1	150-170	Magneto side
Cylinder Head	Bolt M6	2	9-11	
Filter Cover	Bolt M6	2	9-11	
	Hex bolt PT 1/4	1	17-23	
Guide Plate	Bolt M6	2	9-11	
MAG Coil	Hex head bolt M6	3	5.5-6.5	Sealant pre-applied onto threads
MAG Cover	Hex bolt M32	1	12-10	Plastics
	Hex bolt M14	1	3-5	Plastics
Main Shaft	Hex bolt M6	1	12-14	Bearing retaining
Neutral Switch	Screw M5	2	3-5	
Oil Delivery Pipe	Banjo bolt M12	3	15-21	Oil fittings
Oil Drain Plug	Bolt M16	1	20-23	
Oil Drain Case	Bolt M6	3	9-11	
One-way Clutch	Hex head Bolt M6	8	13-15	Sealant pre-applied onto threads
Plate (release shaft)	Bolt M6	1	7-13	
Plug (one-way)	M11	1	15-21	
Pulsar Coil	Screw M5	2	2.5-3.5	
Reverse Lock	Bolt M6	1	9-11	Apply TB1344 onto threads
Shift Drum	Special bolt M8	1	20-26	Sealant pre-applied onto threads
Shift Drum Bearing	Hex bolt M6	2	7-9	Apply TB1316 onto threads
Shift Shaft	Special bolt M8	1	20-26	Apply TB1316 onto threads
Spark Plug	M12	1	15-20	New plug
Starter Motor	Bolt M6	2	9-11	
Stopper Arm CP	Special bolt M6	1	9-11	Apply TB1316 onto threads
Thermo Cover	Bolt M6	2	7-9	
Thermo Switch	NPT 3/8	1	32-38	
Water Pump Case	Bolt M6	7	9-11	
Water Pump Impeller	Bolt M6	1	9-11	

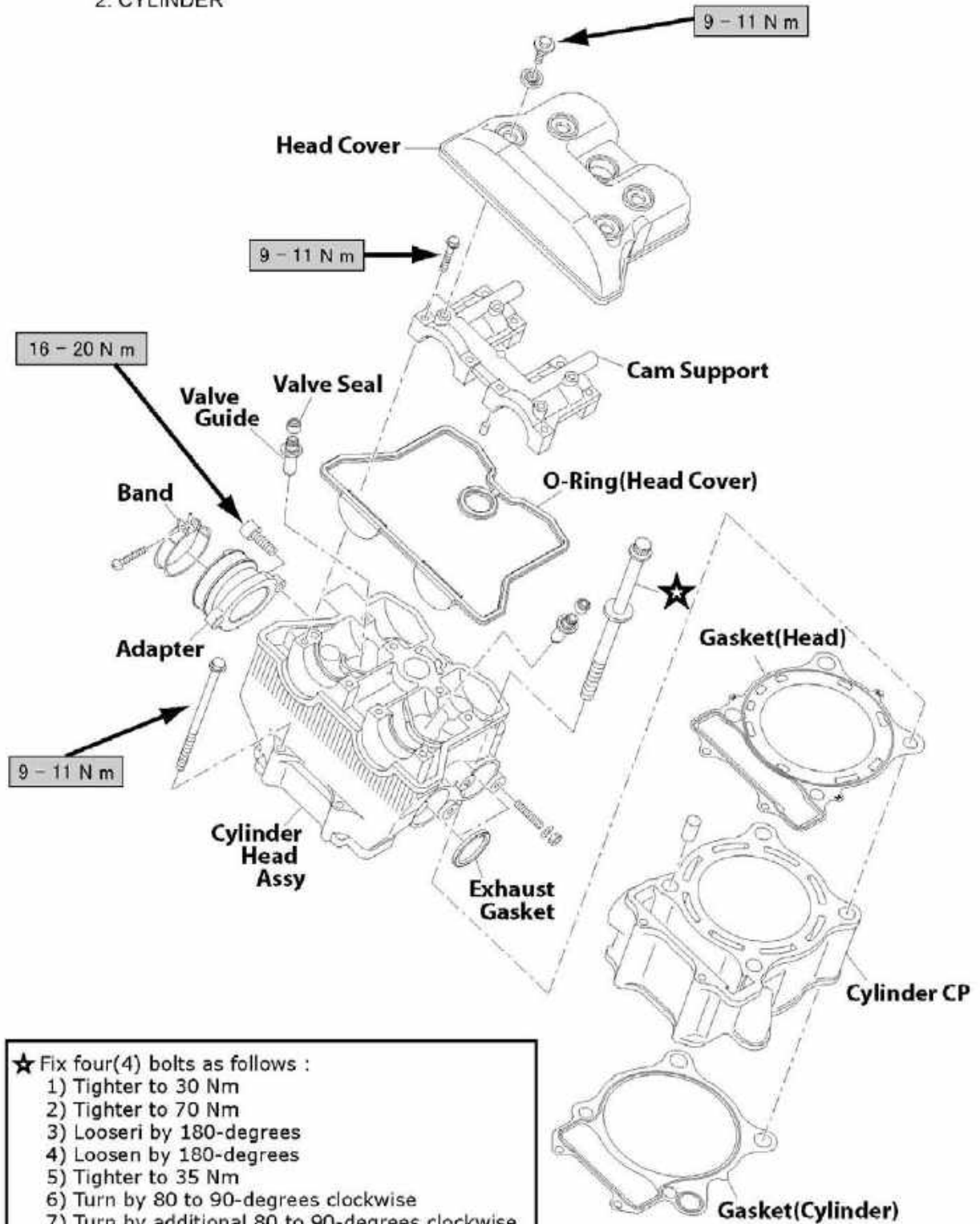
1. CRANKCASE

**ATTACHMENT (5)**  
Tightening Torque chart



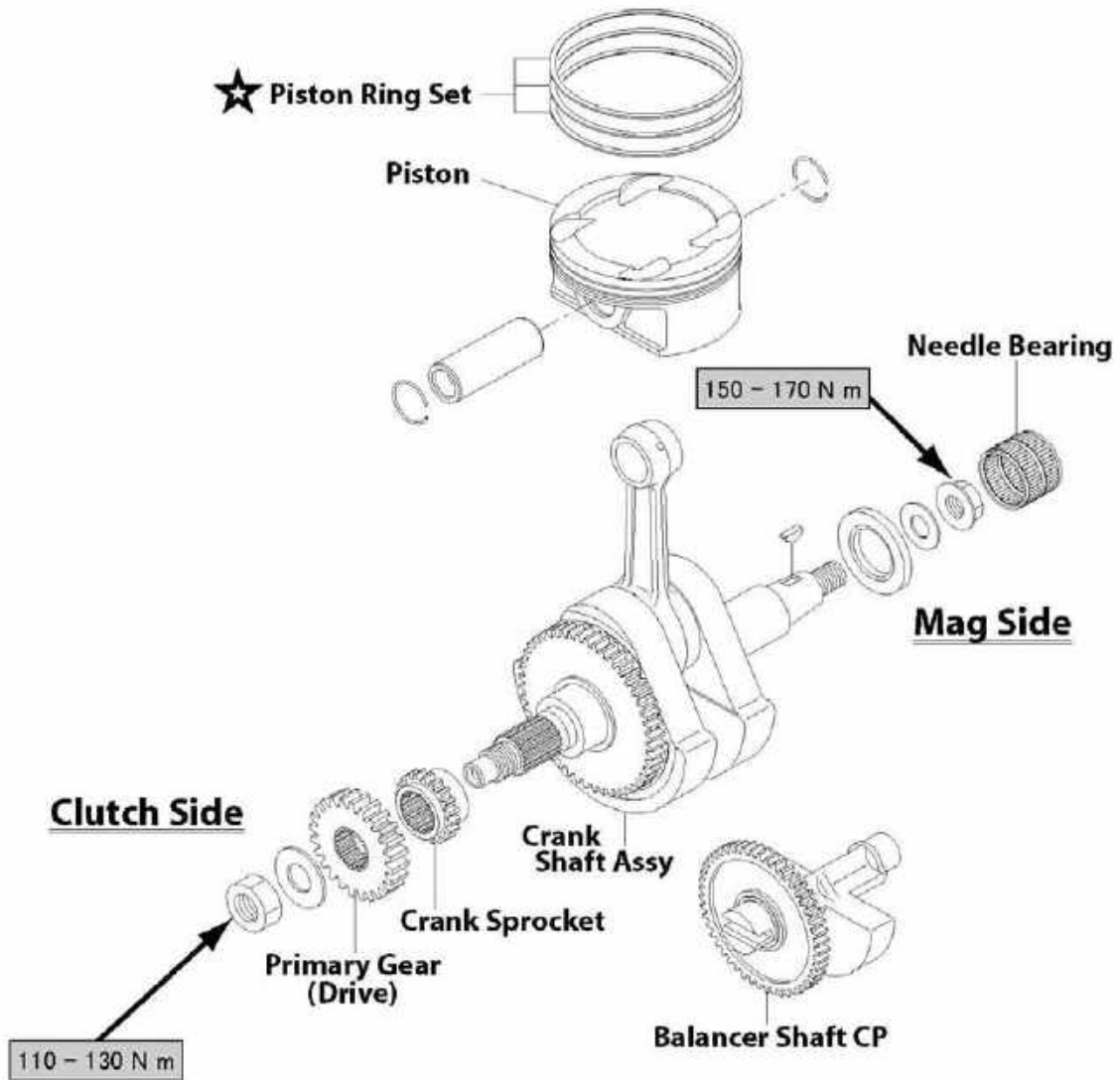
☆ Apply, TB #1215 auto mating surface.

2. CYLINDER

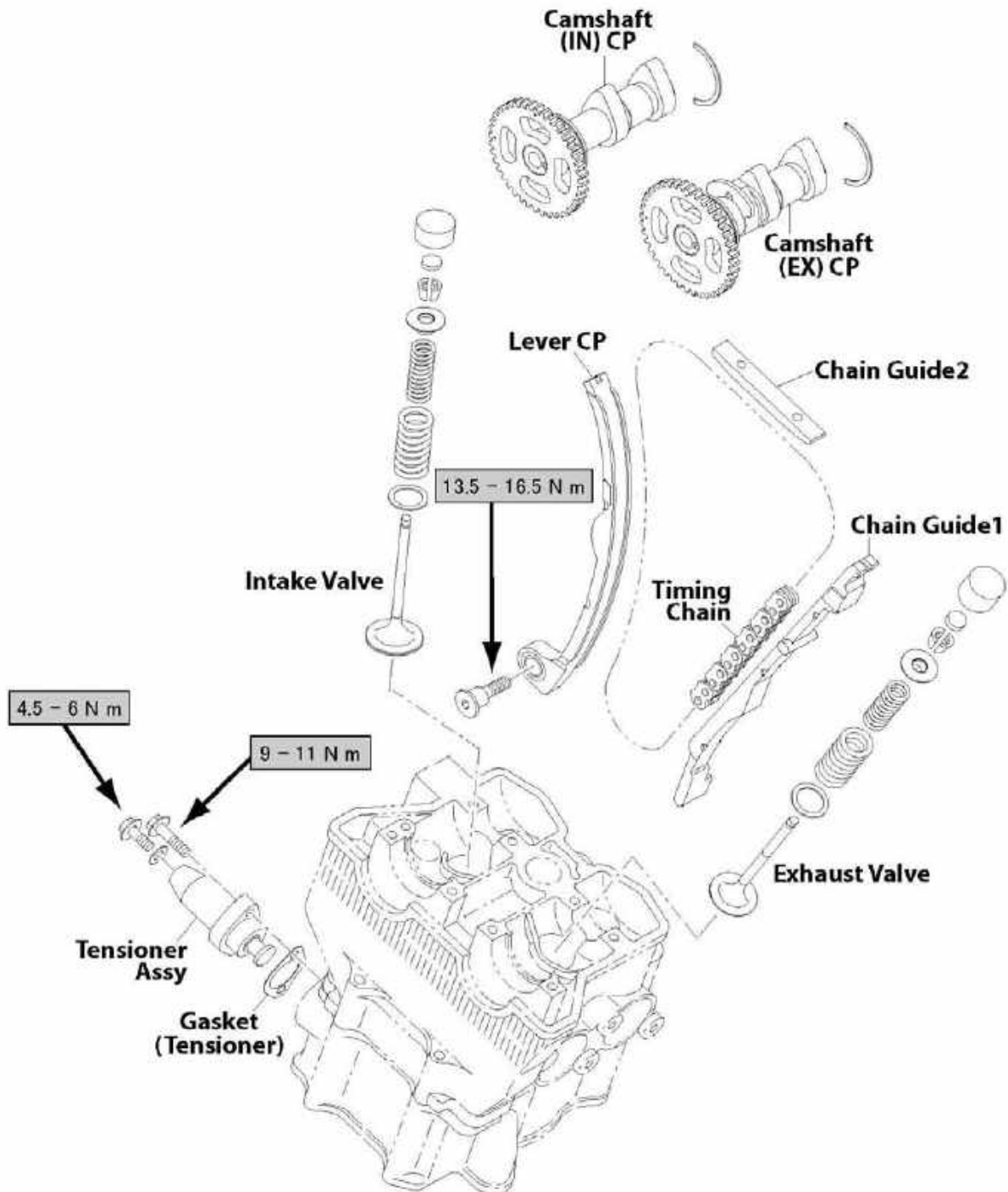


3. CRANKSHAFT & PISTON

★ Offset the Piston Ring gaps by approximately 120° to one each other.

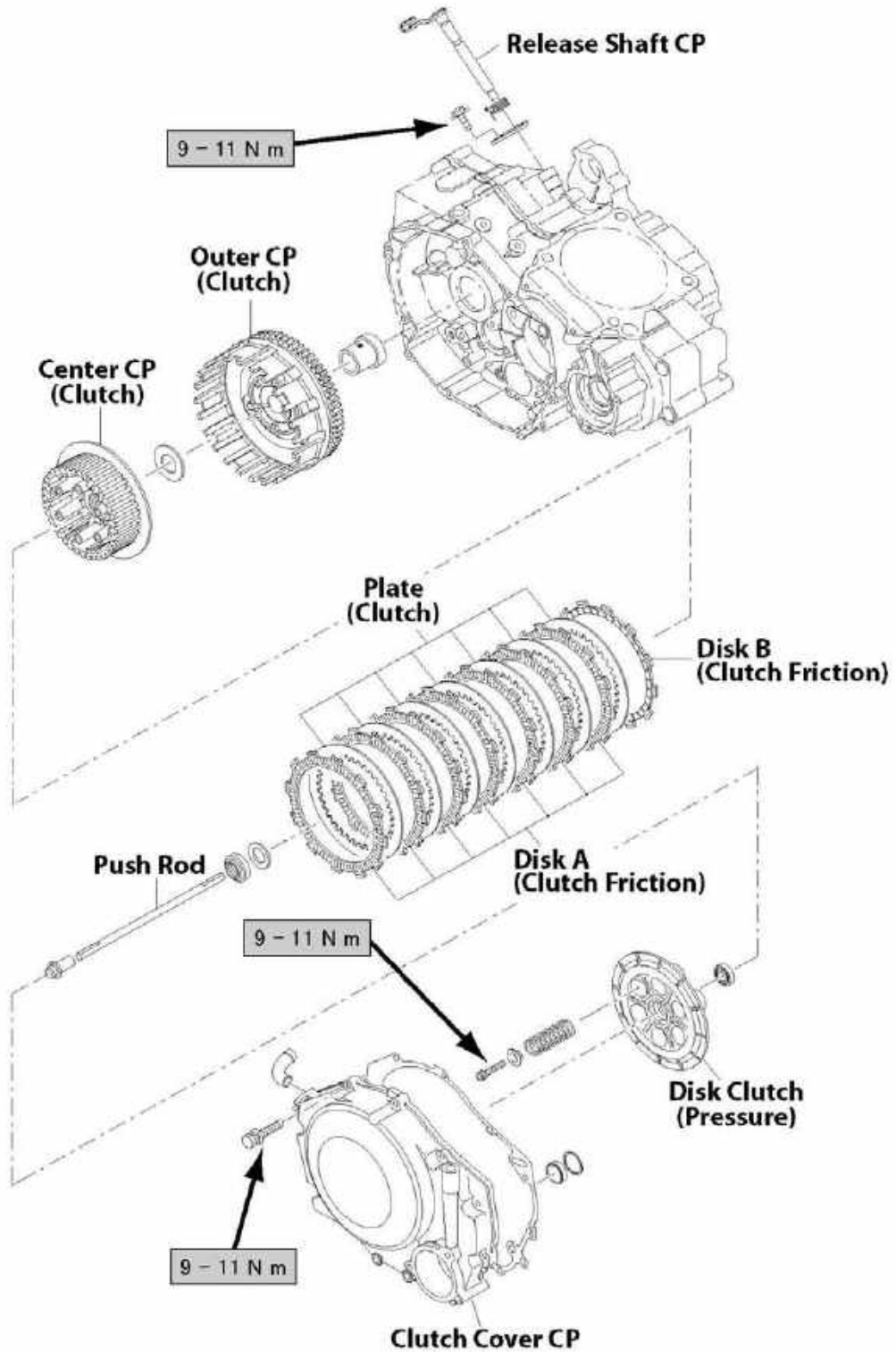


4. INTAKE & EXHAUST

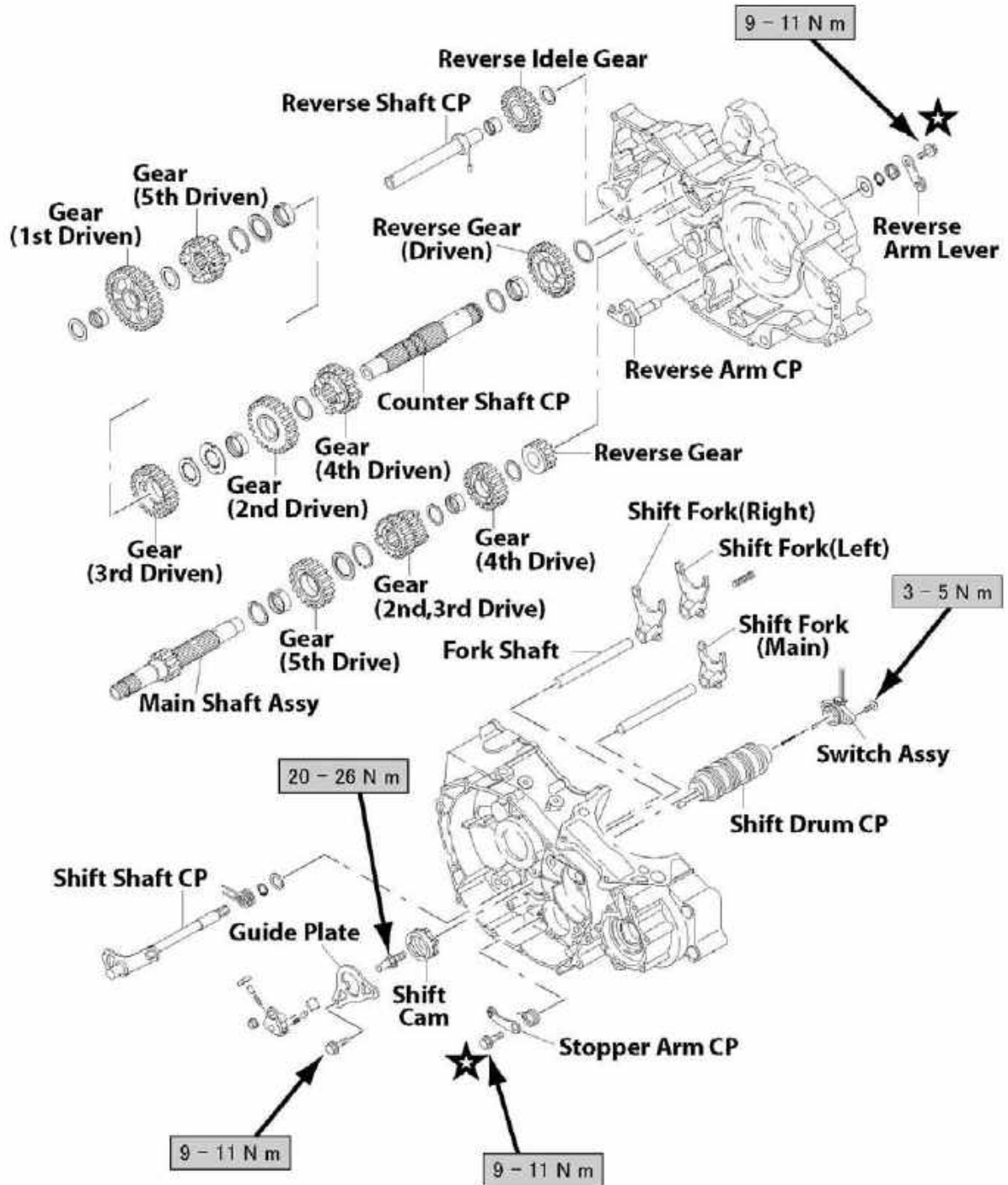




5. CLUTCH (No.1)

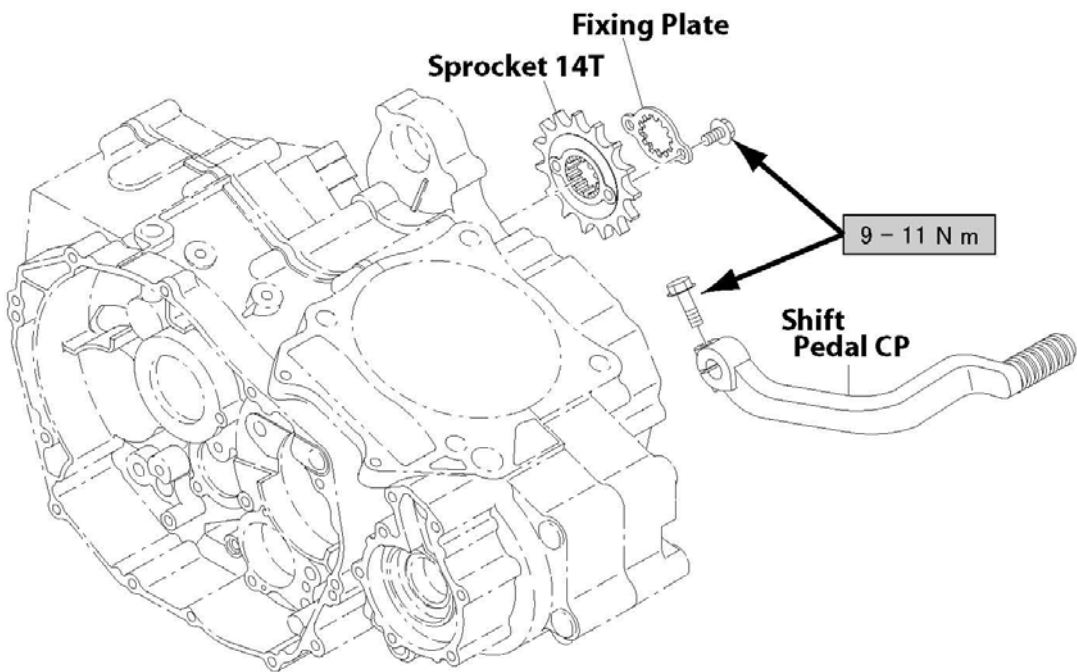


6. CLUTCH (No.2)

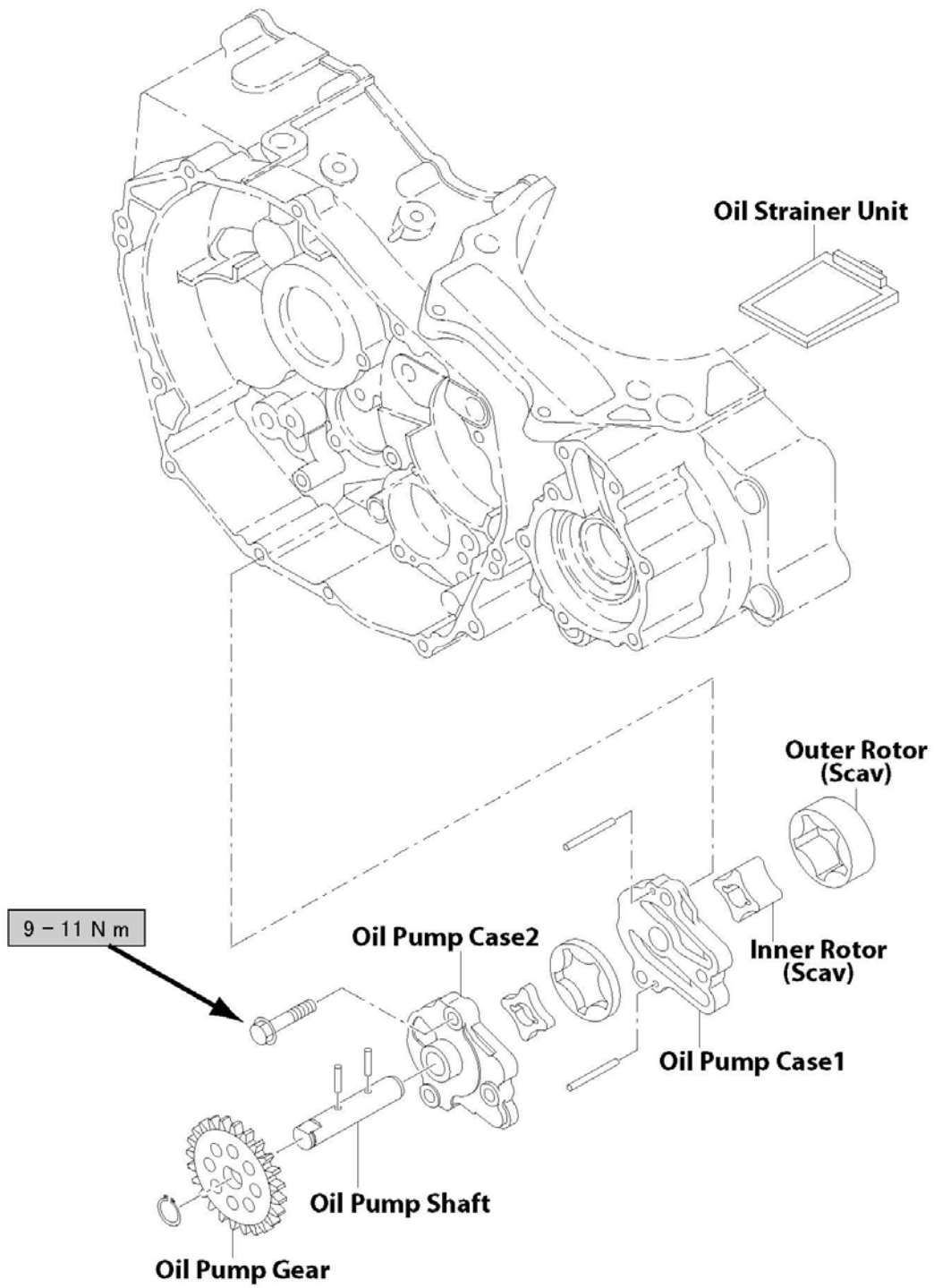


★ Apply, TB #1316 auto mating surface.

7. COVER (CHAIN)



8. OIL PUMP



9. WATER PUMP

★ Apply, TB #1344 auto mating surface.

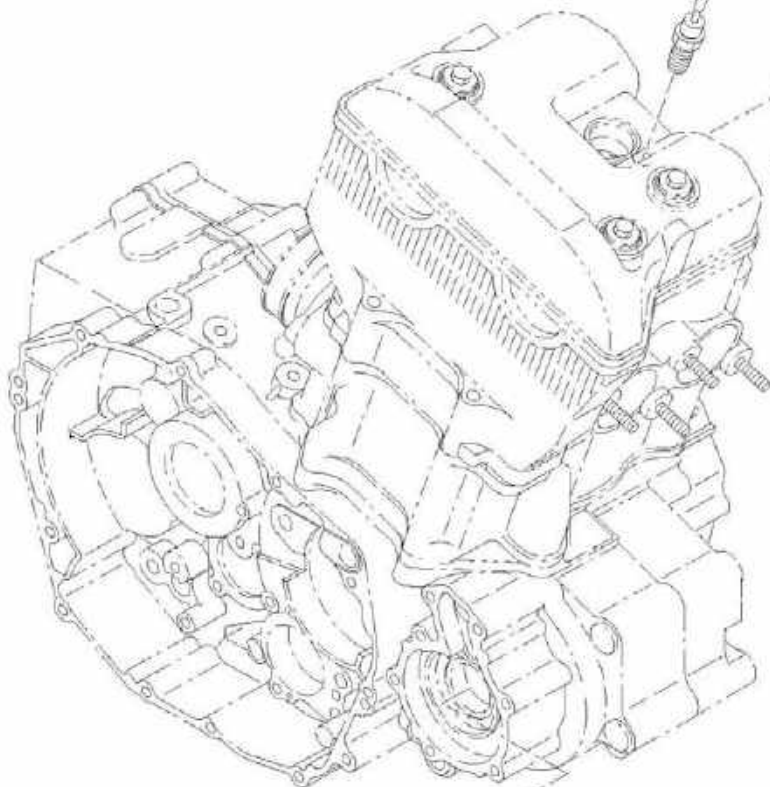
★ Install the Thermostat CP so as that its small hole lacates on top.

7 - 9 N m

Thermo Switch CP

Thermo Stat CP

Thermo Cover



Impeller

Gasket(Water Pump)

Water Pump Case

9 - 11 N m

★ The copper gasket is used in this position only.

## ATTACHMENT (6) Service Data

### Cylinder Head and Valve

Items			Standards	Service Limit
Compression Pressure (Engine cranking speed at 400 rpm)			588-618 KPa (6.0-6.3 Kgf/cm <sup>2</sup> )	
Valve Clearance (Cold engine)	IN		0.150 ± 0.05 mm	---
	EX		0.270 ± 0.05 mm	---
Warpage on cylinder head upper surface			---	0.05mm
Camshaft	Cam height	IN	42.35 – 42.45 mm	42.05 mm
		EX	42.35 – 42.45 mm	42.05 mm
	Inner diameter of Camshaft bearing	MAG	25.000 – 25.021 mm	---
		PTO	21.99 – 22.00 mm	---
	Outer diameter of Camshaft bearing	MAG	24.946 – 24.963 mm	---
		PTO	21.976 – 21.985 mm	---
	Oil clearance of camshaft bearing	MAG	0.037 – 0.075 mm	0.10 mm
		PTO	0.005 – 0.024 mm	0.10 mm
Valve and Valve Guide	Outer diameter of Valve Stem	IN	5.950 – 5.965 mm	---
		EX	5.945 – 5.960 mm	---
	Marginal width of Valve face portion	IN	1.0 mm	0.8 mm
		EX	1.0 mm	0.8 mm
	Inner diameter of Valve Guide	IN	6.000 – 6.012 mm	---
		EX	6.000 – 6.012 mm	---
	Clearance between Stem and Guide	IN	0.035 – 0.062 mm	0.15 mm
		EX	0.040 – 0.067 mm	0.15 mm
Free length of Valve Spring	Inner	IN/Ex	40 mm	38.0 mm
	Outer	IN/Ex	41.9 mm	39.9 mm

### Cylinder and Piston

Items		Standards	Service Limit	
Cylinder	Inner diameter	94.000 – 94.020 mm	---	
	Cylindricity	---	0.05 mm	
	Roundness	---	0.05 mm	
	Warpage (Upper surface)	---	0.05 mm	
Piston	Outer diameter*	93.955 – 93.970 mm	---	
Piston Ring	Clearance between cylinder and piston	0.030 – 0.065 mm	0.10 mm	
Piston Pin	Inner diameter of Piston Pin hole	23.001 – 23.007 mm	---	
	Outer diameter of Piston Pin	22.996 – 23.000 mm	---	
	Clearance between Piston and Piston Pin	0.001 – 0.011 mm	---	
	Clearance between Piston Pin and Connecting Rod small end hole	0.007 – 0.024 mm	0.050 mm	
	Gap (Opening end) of Piston Ring	Top ring	0.20 – 0.35 mm	0.7 mm
		Second ring	0.35 – 0.50 mm	0.8 mm
		Oil ring	0.10 – 0.50 mm	1.0 mm
	Clearance Between Ring and Ring Groove	Top ring	0.030 – 0.070 mm	0.15 mm
		Second ring	0.030 – 0.070 mm	0.15 mm
Oil ring		0.040 – 0.120 mm	---	
Connecting Rod	Inner diameter of small end	23.00 – 23.020 mm	---	
	Side clearance at large end	0.09 – 0.5 mm	0.65 mm	
Crankshaft	Runout	---	0.06 mm	

\*: At 11 mm point from piston skirt bottom end.

## ATTACHMENT (7) Adhesive, Sealant and Oil application

### Adhesive or Sealant Application

Adhesive or Sealant	Application	
TB#1215	Crankcase 2	Mating surface to Crankcase 1
	Clutch Cover	Spotting application for keeping gasket in position
	MAG Cover	
TB#1306	Flywheel	Oil removing from taper portion
TB#1316	Shift Drum	M8 Bolt Threads
	Stopper Arm CP	M6 Bolt Threads
	Shift Drum Bearing retainer	M6 Bolt (2 pcs) Threads
	Shift Shaft	M6 Bolt Threads
TB#1342N	Pulsar Coil	M5 Screw
TB#1344	Thermo Switch	Treads
TB#1377N	Clutch Cover	At press-fitting of Pipe CP
	Crankcase	AT press-fitting of Pipe CP

TB: Three Bond

### Oil or Grease Application

Oil or Grease	Application	
Engine Oil 10W-30	Oil Pump	Rotor
	Transmission	Gears and Crank Shaft
	IN and EX Valve	Stem and ends
	Water Pump Shaft	O-ring
	Position Switch	O-ring
	Starter Motor	O-ring
	Cylinder	Bore
	Head Bolt (M11, 4pcs)	Threads and washer
	Cylinder Head	Cam Shaft bearing (2 portions)
		IN and EX Cam Shaft (4 portions)
	Shift Shaft	Shaft
	Clutch	Caller hole (rotate after application)
		Push Rod
Grease	Clutch Cover	Oil seal lip portion
	Crankcase	Oil seal
	Starter Gear	Needle Bearing
	Starter	Reduction Gear 1 & 2
		Shaft 1 & 2 (outer surface and ends)
	Counter Shaft	Spline (PTO)
	Sprocket 14T	Both side surfaces



## ATTACHMENT (8) Periodic Maintenance Schedule

Note;

The maintenance schedule indicated in the following table is based on the normal operation condition. If operated in the extremely dusty condition or in heavier loading condition, the maintenance intervals must be Shortened depending on the conditions of oil, clogging of oil filter and air cleaner elements, ware of parts and so on.

	Every day	Every week	Every month	Every 6 months	Every year	Every two years
Check ENGINE OIL level	X					
Check COOLANT level	X					
Clean AIR CLEANER		X				
Replace ENGINE OIL			X			
Replace ENGINE OIL FILTER			X			
Clean SPARK PLUG and adjust ELECTRODE gap				X		
Check and replace CARBURETOR FLOAT BOWL				X		
Check and replace FUEL SYSTEM				X		
Check and replace ENGINE BREATHER HOSES				X		
Check and adjust IDLE SPEED					X	
Check and adjust VALVE CLEARANCE					X	
Check and adjust IGNITION TIMING					X	
Replace COOLANT						X
Replace FUEL LINES						X

\* Initial one month or 1,000 km operation whichever comes first, after that every 100 hours or 2,000 km operation whichever comes first.

## ATTACHMENT (9) SPECIFICATIONS

### DIMENSIONS

LENGTH	382 mm
WIDTH	458 mm
HEIGHT	489 mm
DRY WEIGHT	48 kg

### ENGINE SPECIFICATIONS

TYPE	4 CYCLE DOHC GASOLINE ENGINE
CLINDER ARRANGEMENT	SINGLE CYLINDER INCLINED 20° FROM VERTICAL
BORE X STROKE	φ 94.0 X 64.6 mm
DISPLACEMENT	0.448 L
COMPRESSION RATIO	10.8, UNLEADED GAS ONLY
MAXIMUM HORSE POWER (SAE)	33.6 kW / 8250 rpm (45 HP / 8250 rpm)
MAXIMUM TORQUE (SAE)	41.2 N-m / 7500 rpm (4.2 Kg-m / 7500 rpm)
MAXIMUM ENGINE SPEED	9100 rpm (IGNITION CUT AT MORE THAN 9100 rpm)
IDLE ENGINE SPEED	1600 rpm
COOLING SYSTEM	LIQUID COOLING
LUBRICATION SYSTEM	FORCED LUBRICATION (DRY SUMP)
LUBRICANT	AUTOMOBILE ENGINE OIL 10W-30 PR 10W-40, GRADE SF OR HIGHER
CARBURETOR	MIKUNI BSR42
FUEL PUMP	PULSE PUMP
METHOD OF IGNITION	FLY WHEEL MAGNETO TYPE (DC-CDI)
SPARK PLUG	DCPR8E (NGK)
ALTERNATOR OUTPUT	DC14V-13.7A AT 3000 rpm
STARTING SYSTEM	STARTING MOTOR
THERMOSTAT OPENING TEMPERATURE	71°C

### DRIVE TRAIN SPECIFICATIONS

PRIMARY REDUCTION SYSTEM: TYPE REDUCTION RATIO	GEAR 2880 (72/25)
CLUTCH TYPE	MANUAL RELEASE, MULTI PLATE (8 PLATES), WET
TRANSMISSION TYPE  GEAR RATIO: 1 <sup>ST</sup> 2 <sup>ND</sup> 3 <sup>RD</sup> 4 <sup>TH</sup> 5 <sup>TH</sup> REV	5SPEED, DOG CLUTCH, CONSTANT MESH  GEAR RATIO, CRANKSHAFT VS OUTPUTSHAFT 2.429 (34/14) 6.994 1.611 (29/18) 4.640 1.286 (27/21) 3.703 1.087 (25/23) 3.130 0.920 (23/25) 2.650 2.071 (29/14) 5.966
FINAL DRIVE SYSTEM TYPE  REDUCTION RATIO	ROLLER CHAIN & SPROCKET (OUTPUTSHAFT HAS SPLINE FOR DRIVE SPROCKET)  2.714 (38/14)

NOTE:

1. UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE MONINAL.
2. UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS IN MILLIMETERS.
3. PERMISSIBLE OPERATING TEMPERATURE: -10°C~45°C
4. THIS ENGINE IS ADAPTED TO ASBESTOS FREE.

# Electrical System

## Table of Contents

Specifications-----	7-2
Parts Location-----	7-3
Precautions-----	7-5
Electrical Wiring-----	7-6
Wiring Inspection-----	7-6
Battery-----	7-7
Battery Charging-----	7-7
Charging Procedures-----	7-8
Battery Test Charging-----	7-8
Regulator/Rectifier Output Voltage Inspection-----	7-9
Alternator Inspection-----	7-10
Ignition System-----	7-11
Spark Plug Removal/Installation-----	7-11
Spark Plug Cleaning/Inspection-----	7-11
Spark Plug Gap-----	7-11
Ignition Coil Removal-----	7-11
Ignition Coil Installation-----	7-12
Ignition Coil Inspection-----	7-12
Ignition Timing Test-----	7-13
CDI Unit Inspection-----	7-13
Lighting System-----	7-14
Headlight Bulb Replacement-----	7-14
Taillight Bulb Replacement-----	7-14
Indicator Bulb Replacement-----	7-14
Rear-View Mirror Replacement-----	7-15
Neutral Light Bulb Replacement-----	7-15
Fuses-----	7-15
Main Fuse Removal-----	7-15
Fuse Inspection-----	7-15
Wiring Diagram-----	7-16

## Specifications

Item		Standard	
Battery Capacity		12 V 14Ah,	
Alternator type		Three-phase AC	
Charging voltage (Regulator/rectifier output)		14~15 V	
Alternator output voltage		DC14V-13.7A @ 3000 rpm	
Stator	Charge Coil	Y1-Y2	0.52 $\Omega$
		Y2-Y/R	0.49 $\Omega$
		Y/R-Y1	0.49 $\Omega$
		Y-Ground	$\infty$
	Pulser Coil	W/R-W	190 $\Omega$
		W-Grnd	
Ignition Coil		Primary	0.3 $\Omega$
		Secondary	6.3 k $\Omega$
Spark plug		Gap	0.9 mm
		Cap resistance	5 k $\Omega$
Starter motor		Nominal Output	0.7 kW
		Reduction Ratio	28.235

**Parts Location**

High/Low Beam Switch [A]

Hazard Lights Switch [B]

Horn Switch [F]

Indicator Switch [D]

Ignition Switch [E]



Starter Button [C]



Battery [A]

Starter Circuit Relay [B]

CDI Unit [C]

Ignition Coil [D]

Spark Plug [E]

Indicator Relay [F]



Regulator/Rectifier [G]



Magneto CP [A]  
Starter Motor [B]



Horn [B]



Temperature Sensor[C]



## Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery lead connections. This will burn out the diodes in the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Do not use a illumination bulb rated for other than the voltage or wattage specified in the wiring diagram, as the handle cover could be warped by excessive heat radiated from the bulb.

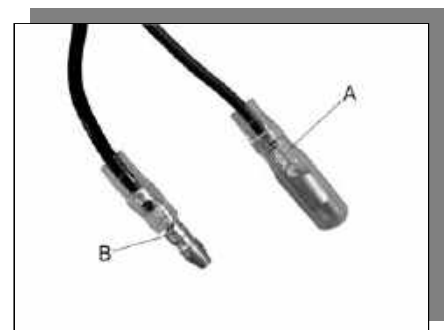
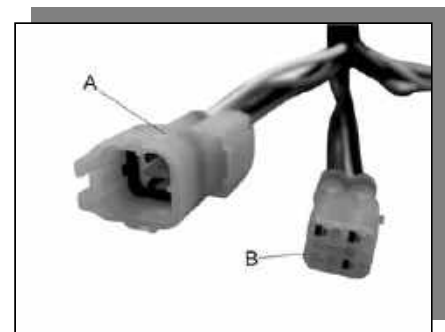
**Caution**  
**Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.**

- Troubles may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the parts is cold (at room temperature).

○ Color codes:

B	Black	G	Green	P	Pink
BU	Blue	GY	Gray	PU	Purple
BR	Brown	LB	Light blue	R	Red
CH	Chocolate	LG	Light green	W	White
DG	Dark green	O	Orange	Y	Yellow

- Electrical Connectors:  
 Female Connectors [A]  
 Male Connectors [B]

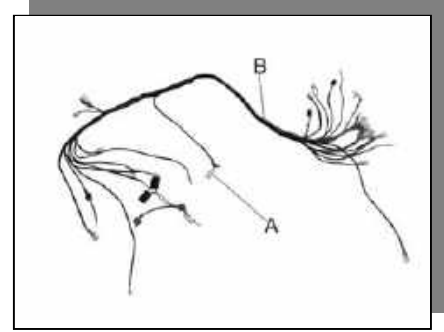




## Electrical Wiring

### Wiring Inspection

- Visually inspect the wiring for signs of burning, fraying, etc.
- ★ If any wiring is poor, replace the damaged wiring.
- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.
- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
- Connect the hand tester between the ends of the leads.
- Set the tester to the x 1  $\Omega$  range, and read the tester.
- ★ If the tester does not read 0  $\Omega$  the lead is defective.  
Replace the lead or the wiring harness [B] if necessary.



### Battery Removal

- Disconnect the battery negative (-) cable [Black] first and then the positive (+) cable [red].
- Take out the battery.

### Battery Installation

- Connect the positive cable first and then the negative cable.



## Battery

### Battery Charging

**△WARNING**

**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger. This procedure prevents sparks at the battery terminals, which could ignite any battery gases.**

The battery is a maintenance-free design and construction. Use of conventional lead-acid batteries is not recommended. No electrolyte or refilling water is required. Because this battery is a completely sealed type, abuse of the battery can cause an explosion.

Please adhere to the following points:

1. Follow the instructions shown on battery package for preparation and filling with battery electrolyte.
2. Never interfere with the sealed state of the battery.
3. Check the charging conditions with a voltmeter (Normal charging voltage should be 12.8V)
4. This battery may be installed on if replaces a similar sealed type battery.
5. Keep away from high temperature of fire.
6. In the case of an accident sulfuric acid may escape. Avoid contact with skin, eyes or clothing.

#### Charging Method

Normal Charge: 1.4A    5~10 hrs  
Fast Charge    : 14A     0.5 hrs

#### New Battery:

Use of conventional lead-acid batteries is not recommended.

Batteries must be

**CAUTION**

**NEVER attempt to add electrolyte or water to the maintenance-free design and construction. Doing so will damage the case and shorten the life of the battery.**

### Charging Procedure

- Remove the battery (see Battery Removal).
- Connect a charger to the battery BEFORE plugging it in or turning it on.
- Set the charging rate and time according to the battery condition previously determined

#### CAUTION

**Always remove the battery from the vehicle for charging. Do not use a high rate battery charger, as is typically employed at automotive service stations, unless the charger rate can be reduced to the level required. Charging the battery at a rate higher than specified may ruin the battery. Charging at a high rate causes excess heat, which can warp the plates and cause internal shorting. Higher-than-normal charging rates also cause the plates to shed active material. Deposits will accumulate, and can cause internal shorting**

- Turn the charger off or unplug it, then disconnect it from the battery.
- Check battery condition.
- ★ If the battery condition indicates that is not fully charged, additional charging time is necessary.

### Battery Test Charging

- If the battery is suspected of being defective, sulfated, or unable to take a charge, consult the table.
- To test charge a battery, perform the ordinary charging procedure and monitor the battery voltage and other signs as mentioned below.
- ★ If the battery voltage suddenly jumps to over 13 V just after the start of charging, the plates are probably sulfated. A good battery will rise to 12 V immediately and then gradually go up to 12.5 or 13 V in about 30 min. to an hour after the start of charging.
- If there does not appear to be enough sediment in a cell to short the plates, but that cell has a very low specific gravity after the battery is fully charged, the trouble may be that there is not enough acid in that one cell. In this case only, sulfuric acid solution may be added to correct the specific gravity.
- ★ If a fully charged battery not in loses its charge after 2 to 7 days; or if the specific gravity drops markedly, the battery is defective. The self-discharge rate of a good battery is only about 1% per day.

### Regulator / Rectifier Output Voltage Inspection

- Check the battery condition (see Battery section)
- Warm up the engine to obtain actual alternator operating conditions.
- Check that the ignition switch is turned off, and connect the hand tester to the battery terminal.
- Start the engine, and note the voltage readings at various engines speeds with the headlight turned on and then turned off. The readings should show nearly battery voltage when the engine speed is low, and as the engine speed rises, the readings should also rise. But they must be kept under the specified voltage.

### Regulator/ Rectifier Output Voltage

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
25 V DC	Battery (+)	Battery (-)	14 ~ 15 V

- Turn off the ignition switch to stop the engine, and disconnect the hand tester.
- ★ If the regulator/rectifier output voltage is kept between the values given in the table, the charging system is considered to be working normally.
- ★ If the output voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.
- ★ If the battery voltage does not rise as the engine speed increases, then the regulator/rectified is defective or the alternator output is insufficient for the loads, check the alternator and regulator/rectifier to determine which part is defective.

### **Alternator Inspection**

There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by again, will result in low output.

- To check the alternator output voltage, do the following procedures.
- Disconnect the alternator connector
- Connect the hand tester. (+) to red/white; (-) to white
- Start the engine.
- Run it at the rpm.
- Note the voltage readings (total 3 measurements).

### **Alternator Output Voltage:**

**Minimum of 5 AC Amps at Idle**

### **CDI Output Test: (Using Peak Reading Adaptor)**

Connect all CDI wires to stator wires. Disconnect CDI module wire from ignition coil primary terminal. Connect one lead to engine ground and the other to the ignition coil primary wire leading from the CDI module. Set meter to read DC Volts. Crank engine and check output of CDI wire to coil. Reconnect CDI wire to coil.

**Average Output w/Digital Voltmeter with or without Peak Reader:**

**200~400 DCV**

## Ignition System

### △WARNING

The ignition system produces extremely high voltage. Do not touch the spark plug, ignition coil, or spark plug lead while the engine is running, or you could receive a severe electrical shock.

### CAUTION

Do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent CDI unit damage. Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and CDI unit. Use the standard regulator/rectifier, or the CDI unit will be damaged.

### Spark Plug Removal/Installation

- Remove or install the spark plug [A] using the spark plug wrench from the vehicle right side.

**Torque - Spark Plug: 14 N-m (1.4 kgf-m, 10.0 ft-lb)**

### Spark Plug Cleaning/ Inspection

- Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high flash-point solvent and a wire brush or other suitable tool. If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard spark plug or its equivalent.

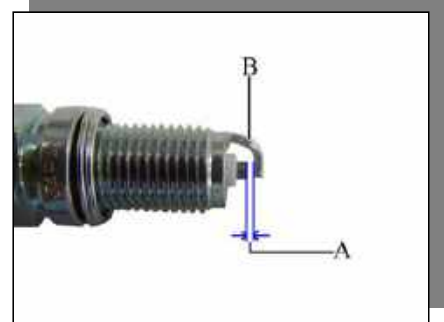
### Spark Plug Gap

- Measure the gap [A] with a wire-type thickness gauge.
- If the gap is incorrect, carefully bend the side electrode [B] with a suitable tool to obtain the correct gap.

**Spark Plug Gap 0.8 ~ 0.9 mm**

### Ignition Coil Removal

- Remove:
  - Front Side Covers (see Frame Removal)
  - Spark Plug Cap [A]
  - Primary Lead connectors
  - Bolt\*2
  - Ignition Coil



### **Ignition Coil Installation**

- Connect the primary winding leads to the ignition coil terminals

### **Ignition Coil Inspection**

- Remove the ignition coil.
- Measure the primary winding resistance as follows:
  - Connect the tester between the coil terminals.
  - Set the tester to the  $\times 1\Omega$  range, and read the tester.
- Measure the secondary winding resistance as follows:
  - Remove the plug cap by turning it counterclockwise.
  - Connect the tester between the spark plug lead and terminal.
  - Set the tester to the  $\times 1\text{ k}\Omega$  range, and read the tester.
- ★ If the hand tester does not read as specified, replace the coil.
- To install the plug cap, turn it clockwise.

### Ignition Timing Test

- Remove the ignition inspection plug [A].
- Attach the timing light and a tachometer in the manner prescribed by the manufacturer.
- Start the engine and aim the timing light at the timing mark on the Alternator rotor.
- Run the engine at the speeds specified and note the alignment of the timing marks.



#### NOTE

Do not mix up the timing marks with the top mark “T”

- ★ If the ignition timing is incorrect, replace the CDI unit and the pickup coil.

### Ignition Timing for EW45: Max 30° @3500 RPM

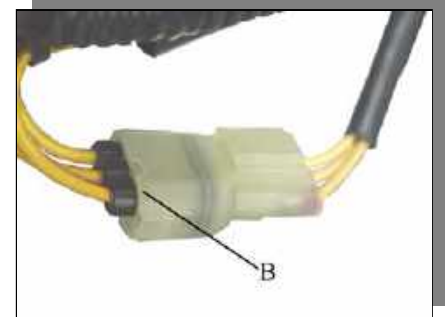
### CDI Unit Inspection

#### CAUTION

When inspecting the CDI unit, observe the following to avoid damage to the CDI unit. Do not disconnect the CDI unit with the ignition switch on. This may damage the CDI unit. Do not disconnect the battery leads while the engine is running. This may damage the CDI unit.



- Remove the seat (see Frame chapter).
- Remove the CDI unit [A] and disconnect the connectors [B].
- Set the hand tester to the  $\times 1k\Omega$  range and make the measurements shown in the table.
- ★ If the tester readings are not as specified, replace the CDI unit.



### Starter Relay Inspection

- Remove:
  - Seat (see Frame chapter)
  - Starter Relay [A]
- Connect the hand tester and 12V battery to the starter relay as shown.
- If the relay does not work as specified, the relay is defective, replace the relay.



### Testing Relay

Hand Tester Range:  $\times 1\Omega$  range

Criteria: When battery is connected  $\rightarrow 0\Omega$

When battery is disconnected  $\rightarrow \infty\Omega$



## Lighting System

### Headlight Bulb Replacement

- Remove:
  - Headlight Unit. (See Frame Removal Chapter)
  - Bulb Holder
- Slide back the dust protection , and remove the bulb from the headlight unit.
- Turn the holder counterclockwise and pull it out.
- Be sure the socket is clean.
- Insert the new bulb by aligning the tang with the notch in the headlight unit.
- Push the holder in, turn it clockwise, and release it, it should lock in position.
- Fit the dust cover completely.



### Taillight Bulb Replacement

- Remove:
  - Taillight Bracket Bolt \*2 [A]
  - Taillight Bracket Screw \*2 [B]
  - Taillight Unit
- Remove:
  - Taillight Screw \*4 [C]
- Insert the new bulb



### Indicator Bulb Replacement

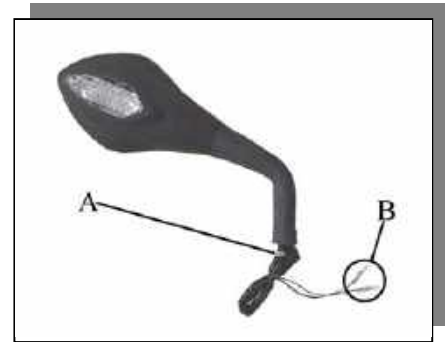
- Remove:
  - Indicator Screw [A]
  - Indicator Lens [B]
- Insert the new bulb



### Rear-View Mirror Replacement

- Loosen the nut [A] anti-clockwise and disconnect the front indicator light wire [B] to remove the mirror.
- Reverse above procedure to assemble the new mirror.
- Be sure to connect wiring with correct color as following chart.

Color	Mirror Wiring	Wiring Harness
L-Mirror	Green	Orange
	Black	Black
R-Mirror	Green	Blue
	Black	Black



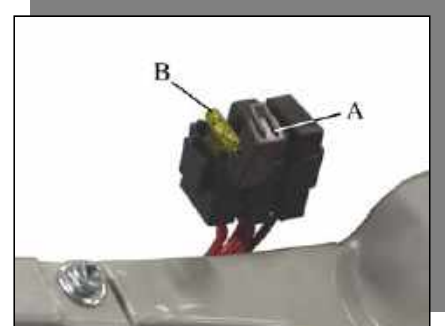
### Neutral Light Bulb Replacement

- Please refer the Headlight Bulb Replacement

### Fuses

#### Main Fuse Removal

- Remove the seat (see Frame chapter)
- Remove the fuse case cap [A] and take out the fuse [B].



#### Fuse Inspection

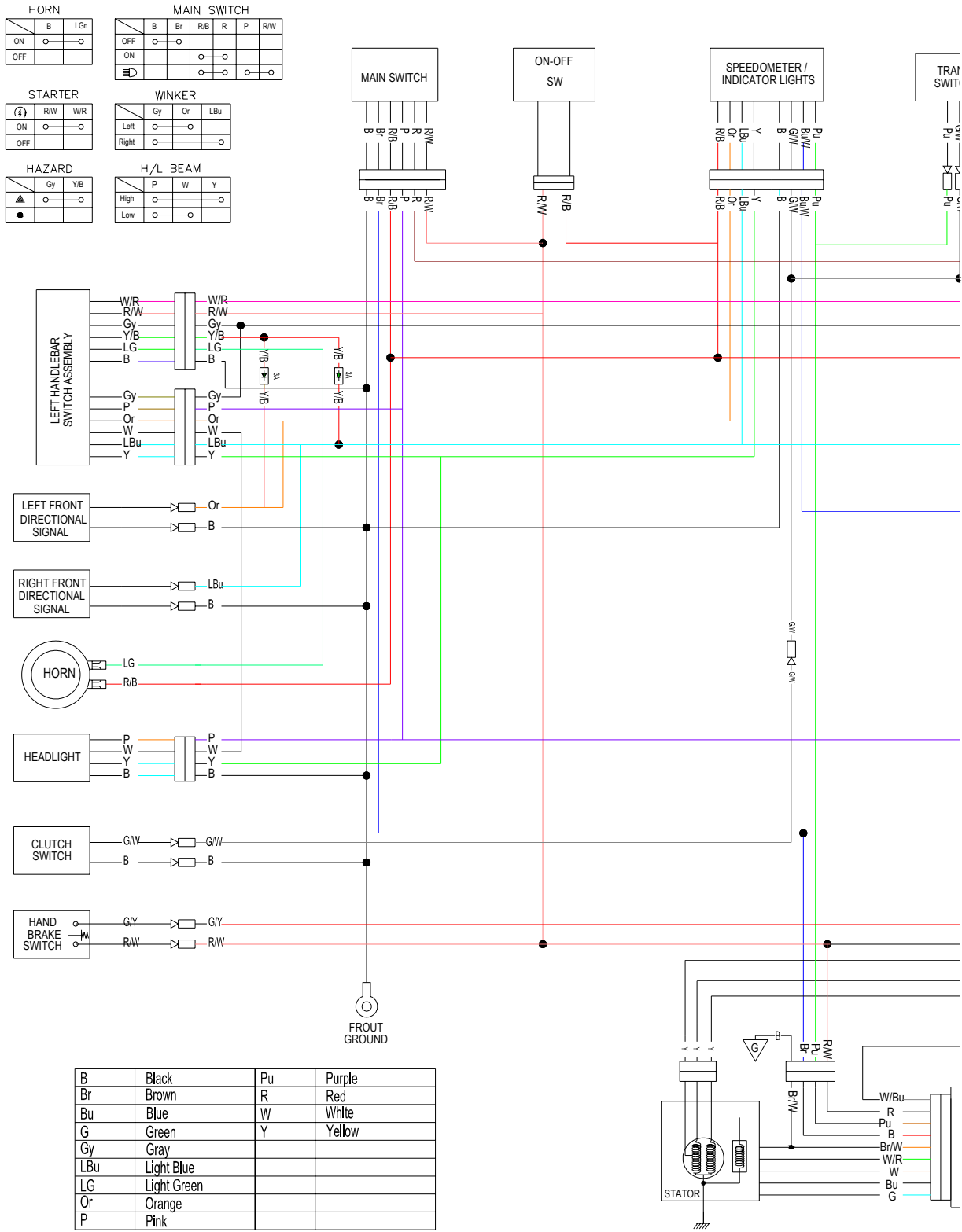
- Inspect the fuse element [A]
- ★ If it is blown out, replace the fuse. Before replacing a blow fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.



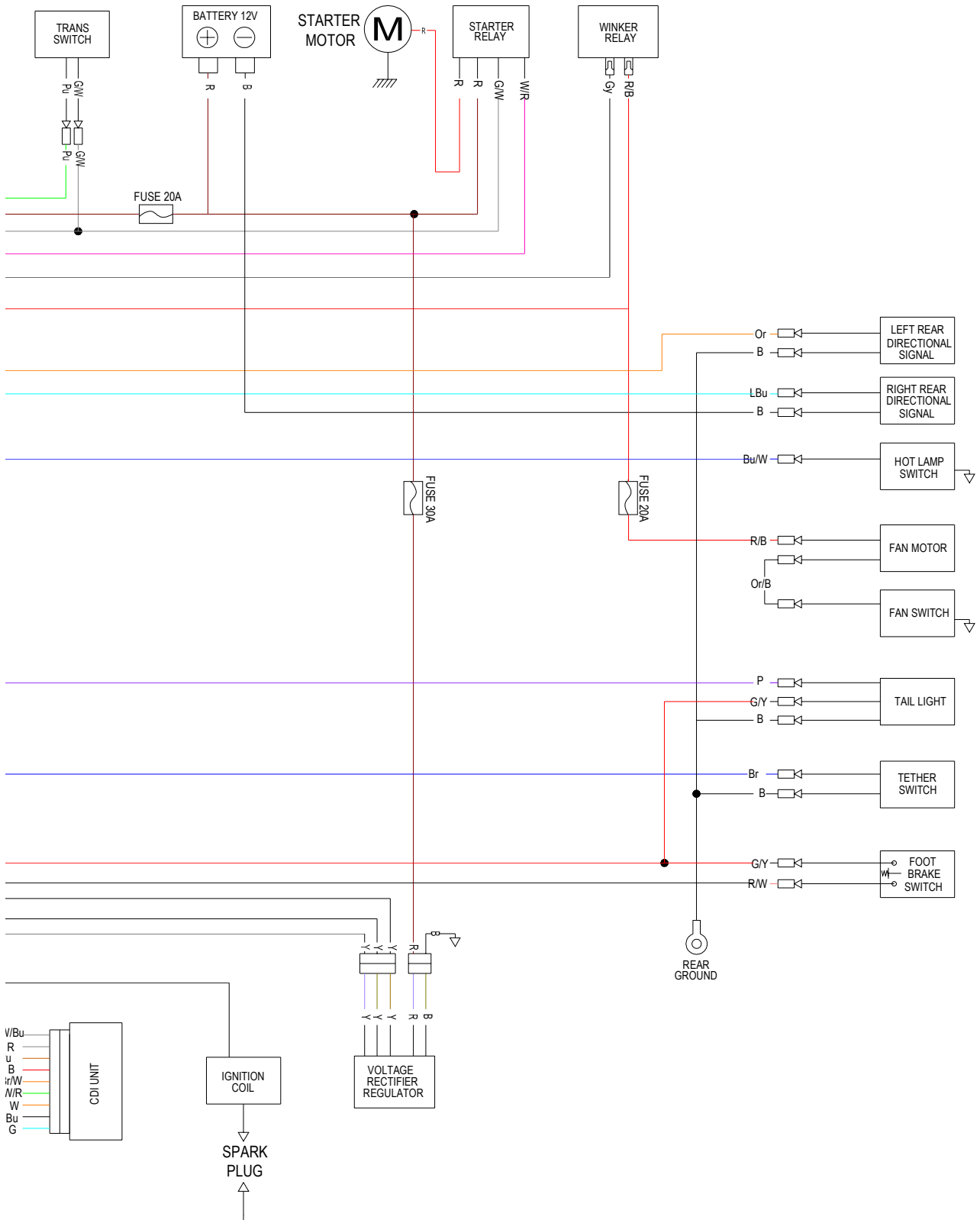
### CAUTION

**When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.**

## Wiring Diagram



# Wiring Diagram



*NOTE:*

# Appendix

## Table of Contents

Considerations for Various Riding Conditions-----	8-2
Carburetor-----	8-2
Fuel System-----	8-3
Spark Plug-----	8-4
Clutch Adjustment-----	8-6
Troubleshooting Guide-----	8-7

## Considerations for Various Riding Conditions

This vehicle has been designed and manufactured to operate under a wide range of riding conditions. However, it is not feasible to anticipate all of the conditions under which this vehicle might be used. Extremes of temperature, altitude, and riding usage may make changing some carburetor parts or the spark plug desirable to maintain the vehicle in peak operating condition.

### Carburetor:

Some an alteration may be desirable for good performance under different riding conditions when proper mixture is not obtained after the carburetor has been adjusted, and all parts cleaned and found to be functioning properly.

If the engine still exhibits symptoms of overly rich or lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced with a smaller or larger one. A smaller numbered jet gives a leaner mixture and a larger numbered jet a richer mixture.

### Carburetor Pilot Screw Adjustment:

#### Note:

Pilot screw is covered by a welsh plug. Plug removal will be required to perform these procedures.

- Start engine and warm it up to operating temperature (about 10 minutes).
- With engine off, turn pilot screw in (clockwise) until lightly seated.

#### Note:

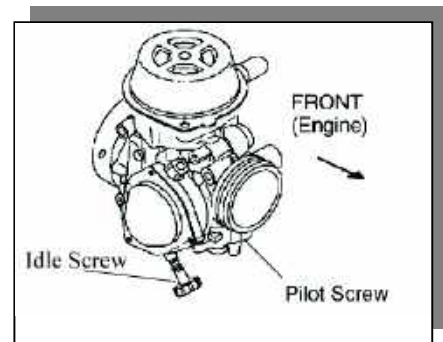
Do not tighten the pilot screw forcefully against the seat or the screw and/or seat will be permanently damaged.

- Connect an accurate tachometer that will read in increments of + or – 50 RPM. Start engine.
- Set idle speed to 1600 RPM.

#### Note:

Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.

- Slowly turn mixture screw clockwise using the pilot screw wrench until engine begins to miss.
- Slowly turn mixture screw counterclockwise until idle speed increases to maximum RPM. Continue turning counterclockwise until idle RPM begins to drop.
- Center the pilot screw between the points in Step 5 and 6.



- Readjust idle speed to specification.

Note:

Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.

### Idle Speed Adjustment

- Start engine and warm it up thoroughly.
- Adjust idle speed by turning the idle adjustment screw in (clockwise) to increase or out (counterclockwise) to decrease RPM.

Note:

Adjusting the idle speed affects throttle cable freeplay and electronic throttle control (ETC) adjustment. Always check throttle cable freeplay after adjusting idle speed and adjust if necessary.

**Idle Speed: 1600 +/- 100 RPM**

### Fuel System

<b>WARNING</b>
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<b>Gasoline is extremely flammable and explosive under certain conditions.</b>
--

- Always stop the engine and refuel outdoors or in a well ventilated area.
- Do not smoke or allow open flames or sparks in/near the area where refueling is performed or where gasoline is stored.
- Do not overfill the tank. Do not fill the tank neck.
- If you get gasoline in your eyes or if you swallow gasoline, seek medical attention immediately.
- If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.
- Never start the engine or let it run in an enclosed area. Engine exhaust fumes are poisonous and can result loss of consciousness or death in a short time.
- Never drain the float bowl when the engine is hot. Severe burns may result.

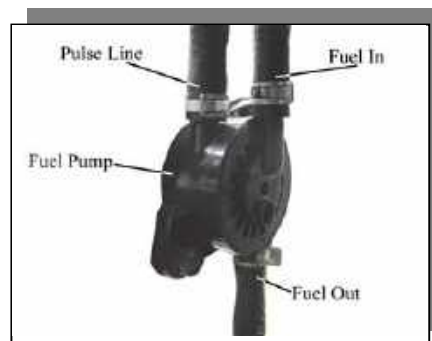
### Fuel Lines

- Check fuel lines for signs of wear, deterioration, damage or leakage. Replace if necessary.
- Be sure fuel lines are routed properly and secured with cable ties.

<b>CAUTION</b>
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<b>Make sure lines are not kinked or pinched.</b>
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- Replace all fuel lines every two years.





## Spark Plug:

The spark plug ignites the fuel and air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plug must be kept clean and the gap adjusted.

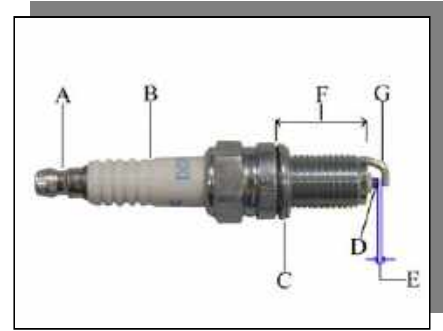
Tests have shown the plug listed in the General Information chapter to be the best plug for general use.

Since spark plug requirements change with the ignition and carburetion adjustments and with riding conditions, whether or not a spark plug of the correct heat range is used should be determined by removing and inspecting the plug.

Terminal [A]	Insulator [B]
Gasket [C]	Center Electrode [D]
Gap [E] (0.8~0.9 mm)	Reach [F]
Side Electrode [G]	

When a plug of the correct heat range is being used, the electrodes will stay hot enough to keep all the carbon burned off, but cool enough to keep from damaging the engine and the plug itself. This temperature is about 400 ~ 800 °C (750 ~ 1,450 °F) and can be judged by noting the condition and color of the ceramic insulator around the center electrode. If the ceramic is clean and of a light brown color, the plug is operating at the right temperature.

A spark plug for higher operating temperatures sometimes may be needed for severe conditions, such as continuous high-speed riding, or towing heavy loads. Such a plug is designed for better cooling efficiency so that it will not overheat and thus is often called a “colder” plug. If a spark plug with a heat range is used – that is, a “cold” plug that cools itself too well, - the plug will stay too cool to burn off the carbon, and the carbon will collect on the electrodes and the ceramic insulator.



The carbon on the electrodes conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bring across the gap. Such a short will prevent an effective spark. Carbon build-up on the plug can also cause other troubles. It can heat up red-hot and cause pre-ignition and knocking, which may eventually burn a hole in the top of the piston.

### Spark Plug Inspection

- Remove the spark plug and inspect the ceramic insulator.
- ★ Whether or not the right temperature plug is being used can be ascertained by noting the condition of the ceramic insulator around the electrode. A light brown color indicates the correct plug is being used. If the ceramic is black, it indicates that the plug is firing at too low a temperature, so the next hotter type should be used instead. If the ceramic is white, the plug is operating at too high a temperature and it should be replaced with the next colder type.

#### CAUTION

**If the spark plug is replaced with a type other than the standard plug, make certain the replacement plug has the same thread pitch and reach (length of threaded portion) and the same insulator type (regular type or projected type) as the standard plug.**

**If the plug reach is too short, carbon will build up on the plug hole threads in the cylinder head, causing overheating and making it very difficult to insert the correct spark plug later. If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, pre ignition, and possibly burning a hole in the piston top. In addition, it may be impossible to remove the plug without damaging the cylinder head.**

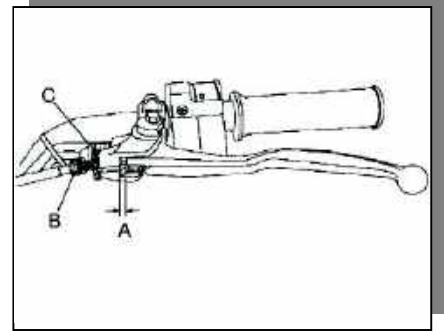
#### CAUTION

**The heat range of the spark plug functions like a thermostat for the engine. Using the wrong type of spark plug can make the engine run too hot (resulting in engine damage) or too cold (with poor performance, misfiring, and stalling).**

## Clutch Adjustment

### Clutch Lever Freeplay

- Measure clutch lever freeplay between the perch and the lever (A). This distance should be 3~4.5mm.
- If adjustment is required, slide the clutch perch pivot boot down the clutch cable to access the clutch adjustment screw (B) and lock ring (C).
- Loosen the lock ring and turn the screw in (clockwise) to increase lever travel. Turn the screw out (counterclockwise) to decrease lever travel. Tighten the lock ring.
- Squeeze the lever fully and release. Slightly squeeze the lever again until a slight resistance is felt. Measure the freeplay again. If necessary, repeat the adjustment procedure until proper freeplay is attained.
- Replace the clutch perch pivot boot over the screw and lock ring.



## Troubleshooting Guide

### NOTE

○ This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.

### Engine Doesn't Start, Starting Difficulty:

#### Starter motor not rotating:

- Neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Relays not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch trouble
- Engine stop switch trouble
- Fuse blown

#### Starter motor rotating but engine doesn't turn over:

- Starter motor clutch trouble

#### Recoil starter not operating

- Recoil starter spring broken
- Recoil starter pawl not engaging

#### Engine won't turn over:

- Valve seizure
- Rocker arm seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Balancer bearing seizure

#### No fuel flow:

- Fuel tank air vent obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

#### Engine flooded:

- Fuel level too high
- Float valve worn or stuck open
- Starting technique faulty  
(when flooded, crank the engine with the throttle fully opened to allow more air to reach the engine.)

#### Fuel/air mixture incorrect:

- Pilot screw and/or idle adjusting screw maladjusted
- Pilot jet, or air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Starter jet clogged.

#### No spark; spark weak:

- Spark plug dirty, broken, or maladjusted
- Spark plug cap or spark plug lead trouble
- Spark plug cap not in good contact
- Spark plug incorrect
- Pickup coil trouble

CDI unit trouble

- Ignition coil trouble
- Battery voltage low
- Ignition or engine stop switch shorted
- Wiring shorted or open
- Fuse blown

#### Compression Low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

#### Poor Running at Low Speed:

##### Spark weak:

- Spark plug dirty, broken, or maladjusted
- Spark plug cap or Spark plug lead trouble.
- Spark plug cap shorted or not in good contact
- Spark plug incorrect
- CDI unit trouble
- Pickup coil trouble
- Ignition coil trouble
- Battery voltage low

##### Fuel/air mixture incorrect:

- Pilot screw and/or idle adjusting screw maladjusted
- Pilot jet, or air passage clogged
- Starter plunger stuck open
- Air cleaner clogged, poorly sealed, or missing
- Fuel level too high or too low
- Fuel tank air vent obstructed
- Carburetor holder loose
- Air cleaner duct loose

##### Compression low:

- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

**Other:**

Carburetor vacuum piston doesn't slide smoothly  
Engine oil viscosity too high  
Brake dragging  
CDI unit trouble  
Front or rear final gear case oil viscosity too high

**Poor Running or No Power at High Speed:****Firing incorrect:**

Spark plug dirty, broken, or maladjusted  
Spark plug cap or Spark plugs lead trouble.  
Spark plug cap shorted or not in good contact  
Spark plug incorrect  
Pickup coil trouble  
CDI unit trouble  
Ignition coil trouble

**Fuel/air mixture incorrect:**

Main jet clogged or wrong size  
Jet needle or needle jet worn  
Main air jet clogged  
Bleed holes of air bleed pipe or needle jet clogged  
Fuel level too high or too low  
Air cleaner clogged, poorly sealed, or missing  
Starter plunger stuck open  
Water or foreign matter in fuel  
Carburetor holder loose  
Air cleaner duct loose  
Fuel tank air vent obstructed  
Fuel tap clogged  
Fuel line clogged

**Compression low:**

Spark plug loose  
Cylinder head not sufficiently tightened down  
No valve clearance  
Cylinder, piston worn  
Piston rings bad (worn, weak, broken, or sticking)  
Piston ring/groove clearance excessive  
Cylinder head gasket damaged  
Cylinder head warped  
Valve spring broken or weak  
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

**Knocking:**

Carbon built up in combustion chamber  
Fuel poor quality or incorrect  
Spark plug incorrect  
CDI unit trouble

**Miscellaneous:**

Throttle valve won't fully open  
Carburetor vacuum piston doesn't slide smoothly  
Brake dragging  
Overheating  
Engine oil level too high  
Engine oil viscosity too high  
Balancer mechanism malfunctioning  
Front or rear final gear case oil viscosity too high.

**Overheating:****Firing incorrect:**

Spark plug dirty, broken, or maladjusted  
Spark plug incorrect  
CDI unit trouble

**Fuel/air mixture incorrect:**

Main jet clogged  
Fuel level too low  
Carburetor holder loose  
Air cleaner poorly sealed, or missing  
Air cleaner duct loose  
Air cleaner clogged

**Compression high:**

Carbon built up in combustion chamber

**Engine load faulty:**

Engine oil level too high  
Engine oil viscosity too high  
Drive train trouble  
Brake dragging

**Lubrication inadequate:**

Engine oil level too low  
Engine oil poor quality or incorrect

**Front or rear final gear case overheating:**

Insufficient oil  
Bevel gears maladjusted

**Converter Operation Faulty:****Belt slipping:**

Belt dirty, worn, or wetted  
Drive or driven pulley sheave dirty or worn  
Drive pulley spring broken or weak

**Converter engagement speed too low:**

Drive pulley spring broken or weak.

**Converter engagement speed too high:**

Belt drive or worn  
Drive or driven pulley sheave dirty worn.  
Drive pulley weight doesn't move smoothly.  
Drive pulley movable sheave doesn't move smoothly  
Drive or driven pulley movable sheave bush worn  
Drive pulley weight or roller worn.

**Shifting too quickly:**

Drive pulley spring weak  
Driven pulley spring weak or incorrectly installed (too loose)

**Shifting too slowly:**

Belt dirty or worn  
Drive or driven pulley sheave dirty or worn  
Drive pulley weight doesn't move smoothly.  
Drive pulley movable sheave doesn't move smoothly  
Driven pulley spring incorrectly installed (too tight)  
Drive pulley movable sheave doesn't move smoothly

**Gear Shifting Faulty:****Doesn't go into gear:**

Shift arm bent or seized  
Gear stuck on the shaft  
Shift tie-rod maladjusted  
Shift tie-rod damaged

**Jumps out of gear:**

Shifter groove worn  
Gear dogs worn  
Shift block worn  
Shift arm positioning bolt spring weak or broken  
Shift tie-rod maladjusted  
Drive shaft, output shaft, and/or gear worn

**Over shifts:**

- Shift arm positioning bore spring weak or broken
- Shift tie-rod maladjusted

**Abnormal Engine Noise:**

**Knocking:**

- CDI unit trouble
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect
- Overheating

**Piston Slap:**

- Cylinder/piston clearance excessive
- Cylinder, piston holes worn
- Connecting rod bent
- Piston pin, piston holes worn

**Valve noise:**

- Valve clearance incorrect
- Valve spring broken or weak
- Camshaft bearing worn
- Rocker arm worn

**Other noise:**

- Connecting rod small end clearance excessive
- Connecting rod big end clearance excessive
- Piston ring worn, broken, or stuck
- Piston seizure, damage
- Cylinder head gasket leaking
- Exhaust pipe leaking at cylinder head connection
- Crankshaft runout excessive
- Engine mounts loose
- Crankshaft bearing worn
- Camshaft chain tensioner trouble
- Camshaft chain, sprocket, guides worn
- Balancer bearing worn
- Balancer gear worn or shipped
- Loose alternator rotor

**Abnormal Drive Train Noise:**

**Converter noise:**

- Belt worn
- Drive or driven pulley sheave worn
- Drive or driven pulley movable sheave bush worn
- Drive or driven pulley mount loose.
- Drive pulley shoe worn
- Drive pulley weight or roller side washer worn
- Drive pulley weight or roller worn
- Wear guides worn

**Transmission noise:**

- Bearing worn
- Transmission gears worn or chipped
- Metal chips jammed in gear teeth
- Engine oil insufficient or too thin

**Front or rear final gear case noise:**

- Insufficient lubricant
- Incorrect oil (Front final gear case)
- Bevel gear bearings worn
- Bevel gears worn or chipped
- Bevel gears maladjusted

**Front axle or propeller shaft noise:**

- Constant velocity universal joint damaged

**Abnormal Frame Noise:**

**Shock absorber noise:**

- Shock absorber damaged

**Disc brake noise:**

- Pad installed incorrectly
- Pad surface glazed
- Disc warped
- Caliper trouble

**Other noise:**

- Bracket, nut bolt, etc. not properly mounted or tightened.

**Exhaust Smokes Excessively:**

**White smoke:**

- Piston oil ring worn
- Cylinder worn
- Valve oil seal damaged
- Valve guide worn
- Cylinder head gasket damaged
- Engine oil level too high

**Black Smoke:**

- Air cleaner clogged
- Main jet too large or fallen off
- Starter plunger stuck open
- Fuel level too high

**Brown smoke:**

- Main jet too small
- Fuel level too low
- Air cleaner duct loose
- Air cleaner poorly sealed or missing

**Handling and/or stability Unsatisfactory**

**Handlebar hard to turn:**

- Tire air pressure too low
- Steering stem bearing damaged
- Steering stem bearing lubrication inadequate
- Steering stem bent
- Damaged steering knuckle joint
- Damage tie-rod end

**Handlebar shakes or excessively vibrates:**

- Tire worn
- Wheel rim warped
- Rear axle runout excessive
- Wheel bearing worn
- Handlebar clamp loose

**Handlebar pulls to one side:**

- Frame bent
- Wheel maladjustment
- Suspension arm bent or twisted
- Steering stem bent
- Front or rear tire air pressure unbalanced
- Front shock absorber unbalanced

**Shock absorption unsatisfactory:**

- Too hard:
  - Tire air pressure too high
  - Shock absorber maladjusted
- Too soft:
  - Shock absorber oil leaking
  - Shock absorber spring weak
  - Tire air pressure too low
  - Shock absorber maladjusted

**Break Doesn't Hold**

**Front brake:**

- Air in the brake line
- Brake fluid leakage
- Brake fluid deteriorated
- Primary or secondary cup trouble
- Master cylinder scratched inside
- Pad over worn or worn unevenly
- Oil, grease on pads and disc
- Disc worn or warped
- Brake overheated

**Rear Brake:**

- Brake not properly adjusted
- Linings over worn or worn unevenly
- Drum worn unevenly or scored
- Oil, grease on lining and drum
- Dirt, water between lining and drum
- Overheated

**Battery Discharged:**

- Battery faulty (e.g., plates sulfated, shorted through Sedimentation, electrolyte level too low)
- Battery leads making poor contact
- Load excessive (e.g., bulb of excessive wattage)
- Ignition switch trouble
- Regulator/ rectifier trouble
- Alternator trouble
- Wring faulty

**Battery Over charged:**

- Regulator/rectifier trouble
- Battery trouble



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